



Structural Standard Exhibit

PREPARED FOR



DATE

December 2025

REFERENCE

Oregon Energy Facility Siting Council

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CLIENT: DECH bn, LLC

PROJECT NO: Oregon Energy Facility Siting Council

DATE: December 2025

VERSION: 01

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ACRONYMS AND ABBREVIATIONS

Acronym	Description
ANS Geo	ANS Geo, Inc.
ASCE	American Society of Civil Engineers
Applicant	DECH bn, LLC
BESS	Battery energy storage system
BMP	Best Management Practices
BPA	Bonneville Power Administration
DOGAMI	Department of Geology and Mineral Industries
ESCP	Erosion and Sediment Control Plan
Facility	Solar photovoltaic power generation facility and related or supporting facilities in Wasco County, Oregon
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
IBC	International Building Code
NRCS	National Resources Conservation Service
OAR	Oregon Administrative Rule
OSSC	Oregon Structural Specialty Code
USGS	U.S. Geological Survey

1. INTRODUCTION

DECH bn, LLC (Applicant) plans to construct a solar photovoltaic power generation facility and related or supporting facilities in Wasco County, Oregon (Facility). The Facility will include up to 1,000 megawatts of solar capacity and a battery energy storage system (BESS) with up to 4,000 megawatt hours storage capacity. This Structural Standard Exhibit has been prepared to meet the requirements in OAR 345-022-0020.

2. ANALYSIS AREA

The analysis area for geologic and soil stability is the site boundary, which is defined in the Background Information Exhibit and is shown in Attachment 1, Figure 1. Additionally, a 50-mile buffer around the site boundary was considered in assessing historical seismic activity and potentially active faults that may impact the Facility.

3. GEOLOGIC REPORT

OAR 345-022-0020(4) To assist the Council in determining whether the standard outlined in (1) through (3) has been met, the Applicant must submit information from reasonably available sources regarding the geological and soil stability within the analysis area, including:

- (a) A geologic report meeting the Oregon State Board of Geologist Examiners geologic report guidelines. Current guidelines must be determined based on consultation with the Oregon Department of Geology and Mineral Industries, as described in paragraph (B) of this subsection;*
- (b) A summary of consultation with the Oregon Department of Geology and Mineral Industries regarding the appropriate methodology and scope of the seismic hazards and geology and soil-related hazards assessments, and the appropriate site-specific geotechnical work that must be performed before submitting the application for the Department to determine that the application is complete;*

The Applicant has confirmed with the Oregon Department of Geology and Mineral Industries (DOGAMI) that the Oregon State Board of Engineering Geology (2014) Reports are the current guidelines that apply to the Facility. Consultation with DOGAMI is described in Section 4.

The Applicant has reviewed and used publicly available information to characterize geologic conditions and potential seismic hazards in the vicinity of the Facility. This information includes aerial and site photographs, geologic maps, and geotechnical reports. Subsurface explorations, testing, and engineering analysis conducted prior to design and construction are described in Section 5.

The site boundary is within the Columbia Plateau physiographic province, a relatively flat plateau spanning parts of Washington, Oregon, and Idaho. The Applicant has selected the site boundary for its mostly flat topography and exposure to sunlight. Within the area where solar panels will be developed, ground surface elevation ranges from approximately 1,800 feet above mean sea level (msl) to approximately 2,100 feet msl. Ground surface elevation in the southern portion of the site boundary, where the gen-tie will be developed, steepens up to approximately 3,100 feet msl.



The surficial and bedrock deposits within the site boundary are the Deschutes Formation, Grande Ronde Basalt, Wanapum Basalt, and colluvial deposits (DOGAMI, 2020). A geologic map is provided as Attachment 1, Figure 1.

- The Deschutes Formation is present in the eastern portion of the site boundary and includes Miocene and Pliocene-aged basalt flows, ignimbrites, lahar deposits, ash-flow and air-fall tuffs, and fluvial sediments (Sherrod & Scott, 1995).
- The Grande Ronde Basalt is present in the southern portion of the site and includes Miocene-aged, fine-grained basalt (Sherrod & Scott, 1995).
- The Wanapum Basalt is present in the southeastern portion of the site and includes Miocene-aged, fine- to medium-grained basalt. The Wanapum Basalt is slightly younger than the Grande Ronde Basalt (Sherrod & Scott, 1995).
- The colluvial deposits are present in the southern portion of the site. These poorly-sorted, Holocene and Pleistocene-aged deposits form sheets and fans on lower parts of valley walls (Sherrod & Scott, 1995).
- The unmapped geology in the western portion of the site (Attachment 1, Figure 1) may be Pliocene and Pleistocene-aged sedimentary rocks (Burns et al., 2023).

The bedrock geology on-site was compared to additional information from DOGAMI (2021a) for continuity and consistency¹. Surficial soils in the site boundary are described in the Soil Protection Exhibit.

4. CONSULTATION WITH DOGAMI

OAR 345-022-0020(4)(b) A summary of consultation with the Oregon Department of Geology and Mineral Industries regarding the appropriate methodology and scope of the seismic hazards and geology and soil-related hazards assessments, and the appropriate site-specific geotechnical work that must be performed before submitting the application for the Department to determine that the application is complete;

The Applicant consulted with DOGAMI on 18 June 2025 during an online meeting. Topics discussed including the Facility's general preliminary layout, the analysis area geology, the seismic and non-seismic hazard desktop assessment, and the preliminary geotechnical investigation (Section 5). DOGAMI concurred with the sources utilized and analysis completed at the time of consultation and suggested additional sources, which were incorporated into the analysis presented in this Exhibit. Meeting notes and email correspondence with DOGAMI and ODOE are provided in Attachment 2.

¹ The DOGAMI 2021 GMS-127 Geologic Map of the Dufur Area, Waso County listed in the Project Order was reviewed but did not overlap with the site boundary.

5. SITE-SPECIFIC GEOTECHNICAL INVESTIGATION

OR 345-022-0020(4)(c) A description and schedule of site-specific geotechnical work that will be performed before construction for inclusion in the site certificate as conditions;

ANS Geo, Inc. performed a preliminary geotechnical investigation program for the Facility, which is described in a report dated 1 April 2025 (the Geotech Report). The Geotech Report was signed and sealed by a registered professional engineer in the state of Oregon, which meets industry standards. The Geotech Report field work was executed from September to October 2024 to provide information to support the design and construction of the Facility. The field program consisted of 16 pile load tests, 25 test pit excavations, 9 in-situ electrical resistivity tests, 4 infiltration tests, laboratory thermal resistivity and corrosion tests, laboratory California Bearing Ratio (CBR) tests, and laboratory soil index tests. Test locations included the solar array areas, substation and switchyard, and BESS area. Additionally, surficial geology, bedrock geology, topography, and wetlands were reviewed.

The Geotech Report summarizes the existing geological conditions for which ANS Geo, Inc. (ANS Geo) encountered soil stratigraphy consisting of topsoil followed by clay, cobbles and boulders, and bedrock. Risk of soil liquefaction and swelling were deemed low. Shallow bedrock was encountered from 2.2 feet to 8.5 feet below the ground surface which may impact PV foundation design and installation. Water was observed in two test pits at depths of 4.2 and 8 feet below ground surface.

The preliminary geotechnical report and preliminary design recommendations are provided in Attachment 3. It is possible that field and subsurface conditions may vary at the time of construction depending on the excavation depths, weather, drainage, or construction practices that disturb the subsurface. Therefore, field conditions will be verified at the time of construction.

6. TRANSMISSION LINES AND PIPELINES

OR 345-022-0020(4)(d) For all transmission lines, and for all pipelines that would carry explosive, flammable or hazardous materials, a description of locations along the proposed route where the applicant proposes to perform site specific geotechnical work, including but not limited to railroad crossings, major road crossings, river crossings, dead ends (for transmission lines), corners (for transmission lines), and portions of the proposed route where geologic reconnaissance and other site specific studies provide evidence of existing landslides, marginally stable slopes or potentially liquefiable soils that could be made unstable by the planned construction or experience impacts during the facility's operation;

The Facility will interconnect via a half mile gen-tie line to the existing 500-kilovolt Bonneville Power Administration Marion-Buckley transmission line in the southern portion of the site boundary. A preliminary geotechnical investigation completed 6 test pits in and around the BESS and substation boundaries (Attachment 3). Bedrock at these locations ranged from 2.8 feet to 3.1 feet below ground. Surveyed land was described as flat, with low plasticity cohesive soils of little



swell and liquefaction potential. Slope stability risk was deemed negligible. Further geotechnical testing will be conducted along the gen-tie corridor and throughout the Facility boundary prior to starting design. There are no railroad crossings, major road crossings, or river crossings along the gen-tie line (see Attachment 1 in the Background Information Exhibit). The Marion-Buckley transmission line crosses minor roads within and around the site boundary.

The Facility does not have a pipeline. Therefore, this provision is not applicable.

7. SEISMIC HAZARD ASSESSMENT

OAR 345-022-0020(4)(e) An assessment of seismic hazards, in accordance with standard-of-practice methods and best practices, that addresses all issues relating to the consultation with the Oregon Department of Geology and Mineral Industries described in paragraph (B) of this subsection, and an explanation of how the applicant will design, engineer, construct, and operate the facility to avoid dangers to human safety and the environment from these seismic hazards. Furthermore, an explanation of how the applicant will design, engineer, construct and operate the facility to integrate disaster resilience design to ensure recovery of operations after major disasters. The applicant must include proposed design and engineering features, applicable construction codes, and any monitoring and emergency measures for seismic hazards, including tsunami safety measures if the site is located in the DOGAMI-defined tsunami evacuation zone

7.1 OVERVIEW OF SEISMIC HAZARDS

Earthquakes are ground movements caused by sudden movement at a fault; energy from these movements travels through the earth as seismic waves. Earthquakes in Oregon can occur due to interpolate (i.e., between two tectonic plates), intraplate (i.e., within a single tectonic plate), volcanic, and crustal movements (DOGAMI, 2010). Generally, the largest earthquakes occur at the Cascadia Subduction Zone along the coast of Oregon, where the Juan De Fuca and North American plates converge 1 to 2 inches per year. The Oregon Resilience Plan by the Oregon Seismic Safety Policy Advisory Commission (OSSPAC, 2013) categorizes parts of the state into Cascadia Scenario impact zones. The site boundary is in the 'eastern impact zone', corresponding to 'light damage' from a magnitude 9.0 Cascadia Subduction Zone earthquake. More recently, the Cascadia Subduction Earthquake Model (DOGAMI, 2021) predicts the analysis area to experience moderate to strong shaking, but light to very light potential damage. Light damage could include very light shaking felt outdoors, small unstable objects upset, and liquids disturbed or spilled. If a magnitude 9.0 Cascadia Subduction Zone earthquake were to occur, services and functions would not be disrupted and/or would be restored rapidly in the eastern impact zone.

Smaller-scale, regional earthquakes may also occur throughout Oregon along faults because of crustal deformation from the Cascadia Subduction Zone and volcanism. Faults in Oregon are mapped and characterized: active faults have had displacement within the last 10,000 years and potentially active faults have had movement within the last 1.6 million years (i.e., the Quaternary period). Earthquakes occurring at faults are shallow, originating 6 to 12 miles below the earth's surface (DOGAMI, 2024a, 2024c). Notable faults in Oregon include the Basin and Range Faults,

Brothers Fault, Cascadia Fault, Corvallis Fault, Gales Creek and Portland Hills Faults, and John Day Fault.

Additionally, small earthquake “swarms²²” may occur near volcanoes such as Mount Hood. Non-seismic volcanic hazards are discussed in Section 8.1.2. Seismic events are typically small in magnitude (below $M = 4$) but have reached strength of $M = 6.1$ (Braunmiller et al., 2014). Maupin had one such “swarm” from 2006 to 2011 in which events did not exceed $M = 4.0$. (Johnson, 2011; Braunmiller et al., 2014). Another “swarm” could occur, but if events have a small magnitude, substantial damage is unlikely. Seismic hazard mitigation is discussed in Section 7.3.

7.2 METHODS

The Applicant conducted a desktop review of publicly available data to evaluate the potential for earthquakes and other seismic hazards to occur within the site boundary. The desktop review included publicly available geologic and topographic maps, aerial photographs, geologic reports, and data provided by DOGAMI, the Oregon Water Resources Department, U.S. Geological Survey (USGS), and the National Resources Conservation Service (NRCS). This evaluation included:

- Building code review and calculation of the ‘design seismic event’
- Identification and characterization of potential earthquakes
- Evaluation of seismic hazards

From this review, the Applicant recommends mitigation measures based on site-specific conditions, including specific seismic events that may impact the site, potential for seismic energy amplification at the site, and site-specific response spectrum.

7.2.1 BUILDING CODE REVIEW AND CALCULATION OF THE ‘DESIGN SEISMIC EVENT’

Oregon follows International Building Code (IBC) supplemented by the 2022 Oregon Structural Specialty Code (OSSC). The IBC Chapter 16, Section 1613 contains design codes relating to geology, seismicity, and near-surface soil. The IBC and the OSSC recommend that all new construction be designed for the maximum considered earthquake (i.e., ground motion), referred to as the ‘design seismic event’. The Applicant estimated the potential ground motions within the site boundary from the 2018 USGS National Seismic Hazard Mapping Project (USGS, 2018) and the USGS unified hazard tool. Tool inputs include site boundary location, Site Class C, and a design event with a 2 percent probability of exceedance in 50 years (or a 2,475-year return period).

The tool calculates a design seismic event with a soil amplification factor (F_a) of 1.3 and peak ground acceleration (PGA) of 0.2052 acceleration from gravity at the bedrock surface. The values of PGA on rock are an average representation of the acceleration most likely to occur at the site boundary for all earthquakes (USGS, 2018).

²² The “swarm” designation is typically applied to multiple earthquakes occurring in a relatively small area that do not fit the pattern of a mainshock-aftershock sequence (USGS, 2019).

The preliminary geotechnical investigation (Attachment 3) classified the site as Site Class C and Risk Category II. The following seismic ground motion values were calculated:

- 0.2 second spectral response acceleration, $S_s = 0.457$ g
- 1 second spectral response acceleration, $S_1 = 0.211$ g
- Maximum spectral acceleration for short periods, $S_{MS} = 0.594$ g
- Maximum spectral acceleration for a 1-second period, $S_{M1} = 0.317$ g
- 5 percent damped design spectral acceleration at short periods, $S_{DS} = 0.396$ g
- 5 percent damped design spectral acceleration at 1-second period, $S_{D1} = 0.211$ g

Probabilistic seismic hazard deaggregation at 475-year and 2,475-year intervals as run on the USGS Unified Hazard Tool are presented in Attachment 4.

7.2.2 IDENTIFICATION AND CHARACTERIZATION OF POTENTIAL EARTHQUAKES

No active or potentially active faults are mapped within the site boundary; the closest potentially active fault is approximately 8 miles north of the site boundary (USGS, 2018; Attachment 1, Figure 2). Earthquakes up to magnitude 4.6 have occurred within 50 miles of the site boundary. Earthquakes of this magnitude (i.e. up to 4.6 magnitude) have the potential to cause minor damage. A Table of recorded earthquakes, including the year, epicenter coordinates, and magnitude is provided in Attachment 5 (USGS, 2024).

The American Society of Civil Engineers (ASCE) Hazard Tool within the Geotechnical Report (Attachment 3) lists the design response spectrum based on ASCE/Structural Engineering Institute 7-22 standards. Response spectra are provided for the design seismic event at the site boundary³. The report was completed assuming risk category II and Site Class C as determined by the preliminary geotechnical report. Risk category II is reserved for most buildings and generally assumes lower hazard to communities. Site Class C is generally suited for soft rock and very stiff or dense soil.

7.2.3 EVALUATION OF SEISMIC HAZARDS

Seismic related hazards include ground shaking/ground motion, fault rupture, liquefaction, seismically induced landslides, and subsidence.

- Ground shaking or ground motion is the frequency and intensity of earthquakes and other ground vibrations caused by tectonic movements or volcanic activity. Earthquakes are discussed in Sections 7.1 through 7.2.2.
- Fault Rupture is when movement on a fault deep within the earth breaks through to the surface. This occurs during periods of seismic activity. The probability of a fault rupture within the site boundary is low because there are no active or potentially active faults within the site boundary. There are also no active faults within 50 miles of the site boundary and the closest

³ Note that the ASCE Hazard Tool requires specific coordinates; the output may vary slightly but insignificantly across the site boundary depending on specific coordinates plugged into the tool.

potentially active fault is approximately 8 miles from the site boundary (Attachment 1, Figure 2).

- Liquefaction is when water-saturated sediment temporarily loses strength due to strong ground shaking and acts like a fluid. Soil liquefaction within the site boundary is unlikely to occur because the soils within the site boundary are not saturated and because there is low earthquake potential (Attachment 3).
- Seismically induced landslides occur when earthquakes cause landslides and other mass wasting processes. Landslides have been mapped within the site boundary and outside the site boundary (Attachment 1, Figures 3 and 4); however, landslides can be triggered by non-seismic activity, so landscape deposits are not necessarily indicative of earthquakes. Landslides are discussed further in Section 8.1.
- Subsidence is the sudden sinking or gradual settling of the land surface. Subsidence can occur because of earthquakes or can occur because of non-seismic related activities (e.g., groundwater drawdown, mining, or blasting activity). The site boundary is outside of the M9 subsidence zone identified in the Oregon Resilience Plan (2013). Since bedrock is shallow and soil is cohesive (Attachment 3), risk of subsidence is low.

Mitigation measures to discuss these potential seismic hazards are discussed below in Section 7.3.

7.3 SEISMIC HAZARD MITIGATION

The Facility will be designed to meet or exceed the minimum requirements specified in the IBC and OSSC adopted by the State of Oregon at the time of construction. Oregon follows the IBC 2021 code for structural design, specifically, Section 1613 (Earthquake Loads) of the 2022 OSSC, which is in Chapter 16. Following IBC and OSSC guidelines for Site Class C, the 'design seismic event' for this Facility will have a 2 percent chance of exceedance within the next 50 years (equivalent to a 2,475-year recurrence interval). Conservatively, the Facility will be designed for no life-threatening structural damage from the design seismic event or from secondary hazards such as landslides, liquefaction, or subsidence. Seismic hazards associated with a design seismic event could include ground shaking and instability from landslides or subsurface movement. However, impacts on the Facility from these hazards are likely low and, if a seismic event were to occur, solar facilities pose low risk to human safety because arrays are close to the ground and supported on multiple pile-type foundations that distribute forces over a larger ground surface. Additionally, only 10 to 20 full-time O&M staff are expected to work the site at a time, which further reduces risk.

Additionally, a preliminary site-specific geotechnical investigation was completed to confirm geological data to support Facility design to mitigate potential seismic hazards and is discussed in Section 5. Given that the site is generally flat, slope stability risk is negligible and components of the Facility will avoid steep slopes.

8. NON-SEISMIC GEOLOGICAL HAZARDS

OAR 345-022-0020(4)(f) An assessment of geology and soil-related hazards which could, in the absence of a seismic event, adversely affect or be aggravated by the



construction or operation of the facility, in accordance with standard-of-practice methods and best practices, that address all issues relating to the consultation with the Oregon Department of Geology and Mineral Industries described in paragraph (B) of this subsection. An explanation of how the applicant will design, engineer, construct and operate the facility to adequately avoid dangers to human safety and the environment presented by these hazards, as well as:

(A) An explanation of how the applicant will design, engineer, construct and operate the facility to integrate disaster resilience design to ensure recovery of operations after major disasters; and
(B) An assessment of future climate conditions for the expected life span of the proposed facility and the potential impacts of those conditions on the proposed facility.

8.1 OVERVIEW OF NON-SEISMIC HAZARDS

Non-seismic geological hazards in the Columbia Plateau may include landslides, volcanic activity, erosion, flooding, and shrinking and swelling soils as discussed below. Overall, none of the non-seismic hazards are likely to occur.

8.1.1 LANDSLIDES

Oregon's Statewide Landslide Information Database did not identify any active landslides within the site boundary (Attachment 1, Figure 2). The closest mapped landslides were approximately half a mile south of the site boundary, where the topography steepens.

Per DOGAMI's suggestion (Attachment 2), additional desktop landslide analysis was conducted. Landslide mapping completed for Wasco County by Burns et al. (2023) identified confident consequential landslides within the southern portion of the site boundary, where topography steepens (Attachment 1, Figure 3). The data do not indicate whether the landslides were seismically-induced.

Landslide deposits were also analyzed within a 50-mile buffer around the site boundary (Attachment 1, Figure 4). Mapped landslide deposits appear to be likely landslides, although with less confidence than the landslides referenced within the site boundary (Attachment 1, Figure 3). Landslides have also occurred in the White River outside of the site boundary. Generally, areas of heavier landslide activity are concentrated near Mount Hood, the Hood River, and Mount Hood National Forest. The data does not indicate whether the landslides were seismically induced.

Solar development will be on the flat portion of the site where landslide deposits have not been mapped.

8.1.2 VOLCANIC ACTIVITY

Volcanic activity occurs in Oregon along the Cascade Volcanic Arc where the Juan de Fuca Plate subducts beneath the North American Plate. The closest volcano to the site boundary is Mount Hood, approximately 23 miles northwest from the site boundary. Mount Hood is an active volcano that last erupted in 1865 (USGS, 2023). According to the National Volcano Early Warning System, the threat potential of Mount Hood is very high (USGS, 2018). Although Mount Hood is not explosive, it has produced lava flows 6 to 8 miles from their source (USGS, 2010) and lahars that flow down the Sandy and White River valleys (USGS, 2023). If Mount Hood erupts, the Facility is

beyond reach of lava flows but may be impacted by ash fallout or lahar flow at the White River, to the northwest of the site boundary. The location and severity of ash fallout from an eruption of Mount Hood will depend on the prevailing wind direction. Lahars are typically confined to the valley in which they flow and the Facility structures will be set back from the White River valley. In the event of lahar flow, the Facility would have about 1 to 1.5 hours as warning to complete emergency procedures before seeing lahar flow in the White River (USGS, 2023). Seismic events related to volcanic activity are discussed in Section 7.1.

8.1.3 EROSION

Erosion may occur due to several factors, including wind, water, agriculture, ice, and gravity. The Universal Soil Loss Equation utilizes six factors to predict the average annual rate of soil loss by sheet and rill erosion in tons-per-acre-per-year. One of these is the erosion factor (K), which indicates susceptibility of the soil to sheet and rill erosion by water. Estimates of K are based on soil structure, saturated hydraulic conductivity (Ksat), and percentage of sand, silt, and organic matter. K values can range from 0.02 to 0.69, with higher values corresponding to higher susceptibility to erosion by water.

Data from the NRCS Web Soil Survey (NRCS, 2018) indicates that soils within the site boundary consist of silty and cobbly loam with K values ranging from 0.10 to 0.43 and thus have slight to moderate susceptibility to sheet and rill erosion by water (NRCS, 2018).

To minimize the potential for soil erosion, a construction Erosion and Sediment Control Plan (ESCP) will be prepared for the Facility prior to construction. The ESCP will include structural and nonstructural Best Management Practices (BMPs) to minimize erosion. Examples of structural BMPs include physical controls such as silt fences or riprap to divert water flows away from exposed soil or to limit runoff from exposed areas within the site boundary. Examples of nonstructural BMPs include proper materials handling, disposal requirements, and spill prevention protocol. The Applicant's contractor will obtain a National Pollutant Discharge Elimination System Construction Stormwater Discharge General Permit 1200-C and will prepare an ESCP. Additionally, the Soil Protection Exhibit contains a list of mitigation measures to minimize wind and water erosion.

As necessary, the Applicant will perform hydrology and hydraulic design to ensure stormwater post-development discharge rates do not exceed pre-development conditions. The hydrology analysis will address scour to ensure pile foundation embedment minimum depths are conservative and avoid significant erosion for structural stability.

8.1.4 FLOODING

Flood hazards were mapped and evaluated with the Oregon HazVu: Statewide Geohazards Viewer tool (DOGAMI, 2024c) and Federal Emergency Management Agency (FEMA) flood data (effective and non-effective). The only non-effective result was a portion of Wapinitia Creek, which runs through the site boundary. According to FEMA Flood Insurance Rate Maps (FIRM) (1984), most of the site boundary is in Zone C, which experiences minimal flooding usually depicted on FIRMs as above the 500-year flood level. Zone C may have ponding and local drainage problems that does

not warrant a detailed analysis or designation as base floodplain. Wapinitia Creek is in Zone A, which includes areas of 100-year flood base flood elevations and flood hazard factors not determined. The FEMA FIRM map is included in Attachment 6.

Although the region is warm and dry, seasonal thunderstorms may result in localized flooding and stormwater runoff, particularly in Wapinitia Creek. The Facility will be designed and constructed to withstand these hazards and will meet the requirements of the zoning ordinances and building codes that establish flood protection standards. Engineered access roads and drainages may direct stormwater runoff away from structures and into drainage ditches and culverts. Additionally, the Applicant will avoid installing any structures within the 100-year floodplain.

8.1.5 SHRINKING AND SWELLING SOILS

Certain clay minerals in soils can expand or contract with changes in moisture causing soils to shrink and swell. The amount and type of clay minerals controls the potential soil volume change. Linear extensibility, or shrink-swell potential, is the change in length of an unconfined clod as its moisture content decreases to a dry state. Potential hazards may arise if structures or roads are built on shrinking or swelling soils.

The soils within the site contain clay percentages of 8.1 percent to 40.7 percent, although most of the site ranges from 23.0 percent to 24.5 percent. Prior to construction, the Applicant will include, as part of the geotechnical investigation, an evaluation of the shrinking and swelling potential of soil within the site boundary. Based on the results of the evaluation, the Applicant may include mitigation measures such as wetting and compacting, deep foundations, over-excavating and replacing loess soil with structural fill, or avoiding specific areas of greater concern.

Local frost depth at the site is mapped to exist at approximately 15 inches below grade (US Department of Commerce, CITE). Fine-grained soils within the site boundary are susceptible to freezing, contributing “ad-freeze stress” to steel posts and other embedded structures on-site. ANS Geo has recommended that an unfactored ad-freeze stress of 1,500 pounds per square foot (10.4 psi) should be considered for an 18-inch ad-freeze depth. However, Wasco County General Building Requirements consider a frost depth of at least 24 inches below grade. Therefore, engineering calculations will have to account for this greater depth and stress.

The solar structures will be supported by steel posts. Post depth will vary depending on soil conditions observed but is typically 8 feet below the surface. The preliminary geotechnical investigation determined depths varying from 7 to 10 feet below the surface. If necessary, concrete foundations may be used. Assuming steel posts are used, they will be driven into bedrock.

8.1.6 CORROSION

ANS Geo conducted corrosivity testing at six locations on-site (Attachment 3). pH values ranged from 5.8 to 7.1, indicating acidic soils. Resistivity values ranged from 8,240 to 24,000 ohm-cm, indicating mild corrosive conditions to steel. Combined with sulfate, chloride, and moisture conditions, ANS Geo has evaluated soils on-site to be mildly to moderately corrosive to steel.

Certain considerations may be applied to limited steel decay, including thicker pile sections and increased zinc coating thickness. For example, minimum zinc coating thickness typically ranges from 3-mil to 5-mil depending on steel section size. A 3-mil coated section will corrode at 0.466 mil per year, while a 5-mil coated section will corrode at 0.233 mil per year. To reduce corrosion risk to subsurface structures, thicker pile sections and increased zinc coating thickness should be utilized.

8.2 NON-SEISMIC HAZARD MITIGATION

The Facility will be designed to meet or exceed the minimum requirements specified in the IBC and OSSC. The IBC Chapter 16, Section 1613 contains design codes relating to geology, seismicity, and near-surface soil. A qualified engineer will assess the non-seismic hazards associated with the site boundary and construction requirements will be modified as needed to minimize potential hazards. The landscape within the site boundary is mostly flat, particularly the land where the solar array will be constructed. Building the Facility on flat land will minimize the risk of landslides and soil creep. The Facility will also be set back from mapped stream features, minimizing the potential for flooding.

Solar facilities are designed to be modular, with different circuits and disconnect switches between inverters. In the event of an emergency, portions of a Facility may be taken offline for repair, while the remainder of the solar arrays can continue to operate in a reduced capacity. The Applicant plans to adhere to industry practice of installing excess cabling between strings to allow for splicing and repairs in the event of an emergency. Should any damage occur to Facility components, such as access roads or solar panels, they will be assessed and repaired.

BrightNight Power, LLC (of which the Applicant is a wholly owned subsidiary) manages several renewable energy projects across the United States and Asia Pacific. In the Pacific Northwest, BrightNight Power, LLC is developing the Biglow Solar Project in Sherman County, Oregon and the Greenwater and Hop Hill storage projects in Washington. Washington and Oregon have similar non-seismic hazards; thus, the Applicant is experienced designing and constructing facilities to minimize potential hazards.

8.3 DISASTER RESILIENCE AND CLIMATE CHANGE

Due to climate change, Wasco County is anticipated to experience a slight increase in the intensity of extreme precipitation events (the Oregon Climate Change Research Institute, 2018). The magnitude of precipitation on the wettest day of the year is expected to increase on average by 17 percent and the wettest consecutive five days of the year are projected to increase on average by about 12 percent. The Applicant has sited the Facility to avoid potential hazards associated with climate change. Even with increased intensity of precipitation events, the landslide risk is not projected to change substantially because the Applicant has situated the Facility in an area of decreased risk from landslides (Section 8.1.1). The Applicant has also accounted for flooding risk from Wapinitia Creek and is not planning to develop infrastructure within the 100-year floodplain (Section 8.1.4).

Additionally, reinforcing the local electric grid with solar power, battery storage, and a new transmission line will provide resilience to the energy grid in this region of Oregon and mitigate climate change by providing alternate options to fossil fuels, typically at a reduced rate to consumers. The electric grid is predicted to experience higher loads under rising temperatures and increased power demand from local consumers for summer cooling. Harnessing solar energy will alleviate this stress directly. All aspects of this Facility support climate change resiliency and are designed to withstand adverse weather events, as discussed in Section 8.6.

9. CONCLUSION

The Applicant has, in accordance with OAR 345-022-0020(1)(a), adequately characterized the seismic and non-seismic hazards within the site boundary and surrounding area. The risk of seismic and non-seismic hazards to human safety at the Facility is considered low. The Applicant will adhere to IBC requirements and the Facility will be designed, engineered, and constructed to avoid dangers to human safety in case of a design seismic event, per OAR 345-022-0020(1)(b), and in case of geological and soil hazards within the site boundary, in accordance with OAR 345-022-0020(1)(d).

The Applicant has provided site-specific information and demonstrated, in accordance with OAR 345-022-0020(1)(c) that the construction and operation of the Facility will not adversely affect or aggravate the geological and soil conditions within the site boundary or its surrounding vicinity. As the Facility can be designed to avoid or minimize the hazards of landslides and soil erosion, risks posed by these hazards are low. Erosion hazards resulting from soil and wind movement will be minimized through implementation of an ESCP.

10. APPROVAL STANDARDS

The Applicant has satisfied the standards for the Structural Standard Exhibit outlined in OAR 345-022-0020. Approval standards are summarized in Table 1.

TABLE 1 **APPROVAL STANDARD**

Approval Standard	Handling
<i>OAR 345-022-0020 Structural Standard</i>	
(1) Except for facilities described in sections (2) and (3), to issue a site certificate, the Council must find that:	
(a) The applicant, through appropriate site-specific study, has adequately characterized the seismic hazard risk of the site; and	Section 7
(b) The applicant can design, engineer, and construct the facility to avoid dangers to human safety and the environment presented by seismic hazards affecting the site, as identified in subsection (1)(a);	Sections 7 and 8
(c) The applicant, through appropriate site-specific study, has adequately characterized the potential geological and soils hazards of the site and its vicinity that could, in the absence of a seismic event, adversely affect, or be aggravated by, the construction and operation of the proposed facility; and	Section 8

Approval Standard	Handling
(d) The applicant can design, engineer and construct the facility to avoid dangers to human safety and the environment presented by the hazards identified in subsection (c).	Section 8.3
(2) The Council may not impose the Structural Standard in section (1) to approve or deny an application for an energy facility that would produce power from wind, solar or geothermal energy. However, the Council may, to the extent it determines appropriate, apply the requirements of section (1) to impose conditions on a site certificate issued for such a facility.	Section 1 applies
(3) The Council may not impose the Structural Standard in section (1) to deny an application for a special criteria facility under OAR 345-015-0310 (Request for Expedited Review of Special Criteria Facilities) https://oregon.public.law/rules/oar_345-015-0310 . However, the Council may, to the extent it determines appropriate, apply the requirements of section (1) to impose conditions on a site certificate issued for such a facility.	Section 1 applies
(4) Information from reasonably available sources regarding the geological and soil stability within the analysis area, providing evidence to support findings by the Council as required by OAR 345-022-0020, including:	
(a) A geologic report meeting the Oregon State Board of Geologist Examiners geologic report guidelines. Current guidelines must be determined based on consultation with the Oregon Department of Geology and Mineral Industries, as described in paragraph (B) of this subsection.	Section 3
(b) A summary of consultation with the Oregon Department of Geology and Mineral Industries regarding the appropriate methodology and scope of the seismic hazards and geology and soil-related hazards assessments, and the appropriate site-specific geotechnical work that must be performed before submitting the application for the Department to determine that the application is complete.	Section 4
(c) A description and schedule of site-specific geotechnical work that will be performed before construction for inclusion in the site certificate as conditions.	Section 5
(d) For all transmission lines, and for all pipelines that would carry explosive, flammable or hazardous materials, a description of locations along the proposed route where the applicant proposes to perform site specific geotechnical work, including but not limited to railroad crossings, major road crossings, river crossings, dead ends (for transmission lines), corners (for transmission lines), and portions of the proposed route where geologic reconnaissance and other site specific studies provide evidence of existing landslides, marginally stable slopes or potentially liquefiable soils that could be made unstable by the planned construction or experience impacts during the facility's operation.	Section 6
(e) An assessment of seismic hazards, in accordance with standard-of-practice methods and best practices, that addresses all issues relating to the consultation with the Oregon Department of Geology and Mineral Industries described in paragraph (B) of this subsection, and an explanation of how the applicant will	Section 7

Approval Standard	Handling
design, engineer, construct, and operate the facility to avoid dangers to human safety and the environment from these seismic hazards. Furthermore, an explanation of how the applicant will design, engineer, construct and operate the facility to integrate disaster resilience design to ensure recovery of operations after major disasters. The applicant must include proposed design and engineering features, applicable construction codes, and any monitoring and emergency measures for seismic hazards, including tsunami safety measures if the site is located in the DOGAMI-defined tsunami evacuation zone.	
(f) An assessment of geology and soil-related hazards which could, in the absence of a seismic event, adversely affect or be aggravated by the construction or operation of the facility, in accordance with standard-of-practice methods and best practices, that address all issues relating to the consultation with the Oregon Department of Geology and Mineral Industries described in paragraph (B) of this subsection. An explanation of how the applicant will design, engineer, construct and operate the facility to adequately avoid dangers to human safety and the environment presented by these hazards, as well as:	Section 8
(i) An explanation of how the applicant will design, engineer, construct and operate the facility to integrate disaster resilience design to ensure recovery of operations after major disasters.	Section 8.3

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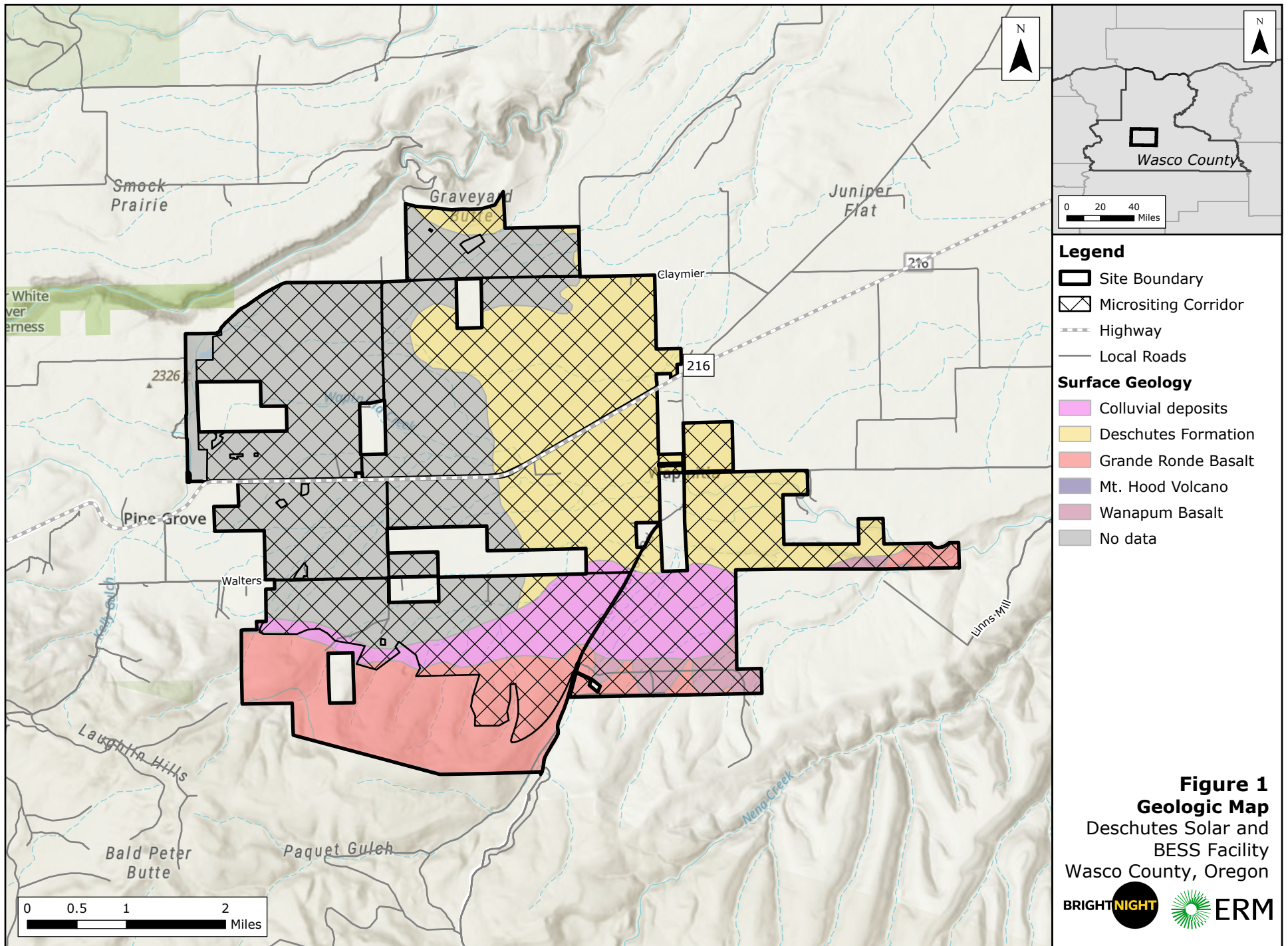
ATTACHMENT 1 FIGURES

Figure 1 – Geologic Map

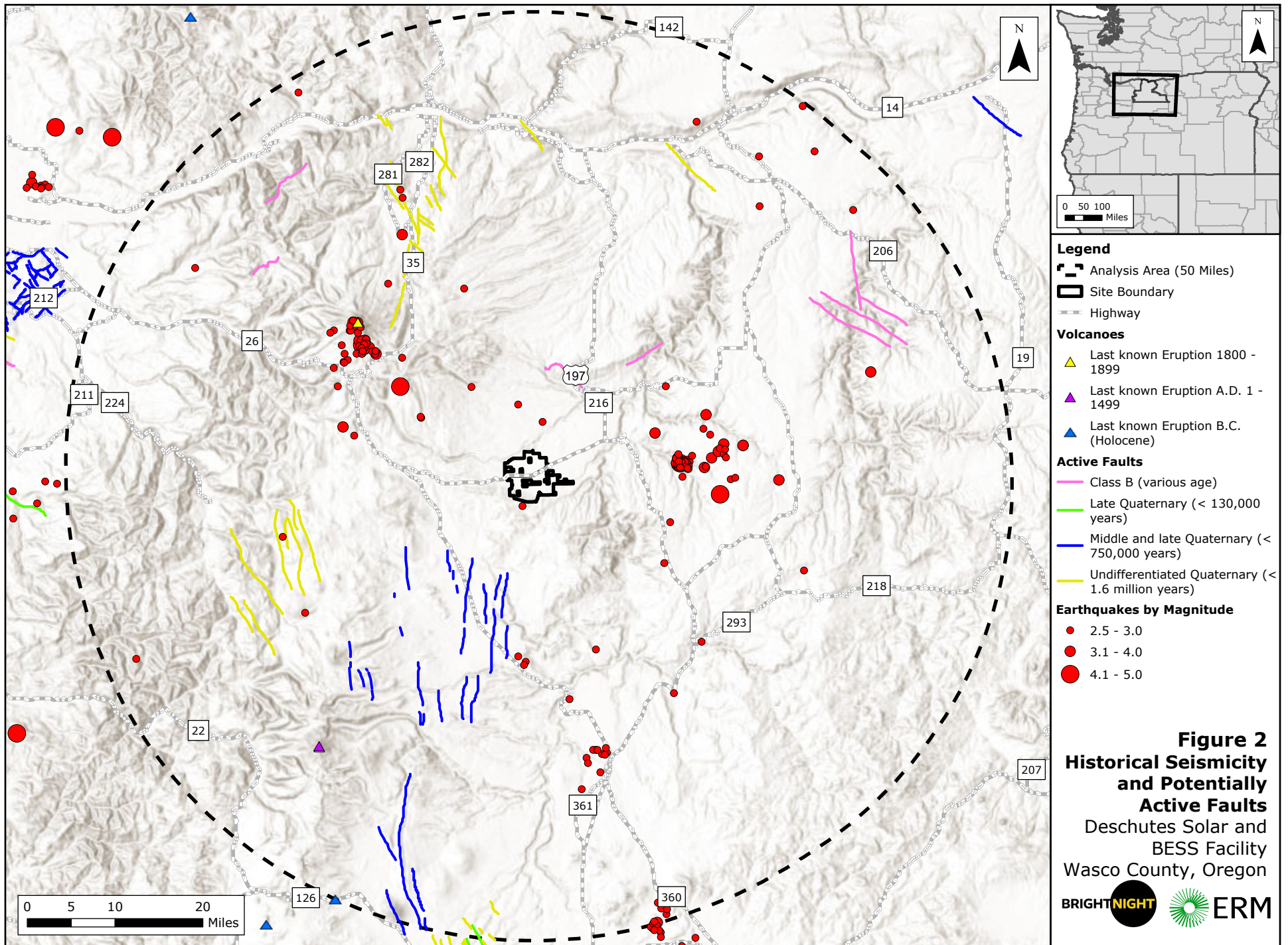
Figure 2 – Historical Seismicity and Potentially Active Faults

Figure 3 – Landslide Analysis

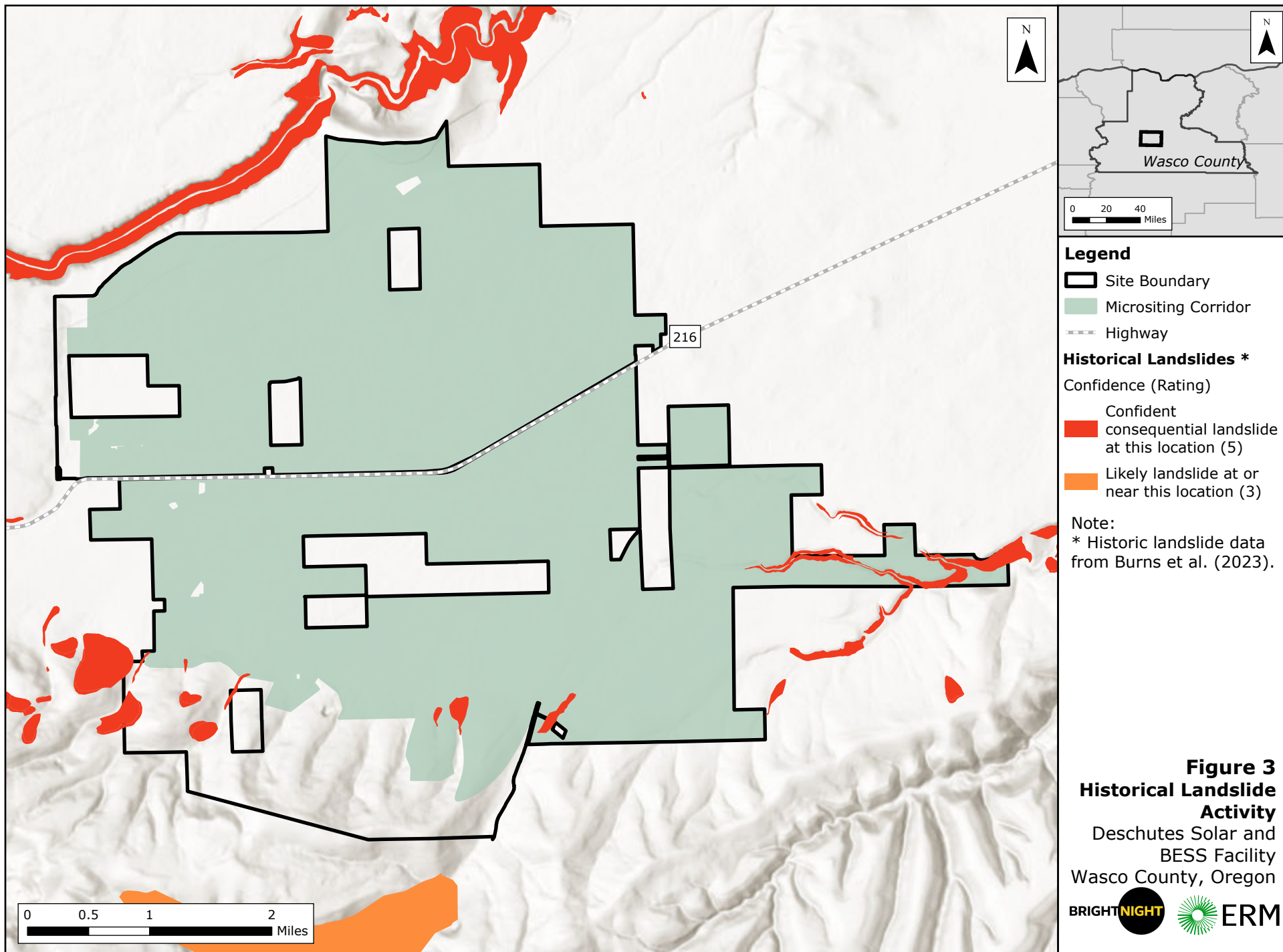
Figure 4 – Landslide Analysis – 50 miles

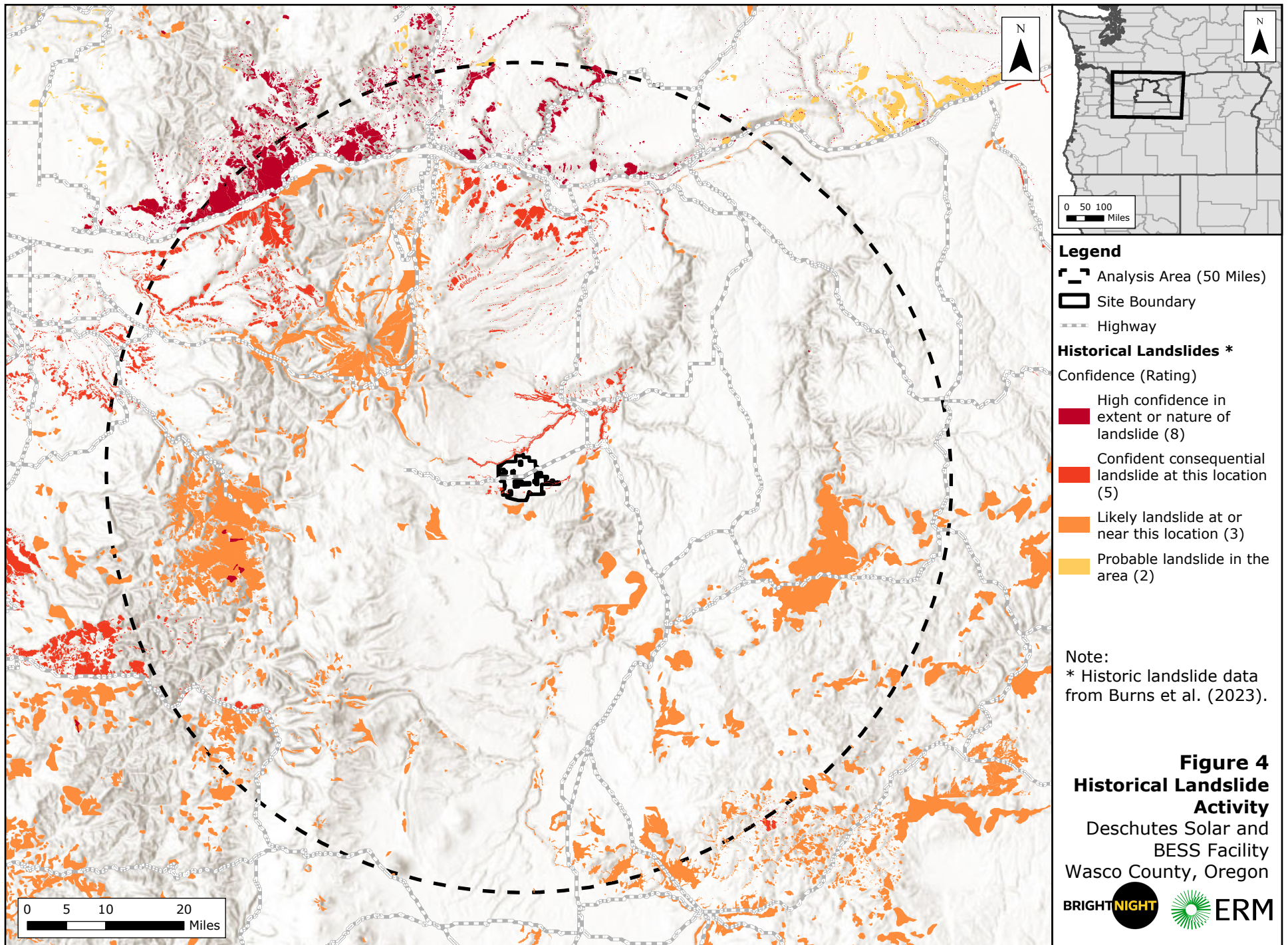


Source: Esri - World Topographic Map; WGS 1984 UTM Zone 10N



Source: Esri - World Topographic Map; WGS 1984 UTM Zone 10N







ATTACHMENT 2
DOGAMI

EVIDENCE OF CONSULTATION WITH

From: SLOAN Kathleen * ODOE <Kathleen.SLOAN@energy.oregon.gov>
Sent: Thursday, March 13, 2025 4:44 PM
To: Bijan Damavandi <Bijan@brightnightpower.com>
Subject: Fw: Comments Requested for the Deschutes Solar and BESS Facility - Notice of Intent

Comments from DOGAMI are below:

From: MCCLAUGHRY Jason * DGMI <Jason.MCCLAUGHRY@dogami.oregon.gov>
Sent: Thursday, March 13, 2025 4:07 PM
To: SLOAN Kathleen * ODOE <Kathleen.SLOAN@energy.oregon.gov>; GUERRERO Lalo * DGMI <Lalo.GUERRERO@dogami.oregon.gov>
Subject: Re: Comments Requested for the Deschutes Solar and BESS Facility - Notice of Intent

Hi Kathleen:

Thanks for the reminder. Lalo had dutifully completed this by March 3rd and I did not then send it to you. Below is our summary. If you have any questions or need additional information, please let us know. Thank you.

Oregon Department of Geology and Mineral Industries (DOGAMI) received notification from Oregon Department of Energy (ODOE) that it received a Notice of Intent to File an Application for a Site Certificate (NOI) for the Deschutes Solar and Battery Energy Storage System Facility in Wasco County, approximately 10 miles SW of Maupin, OR.

The Oregon Geologic Data Compilation (OGDC 7, <https://pubs.oregon.gov/dogami/dds/p-OGDC-7.htm>) contains the publicly available published geologic mapping for the entire state. DOGAMI also published "GMS-127 Geologic map of the Dufur area, Wasco County, Oregon" in 2021, which included an update to geology mapping near the Solar and Battery energy system facility referenced above, and can be found here: <https://pubs.oregon.gov/dogami/gms/p-GMS-127.htm>.

Based on this facility's proposed location, DOGAMI recommends reviewing the geology hazard data available through the Oregon Hazard Viewer (HazVu <https://www.oregon.gov/dogami/hazvu/pages/index.aspx>). The data compiled in HazVu is the best publicly available data for the state on geologic hazards, including earthquakes, landslides, and floods. The seismic hazard data in this viewer comes from the Oregon Seismic Hazard Database v 1.0, which is the most recent state-wide earthquake hazard dataset that is included in HazVu, and is accessible for download here: <https://pubs.oregon.gov/dogami/dds/p-OSHD-1.htm>.

Maupin is located southeast of Mount Hood, and it is located outside of both the near-volcano hazard zones, which means that it is unlikely to be affected by lava and pyroclastic

flow, and it is also outside of the regional lava flow hazard zone (e.g.

<https://www.usgs.gov/volcanoes/mount-hood/science/hazards-summary-mount-hood>).

However, Maupin is close to the confluence of the White and Deschutes River, and there is evidence of lahars reaching the Columbia River via the White-Deschutes corridor, consequently, the hazard posed by volcanic processes should be considered in this situation.

Data and publications from the Cascade Volcano Observatory

(<https://www.usgs.gov/observatories/cvo>) should be consulted for volcanic hazard information.

DOGAMI is aware of recent work in the area that may contain data that can inform the geohazard assessment for this proposed development and suggest reviewing the following journal article and Oregon State University M.S. thesis:

- Johnson, A.K., 2011. Dextral shear and north-directed crustal shortening defines the transition between extensional and contractional provinces in north-central Oregon. (2011 Geology M.S. Thesis, Oregon State University; Prof. Andrew Meigs).
 - Braunmiller, J., Nábělek, J.L. and Tréhu, A.M., 2014. A seasonally modulated earthquake swarm near Maupin, Oregon. *Geophysical Journal International*, 197(3), pp.1736-1743.
-
- We hope that this information can be helpful for project assessments in the area. Should there be any questions or a need for additional information, please let us know.

Best Regards,

Jason

From: [GUERRERO Lalo * DGMI](#)
To: [Alice Sandzen](#); [Todd Ellwood](#); [Arturo Alvarez](#); [Bijan Damavandi](#); [Olivia Burek](#); [Jim Langel](#); [MCCLAUGHRY Jason * DGMI](#); [SLOAN Kathleen * ODOE](#)
Subject: Re: Deschutes Project DOGAMI Consultation Call
Date: Friday, June 20, 2025 11:00:36 AM
Attachments: [image001.png](#)
[Outlook-oiunvsux.png](#)
[Outlook-dwsb3adz.png](#)

EXTERNAL MESSAGE

Hello,

Thank you for sending the meeting minutes, they agree with mine and I don't have anything to add. Below are a couple of recent publications that include Wasco county and the project area. The first one is a landslide inventory study 4th and northern and central part of the county and depending on when you access the slide into database this report might complement the data that you already have or you may already have it. The second is a link to the publication page for Oregon Seismic Hazard Database (OSHD), published in 2021.

pubs.oregon.gov/dogami/ofr/O-23-02/p-O-23-02.htm

[DOGAMI - Digital Data Publication Preview - Oregon Seismic Hazard Database \(OSHD\), release 1.0 \(OSHD-1\)](#)

[DOGAMI - Digital Data Publication Preview - Oregon Seismic Hazard Database \(OSHD\), release 1.0 \(OSHD-1\)](#)

DOGAMI DIGITAL DATA Series | Publications Center | DOGAMI Home Publication Preview. Oregon Seismic Hazard Database (OSHD), release 1.0 (OSHD-1), by Ian P. Madin, Jon J. Franczyk, John M. Bauer, and Carlie J.M. Azzopardi WHAT'S IN THIS PUBLICATION? The Oregon Seismic Hazard Database, release 1 (OSHD-1.0), is the first comprehensive collection of seismic hazard data for Oregon.

pubs.oregon.gov

[PUBLICATION PREVIEW - Oregon](#)

[Go back] | Publications Center | DOGAMI Home PUBLICATION PREVIEW. Open-File Report O-23-02, Landslide Inventory and Risk Reduction of the North and Central Portions of Wasco County, Oregon, by William J. Burns, Nancy Calhoun, Jon Franczyk, Jason D. McClaughry, and Katherine Daniel; 28 p. report, 2 map plates, one Esri® geodatabases with internal metadata, external metadata in .xml format.

Thanks!

Lalo

Eduardo Francisco Guerrero, Ph.D., G.I.T.

Geology Hazard Specialist

I go by my nickname, pronounced LAA-Lo (he/him)

Geological Survey and Services Program

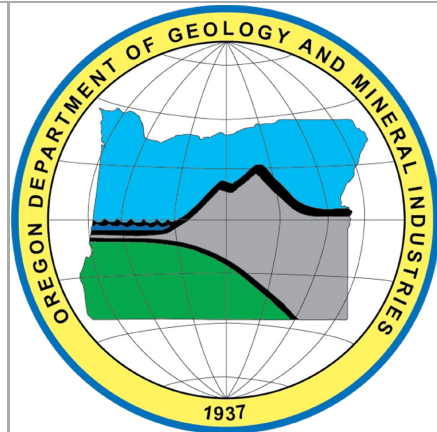
Oregon Department of Geology and Mineral Industries

Address: 800 NE Oregon St., Suite 965, Portland, OR 972332-2162

Mobile: 971-438-7968

Email: lalo.guerrero@dogami.oregon.gov

 [Book time to meet with me](#)



From: Alice Sandzen <Alice.Sandzen@erm.com>

Sent: Wednesday, June 18, 2025 12:26 PM

To: Todd Ellwood <todd.ellwood@brightnightpower.com>; Arturo Alvarez <arturo.alvarez@brightnightpower.com>; Bijan Damavandi <Bijan@brightnightpower.com>; Olivia Burek <olivia.burek@erm.com>; Jim Langel <jim.langel@erm.com>; GUERRERO Lalo * DGMI <Lalo.guerrero@dogami.oregon.gov>; MCCLAUGHRY Jason * DGMI <jason.mcclaughry@dogami.oregon.gov>; SLOAN Kathleen * ODOE <kathleen.sloan@energy.oregon.gov>

Subject: RE: Deschutes Project DOGAMI Consultation Call

Hi Everyone,

Thank you for your time on the call today. Please see attached meeting notes including the two action items we discussed. Please let me know if anyone has any feedback on the notes.

Thanks,
Alice



MINUTES

LOCATION	Online
DATE	18 June 2025
TIME	11:00 AM PST
GROUP/TOPIC	Deschutes Solar Project DOGAMI Consultation Meeting

ATTENDANCE

DOGAMI: Lalo Guerrero

BrightNight: Bijan Damavandi, Arturo Alvarez, Todd Ellwood

ERM: Olivia Burek, Jim Langel, Alice Sandzén

ODOE: Kathleen Sloan

1. AGENDA ITEMS

- Project Overview
- Review of Preliminary Geotech Investigation Scope
 - Question from DOGAMI: Is eastern area of the site boundary being considered for development? And would you expect the soils there to be different?
 - Answer from BrightNight: Project will likely be split into 4 to 6 zones so that design recommendations are zone-specific. Additional sampling/testing planned in the eastern area as part of the final design.
- Review of the Desktop Hazards Analysis
 - Question from ERM: Some portions of the Geologic Map do not have data. Does DOGAMI have any suggestions for additional data sources.
 - Answer from DOGAMI: Lalo Guerrero to check, see action item below.
 - Suggestion from DOGAMI to update the Cascadia Scenario assessment with data from a recent 2021 publication from the Oregon Seismic Hazard Database (OSHD).

Action Items

1. Lalo Guerrero to check to see if there is any additional mapped data within the site boundary
2. ERM to update Cascadia Scenario evaluation to include data from 2021 OSHD



ATTACHMENT 3 PRELIMINARY GEOTECHNICAL REPORT





PRELIMINARY GEOTECHNICAL REPORT



Deschutes Solar and Storage Project Wasco County, Oregon

Revision 1 – April 1, 2025



Renews: Jun 30, 2026

Vatsal Shah, Ph.D, PE
Principal Engineer
OR PE No. 94328PE

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Table Attachments

Table A: Substation and BESS Foundation Recommendations

Attachments

Attachment A – Investigation Location Plan
Attachment B – Geological Map
Attachment C – Test Pit Logs
Attachment D – Laboratory Test Results
Attachment E – Electrical Resistivity Test Data
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1 Executive Summary

ANS Geo, Inc. is pleased to provide this Preliminary Geotechnical Report (Report) to Bright Night to summarize the results of our preliminary geotechnical investigation program in support of the proposed Deschutes Solar and Storage project located in Wasco County, Oregon. ANS Geo has summarized, at a very high level, some of the critical geotechnical items and observations which may impact project design and construction within this Section from our observations during the completion of our preliminary geotechnical investigation at the project site.

1. ANS Geo advanced a total of 25 test pits; 20 test pits were advanced across the proposed array area(s), two (2) test pits were advanced within the proposed BESS footprint, and three (3) test pits were advanced within the proposed substation and switchyard footprint.
2. The encountered soils observed were predominantly clays with varying amounts of sand and gravel. Cobbles and boulders were also regularly observed. Bedrock was encountered throughout the site at depths ranging from 2.2 to 8.5 feet BGS, with an average depth to top of rock at 3.9 feet BGS. Encountered subsurface conditions and laboratory test results are summarized in **Section 3**, and **Section 4**, respectively.
3. Water was observed within two (2) test pits (TP-08 and TP-11) at approximately 4.2 and eight (8) feet below grade, respectively, at the time of our investigation.
4. Pile load testing was completed at 16 test locations across the proposed area area(s). One (1) pile at each test location was embedded to between 7 and 10 below grade and tested for both uplift and lateral capacities. Two (2) of the 16 testing locations experienced pile refusal, PLT-01 at 5 feet BGS and PLT-02 at 7.5 feet BGS.
5. Based on laboratory California Bearing Ratio testing, access roads within the project boundary should be designed assuming a minimum subsurface CBR value of 2%. Under this assumption, access roads should be designed to include at least 13 inches of compacted crushed stone. It is possible that this thickness of stone can be reduced to as little as 7 inches if Class 2 or better geogrid with nonwoven geotextile fabric is used to reinforce the subbase. Further discussion of impacts of reduced aggregate thickness or alternative pavement designs are included in **Section 8.5**.
6. Results of in-situ electrical resistivity testing yielded results as low as 550 ohm-cm and as high as 41,770 ohm-cm. The electrical designer should review the detailed data for the purpose of their design.
7. It is recommended that foundations be over-excavated by at least twelve (12) inches and backfilled with compacted structural fill over geotextile separation fabric to improve the bearing capacity within/under areas of proposed foundations (ie. concrete slabs, inverter pads, substation foundations), and to provide free-draining material beneath foundations to avoid softening during times of precipitation.
8. The frost depth within the project area is mapped as 24 inches below grade, which will govern embedment depths for shallow foundations. Additionally, an adfreeze-induced uplift stress of 1,500 pounds per square foot should be considered within the upper 18 inches for embedded steel piles.
9. ANS Geo has provided Substation and BESS Foundation Recommendations in **Table A** directly preceding our provided Attachments.
10. Due to the large size of the project area and potentially varying depth of bedrock, it may be beneficial and feasible to divide the project site into “zones” with different recommended design parameters for driven piles for the PV array areas. A similar approach can be also applied to access road design recommendations. To accurately make this determination and delineate the zones realistically, a design-level geotechnical investigation including pile load testing program and CBR and index testing is needed. Additionally, an increased frequency of proof-load testing around the

assumed zone boundaries should be conducted in the construction phase if zones are to be utilized.

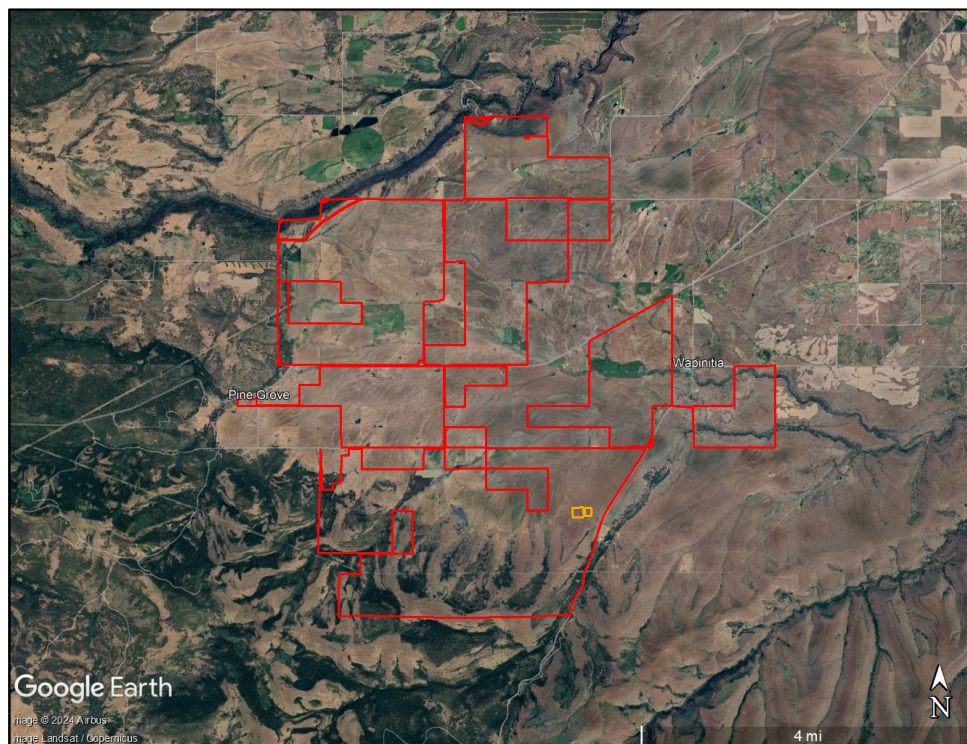
2 Project Description

ANS Geo, Inc. is pleased to provide this Preliminary Geotechnical Report to Bright Night to summarize the results of our geotechnical investigation program in support of the proposed Deschutes Solar and Storage project located in Wasco County, Oregon. ANS Geo, in agreement with Bright Night, developed an early stage geotechnical investigation program, implemented by ANS Geo intended to provide information to support the design and construction of the proposed solar facility.

It is our understanding that the Deschutes Solar and Storage project is expected to encompass roughly 13,000 footprint acres for the development of a photovoltaic (PV) facility and was expected to generate 500 megawatts (MW) of renewable energy.

ANS Geo's geotechnical investigation program included pile load testing, test pit excavations, in-situ electrical resistivity testing, laboratory thermal resistivity and corrosion testing, laboratory California Bearing Ratio (CBR) testing, and laboratory soil index testing. Our targeted test locations were focused within solar array areas, project substation and switchyard, and BESS footprint. A General Location Plan as well as as-completed Investigation Location Plan is provided as **Attachment A**.

Figure 1: Project Site Map



2.1 Reference Files

Prior to commencing our geotechnical investigations, ANS Geo was provided multiple project files from Bright Night detailing the planned development. The referenced files are listed below:

- DECH – Geotechnical RFP [53].docx – dated 06/26/2024
- DECH_ParcelList_2024062_ENG_LayerToKML[21][90].kmz – no date
- 20240724-US-OR-DECH-IFB-ALPVS-NG-V01-R14[65].dwg – dated 07/24/2024

In addition to these project files, site coordination, land access, and project details were shared and communicated between ANS Geo and Bright Night via e-mail and phone conversations.

2.2 Project Assumptions

ANS Geo understands that the proposed solar development will include a solar photovoltaic (PV) system, an battery energy storage system (BESS), substation, switchyard, and supporting structures and equipment. We understand the project footprint spans across multiple/contiguous parcels separated by existing county and state roads, and will include the development of unpaved, aggregate access roadways within the project parcels. ANS Geo assumes the project design life to be 35 years.

ANS Geo's scope of work was completed based on our approved proposal dated 23 August 2024 and our recommendations herein are specific and based on our understanding of the project and communications with Bright Night. Should the configuration of the system differ from our stated understanding, it is imperative that ANS Geo is contacted to review, confirm, and/or update our recommendations to reflect the planned development. For example, recommendations such as pile design parameters will change if alternate pile installation techniques are considered, such as pre-drilling, screw piles, helical piles, compaction-and-backfilling, or other method, and these changes may cause a material change in the design of foundations. Similarly, should the location of access roadways and expected traffic volumes and loading, assumed facility design life, or other site condition change, our recommendations will need to be updated.

3 Methodology

3.1 Test Pit Excavations

ANS Geo advanced a total of 25 test pit excavations across the project area to evaluate the subsurface conditions. Test pit locations were located at relatively evenly spread locations throughout the project's array area(s). All test pits were overseen and documented by an ANS Geo geotechnical representative under the direction of a Professional Engineer licensed in the State of Oregon. Soil strata changes, soil classification, and excavation depths were documented during each test pit excavation and are presented within the test pit logs provided as **Attachment C**. Upon completion, each test pit excavation was backfilled with native soils, bucket-tamped, and driven over several times with the excavator to minimize any post-excavation settlement.

3.2 Electrical Resistivity Testing

As part of our field investigation program, ANS Geo performed field Electrical Resistivity Testing (ERT) at nine (9) locations across the project site; eight (8) locations within the proposed array area(s), and one (1) location within the substation footprint. In-situ soil resistivity measurements were obtained by utilizing the Wenner 4-Pin Method in accordance with ASTM G57 and IEEE Standard 81. Two (2) mutually perpendicular traverses were collected at each array area location utilizing electrode "a"-spacings of 2, 5, 10, 20, and 50 feet. Two (2) mutually perpendicular traverses were collected at the substation location utilizing "a"-spacings of 0.5, 1, 1.5, 2, 3, 5, 7, 10, 15, 20, 30, 45, 70, 100, 200 and 300 feet. Test results are presented as **Attachment E**.

3.3 Pile Load Testing

A photo log of representative testing configurations is included following the pile load testing logs, all provided within **Attachment F**.

3.3.1 Pre-Drilling

Prior to installing test piles, ANS Geo completed pile installations within pre-drilled holes at all 16 test locations in October of 2024. A Mobile B90 rock drill was used to drill 5-inch diameter holes up to 10 feet below grade. These 5-inch diameter holes were used as pilot holes for the installed piles. Following pre-drilling, each pile was installed to depth using a GAYK HRE 4000 Pile Driver. **Table 1** below summarizes the locations and final embedment depths for each pre-drilled pile along with the approximate depth to rock encountered during the pre-drilling.

Table 1: Pre-drilled Pile Summary

Pile Test ID	Approx Depth to Top of Rock (ft)	Pre-Drilled Depth (ft)	Final Pile Embedment Depth (ft)
PLT-01*	N/A	N/A	5
PLT-02	3.5	8	7.5
PLT-03	2.9	9	9
PLT-04	6.0	10	10
PLT-05	2.8	7	7
PLT-06	3.3	8	8
PLT-07	3.3	9	9
PLT-08	6.2	10	10
PLT-09	2.2	7	7
PLT-10	2.7	8	8
PLT-11	8.0	9	9
PLT-12	5.4	10	10
PLT-13	2.7	7	7
PLT-14	2.8	8	8
PLT-15	2.8	9	9
PLT-16	8.5	10	10

*PLT-01 was not pre-drilled due to difficulty accessing the test location with the drilling rig.
Top of rock was identified through test pit excavations

3.3.2 Test Pile Installation

ANS Geo conducted pile load testing at 16 accessible locations (PLT-01 through PLT-16) across the proposed solar array area(s). Each pile location included one (1) test pile at a depth ranging between seven (7) and 10 feet below grade. All piles were tested for both uplift and lateral capacities. With the exception of PLT-01, all nongalvanized W6x9 steel sections (“piles”) were installed into undersized, 5-inch diameter, pre-drilled holes. The holes were drilled with a Mobile B80 truck-mounted drill “rig”. PLT-01 was installed through the overburden, due to the inability of the pre-drill rig to access the test location. All piles were installed via direct push to significant resistance, then driven to their final depths, or until refusal, using a GAYK HRE 4000 Pile Driver.

3.3.3 Uplift Load Testing

Once driven to the final embedment depth (varying between 7 and 10 feet below grade), an uplift load test was performed on each test pile in accordance with the ASTM D3689 (uplift) test method. The tension load was generally applied through the arm of a John Deere 310L EP which aligned the load concentrically to the pile using a chain attached to a dynamometer, as well as a “pacman” clamp attachment to secure the assembly to the pile. Uplift loads were applied in one-minute, 500-pound increments up to 10,000 pounds or one-inch of vertical displacement, whichever occurred first. Once achieved, the load was released, and final displacement was recorded.

3.3.4 Lateral Load Testing

A lateral load test was performed on all piles following each uplift load test, in accordance with ASTM D3966 (lateral) test method. Horizontal loads were applied at approximately four (4) feet above grade on each pile with the pulling force of a hydraulic ram fixed to the backhoe. Each test load was applied in one-minute, 500-pound increments up to 4,500 pounds, or until a deflection of two-inches (measured at six inches above grade) was observed. Once achieved, the load was immediately released and residual deflection was recorded.

3.3.5 Removal of Piles

Upon completion of the pile load testing program, test piles were removed and disposed off-site.

3.4 Infiltration Testing

ANS Geo conducted in-borehole infiltration testing at four (4) locations within the array area footprint. Infiltration tests will be completed within four (4)-inch diameter casings, installed to 12 inches into the bedrock. The holes were drilled with a Mobile B80 truck-mounted drill rig. If bedrock was not encountered, the casing was installed to 5 feet below grade. Each test was filled with 12 inches of clean water and allowed 24 hours to “pre-soak” the subsurface. Following the pre-soak period, each casing was re-filled to the 12-inch mark and water levels will be recorded after one (1) hour. This process will be repeated three (3) times for a total of four (4) observations, per test. Upon completion of the testing, the casings will be removed, and the location was excavated to the top of rock for the purpose of classifying the subsurface material. Geology, Surface, and Subsurface Conditions

Prior to site mobilization, ANS Geo conducted a desktop review of anticipated geologic conditions, including both surficial and bedrock geology.

3.5 Observed Site Conditions

The project area consisted of open rangeland with moderately low slopes and valleys that were able to be traversed with relative ease. There were, however, a significant number of cobbles and boulders at grade that were observed at nearly every testing location and access route. Multiple gates were observed within the rangelands, varying from gates with combination locks to unlocked, separable lengths of fencing. Nearly every field on which test locations were placed, there was a combination of hay farming and cows. While most of the land use on site is for agricultural purposes, an active rock quarry was observed in the southernmost portion of the project site. There was little rainfall during our investigation, but one rainstorm caused flooding in a drainage pattern on the eastern side of the project boundary. Photos of the site conditions observed are in **Attachment I**.

3.6 Historic & Topographic Setting

ANS Geo reviewed publicly available historical satellite imagery dating back to 1957 which indicated that the project area has been continuously used as ranchland since that time. Additionally, a gravel quarry located in the southern portion of the project area was constructed between 1981 and 1994 and is still in use today. Additionally, another gravel pit, owned by the Oregon Department of Transportation, is located approximately 1.5 miles southwest of the project area. The two quarries are not expected to have any impact on site development.

3.7 Surficial Geology

ANS Geo reviewed surficial soil mapping available from the Natural Resource Conservation Service (NRCS) Web Soil Survey application. The NRCS survey was initially created for agricultural purposes and is generally limited to the upper five (5) to six (6) feet BGS; however, the resource provides generalized information pertaining to the soil chemistry and properties. The NRCS mapping identifies the project area to be primarily comprised of the Bakeoven - Maupin Complex and Watama - Wapinitia Silt Loams. The Bakeoven is a very cobbly loam most identified in rangelands, with a parent material of mixed colluvium, loess, and residuum derived from basalt rock. The Watama series consists of moderately deep, well drained soils that formed in loess and colluvium weathered from basalt. Watama soils are commonly on ridges and plateaus.

3.8 Bedrock Geology

ANS Geo reviewed geologic maps made available by the Oregon Department of Geology and Mineral Industries (ODGMI), which indicated the project area is mapped within the Deschutes and Grande Ronde

Basalt Formations. The Deschutes Formation is characterized by sedimentary rocks interbedded with basalt flows, while the Grande Ronde Basalt Formation is characterized by basalt and basaltic andesite lava flows.

3.9 Observed Subsurface Conditions

ANS Geo has provided the generalized subsurface conditions within **Table 2** based on observations recorded within our geotechnical investigation program. Test pit photo logs have been provided as **Attachment C** and should be reviewed for specific soil condition observations.

Table 2: Generalized Subsurface Profile

Stratum	Avg. Depth (ft)	Material (USGS Classification)	Description
	0 ~ 0.3	Topsoil	A layer of Clayey topsoil with high organic content was generally observed in the upper 3 to 4 inches.
I	0.3 ~ 4	Clay (CL)	Low plasticity clays were generally encountered near grade. Varying amounts of gravel and sand were observed within this layer, with the amount of coarse-grained material generally increasing with depth.
II	4 ~ 6	Cobbles and boulders	Cobbles and boulders were predominantly encountered underlying the upper clay layer. Varying amounts of clay, sand, and gravel infilling between cobbles and boulders was also observed within this layer.
III	6 +	Bedrock	Bedrock refusal was encountered within all test pits performed, at depths ranging from 26 to 102 inches BGS.

The mapped soil formations identified within our desktop study are generally consistent with the findings of our field investigations.

3.10 Groundwater

At the time of our investigation program, water was observed in two (2) of the 25 investigated locations, at the depths indicated in **Table 3**. ANS Geo notes this groundwater is likely perched, atop impervious bedrock. Groundwater monitoring should be conducted to confirm whether or not this groundwater is static or perched. ANS Geo notes that it is possible the indicated water levels may represent perched conditions rather than static groundwater levels.

Table 3: Observed Water Levels

Location ID	Depth to Groundwater (ft)
TP-08	4.2
TP-11	6.5

3.11 Infiltration Testing Results

Table 4 below summarizes the results of the in-borehole infiltration testing. Infiltration rates are presented as measured and do not include any correction factors. Any applicable reduction or correction factor should be taken into account by the Civil Engineer of Record.

Table 4: Infiltration Testing Results

Test ID	Depth Installed (feet)	Water Level after 24-hour presoak (in.)	Reading Number 1 (in.)	Reading Number 2 (in.)	Reading Number 3 (in.)	Reading Number 4 (in.)	Average Infiltration Rate (inch/hour)
TP- 17	5	11.75	11.75	11.50	11.50	11.50	0.0625
TP- 18	5	12	9.75	8.25	7.25	6.50	1.375
TP- 19	5	12.5	12.5	12.50	12.25	12.25	0.125
TP- 20	5	13.25	12.00	10.75	10.50	10.25	0.75

3.12 Summary of Geohazards

ANS Geo assessed publicly available information, results of the geotechnical investigation and the site conditions during the investigation to evaluate any potential geotechnical or geological hazards. The project site generally consists of flat ranchlands; therefore, the slope stability risk is negligible. The project site is located near the Columbia Basalt Plateau, which is known to have pseudokarst features such as sinkholes and caves. This pseudokarst is caused by a geologic features known as lava tubes, or pyroducts. These features form when the surface of a lava flow cools, leaving behind a hard surface under which the lava continues to flow. When the lava flow ends the area underneath this surface rock layer is empty. Because they form close to the surface, cover collapse sinkholes and other pseudokarst features are common in these areas. Due to the site's vicinity to the Columbia Basalt Plateau, ANS Geo staff paid careful attention to record any potential pseudokarst features they may encounter throughout the course of their investigation. No features were identified. Therefore, the risk of potential karst to the project is found to be low. Since the project site is located in a low to moderate seismicity area and the bedrock encountered is generally shallow, the liquefaction risk is low. The frost depth for the project site is about 24 inches. The soils at the project site are generally low plasticity cohesive soils with little swell potential. A detailed discussion about the swelling soils and their swell potential is provided in **Section 8.3**.

4 Laboratory Results

Representative soil samples were collected during our investigation and submitted to ANS's accredited materials testing laboratory. Soil samples will be retained for a period of three (3) months following the initial submission of this Report.

4.1 Soil Index Testing

A summary of the grain-size and Atterberg limits laboratory test results are provided within **Table 5** and **Table 6**, below, respectively. As-received laboratory test results are included within **Attachment D**.

Table 5: Soil Index Testing Summary (Sieve Analysis, ASTM D6913)

Location ID	Depth (ft)	% Gravel	% Sand	% Fines	% Moisture
TP-BESS-01	1-3	5.8	27.5	66.7	8.5
TP-SS-01	1.6-12.7	10.9	50.7	38.4	21.4
TP-SS-03	1.5-3.3	1.7	54.4	43.9	21.2
TP-03	2-4	15.6	33.0	51.4	6.9
TP-04	4-6	30.7	42.2	27.1	6.4
TP-08	4-6	41.6	36.3	22.1	13.0
TP-11	6-7	42.1	28.0	29.9	20.9

Table 6: Soil Index Testing Summary (Atterberg Limits, ASTM D4318)

Boring ID	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	% Moisture	USCS
TP-BESS-01	1-3	27	16	11	8.5	CL
TP-BESS-02	1-2	29	17	12	5.9	CL
TP-SS-02	1-2	27	16	11	6.1	CL
TP-SS-03	1.5-3.3	NV	NP	NP	21.2	SM
PLT/TP-01	2-4	30	17	13	9.2	CL
PLT/TP-05	2-4	31	17	14	9.9	CL
PLT/TP-07	2-4	30	16	14	8.2	CL
PLT/TP-10	1-2	30	17	13	7.0	CL
PLT/TP-13	1-2	30	18	12	10.1	CL
PLT/TP-15	0-2	28	16	12	8.3	CL
PLT/TP-16	0-2	27	17	10	6.6	CL
TP-17	2-4	27	17	10	8.1	CL
TP-19	0-2	26	16	10	6.8	CL

4.2 Thermal Resistivity Testing

ANS Geo collected a bulk sample from six locations within the project area from three (3) to five (5) feet below grade for laboratory testing of Thermal Resistivity. Soil was collected in a five-gallon bucket and delivered to ANS's accredited laboratory for testing. The soil was compacted to 85 and 95 percent of its Standard Proctor Density in accordance with ASTM D698, and Thermal Resistivity Testing was conducted for both compaction densities in accordance with IEEE Standard 442-2017. Results of the thermal testing are summarized within **Table 7** and **Table 8**. Complete, as-received results are provided within **Attachment D**.

Table 7: Thermal Resistivity Testing Summary (85% Standard Proctor)

Location ID	Material Type	Thermal Resistivity Values at Various Moisture Contents						Received Moisture Content (%)	Re-Molded Dry Density (lb/ft³)
		% water	% water	% water	% water	% water	% water		
		(°C-cm/W)	(°C-cm/W)	(°C-cm/W)	(°C-cm/W)	(°C-cm/W)	(°C-cm/W)		
TP-BESS-01	CL	0.0	3.9	7.8	11.7	15.6	15.7	15.7	93.5
		286.0	216.3	121.1	91.7	82.2	82.0		
TP-SS-03	CL	0.0	7.1	14.2	21.2	28.3		23.4	76.3
		310.8	208.3	119.9	100.5	89.8			
TP-01	CL	0.0	4.6	9.2	13.8	18.4		7.8	89.1
		289.5	217.0	127.2	96.3	85.6			
TP-04	CL	0.0	3.6	7.2	10.8	14.4		6.1	96.4
		282.2	210.7	117.5	94.5	85.6			
TP-11	CL	0.0	4.4	8.9	13.3	17.7	18.0	18.0	91.5
		274.6	169.2	99.7	88.0	80.6	80.2		
TP-20	CL	0.0	5.2	10.4	15.5	20.7	23.6	23.6	84.7
		297.4	211.1	119.6	98.9	89.0	86.2		

*The sample from TP-BESS-01 was taken from 2.5 to 3 feet BGS due to shallow bedrock.

Table 8: Thermal Resistivity Testing Summary (95% Standard Proctor)

Location ID	Material Type	Thermal Resistivity Values at Various Moisture Contents						Received Moisture Content (%)	Re-Molded Dry Density (lb/ft³)
		% water	% water	% water	% water	% water	% water		
		(°C-cm/W)	(°C-cm/W)	(°C-cm/W)	(°C-cm/W)	(°C-cm/W)	(°C-cm/W)		
TP-BESS-01	CL	0.0	3.9	7.8	11.7	15.6	15.7	15.7	104.5
		250.1	191.7	115.0	88.6	79.2	79.0		
TP-SS-03	CL	0.0	7.1	14.2	21.2	28.3		23.4	85.3
		263.1	185.0	117.7	98.8	87.6			
TP-01	CL	0.0	4.6	9.2	13.8	18.4		7.8	89.1
		252.1	191.9	121.2	93.8	83.1			
TP-04	CL	0.0	3.6	7.2	10.8	14.4		6.1	107.7
		242.1	184.4	109.6	89.0	80.4			
TP-11	CL	0.0	4.4	8.9	13.3	17.7	18.0	18.0	102.3
		226.1	151.6	97.0	85.4	77.7	77.3		
TP-20	CL	0.0	5.2	10.4	15.5	20.7	23.6	23.6	94.6
		248.1	183.9	116.5	97.3	87.0	84.1		

*The sample from TP-BESS-01 was taken from 2.5 to 3 feet BGS due to shallow bedrock.

4.3 Corrosivity Testing

ANS Geo collected six samples from zero (0) to five (5) feet below grade for the purpose of laboratory corrosivity testing. The testing was completed by ANS, and results are summarized within **Table 9** and detailed within **Attachment D**.

Table 9: Corrosivity Testing Summary

Location ID	pH	Sulfate (mg/kg)	Chloride (mg/kg)	Redox Potential (average) (mV)	Soil Box (Calculated Resistivity) (Ω-cm)
TP-BESS-02	6.1	<15	57	316	14,500
TP-SS-02	6.2	<15	105	294	19,600
TP-02	7.1	60	135	264	24,200
TP-08	5.8	120	48	327	8,240
TP-12	6.2	<15	69	273	4,900
TP-14	6.5	120	129	196	10,800

4.4 California Bearing Ratio

ANS Geo collected bulk samples from one (1) to three (3) feet below grade at three (3) locations for testing of California Bearing Ratio (CBR) in accordance with ASTM D1883 at approximately 95 percent of its Standard Proctor Density (ASTM D698). The results of the testing have been summarized within **Table 10** and are detailed within **Attachment D**.

Table 10: California Bearing Ratio Summary

Boring ID	CBR Ratio (%)
TP-SS-01	1.9
TP-05	2.7
TP-10	2.0

5 Pile Load Testing Results

Table 11 presents the summarized results of the pile load testing program at each test location. Complete load testing logs are provided as **Attachment F** and should be referenced for detailed information.

Table 11: Pile Load Testing Summary

Pile Test ID	Embedment Depth (ft)	Total Drive Time (seconds)	Approx. Uplift Load at 1-inch Displacement (lbs.)	Approx. Lateral Load at 1-inch Deflection (lbs.)
PLT-01	5.0	191.02	10,100*	4,500*
PLT-02	7.5	126.12	10,000*	4,500*
PLT-03	9.0	55.26	10,060*	4,540*
PLT-04	10.0	61.04	10,020*	4,500*
PLT-05	7.0	101.19	10,000*	4,600*
PLT-06	8.0	40.14	10,000*	4,520*
PLT-07	9.0	178.32	10,100*	4,500*
PLT-08	10.0	37.36	3,420	4,540*
PLT-09	7.0	53.07	10,000*	4,520*
PLT-10	8.0	88.85	10,000*	4,480*
PLT-11	9.0	10.46	4,280	4,520*
PLT-12	10.0	16.78	10,100*	4,500*
PLT-13	7.0	49.58	10,000*	4,600*
PLT-14	8.0	52.34	10,000*	4,520*
PLT-15	9.0	28.99	10,020*	4,520*
PLT-16	10.0	7.46	3,840	5,100*

* indicates 1-inch deflection was not observed at the indicated load; actual load may be higher.

ANS Geo noted the following general observations based on our pull-out testing campaign:

All drive times ranged from seven (7) to 178 seconds in pre-drilled holes. Lower drive times generally coincided with increased bedrock depths.

Push depths at this site ranged from 1 to 4 feet below grade in pre-drilled holes. A push depth of zero (0) was recorded at PLT-01, which was direct driven into soil.

Three (3) piles exhibited low uplift capacity, with one inch deflection measured at or below 4,280 lbs of uplift force. All three (3) of these piles were installed in pre-drilled holes and deep bedrock depths (74 inches or greater). As a consequence of the deeper bedrock depths in these locations, piles were installed mostly in soil, with minimal surface area contacting soil due to pre-drilling.

In lateral testing, all piles reached the maximum target load of 4,500 lbs prior to one inch of lateral deflection.

6 Seismic Considerations

6.1 Site Classification

Based on the observations recorded within our subsurface investigation program and our familiarity with the project area, Site Class C is assumed as the average condition across the project site for Risk Category II.

The seismic ground motion values for this this were obtained from the USGS Seismic Hazard Maps, referenced in ASCE 7-16 Standard and provided as **Attachment G**, and are as follows:

- 0.2 second spectral response acceleration, $S_s = 0.457 \text{ g}$
- 1 second spectral response acceleration, $S_1 = 0.211 \text{ g}$
- Maximum spectral acceleration for short periods, $S_{MS} = 0.594 \text{ g}$
- Maximum spectral acceleration for a 1-second period, $S_{M1} = 0.317 \text{ g}$
- 5% damped design spectral acceleration at short periods, $S_{DS} = 0.396 \text{ g}$
- 5% damped design spectral acceleration at 1-second period, $S_{D1} = 0.211 \text{ g}$

6.2 Historic Seismic Events

According to the United States Geological Survey (USGS) earthquake catalog, within the past 50 years, there have been 17 recorded earthquakes, magnitude 3.5 or greater, within 50 miles of the project site. All 17 earthquakes are classified as shallow ranging in depths 2.35 to 14.11 miles beneath the surface. The closest earthquake was a magnitude 3.6 event, approximately 14 miles east of the site on April 20, 2009. Given the site's proximity to volcanic activity, shallow earthquakes are expected to occur throughout the life of the project.

6.3 Preliminary Seismic Evaluation

The designated seismic site class is anticipated based on results from our investigation program and using select areas of the site which have been investigated by ANS Geo. Based on our observation of subsurface conditions, estimated Site Class ratings, and review of USGS's 2023 National Seismic Hazard Model and publicly available information, ANS Geo concludes that the area is generally considered to be a moderate seismic hazard zone.

7 Foundation Design Considerations

ANS Geo anticipates that, as typical with solar farm construction, embedded posts, such as W6x9 H-piles, will be used to support the proposed solar panels. Conventional shallow foundations such as sonotubes, spread footings, or systems may also be utilized for equipment pads and associated support structures.

7.1 Corrosion Considerations

7.1.1 Buried Steel

Given the available testing results measuring the soil pH level, sulfate and chloride concentrations, resistivity, and redox potential summarized in **Section 4.3**, in consideration with the soil and moisture conditions observed, the in-situ soil conditions generally indicate soils that are “**mildly to moderately corrosive**” to steel. **Table 12** shows the effect of resistivity on corrosion as described by the National Cooperative Highway Research Program.

Table 12: Effect of Resistivity on Corrosion (NCHRP, 1978)

Aggressiveness	Resistivity (ohm-cm)
Very corrosive	< 700
Corrosive	700 – 2,000
Moderately corrosive	2,000 – 5,000
Mildly corrosive	5,000 – 10,000
Non-corrosive	> 10,000

It is anticipated that hot dipped galvanized steel with a minimum zinc coating thickness in accordance with ASTM A123 may be able to provide some protection prior to the increased rate of expected bare-steel corrosion loss over the project design life. However, we recommend evaluating the need for increased sacrificial steel thickness or an increased zinc coating thickness of 5-mil to meet the corrosion allowance for steel. For structural steel shapes, a minimum zinc coating thickness typically ranges from 3-mil to 5-mil depending on the steel section size as specified by ASTM A123. For example, a W6x9 shall contain a minimum zinc coating grade of 75 micrometers, or a 3-mil thick coating.

Steel section loss in piles decreases the structural load carrying capacity of the member as well as increases the member deflections. Therefore, it is recommended that the final structural design considers the useful life of galvanized (zinc) coating, followed by the anticipated loss of steel due to corrosion to ensure the structural integrity is maintained throughout the service life. Thicker pile sections, increased zinc coating thickness, or other corrosion protection measures may be necessary to accommodate any reduction in structural capacity.

ANS Geo conducted a site-specific corrosion evaluation which consisted of reviewing the corrosivity data collected at the site, along with subsurface profile (soil type), in-situ moisture content, sulfate content, chloride content, field and/or laboratory tested electrical resistivity. The purpose of our evaluation was to estimate the rate of corrosion of zinc coating and bare steel resulting from exposure to the surrounding environment, and the potential steel loss of the member sections. Below are the summarized results for soil (below grade) and atmospheric (above grade) corrosion for a 35-year design service life.

Soil Corrosion:

- **Soil corrosion induced loss of zinc (per side):**
 - **3 mil coating:** 0.466 mil/year (depletion of zinc occurs in 6.4 years)
 - **5 mil coating:** 0.233 mil/year (depletion of zinc occurs in 21.4)
- **Bare steel loss due to soil corrosion after loss of zinc (per side):** 1.614 mil/year

- **With 0 mil coating:** 53.00 mil (at end of 40 years of design life)
- **With 3 mil coating:** 43.24 mil (at the end of 35 years of design life)
- **With 5 mil coating:** 20.54 (at the end of 35 years of design life)

If desired, a more detailed corrosion evaluation report can be developed by ANS Geo, or others, to interpret the soil corrosivity test results and estimate the rate of corrosion for zinc and bare steel resulting from exposure to the surrounding environment. This detailed corrosion evaluation may be provided to a foundation or structural engineer to incorporate the test results into the design and selection of pile foundations, or other buried steel across the site.

7.1.2 Buried Concrete

Corrosive soils can have a significant impact on below-grade concrete foundations by potentially damaging or weakening the concrete. One of the primary forms of concrete deterioration due to exposure to corrosive soils is sulfate attack. Sulfate attack is a common form of concrete deterioration which occurs when concrete comes in contact with water or soil containing sulfates. Sulfates are typically found in some soils, in seawater, and in wastewater treatment plants. The principal factors which affect the rate and severity of sulfate attack are permeability of concrete, concentration of sulfates, tricalcium aluminate (C_3A) content, and calcium hydroxide content. When sulfates react with C_3A , it will form ettringite which will expand and create internal tension within the concrete that eventually leads to cracking. Therefore, a low C_3A content is one of the main considerations when selecting cement for sulfate resistance.

Recommended concrete properties, including cement type, to resist sulfate attack are based on the site-specific sulfate exposure class, as per ACI 318-19, Table 19.3.1.1. The severity of the exposure of concrete to sulfate is divided into four classes (S0 through S3) depending on the water-soluble sulfate in soil (percent by mass) or dissolved sulfates in water (ppm).

If desired, ANS Geo can complete a detailed corrosion evaluation for the PV array post foundations at this project site and provide computations for expected corrosion rates for zinc coatings and bare steel assuming a provided design lifespan.

Table 13: Sulfate Exposure Classification from ACI318-14 Table 19.3.1.1

Sulfate Exposure Class	Water-Soluble Sulfate (SO_4^{2-}) in soil, percent by mass	Dissolved Sulfate (SO_4^{2-}) in groundwater, ppm
S0	$SO_4^{2-} < .10$	$SO_4^{2-} < 150$
S1	$.10 \leq SO_4^{2-} < .20$	$150 \leq SO_4^{2-} < 1,500$ or seawater
S2	$.20 \leq SO_4^{2-} \leq 2.00$	$1,500 \leq SO_4^{2-} \leq 10,000$
S3	$SO_4^{2-} > 2.00$	$SO_4^{2-} > 10,000$

As shown in **Table 9**, the results of laboratory corrosion testing indicate the water-soluble sulfate concentration within soil between two to four feet is averaged to approximately 57.5 mg/kg or .0057 percent by mass. Based on the results of this testing, the site soils appear to have a sulfate exposure class of **S0**, which corresponds to **negligible** sulfate exposure. ANS Geo recommends that concrete adheres to the requirements of ACI 318-14, Table 19.3.2.1 for concrete properties including maximum water-cement ratio, minimum compressive strength (psi), and cement type for the site-specific sulfate exposure class. For sulfate exposure class S0, external sulfate attack is likely not a concern and there are no recommended restrictions on cement type.

ANS Geo recommends that concrete adheres to the requirements of ACI 318-19, Table 19.3.2.1 for concrete properties including maximum water-cement ratio, minimum compressive strength (psi), and cement type for the site-specific sulfate exposure class. These recommendations do not consider acidic or basic soils, which should additionally be considered during cement design.

7.2 Frost Considerations

7.2.1 Frost Depth

According to the US Department of Commerce frost mapping, within Wasco County, Oregon, the local frost depth is mapped to exist at approximately 15 inches below grade. ANS Geo recommends that all shallow (non-pile) foundations should be embedded at least to this depth. Shallower foundation depths may also be accommodated, provided they are appropriately frost-protected by way of appropriately designed haunched edges, foam insulation, and/or free-draining structural fill extending to the frost depth.

For shallow foundations which are not load-bearing or sensitive to movement, such foundations may be able to be founded at shallower depths. ANS Geo should be contacted to provide recommendations for minimum embedment depth in this scenario.

7.2.2 Ad-freeze Influence

We recognize that fluctuations in air temperature, snow cover and insulation, and historic freezing indices have shown empirical correlations of shallower frost depth. For design of array and support structure pile foundations, shallower depths of frost influence may be considered, hereby referred to as “ad-freeze depth”.

Given the location of the project and soils encountered, the potential for frost heave against post foundations should be considered. Fine-grained soils, or granular soils with greater than 10 percent fine-grained content are frost-susceptible due to the inability of entrapped moisture from infiltrating or evaporating prior to freezing. Trapped moisture will begin to create ice lenses, which will grip the steel posts or embedded structures, followed by ice-jacking due to frost heave. The phenomenon is more commonly referred to as “ad-freeze stress”, which can be considered as an external, upward force applied to the post. The magnitude of the upward force will depend on the depth/thickness of the frost zone, the interface bond stress between embedded structure/material and the surrounding area, and the surface area of the structure/material in contact with this bond stress.

Several methods exist to evaluate frost susceptibility of soils, including determination of fine-grained content of near-surface soils, evaluation of air freezing index, and local, empirical correlations such as the Atlas of Soil Freezing Depth Extremes for the Northeastern United States. Frost penetration depth may be calculated in multiple ways, including local, County, or State building code frost depths, the US Army Corps of Engineers method using the modified Berggren Equation, and empirical data.

Based on the Wasco County General Building Requirements, the frost depth requirement is a minimum of 24 inches.

Additionally, using the modified Berggren Equation, frost penetration depth can also be calculated based on assumed values for soil density, moisture content, thermal conductivity, air freezing index, and volumetric latent heat of soil. Using site-specific values and assumptions, input into the modified Berggren Equation, and our professional opinion and experience, the calculated frost penetration depth for a 100-year return period, for ad-freeze stress consideration purposes, is roughly 18 inches.

Based on our evaluation, since conditions may exist where snow cover is not present during low temperature extremes, and using a calculated depth of frost penetration, ANS Geo recommends that piles may be designed considering an “ad-freeze depth” of 18 inches (1.5 feet) below grade with the presence of sod/vegetative cover. As predominantly fine-grained soils were observed near grade, ANS Geo recommends that an unfactored ad-freeze (uplift) stress of 1,500 pounds per square foot (10.4 psi) be considered within the 18-inch ad-freeze depth of posts for panel foundation sizing and design.

7.3 Soil Shrink & Swell Potential

Shrinkage and swelling of soils refer to the volumetric change (decrease and increase) exhibited in primarily fine-grained soils due to a change in moisture conditions. The extent of shrinking and swelling is largely influenced by the type and amount of clay present in the native near-surface soils. Higher-risk soils

generally include fine-grained material with a high clay content, greater than 50 percent by weight, and liquid limits of 50 percent or higher (fat clays).

The subsurface conditions observed within our limited investigation program show the soils within the project area to consist predominantly of medium plasticity clay, with varying amounts of gravel and sand. These soils present a low to negligible risk of soil shrink and swell. Additionally, the presence of shallow bedrock further mitigates this concern.

7.4 Recommended Parameters for PV Array Pile Design

Based on our interpretation of the subsurface conditions observed within our limited investigation program ANS Geo recommends that the soil parameters in **Table 14** be considered for axial and lateral preliminary driven pile designs within array areas only.

Table 14: Recommended LPILE Parameters for Array-Area Driven Pile Design

Depth (ft)	Material Model	Total Unit Weight (pcf)	Internal Friction Angle	Cohesion (psf)	Soil Modulus, k_{static} (psi/in.)	Soil Strain (E_{50})	Allowable End Bearing ^{1,2} (psf)	Allowable Side Resistance ^{1,2} (psf)
0 to 1.5	Stiff Clay w/o Free Water (Reese)	100	--	2,100	---	0.006	--	--
1.5 to 4	Stiff Clay w/o Free Water (Reese)	100	--	2,100	500	0.006	--	75
4 to 6	Stiff Clay w/o Free Water (Reese)	110	--	3,400	500	0.005	--	125
6+	Stiff Clay w/o Free Water (Reese)	150	--	6,000	500	0.003	4,100	275/500 ⁴

1. These recommendations consider a minimum factor of safety of 2.0 for end-bearing and skin friction conditions.
2. Equivalent box perimeter area approach was utilized for axial capacities.
3. Allowable end bearing values are recommended based on strain compatibility with mobilized allowable side resistances.
4. An allowable side resistance of 275 psf should be considered for areas around PLT-08, 11, and 16. In all other tested areas, an allowable side resistance of 500 psf should be utilized.

An effective unit weight value (62.4 pcf subtracted from the Total Unit Weight values prescribed in **Table 13**) should be considered for soil layers below the design (average) groundwater table. **Section 3.10** of this report should be referenced to identify the average observed groundwater table at the time of our investigation program.

ANS Geo recommends that allowable side resistance within the upper 18 inches be neglected due to potential erosion, frost impact, or surficial disturbance. For lateral design considerations, ANS Geo additionally recommends that lateral resistance within the upper six (6) inches be neglected to account for potential erosion; this depth should be confirmed in the Civil Engineer of Record's hydrological study. Pile load testing results and subsurface observations were evaluated by ANS Geo using LPILE software to provide these refined soil parameters. ANS Geo notes that the soil parameters depicted within **Table 11** represent values calibrated to curve-fit our lateral load test data; these parameters should not be relied upon for other site foundation designs. It is our recommendation that a verification load testing program and detailed structural calculations, using the intended pile sections and design loads, be performed prior to construction to confirm these recommendations.

Variation in pile capacities and bedrock depth were observed throughout the site. Due to the large size of the project area and potentially varying depth of bedrock, it may be beneficial and feasible to divide the project site into "zones" with different recommended design parameters for driven piles for the PV array areas. To accurately make this determination and delineate the zones realistically, a design-level geotechnical investigation including pile load testing program is needed. Additionally, an increased

frequency of proof-load testing around the assumed zone boundaries should be conducted in the construction phase if zones are to be utilized

ANS Geo notes that these recommendations are based on typical criteria we have observed through our professional experience; once a racking vendor has been selected, the racking vendor's specific criteria should govern over our recommendations.

7.5 Recommended Soil Parameters – Shallow Foundations

ANS Geo anticipates that shallow foundations such as concrete footings, housekeeping pads, inverter pads, or sonotubes will be used to support non-critical and lightly loaded structures. As such, we recommend the soil parameters depicted within **Table 15** be considered for such foundation designs, assuming a maximum post-construction vertical movement of one-inch. Load-bearing foundations should be installed atop properly prepared subgrade as indicated in **Section 8.3**.

Table 15: Recommended Soil Parameters for Shallow Foundations

Depth (ft)	Material	Max. Allowable Bearing Pressure (psf)		Vertical Subgrade Modulus	Soil / Concrete Friction Factor
		Strip Footings / Grade Beams	Isolated Square / Circular Footings		
0 to 4	Clay	1,500	1,750	65	0.3
4 to 6	Cobbles	2,500	3,000	135	0.4

ANS Geo notes that **Table 15** includes bearing capacities for layers which may be impacted by frost. For foundations which are founded within the frost zone (as noted in **Section 7.2**), these foundations should be frost-protected by way of appropriately designed haunched edges, foam insulation, and/or free-draining structural fill extending to the frost depth. Should the maximum allowable bearing capacity be lower than required, ANS Geo recommends over-excavating below the recommended excavation depth and replacement of native material using additional structural fill placed and prepared as noted in **Section 8.3**. For each additional 12-inches of over-excavation and replacement of structural fill beyond the recommended minimum, an increase of 250 psf can be achieved.

The capacities and parameters noted in **Table 15** are based on foundation considerations and assumptions detailed in **Section 8.3**. The above recommendations in **Table 15** are based on strip footings and isolated spread footings with dimensions producing less than 100 square feet.

7.5.1 Mat Foundations

Mat foundations (100 square feet or larger, such as larger substation slabs) should be founded at a depth of at least two (2) feet or greater on at least 12 inches of properly compacted structural fill as indicated in **Section 8.3**.

Table 16: Recommended Soil Parameters for Mat Foundations

Depth (ft)	Material	Max. Allowable Bearing Pressure (psf)		Vertical Subgrade Modulus	Soil / Concrete Friction Factor
		100 to 500 sq. ft foundation	> 500 sq. ft foundation		
1 – 4	Clay	1,500	1,200	85	0.3

Rigid mat foundations placed on properly compacted fill may be designed for a maximum allowable bearing capacity of 7,600 lb/ft² and may be designed for an increased maximum settlement of two (2) inches. The mat foundation should be constructed on the compacted structural fill layer. Use of a vapor retarder such as polyethylene sheeting may be considered by the designer directly beneath the foundation to limit the

potential for water to wet the underlying fine-grained soils. Adequate construction joints and reinforcement should be provided to reduce the potential for cracking of the floor slab due to differential movement.

Lastly, sliding resistance of any shallow foundations will be largely provided by the friction between the concrete foundation and the underlying subgrade soils. Although the concrete foundation will be separated from the native soil by a compacted structural fill layer, we have conservatively considered direct contact on native fine-grained soils for purposes of obtaining a design value. The base friction coefficient for the foundation on native soils are provided in the above tables. The strains required to mobilize base friction are not compatible with the strains required to mobilize passive resistance. Therefore, we recommend that passive earth pressure be ignored.

7.6 Recommended Soil Parameters – Deep Foundations

If critical substation or BESS structures are subjected to heavy compressive and/or overturning loads, it is recommended that drilled pier foundations be used. Geotechnical design values have been created for use in Ensoft LPILE, Fad Tool's MFAD, or CAISSON software. These parameters have been provided in **Table A** immediately preceding the attachments.

7.6.1 Deep Foundation Capacities

Design capacities can be calculated using the diameter of the shaft, depth of the shaft, installation method, and various geotechnical parameters, provided in **Table A**, that define how the soil will behave under load. A summary of the recommended ultimate skin friction and end bearing values for drilled shaft design is provided in **Table A**. Piers should extend a minimum of 2.0 pier diameters into a given soil stratum to fully develop the recommended design end bearing strengths. A minimum factor of safety of two (2) must be applied to the skin friction values and three (3) to the end bearing capacities for design purposes.

Post-construction settlement for drilled piers designed for end bearing should be limited to one (1) inch or less, based on the recommended capacities provided herein. Foundation loads and dimensions would be required to calculate an explicit anticipated settlement. ANS Geo should be consulted with the final dimensions and loading of the proposed foundations to allow calculation of the anticipated settlement of each structure and confirm the settlement remains within a serviceable limit.

7.6.2 Deep Foundation Construction

Based on the presence of gravelly soils below the upper fine-grained soils, temporary casing may be required, depending on the design embedment depth of the piers, to maintain borehole integrity prior to placement of reinforcing steel and concrete. Contractors should be required to provide bid prices for varying sizes and lengths of temporary casing based on the design depths and diameters of deep foundation elements. Piers should be poured the same day they are drilled and must not be left open overnight. If a pier cannot be poured on the same day as drilling, they may be loosely backfilled and re-drilled the following day for installation. To the extent possible, cast-in-place concrete should be placed "in the dry"; pumps or casing may be necessary to remove or prevent infiltration of groundwater into open excavations prior to placement of concrete.

Pier holes should be inspected for verticality (plumbness), proper depth of drilling, proper bearing strata, and cleanliness of the bottom of the excavation prior to introduction of reinforcing steel or concrete. ANS Geo encourages that concrete should be placed via tremie method to avoid consolidation or segregation of the aggregates in the concrete.

8 Construction Recommendations

8.1 Excavation

Depending on proposed foundation configurations, degree of earthwork, and depth of utilities, some excavations may extend deeper than four (4) feet below grade. Temporary excavations deeper than four (4) feet should be shored or sloped and benched, in accordance with OSHA regulations, to ensure safe working conditions within the excavations. For benching purposes, overburden clays may be considered as “Type A” material and should be sloped no steeper than 3/4H:1V (horizontal to vertical). Clayey sands, “Type B”, should be limited to 1H:1V or flatter. “Type C”, flowing (non-cohesive) sands, should utilize 1-1/2H:1V or shallower. All OSHA soil classifications should be field-determined by the contractor’s “competent person” prior to excavation. Any proposed shoring systems should be designed by the contractor’s “competent person”, be certified by a Professional Engineer licensed in the State of Oregon and should be submitted to the engineer for review.

Contractors are made aware that the presence of shallow rock, cobbles, and boulders were noted and confirmed across the site. Since it is understood that cut activities and earthmoving may be required to meet final design grades for the project, the presence of harder excavation and/or rock excavation will be required. At minimum, Contractors should be prepared to conduct excavation, grading, and rock removal as part of their work. To provide a baseline definition, rock excavation consists of the removal of hard igneous, metamorphic, and/or sedimentary rock, which should be attempted using a track mounted power excavator, equivalent to Caterpillar Model No. 215C LC, which is rated at not less than 115 HP flywheel power and 32,000 pound drawbar pull equipped with a short stick and a 42 inch wide, short tip radius rock bucket rated at 0.81 cubic yard (heaped) capacity. Should rock removal not be possible, the contractor should attempt to break and remove rock using a hoe-ram, rock breaker, or other mechanical means as part of the attempt to grade and remove rock. Lastly, the presence of isolated boulders or rock fragments larger than one (1) cubic yard is not in itself a sufficient cause to change the classification of the surrounding material and should not be considered rock excavation.

Should rock removal not be possible with machinery meeting the minimum requirements of typical rock removal and excavation equipment, and additional means such as controlled blasting, line drilling, or other method be required, the Geotechnical Engineer, Owner, and/or Owner’s representative should be immediately notified in writing, and the Contractor should provide several options and methods based on their site-specific and local experience for the removal of the rock, to allow the Owner to evaluate what additional methods can be used and any additional costs which may be incurred. The Contractor shall have documented their attempt to remove rock using the equipment and traditional means noted above by means of providing cut sheets, video, on-site meeting, and/or other method prior to notifying of harder rock conditions which require additional effort.

8.2 Dewatering

At the time of our geotechnical investigation, perched water and/or groundwater was encountered within two (2) of the 25 test pits at approximately 50 and 78 inches below ground surface existing at the time of our investigation. As such, dewatering is not anticipated for shallow excavations. Notwithstanding, the contractor should be prepared to manage groundwater, perched water, and/or infiltrated stormwater as needed using localized sump-and-pump, wellpoint, or similar techniques to allow for concrete foundation construction in-the-dry. Water discharge should be managed in compliance with applicable state and local regulations. The contractor should be sure to grade the surface as necessary to divert stormwater away from open excavation to the extent possible.

8.3 Subgrade Preparation and Compaction

Prior to the installation of shallow concrete foundations, ANS Geo recommends over-excavating the subgrade by at least 12 inches, proof-rolling the subgrade, lining the exposed material with a geotextile separation fabric, and bringing the subgrade back up to the design foundation elevation with compacted

structural fill as specified within **Table 17**. If geotextile fabric is not desired, an additional two (2) inches of stone should be provided to account for some impregnation of the stone into native soil, to maintain a capillary break, and maintain drainage.

Native material beneath the separation fabric should be inspected for unsatisfactory conditions such as standing water, frozen soil, unsuitable soil, organics, protruding cobbles or boulders, or deleterious materials. Should any unsatisfactory conditions exist within the native subgrade, the excavation should be undercut an additional six (6) inches (18 total inches beneath proposed foundation depth) prior to placement of the geotextile separation fabric.

Table 17: Recommended Specification of Structural Fill

Sieve Size	Percent Passing
2-inch	100
1 ½-inch	60 – 100
No. 4	30 – 60
No. 200	0 – 10
Max. Liquid Limit	Max. Plasticity Index
30	10

Should structural fill material not be available, in accordance with the specifications highlighted in **Table 17**, ANS Geo should be contacted to evaluate alternate materials. Structural fill should be placed in loose lifts not exceeding 12-inches if using large equipment, or 8-inches if using hand-operated tools such as jumping jacks, tamping plates, or similar equipment. Structural fill should be placed within two (2) percent of its optimum moisture content and be compacted to at least 95 percent of its Modified Proctor Density (ASTM D1557). The subgrade preparation (over-excavation, fabric, and structural fill) should horizontally extend at least two (2) times the compacted vertical structural fill thickness beyond each edge of the foundation. For example, a six (6)-inch over-excavation and compacted structural fill thickness should extend at least 12 inches laterally beyond each foundation edge.

For excavations into bedrock (if encountered) which are required in order to support foundations on rock, the exposed rock face should be broom-cleaned to remove fines, power-washed or cleaned of any infilling or surface detritus, followed by concrete foundations cast directly onto the prepared bedrock. The use of rock anchors or other positive connection may be required if the foundations are installed shallower than the recommended foundation depth, and if drainage is not provided to prevent the build-up of water which may form ice lenses beneath proposed structures.

8.4 Backfilling and Compaction

8.4.1 Re-Use of Native Soils

ANS Geo notes that any native soils with considerable fine-grained content (more than 20 percent) may be difficult to handle, place, and compact without proper moisture conditioning and protection. ANS Geo recommends the following measures be considered to reduce the adverse impacts of moisture-sensitive soils:

- Positive measures should be implemented and maintained to intercept and direct surface water away from moisture-sensitive subgrade surfaces.
- Subgrade surfaces should be sloped and, as appropriate, seal-rolled to facilitate proper drainage. Surfaces should be properly prepared in anticipation of inclement weather. Moisture should not be allowed to collect on subgrade surfaces.
- To the extent practical, the limits of exposed subgrade soils should be minimized.
- Construction traffic should be limited to properly constructed haul roads.
- Disturbed soils should be removed and replaced with compacted controlled fill material.
- In place moisture contents should be maintained with two percent wet/dry of the optimum moisture content as determined by the Modified Proctor Test (ASTM D1557).

These soils may be re-used across the project area for fill in landscaped areas; however, it should not be used under or above foundations or load-bearing structures where typically imported structural fill or general backfill are used, respectively. Native material used as backfill for cable trenches should be handled and placed at a moisture content at or above its optimum value to ensure representative thermal properties are maintained. Native soils may also be used in required “fill” areas within the PV array footprint(s), provided that the material is placed and compacted consistent with the “general backfill” recommendations described herein.

8.4.2 General Backfill

In areas around and above installed foundations, large utilities, and other buried site features, ANS Geo recommends well-graded granular soils with less than 20 percent fine-grained content may be used as general backfill. Native soils meeting these criteria, if and where present, may also be used. General backfill material should be screened of any cobbles, boulders, and any particles larger than 3 inches in diameter, and should not be used beneath any load-bearing structures. General backfill should be placed in loose lift thicknesses not exceeding 12 inches and be compacted to at least 95 percent of its Modified Proctor Density (ASTM D1557). Soil used as backfill should not be handled when frozen and should be free of excessive moisture, organics, and deleterious material.

In fill areas beneath foundations and load-bearing structures, ANS Geo recommends structural fill as described in **Section 8.3** and **Table 16**. Flexible base for gravel access roads is specified in **Section 8.5**.

8.4.3 Compaction Testing

Compaction testing should be performed at each discrete equipment foundation location for each compacted lift at a minimum of one test per 2,500 square feet. For linear sections such as trenches, the contractor and/or the owner's representative should perform a visual trench bottom inspection along the length of the trench to confirm no angular, sharp, deleterious, frozen, trash, organic material, or standing water exists at the bottom of trench. For backfilling and compaction of trenches, a minimum of one compaction test per 500 linear feet and minimum one per lift, should be performed. In all cases, the subgrade should be maintained, covered, or protected if concrete is not immediately placed. Excessively wet or dry material should be removed or improved prior to the placement of foundations.

8.5 Access Roads

ANS Geo understands that, as part of the work, access roads will be constructed to provide access for heavy equipment such as a main power transformer, poles, and other ancillary structures, as well as long-term access for site maintenance purposes. It is expected that new, unpaved paths will be constructed of aggregate material placed on native, compacted and proof-rolled subgrade stripped of topsoil and other organic material.

During construction, the delivery and movement of heavier loads such as transformers, inverters, delivery of steel and concrete, and transportation of cabling is expected. Construction loads and vehicles are larger and heavier than the expected vehicles during long-term operation; however, the duration of these activities will be much shorter considering the access road life. Designing for short-duration, construction-phase access road would require increased thickness of aggregate, the use of geogrid, or other soil improvement, but these increased roads would be over-designed for long-term operation including routine light-duty trucks, maintenance vehicles, and infrequent accessibility to emergency personnel including fire-fighting rigs. Therefore, it is typical for access road design to be completed considering the thickness of road base required for long-term use since it is expected that the site subcontractor will be able to maintain serviceable access roads throughout construction and at turn-over of the facility by backfilling ruts greater than two-inches, back-blading and re-compacting loose and rutted areas, re-shaping roads to promote drainage and safe passage of traffic, and other improvements.

Considering the above, ANS Geo has performed an evaluation of the required access road thickness based on infrequent emergency access for firefighting vehicles as well as occasional light vehicular traffic. Our preliminary road evaluation for a post-construction access road assumed the following:

Table 18: Access Road Design Considerations

Design Consideration	Design Assumption
Equivalent Single-Axle Loads (ESALs)	10,000
Allowable Rut Depth	3-inch
Long term Service Life	35 years
Subgrade Soil	Proof-rolled stiff clay
Assumed Min. Design Subgrade CBR	2% (following proof-roll and compaction)

ANS Geo recommends that road base material (flexible base) consists of clean, crushed stone or roadbase material with particle size distribution as presented in **Table 17**.

Table 19: Required Gradation Access Road Material

Sieve Size	Percent Passing
1.5"	100
3/4"	55 – 90
No. 4	25 – 50
No. 50	5 – 20
No. 200	3 – 10

ANS Geo has provided a number of access road configurations in **Table 18** based on the assumptions in **Table 16**. The use of a non-woven geotextile fabric (such as Mirafi HP270) is recommended and presented within our evaluation. In addition, it is possible and likely that certain areas will require stabilization or additional access stone thickness where weaker soils are present. The overall cross-sectional thickness may be reduced by the use of a Class II geogrid (such as Tensar BX1200 or TX7). Cement or lime stabilization can also be utilized to reduce the access road thickness, as long as the stabilized base has a soaked CBR of greater than 35 percent. This access road thickness can also be reduced if a greater rut depth is allowed to minimize the access road thickness as long as maintenance is performed to restore the roadway to a serviceable condition as damage occurs. A comparison of various options and configurations has been provided in **Table 20**.

Table 20: Recommended Aggregate Thickness for Permanent Site Access Roads

Aggregate Construction Option	Access Road Cross Section
Aggregate on prepared native soil	13 inches of Crushed Stone over non-woven geotextile
Aggregate with geotextile fabric	10 inches of Crushed Stone over non-woven geotextile
Aggregate with Class II geogrid and geotextile fabric	7 inches of Crushed Stone over Class II geogrid atop non-woven geotextile

ANS Geo understands that chemically-stabilized subgrades have been shown to deteriorate over time, and the performance of the treated subbase may require some additional maintenance during the design life of the project. Should chemically-stabilized roads be used, ANS Geo recommends that some maintenance (such as adding additional stone, where needed) be considered; or, an additional two inches of crushed stone can be added to the wear course to accommodate the potential deterioration of the chemically-stabilized subgrade.

When using geogrid, it is recommended that a nonwoven geotextile fabric be placed between the clay subgrade and the geogrid to provide separation and avoid the stone aggregate to be blinded with fines. If geotextile fabric is not desired, an additional two (2) inches of stone should be provided to account for some impregnation of the stone into native soil. When geogrid is used, it should be placed in accordance with manufacturer's recommendations such as three (3) foot overlap, fastening overlapping areas, and material storage and handling.

Prior to roadway construction, the subgrade should be stripped of vegetation and topsoil, and should be confirmed to maintain a minimum CBR value assumed in **Table 17** and compaction to 95 percent of its Modified Proctor Density (ASTM D1557) to be in conformance with ANS Geo's above recommendations. Should the desired CBR and/or target compaction not be achieved, ANS Geo first recommends that the upper 12-inches be scarified, moisture-conditioned (dried or wetted to within +/- 2% of optimum moisture content), and re-placed and re-compacted. Should this not produce the desired minimum CBR and subgrade performance, soil improvement such as additional stone, and/or additional stabilization may be required to meet ANS Geo's minimum design recommendations. Crushed stone should be placed in loose lifts not exceeding eight (8) inches in height, and be compacted to ensure a minimum CBR of 35 percent is achieved.

Field conditions should be verified at the time of construction. Subgrade conditions could vary based on excavation depths, weather, drainage, and construction practices that disturb the subgrade. Dynamic cone penetrometer (DCP) testing should be completed on the prepared subgrade per ASTM D6951 and in a consistent manner by trained personnel to obtain useful and reliable data. ANS Geo recommends that, at minimum, DCP testing should be completed at a frequency of one test per each 500-linear feet of access roadway. Should conditions vary, this frequency may be increased or decreased based on observations from the site, or at the discretion of the Geotechnical Engineer of Record, Civil/Structural Engineer of Record or Owners Engineer. The tests should be staggered across the width of the road at outer wheel-tracks (left and right) and the centerline. However, the variability of the road subgrade strength will only become fully apparent when the tests have been carried out. In order to ensure statistical reliability, at least ten tests should be taken in each uniform section. The use of DCP testing may also be used to decrease the thickness of access road stone, if the prepared subgrade is stiffer (is confirmed to have a higher CBR) than ANS Geo's design assumption and no visible surface water or pumping is observed in the section of roadway being tested. ANS Geo can be contacted to provide a table of access road stone thickness compared to field-confirmed CBR.

ANS Geo notes that the presence of standing water may exist across the site around times of precipitation, during construction and development. The presence of water may make the native soil subgrade softer, and it may require additional site preparation to allow vehicles and equipment to pass. The Contractor should take these conditions into consideration, including the need for additional access stone and/or cement or lime for the stabilization of these conditions.

Due to the large size of the project area and varying soil conditions, we understand that different access road recommendations for different areas can be possible. Also, ANS Geo notes that the anticipated traffic on different sections of the access roads will be different. As such, it may be beneficial and feasible to divide the site into "zones" with different recommended aggregate thicknesses. These zones can be determined based on the planned number of ESALs or differences in the subgrade. To accurately make this determination a design-level geotechnical investigation including CBR and Index testing is needed.

If chemical stabilization is performed, the contractor should perform any necessary due diligence to confirm their design, means, and methods. The subgrade should be verified below the treatment depth to evaluate the CBR value of the subgrade prior to treatment. In addition, the recommended chemical stabilization application rate should be taken as an assumed average. The actual application rate should be determined by the contractor and may vary based on the tested and desired subgrade CBR along the proposed roadway, the treatment depth required, and the moisture content. The application rate and treatment depth should be evaluated by performing several test strips at the project site prior to the start of construction and testing the test strips in the field using a dynamic cone penetrometer or plate load test to confirm the CBR. Then, once the application rate and depth are evaluated, verification and calibration testing should be performed using the dynamic cone penetrometer at intervals of no less than 500-linear feet along the access roadway.

8.6 Pile Installation Considerations

ANS Geo anticipates that, as typical with solar farm construction, solar panels may be supported by driven steel wide-flanged piles or screw-type piles torqued to their final embedment depths. Wide-flanged piles are typically installed via direct-push, vibration, and/or percussive hammer methods. Based on our field investigation and knowledge of the regional geology, it is likely that cobbles, boulders, and bedrock may be encountered at the foundation post locations within the anticipated embedment depths and, therefore, piles may not be able to be installed to the typical embedment depth before refusal.

Bucket excavation refusal within test pits was consistently observed, being noted as shallow as 26 inches below ground surface during our field investigation. In total, refusal shallower than 10 feet below ground surface was observed in all 20 array area test pits. Additionally, numerous cobbles were consistently observed within the test pit excavations, documented throughout. One (1) test pile was direct driven into soil. This pile hit practical refusal at a depth of five (5) feet BGS. ANS Geo does not recommend using this factual number to estimate refusal rate, as the actual refusal rate may be higher or lower due to heterogeneity of site conditions and methodologies.

In accordance with the observed cobbles and boulders from our field investigation, it should be noted that in many cases, wide-flanged sections have the ability to “bend” at the flanges or push small cobbles aside. Notwithstanding, ANS Geo recommends a design-level pull-out testing campaign be completed using the planned pile sections (screw piles or W-sections), to the proposed embedment depths, and using the expected construction means and methods.

Should driven piles be implemented, ANS Geo recommends that the contractor be prepared to pre-drill at proposed post locations to clear obstructions, as needed. We recommend that pre-drilled holes be completed to a diameter slightly smaller than the diagonal dimension of the proposed pile section to ensure a tight fit once the pile is driven to its targeted depth. For example, an under-sized, four to five-inch diameter hole may be drilled and utilized for W6x9 section (approx. 7.1-inch diagonal measurement). The contractor should be aware, however, that heavier sections (ie. W6x12 or W6x15) may have limiting “bending” capacity in its flanges, and therefore require a hole of a slightly larger proportion.

Verification testing should follow the requirements of the Authority Having Jurisdiction, the EPC’s racking manufacturer/supplier, or the EPC’s structural engineer typically determines quality control testing frequency for pile installation during construction. If no recommendations are provided by the foundation engineer-of-record, ANS Geo recommends a minimum of 0.2% of piles or two piles per block during construction. Quality control testing quantities should meet industry standards and costs of axial tension and/or axial compression, depending on the governing design capacity, along with lateral load testing. We recommend that piles be allowed a minimum 72-hour “setup” time between installation and testing during verification load testing to maximize soil contact and strength.

9 Limitations

ANS Geo notes that the findings and recommendations presented within this Preliminary Geotechnical Report are based on our investigation programs conducted between September and October 2024, and our engineering judgment. In addition, the current level of investigation does not represent the level of investigation to support a final design, and it is expected that a final, detailed-level geotechnical investigation will be completed at the site prior to final design and start of construction by an EPC to confirm and further define the recommendations provided herein. If ANS Geo's limited and preliminary investigation is used for final design, our recommendations shall only be valid for the exact and specific locations at which field investigations or laboratory testing was completed. All other areas and regions of the site which are not investigated under a final investigation to confirm if our preliminary and limited investigation is valid for the entire project site will be at the risk of the individual or entity using this Report.

If actual site subsurface conditions differ from the inferred conditions on which ANS Geo has based our confirmation-dependent recommendations, ANS Geo will need to modify our confirmation-dependent recommendations to develop final recommendations.

Table A

Substation and BESS Foundation Recommendations

Attachment A

Investigation Location Plan

Attachment B
Geological Map

Attachment C

Test Pit Logs

Attachment C

Test Pit Logs

Attachment D

Laboratory Test Results

Attachment E

Electrical Resistivity Test Data

Attachment F

Pile Load Test Results

Attachment G

Seismic Hazard Site Classification

Attachment H
NRCS Soil Survey

Attachment I

Investigation Photographic Log

ANS GEO

TABLE A

Table A - Deep Foundation Parameters (BESS)																			
Associated Borings	Material Type (USCS)	Lpile/Mfad/Caisson Modeled Material Type	Depth (ft)		LPile / MFAD			MFAD		LPile			Drilled Shafts (Lpile)			Active Earth Pressure Coefficient, K _a	Passive Earth Pressure Coefficient, K _p	Drilled Shafts	
			From	To	Effective Unit Weight [pcf]	Friction Angle soil [°]	Soil Cohesion of soil [psf]	Deformation Modulus, Ed [ksi]	Rock/Concrete Bond Strength [psi]	Unconfined Compressive Strength of Rock [psi]	Strain Factor, k, rm,	RQD (%)	p-y Modulus, K _s (Static Loading) [lb/in ²]	p-y Modulus, K _c (Cyclic Loading) [lb/in ²]	Strain Factor, e50			Ultimate Skin Friction [ksf]	Ultimate End Bearing [ksf]
TP-BESS-01~TP-BESS-02	Silt (ML)	Stiff Clay (Reese)	0	1	100	---	500	0.30	---	--	--	--	---	---	0.01	1.00	1.00	---	---
	Silt (ML)	Stiff Clay (Reese)	1	3	100	---	750	0.50	---	--	--	--	200	---	0.01	1.00	1.00	---	---
	Rock	Weak Rock (Lpile) Rock (MFAD)	3	40	130	--	2,500	930	200	1500	--	--	--	--	--	--	--	15.1	32.8

- Parameters assume no groundwater.
- Skin friction in the upper 1.0 foot should be neglected.
- Skin Friction and End Bearing Resistances assume a 24-inch diameter shaft is constructed. Larger diameter foundations may exhibit larger resistances.
- A factor of safety of 3.0 and 2.0 is recommended for end bearing and ultimate skin friction capacities, respectively.
- ANS Geo notes that the parameter values in Table A, initially derived from test pit data, require further verification through detailed soil boring and laboratory tests.

Table A - Deep Foundation Parameters (Substation)																			
Associated Borings	Material Type (USCS)	Lpile/Mfad/Caisson Modeled Material Type	Depth (ft)		LPile / MFAD			MFAD		Unconfined Compressive Strength of Rock [psi]	LPile Strain Factor, k, rm,	RQD (%)	Drilled Shafts (Lpile)			Active Earth Pressure Coefficient, K _a	Passive Earth Pressure Coefficient, K _p	Drilled Shafts	
			From	To	Effective Unit Weight [pcf]	Friction Angle soil or rock [°]	Cohesion of soil or rock [psf]	Deformation Modulus, Ed [ksi]	Rock/Concrete Bond Strength [psi]				p-y Modulus, K _s (Static Loading) [lb/in ³]	p-y Modulus, K _c (Cyclic Loading) [lb/in ³]	Strain Factor, e50			Ultimate Skin Friction [ksf]	Ultimate End Bearing [ksf]
TP-SS-01~TP-SS-03	Silt (ML)	Stiff Clay (Reese)	0	1	100	---	500	0.30	---	--	--	--	---	---	0.01	1.00	1.00	---	---
	Silt (ML)	Stiff Clay (Reese)	1	3	100	---	750	0.50	---	--	--	--	200	---	0.01	1.00	1.00	---	---
	Rock	Weak Rock (Lpile) Rock (MFAD)	3	40	130	---	2,600	560	150	1250	0.0005	--	---	---	---	---	---	14.31	32.8

- Notes:
- Parameters assume no groundwater.
 - Skin friction in the upper 1.0 foot should be neglected.
 - Skin Friction and End Bearing Resistances assume a 24-inch diameter shaft is constructed. Larger diameter foundations may exhibit larger resistances.
 - A factor of safety of 3.0 and 2.0 is recommended for end bearing and ultimate skin friction capacities, respectively.
 - ANS Geo notes that the parameter values in Table A, initially derived from test pit data, require further verification through detailed soil boring and laboratory tests.

Attachment A

Site Investigation Mapping

INVESTIGATION LOCATION PLAN



Client:



INVESTIGATION LOCATION PLAN Substation and BESS

BRIGHTNIGHT
DESCHUTES SOLAR AND
STORAGE
WASCO COUNTY, OREGON

Legend

- Substation Location
- BESS Boundary
- ⊗ Test Pit Location
- ⊗ Substation Electrical Resistivity (ERT) Location

0 150 300 ft



Absolute Scale: 1 inch = 150 feet
Scale at 11" x 17" AS SHOWN

Prepared by: Amna Alashkhari
Date: October 24, 2024
Drawing Number: ILP-PLT Rev.0

TP-BESS-01A
TP-BESS-01B

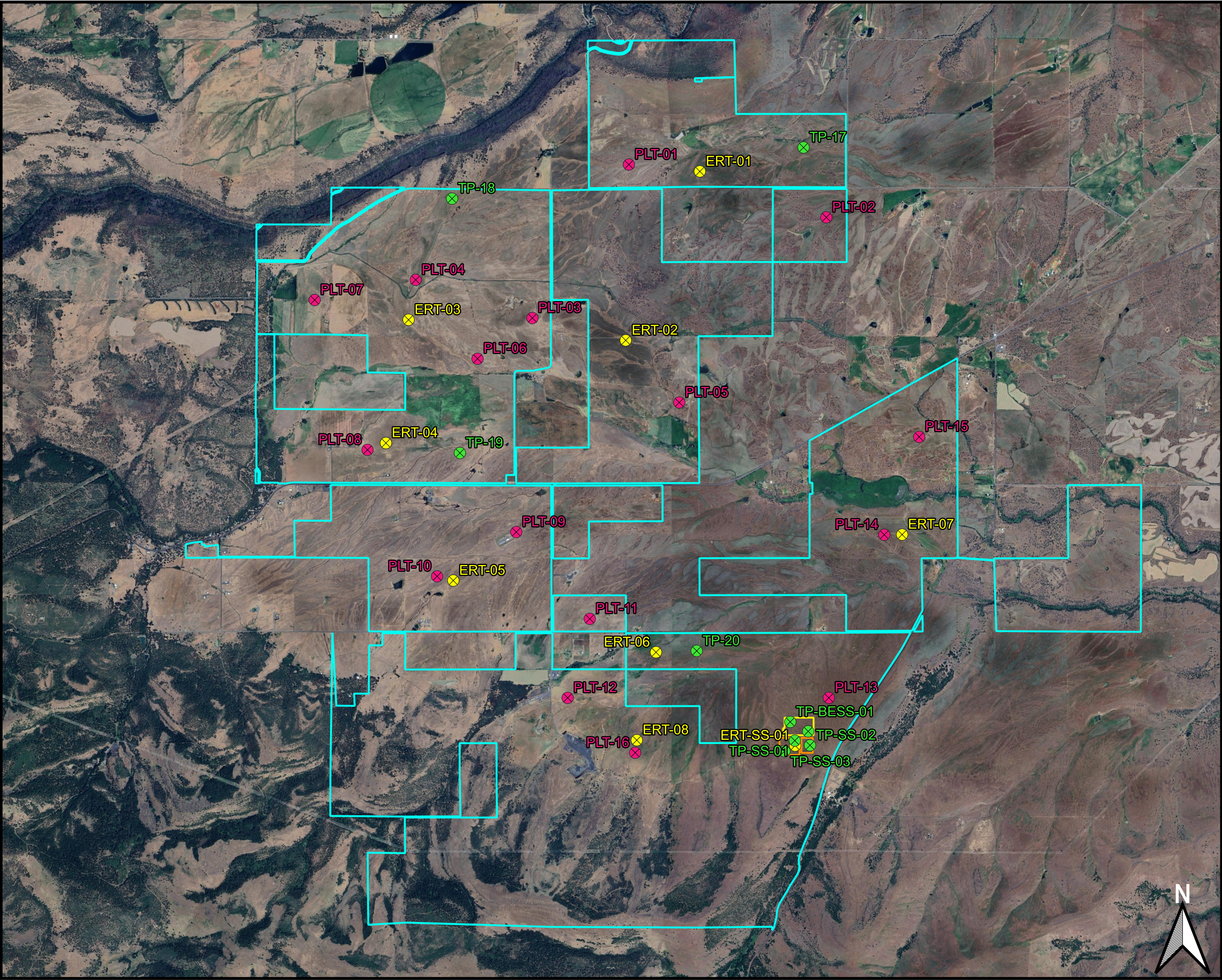
TP-BESS-02

TP-SS-01
ERT-SS-01

TP-SS-03

TP-SS-02





Client:



INVESTIGATION LOCATION PLAN Delineated Wetlands

**BRIGHTNIGHT
DESCHUTES SOLAR AND
STORAGE
WASCO COUNTY, OREGON**

Legend

- Substation Location
- Project Boundaries
- BESS Boundary
- Water Buffer

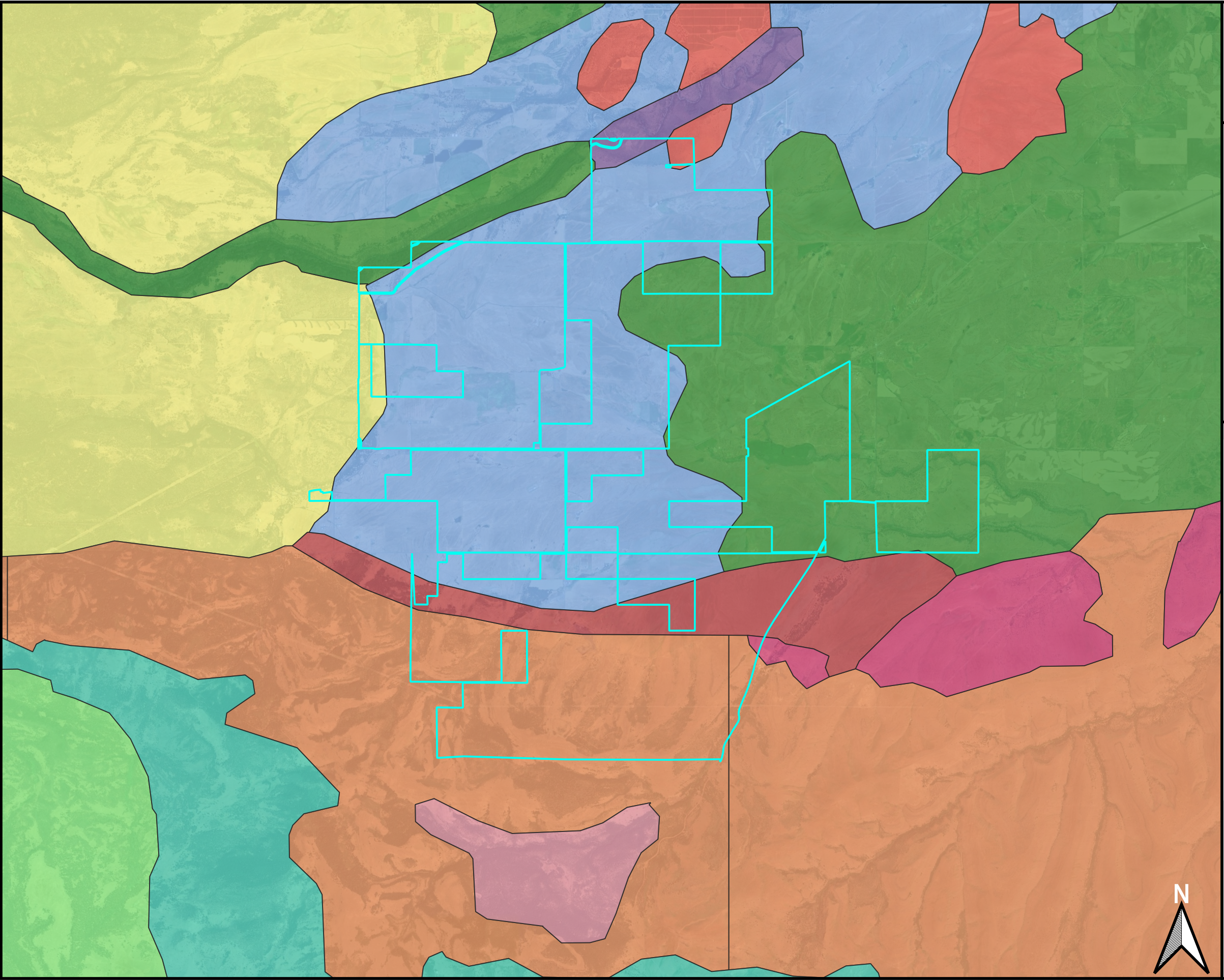


**Absolute Scale: 1 inch = 3,500 feet
Scale at 11" x 17" AS SHOWN**

Prepared by: Amna Alashkhari
Date: October 24, 2024
Drawing Number: ILP-PLT Rev.0

Attachment B

Geologic Mapping



Client:

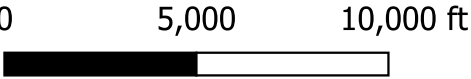


GEOLOGIC MAP

**BRIGHTNIGHT
DESCHUTES SOLAR AND
STORAGE
WASCO COUNTY, OREGON**

Legend

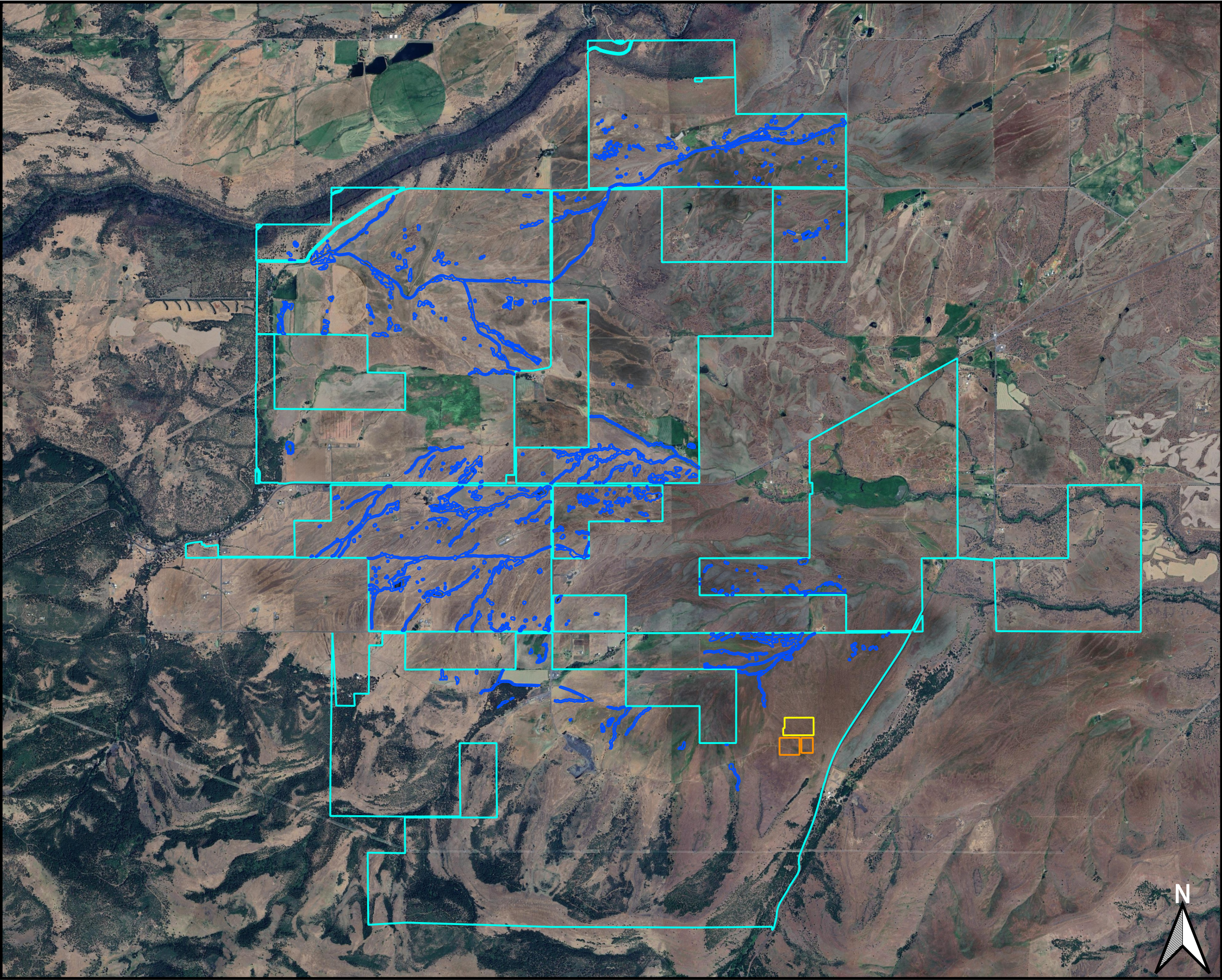
- Project Boundaries
- Sedimentary rocks: Semiconsolidated lacustrine and fluvial ashy and palagonitic
- Olivine basalt
- Grande Ronde Basalt
- Basalt and basaltic andesite
- Wanapum Basalt
- Lacustrine and fluvial sedimentary rocks
- Silicic vent complexes
- Pyroclastic ejecta of basaltic cinder cones
- Landslide and debris-flow deposits
- John Day Formation
- Clastic rocks and andesite flows



**Absolute Scale: 1 inch = 5,000 feet
Scale at 11" x 17" AS SHOWN**



Prepared by: Amna Alashkhari
Date: October 10, 2024
Drawing Number: GM Rev.0



Client:

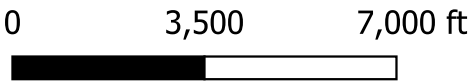


INVESTIGATION LOCATION PLAN
Delineated Wetlands

BRIGHTNIGHT
DESCHUTES SOLAR AND
STORAGE
WASCO COUNTY, OREGON

Legend

- Substation Location
- Project Boundaries
- BESS Boundary
- Water Buffer



Absolute Scale: 1 inch = 3,500 feet
Scale at 11" x 17" AS SHOWN

Prepared by: Amna Alashkhari
Date: October 24, 2024
Drawing Number: ILP-PLT Rev.0

Attachment C

Test Pit Logs

Test Pit Photo Log



Project Name	Bright Night – Deschutes Solar and Storage Project	Test Pit ID	TP-01	
Site Location	Wasco County, Oregon	Date	12-October-2024	
Test Pit Contractor	Courtney Andrus	ANS Geo Representative	Collin Lester	
Equipment Used	John Deere 310LEP	Weather/Temp	Partly Cloudy/80°	
Final Test Pit Depth (feet)	3.83 feet (46 inches)	Time Opened/Close	2:25 PM	4:05 PM
Groundwater Depth (feet)	N/A	Coordinates	45.146917°, -121.303233°	

0 - 4 "
Loose CLAY, some Silt, dry (CL)

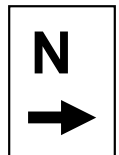
Trace Organics

4 - 20 "
Brown CLAY, some coarse to fine Sand, little Silt, trace coarse to fine Gravel, dry (CL)

20 - 46 "
Brown CLAY, some Silt, little coarse to fine Gravel, trace coarse to fine Sand, dry (CL)

Cobbles present

> 46 "
Solid Bedrock



* The dash lines depicted in the photograph are solely intended to serve as a visual aid to demonstrate the differing encountered soil compositions, and as such, are not intended to represent factual or calculated depths for each soil.

Test Pit Photo Log



Project Name	Bright Night – Deschutes Solar and Storage Project	Test Pit ID	TP-02	
Site Location	Wasco County, Oregon	Date	13-October-2024	
Test Pit Contractor	Courtney Andrus	ANS Geo Representative	Collin Lester	
Equipment Used	John Deere 310LEP	Weather/Temp	Sunny/60°	
Final Test Pit Depth (feet)	3.5 feet (42 inches)	Time Opened/Close	10:25 AM	11:15 AM
Groundwater Depth (feet)	N/A	Coordinates	45.140133°, -121.279917°	

0 - 4 "
Loose CLAY, some Silt, dry (CL)

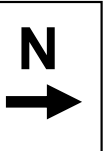
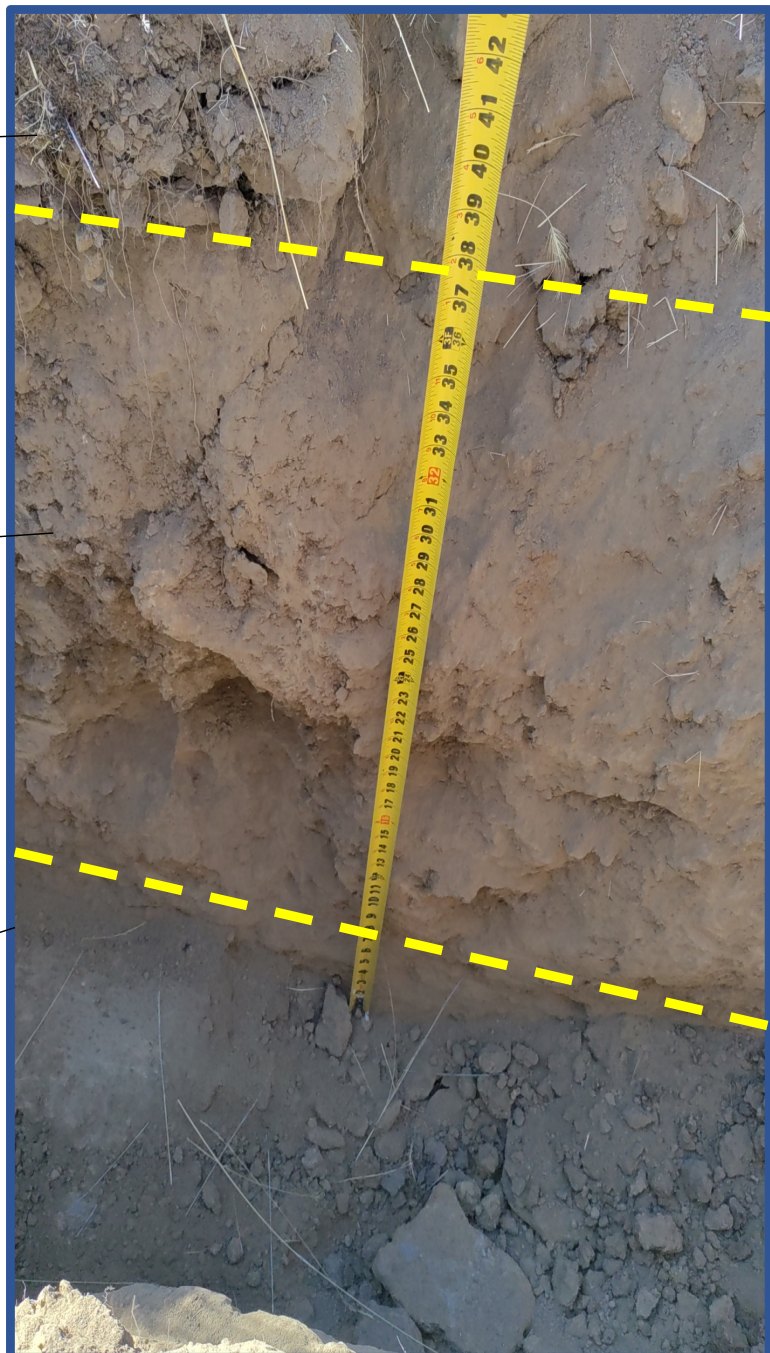
Trace Organics

4 - 42 "
Brown CLAY, some Silt, trace coarse to fine Gravel, trace Sand (CL)

Cobbles present.

Boulders present from 30" and below.

> 42 "
Solid Bedrock



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Test Pit Photo Log



Project Name	Bright Night – Deschutes Solar and Storage Project	Test Pit ID	TP-03	
Site Location	Wasco County, Oregon	Date	12-October-2024	
Test Pit Contractor	Courtney Andrus	ANS Geo Representative	Collin Lester	
Equipment Used	John Deere 310LEP	Weather/Temp	Cloudy/70°	
Final Test Pit Depth (feet)	2.92 feet (35 inches)	Time Opened/Close	12:30 PM	2:10 PM
Groundwater Depth (feet)	N/A	Coordinates	45.130283°, -121.320700°	

0 - 5 "
Loose CLAY, some Sand, dry (CL)

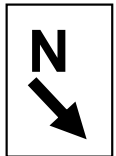
Trace Organics

5 - 19 "
Brown CLAY, some Silt, little coarse to fine Gravel, little coarse to fine Sand, dry (CL)

Cobbles present

19 - 35 "
Cobbles and Boulders infilled with brown CLAY, some Silt, little coarse to fine Gravel, little coarse to fine Sand, dry (CL)

> 35 "
Solid Bedrock



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Test Pit Photo Log



Project Name	Bright Night – Deschutes Solar and Storage Project	Test Pit ID	TP-04	
Site Location	Wasco County, Oregon	Date	12-October-2024	
Test Pit Contractor	Courtney Andrus	ANS Geo Representative	Collin Lester	
Equipment Used	John Deere 310LEP	Weather/Temp	Cloudy/70°	
Final Test Pit Depth (feet)	6.0 feet (72 inches)	Time Opened/Close	10:55 AM	11:35 AM
Groundwater Depth (feet)	N/A	Coordinates	45.134017°, -121.336883°	

0 - 7 "
Loose CLAY, some Silt, dry (CL)

Trace Organics

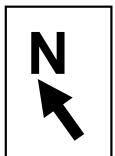
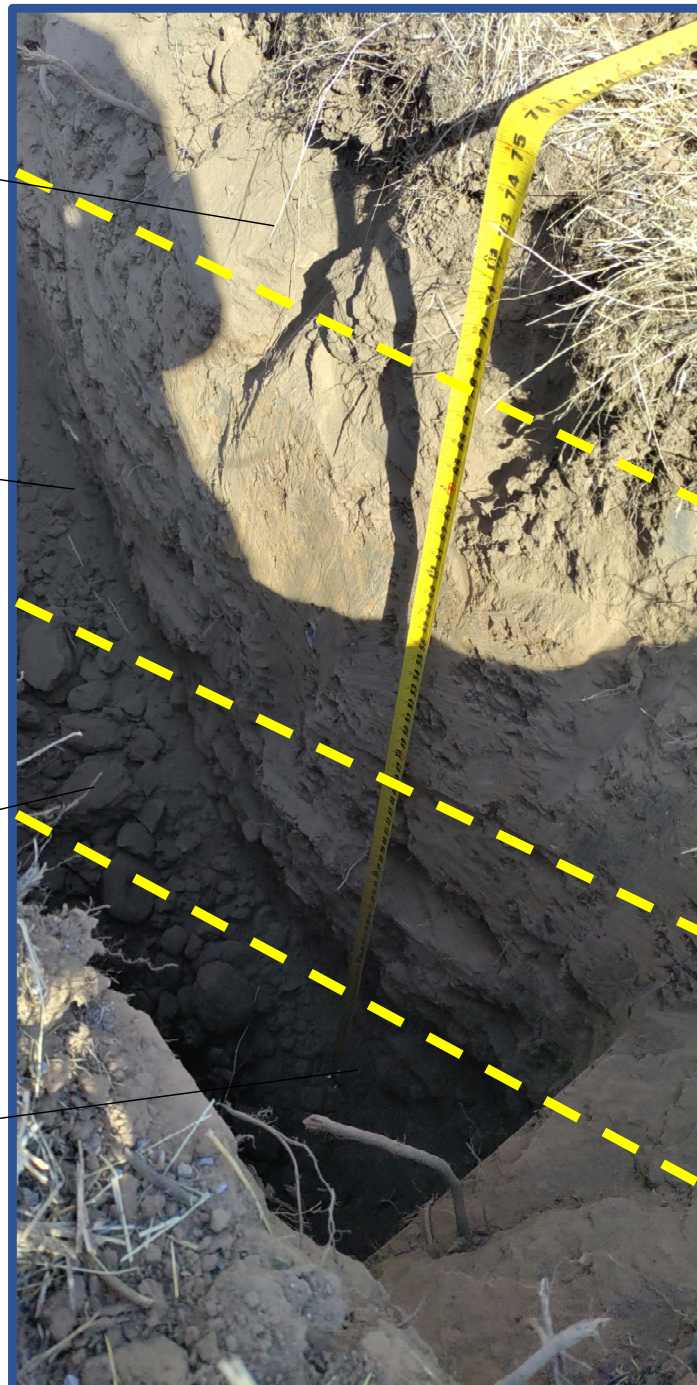
7 - 48 "
Brown CLAY, some coarse to fine Gravel, some Silt, trace coarse to fine Sand, dry (CL)

Cobbles present

48 - 72 "
Cobbles infilled with brown coarse to fine Gravelly CLAY, some coarse to fine Gravel, some Silt, dry (CL)

Boulder present at 54"

> 72 "
Weathered Bedrock



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Test Pit Photo Log



Project Name	Bright Night – Deschutes Solar and Storage Project	Test Pit ID	TP-05	
Site Location	Wasco County, Oregon	Date	14-October-2024	
Test Pit Contractor	Courtney Andrus	ANS Geo Representative	Collin Lester	
Equipment Used	John Deere 310LEP	Weather/Temp	Sunny/60°	
Final Test Pit Depth (feet)	2.75 feet (33 inches)	Time Opened/Close	8:15 AM	8:45 AM
Groundwater Depth (feet)	N/A	Coordinates	45.122017°, -121.300317°	



0 - 3 "

Loose CLAY, some Silt, dry (CL)

Trace Organics

3 - 33 "

Brown CLAY, some Silt, trace coarse to fine Gravel, trace coarse to fine Sand, dry (CL)

Cobbles present

Boulder observed at 18"

> 33 "

Solid Bedrock



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Test Pit Photo Log



Project Name	Bright Night – Deschutes Solar and Storage Project	Test Pit ID	TP-06	
Site Location	Wasco County, Oregon	Date	11-October-2024	
Test Pit Contractor	Courtney Andrus	ANS Geo Representative	Collin Lester	
Equipment Used	John Deere 310LEP	Weather/Temp	Cloudy/60°	
Final Test Pit Depth (feet)	3.25 feet (39 inches)	Time Opened/Close	5:15 PM	5:50 PM
Groundwater Depth (feet)	N/A	Coordinates	45.126300°, -121.328300°	

0 - 3 "
Loose CLAY, some Silt, dry (CL)

Trace Organics

3 - 14 "
Light brown CLAY, some Silt, trace coarse to fine Gravel, trace coarse to fine Sand, dry (CL)

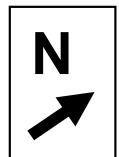
Cobbles present

14 - 29 "
Brown to gray CLAY, some Silt, little coarse to fine Gravel, trace coarse to fine Sand, dry (CL)

Cobbles present

29 - 39 "
Cobbles infilled with reddish brown CLAY, some Silt, little coarse to fine Gravel, little coarse to fine Sand, moist (CL)

> 39 "
Solid Bedrock



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Test Pit Photo Log



Project Name	Bright Night – Deschutes Solar and Storage Project	Test Pit ID	TP-07	
Site Location	Wasco County, Oregon	Date	11-October-2024	
Test Pit Contractor	Courtney Andrus	ANS Geo Representative	Collin Lester	
Equipment Used	John Deere 310LEP	Weather/Temp	Partly Cloudy/60°	
Final Test Pit Depth (feet)	3.25 feet (39 inches)	Time Opened/Close	2:45 PM	3:05 PM
Groundwater Depth (feet)	N/A	Coordinates	45.132050°, -121.350900°	

0 - 6 "
Loose CLAY, some Silt, dry (CL)

Trace Organics

6 - 15 "
Dark brown CLAY, some Silt, trace coarse to fine Gravel, trace coarse to fine Sand, dry (CL)

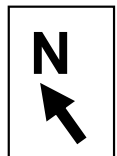
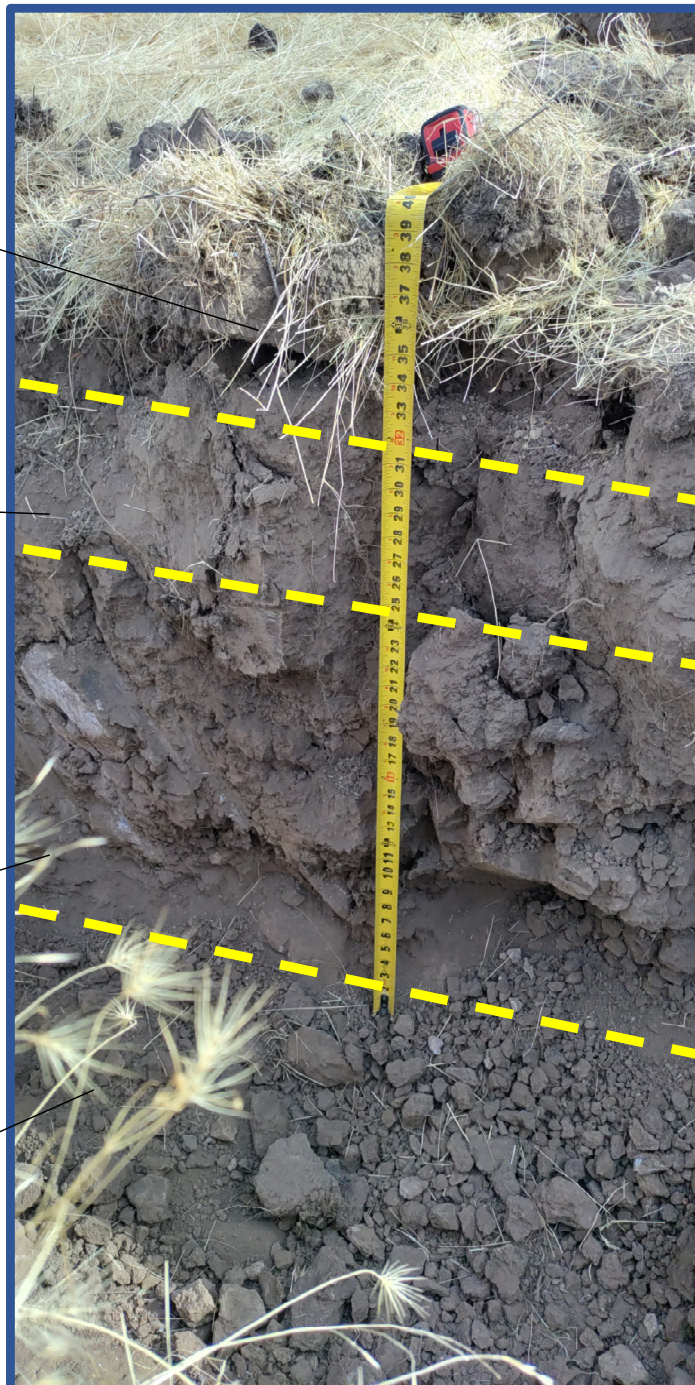
Cobbles present

15 - 39 "
Dark brown CLAY, some Silt, little coarse to fine Gravel, trace coarse to fine Sand, moist (CL)

Cobbles present

Boulder at 36" BGS

> 39 "
Solid Bedrock



* The dash lines depicted in the photograph are solely intended to serve as a visual aid to demonstrate the differing encountered soil compositions, and as such, are not intended to represent factual or calculated depths for each soil.

Test Pit Photo Log



Project Name	Bright Night – Deschutes Solar and Storage Project	Test Pit ID	TP-08	
Site Location	Wasco County, Oregon	Date	11-October-2024	
Test Pit Contractor	Courtney Andrus	ANS Geo Representative	Collin Lester	
Equipment Used	John Deere 310LEP	Weather/Temp	Cloudy/60°	
Final Test Pit Depth (feet)	6.17 feet (74 inches)	Time Opened/Close	12:50 PM	1:35 PM
Groundwater Depth (feet)	4.17 feet (50 inches)	Coordinates	45.117383°, -121.343567°	

0 - 12 "

Brown CLAY, some coarse to fine Gravel, some Silt, trace coarse to fine Sand, dry (CL)

Trace Organics

Cobbles present

12 - 46 "

Dark brown CLAY, some Silt, little coarse to fine Gravel, trace coarse to fine Sand, moist (CL)

Cobbles present

46 - 74 "

Cobbles infilled with dark brown coarse to fine Gravelly CLAY, some coarse to fine Sand, some Silt, wet (CL)

Groundwater encountered at 50" BGS

Boulders at 66" BGS

> 74 "

Solid Bedrock



* The dash lines depicted in the photograph are solely intended to serve as a visual aid to demonstrate the differing encountered soil compositions, and as such, are not intended to represent factual or calculated depths for each soil.

Test Pit Photo Log



Project Name	Bright Night – Deschutes Solar and Storage Project	Test Pit ID	TP-09	
Site Location	Wasco County, Oregon	Date	14-October-2024	
Test Pit Contractor	Courtney Andrus	ANS Geo Representative	Collin Lester	
Equipment Used	John Deere 310LEP	Weather/Temp	Sunny/70°	
Final Test Pit Depth (feet)	2.17 feet (26 inches)	Time Opened/Close	10:35 AM	11:05 AM
Groundwater Depth (feet)	N/A	Coordinates	45.109333°, -121.322933°	

0 - 2 "

Loose CLAY, some Silt, dry (CL)

Trace Organics

2 - 8 "

Brown CLAY, some Silt, trace coarse to fine Gravel, trace coarse to fine Sand, dry (CL)

Cobbles and Boulders present

8 - 26 "

Cobbles and Boulders infilled with brown CLAY, some Silt, little coarse to fine Gravel, trace coarse to fine Sand, dry (CL)

> 26 "

Solid bedrock



* The dash lines depicted in the photograph are solely intended to serve as a visual aid to demonstrate the differing encountered soil compositions, and as such, are not intended to represent factual or calculated depths for each soil.

Test Pit Photo Log



Project Name	Bright Night – Deschutes Solar and Storage Project	Test Pit ID	TP-10	
Site Location	Wasco County, Oregon	Date	15-October-2024	
Test Pit Contractor	Courtney Andrus	ANS Geo Representative	Miranda Bishop	
Equipment Used	John Deere 310LEP	Weather/Temp	Sunny/60°	
Final Test Pit Depth (feet)	2.67 feet (32 inches)	Time Opened/Close	11:50 AM	12:15 PM
Groundwater Depth (feet)	N/A	Coordinates	45.105000°, -121.333917°	

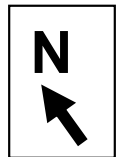
0 - 4 "
Brown CLAY, some Silt, dry (CL)

Organics present

4 - 32 "
Light brown CLAY, some Silt, trace coarse to fine Sand, moist (CL)

Cobbles present

> 32 "
Solid Bedrock



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Test Pit Photo Log



Project Name	Bright Night – Deschutes Solar and Storage Project	Test Pit ID	TP-11	
Site Location	Wasco County, Oregon	Date	15-October-2024	
Test Pit Contractor	Courtney Andrus	ANS Geo Representative	Miranda Bishop	
Equipment Used	John Deere 310LEP	Weather/Temp	Sunny/60°	
Final Test Pit Depth (feet)	8.0 feet (96 inches)	Time Opened/Close	1:42 PM	1:55 PM
Groundwater Depth (feet)	6.5 feet (78 inches)	Coordinates	45.100833°, -121.312733°	

0 - 4 "

Loose CLAY, some Silt, moist (CL)

Trace Organics

4 - 48 "

Brown CLAY, some Silt, little coarse to fine Sand, trace coarse to fine Gravel, dry (CL)

Cobbles Present

48 - 90 "

Brown to brownish yellow coarse to fine Gravelly SAND, some Clay, wet (SC)

Groundwater encountered at 78" BGS

Cobbles present

90 - 96 "

Cobbles and Boulders infilled with above layer

> 96 "

Solid Bedrock



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Test Pit Photo Log



Project Name	Bright Night – Deschutes Solar and Storage Project	Test Pit ID	TP-12	
Site Location	Wasco County, Oregon	Date	15-October-2024	
Test Pit Contractor	Courtney Andrus	ANS Geo Representative	Miranda Bishop	
Equipment Used	John Deere 310LEP	Weather/Temp	Cloudy/50°	
Final Test Pit Depth (feet)	5.42 feet (65 inches)	Time Opened/Close	3:00 PM	3:30 PM
Groundwater Depth (feet)	N/A	Coordinates	45.093100°, -121.315800°	

0 - 5 "
Loose CLAY, some Silt, dry (CL)

Organics present

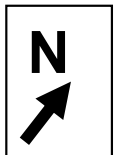
5 - 29 "
Brown CLAY, some Silt, trace Gravel, trace coarse to fine Sand, dry (CL)

29 - 44 "
Brown coarse to fine SAND, little coarse to fine Gravel, little Clay, moist (SC)

Cobbles present

44 - 65 "
Cobbles and Boulders infilled with above layer

> 65 "
Weathered Bedrock



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Test Pit Photo Log



Project Name	Bright Night – Deschutes Solar and Storage Project	Test Pit ID	TP-13	
Site Location	Wasco County, Oregon	Date	16-October-2024	
Test Pit Contractor	Courtney Andrus	ANS Geo Representative	Miranda Bishop	
Equipment Used	John Deere 310LEP	Weather/Temp	Partly Cloudy/51°	
Final Test Pit Depth (feet)	2.58 feet (31 inches)	Time Opened/Close	7:51 AM	8:20 AM
Groundwater Depth (feet)	N/A	Coordinates	45.093099°, -121.279575°	

0 - 4 "
Loose brown CLAY, some Silt, dry (CL)

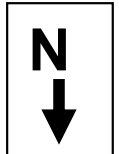
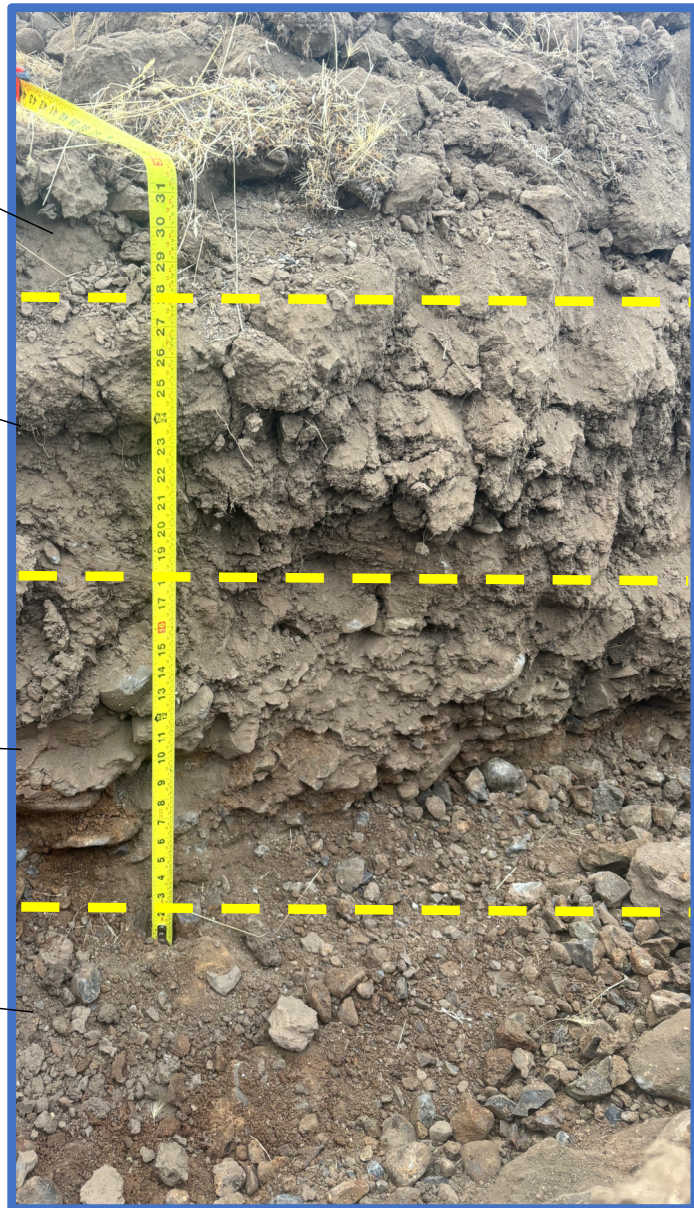
Organics present

4 - 16 "
Brown CLAY, some Silt, little coarse to fine sand, trace coarse to fine Gravel, (CL)

Cobbles and Boulders present

16 - 32 "
Cobbles and Boulders infilled with above layer

> 32 "
Weathered Bedrock



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Test Pit Photo Log



Project Name	Bright Night – Deschutes Solar and Storage Project	Test Pit ID	TP-14	
Site Location	Wasco County, Oregon	Date	15-October-2024	
Test Pit Contractor	Courtney Andrus	ANS Geo Representative	Miranda Bishop	
Equipment Used	John Deere 310LEP	Weather/Temp	Sunny/55°	
Final Test Pit Depth (feet)	2.83 feet (34 inches)	Time Opened/Close	9:09 AM	9:30 AM
Groundwater Depth (feet)	N/A	Coordinates	45.109067°, -121.271883°	

0 - 3 "
Brown CLAY, some Silt, dry (CL)

Organics present

3 - 25 "
Brown CLAY, some Silt, trace coarse to fine Gravel, trace coarse to fine Sand, dry (CL)

Some cobbles present

25 - 34 "
Cobbles and Boulders infilled with brown to brownish yellow coarse to fine SAND, some Clay, little coarse to fine Gravel, moist (SC)

> 34 "
Solid Bedrock



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Test Pit Photo Log



Project Name	Bright Night – Deschutes Solar and Storage Project	Test Pit ID	TP-15	
Site Location	Wasco County, Oregon	Date	13-October-2024	
Test Pit Contractor	Courtney Andrus	ANS Geo Representative	Collin Lester	
Equipment Used	John Deere 310LEP	Weather/Temp	Partly Cloudy/80°	
Final Test Pit Depth (feet)	2.75 feet (33 inches)	Time Opened/Close	1:50 PM	2:25 PM
Groundwater Depth (feet)	N/A	Coordinates	45.118648°, -121.267039°	

0 - 4 "
Loose CLAY, some Silt, dry (CL)

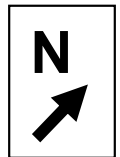
Organics present

4 - 33 "
Brown CLAY, some Silt, trace coarse to fine Gravel, trace coarse to fine Sand, dry (CL)

Cobbles present.

Boulders present from 24" and below.

> 33 "
Solid Bedrock



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Test Pit Photo Log



Project Name	Bright Night – Deschutes Solar and Storage Project	Test Pit ID	TP-16	
Site Location	Wasco County, Oregon	Date	11-October-2024	
Test Pit Contractor	Courtney Andrus	ANS Geo Representative	Collin Lester	
Equipment Used	John Deere 310LEP	Weather/Temp	Cloudy/54°	
Final Test Pit Depth (feet)	8.5 feet (102 inches)	Time Opened/Close	10:35 AM	11:25 AM
Groundwater Depth (feet)	N/A	Coordinates	45.087717°, -121.306433°	

0 - 16 "

Loose CLAY, some Silt, dry (CL)

Trace Organics

16 - 26 "

Light brown CLAY, some Silt, trace coarse to fine Gravel, dry (CL)

26 - 80 "

Dark brown to reddish brown CLAY, some Silt, little coarse to fine Gravel, trace coarse to fine Sand, moist (CL)

Cobbles present

80 - 102 "

Dark brown CLAY, some Silt, some coarse to fine Gravel, little coarse to fine Sand, moist (CL)

Cobbles present

> 102 "

Weathered Bedrock



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Test Pit Photo Log



Project Name	Bright Night – Deschutes Solar and Storage Project	Test Pit ID	TP-17	
Site Location	Wasco County, Oregon	Date	13-October-2024	
Test Pit Contractor	Courtney Andrus	ANS Geo Representative	Collin Lester	
Equipment Used	John Deere 310LEP	Weather/Temp	Sunny/70°	
Final Test Pit Depth (feet)	3.83 feet (46 inches)	Time Opened/Close	11:45 AM	12:25 PM
Groundwater Depth (feet)	N/A	Coordinates	45.146867°, -121.283200°	

0 - 2 "
Loose CLAY, some Silt, dry (CL)

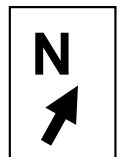
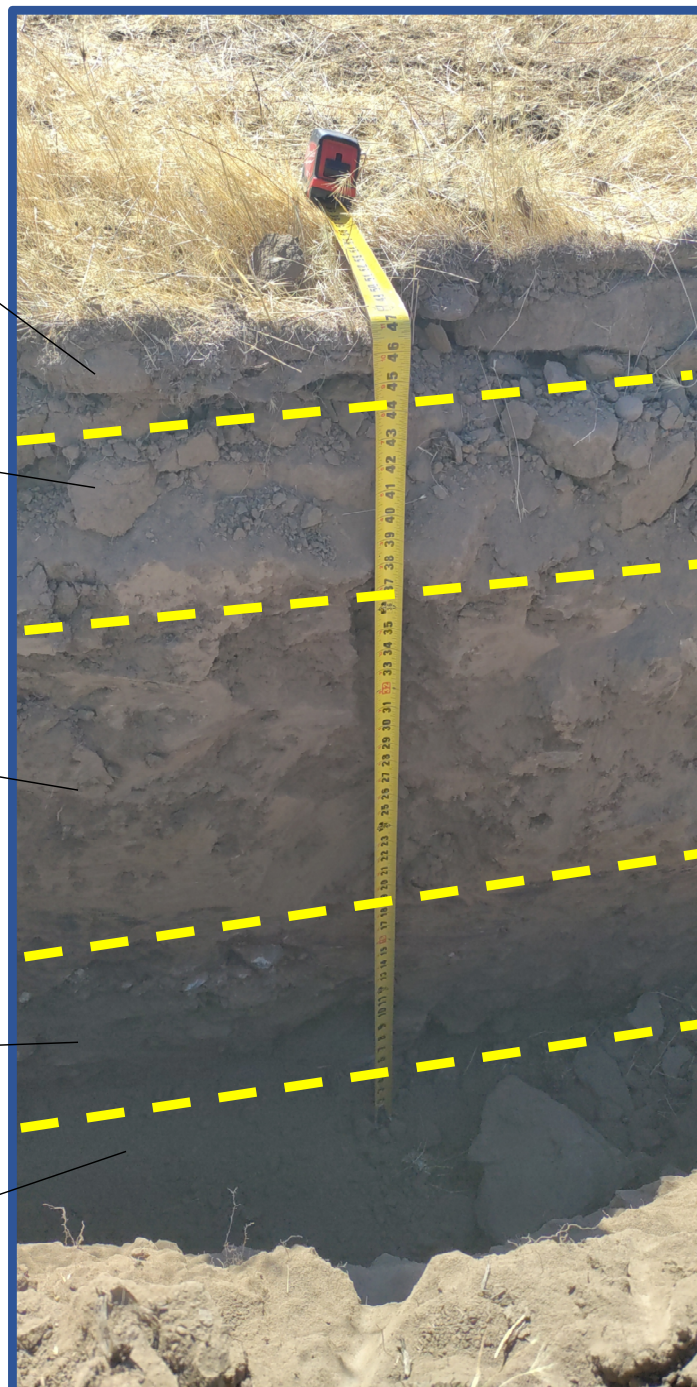
Trace Organics

2 - 16 "
Brown CLAY, some Silt, trace coarse to fine Gravel, trace coarse to fine Sand, trace Cobbles, moist (CL)

16 - 32 "
Brown CLAY, some Silt, trace coarse to fine Gravel, trace coarse to fine Sand, little Cobbles, moist (CL)

32 - 46 "
Brown CLAY, some Silt, trace coarse to fine Gravel, trace coarse to fine Sand, some Cobbles, moist (CL)

> 46 "
Solid Bedrock



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Test Pit Photo Log



Project Name	Bright Night – Deschutes Solar and Storage Project	Test Pit ID	TP-18	
Site Location	Wasco County, Oregon	Date	12-October-2024	
Test Pit Contractor	Courtney Andrus	ANS Geo Representative	Collin Lester	
Equipment Used	John Deere 310LEP	Weather/Temp	Partly Sunny/70°	
Final Test Pit Depth (feet)	4.17 feet (50 inches)	Time Opened/Close	11:40 AM	12:10 PM
Groundwater Depth (feet)	N/A	Coordinates	45.141967°, -121.331750°	

0 - 3 "

Loose CLAY, some Silt, dry (CL)

Trace Organics

3 - 34 "

Brown CLAY, some Silt, trace coarse to fine Gravel, trace coarse to fine Sand, dry (CL)

Cobbles present

34 - 50 "

Reddish brown CLAY, some Silt, trace coarse to fine Gravel, trace coarse to fine Sand, dry (CL)

Cobbles present

> 50 "

Weathered rock



N



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Test Pit Photo Log



Project Name	Bright Night – Deschutes Solar and Storage Project	Test Pit ID	TP-19	
Site Location	Wasco County, Oregon	Date	12-October-2024	
Test Pit Contractor	Courtney Andrus	ANS Geo Representative	Collin Lester	
Equipment Used	John Deere 310LEP	Weather/Temp	Cloudy/65°	
Final Test Pit Depth (feet)	1.83 feet (22 inches)	Time Opened/Close	9:05 AM	9:25 AM
Groundwater Depth (feet)	N/A	Coordinates	45.117073°, -121.330751°	

0 - 3 "
Loose CLAY, some Silt, dry (CL)

Trace Organics

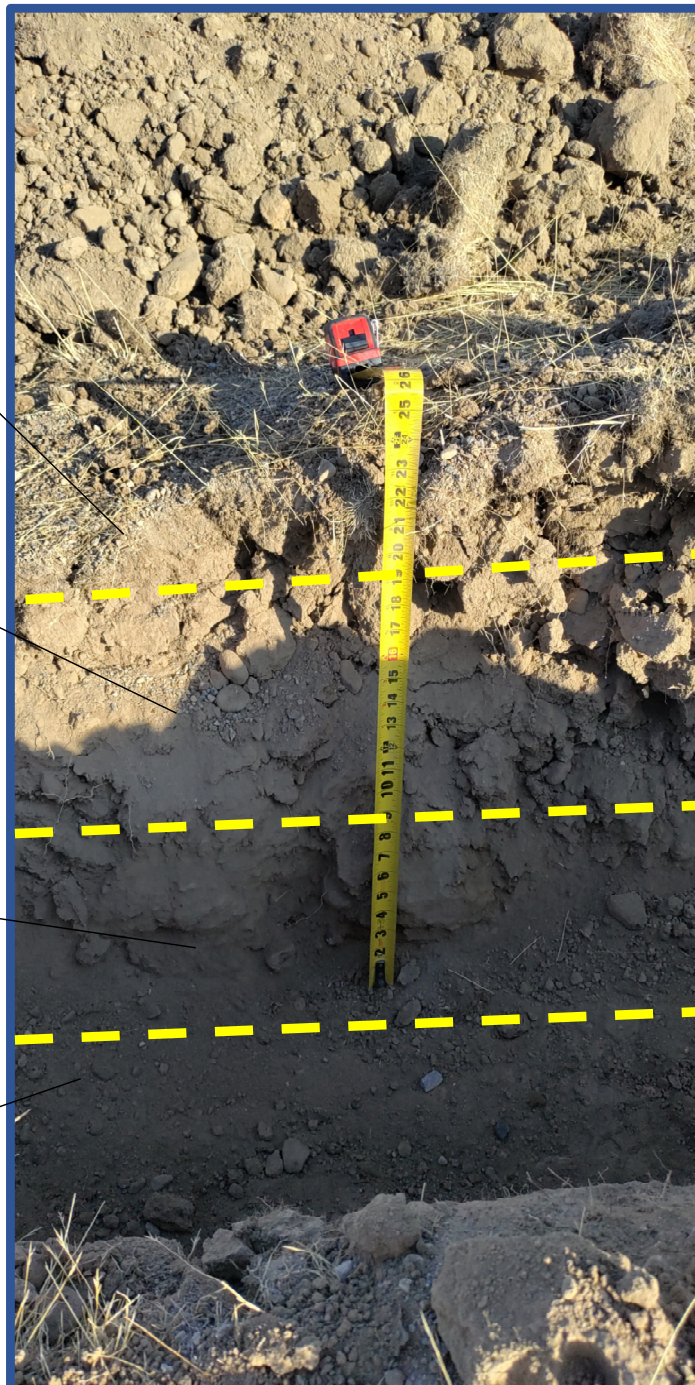
3 - 16 "
Brown CLAY, some Silt, trace coarse to fine Gravel, trace coarse to fine Sand, dry (CL)

Cobbles present

16 - 22 "
Brown CLAY, some Silt, little coarse to fine Gravel, trace coarse to fine Sand, dry (CL)

Cobbles present

> 22 "
Solid Bedrock



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Test Pit Photo Log



Project Name	Bright Night – Deschutes Solar and Storage Project	Test Pit ID	TP-20	
Site Location	Wasco County, Oregon	Date	15-October-2024	
Test Pit Contractor	Courtney Andrus	ANS Geo Representative	Miranda Bishop	
Equipment Used	John Deere 310LEP	Weather/Temp	Sunny/60°	
Final Test Pit Depth (feet)	5.08 feet (61 inches)	Time Opened/Close	10:15 AM	10:45 AM
Groundwater Depth (feet)	N/A	Coordinates	45.097697°, -121.297900°	

0 - 4 "
Brown CLAY, some Silt, dry (CL)

Organics present

4 - 38 "
Brown CLAY, some Silt, trace coarse to fine Sand, dry (CL)

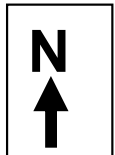
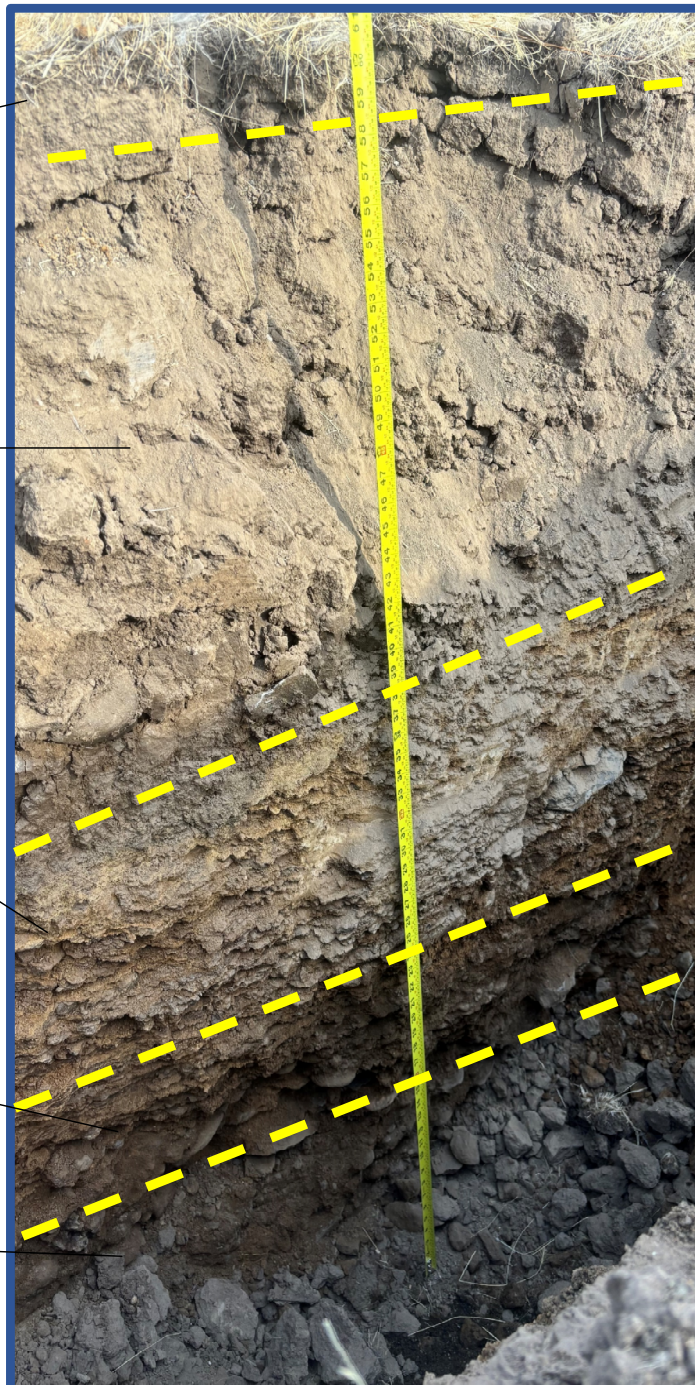
Cobbles present

38 - 50 "
Yellowish red coarse to fine Sandy Gravel, little Clay, moist (GC)

Cobbles present

50 - 64 "
Boulders and Cobbles infilled with above layer

> 64 "
Weathered Rock



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Test Pit Photo Log



Project Name	Bright Night – Deschutes Solar and Storage Project	Test Pit ID	TP-BESS-01	
Site Location	Wasco County, Oregon	Date	16-October-2024	
Test Pit Contractor	Courtney Andrus	ANS Geo Representative	Miranda Bishop	
Equipment Used	John Deere 310LEP	Weather/Temp	Sunny/50°	
Final Test Pit Depth (feet)	2.67 feet (32 inches)	Time Opened/Close	9:50 AM	10:21 AM
Groundwater Depth (feet)	N/A	Coordinates	45.090743°, -121.284921°	

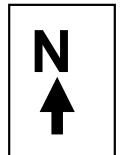
0 - 3 "
Brown coarse to fine Sandy CLAY, some Silt, dry (CL)

Organics and Cobbles present

3 - 24 "
Brown coarse to fine Sandy CLAY, some Silt, trace coarse to fine Gravel, dry (CL)

24 - 34 "
Cobbles infilled with brown Clayey coarse to fine SAND, little coarse to fine Gravel, moist (SC)

> 34 "
Solid Bedrock



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Test Pit Photo Log



Project Name	Bright Night – Deschutes Solar and Storage Project	Test Pit ID	TP-BESS-02	
Site Location	Wasco County, Oregon	Date	16-October-2024	
Test Pit Contractor	Courtney Andrus	ANS Geo Representative	Miranda Bishop	
Equipment Used	John Deere 310LEP	Weather/Temp	Cloudy/50°	
Final Test Pit Depth (feet)	2.75 feet (33 inches)	Time Opened/Close	10:25 AM	10:45 AM
Groundwater Depth (feet)	N/A	Coordinates	45.089816°, -121.282431°	

0 - 4 "
Brown CLAY, some Silt, dry (CL)

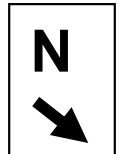
Organics and Cobbles present

4 - 18 "
Brown CLAY, some Silt, trace coarse to fine Gravel, trace coarse to fine Sand, dry (CL)

Cobbles present

18 - 33 "
Cobbles and Boulders infilled with brown to reddish brown Clayey coarse to fine SAND, little coarse to fine Gravel, moist (SC)

> 33 "
Solid Bedrock



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Test Pit Photo Log



Project Name	Bright Night – Deschutes Solar and Storage Project	Test Pit ID	TP-SS-01	
Site Location	Wasco County, Oregon	Date	16-October-2024	
Test Pit Contractor	Courtney Andrus	ANS Geo Representative	Miranda Bishop	
Equipment Used	John Deere 310LEP	Weather/Temp	Cloudy/50°	
Final Test Pit Depth (feet)	2.83 feet (34 inches)	Time Opened/Close	9:15 AM	9:45 AM
Groundwater Depth (feet)	N/A	Coordinates	45.088905°, -121.284288°	

0 - 4 "
Brown CLAY, some Silt, dry (CL)

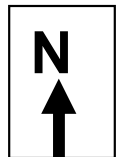
Organics and cobbles present

4 - 19 "
Brown CLAY, some Silt, little coarse to fine Sand, trace coarse to fine Gravel, dry (CL)

Cobbles present

19 - 34 "
Cobbles infilled with brown to brownish yellow Clayey coarse to fine SAND, little fine Gravel, moist (SC)

> 34 "
Solid Bedrock



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Test Pit Photo Log



Project Name	Bright Night – Deschutes Solar and Storage Project	Test Pit ID	TP-SS-02	
Site Location	Wasco County, Oregon	Date	16-October-2024	
Test Pit Contractor	Courtney Andrus	ANS Geo Representative	Miranda Bishop	
Equipment Used	John Deere 310LEP	Weather/Temp	Sunny/60°	
Final Test Pit Depth (feet)	3.08 feet (37 inches)	Time Opened/Close	11:30 AM	12:00 PM
Groundwater Depth (feet)	N/A	Coordinates	45.088483°, -121.28205°	

0 - 3 "
Brown CLAY, some Silt, dry (CL)

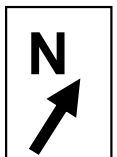
Organics and Cobbles present

3 - 21 "
Brown CLAY, some Silt, trace coarse to fine Sand, trace Clay, dry (CL)

Cobbles present

21 - 37 "
Cobbles infilled with brown CLAY, some Silt, some coarse to fine Sand, little coarse to fine Gravel, dry (CL)

> 37 "
Solid Bedrock



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Test Pit Photo Log



Project Name	Bright Night – Deschutes Solar and Storage Project	Test Pit ID	TP-SS-03	
Site Location	Wasco County, Oregon	Date	16-October-2024	
Test Pit Contractor	Courtney Andrus	ANS Geo Representative	Miranda Bishop	
Equipment Used	John Deere 310LEP	Weather/Temp	Cloudy/50°	
Final Test Pit Depth (feet)	5.0 feet (60 inches)	Time Opened/Close	8:40 AM	9:00 AM
Groundwater Depth (feet)	N/A	Coordinates	45.087872°, -121.285712°	

0 - 2 "

Brown CLAY, some Silt dry (CL)

Organics and Cobbles present

2 - 18 "

Brown CLAY, some Silt little coarse to fine Sand, trace Gravel, dry (CL)

Cobbles present

18 - 39 "

Brown Clayey coarse to fine SAND, trace fine Gravel, moist (SC)

Cobbles present

39 - 60 "

Brown CLAY, some Silt, little coarse to fine Sand, trace fine Gravel, moist (CL)

Boulders present

> 60 "

Solid Bedrock



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Attachment D

Laboratory Test Results

**MOISTURE
CONTENT
ANALYSIS
RESULTS**

**ANS CONSULTANTS, INC.**

4405 South Clinton Avenue

South Plainfield, NJ 07080

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UST Removal, Environmental Testing & Reports

Laboratory Determination of Water (Moisture) Content of Soil and Rock (ASTM D2216)

Client Name: Bright Night, LLC

LAB IRN: 24-T-122

Project Name: Deschutes Solar, Wasco County, OR

Date: 10/24/2024

Sample ID	TP-BESS-01	TP-BESS-02	TP-SS-01	TP-SS-02	TP-SS-03
Depth	1'-3'	1'-2'	19"-32"	1'-2'	18"-39"
Wet soil + Tare (g)	1213.6	367.3	931.1	560.7	635.9
Dry soil + Tare (g)	1142.4	347.7	820.6	529.4	580.5
Wt. of Tare (g)	305.6	14.7	304.1	14.9	319.4
Moisture Content	8.5%	5.9%	21.4%	6.1%	21.2%

Sample ID	PLT/TP-01	PLT/TP-03	PLT/TP-04	PLT/TP-05	PLT/TP-07
Depth	2'-4'	2'-4'	4'-6'	2'-4'	2'-4'
Wet soil + Tare (g)	434.2	1610.5	1531.1	469.0	496.8
Dry soil + Tare (g)	399.1	1526.4	1456.7	428.1	460.3
Wt. of Tare (g)	15.0	302.5	301.6	14.9	14.9
Moisture Content	9.2%	6.9%	6.4%	9.9%	8.2%

Sample ID	PLT/TP-08	PLT/TP-10	PLT/TP-11	PLT/TP-12	PLT/TP-13
Depth	4'-6'	1'-2'	6'-7'	29"-44"	1'-2'
Wet soil + Tare (g)	1132.9	343.1	1998.3	336.5	403.0
Dry soil + Tare (g)	1038.1	321.5	1705.4	285.7	367.3
Wt. of Tare (g)	308.9	14.8	301.3	14.9	14.8
Moisture Content	13.0%	7.0%	20.9%	18.8%	10.1%

Tested By: ES

Checked By: ANS

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South Plainfield, NJ 07080**NJ EDA Approved Testing Laboratory • MBE/DBE Certified • NJ DEP Certified**www.ANSConsultants.net**Tel: (800) 585-ATUL****(908) 754-8383****Fax: (908) 754-8633**

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UST Removal, Environmental Testing & Reports**

Laboratory Determination of Water (Moisture) Content of Soil and Rock (ASTM D2216)

Client Name: Bright Night, LLC

LAB IRN: 24-T-122

Project Name: Deschutes Solar, Wasco County, OR

Date: 10/24/2024

Sample ID	PLT/TP-15	PLT/TP-16	TP-17	TP-19
Depth	0'-2'	0'-2'	2'-4'	0'-2'
Wet soil + Tare (g)	465.5	362.9	455.7	462.0
Dry soil + Tare (g)	430.9	341.3	422.8	433.7
Wt. of Tare (g)	14.9	14.9	14.8	15.1
Moisture Content	8.3%	6.6%	8.1%	6.8%

Tested By: ES

Checked By: ANS

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UST Removal, Environmental Testing & Reports

Laboratory Determination of Water (Moisture) Content of Soil and Rock (ASTM D2216)

Client Name: Bright Night, LLC

LAB IRN: 24-T-124

Project Name: Deschutes Solar, Wasco County, OR

Date: 10/28/2024

Sample ID	TP-BESS-01	TP-BESS-02	TP-SS-01	TP-SS-02	TP-SS-03
Depth	TRT-1, 2.5'-3'	CORR-1, 0'-3'	CBR-1, 1'-3'	CORR-2, 0'-3'	TRT-2, 1'-3'
Wet soil + Tare (g)	387.7	297.6	126.7	257.0	350.8
Dry soil + Tare (g)	337.2	269.0	117.9	237.2	287.0
Wt. of Tare (g)	15.2	14.9	15.0	15.2	15.0
Moisture Content	15.7%	11.3%	8.5%	8.9%	23.4%

Sample ID	PLT/TP-01	PLT/TP-02	PLT/TP-04	PLT/TP-05	PLT/TP-08
Depth	TRT-3, 3'-5'	CORR-3, 0'-5'	TRT-4, 3'-5'	CBR-2, 1'-3'	CORR-4, 0'-5'
Wet soil + Tare (g)	322.2	265.1	343.1	192.6	356.6
Dry soil + Tare (g)	299.9	248.6	324.3	177.8	318.1
Wt. of Tare (g)	15.3	15.2	14.8	15.1	15.0
Moisture Content	7.8%	7.1%	6.1%	9.1%	12.7%

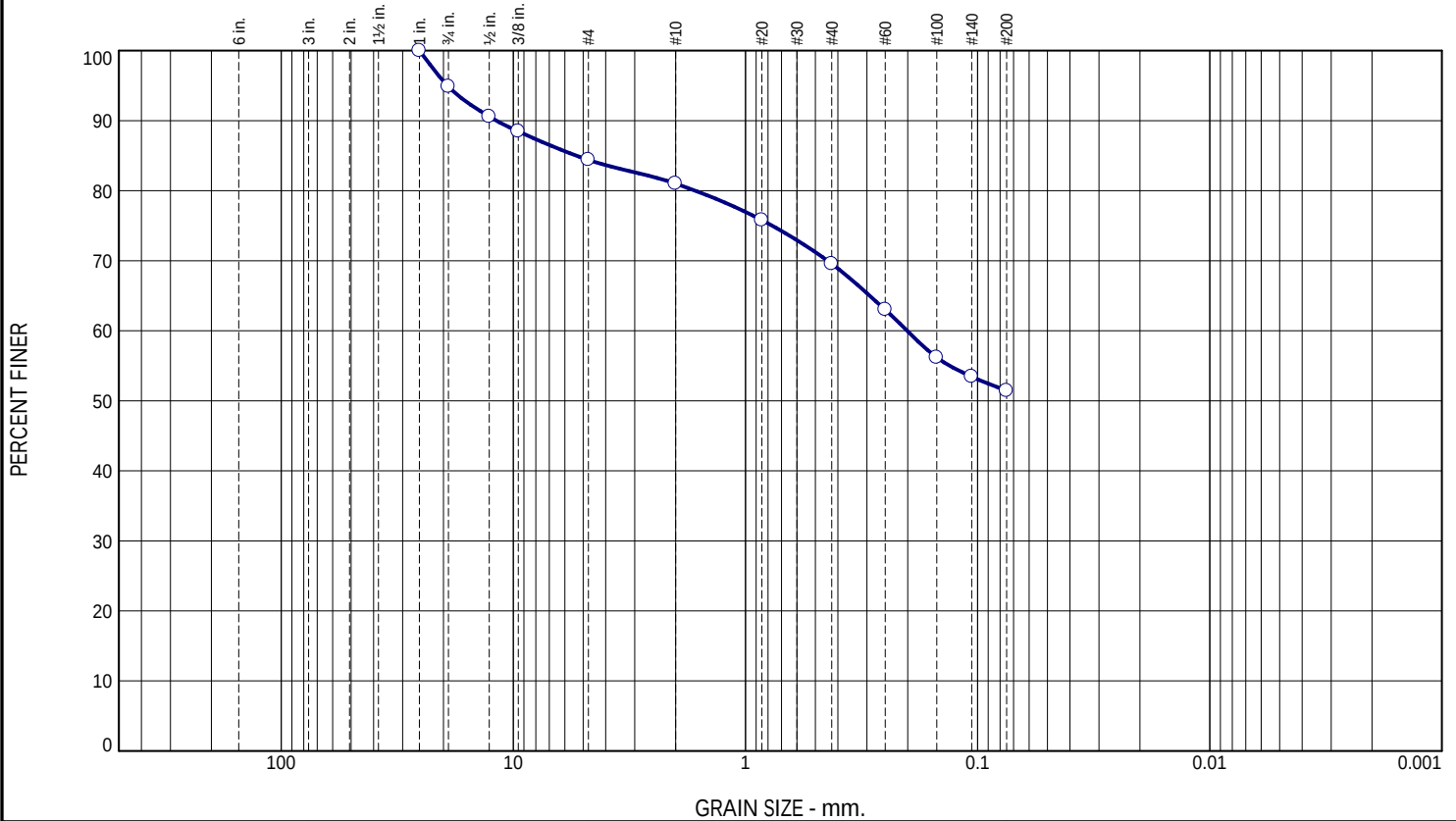
Sample ID	PLT/TP-10	PLT/TP-11	PLT/TP-12	PLT/TP-14	PLT/TP-20
Depth	CBR-3, 1'-3'	TRT-6, 3'-5'	CORR-5, 0'-5'	CORR-6, 0'-5'	TRT-5, 3'-5'
Wet soil + Tare (g)	186.6	289.3	335.5	286.4	297.2
Dry soil + Tare (g)	169.6	247.5	297.0	244.1	243.3
Wt. of Tare (g)	15.1	15.0	15.0	14.9	14.9
Moisture Content	11.0%	18.0%	13.7%	18.5%	23.6%

Tested By: ES

Checked By: ANS

SIEVE ANALYSIS

PARTICLE SIZE DISTRIBUTION REPORT (ASTM D6913)



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	5.1	10.5	3.4	11.4	18.2	51.4	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.0"	100.0		
0.75"	94.9		
0.5"	90.6		
0.375"	88.5		
#4	84.4		
#10	81.0		
#20	75.8		
#40	69.6		
#60	63.0		
#100	56.2		
#140	53.4		
#200	51.4		

Soil Description

Brown

Atterberg Limits

PL= LL= PI=

Coefficients

D₉₀= 11.8348 D₈₅= 5.3455 D₆₀= 0.2011
D₅₀= D₃₀= D₁₅=
D₁₀= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Undersized Specimen

* (no specification provided)

Sample Number: PLT/TP-03

Depth: 2'-4'

Date: 10/24/2024

ANS CONSULTANTS, INC.

South Plainfield, New Jersey

Client: Bright Night, LLC

Project: Deschutes Solar, Wasco County, OR

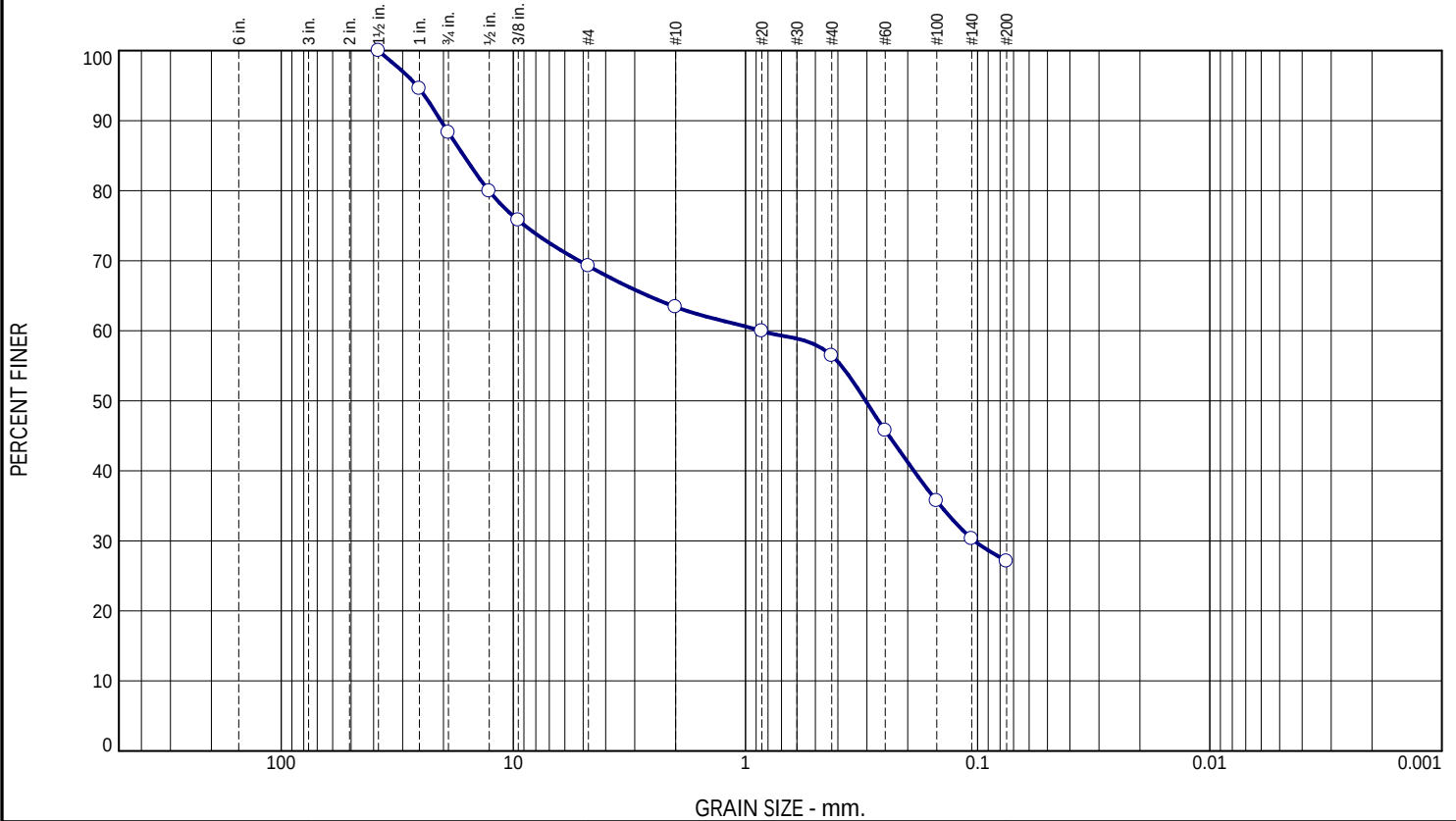
Project No: IRN 24-T-122

Figure

Tested By: LD

Checked By: ANS

PARTICLE SIZE DISTRIBUTION REPORT (ASTM D6913)



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	11.7	19.0	5.9	7.0	29.3	27.1	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5"	100.0		
1.0"	94.6		
0.75"	88.3		
0.5"	79.9		
0.375"	75.8		
#4	69.3		
#10	63.4		
#20	59.9		
#40	56.4		
#60	45.8		
#100	35.7		
#140	30.3		
#200	27.1		

* (no specification provided)

Soil Description

Brown

PL= Atterberg Limits LL= PI=

Coefficients

D₉₀= 20.5469 D₈₅= 16.3430 D₆₀= 0.8621

D₅₀= 0.3036 D₃₀= 0.1033 D₁₅=

D₁₀= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Undersized Specimen

Sample Number: PLT/TP-04

Depth: 4'-6'

Date: 10/24/2024

ANS CONSULTANTS, INC.

South Plainfield, New Jersey

Client: Bright Night, LLC

Project: Deschutes Solar, Wasco County, OR

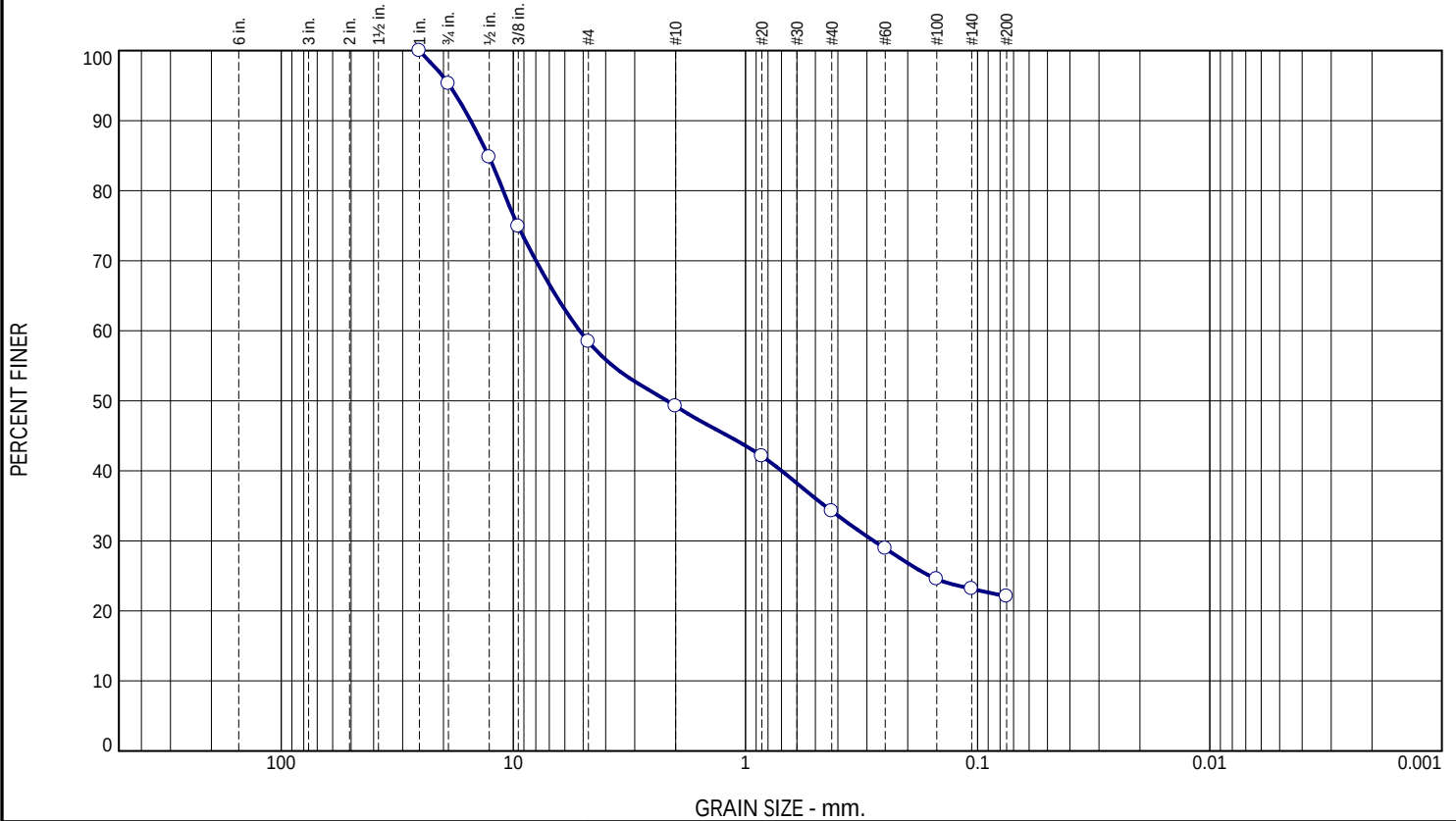
Project No: IRN 24-T-122

Figure

Tested By: LD

Checked By: ANS

PARTICLE SIZE DISTRIBUTION REPORT (ASTM D6913)



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	4.7	36.9	9.2	15.0	12.1	22.1	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.0"	100.0		
0.75"	95.3		
0.5"	84.8		
0.375"	74.9		
#4	58.4		
#10	49.2		
#20	42.1		
#40	34.2		
#60	28.9		
#100	24.5		
#140	23.2		
#200	22.1		

Soil Description

Brown

Atterberg Limits

PL= LL= PI=

Coefficients

D₉₀= 15.2645 D₈₅= 12.7926 D₆₀= 5.1780

D₅₀= 2.1735 D₃₀= 0.2804 D₁₅=

D₁₀= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Undersized Specimen

* (no specification provided)

Sample Number: PLT/TP-08

Depth: 4'-6'

Date: 10/24/2024

ANS CONSULTANTS, INC.

South Plainfield, New Jersey

Client: Bright Night, LLC

Project: Deschutes Solar, Wasco County, OR

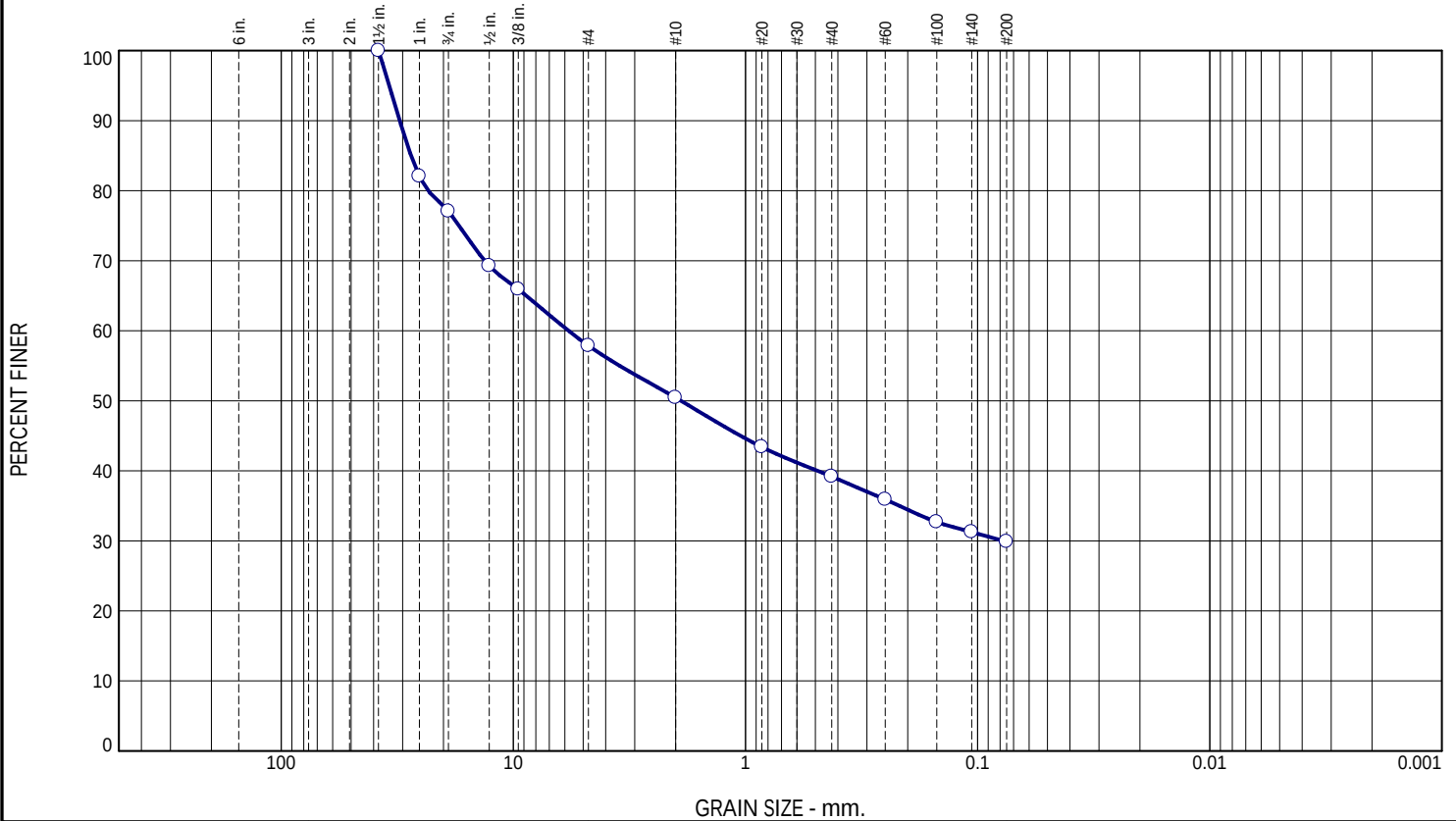
Project No: IRN 24-T-122

Figure

Tested By: LD

Checked By: ANS

PARTICLE SIZE DISTRIBUTION REPORT (ASTM D6913)



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	22.9	19.2	7.5	11.2	9.3	29.9	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5"	100.0		
1.0"	82.1		
0.75"	77.1		
0.5"	69.3		
0.375"	65.9		
#4	57.9		
#10	50.4		
#20	43.4		
#40	39.2		
#60	35.9		
#100	32.7		
#140	31.3		
#200	29.9		

* (no specification provided)

Soil Description

Brown

Atterberg Limits

PL= LL= PI=

Coefficients

D₉₀= 30.8800 D₈₅= 27.5785 D₆₀= 5.7823
D₅₀= 1.8978 D₃₀= 0.0774 D₁₅=
D₁₀= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Undersized Specimen

Sample Number: PLT/TP-11

Depth: 6'-7'

Date: 10/24/2024

ANS CONSULTANTS, INC.

South Plainfield, New Jersey

Client: Bright Night, LLC

Project: Deschutes Solar, Wasco County, OR

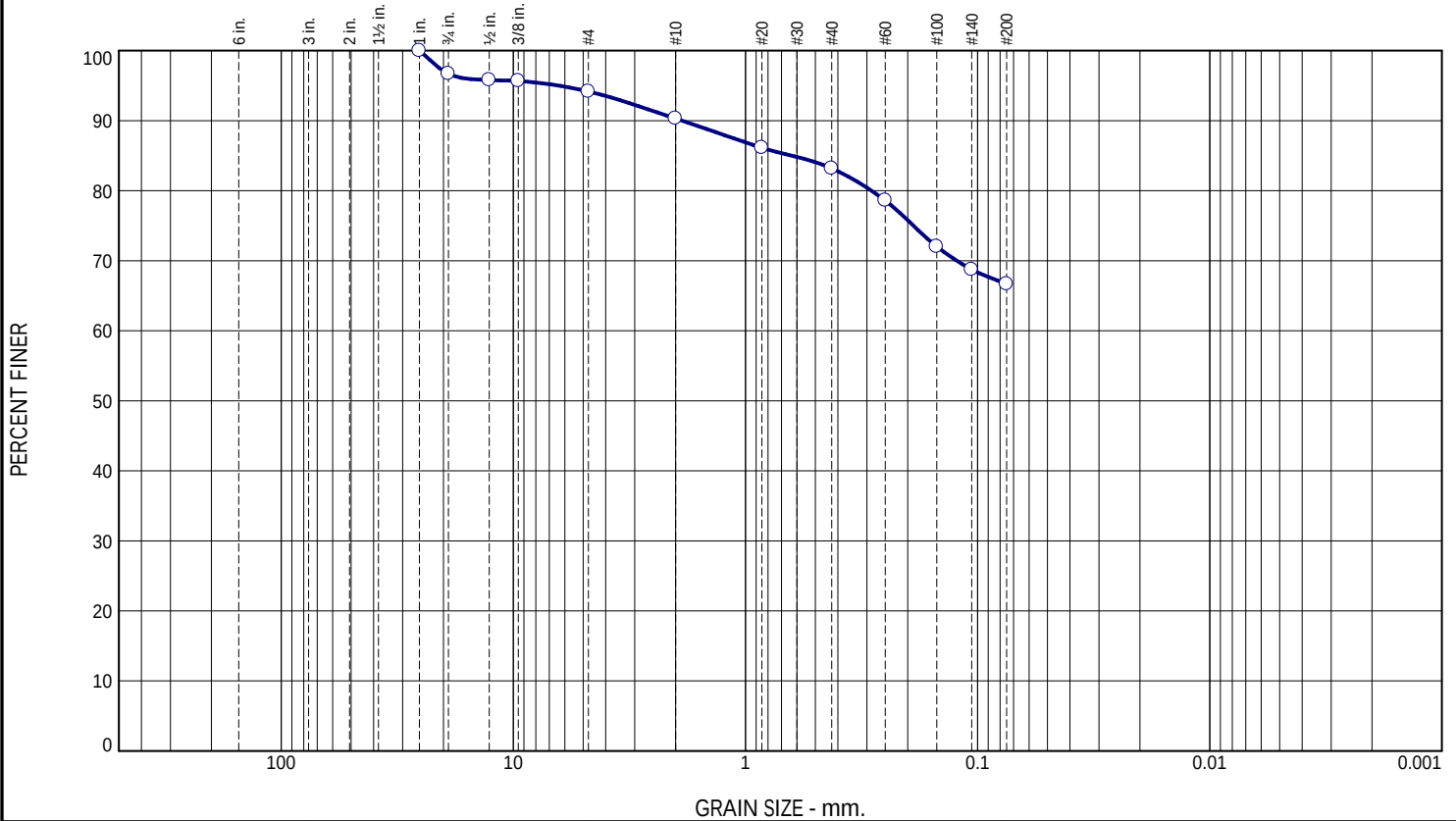
Project No: IRN 24-T-122

Figure

Tested By: LD

Checked By: ANS

PARTICLE SIZE DISTRIBUTION REPORT (ASTM D6913)



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	3.3	2.5	3.9	7.1	16.5	66.7	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.0"	100.0		
0.75"	96.7		
0.5"	95.8		
0.375"	95.7		
#4	94.2		
#10	90.3		
#20	86.1		
#40	83.2		
#60	78.6		
#100	72.0		
#140	68.7		
#200	66.7		

* (no specification provided)

<u>Soil Description</u>		
Brown sandy lean clay		
<u>Atterberg Limits</u>		
PL= 16	LL= 27	PI= 11
<u>Coefficients</u>		
D ₉₀ = 1.8738	D ₈₅ = 0.6310	D ₆₀ =
D ₅₀ =	D ₃₀ =	D ₁₅ =
D ₁₀ =	C _u =	C _c =
<u>Classification</u>		
USCS= CL	AASHTO=	A-6(5)
<u>Remarks</u>		

Sample Number: TP-BESS-01 Depth: 1'-3'

Date: 10/24/2024

ANS CONSULTANTS, INC.

South Plainfield, New Jersey

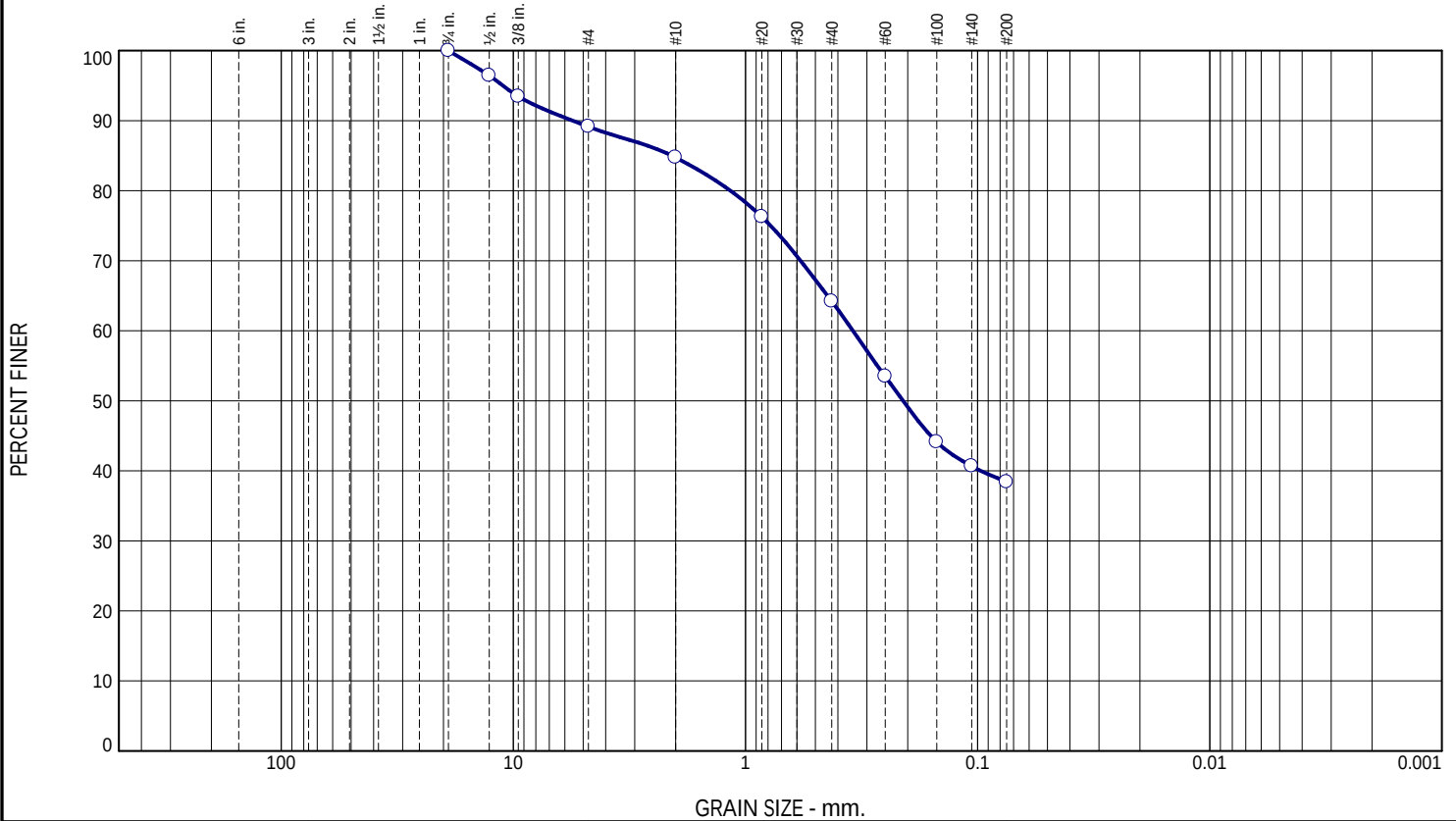
Client: Bright Night, LLC
Project: Deschutes Solar, Wasco County, OR

Project No: IRN 24-T-122

Figure

Tested By: LD Checked By: ANS

PARTICLE SIZE DISTRIBUTION REPORT (ASTM D6913)



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	10.9	4.4	20.5	25.8	38.4	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75"	100.0		
0.5"	96.5		
0.375"	93.5		
#4	89.1		
#10	84.7		
#20	76.3		
#40	64.2		
#60	53.5		
#100	44.1		
#140	40.7		
#200	38.4		

* (no specification provided)

Soil Description

Brown

PL= **Atterberg Limits** LL= PI=

Coefficients

D₉₀= 5.5445 D₈₅= 2.0726 D₆₀= 0.3443

D₅₀= 0.2096 D₃₀= D₁₅=

D₁₀= C_u= C_c=

USCS= **Classification** AASHTO=

Remarks

Sample Number: TP-SS-01 Depth: 19"-32"

Date: 10/24/2024

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South Plainfield, New Jersey

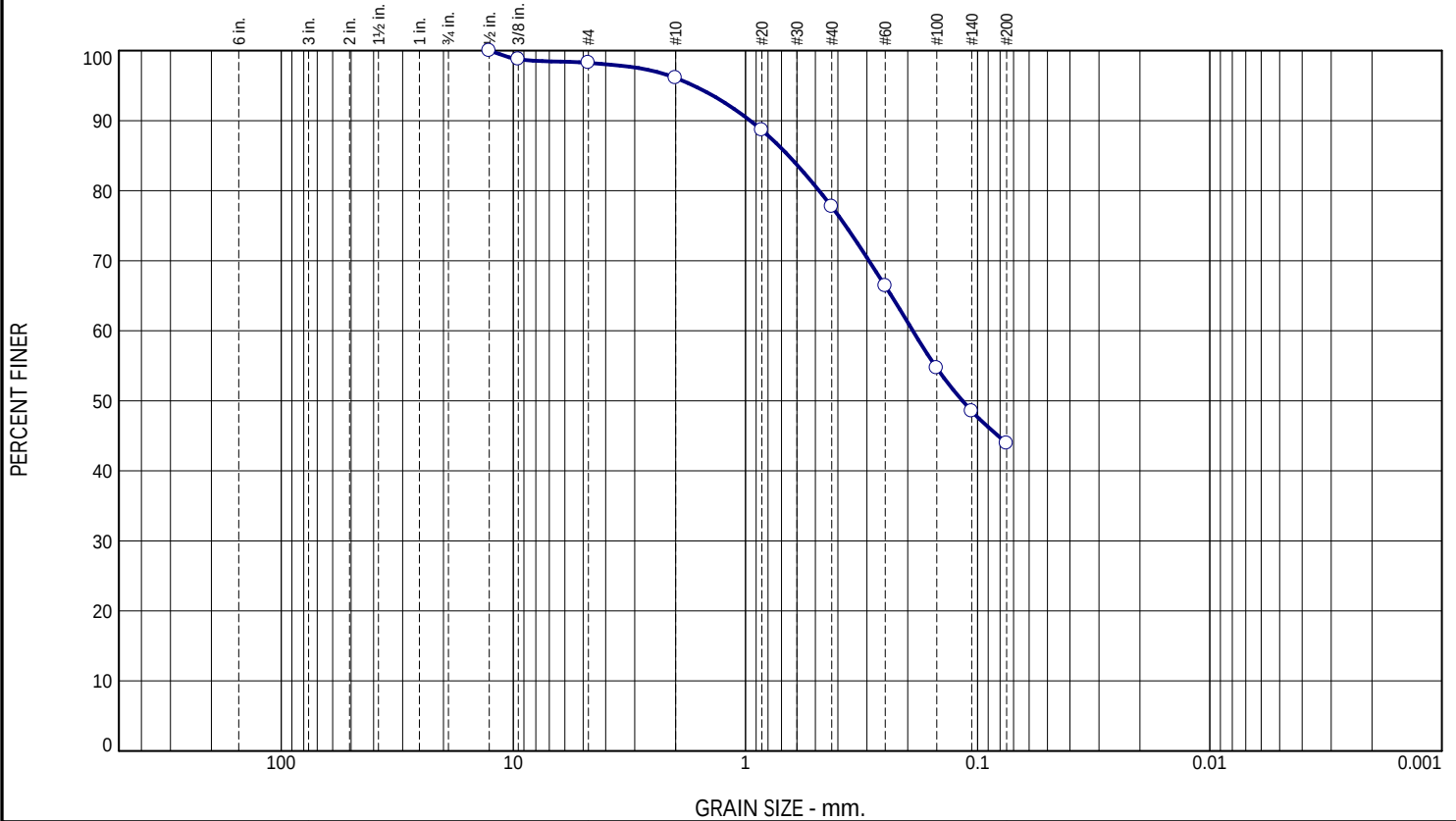
Client: Bright Night, LLC
Project: Deschutes Solar, Wasco County, OR

Project No: IRN 24-T-122

Figure

Tested By: LD Checked By: ANS

PARTICLE SIZE DISTRIBUTION REPORT (ASTM D6913)



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	1.7	2.2	18.4	33.8	43.9	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.5"	100.0		
0.375"	98.8		
#4	98.3		
#10	96.1		
#20	88.7		
#40	77.7		
#60	66.4		
#100	54.7		
#140	48.5		
#200	43.9		

* (no specification provided)

Sample Number: TP-SS-03 Depth: 18"-39"

Date: 10/24/2024

<u>Soil Description</u>		
Brown silty sand		
<u>Atterberg Limits</u>		
PL= NP	LL= NV	PI= NP
<u>Coefficients</u>		
D ₉₀ = 0.9534	D ₈₅ = 0.6520	D ₆₀ = 0.1902
D ₅₀ = 0.1162	D ₃₀ =	D ₁₅ =
D ₁₀ =	C _u =	C _c =
<u>Classification</u>		
USCS= SM	AASHTO=	A-4(0)
<u>Remarks</u>		

ANS CONSULTANTS, INC.

South Plainfield, New Jersey

Client: Bright Night, LLC
Project: Deschutes Solar, Wasco County, OR

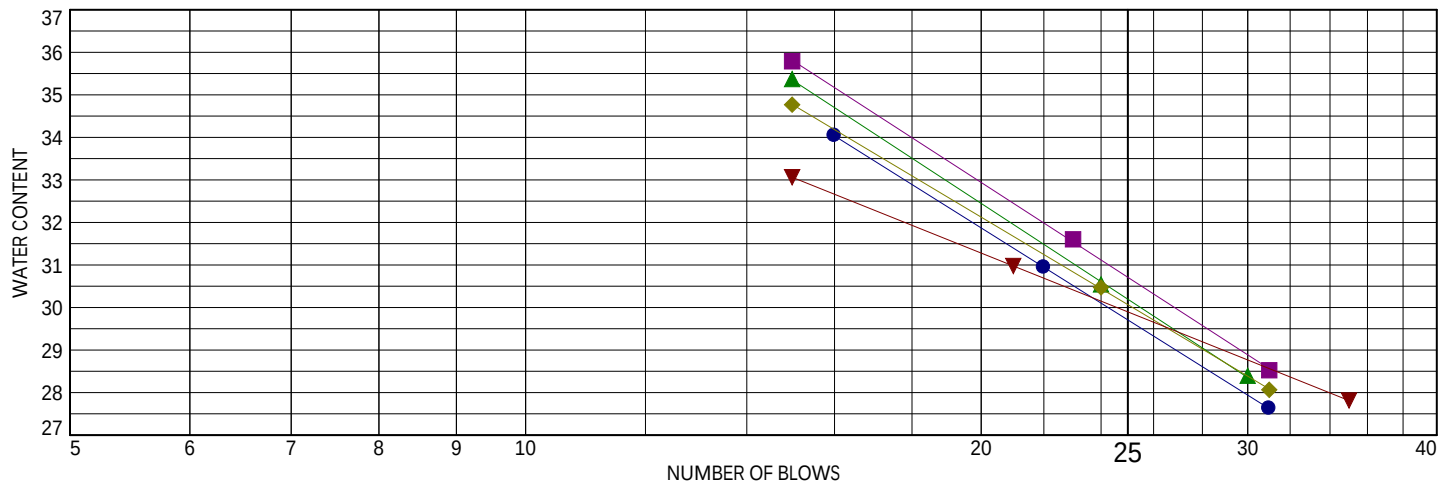
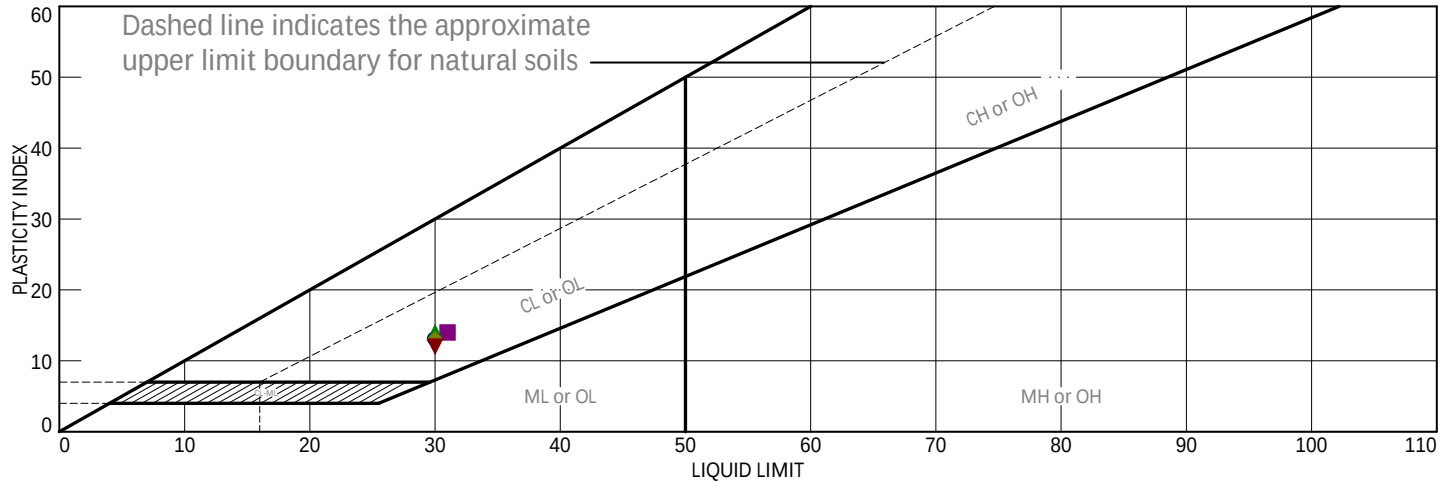
Project No: IRN 24-T-122

Figure

Tested By: LD Checked By: ANS

ATTERBERG LIMITS RESULTS

LIQUID AND PLASTIC LIMITS TEST REPORT (ASTM D4318)



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Brown Clay & Silt, little cmf Sand (Visual)	30	17	13			
■	Brown Clay & Silt, little cmf Sand (Visual)	31	17	14			
▲	Brown Clay & silt, little cmf Sand (Visual)	30	16	14			
◆	Brown Clay & Silt, little cmf Sand (Visual)	30	17	13			
▼	Grayish Brown Clay & Silt, little cmf Sand (Visual)	30	18	12			

Project No. IRN 24-T-122 Client: Bright Night, LLC

Project: Deschutes Solar, Wasco County, OR

● Depth: 2'-4' Sample Number: PLT/TP-01
 ■ Depth: 2'-4' Sample Number: PLT/TP-05
 ▲ Depth: 2'-4' Sample Number: PLT/TP-07
 ◆ Depth: 1'-2' Sample Number: PLT/TP-10
 ▼ Depth: 1'-2' Sample Number: PLT/TP-13

ANS CONSULTANTS, INC.

South Plainfield, New Jersey

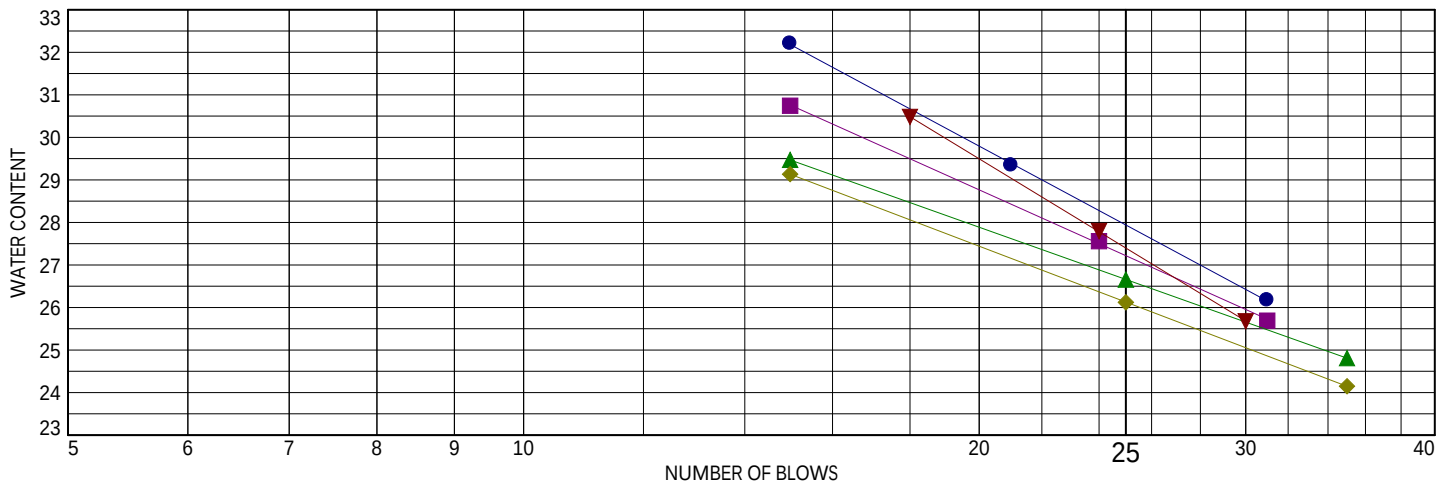
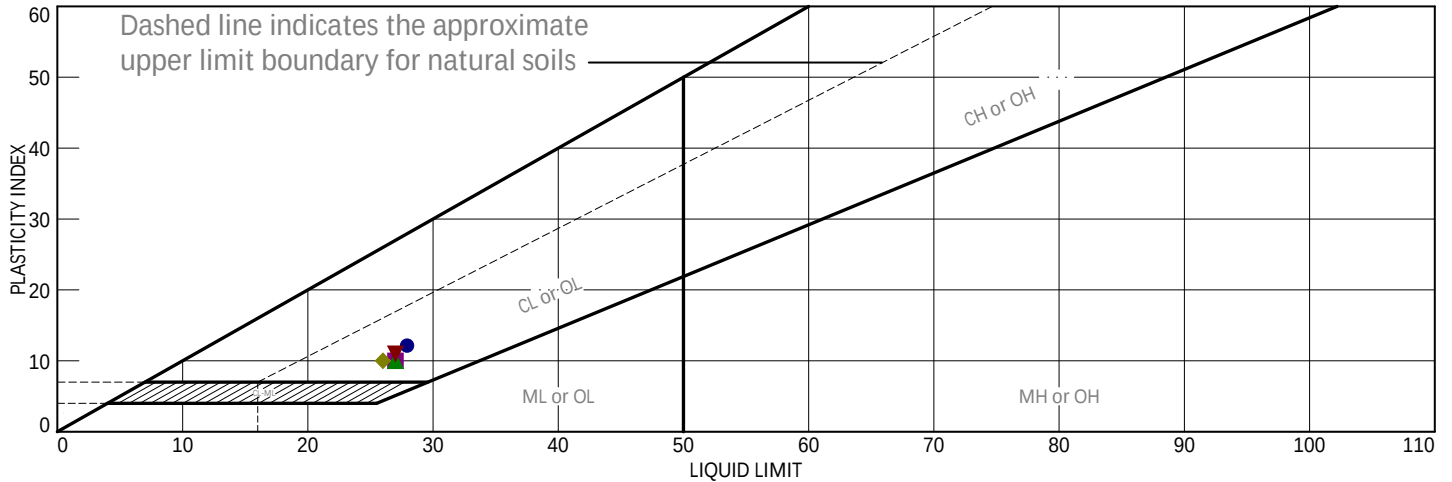
Remarks:

● ASTM D4318 - Sample Air-Dried,
 LL Device: Manual, PL Rolling
 Method: Hand-Rolled, Grooving
 Tool: Metal
 10/24/2024

Figure

Tested By: JE Checked By: ANS

LIQUID AND PLASTIC LIMITS TEST REPORT (ASTM D4318)



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Grayish Brown Clay & Silt, some cmf Sand (Visual)	28	16	12			
■	Dark Brown Clay & Silt, some cmf Sand (Visual)	27	17	10			
▲	Brown Clay & Silt, some cmf Sand (Visual)	27	17	10			
◆	Brown Clay & Silt, some cmf Sand (Visual)	26	16	10			
▼	Brown sandy lean clay	27	16	11	83.2	66.7	CL

Project No. IRN 24-T-122 Client: Bright Night, LLC

Project: Deschutes Solar, Wasco County, OR

● Depth: 0'-2' Sample Number: PLT/TP-15
 ■ Depth: 0'-2' Sample Number: PLT/TP-16
 ▲ Depth: 2'-4' Sample Number: TP-17
 ◆ Depth: 0'-2' Sample Number: TP-19
 ▼ Depth: 1'-3' Sample Number: TP-BESS-01

ANS CONSULTANTS, INC.

South Plainfield, New Jersey

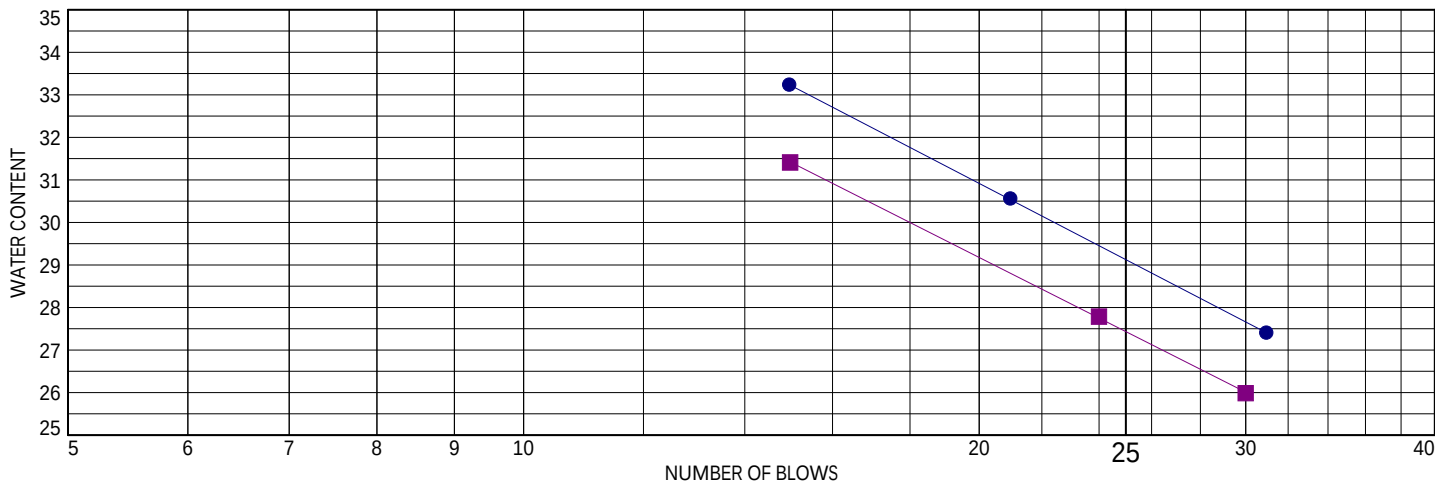
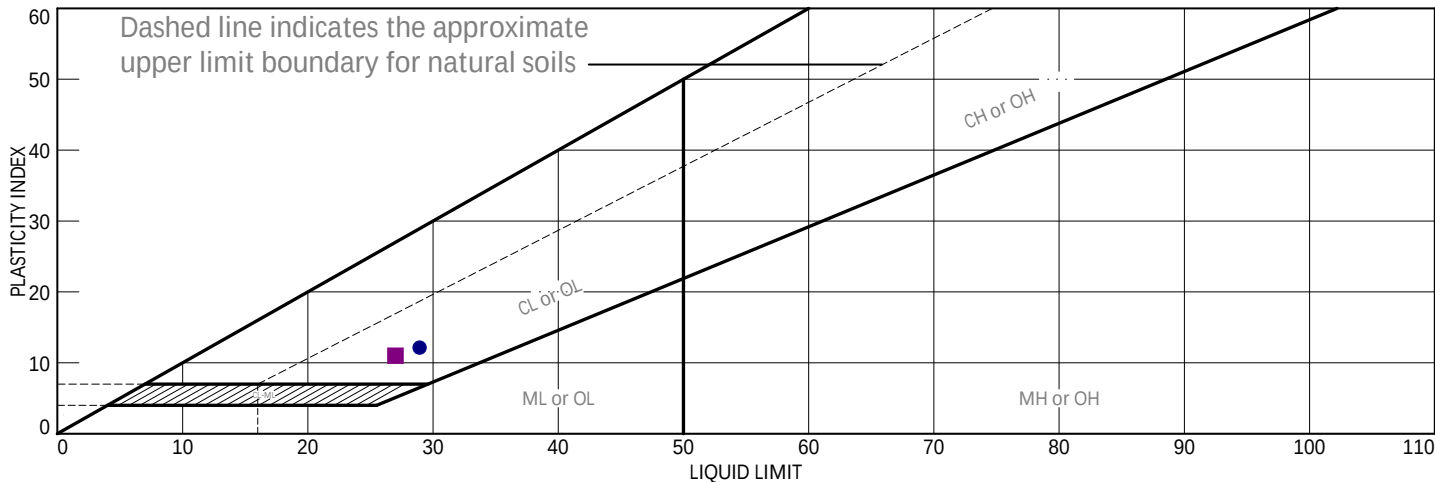
Remarks:

● ASTM D4318 - Sample Air-Dried,
 LL Device: Manual, PL Rolling
 Method: Hand-Rolled, Grooving
 Tool: Metal
 10/24/2024

Figure

Tested By: JE _____ Checked By: ANS _____

LIQUID AND PLASTIC LIMITS TEST REPORT (ASTM D4318)



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Grayish Brown Clay & Silt, some cmf Sand (Visual)	29	17	12			
■	Grayish Brown Clay & Silt, some cmf Sand (Visual)	27	16	11			
▲	Brown silty sand	NV	NP	NP	77.7	43.9	SM

Project No. IRN 24-T-122 Client: Bright Night, LLC

Project: Deschutes Solar, Wasco County, OR

● Depth: 1'-2'

Sample Number: TP-BESS-02

■ Depth: 1'-2'

Sample Number: TP-SS-02

▲ Depth: 18"-39"

Sample Number: TP-SS-03

Remarks:

● ASTM D4318 - Sample Air-Dried,
LL Device: Manual, PL Rolling
Method: Hand-Rolled, Grooving
Tool: Metal
10/24/2024

ANS CONSULTANTS, INC.

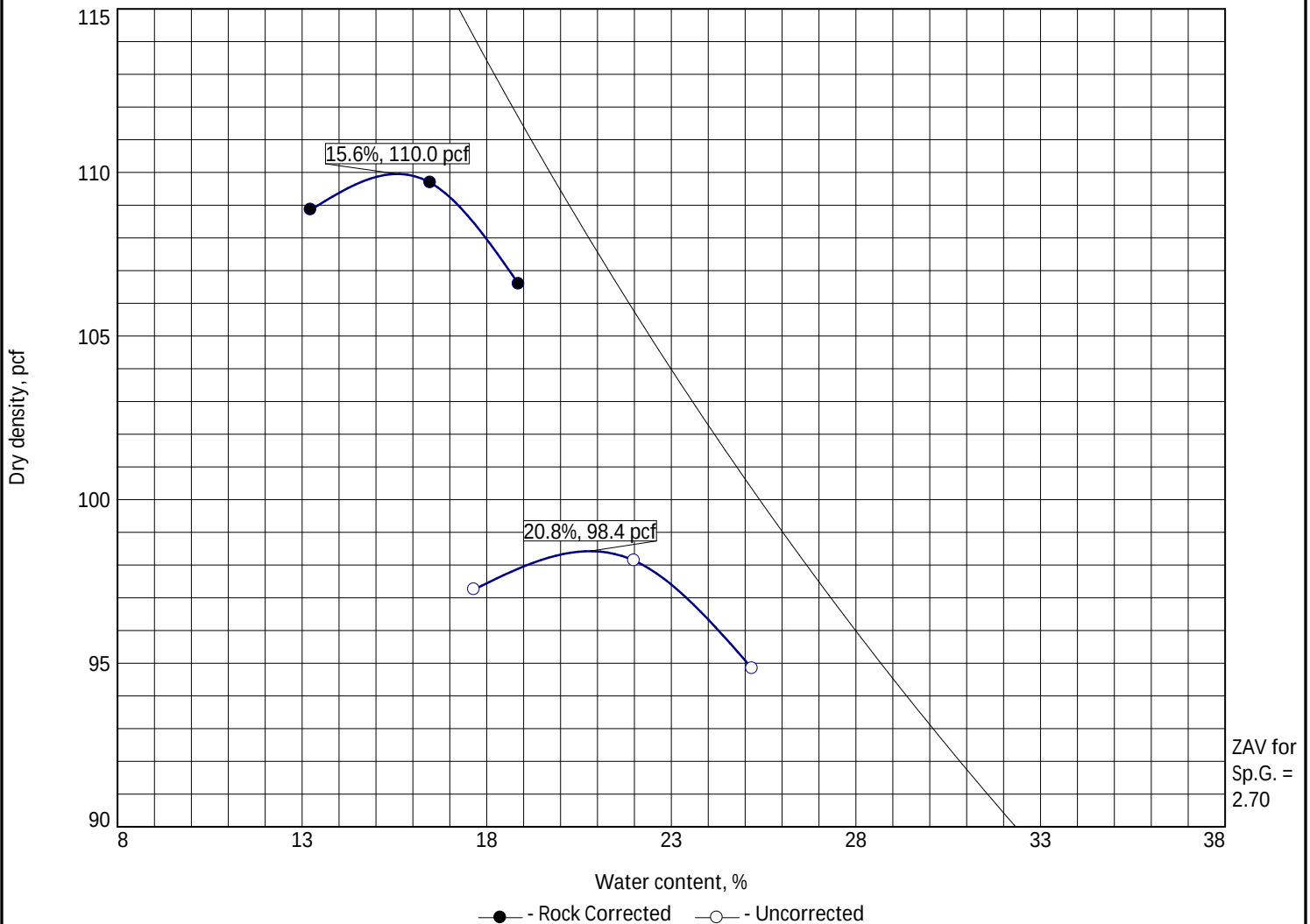
South Plainfield, New Jersey

Figure

Tested By: JE _____ Checked By: ANS _____

COMPACTION TEST RESULTS

COMPACTION TEST REPORT



Test specification: ASTM D 698-12 Method B Standard
ASTM D4718-15 Oversize Corr. Applied to Each Test Point

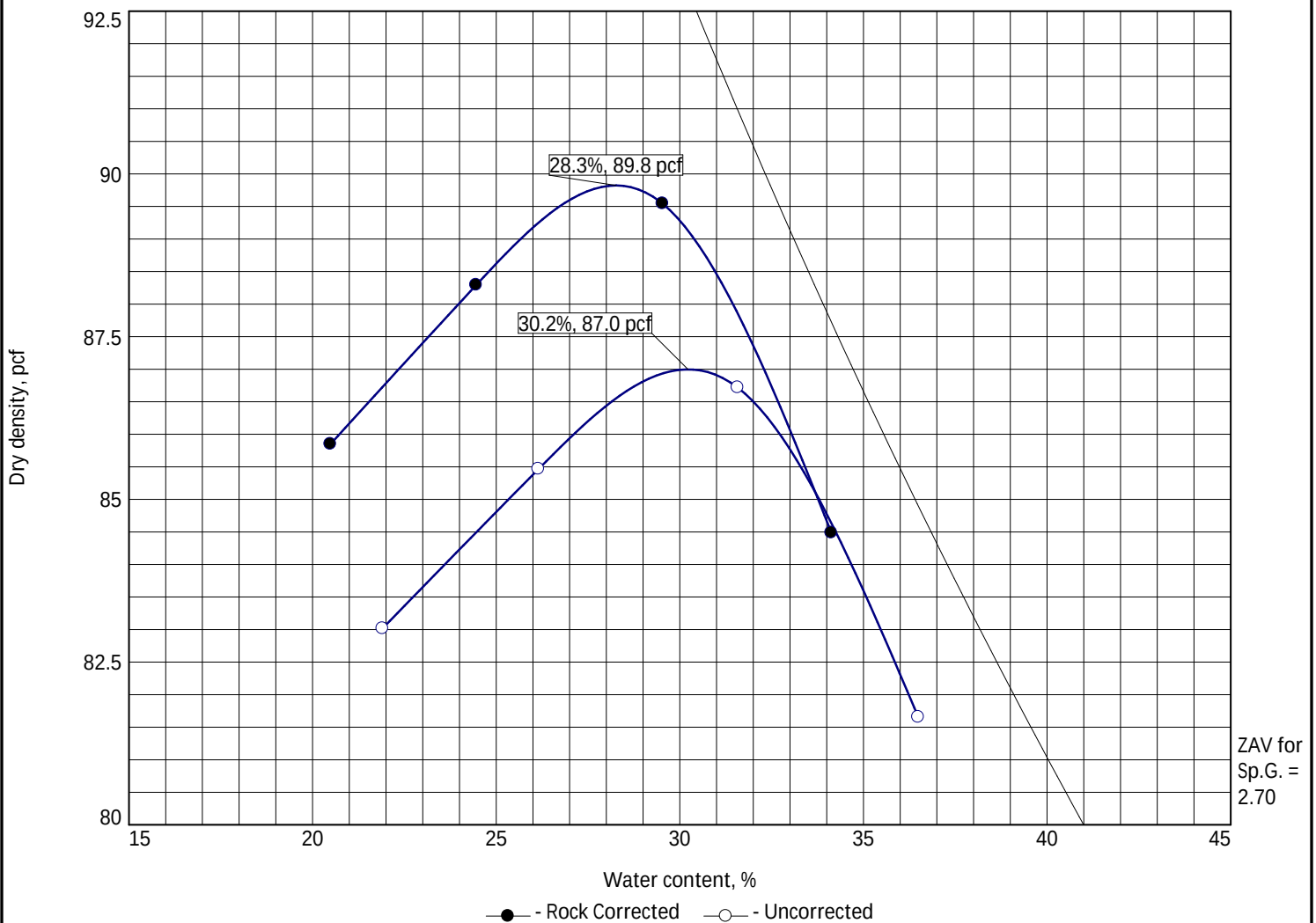
Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/8 in.	% < No.200
	USCS	AASHTO						
2.5'-3'				2.7			25.2	

ROCK CORRECTED TEST RESULTS		UNCORRECTED	MATERIAL DESCRIPTION
Maximum dry density = 110.0 pcf		98.4 pcf	Brown Clay & Silt, some mf Gravel, trace cmf Sand (Visual)
Optimum moisture = 15.6 %		20.8 %	
Project No. IRN 24-T-124 Client: Bright Night, LLC Project: Deschutes Solar, Wasco County, OR Date: 10/28/2024 ○ Sample Number: TP-BESS-01, TRT-1			Remarks: SG Assumed <

Figure

Tested By: JS Checked By: ANS

COMPACTION TEST REPORT



Test specification: ASTM D 698-12 Method B Standard
ASTM D4718-15 Oversize Corr. Applied to Each Test Point

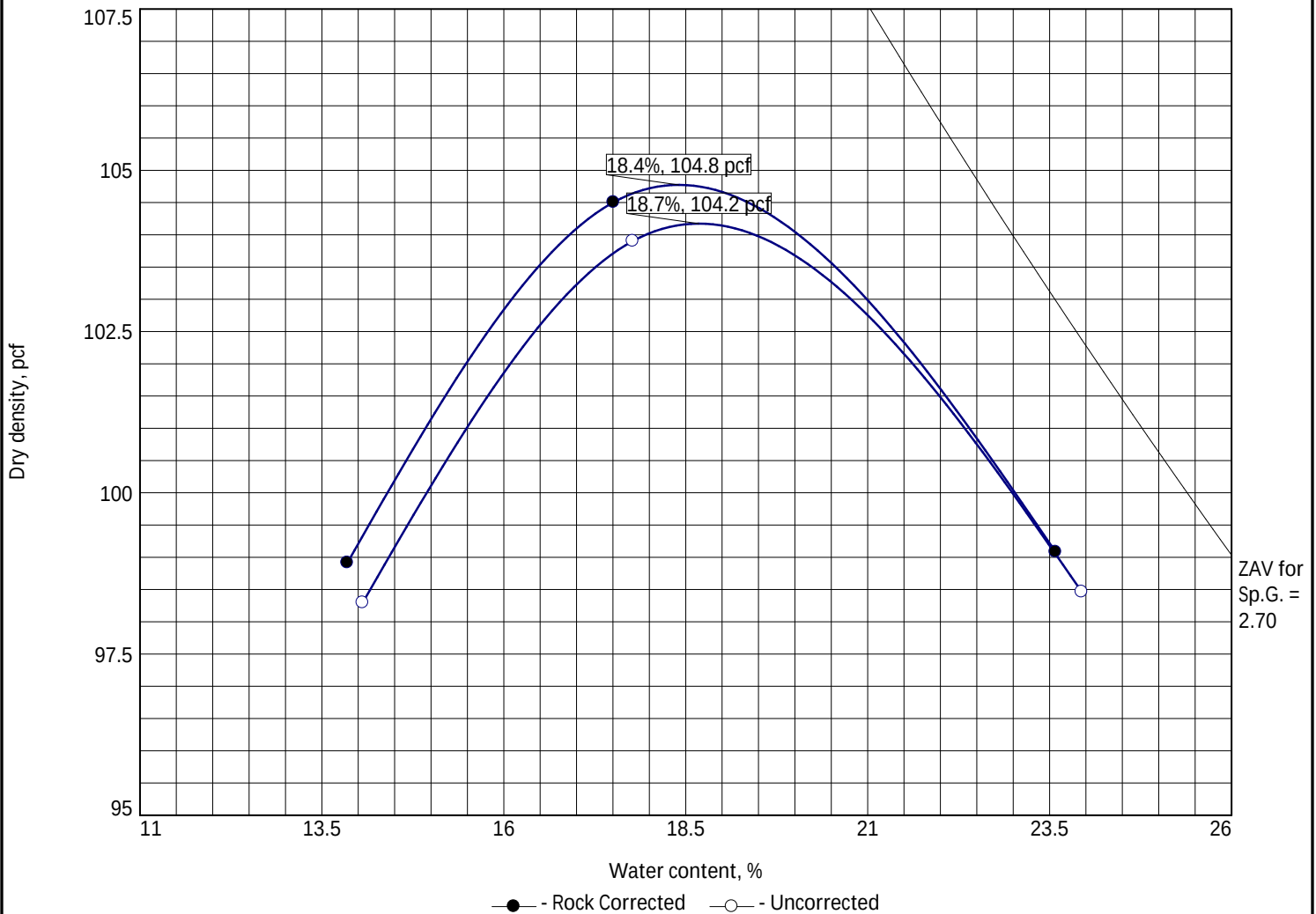
Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/8 in.	% < No.200
	USCS	AASHTO						
1'-3'				2.7			6.5	

ROCK CORRECTED TEST RESULTS		UNCORRECTED	MATERIAL DESCRIPTION
Maximum dry density = 89.8 pcf		87.0 pcf	Brown Clay & Silt, trace cmf Sand, trace mf Gravel (Visual)
Optimum moisture = 28.3 %		30.2 %	
Project No. IRN 24-T-124 Client: Bright Night, LLC Project: Deschutes Solar, Wasco County, OR Date: 10/28/2024 ○ Sample Number: TP-SS-03, TRT-2			Remarks: SG Assumed

Figure

Tested By: JS Checked By: ANS

COMPACTION TEST REPORT



Test specification: ASTM D 698-12 Method B Standard
ASTM D4718-15 Oversize Corr. Applied to Each Test Point

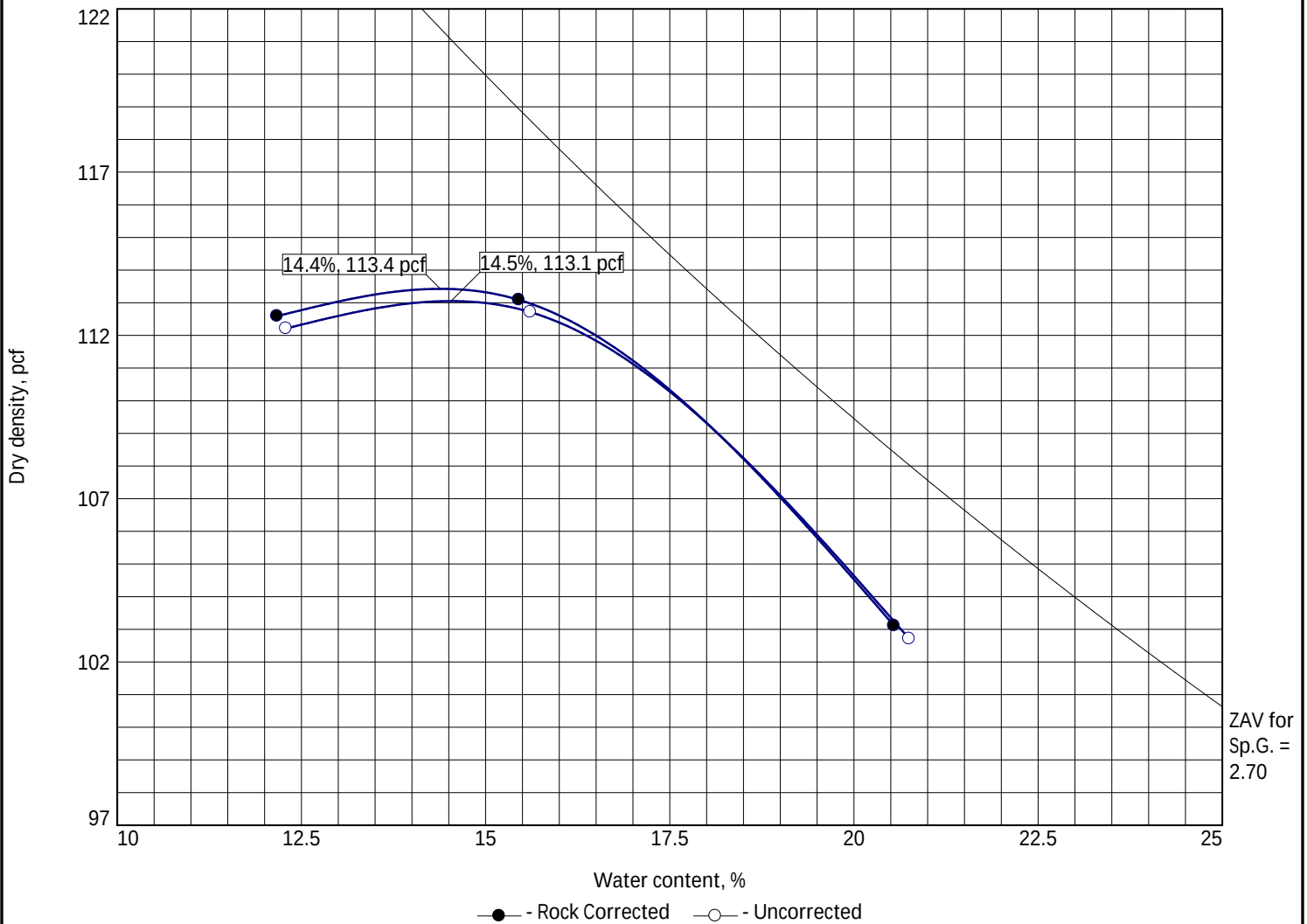
Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/8 in.	% < No.200
	USCS	AASHTO						
3'-5'				2.7			1.5	

ROCK CORRECTED TEST RESULTS		UNCORRECTED	MATERIAL DESCRIPTION
Maximum dry density = 104.8 pcf		104.2 pcf	Brown Clay & Silt, little cmf Sand, trace cmf Sand (Visual)
Optimum moisture = 18.4 %		18.7 %	
Project No. IRN 24-T-124 Client: Bright Night, LLC Project: Deschutes Solar, Wasco County, OR Date: 10/28/2024			Remarks: SG Assumed
○ Sample Number: PLT/TP-01, TRT-3			
ANS CONSULTANTS, INC. South Plainfield, New Jersey			Figure

Figure

Tested By: JS Checked By: ANS

COMPACTION TEST REPORT



Test specification: ASTM D 698-12 Method B Standard
 ASTM D4718-15 Oversize Corr. Applied to Each Test Point

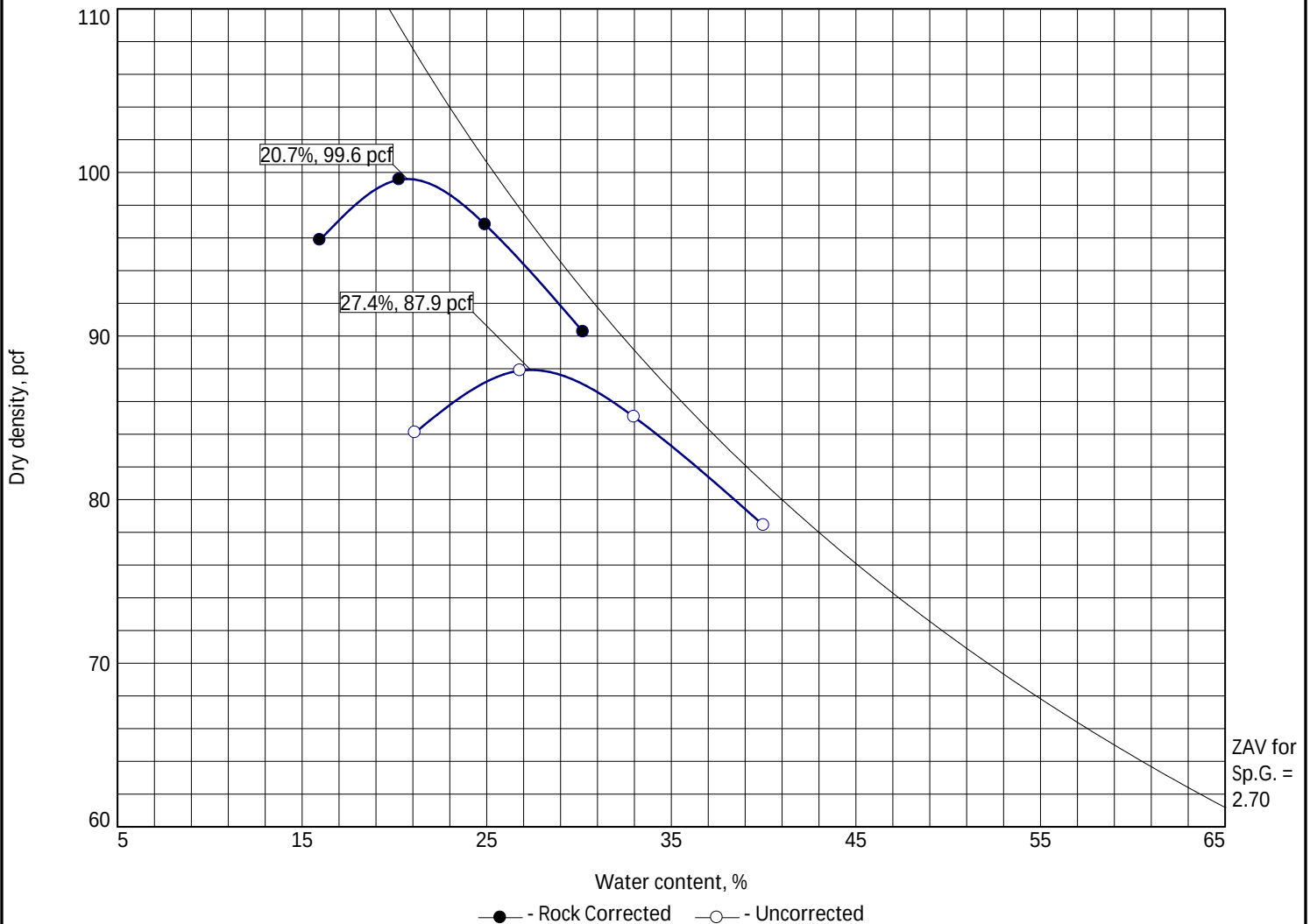
Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/8 in.	% < No.200
	USCS	AASHTO						
3'-5'				2.7			1.0	

ROCK CORRECTED TEST RESULTS		UNCORRECTED	MATERIAL DESCRIPTION
Maximum dry density = 113.4 pcf		113.1 pcf	Brown Clay & Silt, some cmf Sand, trace mf Gravel (Visual)
Optimum moisture = 14.4 %		14.5 %	
Project No. IRN 24-T-124 Client: Bright Night, LLC Project: Deschutes Solar, Wasco County, OR Date: 10/28/2024 ○ Sample Number: PLT/TP-04, TRT-4			Remarks: SG Assumed

Figure

Tested By: JS Checked By: ANS

COMPACTION TEST REPORT



Test specification: ASTM D 698-12 Method B Standard
 ASTM D4718-15 Oversize Corr. Applied to Each Test Point

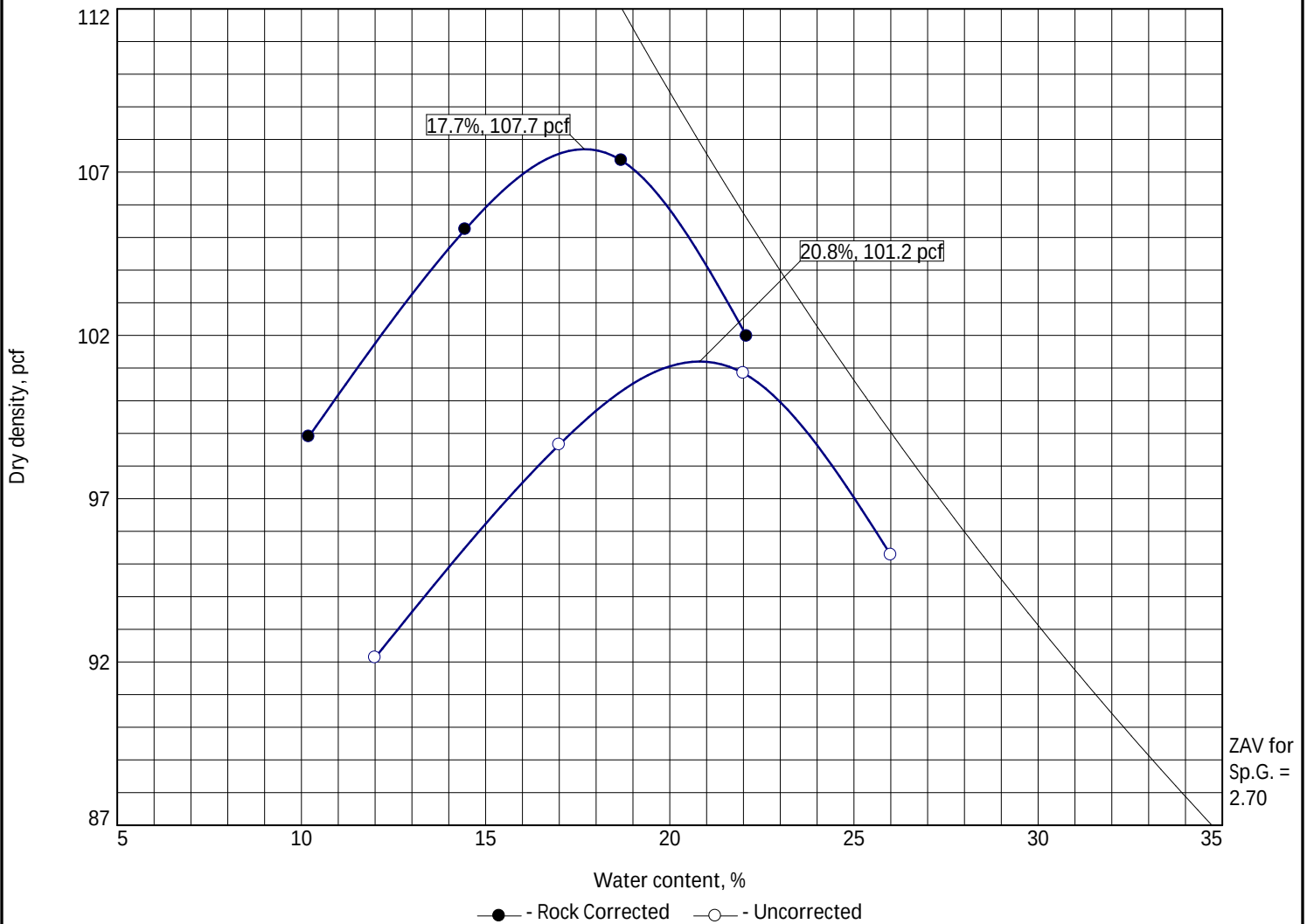
Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/8 in.	% < No.200
	USCS	AASHTO						
3'-5'				2.7			24.5	

ROCK CORRECTED TEST RESULTS		UNCORRECTED	MATERIAL DESCRIPTION
Maximum dry density = 99.6 pcf		87.9 pcf	Brown Clay & Silt, some mf Gravel, trace cmf Sand (Visual)
Optimum moisture = 20.7 %		27.4 %	
Project No. IRN 24-T-124 Client: Bright Night, LLC Project: Deschutes Solar, Wasco County, OR Date: 10/28/2024 ○ Sample Number: TP-20, TRT-5			Remarks: SG Assumed

Figure

Tested By: JS Checked By: ANS

COMPACTION TEST REPORT



Test specification: ASTM D 698-12 Method B Standard
ASTM D4718-15 Oversize Corr. Applied to Each Test Point

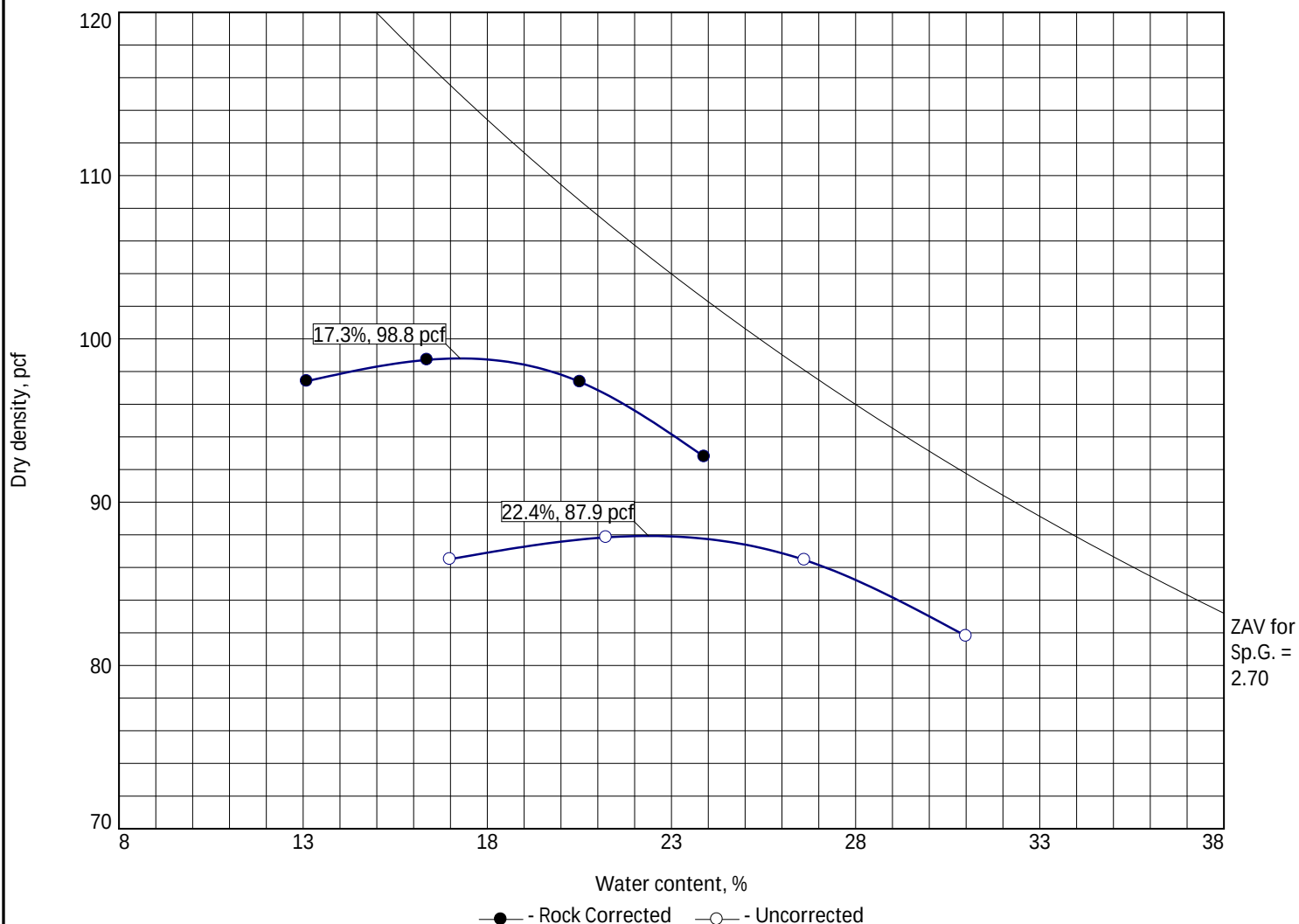
Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/8 in.	% < No.200
	USCS	AASHTO						
3'-5'				2.7			15.1	

ROCK CORRECTED TEST RESULTS		UNCORRECTED	MATERIAL DESCRIPTION
Maximum dry density = 107.7 pcf		101.2 pcf	Dark Brown Clay & Silt, little mf Gravel, trace cmf Sand (Visual)
Optimum moisture = 17.7 %		20.8 %	
Project No. IRN 24-T-124 Client: Bright Night, LLC Project: Deschutes Solar, Wasco County, OR Date: 10/28/2024 ○ Sample Number: PLT/TP-11, TRT-6			Remarks: SG Assumed
ANS CONSULTANTS, INC. South Plainfield, New Jersey			

Figure

Tested By: JS Checked By: ANS

COMPACTION TEST REPORT



Test specification: ASTM D 698-12 Method B Standard
ASTM D4718-15 Oversize Corr. Applied to Each Test Point

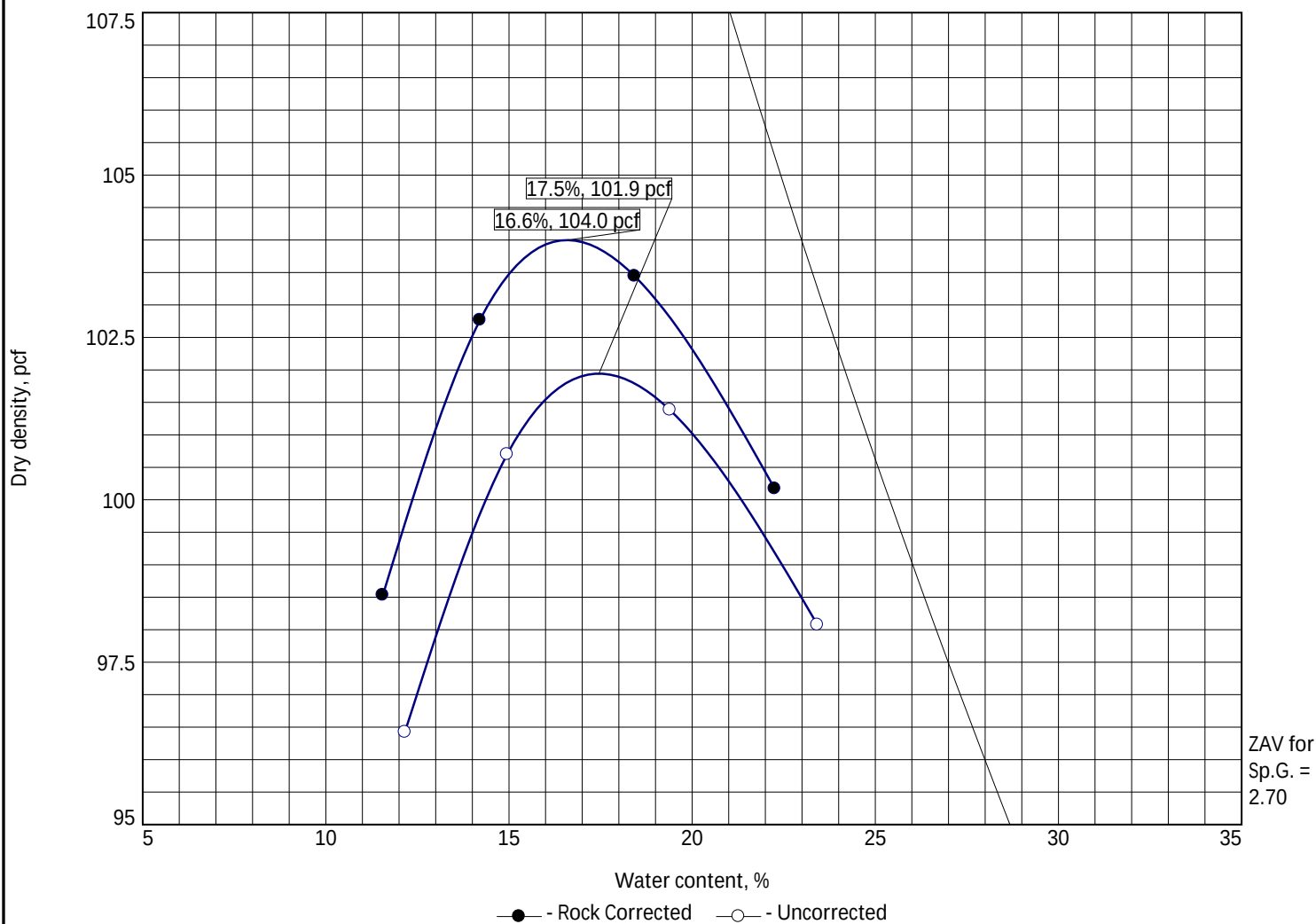
Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/8 in.	% < No.200
	USCS	AASHTO						
1'-3'				2.7			23.0	

ROCK CORRECTED TEST RESULTS		UNCORRECTED	MATERIAL DESCRIPTION
Maximum dry density = 98.8 pcf		87.9 pcf	Brown Clay & Silt, some mf Gravel, trace cmf Sand (Visual)
Optimum moisture = 17.3 %		22.4 %	
Project No. IRN 24-T-124 Client: Bright Night, LLC Project: Deschutes Solar, Wasco County, OR Date: 10/28/2024 ○ Sample Number: TP-SS-01, CBR-1			Remarks: SG Assumed
ANS CONSULTANTS, INC. South Plainfield, New Jersey			
			Figure

Figure

Tested By: ES Checked By: ANS

COMPACTION TEST REPORT



Test specification: ASTM D 698-12 Method B Standard
ASTM D4718-15 Oversize Corr. Applied to Each Test Point

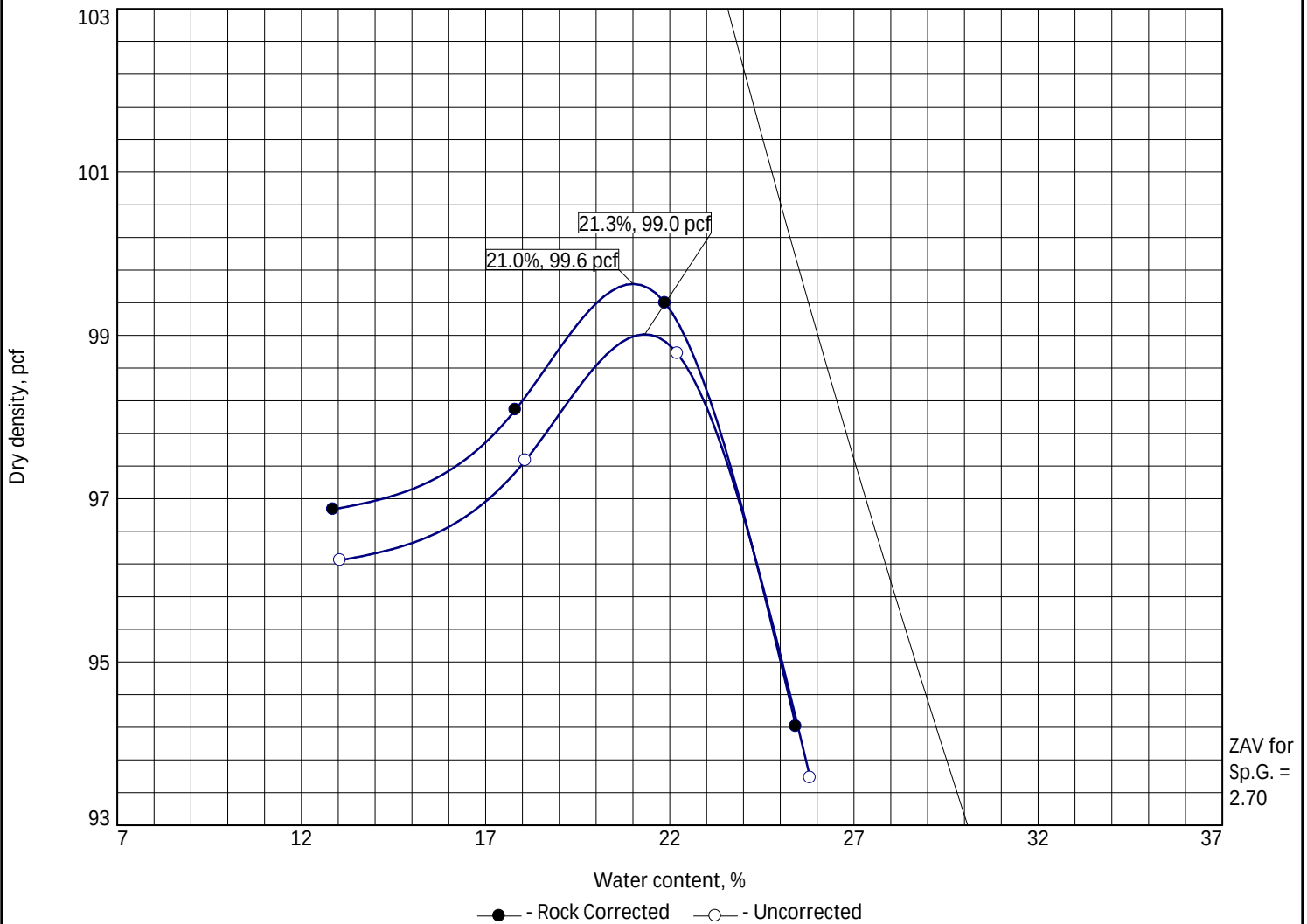
Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/8 in.	% < No.200
	USCS	AASHTO						
1'-3'				2.7			5.0	

ROCK CORRECTED TEST RESULTS		UNCORRECTED	MATERIAL DESCRIPTION
Maximum dry density = 104.0 pcf		101.9 pcf	Brown Clay & Silt, trace cmf Sand, trace mf Gravel (Visual)
Optimum moisture = 16.6 %		17.5 %	
Project No. IRN 24-T-124 Client: Bright Night, LLC Project: Deschutes Solar, Wasco County, OR Date: 10/28/2024 ○ Sample Number: PLT/TP-05, CBR-2			Remarks: SG Assumed
ANS CONSULTANTS, INC. South Plainfield, New Jersey			
			Figure

Figure

Tested By: ES Checked By: ANS

COMPACTION TEST REPORT



Test specification: ASTM D 698-12 Method B Standard
ASTM D4718-15 Oversize Corr. Applied to Each Test Point

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/8 in.	% < No.200
	USCS	AASHTO						
1'-3'				2.7			1.5	

ROCK CORRECTED TEST RESULTS		UNCORRECTED	MATERIAL DESCRIPTION
Maximum dry density = 99.6 pcf		99.0 pcf	Brown Clay & Silt, trace cmf Sand, trace mf Gravel (Visual)
Optimum moisture = 21.0 %		21.3 %	
Project No. IRN 24-T-124 Client: Bright Night, LLC Project: Deschutes Solar, Wasco County, OR Date: 10/28/2024 ○ Sample Number: PLT/TP-10, CBR-3			Remarks: SG Assumed
ANS CONSULTANTS, INC. South Plainfield, New Jersey			

Figure

Tested By: ES Checked By: ANS

**THERMAL
RESISTIVITY TEST
RESULTS**

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UST Removal, Environmental Testing & Reports

Determination of Thermal Conductivity of Soil and Rock by Thermal Needle Probe (ASTM D5334)

Client Name: Bright Night, LLC

LAB IRN: 24-T-124

Project Name: Deschutes Solar, Wasco County, OR

Date: 10/28/2024

Sample ID: TP-BESS-01, TRT-1, 2.5'-3'

Description: Brown Clay & Silt, some mf Gravel, trace cmf Sand (Visual)

Specimen type: Reconstituted Sample

Maximum Dry Density: 110.0 PCF

In-Situ Moisture: 15.7 %

Optimum Moisture: 15.6 %

S.No.	Moisture (%)		85% D698 (PCF): 93.5		95% D698 (PCF): 104.5	
			Thermal Cond. (W/mK)	Thermal Res. (°C-cm/W)	Thermal Cond. (W/mK)	Thermal Res. (°C-cm/W)
1	Dry	0.0	0.3496	286.0	0.3998	250.1
2	¼ OMC	3.9	0.4624	216.3	0.5216	191.7
3	½ OMC	7.8	0.8257	121.1	0.8693	115.0
4	¾ OMC	11.7	1.0903	91.7	1.1281	88.6
5	OMC	15.6	1.2168	82.2	1.2621	79.2
6	In-Situ	15.7	1.2195	82.0	1.2651	79.0

Remarks:

1. Needle size: 2.4 mm diameter × 100 mm length
2. Thermal grease used: High-density polysynthetics silver thermal compound
3. Tested under controlled room temperature conditions (20°C to 22°C)

Tested By: LD/ES

Checked By: ANS

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Thermal Dryout Curve (ASTM D5334)

Client Name: Bright Night, LLC

LAB IRN: 24-T-124

Project Name: Deschutes Solar, Wasco County, OR

Date: 10/28/2024

Sample ID: TP-BESS-01, TRT-1, 2.5'-3'

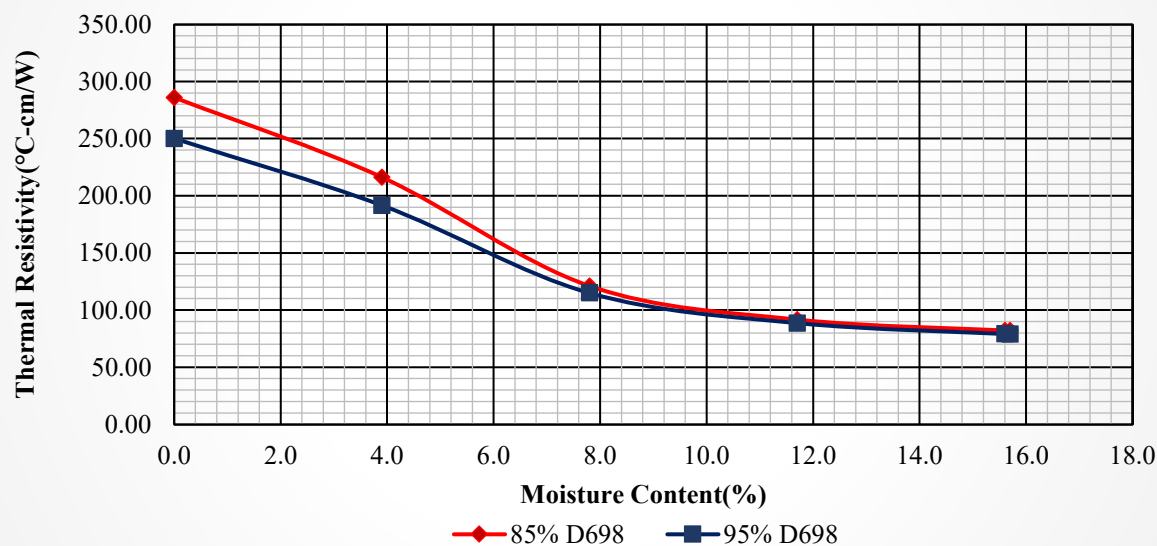
Description: Brown Clay & Silt, some mf Gravel, trace cmf Sand (Visual)

Specimen type: Reconstituted Sample

Maximum Dry Density: 110.0 PCF

In-Situ Moisture: 15.7 %

Optimum Moisture: 15.6 %

Thermal Dry-out Curve

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Determination of Thermal Conductivity of Soil and Rock by Thermal Needle Probe (ASTM D5334)

Client Name: Bright Night, LLC

LAB IRN: 24-T-124

Project Name: Deschutes Solar, Wasco County, OR

Date: 10/28/2024

Sample ID: TP-SS-03, TRT-2, 1'-3'

Description: Brown Clay & Silt, trace cmf Sand, trace mf Gravel (Visual)

Specimen type: Reconstituted Sample

Maximum Dry Density: 89.8 PCF

In-Situ Moisture: 23.4 %

Optimum Moisture: 28.3 %

S.No.	Moisture (%)		85% D698 (PCF): 76.3		95% D698 (PCF): 85.3	
			Thermal Cond. (W/mK)	Thermal Res. (°C-cm/W)	Thermal Cond. (W/mK)	Thermal Res. (°C-cm/W)
1	Dry	0.0	0.3217	310.8	0.3801	263.1
2	¼ OMC	7.1	0.4800	208.3	0.5404	185.0
3	½ OMC	14.2	0.8337	119.9	0.8498	117.7
4	¾ OMC	21.2	0.9946	100.5	1.0121	98.8
5	OMC	28.3	1.1132	89.8	1.1422	87.6

Remarks:

1. Needle size: 2.4 mm diameter × 100 mm length
2. Thermal grease used: High-density polysynthetics silver thermal compound
3. Tested under controlled room temperature conditions (20°C to 22°C)

Tested By: LD/ES

Checked By: ANS

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Thermal Dryout Curve (ASTM D5334)

Client Name: Bright Night, LLC

LAB IRN: 24-T-124

Project Name: Deschutes Solar, Wasco County, OR

Date: 10/28/2024

Sample ID: TP-SS-03, TRT-2, 1'-3'

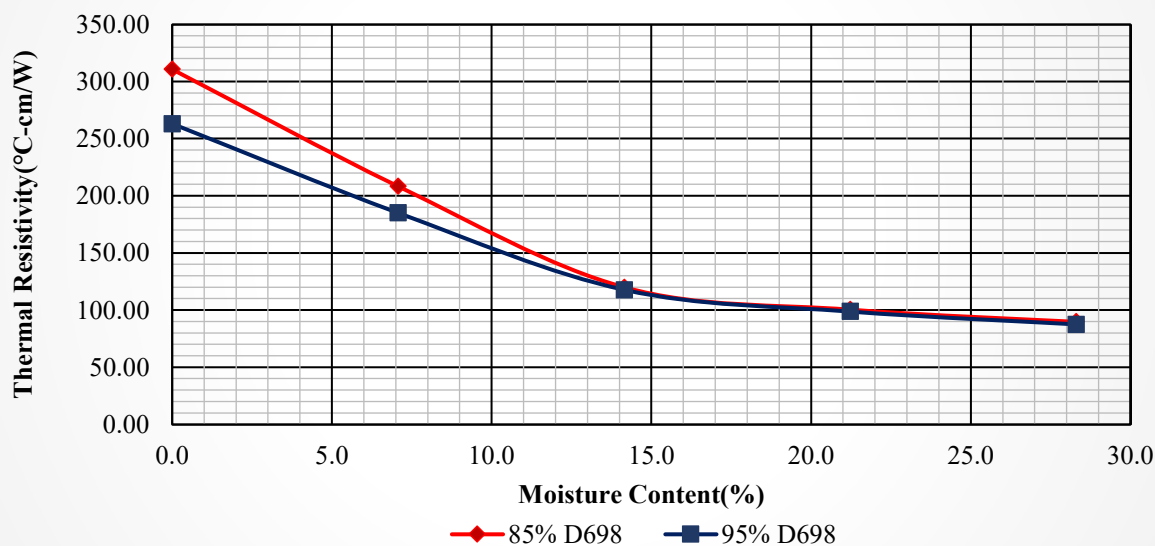
Description: Brown Clay & Silt, trace cmf Sand, trace mf Gravel (Visual)

Specimen type: Reconstituted Sample

Maximum Dry Density: 89.8 PCF

In-Situ Moisture: 23.4 %

Optimum Moisture: 28.3 %

Thermal Dry-out Curve

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Determination of Thermal Conductivity of Soil and Rock by Thermal Needle Probe (ASTM D5334)

Client Name: Bright Night, LLC

LAB IRN: 24-T-124

Project Name: Deschutes Solar, Wasco County, OR

Date: 10/28/2024

Sample ID: PLT/TP-01, TRT-3, 3'-5'

Description: Brown Clay & Silt, little cmf Sand, trace cmf Sand (Visual)

Specimen type: Reconstituted Sample

Maximum Dry Density: 104.8 PCF

In-Situ Moisture: 7.8 %

Optimum Moisture: 18.4 %

S.No.	Moisture (%)		85% D698 (PCF): 89.1		95% D698 (PCF): 99.6	
			Thermal Cond. (W/mK)	Thermal Res. (°C-cm/W)	Thermal Cond. (W/mK)	Thermal Res. (°C-cm/W)
1	Dry	0.0	0.3454	289.5	0.3966	252.1
2	¼ OMC	4.6	0.4608	217.0	0.5212	191.9
3	½ OMC	9.2	0.7863	127.2	0.8249	121.2
4	¾ OMC	13.8	1.0382	96.3	1.0658	93.8
5	OMC	18.4	1.1683	85.6	1.2029	83.1

Remarks:

1. Needle size: 2.4 mm diameter × 100 mm length
2. Thermal grease used: High-density polysynthetics silver thermal compound
3. Tested under controlled room temperature conditions (20°C to 22°C)

Tested By: LD/ES

Checked By: ANS

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Thermal Dryout Curve (ASTM D5334)

Client Name: Bright Night, LLC

LAB IRN: 24-T-124

Project Name: Deschutes Solar, Wasco County, OR

Date: 10/28/2024

Sample ID: PLT/TP-01, TRT-3, 3'-5'

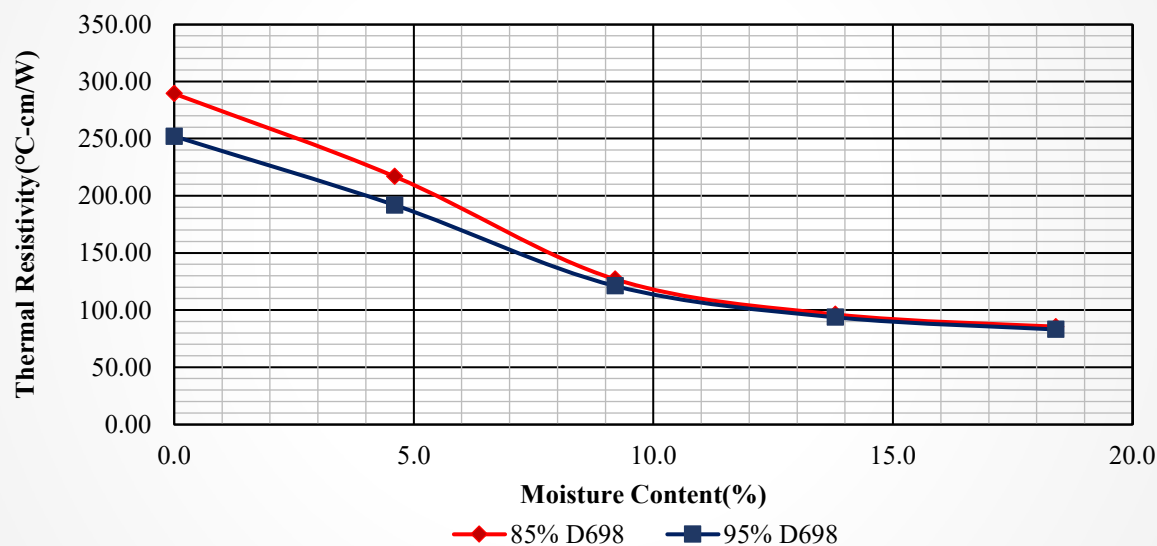
Description: Brown Clay & Silt, little cmf Sand, trace cmf Sand (Visual)

Specimen type: Reconstituted Sample

Maximum Dry Density: 104.8 PCF

In-Situ Moisture: 7.8 %

Optimum Moisture: 18.4 %

Thermal Dry-out Curve

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Determination of Thermal Conductivity of Soil and Rock by Thermal Needle Probe (ASTM D5334)

Client Name: Bright Night, LLC

LAB IRN: 24-T-124

Project Name: Deschutes Solar, Wasco County, OR

Date: 10/28/2024

Sample ID: PLT/TP-04, TRT-4, 3'-5'

Description: Brown Clay & Silt, some cmf Sand, trace mf Gravel (Visual)

Specimen type: Reconstituted Sample

Maximum Dry Density: 113.4 PCF

In-Situ Moisture: 6.1 %

Optimum Moisture: 14.4 %

S.No.	Moisture (%)		85% D698 (PCF): 96.4		95% D698 (PCF): 107.7	
			Thermal Cond. (W/mK)	Thermal Res. (°C-cm/W)	Thermal Cond. (W/mK)	Thermal Res. (°C-cm/W)
1	Dry	0.0	0.3544	282.2	0.4131	242.1
2	¼ OMC	3.6	0.4747	210.7	0.5422	184.4
3	½ OMC	7.2	0.8509	117.5	0.9123	109.6
4	¾ OMC	10.8	1.0584	94.5	1.1236	89.0
5	OMC	14.4	1.1684	85.6	1.2432	80.4

Remarks:

1. Needle size: 2.4 mm diameter × 100 mm length
2. Thermal grease used: High-density polysynthetics silver thermal compound
3. Tested under controlled room temperature conditions (20°C to 22°C)

Tested By: LD/ES

Checked By: ANS

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Thermal Dryout Curve (ASTM D5334)

Client Name: Bright Night, LLC

LAB IRN: 24-T-124

Project Name: Deschutes Solar, Wasco County, OR

Date: 10/28/2024

Sample ID: PLT/TP-04, TRT-4, 3'-5'

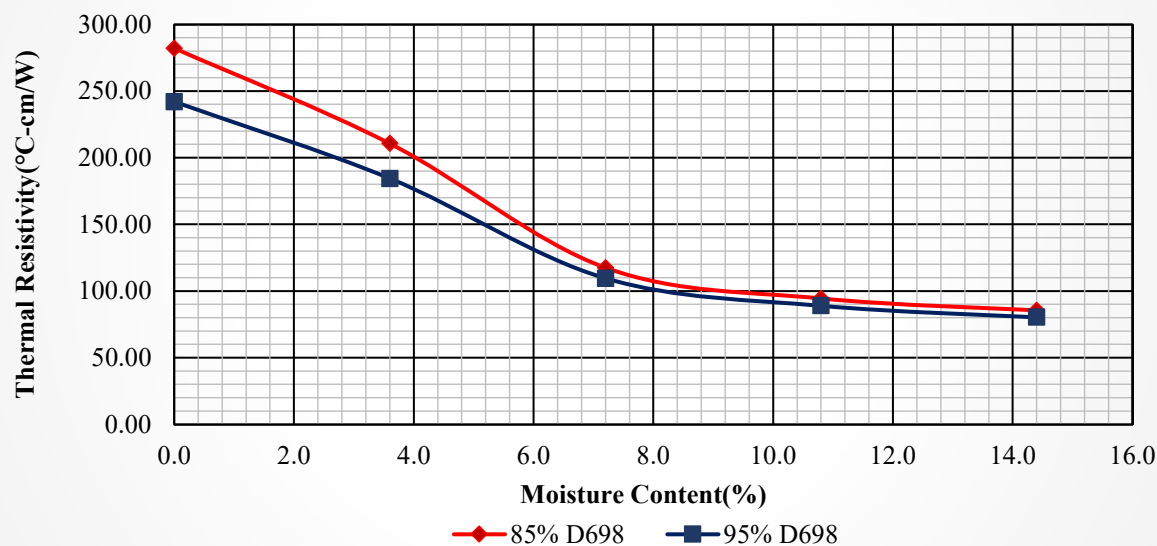
Description: Brown Clay & Silt, some cmf Sand, trace mf Gravel (Visual)

Specimen type: Reconstituted Sample

Maximum Dry Density: 113.4 PCF

In-Situ Moisture: 6.1 %

Optimum Moisture: 14.4 %

Thermal Dry-out Curve

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Determination of Thermal Conductivity of Soil and Rock by Thermal Needle Probe (ASTM D5334)

Client Name: Bright Night, LLC

LAB IRN: 24-T-124

Project Name: Deschutes Solar, Wasco County, OR

Date: 10/28/2024

Sample ID: TP-20, TRT-5, 3'-5'

Description: Brown Clay & Silt, some mf Gravel, trace cmf Sand (Visual)

Specimen type: Reconstituted Sample

Maximum Dry Density: 99.6 PCF

In-Situ Moisture: 23.6 %

Optimum Moisture: 20.7 %

S.No.	Moisture (%)		85% D698 (PCF): 84.7		95% D698 (PCF): 94.6	
			Thermal Cond. (W/mK)	Thermal Res. (°C-cm/W)	Thermal Cond. (W/mK)	Thermal Res. (°C-cm/W)
1	Dry	0.0	0.3363	297.4	0.4030	248.1
2	¼ OMC	5.2	0.4736	211.1	0.5438	183.9
3	½ OMC	10.4	0.8364	119.6	0.8581	116.5
4	¾ OMC	15.5	1.0116	98.9	1.0280	97.3
5	OMC	20.7	1.1233	89.0	1.1489	87.0
6	In-Situ	23.6	1.1595	86.2	1.1890	84.1

Remarks:

1. Needle size: 2.4 mm diameter × 100 mm length
2. Thermal grease used: High-density polysynthetics silver thermal compound
3. Tested under controlled room temperature conditions (20°C to 22°C)

Tested By: LD/ES

Checked By: ANS

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Thermal Dryout Curve (ASTM D5334)

Client Name: Bright Night, LLC

LAB IRN: 24-T-124

Project Name: Deschutes Solar, Wasco County, OR

Date: 10/28/2024

Sample ID: TP-20, TRT-5, 3'-5'

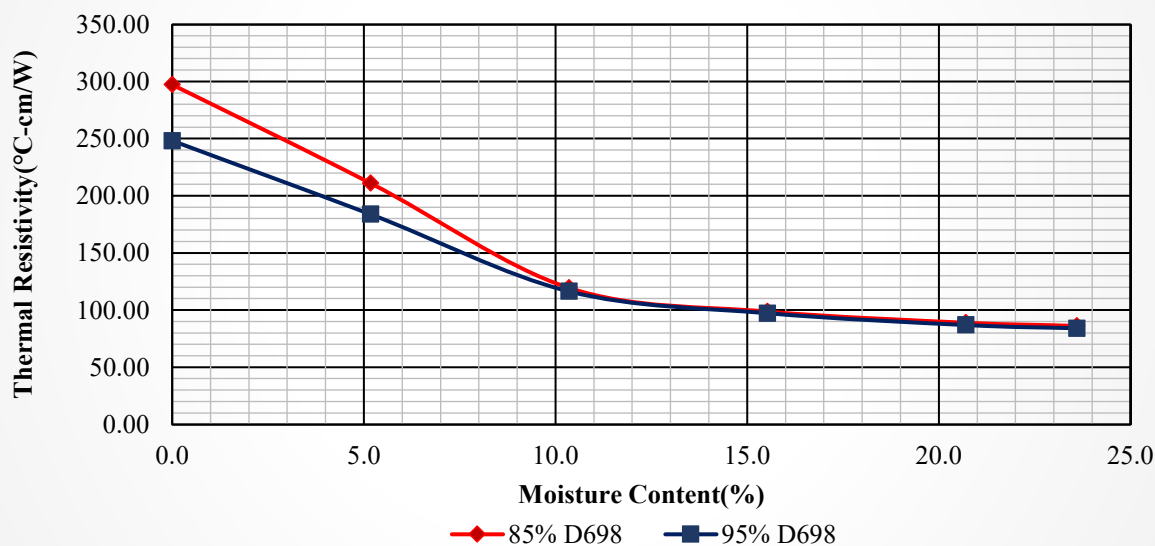
Description: Brown Clay & Silt, some mf Gravel, trace cmf Sand (Visual)

Specimen type: Reconstituted Sample

Maximum Dry Density: 99.6 PCF

In-Situ Moisture: 23.6 %

Optimum Moisture: 20.7 %

Thermal Dry-out Curve

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Determination of Thermal Conductivity of Soil and Rock by Thermal Needle Probe (ASTM D5334)

Client Name: Bright Night, LLC

LAB IRN: 24-T-124

Project Name: Deschutes Solar, Wasco County, OR

Date: 10/28/2024

Sample ID: PLT/TP-11, TRT-6, 3'-5'

Description: Dark Brown Clay & Silt, little mf Gravel, trace cmf Sand (Visual)

Specimen type: Reconstituted Sample

Maximum Dry Density: 107.7 PCF

In-Situ Moisture: 18.0 %

Optimum Moisture: 17.7 %

S.No.	Moisture (%)		85% D698 (PCF): 91.5		95% D698 (PCF): 102.3	
			Thermal Cond. (W/mK)	Thermal Res. (°C-cm/W)	Thermal Cond. (W/mK)	Thermal Res. (°C-cm/W)
1	Dry	0.0	0.3641	274.6	0.4422	226.1
2	¼ OMC	4.4	0.5911	169.2	0.6598	151.6
3	½ OMC	8.9	1.0028	99.7	1.0313	97.0
4	¾ OMC	13.3	1.1358	88.0	1.1706	85.4
5	OMC	17.7	1.2403	80.6	1.2863	77.7
6	In-Situ	18.0	1.2473	80.2	1.2940	77.3

Remarks:

1. Needle size: 2.4 mm diameter × 100 mm length
2. Thermal grease used: High-density polysynthetics silver thermal compound
3. Tested under controlled room temperature conditions (20°C to 22°C)

Tested By: LD/ES

Checked By: ANS

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Thermal Dryout Curve (ASTM D5334)

Client Name: Bright Night, LLC

LAB IRN: 24-T-124

Project Name: Deschutes Solar, Wasco County, OR

Date: 10/28/2024

Sample ID: PLT/TP-11, TRT-6, 3'-5'

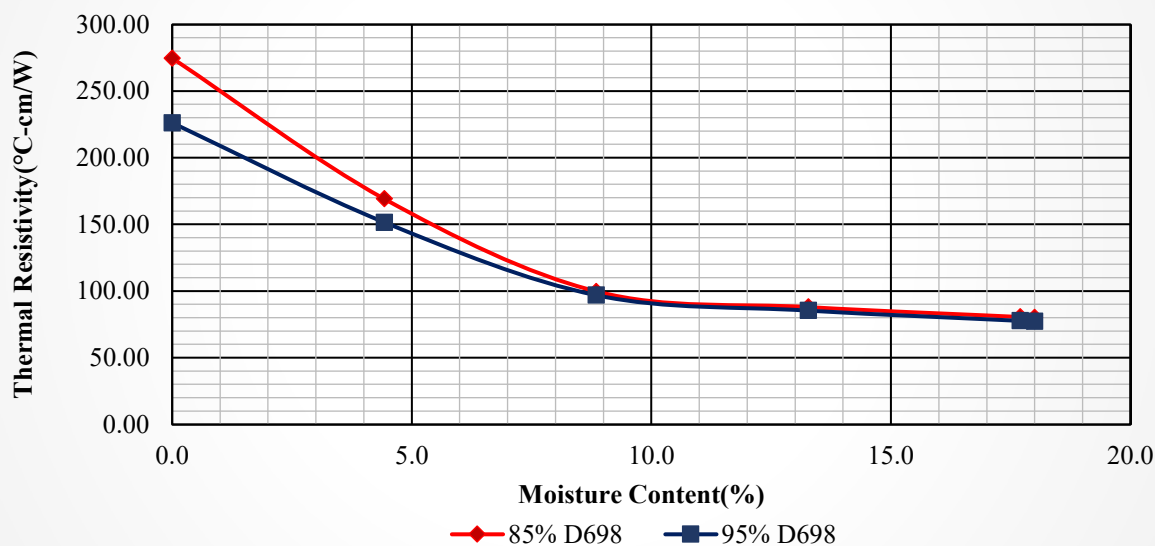
Description: Dark Brown Clay & Silt, little mf Gravel, trace cmf Sand (Visual)

Specimen type: Reconstituted Sample

Maximum Dry Density: 107.7 PCF

In-Situ Moisture: 18.0 %

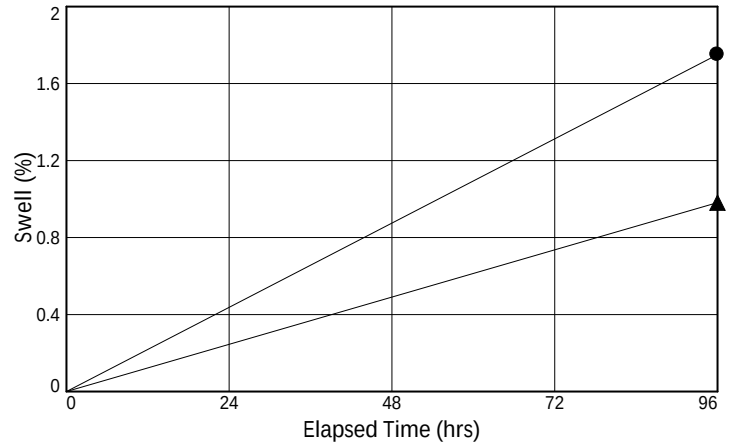
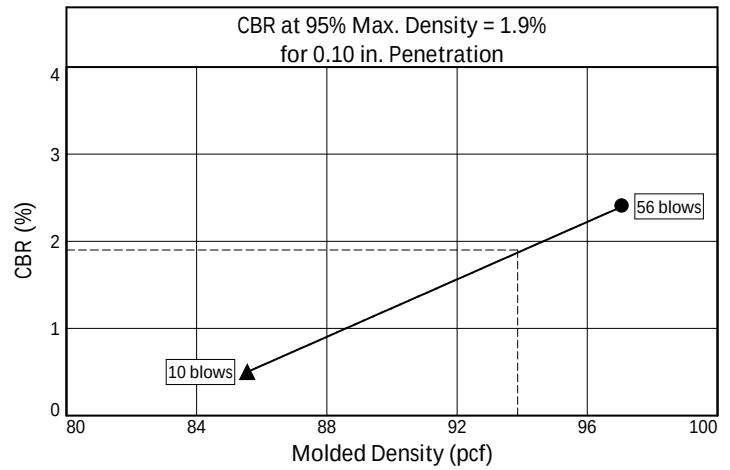
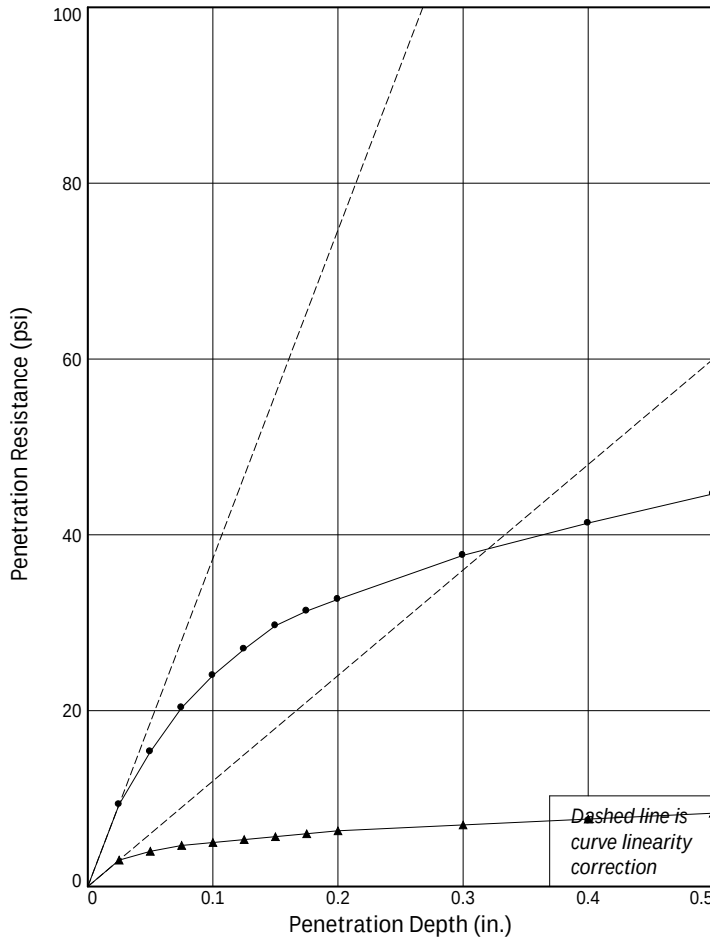
Optimum Moisture: 17.7 %

Thermal Dry-out Curve

**CALIFORNIA
BEARING RATIO
RESULTS**

BEARING RATIO TEST REPORT

ASTM D1883-21



	Molded			Soaked			CBR (%)		Linearity Correction (in.)	Surcharge (lbs.)	Max. Swell (%)
	Density (pcf)	Percent of Max. Dens.	Moisture (%)	Density (pcf)	Percent of Max. Dens.	Moisture (%)	0.10 in.	0.20 in.			
1 ●	97.1	98.3	17.3	95.4	96.6	38.5	2.4	2.2	0.000	10	1.8
2 ▲	85.6	86.6	17.3	84.7	85.8	43.9	0.5	0.4	0.000	10	1
3 ■											

Material Description		USCS	Max. Dens. (pcf)	Optimum Moisture (%)	LL	PI
Brown Clay & Silt, some mf Gravel, trace cmf Sand (Visual)						
			98.8	17.3		

Project No: IRN 24-T-124
 Project: Deschutes Solar, Wasco County, OR
 Sample Number: TP-SS-01, CBR-1 Depth: 1'-3'
 Date: 10/28/2024

BEARING RATIO TEST REPORT
 ANS CONSULTANTS, INC.

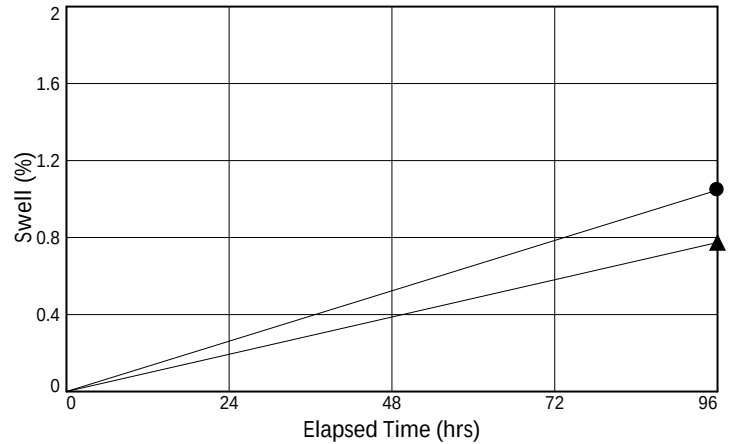
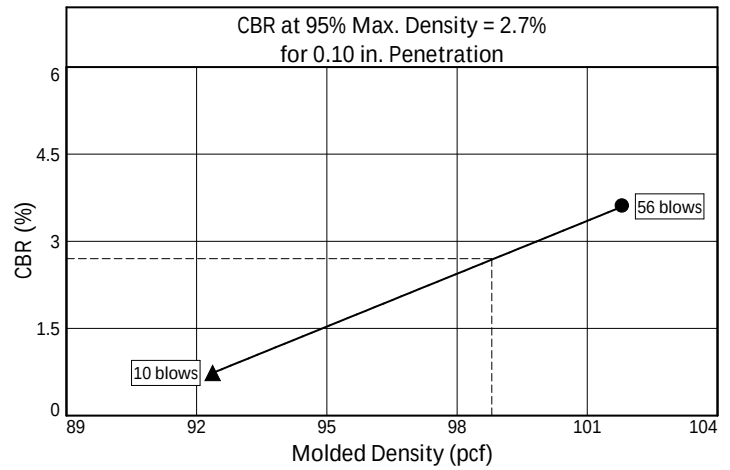
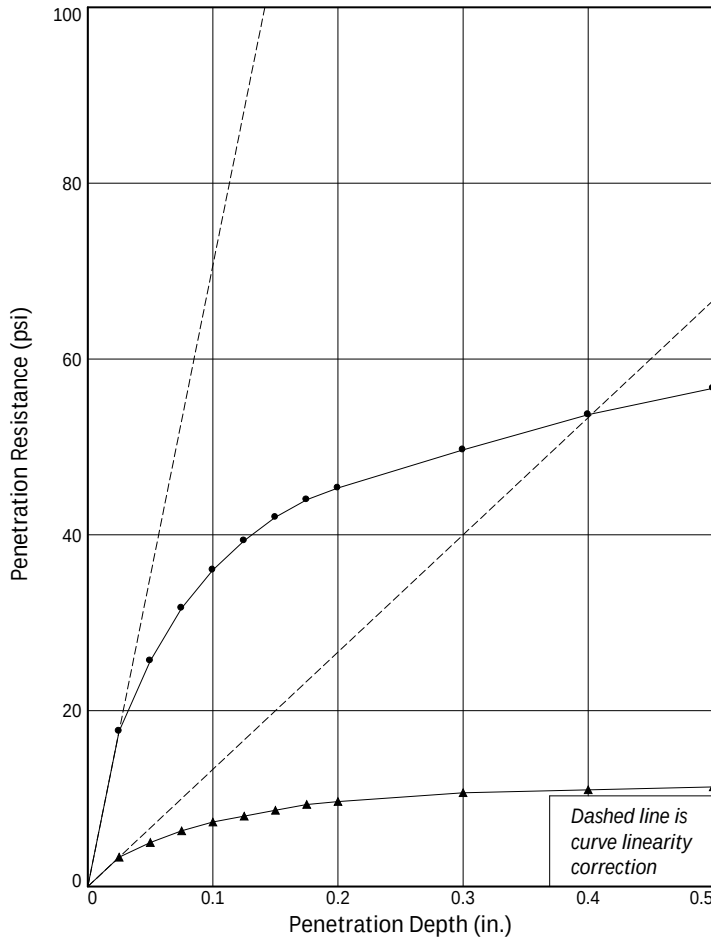
Test Remarks:
 Saturation Period: 96 Hours

Figure _____

Tested By: ES Checked By: ANS

BEARING RATIO TEST REPORT

ASTM D1883-21



	Molded			Soaked			CBR (%)		Linearity Correction (in.)	Surcharge (lbs.)	Max. Swell (%)
	Density (pcf)	Percent of Max. Dens.	Moisture (%)	Density (pcf)	Percent of Max. Dens.	Moisture (%)	0.10 in.	0.20 in.			
1 ●	101.8	97.9	16.6	100.8	96.9	24.4	3.6	3.0	0.000	10	1
2 ▲	92.4	88.8	16.6	91.7	88.1	29.8	0.7	0.6	0.000	10	0.8
3 ■											

Material Description		USCS	Max. Dens. (pcf)	Optimum Moisture (%)	LL	PI
Brown Clay & Silt, trace cmf Sand, trace mf Gravel (Visual)						
			104.0	16.6		

Project No: IRN 24-T-124
 Project: Deschutes Solar, Wasco County, OR
 Sample Number: PLT/TP-05, CBR-2 Depth: 1'-3'
 Date: 10/28/2024

BEARING RATIO TEST REPORT
 ANS CONSULTANTS, INC.

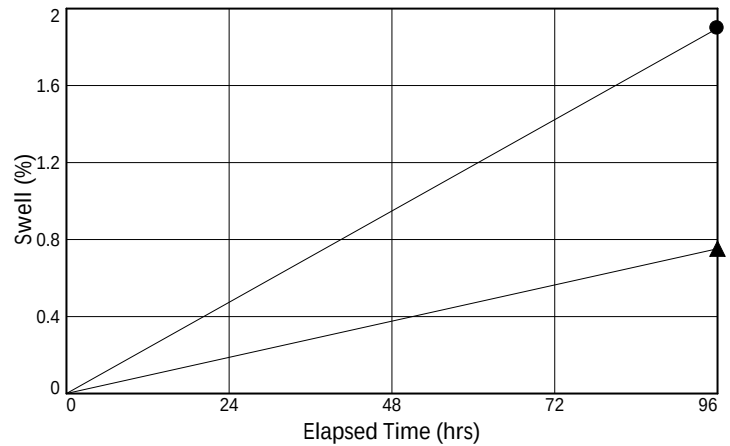
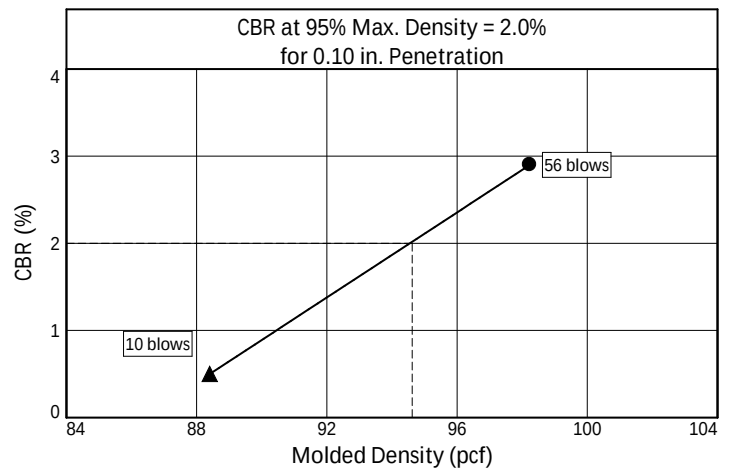
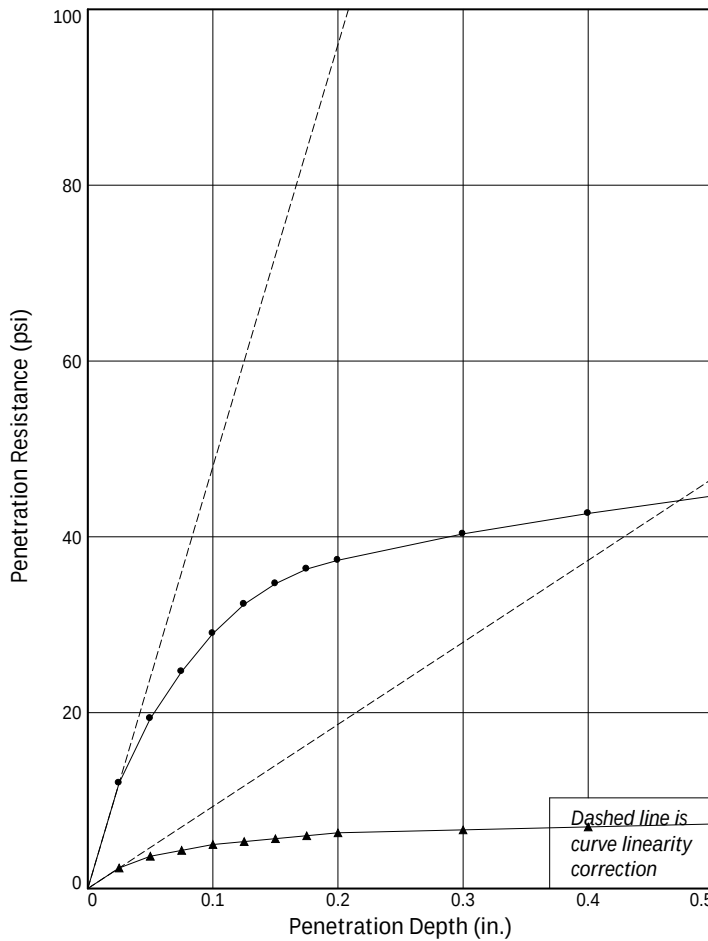
Test Remarks:
 Saturation Period: 96 Hours

Figure _____

Tested By: ES Checked By: ANS

BEARING RATIO TEST REPORT

ASTM D1883-21



	Molded			Soaked			CBR (%)		Linearity Correction (in.)	Surcharge (lbs.)	Max. Swell (%)
	Density (pcf)	Percent of Max. Dens.	Moisture (%)	Density (pcf)	Percent of Max. Dens.	Moisture (%)	0.10 in.	0.20 in.			
1 ●	98.2	98.6	21.0	96.4	96.8	33.0	2.9	2.5	0.000	10	1.9
2 ▲	88.4	88.8	21.0	87.7	88.1	34.5	0.5	0.4	0.000	10	0.8
3 ■											

Material Description		USCS	Max. Dens. (pcf)	Optimum Moisture (%)	LL	PI
Brown Clay & Silt, trace cmf Sand, trace mf Gravel (Visual)						
			99.6	21.0		

Project No: IRN 24-T-124
 Project: Deschutes Solar, Wasco County, OR
 Sample Number: PLT/TP-10, CBR-3 Depth: 1'-3'
 Date: 10/28/2024

BEARING RATIO TEST REPORT
 ANS CONSULTANTS, INC.

Test Remarks:
 Saturation Period: 96 Hours

Figure _____

Tested By: ES Checked By: ANS

**CORROSIVITY
SUITE
RESULTS**

**ANS CONSULTANTS, INC.**4405 South Clinton Avenue
South Plainfield, NJ 07080

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UST Removal, Environmental Testing & Reports

Corrosivity Testing of Soil

Client Name: Bright Night, LLC

LAB IRN: 24-T-124

Project Name: Deschutes Solar, Wasco County, OR

Date: 10/28/2024

S.No.	Sample	Depth	Soil Resistivity (ohm-cm)	pH of Soil	Sulfate Content (mg/kg)	Chloride Content (mg/kg)	Oxidation-Reduction Pot. (mV)
		Natural Moisture	ASTM G187	ASTM G51	ASTM C1580	AASHTO T291	ASTM G200
1	TP-BESS-02 CORR-1	0'-3'	14,500	6.1	<15	57	316
		11.3%	(Sat.=1.8k)	Brown C&S, little mf Gravel, little cmf Sand (Vis.)			
2	TP-SS-02 CORR-2	0'-3'	19,600	6.2	<15	105	294
		8.9%	(Sat.=2.5k)	Brown C&S, little mf Gravel, little cmf Sand (Vis.)			
3	PLT/TP-02 CORR-3	0'-3'	24,200	7.1	60	135	264
		7.1%	(Sat.=2.4k)	Brown C&S, little mf Gravel, trace cmf Sand (Vis.)			
4	PLT/TP-08 CORR-4	0'-3'	8,240	5.8	120	48	327
		12.7%	(Sat.=4.0k)	Brown C&S, little mf Gravel, little cmf Sand (Vis.)			
5	PLT/TP-12 CORR-5	0'-3'	4,900	6.2	<15	69	273
		13.7%		Brown C&S, little mf Gravel, little cmf Sand (Vis.)			
6	PLT/TP-14 CORR-6	0'-3'	10,800	6.5	120	129	196
		18.5%	(Sat.=1.2k)	Brown C&S, little mf Gravel, little cmf Sand (Vis.)			

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UST Removal, Environmental Testing & Reports

Corrosivity Testing of Soil

Client Name: Bright Night, LLC

LAB IRN: 24-T-124

Project Name: Deschutes Solar, Wasco County, OR

Date: 10/28/2024

Remarks:

1. Turbidimetric procedure used for ASTM C1580.
2. Mohr's procedure with Silver Nitrate used for AASHTO T291.
3. Miller 400D Resistance Meter used for Resistivity testing, Multiplication factor = 1.
4. As per ASTM G187, gravel and small stones removed from sample.
5. Tests conducted under standard laboratory conditions of temperature (72°F) and humidity.
6. Sat soil resistivity indicates minimum electrical resistivity value (Saturated conditions).

Tested By: ES

Checked By: ANS

Attachment E

Electrical Resistivity Test Data



Soil Resistivity Results

Client:	BrightNight	Date:	10/1/2024 - 10/4/2024
Project Name:	Deschutes Solar & Storage	Weather:	Sunny
Project Location:	Wasco County, Oregon	Temperature:	66 degF
Equipment:	AGI MiniSting		
Test Method:	Wenner 4 Electrode Array		

Array		Data					
			2	5	10	20	50
ERT-01	N-S	Measured Resistance (Ω)	13.48	2.85	2.223	2.048	1.811
		Apparent Resistivity (Ω-m)	51.63	27.29	42.58	78.43	173.43
	E-W	Measured Resistance (Ω)	13.54	2.877	2.205	2.17	1.881
		Apparent Resistivity (Ω-m)	51.88	27.55	42.25	83.12	179.59
ERT-02	N-S	Measured Resistance (Ω)	23.97	4.527	3.203	2.587	1.889
		Apparent Resistivity (Ω-m)	91.81	43.34	61.33	99.09	180.87
	E-W	Measured Resistance (Ω)	19.5	4.962	3.13	2.664	1.9907
		Apparent Resistivity (Ω-m)	74.71	47.52	59.95	102.05	190.62
ERT-03	N-S	Measured Resistance (Ω)	5.508	1.904	1.176	1.033	1.005
		Apparent Resistivity (Ω-m)	21.10	18.23	22.52	39.59	96.19
	E-W	Measured Resistance (Ω)	6.176	1.931	1.208	1.053	1.021
		Apparent Resistivity (Ω-m)	23.66	18.49	23.13	40.33	97.78
ERT-04	N-S	Measured Resistance (Ω)	108.8	30.59	10.54	3.202	1.428
		Apparent Resistivity (Ω-m)	416.66	292.94	201.84	122.65	136.73
	E-W	Measured Resistance (Ω)	96.05	25.33	9.345	3.289	1.409
		Apparent Resistivity (Ω-m)	367.89	242.56	178.98	125.67	134.90
ERT-05	N-S	Measured Resistance (Ω)	34.82	10.6	5.568	3.506	1.779
		Apparent Resistivity (Ω-m)	133.38	102.11	106.56	134.26	170.32
	E-W	Measured Resistance (Ω)	35.25	10.87	5.608	3.598	1.868
		Apparent Resistivity (Ω-m)	135.03	104.15	107.41	137.80	178.89
ERT-06	N-S	Measured Resistance (Ω)	3.168	2.26	1.177	0.617	0.4699
		Apparent Resistivity (Ω-m)	12.13	21.66	22.54	23.63	44.23
	E-W	Measured Resistance (Ω)	3.37	2.191	1.158	0.67	0.5488
		Apparent Resistivity (Ω-m)	12.91	20.98	22.18	25.66	52.55
ERT-07	N-S	Measured Resistance (Ω)	15.94	4.606	3.222	2.203	1.809
		Apparent Resistivity (Ω-m)	61.05	42.89	61.54	78.94	170.93
	E-W	Measured Resistance (Ω)	14.75	4.503	3.252	2.599	1.776
		Apparent Resistivity (Ω-m)	56.48	43.43	61.87	98.97	170.35
ERT-08	N-S	Measured Resistance (Ω)	1.425	1.447	0.741	0.5156	0.2231
		Apparent Resistivity (Ω-m)	5.56	13.86	14.19	19.75	21.36
	E-W	Measured Resistance (Ω)	1.617	1.469	0.7963	0.5094	0.2544
		Apparent Resistivity (Ω-m)	6.19	14.06	15.25	19.51	22.45
		Site Average (Ω)	24.84	7.06	3.41	2.02	1.32
		Site Average (Ω-ft)	95.13	67.57	65.26	76.84	126.33



Soil Resistivity Results

Client:	BrightNight	Date:	10/4/2024
Project Name:	Deschutes Solar & Storage	Weather:	Sunny
Project Location:	Wasco County, Oregon	Temperature:	66 degF
Equipment:	AGI MiniSting		
Test Method:	Wenner 4 Electrode Array		

Array		Data	Array spacing (ft)																
			0.5	1	1.5	2	3	5	7	10	15	20	30	45	70	100	150	200	300
ERT-SS-01	N-S	Measured Resistance (Ω)	825.3	842.2	132.2	141.1	27.02	3.225	1.376	0.6489	0.2679	0.2609	0.2135	0.2027	0.2082	0.1774	0.1801	0.1487	0.1399
		Apparent Resistivity (Ω-m)	790.35	1613.00	480.67	540.41	155.23	30.88	18.44	12.43	7.70	9.99	12.27	17.47	27.91	33.95	51.72	56.97	80.35
	E-W	Measured Resistance (Ω)	784.6	790.4	143.6	124.6	24.32	3.02	1.2134	0.5196	0.2863	0.2266	0.225	0.2173	0.2051	0.1715	0.1934	0.1573	0.1432
		Apparent Resistivity (Ω-m)	751.33	1513.64	412.70	477.32	139.78	28.92	16.27	9.95	8.22	8.64	12.87	18.73	27.50	32.86	55.57	60.26	82.33
		Site Average (Ω)	804.95	816.30	137.90	132.85	25.67	3.12	1.29	0.58	0.28	0.24	0.22	0.21	0.21	0.17	0.19	0.15	0.14
		Site Average (Ω-ft)	770.84	1563.32	446.68	508.86	147.51	29.90	17.36	11.19	7.96	9.32	12.57	18.10	27.70	33.41	53.64	58.61	81.34

Attachment F

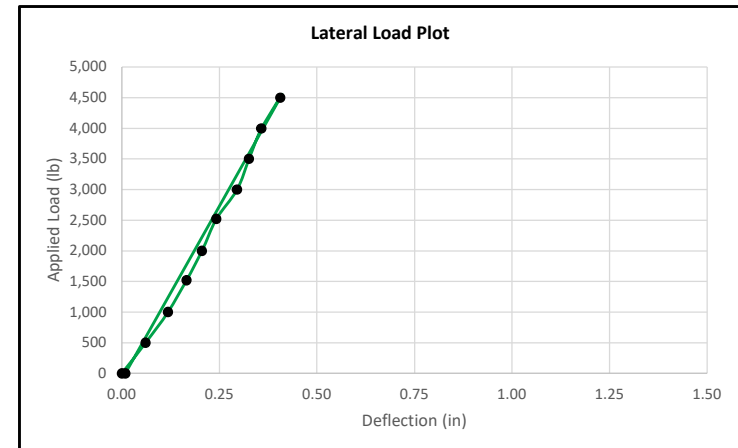
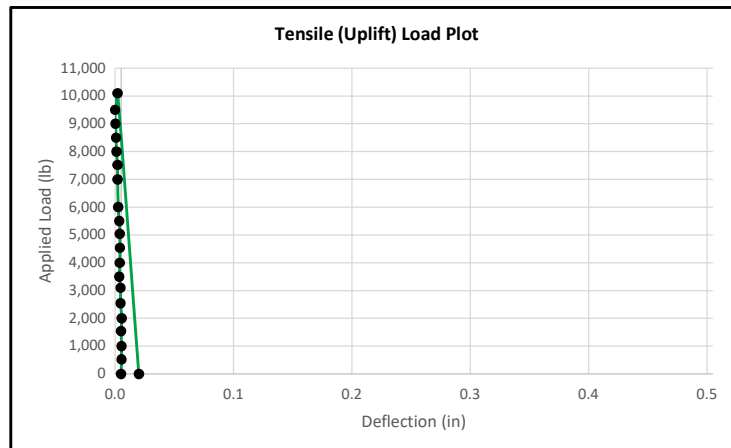
Pile Load Test Logs

Project Name:	Deschutes Solar Project	Embedment Depth (ft):	5.0	Pile ID:	PLT-01
Site Location:	Wasco County, OR	Pushed to Depth (ft):	0.0	Pile Section:	W6x9
Date/Time Installed:	10/10/2024	Pre-Excavation Depth (ft):	-	Pile Length (ft):	15.0
Date/Time Tested:	10/12/2024	Pre-Drill Diameter (in):	-	Total Drive Time (sec):	191.02
Installed Coordinates:	45.145302°, -121.307313°	Pre-Drill Depth (ft):	-	Avg. Installation Rate (sec/ft):	38.20

Embedment Data	
Depth (ft)	Time (s)
1	1.24
2	1.66
3	2.09
4	54.45
5	131.58
Total Time (s) =	191.02

Tensile (Uplift) Testing					
Hold Time (min)	Target Load (lbs)	Applied Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	500	520	0.0005	0.0000	0.0003
1	1,000	1,000	0.0005	0.0000	0.0003
1	1,500	1,540	0.0015	-0.0015	0.0000
1	2,000	2,000	0.0025	-0.0015	0.0005
1	2,500	2,540	0.0030	-0.0040	-0.0005
1	3,000	3,100	0.0045	-0.0055	-0.0005
1	3,500	3,500	0.0055	-0.0085	-0.0015
1	4,000	4,000	0.0070	-0.0095	-0.0013
1	4,500	4,540	0.0100	-0.0120	-0.0010
1	5,000	5,040	0.0120	-0.0145	-0.0013
1	5,500	5,500	0.0130	-0.0160	-0.0015
1	6,000	6,000	0.0145	-0.0195	-0.0025
1	6,500	Load Stage Missed			
1	7,000	7,000	0.0165	-0.0225	-0.0030
1	7,500	7,520	0.0195	-0.0255	-0.0030
1	8,000	8,000	0.0210	-0.0290	-0.0040
1	8,500	8,500	0.0220	-0.0305	-0.0043
1	9,000	9,000	0.0240	-0.0335	-0.0048
1	9,500	9,500	0.0250	-0.0350	-0.0050
1	10,000	10,100	0.0290	-0.0350	-0.0030
1	0	0	0.0300	0.0000	0.0150

Lateral Testing					
Lateral Load Height Above Grade (ft):		4.0	Deflection Gauge Height (in):		6
Hold Time (min)	Target Load (lbs)	Applied Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	500	500	0.0565	0.0655	0.0610
1	1,000	1,000	0.0970	0.1390	0.1180
1	1,500	1,520	0.1280	0.2032	0.1656
1	2,000	2,000	0.1575	0.2525	0.2050
1	2,500	2,520	0.1890	0.2955	0.2423
1	3,000	3,000	0.2335	0.3570	0.2953
1	3,500	3,500	0.2605	0.3915	0.3260
1	4,000	4,000	0.2880	0.4275	0.3578
1	4,500	4,500	0.3290	0.4835	0.4063
1	0	0	0.0270	-0.0095	0.0088

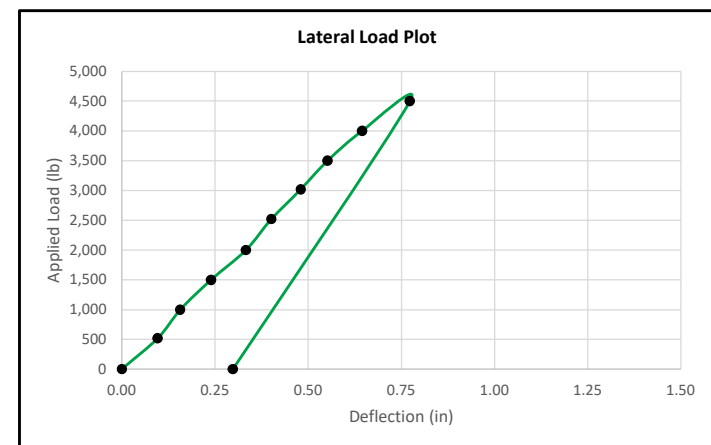
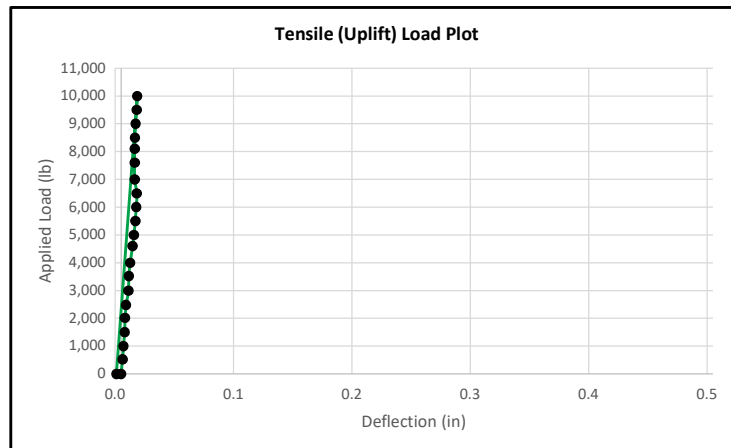


Project Name:	Deschutes Solar Project	Embedment Depth (ft):	7.5	Pile ID:	PLT-02
Site Location:	Wasco County, OR	Pushed to Depth (ft):	2.0	Pile Section:	W6x9
Date/Time Installed:	10/9/2024	Pre-Excavation Depth (ft):	-	Pile Length (ft):	15.0
Date/Time Tested:	10/13/2024	Pre-Drill Diameter (in):	5.0	Total Drive Time (sec):	126.12
Installed Coordinates:	45.140133°, -121.279917°	Pre-Drill Depth (ft):	8.0	Avg. Installation Rate (sec/ft):	22.93

Embedment Data	
Depth (ft)	Time (s)
1	-
2	-
3	2.69
4	9.23
5	20.83
6	38.53
7	54.84
Total Time (s) =	126.12

Tensile (Uplift) Testing					
Hold Time (min)	Target Load (lbs)	Applied Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	500	520	0.0030	-0.0005	0.0013
1	1,000	1,000	0.0040	0.0000	0.0020
1	1,500	1,500	0.0045	0.0015	0.0030
1	2,000	2,020	0.0045	0.0020	0.0033
1	2,500	2,480	0.0075	0.0010	0.0043
1	3,000	3,000	0.0095	0.0030	0.0063
1	3,500	3,520	0.0095	0.0035	0.0065
1	4,000	4,000	0.0110	0.0045	0.0078
1	4,500	4,600	0.0120	0.0075	0.0098
1	5,000	5,000	0.0140	0.0075	0.0108
1	5,500	5,500	0.0155	0.0085	0.0120
1	6,000	6,000	0.0160	0.0095	0.0128
1	6,500	6,500	0.0175	0.0090	0.0133
1	7,000	7,000	0.0140	0.0090	0.0115
1	7,500	7,600	0.0145	0.0085	0.0115
1	8,000	8,100	0.0145	0.0085	0.0115
1	8,500	8,500	0.0150	0.0085	0.0118
1	9,000	9,000	0.0155	0.0090	0.0123
1	9,500	9,500	0.0160	0.0105	0.0133
1	10,000	10,000	0.0165	0.0105	0.0135
1	0	0	-0.0090	0.0010	-0.0040

Lateral Testing					
Lateral Load Height Above Grade (ft):		4.0	Deflection Gauge Height (in):		6
Hold Time (min)	Target Load (lbs)	Applied Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	500	520	0.0935	0.0985	0.0960
1	1,000	1,000	0.1045	0.2090	0.1568
1	1,500	1,500	0.1215	0.3576	0.2396
1	2,000	2,000	0.1270	0.5390	0.3330
1	2,500	2,520	0.1345	0.6680	0.4013
1	3,000	3,020	0.1100	0.8500	0.4800
1	3,500	3,500	0.0870	1.0165	0.5518
1	4,000	4,000	0.0490	1.2400	0.6445
1	4,500	4,500	0.0130	1.5320	0.7725
1	0	0	0.0790	0.5170	0.2980

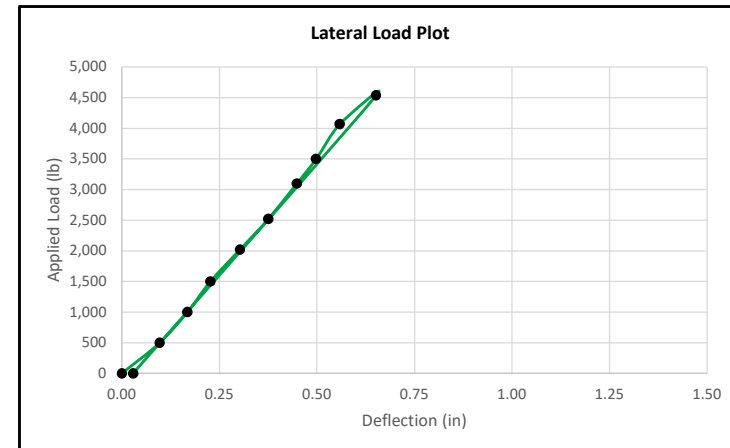
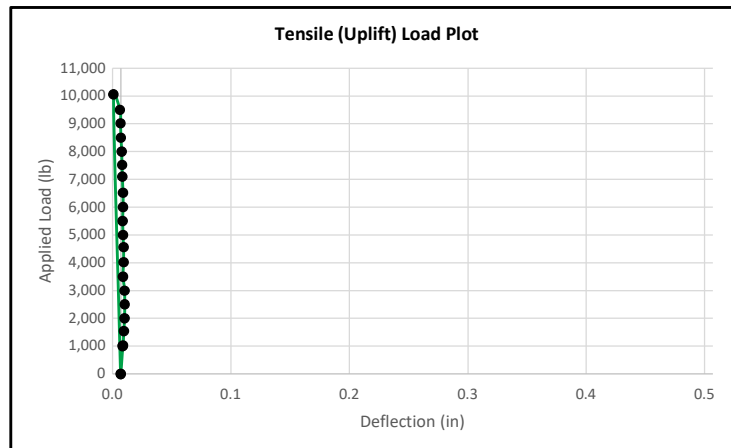


Project Name:	Deschutes Solar Project	Embedment Depth (ft):	9.0	Pile ID:	PLT-03
Site Location:	Wasco County, OR	Pushed to Depth (ft):	3.0	Pile Section:	W6x9
Date/Time Installed:	10/9/2024	Pre-Excavation Depth (ft):	-	Pile Length (ft):	15.0
Date/Time Tested:	10/12/2024	Pre-Drill Diameter (in):	5.0	Total Drive Time (sec):	68.04
Installed Coordinates:	45.130283°, -121.320700°	Pre-Drill Depth (ft):	9.0	Avg. Installation Rate (sec/ft):	11.34

Embedment Data	
Depth (ft)	Time (s)
1	-
2	-
3	-
4	4.95
5	9.36
6	10.21
7	10.71
8	12.78
9	20.03
Total Time (s) =	68.04

Tensile (Uplift) Testing					
Hold Time (min)	Target Load (lbs)	Applied Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	500	1,000	0.0030	0.0000	0.0015
1	1,000	1,020	0.0040	-0.0005	0.0018
1	1,500	1,540	0.0060	-0.0010	0.0025
1	2,000	2,000	0.0060	0.0000	0.0030
1	2,500	2,500	0.0075	-0.0010	0.0033
1	3,000	3,000	0.0065	-0.0003	0.0031
1	3,500	3,500	0.0065	-0.0030	0.0018
1	4,000	4,020	0.0065	-0.0020	0.0023
1	4,500	4,560	0.0080	-0.0035	0.0023
1	5,000	5,000	0.0085	-0.0050	0.0018
1	5,500	5,500	0.0095	-0.0065	0.0015
1	6,000	6,000	0.0100	-0.0075	0.0018
1	6,500	6,520	0.0110	-0.0090	0.0018
1	7,000	7,100	0.0115	-0.0100	0.0013
1	7,500	7,520	0.0120	-0.0105	0.0010
1	8,000	8,000	0.0120	-0.0120	0.0008
1	8,500	8,500	0.0120	-0.0125	0.0000
1	9,000	9,020	0.0120	-0.0130	-0.0003
1	9,500	9,500	0.0115	-0.0140	-0.0008
1	10,000	10,060	0.0015	-0.0140	-0.0063
1	0	0	0.0005	-0.0010	-0.0003

Lateral Testing					
Lateral Load Height Above Grade (ft):		4.0	Deflection Gauge Height (in):		6
Hold Time (min)	Target Load (lbs)	Applied Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	500	500	0.0990	0.0950	0.0970
1	1,000	1,000	0.1770	0.1585	0.1678
1	1,500	1,500	0.2380	0.2160	0.2270
1	2,000	2,020	0.3095	0.2960	0.3028
1	2,500	2,520	0.3740	0.3770	0.3755
1	3,000	3,100	0.4235	0.4735	0.4485
1	3,500	3,500	0.4530	0.5420	0.4975
1	4,000	4,070	0.4845	0.6325	0.5585
1	4,500	4,540	0.5095	0.7940	0.6518
1	0	0	-0.0115	0.0690	0.0288

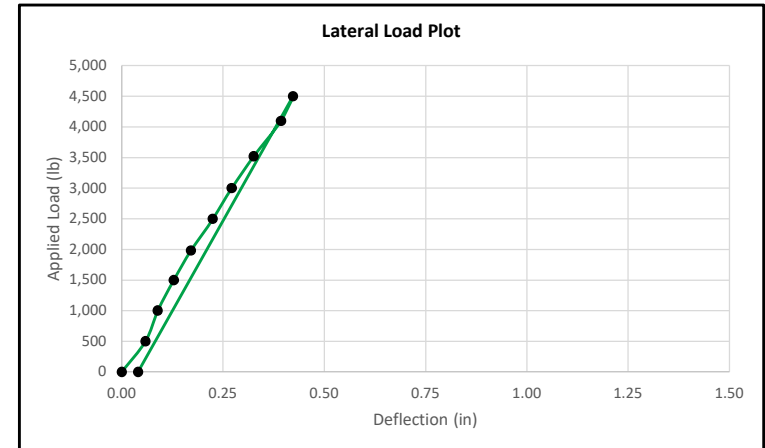
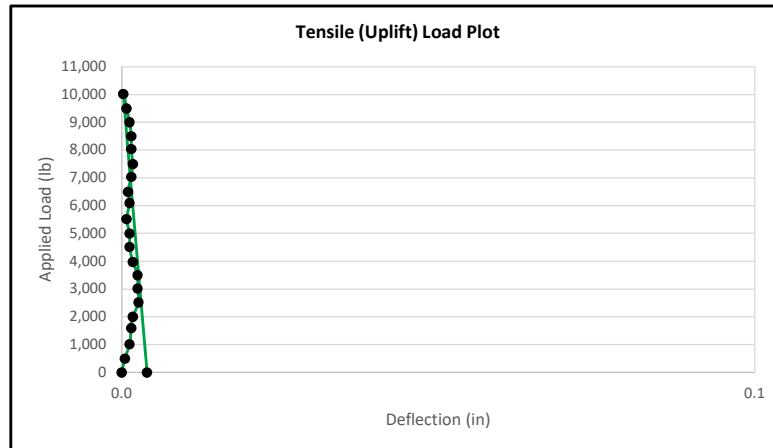


Project Name:	Deschutes Solar Project	Embedment Depth (ft):	10.0	Pile ID:	PLT-04
Site Location:	Wasco County, OR	Pushed to Depth (ft):	4.0	Pile Section:	W6x9
Date/Time Installed:	10/10/2024	Pre-Excavation Depth (ft):	-	Pile Length (ft):	15.0
Date/Time Tested:	10/12/2024	Pre-Drill Diameter (in.):	5.0	Total Drive Time (sec):	61.05
Installed Coordinates:	45.134017°, -121.336883°	Pre-Drill Depth (ft):	10.0	Avg. Installation Rate (sec/ft):	10.18

Embedment Data	
Depth (ft)	Time (s)
1	-
2	-
3	-
4	-
5	1.29
6	4.67
7	9.65
8	18.16
9	12.25
10	15.03
Total Time (s) =	61.05

Tensile (Uplift) Testing					
Hold Time (min)	Target Load (lbs)	Applied Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	500	500	0.0000	0.0010	0.0005
1	1,000	1,020	0.0000	0.0025	0.0013
1	1,500	1,600	0.0000	0.0030	0.0015
1	2,000	2,000	0.0000	0.0035	0.0018
1	2,500	2,520	0.0008	0.0045	0.0027
1	3,000	3,020	0.0005	0.0045	0.0025
1	3,500	3,500	0.0005	0.0045	0.0025
1	4,000	3,980	0.0010	0.0025	0.0018
1	4,500	4,520	0.0015	0.0010	0.0013
1	5,000	5,000	0.0020	0.0005	0.0013
1	5,500	5,520	0.0015	0.0000	0.0008
1	6,000	6,100	0.0035	-0.0010	0.0013
1	6,500	6,500	0.0045	-0.0025	0.0010
1	7,000	7,040	0.0055	-0.0025	0.0015
1	7,500	7,500	0.0065	-0.0030	0.0018
1	8,000	8,040	0.0070	-0.0040	0.0015
1	8,500	8,500	0.0075	-0.0045	0.0015
1	9,000	9,000	0.0080	-0.0055	0.0013
1	9,500	9,500	0.0085	-0.0070	0.0008
1	10,000	10,020	0.0095	-0.0090	0.0003
1	0	0	0.0050	0.0030	0.0040

Lateral Testing					
Lateral Load Height Above Grade (ft):		4.0	Deflection Gauge Height (in):		6
Hold Time (min)	Target Load (lbs)	Applied Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	500	500	0.0590	0.0580	0.0585
1	1,000	1,000	0.0930	0.0850	0.0890
1	1,500	1,500	0.1325	0.1245	0.1285
1	2,000	1,980	0.1705	0.1715	0.1710
1	2,500	2,500	0.2130	0.2370	0.2250
1	3,000	3,000	0.2500	0.2930	0.2715
1	3,500	3,520	0.2950	0.3565	0.3258
1	4,000	4,100	0.3490	0.4380	0.3935
1	4,500	4,500	0.3730	0.4725	0.4228
1	0	0	0.0465	0.0345	0.0405

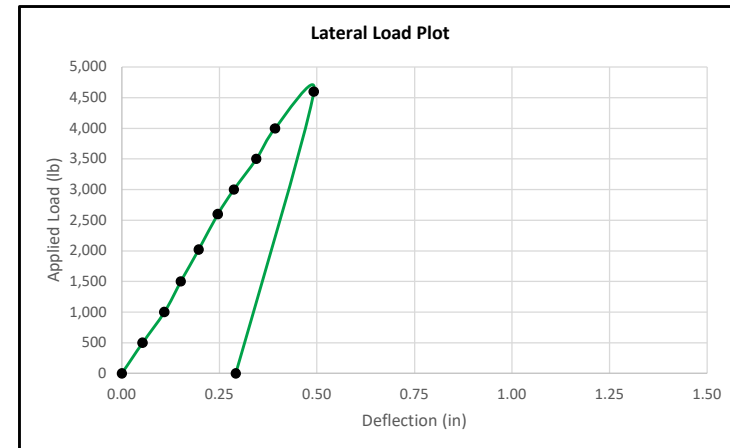
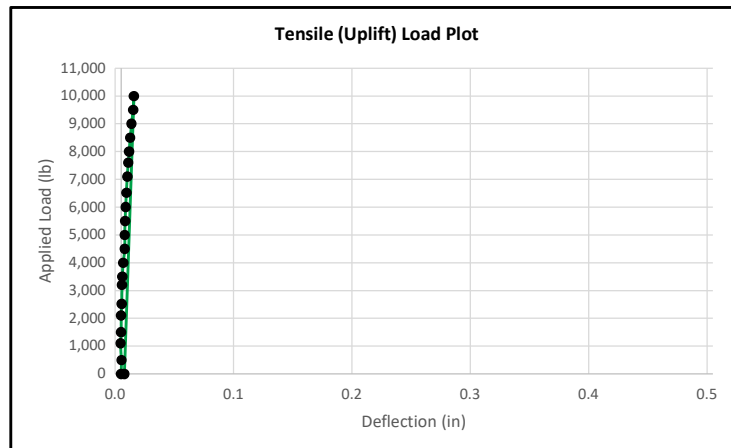


Project Name:	Deschutes Solar Project	Embedment Depth (ft):	7.0	Pile ID:	PLT-05
Site Location:	Wasco County, OR	Pushed to Depth (ft):	2.0	Pile Section:	W6x9
Date/Time Installed:	10/10/2024	Pre-Excavation Depth (ft):	-	Pile Length (ft):	15.0
Date/Time Tested:	10/13/2024	Pre-Drill Diameter (in.):	5.0	Total Drive Time (sec):	101.19
Installed Coordinates:	45.122017°, -121.300317°	Pre-Drill Depth (ft):	7.0	Avg. Installation Rate (sec/ft):	20.24

Embedment Data	
Depth (ft)	Time (s)
1	-
2	-
3	0.78
4	2.18
5	10.89
6	25.84
7	61.5
Total Time (s) =	101.19

Tensile (Uplift) Testing					
Hold Time (min)	Target Load (lbs)	Applied Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	500	500	0.0000	0.0005	0.0003
1	1,000	1,100	0.0000	-0.0010	-0.0005
1	1,500	1,500	0.0000	0.0000	0.0000
1	2,000	2,100	0.0000	0.0000	0.0000
1	2,500	2,520	0.0010	0.0000	0.0005
1	3,000	3,200	0.0020	-0.0005	0.0008
1	3,500	3,500	0.0030	-0.0010	0.0010
1	4,000	4,000	0.0065	-0.0030	0.0018
1	4,500	4,500	0.0105	-0.0045	0.0030
1	5,000	5,000	0.0120	-0.0060	0.0030
1	5,500	5,500	0.0140	-0.0070	0.0035
1	6,000	6,000	0.0160	-0.0085	0.0038
1	6,500	6,520	0.0180	-0.0090	0.0045
1	7,000	7,100	0.0210	-0.0105	0.0053
1	7,500	7,600	0.0235	-0.0115	0.0060
1	8,000	8,000	0.0255	-0.0120	0.0068
1	8,500	8,500	0.0275	-0.0120	0.0078
1	9,000	9,000	0.0300	-0.0125	0.0088
1	9,500	9,500	0.0330	-0.0125	0.0103
1	10,000	10,000	0.0345	-0.0130	0.0108
1	0	0	0.0025	0.0030	0.0028

Lateral Testing					
Lateral Load Height Above Grade (ft):		4.0	Deflection Gauge Height (in):		6
Hold Time (min)	Target Load (lbs)	Applied Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	500	500	0.0455	0.0605	0.0530
1	1,000	1,000	0.0975	0.1205	0.1090
1	1,500	1,500	0.1375	0.1650	0.1513
1	2,000	2,020	0.1825	0.2110	0.1968
1	2,500	2,600	0.2315	0.2605	0.2460
1	3,000	3,000	0.2705	0.3035	0.2870
1	3,500	3,500	0.3305	0.3590	0.3448
1	4,000	4,000	0.3825	0.4030	0.3928
1	4,500	4,600	0.5005	0.4835	0.4920
1	0	0	0.5500	0.0345	0.2923

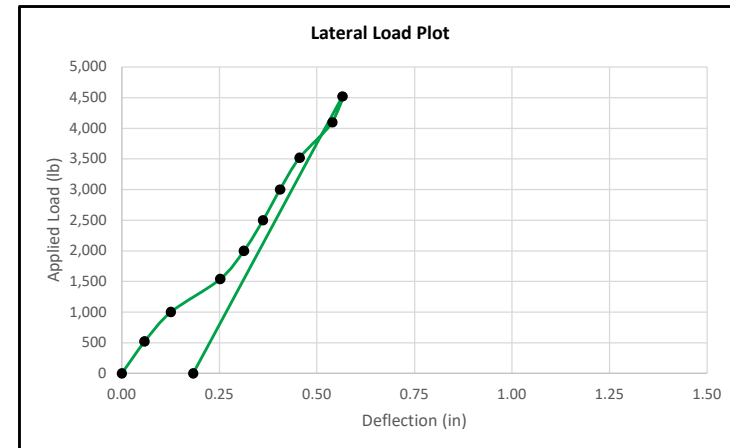
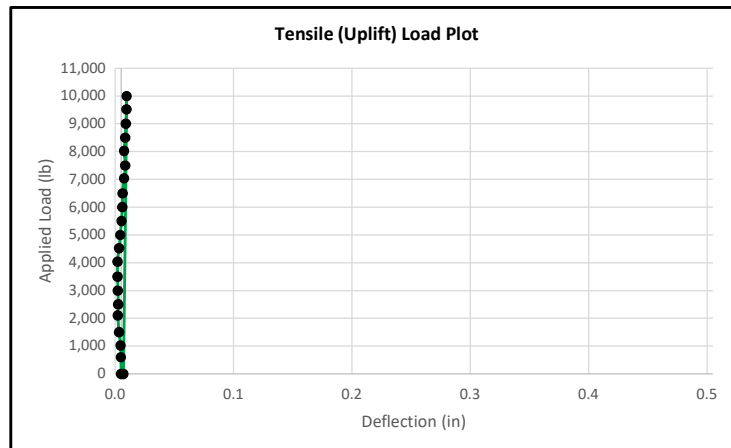


Project Name:	Deschutes Solar Project	Embedment Depth (ft):	8.0	Pile ID:	PLT-06
Site Location:	Wasco County, OR	Pushed to Depth (ft):	2.0	Pile Section:	W6x9
Date/Time Installed:	10/9/2024	Pre-Excavation Depth (ft):	-	Pile Length (ft):	15.0
Date/Time Tested:	10/11/2024	Pre-Drill Diameter (in.):	5.0	Total Drive Time (sec):	40.14
Installed Coordinates:	45.126300°, -121.328300°	Pre-Drill Depth (ft):	8.0	Avg. Installation Rate (sec/ft):	6.69

Embedment Data	
Depth (ft)	Time (s)
1	-
2	-
3	1.83
4	3.06
5	3.66
6	4.12
7	10.51
8	16.96
Total Time (s) =	40.14

Tensile (Uplift) Testing					
Hold Time (min)	Target Load (lbs)	Applied Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	500	600	0.0030	-0.0035	-0.0003
1	1,000	1,020	0.0035	-0.0045	-0.0005
1	1,500	1,500	0.0030	-0.0065	-0.0018
1	2,000	2,100	0.0030	-0.0085	-0.0028
1	2,500	2,500	0.0030	-0.0080	-0.0025
1	3,000	3,000	0.0020	-0.0075	-0.0028
1	3,500	3,500	0.0010	-0.0070	-0.0030
1	4,000	4,040	0.0010	-0.0070	-0.0030
1	4,500	4,520	0.0030	-0.0065	-0.0018
1	5,000	5,000	0.0045	-0.0060	-0.0008
1	5,500	5,500	0.0060	-0.0055	0.0003
1	6,000	6,000	0.0075	-0.0055	0.0010
1	6,500	6,500	0.0085	-0.0060	0.0013
1	7,000	7,040	0.0105	-0.0055	0.0025
1	7,500	7,500	0.0120	-0.0050	0.0035
1	8,000	8,020	0.0120	-0.0070	0.0025
1	8,500	8,500	0.0140	-0.0070	0.0035
1	9,000	9,000	0.0150	-0.0070	0.0040
1	9,500	9,520	0.0165	-0.0075	0.0045
1	10,000	10,000	0.0175	-0.0080	0.0048
1	0	0	0.0020	0.0020	0.0020

Lateral Testing					
Lateral Load Height Above Grade (ft):		4.0	Deflection Gauge Height (in):		6
Hold Time (min)	Target Load (lbs)	Applied Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	500	520	0.0885	0.0280	0.0583
1	1,000	1,000	0.1805	0.0705	0.1255
1	1,500	1,540	0.3405	0.1635	0.2520
1	2,000	2,000	0.3895	0.2360	0.3128
1	2,500	2,500	0.4150	0.3085	0.3618
1	3,000	3,000	0.4330	0.3780	0.4055
1	3,500	3,520	0.4535	0.4575	0.4555
1	4,000	4,100	0.4675	0.6120	0.5398
1	4,500	4,520	0.4480	0.6830	0.5655
1	0	0	0.1545	0.2115	0.1830

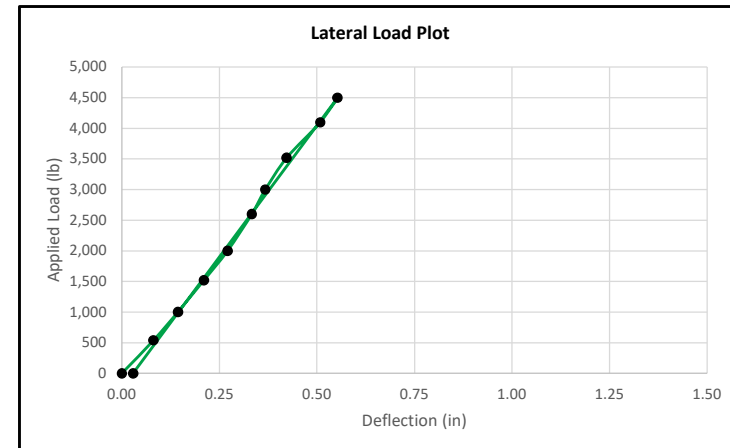
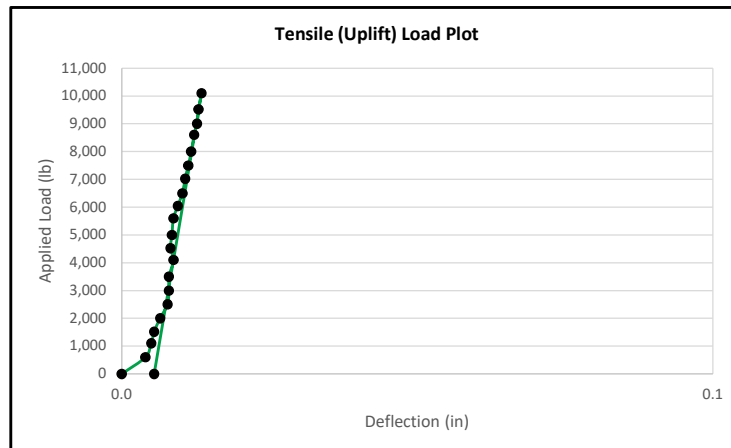


Project Name:	Deschutes Solar Project	Embedment Depth (ft):	9.0	Pile ID:	PLT-07
Site Location:	Wasco County, OR	Pushed to Depth (ft):	2.0	Pile Section:	W6x9
Date/Time Installed:	10/10/2024	Pre-Excavation Depth (ft):	-	Pile Length (ft):	15.0
Date/Time Tested:	10/11/2024	Pre-Drill Diameter (in):	5.0	Total Drive Time (sec):	178.9
Installed Coordinates:	45.132050°, -121.350900°	Pre-Drill Depth (ft):	9.0	Avg. Installation Rate (sec/ft):	25.56

Embedment Data	
Depth (ft)	Time (s)
1	-
2	-
3	2.76
4	12.11
5	17.14
6	27.84
7	32.35
8	40.53
9	46.17
Total Time (s) =	178.9

Tensile (Uplift) Testing					
Hold Time (min)	Target Load (lbs)	Applied Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	500	600	0.0125	-0.0045	0.0040
1	1,000	1,100	0.0185	-0.0085	0.0050
1	1,500	1,520	0.0195	-0.0085	0.0055
1	2,000	2,000	0.0215	-0.0085	0.0065
1	2,500	2,500	0.0245	-0.0090	0.0078
1	3,000	3,000	0.0250	-0.0090	0.0080
1	3,500	3,500	0.0250	-0.0090	0.0080
1	4,000	4,100	0.0250	-0.0075	0.0088
1	4,500	4,520	0.0240	-0.0060	0.0083
1	5,000	5,000	0.0230	-0.0040	0.0085
1	5,500	5,600	0.0215	-0.0015	0.0088
1	6,000	6,040	0.0205	0.0005	0.0095
1	6,500	6,500	0.0200	0.0020	0.0103
1	7,000	7,020	0.0195	0.0035	0.0108
1	7,500	7,500	0.0190	0.0045	0.0113
1	8,000	8,000	0.0190	0.0060	0.0118
1	8,500	8,600	0.0185	0.0075	0.0123
1	9,000	9,000	0.0180	0.0085	0.0128
1	9,500	9,520	0.0175	0.0100	0.0130
1	10,000	10,100	0.0170	0.0110	0.0135
1	0	0	0.0070	0.0040	0.0055

Lateral Testing					
Lateral Load Height Above Grade (ft):		4.0	Deflection Gauge Height (in):		6
Hold Time (min)	Target Load (lbs)	Applied Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	500	540	0.1290	0.0330	0.0810
1	1,000	1,000	0.2030	0.0845	0.1438
1	1,500	1,520	0.2780	0.1420	0.2100
1	2,000	2,000	0.3435	0.1985	0.2710
1	2,500	2,600	0.4135	0.2520	0.3328
1	3,000	3,000	0.4585	0.2770	0.3678
1	3,500	3,520	0.5335	0.3110	0.4223
1	4,000	4,100	0.6665	0.3510	0.5088
1	4,500	4,500	0.7420	0.3635	0.5528
1	0	0	0.0650	-0.0070	0.0290

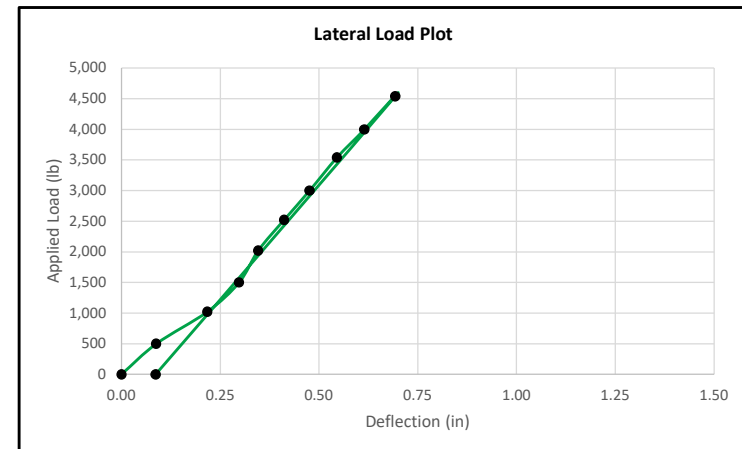
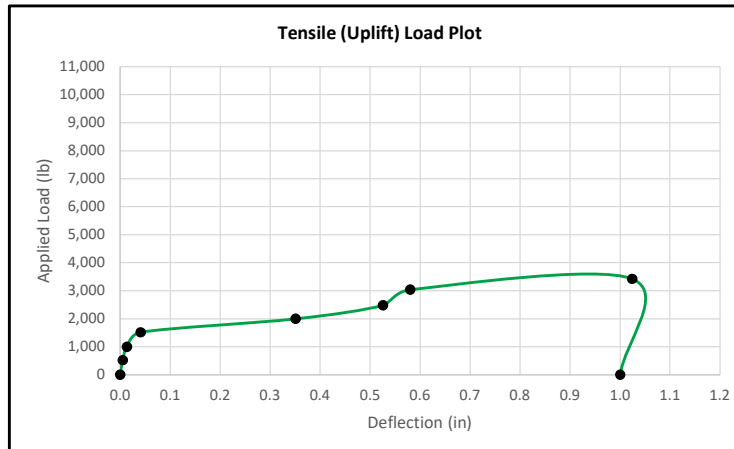


Project Name:	Deschutes Solar Project	Embedment Depth (ft):	10.0	Pile ID:	PLT-08
Site Location:	Wasco County, OR	Pushed to Depth (ft):	2.0	Pile Section:	W6x9
Date/Time Installed:	10/10/2024	Pre-Excavation Depth (ft):	-	Pile Length (ft):	15.0
Date/Time Tested:	10/11/2024	Pre-Drill Diameter (in):	5.0	Total Drive Time (sec):	37.87
Installed Coordinates:	45.117383°, -121.343567°	Pre-Drill Depth (ft):	10.0	Avg. Installation Rate (sec/ft):	4.73

Embedment Data	
Depth (ft)	Time (s)
1	-
2	-
3	1.41
4	1.38
5	2.39
6	1.11
7	1.44
8	3.44
9	10.85
10	15.85
Total Time (s) =	37.87

Tensile (Uplift) Testing					
Hold Time (min)	Target Load (lbs)	Applied Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	500	520	0.0040	0.0060	0.0050
1	1,000	1,000	0.0090	0.0175	0.0133
1	1,500	1,520	0.0335	0.0475	0.0405
1	2,000	2,000	0.3350	0.3665	0.3508
1	2,500	2,480	0.5040	0.5470	0.5255
1	3,000	3,040	0.5560	0.6045	0.5803
1	3,500	3,420	1.0005	1.0475	1.0240
1	0	0	1.0000	1.0005	1.0003

Lateral Testing					
Lateral Load Height Above Grade (ft):		4.0	Deflection Gauge Height (in):		6
Hold Time (min)	Target Load (lbs)	Applied Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	500	500	0.0610	0.1150	0.0880
1	1,000	1,020	0.1715	0.2625	0.2170
1	1,500	1,500	0.1955	0.4000	0.2978
1	2,000	2,020	0.2200	0.4720	0.3460
1	2,500	2,520	0.2530	0.5700	0.4115
1	3,000	3,000	0.2875	0.6650	0.4763
1	3,500	3,540	0.3020	0.7885	0.5453
1	4,000	4,000	0.3100	0.9200	0.6150
1	4,500	4,540	0.3195	1.0665	0.6930
1	0	0	0.0605	0.1125	0.0865

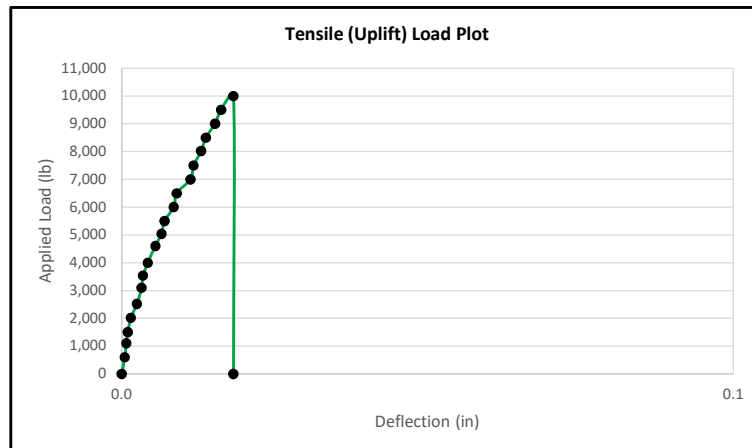


Project Name:	Deschutes Solar Project	Embedment Depth (ft):	7.0	Pile ID:	PLT-09
Site Location:	Wasco County, OR	Pushed to Depth (ft):	0.0	Pile Section:	W6x9
Date/Time Installed:	10/10/2024	Pre-Excavation Depth (ft):	-	Pile Length (ft):	15.0
Date/Time Tested:	10/14/2024	Pre-Drill Diameter (in):	5.0	Total Drive Time (sec):	78.5
Installed Coordinates:	45.109333°, -121.322933°	Pre-Drill Depth (ft):	7.0	Avg. Installation Rate (sec/ft):	11.21

Embedment Data	
Depth (ft)	Time (s)
1	0.61
2	2.24
3	4.14
4	6.90
5	15.77
6	23.41
7	25.43
Total Time (s) =	78.50

Tensile (Uplift) Testing					
Hold Time (min)	Target Load (lbs)	Applied Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	500	600	0.0020	-0.0010	0.0005
1	1,000	1,100	0.0025	-0.0010	0.0008
1	1,500	1,500	0.0030	-0.0010	0.0010
1	2,000	2,020	0.0045	-0.0015	0.0015
1	2,500	2,520	0.0070	-0.0020	0.0025
1	3,000	3,100	0.0075	-0.0010	0.0033
1	3,500	3,540	0.0080	-0.0010	0.0035
1	4,000	4,000	0.0085	0.0000	0.0043
1	4,500	4,600	0.0100	0.0010	0.0055
1	5,000	5,040	0.0095	0.0035	0.0065
1	5,500	5,500	0.0095	0.0045	0.0070
1	6,000	6,000	0.0095	0.0075	0.0085
1	6,500	6,500	0.0095	0.0085	0.0090
1	7,000	7,000	0.0095	0.0130	0.0113
1	7,500	7,500	0.0095	0.0140	0.0118
1	8,000	8,020	0.0090	0.0170	0.0130
1	8,500	8,500	0.0090	0.0185	0.0138
1	9,000	9,000	0.0090	0.0215	0.0153
1	9,500	9,500	0.0090	0.0235	0.0163
1	10,000	10,000	0.0095	0.0270	0.0183
1	0	0	0.0095	0.0270	0.0183

Lateral Testing					
Lateral Load Height Above Grade (ft):		4.0	Deflection Gauge Height (in):		6
Hold Time (min)	Target Load (lbs)	Applied Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	500	600	0.0410	0.0495	0.0453
1	1,000	1,000	0.0860	0.0990	0.0925
1	1,500	1,500	0.1370	0.1500	0.1435
1	2,000	2,000	0.2105	0.2085	0.2095
1	2,500	2,520	0.2915	0.2635	0.2775
1	3,000	3,000	0.3505	0.2930	0.3218
1	3,500	3,520	0.4250	0.3260	0.3755
1	4,000	4,000	0.5240	0.3565	0.4403
1	4,500	4,520	0.6545	0.3675	0.5110
1	0	0	0.1010	-0.0375	0.0318

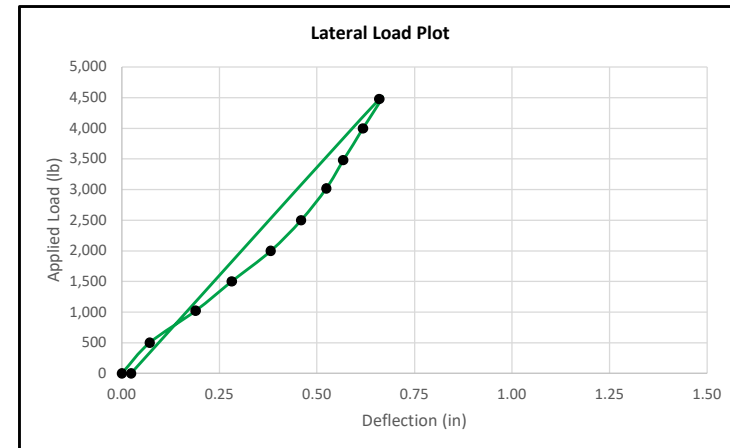
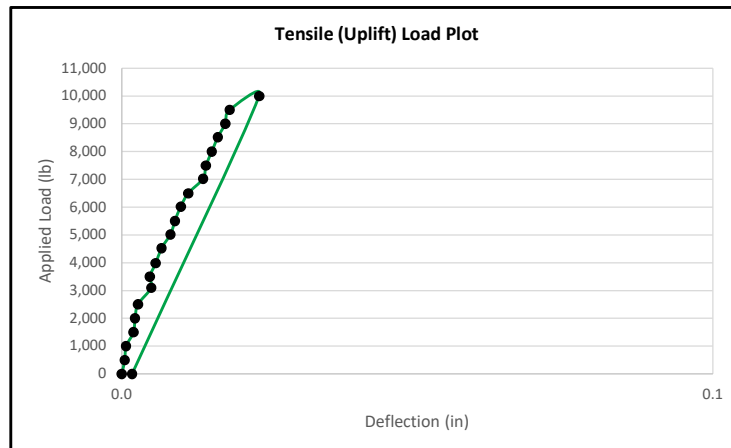


Project Name:	Deschutes Solar Project	Embedment Depth (ft):	8.0	Pile ID:	PLT-10
Site Location:	Wasco County, OR	Pushed to Depth (ft):	2.0	Pile Section:	W6x9
Date/Time Installed:	10/10/2024	Pre-Excavation Depth (ft):	-	Pile Length (ft):	15.0
Date/Time Tested:	10/14/2024	Pre-Drill Diameter (in):	5.0	Total Drive Time (sec):	88.85
Installed Coordinates:	45.105000°, -121.333917°	Pre-Drill Depth (ft):	8.0	Avg. Installation Rate (sec/ft):	14.81

Embedment Data	
Depth (ft)	Time (s)
1	-
2	-
3	1.37
4	4.89
5	11.18
6	17.5
7	27.89
8	26.02
Total Time (s) =	88.85

Tensile (Uplift) Testing					
Hold Time (min)	Target Load (lbs)	Applied Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	500	500	0.0010	0.0000	0.0005
1	1,000	1,000	0.0015	0.0000	0.0008
1	1,500	1,500	0.0040	0.0000	0.0020
1	2,000	2,000	0.0050	-0.0005	0.0023
1	2,500	2,500	0.0065	-0.0010	0.0028
1	3,000	3,100	0.0120	-0.0020	0.0050
1	3,500	3,500	0.0135	-0.0040	0.0048
1	4,000	3,980	0.0165	-0.0050	0.0058
1	4,500	4,520	0.0205	-0.0070	0.0068
1	5,000	5,020	0.0240	-0.0075	0.0083
1	5,500	5,500	0.0275	-0.0095	0.0090
1	6,000	6,020	0.0320	-0.0120	0.0100
1	6,500	6,500	0.0350	-0.0125	0.0113
1	7,000	7,020	0.0435	-0.0160	0.0138
1	7,500	7,500	0.0470	-0.0185	0.0143
1	8,000	8,000	0.0520	-0.0215	0.0153
1	8,500	8,520	0.0560	-0.0235	0.0163
1	9,000	9,000	0.0600	-0.0250	0.0175
1	9,500	9,500	0.0655	-0.0290	0.0183
1	10,000	10,000	0.0765	-0.0300	0.0233
1	0	0	0.0035	0.0000	0.0018

Lateral Testing					
Lateral Load Height Above Grade (ft):		4.0	Deflection Gauge Height (in):		6
Hold Time (min)	Target Load (lbs)	Applied Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	500	500	0.0750	0.0675	0.0713
1	1,000	1,020	0.1920	0.1860	0.1890
1	1,500	1,500	0.2820	0.2815	0.2818
1	2,000	2,000	0.3815	0.3815	0.3815
1	2,500	2,500	0.4510	0.4685	0.4598
1	3,000	3,020	0.5065	0.5420	0.5243
1	3,500	3,480	0.5405	0.5940	0.5673
1	4,000	4,000	0.5825	0.6535	0.6180
1	4,500	4,480	0.6150	0.7050	0.6600
1	0	0	0.0325	0.0150	0.0238

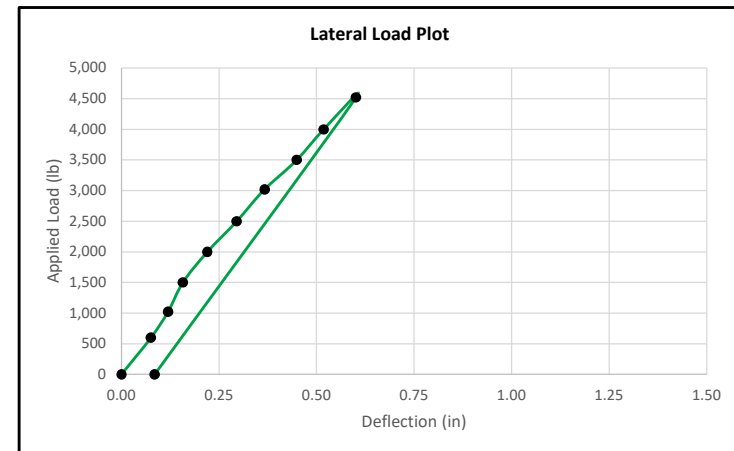
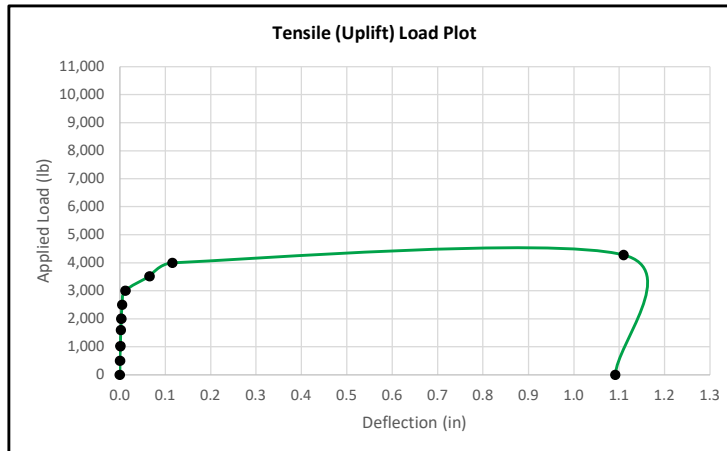


Project Name:	Deschutes Solar Project	Embedment Depth (ft):	9.0	Pile ID:	PLT-11
Site Location:	Wasco County, OR	Pushed to Depth (ft):	3.0	Pile Section:	W6x9
Date/Time Installed:	10/10/2024	Pre-Excavation Depth (ft):	-	Pile Length (ft):	15.0
Date/Time Tested:	10/14/2024	Pre-Drill Diameter (in):	5.0	Total Drive Time (sec):	10.46
Installed Coordinates:	45.100833°, -121.312733°	Pre-Drill Depth (ft):	9.0	Avg. Installation Rate (sec/ft):	1.74

Embedment Data	
Depth (ft)	Time (s)
1	-
2	-
3	-
4	1.34
5	1.46
6	0.73
7	2.57
8	1.19
9	3.17
Total Time (s) =	10.46

Tensile (Uplift) Testing					
Hold Time (min)	Target Load (lbs)	Applied Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	500	500	0.0010	0.0000	0.0003
1	1,000	1,020	0.0030	-0.0005	0.0015
1	1,500	1,600	0.0040	0.0000	0.0023
1	2,000	2,000	0.0045	0.0005	0.0033
1	2,500	2,500	0.0060	0.0020	0.0050
1	3,000	3,000	0.0120	0.0040	0.0123
1	3,500	3,520	0.0230	0.0125	0.0655
1	4,000	4,000	0.1235	0.1080	0.1158
1	4,500	4,280	1.1245	1.0940	1.1093
1	0	0	1.1045	1.0775	1.0910

Lateral Testing					
Lateral Load Height Above Grade (ft):		4.0	Deflection Gauge Height (in):		6
Hold Time (min)	Target Load (lbs)	Applied Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	500	600	0.0720	0.0790	0.0755
1	1,000	1,020	0.1225	0.1160	0.1193
1	1,500	1,500	0.1670	0.1475	0.1573
1	2,000	2,000	0.2315	0.2085	0.2200
1	2,500	2,500	0.3050	0.2850	0.2950
1	3,000	3,020	0.3810	0.3530	0.3670
1	3,500	3,500	0.4710	0.4270	0.4490
1	4,000	4,000	0.5505	0.4865	0.5185
1	4,500	4,520	0.6545	0.5475	0.6010
1	0	0	0.1425	0.0275	0.0850

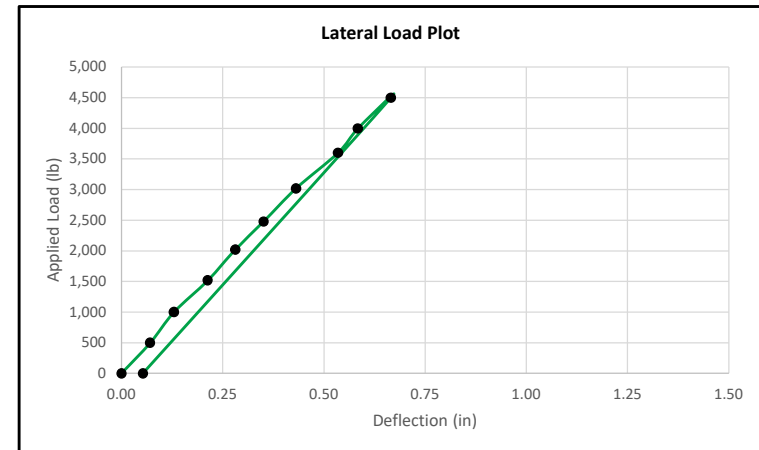
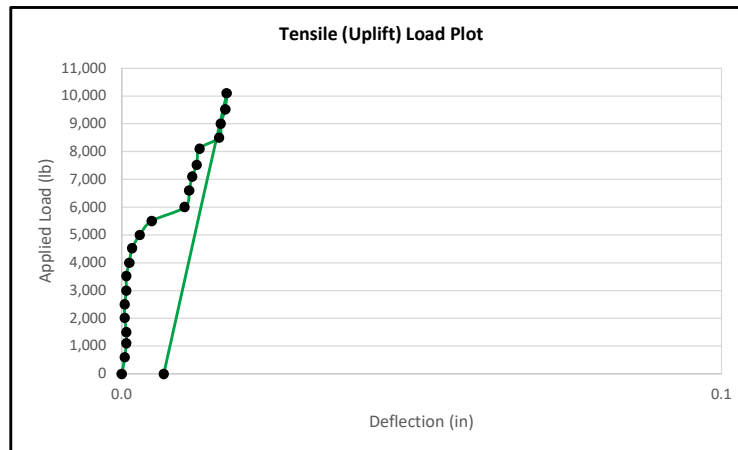


Project Name:	Deschutes Solar Project	Embedment Depth (ft):	10.0	Pile ID:	PLT-12
Site Location:	Wasco County, OR	Pushed to Depth (ft):	2.0	Pile Section:	W6x9
Date/Time Installed:	10/10/2024	Pre-Excavation Depth (ft):	-	Pile Length (ft):	15.0
Date/Time Tested:	10/14/2024	Pre-Drill Diameter (in):	5.0	Total Drive Time (sec):	53.26
Installed Coordinates:	45.093100°, -121.315800°	Pre-Drill Depth (ft):	10.0	Avg. Installation Rate (sec/ft):	6.66

Embedment Data	
Depth (ft)	Time (s)
1	-
2	-
3	1.37
4	3.07
5	2.52
6	4.55
7	5.27
8	8.95
9	12.18
10	15.35
Total Time (s) =	53.26

Tensile (Uplift) Testing					
Hold Time (min)	Target Load (lbs)	Applied Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	500	600	0.0005	0.0005	0.0005
1	1,000	1,100	0.0005	0.0010	0.0008
1	1,500	1,500	0.0005	0.0010	0.0008
1	2,000	2,020	0.0000	0.0010	0.0005
1	2,500	2,500	0.0000	0.0010	0.0005
1	3,000	3,000	0.0005	0.0010	0.0008
1	3,500	3,520	0.0005	0.0010	0.0008
1	4,000	4,000	0.0010	0.0010	0.0013
1	4,500	4,520	0.0020	0.0015	0.0018
1	5,000	5,000	0.0030	0.0015	0.0030
1	5,500	5,500	0.0030	0.0030	0.0050
1	6,000	6,000	0.0135	0.0070	0.0105
1	6,500	6,600	0.0145	0.0075	0.0113
1	7,000	7,100	0.0150	0.0080	0.0118
1	7,500	7,520	0.0165	0.0085	0.0125
1	8,000	8,100	0.0175	0.0085	0.0130
1	8,500	8,500	0.0185	0.0085	0.0163
1	9,000	9,000	0.0190	0.0140	0.0165
1	9,500	9,520	0.0195	0.0140	0.0173
1	10,000	10,100	0.0200	0.0150	0.0175
1	0	0	0.0130	0.0010	0.0070

Lateral Testing					
Lateral Load Height Above Grade (ft):		4.0	Deflection Gauge Height (in):		6
Hold Time (min)	Target Load (lbs)	Applied Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	500	500	0.0735	0.0680	0.0708
1	1,000	1,000	0.1530	0.1065	0.1298
1	1,500	1,520	0.2305	0.1960	0.2133
1	2,000	2,020	0.2945	0.2675	0.2810
1	2,500	2,480	0.3560	0.3460	0.3510
1	3,000	3,020	0.4220	0.4405	0.4313
1	3,500	3,600	0.5060	0.5635	0.5348
1	4,000	4,000	0.5455	0.6220	0.5838
1	4,500	4,500	0.6115	0.7195	0.6655
1	0	0	0.0340	0.0725	0.0533

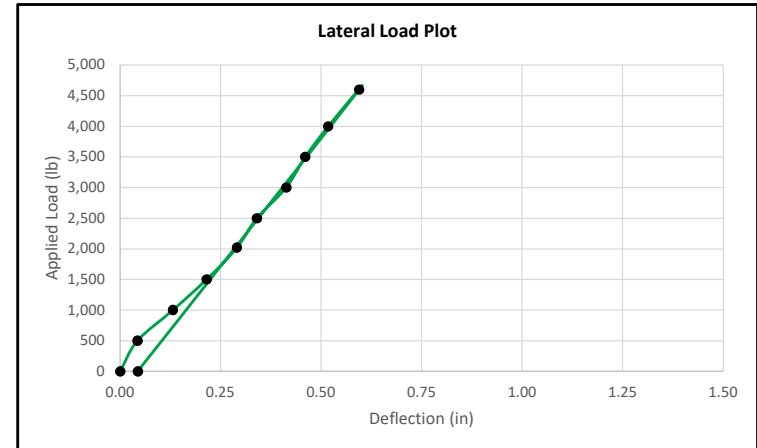
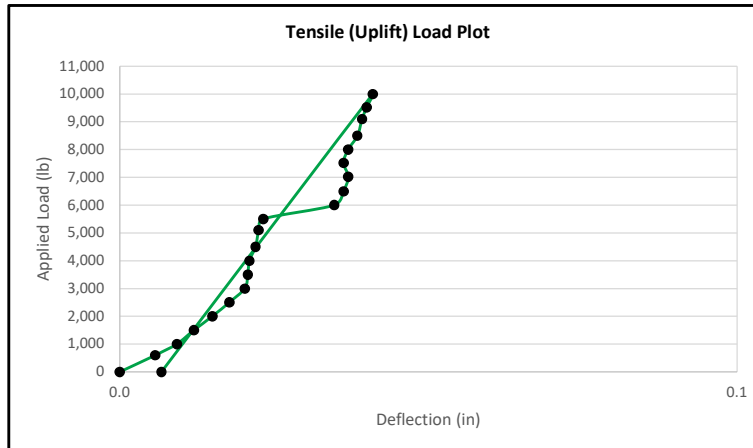


Project Name:	Deschutes Solar Project	Embedment Depth (ft):	7.0	Pile ID:	PLT-13
Site Location:	Wasco County, OR	Pushed to Depth (ft):	1.0	Pile Section:	W6x9
Date/Time Installed:	10/10/2024	Pre-Excavation Depth (ft):	-	Pile Length (ft):	15.0
Date/Time Tested:	10/14/2024	Pre-Drill Diameter (in.):	5.0	Total Drive Time (sec):	49.58
Installed Coordinates:	45.093099°, -121.279575°	Pre-Drill Depth (ft):	7.0	Avg. Installation Rate (sec/ft):	8.26

Embedment Data	
Depth (ft)	Time (s)
1	-
2	0.74
3	1.68
4	4.53
5	7.3
6	11.26
7	24.07
Total Time (s) =	49.58

Tensile (Uplift) Testing					
Hold Time (min)	Target Load (lbs)	Applied Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	500	600	0.0060	0.0055	0.0058
1	1,000	1,000	0.0090	0.0095	0.0093
1	1,500	1,500	0.0120	0.0120	0.0120
1	2,000	2,000	0.0160	0.0140	0.0150
1	2,500	2,500	0.0195	0.0160	0.0178
1	3,000	3,000	0.0230	0.0175	0.0203
1	3,500	3,500	0.0235	0.0180	0.0208
1	4,000	4,000	0.0240	0.0180	0.0210
1	4,500	4,500	0.0250	0.0190	0.0220
1	5,000	5,100	0.0260	0.0190	0.0225
1	5,500	5,500	0.0270	0.0195	0.0233
1	6,000	6,000	0.0415	0.0280	0.0348
1	6,500	6,500	0.0420	0.0305	0.0363
1	7,000	7,020	0.0420	0.0320	0.0370
1	7,500	7,520	0.0430	0.0295	0.0363
1	8,000	8,000	0.0435	0.0305	0.0370
1	8,500	8,500	0.0445	0.0325	0.0385
1	9,000	9,100	0.0450	0.0335	0.0393
1	9,500	9,520	0.0455	0.0345	0.0400
1	10,000	10,000	0.0460	0.0360	0.0410
1	0	0	0.0045	0.0090	0.0068

Lateral Testing					
Lateral Load Height Above Grade (ft):		4.0	Deflection Gauge Height (in):		6
Hold Time (min)	Target Load (lbs)	Applied Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	500	500	0.0530	0.0325	0.0428
1	1,000	1,000	0.1075	0.1545	0.1310
1	1,500	1,500	0.1935	0.2365	0.2150
1	2,000	2,020	0.2755	0.3055	0.2905
1	2,500	2,500	0.3270	0.3530	0.3400
1	3,000	3,000	0.3995	0.4270	0.4133
1	3,500	3,500	0.4455	0.4750	0.4603
1	4,000	4,000	0.4995	0.5350	0.5173
1	4,500	4,600	0.5705	0.6185	0.5945
1	0	0	0.0380	0.0500	0.0440

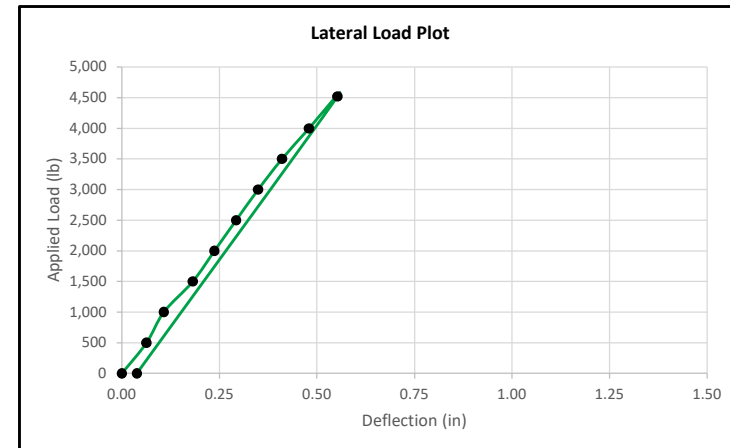
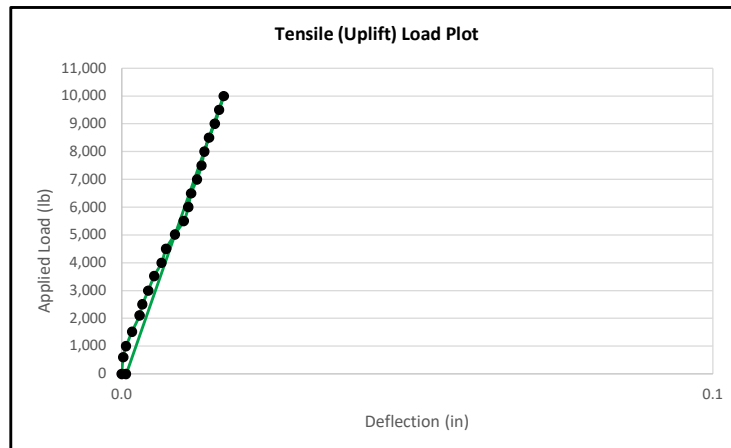


Project Name:	Deschutes Solar Project	Embedment Depth (ft):	8.0	Pile ID:	PLT-14
Site Location:	Wasco County, OR	Pushed to Depth (ft):	2.0	Pile Section:	W6x9
Date/Time Installed:	10/10/2024	Pre-Excavation Depth (ft):	-	Pile Length (ft):	15.0
Date/Time Tested:	10/14/2024	Pre-Drill Diameter (in):	5.0	Total Drive Time (sec):	52.34
Installed Coordinates:	45.109067°, -121.271883°	Pre-Drill Depth (ft):	8.0	Avg. Installation Rate (sec/ft):	8.72

Embedment Data	
Depth (ft)	Time (s)
1	-
2	-
3	7.85
4	6.70
5	8.25
6	7.15
7	6.19
8	16.20
Total Time (s) =	52.34

Tensile (Uplift) Testing					
Hold Time (min)	Target Load (lbs)	Applied Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	500	600	0.0005	0.0000	0.0003
1	1,000	1,000	0.0010	0.0005	0.0008
1	1,500	1,520	0.0020	0.0015	0.0018
1	2,000	2,100	0.0030	0.0030	0.0030
1	2,500	2,500	0.0035	0.0035	0.0035
1	3,000	3,000	0.0045	0.0045	0.0045
1	3,500	3,520	0.0055	0.0055	0.0055
1	4,000	4,000	0.0075	0.0060	0.0068
1	4,500	4,500	0.0085	0.0065	0.0075
1	5,000	5,020	0.0085	0.0080	0.0090
1	5,500	5,500	0.0100	0.0095	0.0105
1	6,000	6,000	0.0105	0.0110	0.0113
1	6,500	6,500	0.0110	0.0120	0.0118
1	7,000	7,000	0.0120	0.0125	0.0128
1	7,500	7,500	0.0135	0.0135	0.0135
1	8,000	8,000	0.0145	0.0135	0.0140
1	8,500	8,500	0.0160	0.0135	0.0148
1	9,000	9,000	0.0180	0.0135	0.0158
1	9,500	9,500	0.0195	0.0135	0.0165
1	10,000	10,000	0.0210	0.0135	0.0173
1	0	0	0.0005	0.0010	0.0008

Lateral Testing					
Lateral Load Height Above Grade (ft):		4.0	Deflection Gauge Height (in):		6
Hold Time (min)	Target Load (lbs)	Applied Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	500	500	0.0675	0.0585	0.0630
1	1,000	1,000	0.1205	0.0945	0.1075
1	1,500	1,500	0.2070	0.1570	0.1820
1	2,000	2,000	0.2675	0.2070	0.2373
1	2,500	2,500	0.3215	0.2640	0.2928
1	3,000	3,000	0.3845	0.3140	0.3493
1	3,500	3,500	0.4525	0.3685	0.4105
1	4,000	4,000	0.5325	0.4270	0.4798
1	4,500	4,520	0.6230	0.4820	0.5525
1	0	0	0.0900	-0.0135	0.0383

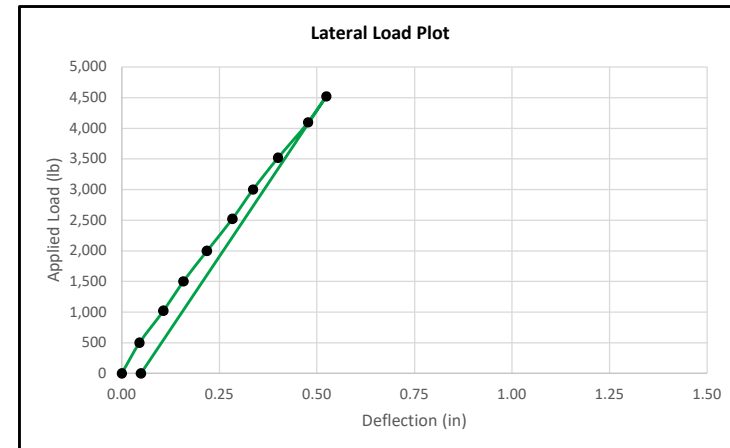
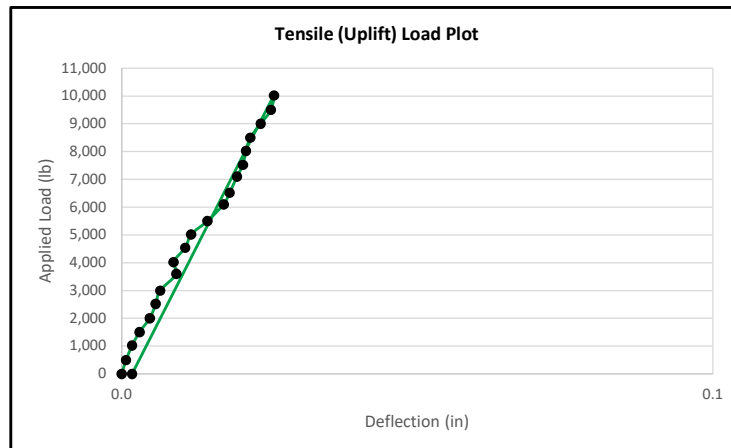


Project Name:	Deschutes Solar Project	Embedment Depth (ft):	9.0	Pile ID:	PLT-15
Site Location:	Wasco County, OR	Pushed to Depth (ft):	3.0	Pile Section:	W6x9
Date/Time Installed:	10/10/2024	Pre-Excavation Depth (ft):	-	Pile Length (ft):	15.0
Date/Time Tested:	10/13/2024	Pre-Drill Diameter (in):	5.0	Total Drive Time (sec):	34.36
Installed Coordinates:	45.118648°, -121.267039°	Pre-Drill Depth (ft):	9.0	Avg. Installation Rate (sec/ft):	5.73

Embedment Data	
Depth (ft)	Time (s)
1	-
2	-
3	-
4	1.21
5	7.58
6	5.32
7	5.60
8	6.62
9	8.03
Total Time (s) =	34.36

Tensile (Uplift) Testing					
Hold Time (min)	Target Load (lbs)	Applied Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	500	500	0.0005	0.0010	0.0008
1	1,000	1,020	0.0010	0.0025	0.0018
1	1,500	1,500	0.0030	0.0030	0.0030
1	2,000	2,000	0.0045	0.0050	0.0048
1	2,500	2,520	0.0050	0.0065	0.0058
1	3,000	3,000	0.0065	0.0065	0.0065
1	3,500	3,600	0.0120	0.0065	0.0093
1	4,000	4,020	0.0125	0.0050	0.0088
1	4,500	4,540	0.0155	0.0060	0.0108
1	5,000	5,020	0.0175	0.0060	0.0118
1	5,500	5,500	0.0235	0.0055	0.0145
1	6,000	6,100	0.0280	0.0065	0.0173
1	6,500	6,520	0.0300	0.0065	0.0183
1	7,000	7,100	0.0320	0.0070	0.0195
1	7,500	7,520	0.0340	0.0070	0.0205
1	8,000	8,020	0.0350	0.0070	0.0210
1	8,500	8,500	0.0360	0.0075	0.0218
1	9,000	9,000	0.0390	0.0080	0.0235
1	9,500	9,500	0.0420	0.0085	0.0253
1	10,000	10,020	0.0430	0.0085	0.0258
1	0	0	0.0035	0.0000	0.0018

Lateral Testing					
Lateral Load Height Above Grade (ft):		4.0	Deflection Gauge Height (in):		6
Hold Time (min)	Target Load (lbs)	Applied Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	500	500	0.0440	0.0465	0.0453
1	1,000	1,020	0.1125	0.1000	0.1063
1	1,500	1,500	0.1665	0.1490	0.1578
1	2,000	2,000	0.2235	0.2130	0.2183
1	2,500	2,520	0.2875	0.2790	0.2833
1	3,000	3,000	0.3430	0.3300	0.3365
1	3,500	3,520	0.4100	0.3905	0.4003
1	4,000	4,100	0.4960	0.4585	0.4773
1	4,500	4,520	0.5495	0.4990	0.5243
1	0	0	0.0475	0.0510	0.0493

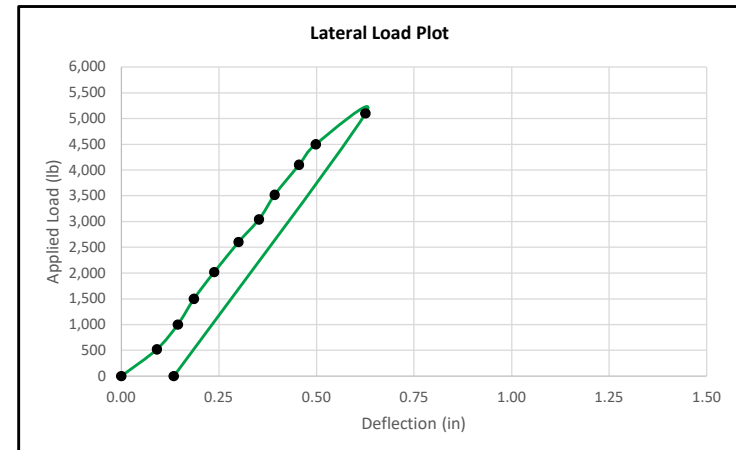
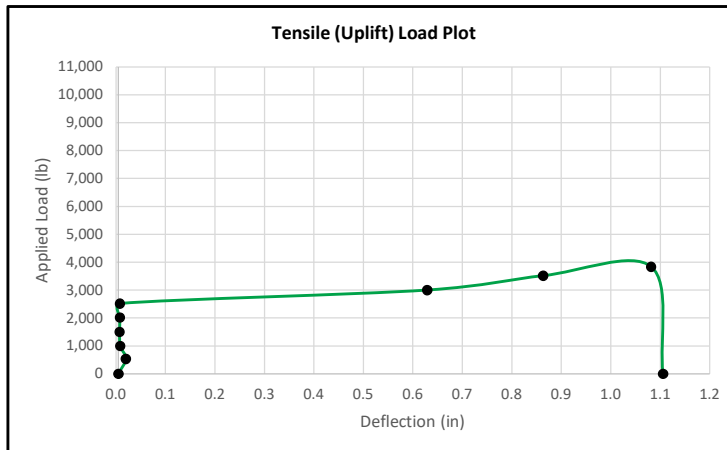


Project Name:	Deschutes Solar Project	Embedment Depth (ft):	10.0	Pile ID:	PLT-16
Site Location:	Wasco County, OR	Pushed to Depth (ft):	4.0	Pile Section:	W6x9
Date/Time Installed:	10/10/2024	Pre-Excavation Depth (ft):	-	Pile Length (ft):	15.0
Date/Time Tested:	10/11/2024	Pre-Drill Diameter (in.):	5.0	Total Drive Time (sec):	10.02
Installed Coordinates:	45.087717°, -121.306433°	Pre-Drill Depth (ft):	10.0	Avg. Installation Rate (sec/ft):	1.67

Embedment Data	
Depth (ft)	Time (s)
1	-
2	-
3	-
4	-
5	1.37
6	1.66
7	1.08
8	1.39
9	1.96
10	2.56
Total Time (s) =	10.02

Tensile (Uplift) Testing					
Hold Time (min)	Target Load (lbs)	Applied Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	500	540	0.0305	-0.0005	0.0150
1	1,000	1,000	0.0110	-0.0035	0.0038
1	1,500	1,500	0.0140	-0.0095	0.0023
1	2,000	2,020	0.0185	-0.0120	0.0033
1	2,500	2,520	0.0235	-0.0170	0.0033
1	3,000	3,000	0.6500	0.5980	0.6240
1	3,500	3,520	0.8920	0.8245	0.8583
1	4,000	3,840	0.9450	1.2080	1.0765
1	0	0	0.9405	1.2605	1.1005

Lateral Testing					
Lateral Load Height Above Grade (ft):		4.0	Deflection Gauge Height (in):		6
Hold Time (min)	Target Load (lbs)	Applied Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	500	520	0.1655	0.0170	0.0913
1	1,000	1,000	0.2455	0.0440	0.1448
1	1,500	1,500	0.3030	0.0695	0.1863
1	2,000	2,020	0.3640	0.1125	0.2383
1	2,500	2,600	0.4260	0.1745	0.3003
1	3,000	3,040	0.4725	0.2330	0.3528
1	3,500	3,520	0.5040	0.2825	0.3933
1	4,000	4,100	0.5470	0.3640	0.4555
1	4,500	4,500	0.5715	0.4250	0.4983
1	5,000	5,100	0.5545	0.6965	0.6255
1	0	0	0.0870	0.1820	0.1345



Attachment G

Seismic Hazard Site Classification

ASCE Hazards Report

Address:

No Address at This Location

Standard:

ASCE/SEI 7-16

Risk Category: II

Soil Class:

C - Very Dense
Soil and Soft Rock

Latitude:

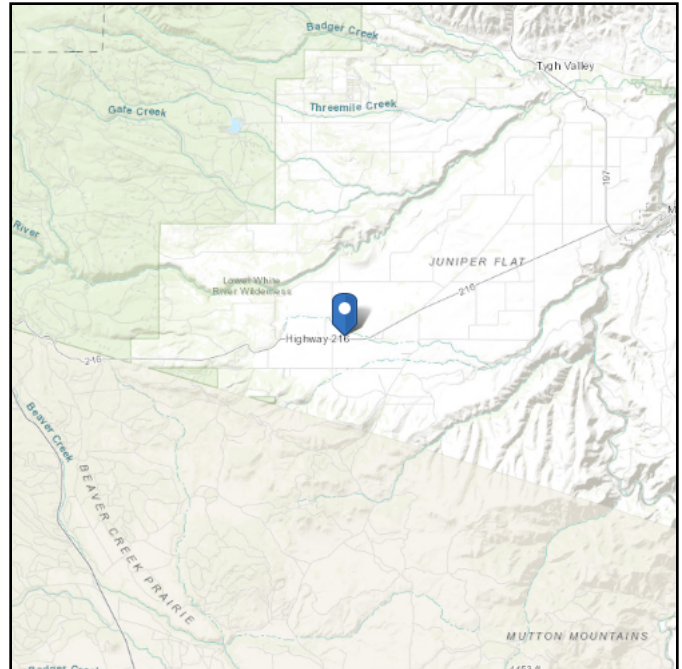
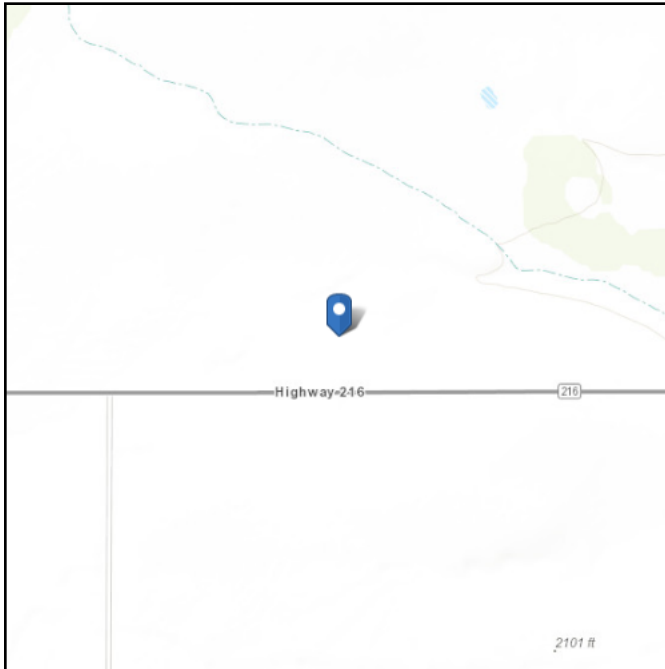
45.115307

Longitude:

-121.309723

Elevation:

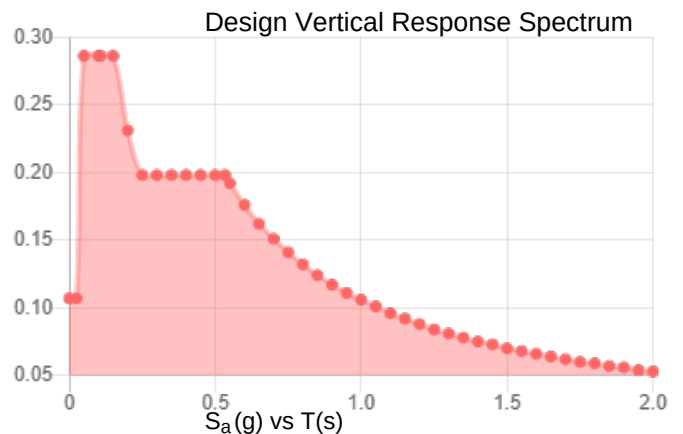
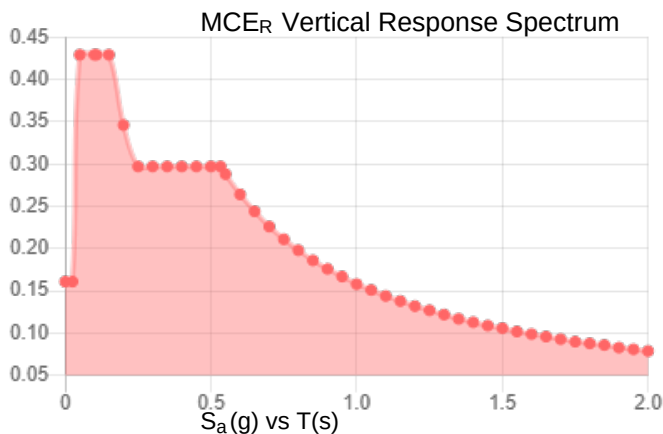
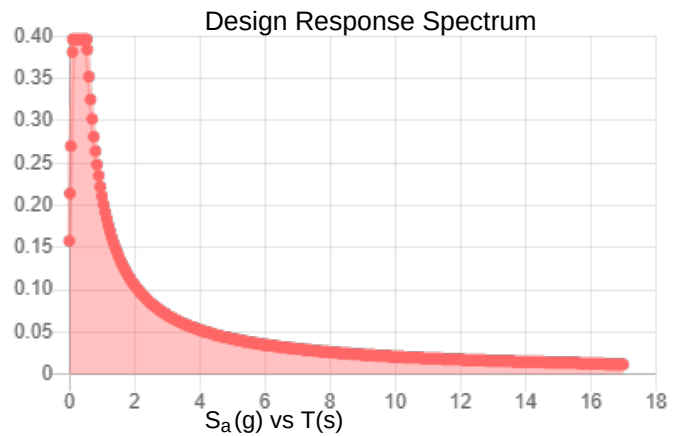
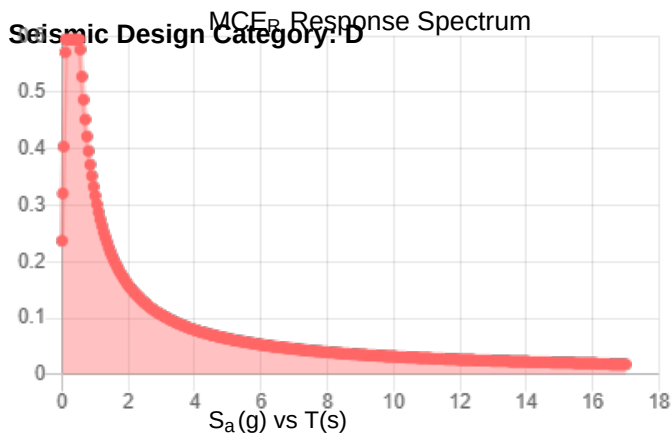
2095.1044948320555 ft
(NAVD 88)



Site Soil Class: C - Very Dense Soil and Soft Rock

Results:

S_S :	0.457	S_{D1} :	0.211
S_1 :	0.211	T_L :	16
F_a :	1.3	PGA :	0.206
F_v :	1.5	PGA _M :	0.247
S_{MS} :	0.594	F_{PGA} :	1.2
S_{M1} :	0.317	I_e :	1
S_{DS} :	0.396	C_v :	0.904



Data Accessed: Tue Apr 01 2025

Date Source:

USGS Seismic Design Maps based on ASCE/SEI 7-16 and ASCE/SEI 7-16 Table 1.5-2. Additional data for site-specific ground motion procedures in accordance with ASCE/SEI 7-16 Ch. 21 are available from USGS.

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Attachment H

NRCS Soil Survey Report



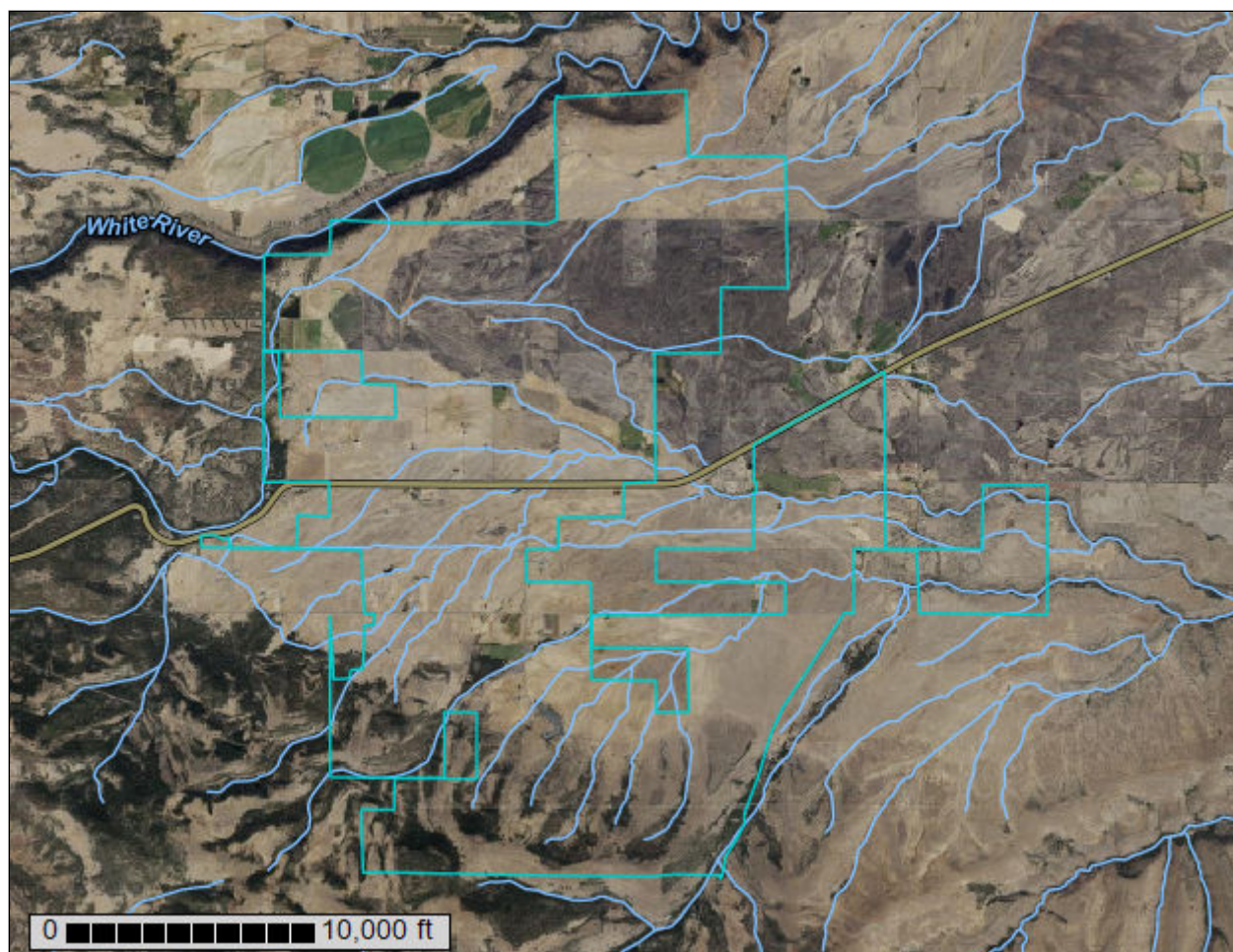
United States
Department of
Agriculture

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 Warm Springs Indian Reservation, Oregon; and Wasco County, Oregon, Northern Part



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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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

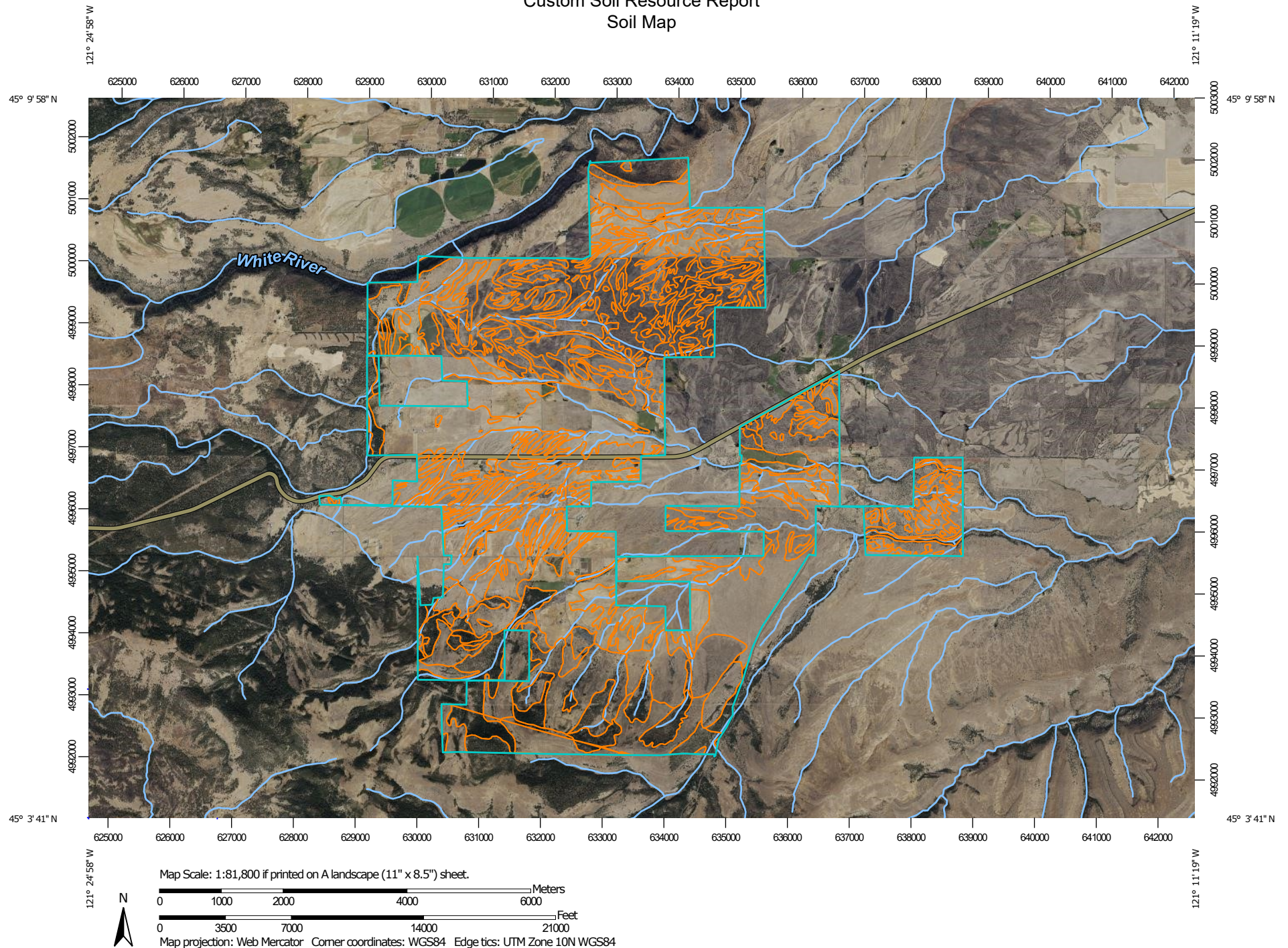
Custom Soil Resource Report

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



Custom Soil Resource Report

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 scales ranging from 1:20,000 to 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: Warm Springs Indian Reservation, Oregon

Survey Area Data: Version 19, Aug 30, 2024

Soil Survey Area: Wasco County, Oregon, Northern Part

Survey Area Data: Version 19, Aug 30, 2024

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

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

Date(s) aerial images were photographed: Sep 16, 2022—Sep 26, 2022

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background

MAP LEGEND

MAP INFORMATION

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
11	Boardflower loam, 2 to 20 percent slopes	41.8	0.4%
12	Bodell very cobbly loam, 30 to 55 percent slopes	4.3	0.0%
57	Jorn-Bodell complex, 30 to 55 percent slopes	0.6	0.0%
85	Mutton gravelly loam, 12 to 30 percent slopes	16.3	0.1%
86	Mutton gravelly loam, 30 to 55 percent slopes	79.5	0.7%
113	Rockly extremely gravelly silt loam, 2 to 20 percent slopes	152.4	1.3%
Subtotals for Soil Survey Area		294.9	2.6%
Totals for Area of Interest		11,372.3	100.0%

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
2D	Bakeoven very cobbly loam, 2 to 20 percent slopes	501.1	4.4%
4C	Bakeoven-Maupin complex, 0 to 12 percent slopes	465.9	4.1%
5C	Bakeoven-Watama complex, 0 to 12 percent slopes	3,505.3	30.8%
6E	Bald cobbly loam, 5 to 45 percent slopes	322.3	2.8%
10E	Bodell cobbly loam, 5 to 45 percent slopes	521.9	4.6%
11F	Bodell very cobbly loam, 45 to 75 percent slopes	35.5	0.3%
27F	Hesslan complex, 30 to 70 percent slopes	149.2	1.3%
28E	Hesslan-Skyline complex, 5 to 40 percent slopes	82.6	0.7%
29E	Ketchly loam, 3 to 30 percent slopes	104.3	0.9%
29F	Ketchly loam, 30 to 65 percent slopes	28.8	0.3%
30E	Licksillet very stony loam, 15 to 40 percent slopes	22.9	0.2%
32A	Maupin loam, 0 to 5 percent slopes	199.9	1.8%
35	Pedigo silt loam	53.6	0.5%
40E	Sherar cobbly loam, 5 to 45 percent slopes	25.3	0.2%

Custom Soil Resource Report

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
42F	Sinamox silt loam, 45 to 70 percent slopes	34.1	0.3%
43F	Skyline-Hesslan complex, 40 to 65 percent slopes	1.5	0.0%
44	Tygh fine sandy loam	36.1	0.3%
49B	Wamic loam, 1 to 5 percent slopes	138.4	1.2%
49C	Wamic loam 5 to 12 percent north slopes	6.5	0.1%
50E	Wamic loam, 20 to 40 percent slopes	3.9	0.0%
51D	Wamic-Skyline complex, 2 to 20 percent slopes	50.5	0.4%
52B	Wapinitia variant silt loam, 1 to 7 percent slopes	1,061.8	9.3%
54B	Watama-Wapinitia silt loams, 0 to 5 percent slopes	3,218.9	28.3%
54C	Watama-Wapinitia silt loams, 5 to 12 percent slopes	37.7	0.3%
54D	Watama-Wapinitia silt loams, 12 to 20 percent slopes	19.9	0.2%
54E	Watama-Wapinitia silt loams, 20 to 35 percent slopes	6.4	0.1%
58E	Mutton gravelly loam, 12 to 30 percent slopes	95.3	0.8%
58F	Mutton gravelly loam, 30 to 55 percent slopes	152.6	1.3%
59D	Rockly extremely gravelly silt loam, 2 to 20 percent slopes	189.2	1.7%
W	Water	5.9	0.1%
Subtotals for Soil Survey Area		11,077.4	97.4%
Totals for Area of Interest		11,372.3	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.

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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.

Warm Springs Indian Reservation, Oregon

11—Boardflower loam, 2 to 20 percent slopes

Map Unit Setting

National map unit symbol: 23md

Elevation: 2,600 to 3,500 feet

Mean annual precipitation: 16 to 20 inches

Mean annual air temperature: 45 to 48 degrees F

Frost-free period: 90 to 120 days

Farmland classification: Farmland of statewide importance

Map Unit Composition

Boardflower and similar soils: 85 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Boardflower

Setting

Landform: Mountain slopes

Landform position (two-dimensional): Summit, footslope

Landform position (three-dimensional): Mountaintop, mountainbase

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Volcanic ash over colluvium and residuum weathered from sedimentary rock

Typical profile

Oi - 0 to 2 inches: slightly decomposed plant material

H1 - 2 to 10 inches: loam

H2 - 10 to 27 inches: loam

H3 - 27 to 36 inches: clay loam

H4 - 36 to 62 inches: clay

Properties and qualities

Slope: 2 to 20 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Well drained

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

Available water supply, 0 to 60 inches: High (about 9.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 3e

Hydrologic Soil Group: C

Ecological site: F006XB802OR - Mesic Xeric North Slopes 15-25 PZ

Hydric soil rating: No

12—Bodell very cobbly loam, 30 to 55 percent slopes

Map Unit Setting

National map unit symbol: 23mz
Elevation: 2,600 to 3,500 feet
Mean annual precipitation: 16 to 20 inches
Mean annual air temperature: 45 to 48 degrees F
Frost-free period: 90 to 120 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Bodell

Setting

Landform: Mountain slopes
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Mountainflank
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Volcanic ash over colluvium and residuum weathered from basalt

Typical profile

H1 - 0 to 4 inches: very cobbly loam
H2 - 4 to 10 inches: very gravelly loam
H3 - 10 to 14 inches: extremely gravelly clay loam
H4 - 14 to 24 inches: unweathered bedrock

Properties and qualities

Slope: 30 to 55 percent
Depth to restrictive feature: 12 to 20 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 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: Very low (about 1.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Ecological site: R006XB208OR - Shallow Slopes 14-20 PZ
Hydric soil rating: No

57—Jorn-Bodell complex, 30 to 55 percent slopes

Map Unit Setting

National map unit symbol: 23wt

Elevation: 2,600 to 3,500 feet

Mean annual precipitation: 16 to 20 inches

Mean annual air temperature: 45 to 48 degrees F

Frost-free period: 90 to 120 days

Farmland classification: Farmland of statewide importance

Map Unit Composition

Jorn and similar soils: 50 percent

Bodell and similar soils: 35 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Jorn

Setting

Landform: Mountain slopes

Landform position (two-dimensional): Summit, shoulder

Landform position (three-dimensional): Mountaintop

Down-slope shape: Concave

Across-slope shape: Linear

Parent material: Colluvium residuum weathered from sedimentary rock with influence of volcanic ash

Typical profile

H1 - 0 to 5 inches: cobbly silt loam

H2 - 5 to 12 inches: gravelly silty clay loam

H3 - 12 to 21 inches: gravelly silty clay

H4 - 21 to 24 inches: gravelly silty clay

H5 - 24 to 34 inches: weathered bedrock

Properties and qualities

Slope: 30 to 55 percent

Depth to restrictive feature: 20 to 40 inches to paralithic bedrock

Drainage class: Well 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: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water supply, 0 to 60 inches: Low (about 3.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 6e

Hydrologic Soil Group: D

Ecological site: F006XY710OR - Mesic Xeric Foothills 14-20 PZ

Hydric soil rating: No

Description of Bodell

Setting

Landform: Mountain slopes

Landform position (two-dimensional): Shoulder, backslope

Landform position (three-dimensional): Mountainflank

Down-slope shape: Concave

Across-slope shape: Linear

Parent material: Volcanic ash over colluvium and residuum weathered from basalt

Typical profile

H1 - 0 to 4 inches: very cobbly loam

H2 - 4 to 10 inches: very gravelly loam

H3 - 10 to 14 inches: extremely gravelly clay loam

H4 - 14 to 24 inches: unweathered bedrock

Properties and qualities

Slope: 30 to 55 percent

Depth to restrictive feature: 12 to 20 inches to lithic bedrock

Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 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: Very low (about 1.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7s

Hydrologic Soil Group: D

Ecological site: R006XB208OR - Shallow Slopes 14-20 PZ

Hydric soil rating: No

85—Mutton gravelly loam, 12 to 30 percent slopes

Map Unit Setting

National map unit symbol: 23xt

Elevation: 2,600 to 3,500 feet

Mean annual precipitation: 16 to 20 inches

Mean annual air temperature: 45 to 48 degrees F

Frost-free period: 90 to 120 days

Farmland classification: Farmland of statewide importance

Map Unit Composition

Mutton and similar soils: 80 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Mutton

Setting

Landform: Mountain slopes

Landform position (two-dimensional): Footslope

Landform position (three-dimensional): Mountaintop, mountainbase

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Colluvium residuum weathered from tuff rock with influence of volcanic ash

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material

H1 - 1 to 9 inches: gravelly loam

H2 - 9 to 18 inches: gravelly loam

H3 - 18 to 37 inches: very gravelly loam

H4 - 37 to 45 inches: extremely gravelly loam

H5 - 45 to 61 inches: extremely stony silty clay loam

Properties and qualities

Slope: 12 to 30 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 (0.20 to 0.57 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: Moderate (about 6.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 6e

Hydrologic Soil Group: B

Ecological site: F006XB802OR - Mesic Xeric North Slopes 15-25 PZ

Hydric soil rating: No

86—Mutton gravelly loam, 30 to 55 percent slopes

Map Unit Setting

National map unit symbol: 23xv

Elevation: 2,600 to 3,500 feet

Mean annual precipitation: 16 to 20 inches

Mean annual air temperature: 45 to 48 degrees F

Frost-free period: 90 to 120 days

Farmland classification: Farmland of statewide importance

Map Unit Composition

Mutton and similar soils: 85 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Mutton

Setting

Landform: Mountain slopes

Landform position (two-dimensional): Backslope, footslope

Landform position (three-dimensional): Mountainflank

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Colluvium residuum weathered from tuff rock with influence of volcanic ash

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material

H1 - 1 to 9 inches: gravelly loam

H2 - 9 to 18 inches: gravelly loam

H3 - 18 to 37 inches: very gravelly loam

H4 - 37 to 45 inches: extremely gravelly loam

H5 - 45 to 61 inches: extremely stony silty clay loam

Properties and qualities

Slope: 30 to 55 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 (0.20 to 0.57 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: Moderate (about 6.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 6e

Hydrologic Soil Group: B

Ecological site: F006XB802OR - Mesic Xeric North Slopes 15-25 PZ

Hydric soil rating: No

113—Rockly extremely gravelly silt loam, 2 to 20 percent slopes

Map Unit Setting

National map unit symbol: 23mn

Elevation: 2,400 to 3,000 feet

Mean annual precipitation: 12 to 16 inches

Mean annual air temperature: 48 to 50 degrees F

Frost-free period: 100 to 140 days

Farmland classification: Not prime farmland

Map Unit Composition

Rockly and similar soils: 90 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Rockly

Setting

Landform: Mesas

Landform position (two-dimensional): Summit

Landform position (three-dimensional): Interfluve

Down-slope shape: Convex

Across-slope shape: Linear

Parent material: Colluvium weathered from basalt rock with influence of loess in upper part

Typical profile

H1 - 0 to 3 inches: extremely gravelly silt loam

H2 - 3 to 7 inches: very cobbly silt loam

H3 - 7 to 9 inches: extremely cobbly silty clay loam

H4 - 9 to 19 inches: unweathered bedrock

Properties and qualities

Slope: 2 to 20 percent

Depth to restrictive feature: 4 to 10 inches to lithic bedrock

Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 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: Very low (about 0.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7s

Hydrologic Soil Group: D

Ecological site: R009XY025OR - Very Shallow 14-18 PZ

Hydric soil rating: No

Wasco County, Oregon, Northern Part

2D—Bakeoven very cobbly loam, 2 to 20 percent slopes

Map Unit Setting

National map unit symbol: 23jg
Elevation: 1,600 to 3,600 feet
Mean annual precipitation: 10 to 13 inches
Mean annual air temperature: 45 to 52 degrees F
Frost-free period: 110 to 150 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Bakeoven

Setting

Landform: Plateaus
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Side slope
Down-slope shape: Convex, linear
Across-slope shape: Linear
Parent material: Loess and residuum weathered from basalt

Typical profile

H1 - 0 to 3 inches: very cobbly loam
H2 - 3 to 6 inches: very cobbly loam
H3 - 6 to 9 inches: very cobbly clay loam
H4 - 9 to 19 inches: unweathered bedrock

Properties and qualities

Slope: 2 to 20 percent
Depth to restrictive feature: 4 to 10 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 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: Very low (about 0.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Ecological site: R008XY150OR - Very Shallow Loam 10-14 PZ
Hydric soil rating: No

4C—Bakeoven-Maupin complex, 0 to 12 percent slopes

Map Unit Setting

National map unit symbol: 23kl
Elevation: 1,600 to 3,600 feet
Mean annual precipitation: 10 to 13 inches
Mean annual air temperature: 45 to 52 degrees F
Frost-free period: 110 to 150 days
Farmland classification: Not prime farmland

Map Unit Composition

Bakeoven and similar soils: 65 percent
Maupin and similar soils: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Bakeoven

Setting

Landform: Plateaus
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loess and residuum weathered from basalt

Typical profile

H1 - 0 to 3 inches: very cobbly loam
H2 - 3 to 6 inches: very cobbly loam
H3 - 6 to 9 inches: very cobbly clay loam
H4 - 9 to 19 inches: unweathered bedrock

Properties and qualities

Slope: 0 to 12 percent
Depth to restrictive feature: 4 to 10 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 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: Very low (about 0.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Ecological site: R008XY150OR - Very Shallow Loam 10-14 PZ
Hydric soil rating: No

Description of Maupin

Setting

Landform: Plateaus
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loess and volcanic ash

Typical profile

H1 - 0 to 10 inches: loam
H2 - 10 to 20 inches: loam
H3 - 20 to 31 inches: loam
H4 - 31 to 37 inches: cemented material
H5 - 37 to 47 inches: unweathered bedrock

Properties and qualities

Slope: 0 to 12 percent
Depth to restrictive feature: 20 to 40 inches to duripan; 25 to 45 inches to lithic bedrock
Drainage class: Well 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: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 4.9 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: R010XB013OR - JD Shrubby Loam 12-16 PZ
Hydric soil rating: No

5C—Bakeoven-Watama complex, 0 to 12 percent slopes

Map Unit Setting

National map unit symbol: 23I9
Elevation: 1,600 to 3,600 feet
Mean annual precipitation: 10 to 13 inches
Mean annual air temperature: 45 to 52 degrees F
Frost-free period: 110 to 150 days
Farmland classification: Not prime farmland

Map Unit Composition

Bakeoven and similar soils: 65 percent

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Watama and similar soils: 20 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Bakeoven

Setting

Landform: Plateaus

Landform position (two-dimensional): Summit

Landform position (three-dimensional): Interfluve

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Loess and residuum weathered from basalt

Typical profile

H1 - 0 to 3 inches: very cobbly loam

H2 - 3 to 6 inches: very cobbly loam

H3 - 6 to 9 inches: very cobbly clay loam

H4 - 9 to 19 inches: unweathered bedrock

Properties and qualities

Slope: 0 to 12 percent

Depth to restrictive feature: 4 to 10 inches to lithic bedrock

Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 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: Very low (about 0.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7s

Hydrologic Soil Group: D

Ecological site: R008XY150OR - Very Shallow Loam 10-14 PZ

Hydric soil rating: No

Description of Watama

Setting

Landform: Plateaus

Landform position (two-dimensional): Summit

Landform position (three-dimensional): Interfluve

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Loess and volcanic ash

Typical profile

H1 - 0 to 4 inches: silt loam

H2 - 4 to 10 inches: silt loam

H3 - 10 to 24 inches: loam

H4 - 24 to 34 inches: clay loam

H5 - 34 to 44 inches: unweathered bedrock

Properties and qualities

Slope: 0 to 12 percent

Depth to restrictive feature: 20 to 40 inches to lithic bedrock

Drainage class: Well drained

Custom Soil Resource Report

Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 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: Moderate (about 6.2 inches)

Interpretive groups

Land capability classification (irrigated): 3e

Land capability classification (nonirrigated): 4e

Hydrologic Soil Group: C

Ecological site: R010XB013OR - JD Shrubby Loam 12-16 PZ

Hydric soil rating: No

6E—Bald cobbly loam, 5 to 45 percent slopes

Map Unit Setting

National map unit symbol: 23lb

Elevation: 200 to 3,000 feet

Mean annual precipitation: 20 to 30 inches

Mean annual air temperature: 48 to 51 degrees F

Frost-free period: 100 to 140 days

Farmland classification: Farmland of statewide importance

Map Unit Composition

Bald and similar soils: 85 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Bald

Setting

Landform: Hillslopes

Landform position (two-dimensional): Backslope

Landform position (three-dimensional): Side slope

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Loess and volcanic ash over colluvium derived from basalt

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material

H1 - 1 to 6 inches: cobbly loam

H2 - 6 to 13 inches: very gravelly loam

H3 - 13 to 22 inches: very cobbly loam

H4 - 22 to 38 inches: extremely cobbly loam

H5 - 38 to 48 inches: unweathered bedrock

Properties and qualities

Slope: 5 to 45 percent

Depth to restrictive feature: 20 to 40 inches to lithic bedrock

Drainage class: Well drained

Custom Soil Resource Report

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: Low (about 3.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 6s

Hydrologic Soil Group: C

Ecological site: R006XA304OR - Loamy 20-40 PZ

Hydric soil rating: No

10E—Bodell cobbly loam, 5 to 45 percent slopes

Map Unit Setting

National map unit symbol: 23h2

Elevation: 200 to 2,500 feet

Mean annual precipitation: 20 to 30 inches

Mean annual air temperature: 48 to 51 degrees F

Frost-free period: 100 to 140 days

Farmland classification: Not prime farmland

Map Unit Composition

Bodell and similar soils: 85 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Bodell

Setting

Landform: Hillslopes

Landform position (two-dimensional): Summit, shoulder

Landform position (three-dimensional): Interfluvium, nose slope, crest

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Loess and volcanic ash over colluvium derived from basalt

Typical profile

H1 - 0 to 5 inches: cobbly loam

H2 - 5 to 13 inches: extremely cobbly loam

H3 - 13 to 18 inches: extremely cobbly clay loam

H4 - 18 to 28 inches: unweathered bedrock

Properties and qualities

Slope: 5 to 45 percent

Depth to restrictive feature: 12 to 20 inches to lithic bedrock

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

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Frequency of ponding: None

Available water supply, 0 to 60 inches: Very low (about 1.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7e

Hydrologic Soil Group: D

Ecological site: R006XA204OR - South Slopes 20-40 PZ

Hydric soil rating: No

11F—Bodell very cobbly loam, 45 to 75 percent slopes

Map Unit Setting

National map unit symbol: 23h3

Elevation: 200 to 2,500 feet

Mean annual precipitation: 20 to 30 inches

Mean annual air temperature: 48 to 51 degrees F

Frost-free period: 100 to 140 days

Farmland classification: Not prime farmland

Map Unit Composition

Bodell and similar soils: 85 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Bodell

Setting

Landform: Hillslopes

Landform position (two-dimensional): Shoulder, backslope

Landform position (three-dimensional): Nose slope, side slope

Down-slope shape: Concave, convex

Across-slope shape: Concave, convex

Parent material: Loess and volcanic ash over colluvium derived from basalt

Typical profile

H1 - 0 to 5 inches: very cobbly loam

H2 - 5 to 13 inches: extremely cobbly loam

H3 - 13 to 18 inches: extremely cobbly clay loam

H4 - 18 to 28 inches: unweathered bedrock

Properties and qualities

Slope: 45 to 75 percent

Depth to restrictive feature: 12 to 20 inches to lithic bedrock

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: Very low (about 1.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified

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Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Ecological site: R006XA204OR - South Slopes 20-40 PZ
Hydric soil rating: No

27F—Hesslan complex, 30 to 70 percent slopes

Map Unit Setting

National map unit symbol: 23jb
Elevation: 500 to 3,500 feet
Mean annual precipitation: 14 to 20 inches
Mean annual air temperature: 45 to 49 degrees F
Frost-free period: 110 to 140 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Hesslan, stony, and similar soils: 60 percent
Hesslan and similar soils: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hesslan, Stony

Setting

Landform: Hillslopes
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Nose slope, side slope, crest
Down-slope shape: Concave
Across-slope shape: Concave, linear
Parent material: Loess, volcanic ash, and colluvium derived from sandstone

Typical profile

H1 - 0 to 9 inches: stony loam
H2 - 9 to 18 inches: loam
H3 - 18 to 23 inches: cobbly loam
H4 - 23 to 33 inches: weathered bedrock

Properties and qualities

Slope: 30 to 70 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
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: Low (about 3.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Ecological site: R006XA202OR - North Slopes 14-20 PZ

Hydric soil rating: No

Description of Hesslan

Setting

Landform: Hillslopes

Landform position (two-dimensional): Summit, shoulder, backslope

Landform position (three-dimensional): Nose slope, side slope, crest

Down-slope shape: Concave

Across-slope shape: Concave, linear

Parent material: Loess, volcanic ash, and colluvium derived from sandstone

Typical profile

H1 - 0 to 9 inches: loam

H2 - 9 to 18 inches: loam

H3 - 18 to 23 inches: cobbly loam

H4 - 23 to 33 inches: weathered bedrock

Properties and qualities

Slope: 30 to 70 percent

Depth to restrictive feature: 20 to 40 inches to paralithic bedrock

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: Low (about 3.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 6e

Hydrologic Soil Group: C

Ecological site: R006XA202OR - North Slopes 14-20 PZ

Hydric soil rating: No

28E—Hesslan-Skyline complex, 5 to 40 percent slopes

Map Unit Setting

National map unit symbol: 23jc

Elevation: 500 to 3,500 feet

Mean annual precipitation: 14 to 20 inches

Mean annual air temperature: 45 to 49 degrees F

Frost-free period: 110 to 140 days

Farmland classification: Farmland of statewide importance

Map Unit Composition

Hesslan and similar soils: 45 percent

Skyline and similar soils: 35 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hesslan

Setting

Landform: Hillslopes

Landform position (two-dimensional): Summit, shoulder

Landform position (three-dimensional): Interfluve, nose slope, crest

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Loess, volcanic ash, and colluvium derived from sandstone

Typical profile

H1 - 0 to 9 inches: stony loam

H2 - 9 to 18 inches: loam

H3 - 18 to 23 inches: cobbly loam

H4 - 23 to 33 inches: weathered bedrock

Properties and qualities

Slope: 5 to 40 percent

Depth to restrictive feature: 20 to 40 inches to paralithic bedrock

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: Low (about 3.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 4e

Hydrologic Soil Group: C

Ecological site: R006XA200OR - South Slopes 14-20 PZ

Hydric soil rating: No

Description of Skyline

Setting

Landform: Hillslopes

Landform position (two-dimensional): Summit, shoulder

Landform position (three-dimensional): Interfluve, nose slope, crest

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Loess, volcanic ash, and colluvium

Typical profile

H1 - 0 to 2 inches: very cobbly loam

H2 - 2 to 9 inches: cobbly loam

H3 - 9 to 14 inches: gravelly loam

H4 - 14 to 24 inches: weathered bedrock

Properties and qualities

Slope: 5 to 40 percent

Depth to restrictive feature: 12 to 20 inches to paralithic bedrock

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

Custom Soil Resource Report

Frequency of flooding: None

Frequency of ponding: None

Available water supply, 0 to 60 inches: Very low (about 1.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7s

Hydrologic Soil Group: D

Ecological site: R006XA200OR - South Slopes 14-20 PZ

Hydric soil rating: No

29E—Ketchly loam, 3 to 30 percent slopes

Map Unit Setting

National map unit symbol: 23jd

Elevation: 2,000 to 3,600 feet

Mean annual precipitation: 25 to 30 inches

Mean annual air temperature: 42 to 45 degrees F

Frost-free period: 70 to 120 days

Farmland classification: Farmland of statewide importance

Map Unit Composition

Ketchly and similar soils: 85 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ketchly

Setting

Landform: Hillslopes

Landform position (two-dimensional): Summit

Landform position (three-dimensional): Interfluve

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Loess, volcanic ash, and colluvium derived from andesite

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material

H1 - 1 to 12 inches: loam

H2 - 12 to 43 inches: loam

H3 - 43 to 46 inches: very cobbly clay loam

H4 - 46 to 56 inches: unweathered bedrock

Properties and qualities

Slope: 3 to 30 percent

Depth to restrictive feature: 41 to 81 inches to lithic bedrock

Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 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: Moderate (about 7.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 6e

Hydrologic Soil Group: C

Ecological site: F006XA803OR - Frigid Xeric Maritime North Slopes 35-55 PZ

Hydric soil rating: No

29F—Ketchly loam, 30 to 65 percent slopes

Map Unit Setting

National map unit symbol: 23jf

Elevation: 2,000 to 3,600 feet

Mean annual precipitation: 25 to 30 inches

Mean annual air temperature: 42 to 45 degrees F

Frost-free period: 70 to 120 days

Farmland classification: Not prime farmland

Map Unit Composition

Ketchly and similar soils: 85 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ketchly

Setting

Landform: Hillslopes

Landform position (two-dimensional): Backslope, footslope

Landform position (three-dimensional): Head slope, side slope

Down-slope shape: Concave

Across-slope shape: Concave

Parent material: Loess, volcanic ash, and colluvium derived from andesite

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material

H1 - 1 to 12 inches: loam

H2 - 12 to 43 inches: loam

H3 - 43 to 46 inches: very cobbly clay loam

H4 - 46 to 56 inches: unweathered bedrock

Properties and qualities

Slope: 30 to 65 percent

Depth to restrictive feature: 41 to 81 inches to lithic bedrock

Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 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: Moderate (about 7.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Custom Soil Resource Report

Land capability classification (nonirrigated): 7e

Hydrologic Soil Group: C

Ecological site: F006XA803OR - Frigid Xeric Maritime North Slopes 35-55 PZ

Hydric soil rating: No

30E—Lickskillet very stony loam, 15 to 40 percent slopes

Map Unit Setting

National map unit symbol: 23jh

Elevation: 200 to 3,600 feet

Mean annual precipitation: 10 to 13 inches

Mean annual air temperature: 45 to 52 degrees F

Frost-free period: 100 to 180 days

Farmland classification: Not prime farmland

Map Unit Composition

Lickskillet and similar soils: 85 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Lickskillet

Setting

Landform: Hillslopes

Landform position (two-dimensional): Summit, shoulder

Landform position (three-dimensional): Interfluve, nose slope, crest

Down-slope shape: Concave, convex

Across-slope shape: Linear, convex

Parent material: Stony colluvium consisting of a mixture of loess and residuum weathered from basalt

Typical profile

H1 - 0 to 10 inches: very stony loam

H2 - 10 to 16 inches: very gravelly loam

H3 - 16 to 26 inches: unweathered bedrock

Properties and qualities

Slope: 15 to 40 percent

Depth to restrictive feature: 12 to 20 inches to lithic bedrock

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

Calcium carbonate, maximum content: 5 percent

Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)

Available water supply, 0 to 60 inches: Very low (about 1.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7s

Hydrologic Soil Group: D

Custom Soil Resource Report

Ecological site: R008XY210OR - Shallow South 10-14 PZ

Hydric soil rating: No

32A—Maupin loam, 0 to 5 percent slopes

Map Unit Setting

National map unit symbol: 23jk

Elevation: 1,600 to 3,400 feet

Mean annual precipitation: 10 to 12 inches

Mean annual air temperature: 45 to 52 degrees F

Frost-free period: 120 to 170 days

Farmland classification: Prime farmland if irrigated

Map Unit Composition

Maupin and similar soils: 90 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Maupin

Setting

Landform: Hillslopes

Landform position (two-dimensional): Summit, shoulder

Landform position (three-dimensional): Interfluve, nose slope, crest

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Loess and volcanic ash

Typical profile

H1 - 0 to 10 inches: loam

H2 - 10 to 20 inches: loam

H3 - 20 to 31 inches: loam

H4 - 31 to 37 inches: cemented material

H5 - 37 to 47 inches: unweathered bedrock

Properties and qualities

Slope: 0 to 5 percent

Depth to restrictive feature: 20 to 40 inches to duripan; 25 to 45 inches to lithic bedrock

Drainage class: Well 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: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Calcium carbonate, maximum content: 5 percent

Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)

Available water supply, 0 to 60 inches: Low (about 4.9 inches)

Interpretive groups

Land capability classification (irrigated): 2e

Land capability classification (nonirrigated): 2c

Hydrologic Soil Group: C

Ecological site: R010XB013OR - JD Shrubby Loam 12-16 PZ
Hydric soil rating: No

35—Pedigo silt loam

Map Unit Setting

National map unit symbol: 23jp
Elevation: 200 to 2,700 feet
Mean annual precipitation: 10 to 13 inches
Mean annual air temperature: 50 to 53 degrees F
Frost-free period: 130 to 180 days
Farmland classification: Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season

Map Unit Composition

Pedigo and similar soils: 90 percent
Minor components: 4 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Pedigo

Setting

Landform: Stream terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from loess and volcanic ash

Typical profile

H1 - 0 to 8 inches: silt loam
H2 - 8 to 21 inches: silt loam
H3 - 21 to 40 inches: silt loam
H4 - 40 to 49 inches: silt loam
H5 - 49 to 60 inches: loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained
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: About 30 to 42 inches
Frequency of flooding: Frequent
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Maximum salinity: Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 10.3 inches)

Interpretive groups

Land capability classification (irrigated): 4w
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: C

Custom Soil Resource Report

Ecological site: R010XY007OR - SODIC BOTTOM

Hydric soil rating: No

Minor Components

Aquolls, poorly drained

Percent of map unit: 2 percent

Landform: Flood plains

Hydric soil rating: Yes

Xerofluvents, frequently flooded

Percent of map unit: 2 percent

Landform: Flood plains

Hydric soil rating: Yes

40E—Sherar cobbly loam, 5 to 45 percent slopes

Map Unit Setting

National map unit symbol: 23jw

Elevation: 1,500 to 2,500 feet

Mean annual precipitation: 10 to 12 inches

Mean annual air temperature: 48 to 52 degrees F

Frost-free period: 120 to 170 days

Farmland classification: Farmland of statewide importance

Map Unit Composition

Sherar and similar soils: 85 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Sherar

Setting

Landform: Hillslopes

Landform position (two-dimensional): Summit, footslope

Landform position (three-dimensional): Interfluve, base slope

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Loess and gravelly colluvium

Typical profile

H1 - 0 to 3 inches: cobbly loam

H2 - 3 to 9 inches: clay loam

H3 - 9 to 18 inches: clay

H4 - 18 to 29 inches: gravelly clay

H5 - 29 to 35 inches: very gravelly clay

H6 - 35 to 45 inches: weathered bedrock

Properties and qualities

Slope: 5 to 45 percent

Depth to restrictive feature: 20 to 40 inches to paralithic bedrock

Drainage class: Well drained

Custom Soil Resource Report

Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.57 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: Low (about 4.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 6e

Hydrologic Soil Group: C

Ecological site: R010XB013OR - JD Shrubby Loam 12-16 PZ

Hydric soil rating: No

42F—Sinamox silt loam, 45 to 70 percent slopes

Map Unit Setting

National map unit symbol: 23k2

Elevation: 1,500 to 2,500 feet

Mean annual precipitation: 10 to 12 inches

Mean annual air temperature: 48 to 52 degrees F

Frost-free period: 120 to 170 days

Farmland classification: Not prime farmland

Map Unit Composition

Sinamox and similar soils: 85 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Sinamox

Setting

Landform: Hillslopes

Landform position (two-dimensional): Backslope, footslope

Landform position (three-dimensional): Head slope, side slope

Down-slope shape: Concave

Across-slope shape: Linear

Parent material: Loess and gravelly colluvium

Typical profile

H1 - 0 to 24 inches: silt loam

H2 - 24 to 33 inches: silt loam

H3 - 33 to 49 inches: gravelly clay loam

H4 - 49 to 63 inches: silty clay

H5 - 63 to 67 inches: weathered bedrock

Properties and qualities

Slope: 45 to 70 percent

Depth to restrictive feature: 40 to 80 inches to paralithic bedrock

Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)

Depth to water table: More than 80 inches

Custom Soil Resource Report

Frequency of flooding: None

Frequency of ponding: None

Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)

Available water supply, 0 to 60 inches: High (about 10.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7e

Hydrologic Soil Group: C

Ecological site: R006XA202OR - North Slopes 14-20 PZ

Hydric soil rating: No

43F—Skyline-Hesslan complex, 40 to 65 percent slopes

Map Unit Setting

National map unit symbol: 23k3

Elevation: 500 to 3,500 feet

Mean annual precipitation: 14 to 20 inches

Mean annual air temperature: 45 to 48 degrees F

Frost-free period: 110 to 140 days

Farmland classification: Not prime farmland

Map Unit Composition

Skyline and similar soils: 60 percent

Hesslan and similar soils: 20 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Skyline

Setting

Landform: Hillslopes

Landform position (two-dimensional): Shoulder, backslope

Landform position (three-dimensional): Nose slope, side slope

Down-slope shape: Concave, convex

Across-slope shape: Concave, convex

Parent material: Loess, volcanic ash, and colluvium

Typical profile

H1 - 0 to 2 inches: very cobbly loam

H2 - 2 to 9 inches: cobbly loam

H3 - 9 to 14 inches: gravelly loam

H4 - 14 to 24 inches: weathered bedrock

Properties and qualities

Slope: 40 to 65 percent

Depth to restrictive feature: 12 to 20 inches to paralithic bedrock

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

Custom Soil Resource Report

Available water supply, 0 to 60 inches: Very low (about 1.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7s

Hydrologic Soil Group: D

Ecological site: R006XA200OR - South Slopes 14-20 PZ

Hydric soil rating: No

Description of Hesslan

Setting

Landform: Hillslopes

Landform position (two-dimensional): Shoulder, backslope

Landform position (three-dimensional): Nose slope, side slope

Down-slope shape: Concave, convex

Across-slope shape: Concave, convex

Parent material: Loess, volcanic ash, and colluvium derived from sandstone

Typical profile

H1 - 0 to 9 inches: stony loam

H2 - 9 to 18 inches: loam

H3 - 18 to 23 inches: cobbly loam

H4 - 23 to 33 inches: weathered bedrock

Properties and qualities

Slope: 40 to 65 percent

Depth to restrictive feature: 20 to 40 inches to paralithic bedrock

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: Low (about 3.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 6e

Hydrologic Soil Group: C

Ecological site: R006XA200OR - South Slopes 14-20 PZ

Hydric soil rating: No

44—Tygh fine sandy loam

Map Unit Setting

National map unit symbol: 23k4

Elevation: 200 to 1,800 feet

Mean annual precipitation: 14 to 20 inches

Mean annual air temperature: 48 to 52 degrees F

Frost-free period: 130 to 150 days

Custom Soil Resource Report

Farmland classification: Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season

Map Unit Composition

Tygh and similar soils: 90 percent

Minor components: 2 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Tygh

Setting

Landform: Stream terraces

Landform position (three-dimensional): Tread

Down-slope shape: Concave

Across-slope shape: Linear

Parent material: Alluvium derived from volcanic ash, loess, and weathered sedimentary rock

Typical profile

H1 - 0 to 10 inches: fine sandy loam

H2 - 10 to 30 inches: fine sandy loam

H3 - 30 to 41 inches: sandy loam

H4 - 41 to 46 inches: loamy sand

H5 - 46 to 60 inches: extremely gravelly sand

Properties and qualities

Slope: 0 to 3 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Somewhat poorly drained

Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)

Depth to water table: About 24 to 36 inches

Frequency of flooding: Frequent

Frequency of ponding: None

Available water supply, 0 to 60 inches: Low (about 5.5 inches)

Interpretive groups

Land capability classification (irrigated): 3w

Land capability classification (nonirrigated): 3w

Hydrologic Soil Group: B

Ecological site: R010XY005OR - LOAMY BOTTOM

Hydric soil rating: No

Minor Components

Aquolls, poorly drained

Percent of map unit: 1 percent

Landform: Flood plains

Hydric soil rating: Yes

Xerofluvents, frequently flooded

Percent of map unit: 1 percent

Landform: Flood plains

Hydric soil rating: Yes

49B—Wamic loam, 1 to 5 percent slopes

Map Unit Setting

National map unit symbol: 23kj
Elevation: 1,000 to 3,600 feet
Mean annual precipitation: 14 to 20 inches
Mean annual air temperature: 46 to 50 degrees F
Frost-free period: 100 to 150 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

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

Description of Wamic

Setting

Landform: Hillslopes
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Volcanic ash and loess over alluvium or colluvium derived from basalt or andesite

Typical profile

H1 - 0 to 7 inches: loam
H2 - 7 to 28 inches: loam
H3 - 28 to 44 inches: loam
H4 - 44 to 54 inches: unweathered bedrock

Properties and qualities

Slope: 1 to 5 percent
Depth to restrictive feature: 40 to 60 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 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 supply, 0 to 60 inches: Moderate (about 7.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: R006XA300OR - Loamy 14-20 PZ
Hydric soil rating: No

49C—Wamic loam 5 to 12 percent north slopes

Map Unit Setting

National map unit symbol: 23kk

Elevation: 1,000 to 3,600 feet

Mean annual precipitation: 14 to 20 inches

Mean annual air temperature: 46 to 50 degrees F

Frost-free period: 100 to 150 days

Farmland classification: Farmland of statewide importance

Map Unit Composition

Wamic, north, and similar soils: 90 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Wamic, North

Setting

Landform: Hillslopes

Landform position (two-dimensional): Summit

Landform position (three-dimensional): Interfluve

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Volcanic ash and loess over alluvium or colluvium derived from basalt or andesite

Typical profile

H1 - 0 to 7 inches: loam

H2 - 7 to 28 inches: loam

H3 - 28 to 44 inches: loam

H4 - 44 to 54 inches: unweathered bedrock

Properties and qualities

Slope: 5 to 12 percent

Depth to restrictive feature: 40 to 60 inches to lithic bedrock

Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 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 supply, 0 to 60 inches: Moderate (about 7.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 4e

Hydrologic Soil Group: C

Ecological site: R006XA300OR - Loamy 14-20 PZ

Hydric soil rating: No

50E—Wamic loam, 20 to 40 percent slopes

Map Unit Setting

National map unit symbol: 23kp

Elevation: 1,000 to 3,600 feet

Mean annual precipitation: 14 to 20 inches

Mean annual air temperature: 46 to 50 degrees F

Frost-free period: 100 to 150 days

Farmland classification: Farmland of statewide importance

Map Unit Composition

Wamic and similar soils: 90 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Wamic

Setting

Landform: Hillslopes

Landform position (two-dimensional): Backslope, footslope

Landform position (three-dimensional): Head slope, side slope

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Volcanic ash and loess over alluvium or colluvium derived from basalt or andesite

Typical profile

H1 - 0 to 7 inches: loam

H2 - 7 to 28 inches: loam

H3 - 28 to 44 inches: loam

H4 - 44 to 54 inches: unweathered bedrock

Properties and qualities

Slope: 20 to 40 percent

Depth to restrictive feature: 40 to 60 inches to lithic bedrock

Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 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 supply, 0 to 60 inches: Moderate (about 7.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 6e

Hydrologic Soil Group: C

Ecological site: R006XA304OR - Loamy 20-40 PZ

Hydric soil rating: No

51D—Wamic-Skyline complex, 2 to 20 percent slopes

Map Unit Setting

National map unit symbol: 23kr

Elevation: 1,000 to 3,600 feet

Mean annual precipitation: 14 to 20 inches

Mean annual air temperature: 46 to 50 degrees F

Frost-free period: 100 to 150 days

Farmland classification: Farmland of statewide importance

Map Unit Composition

Wamic and similar soils: 60 percent

Skyline and similar soils: 20 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Wamic

Setting

Landform: Hillslopes

Landform position (two-dimensional): Summit, backslope

Landform position (three-dimensional): Interfluve, side slope

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Volcanic ash and loess over alluvium or colluvium derived from basalt or andesite

Typical profile

H1 - 0 to 7 inches: loam

H2 - 7 to 28 inches: loam

H3 - 28 to 44 inches: loam

H4 - 44 to 54 inches: unweathered bedrock

Properties and qualities

Slope: 2 to 20 percent

Depth to restrictive feature: 40 to 60 inches to lithic bedrock

Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 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 supply, 0 to 60 inches: Moderate (about 7.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 4e

Hydrologic Soil Group: C

Ecological site: R006XA200OR - South Slopes 14-20 PZ

Hydric soil rating: No

Description of Skyline

Setting

Landform: Hillslopes

Landform position (two-dimensional): Summit, shoulder

Landform position (three-dimensional): Interfluve, nose slope, crest

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Loess, volcanic ash, and colluvium

Typical profile

H1 - 0 to 2 inches: very cobbly loam

H2 - 2 to 9 inches: cobbly loam

H3 - 9 to 14 inches: gravelly loam

H4 - 14 to 24 inches: weathered bedrock

Properties and qualities

Slope: 2 to 20 percent

Depth to restrictive feature: 12 to 20 inches to paralithic bedrock

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: Very low (about 1.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7s

Hydrologic Soil Group: D

Ecological site: R006XA200OR - South Slopes 14-20 PZ

Hydric soil rating: No

52B—Wapinitia variant silt loam, 1 to 7 percent slopes

Map Unit Setting

National map unit symbol: 23ks

Elevation: 1,800 to 3,400 feet

Mean annual precipitation: 13 to 16 inches

Mean annual air temperature: 48 to 50 degrees F

Frost-free period: 120 to 170 days

Farmland classification: Prime farmland if irrigated

Map Unit Composition

Wapinitia, variant, and similar soils: 90 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Wapinitia, Variant

Setting

Landform: Hillslopes
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loess and volcanic ash

Typical profile

H1 - 0 to 12 inches: silt loam
H2 - 12 to 22 inches: silty clay loam
H3 - 22 to 53 inches: clay
H4 - 53 to 57 inches: unweathered bedrock

Properties and qualities

Slope: 1 to 7 percent
Depth to restrictive feature: 40 to 60 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.57 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 9.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: R010XB013OR - JD Shrubby Loam 12-16 PZ
Hydric soil rating: No

54B—Watama-Wapinitia silt loams, 0 to 5 percent slopes

Map Unit Setting

National map unit symbol: 23kv
Elevation: 1,800 to 4,000 feet
Mean annual precipitation: 13 to 16 inches
Mean annual air temperature: 48 to 50 degrees F
Frost-free period: 120 to 170 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Watama and similar soils: 60 percent
Wapinitia and similar soils: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Watama

Setting

Landform: Hillslopes

Landform position (two-dimensional): Summit, shoulder

Landform position (three-dimensional): Interfluvium, nose slope, crest

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Loess and volcanic ash

Typical profile

H1 - 0 to 4 inches: silt loam

H2 - 4 to 10 inches: silt loam

H3 - 10 to 24 inches: loam

H4 - 24 to 34 inches: clay loam

H5 - 34 to 44 inches: unweathered bedrock

Properties and qualities

Slope: 0 to 5 percent

Depth to restrictive feature: 20 to 40 inches to lithic bedrock

Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 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: Moderate (about 6.2 inches)

Interpretive groups

Land capability classification (irrigated): 3s

Land capability classification (nonirrigated): 4s

Hydrologic Soil Group: C

Ecological site: R010XB013OR - JD Shrubby Loam 12-16 PZ

Hydric soil rating: No

Description of Wapinitia

Setting

Landform: Hillslopes

Landform position (two-dimensional): Summit, footslope

Landform position (three-dimensional): Interfluvium, base slope

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Loess and volcanic ash

Typical profile

H1 - 0 to 6 inches: silt loam

H2 - 6 to 19 inches: silt loam

H3 - 19 to 29 inches: silty clay loam

H4 - 29 to 36 inches: fine sandy loam

H5 - 36 to 50 inches: clay loam

H6 - 50 to 60 inches: unweathered bedrock

Properties and qualities

Slope: 0 to 5 percent

Depth to restrictive feature: 40 to 60 inches to lithic bedrock

Drainage class: Well drained

Custom Soil Resource Report

Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 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 supply, 0 to 60 inches: High (about 9.2 inches)

Interpretive groups

Land capability classification (irrigated): 2e

Land capability classification (nonirrigated): 2c

Hydrologic Soil Group: C

Ecological site: R010XB013OR - JD Shrubby Loam 12-16 PZ

Hydric soil rating: No

54C—Watama-Wapinitia silt loams, 5 to 12 percent slopes

Map Unit Setting

National map unit symbol: 23kw

Elevation: 1,800 to 4,000 feet

Mean annual precipitation: 13 to 16 inches

Mean annual air temperature: 48 to 50 degrees F

Frost-free period: 120 to 170 days

Farmland classification: Farmland of statewide importance

Map Unit Composition

Watama and similar soils: 60 percent

Wapinitia and similar soils: 25 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Watama

Setting

Landform: Hillslopes

Landform position (two-dimensional): Summit, shoulder

Landform position (three-dimensional): Interfluve, nose slope, crest

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Loess and volcanic ash

Typical profile

H1 - 0 to 4 inches: silt loam

H2 - 4 to 10 inches: silt loam

H3 - 10 to 24 inches: loam

H4 - 24 to 34 inches: clay loam

H5 - 34 to 44 inches: unweathered bedrock

Properties and qualities

Slope: 5 to 12 percent

Depth to restrictive feature: 20 to 40 inches to lithic bedrock

Drainage class: Well drained

Custom Soil Resource Report

Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 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: Moderate (about 6.2 inches)

Interpretive groups

Land capability classification (irrigated): 3e

Land capability classification (nonirrigated): 4e

Hydrologic Soil Group: C

Ecological site: R010XB013OR - JD Shrubby Loam 12-16 PZ

Hydric soil rating: No

Description of Wapinitia

Setting

Landform: Hillslopes

Landform position (two-dimensional): Summit, footslope

Landform position (three-dimensional): Interfluve, base slope

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Loess and volcanic ash

Typical profile

H1 - 0 to 6 inches: silt loam

H2 - 6 to 19 inches: silt loam

H3 - 19 to 29 inches: silty clay loam

H4 - 29 to 36 inches: fine sandy loam

H5 - 36 to 50 inches: clay loam

H6 - 50 to 60 inches: unweathered bedrock

Properties and qualities

Slope: 5 to 12 percent

Depth to restrictive feature: 40 to 60 inches to lithic bedrock

Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 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 supply, 0 to 60 inches: High (about 9.2 inches)

Interpretive groups

Land capability classification (irrigated): 3e

Land capability classification (nonirrigated): 3e

Hydrologic Soil Group: C

Ecological site: R010XB013OR - JD Shrubby Loam 12-16 PZ

Hydric soil rating: No

54D—Watama-Wapinitia silt loams, 12 to 20 percent slopes

Map Unit Setting

National map unit symbol: 23kx
Elevation: 1,800 to 4,000 feet
Mean annual precipitation: 13 to 16 inches
Mean annual air temperature: 48 to 50 degrees F
Frost-free period: 120 to 170 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Watama and similar soils: 60 percent
Wapinitia and similar soils: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Watama

Setting

Landform: Hillslopes
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Interfluve, nose slope, crest
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loess and volcanic ash

Typical profile

H1 - 0 to 4 inches: silt loam
H2 - 4 to 10 inches: silt loam
H3 - 10 to 24 inches: loam
H4 - 24 to 34 inches: clay loam
H5 - 34 to 44 inches: unweathered bedrock

Properties and qualities

Slope: 12 to 20 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 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: Moderate (about 6.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Ecological site: R010XB013OR - JD Shrubby Loam 12-16 PZ
Hydric soil rating: No

Description of Wapinitia

Setting

Landform: Hillslopes
Landform position (two-dimensional): Summit, footslope
Landform position (three-dimensional): Interfluvium, base slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loess and volcanic ash

Typical profile

H1 - 0 to 6 inches: silt loam
H2 - 6 to 19 inches: silt loam
H3 - 19 to 29 inches: silty clay loam
H4 - 29 to 36 inches: fine sandy loam
H5 - 36 to 50 inches: clay loam
H6 - 50 to 60 inches: unweathered bedrock

Properties and qualities

Slope: 12 to 20 percent
Depth to restrictive feature: 40 to 60 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 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 supply, 0 to 60 inches: High (about 9.2 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: R010XB013OR - JD Shrubby Loam 12-16 PZ
Hydric soil rating: No

54E—Watama-Wapinitia silt loams, 20 to 35 percent slopes

Map Unit Setting

National map unit symbol: 23ky
Elevation: 1,800 to 4,000 feet
Mean annual precipitation: 13 to 16 inches
Mean annual air temperature: 48 to 50 degrees F
Frost-free period: 120 to 170 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Watama and similar soils: 60 percent
Wapinitia and similar soils: 25 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Watama

Setting

Landform: Hillslopes

Landform position (two-dimensional): Summit, shoulder

Landform position (three-dimensional): Interfluve, nose slope, crest

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Loess and volcanic ash

Typical profile

H1 - 0 to 4 inches: silt loam

H2 - 4 to 10 inches: silt loam

H3 - 10 to 24 inches: loam

H4 - 24 to 34 inches: clay loam

H5 - 34 to 44 inches: unweathered bedrock

Properties and qualities

Slope: 20 to 35 percent

Depth to restrictive feature: 20 to 40 inches to lithic bedrock

Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 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: Moderate (about 6.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 6e

Hydrologic Soil Group: C

Ecological site: R008XY220OR - North 10-14 PZ

Hydric soil rating: No

Description of Wapinitia

Setting

Landform: Hillslopes

Landform position (two-dimensional): Summit, footslope

Landform position (three-dimensional): Interfluve, base slope

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Loess and volcanic ash

Typical profile

H1 - 0 to 6 inches: silt loam

H2 - 6 to 19 inches: silt loam

H3 - 19 to 29 inches: silty clay loam

H4 - 29 to 36 inches: fine sandy loam

H5 - 36 to 50 inches: clay loam

H6 - 50 to 60 inches: unweathered bedrock

Properties and qualities

Slope: 20 to 35 percent

Depth to restrictive feature: 40 to 60 inches to lithic bedrock

Custom Soil Resource Report

Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 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 supply, 0 to 60 inches: High (about 9.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 4e

Hydrologic Soil Group: C

Ecological site: R008XY220OR - North 10-14 PZ

Hydric soil rating: No

58E—Mutton gravelly loam, 12 to 30 percent slopes

Map Unit Setting

National map unit symbol: 23l6

Elevation: 2,200 to 3,800 feet

Mean annual precipitation: 16 to 20 inches

Mean annual air temperature: 45 to 48 degrees F

Frost-free period: 90 to 120 days

Farmland classification: Farmland of statewide importance

Map Unit Composition

Mutton and similar soils: 100 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Mutton

Setting

Landform: Mountain slopes

Landform position (two-dimensional): Backslope, footslope

Landform position (three-dimensional): Mountainflank

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Residuum and colluvium derived from tuff, mixed with volcanic ash

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material

H1 - 1 to 9 inches: gravelly loam

H2 - 9 to 18 inches: gravelly loam

H3 - 18 to 37 inches: very gravelly loam

H4 - 37 to 45 inches: extremely gravelly loam

H5 - 45 to 60 inches: extremely stony silty clay loam

Properties and qualities

Slope: 12 to 30 percent

Custom Soil Resource Report

Depth to restrictive feature: More than 80 inches

Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 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: Moderate (about 6.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 6e

Hydrologic Soil Group: B

Ecological site: F006XB802OR - Mesic Xeric North Slopes 15-25 PZ

Hydric soil rating: No

58F—Mutton gravelly loam, 30 to 55 percent slopes

Map Unit Setting

National map unit symbol: 23I7

Elevation: 2,200 to 3,800 feet

Mean annual precipitation: 16 to 20 inches

Mean annual air temperature: 45 to 48 degrees F

Frost-free period: 90 to 120 days

Farmland classification: Farmland of statewide importance

Map Unit Composition

Mutton and similar soils: 100 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Mutton

Setting

Landform: Mountain slopes

Landform position (two-dimensional): Backslope

Landform position (three-dimensional): Mountainflank

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Residuum and colluvium derived from tuff, mixed with volcanic ash

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material

H1 - 1 to 9 inches: gravelly loam

H2 - 9 to 18 inches: gravelly loam

H3 - 18 to 37 inches: very gravelly loam

H4 - 37 to 45 inches: extremely gravelly loam

H5 - 45 to 60 inches: extremely stony silty clay loam

Properties and qualities

Slope: 30 to 55 percent

Depth to restrictive feature: More than 80 inches

Custom Soil Resource Report

Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 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: Moderate (about 6.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 6e

Hydrologic Soil Group: B

Ecological site: F006XB802OR - Mesic Xeric North Slopes 15-25 PZ

Hydric soil rating: No

59D—Rockly extremely gravelly silt loam, 2 to 20 percent slopes

Map Unit Setting

National map unit symbol: 23l8

Elevation: 2,400 to 3,000 feet

Mean annual precipitation: 12 to 16 inches

Mean annual air temperature: 48 to 50 degrees F

Frost-free period: 100 to 140 days

Farmland classification: Not prime farmland

Map Unit Composition

Rockly and similar soils: 100 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Rockly

Setting

Landform: Mesas

Landform position (two-dimensional): Summit

Landform position (three-dimensional): Interfluve

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Colluvium derived from basalt mixed with loess

Typical profile

H1 - 0 to 3 inches: extremely gravelly silt loam

H2 - 3 to 7 inches: very cobbly silt loam

H3 - 7 to 9 inches: extremely cobbly silty clay loam

H4 - 9 to 19 inches: unweathered bedrock

Properties and qualities

Slope: 2 to 20 percent

Depth to restrictive feature: 4 to 10 inches to lithic bedrock

Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)

Depth to water table: More than 80 inches

Custom Soil Resource Report

Frequency of flooding: None

Frequency of ponding: None

Available water supply, 0 to 60 inches: Very low (about 0.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7s

Hydrologic Soil Group: D

Ecological site: R009XY025OR - Very Shallow 14-18 PZ

Hydric soil rating: No

W—Water

Map Unit Composition

Water: 100 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Soil Information for All Uses

Suitabilities and Limitations for Use

The Suitabilities and Limitations for Use section includes various soil interpretations displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each interpretation.

Building Site Development

Building site development interpretations are designed to be used as tools for evaluating soil suitability and identifying soil limitations for various construction purposes. As part of the interpretation process, the rating applies to each soil in its described condition and does not consider present land use. Example interpretations can include corrosion of concrete and steel, shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping.

Corrosion of Concrete

ENG

Engineering

AGR

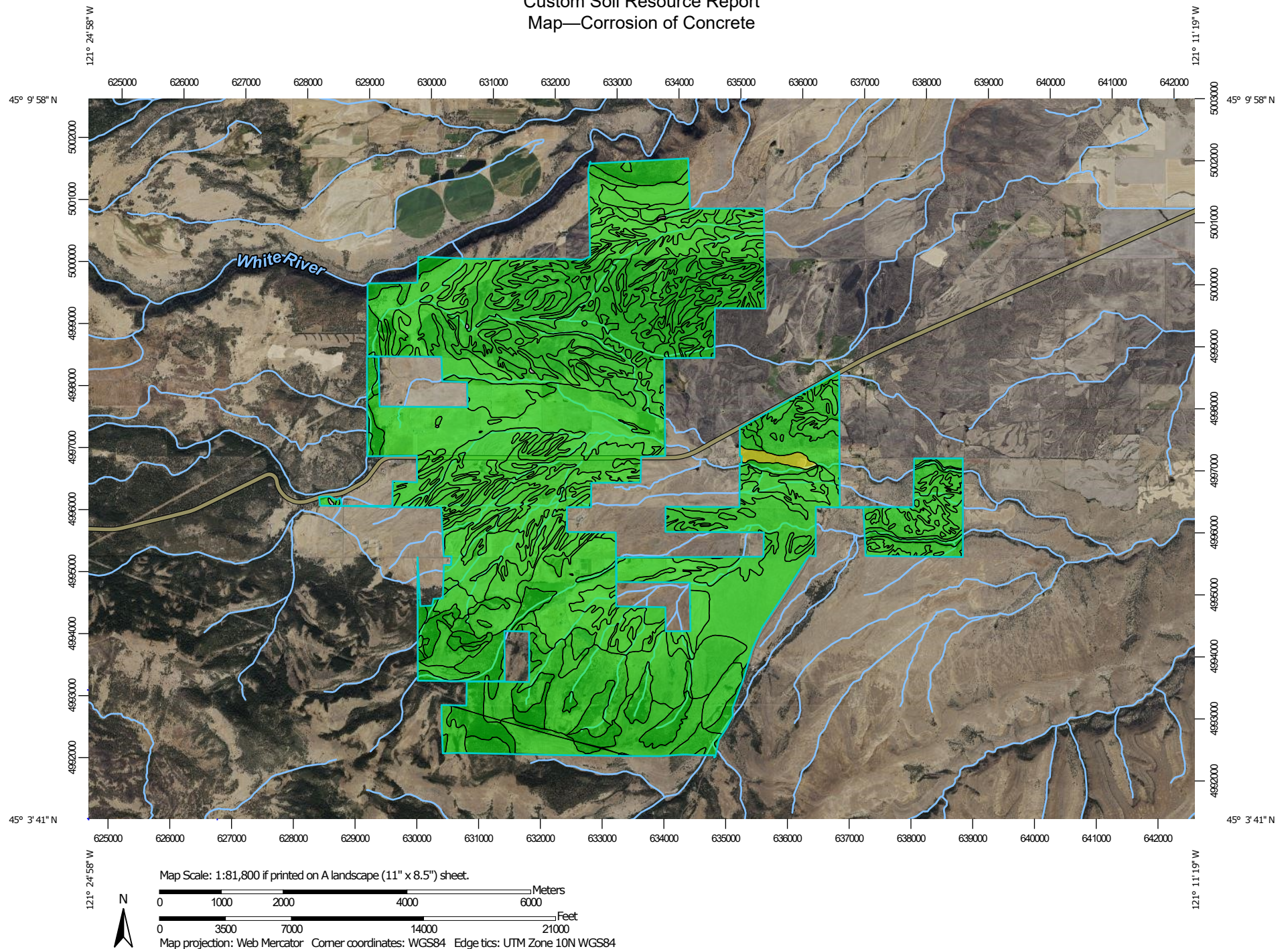
Agronomy

"Risk of corrosion" pertains to potential soil-induced electrochemical or chemical action that corrodes or weakens concrete. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors results in a severe hazard of corrosion. The concrete in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than the concrete in installations that are entirely within one kind of soil or within one soil layer.

Custom Soil Resource Report

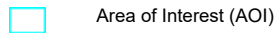
The risk of corrosion is expressed as "low," "moderate," or "high."

Custom Soil Resource Report Map—Corrosion of Concrete



MAP LEGEND

Area of Interest (AOI)



Area of Interest (AOI)

Background



Aerial Photography

Soils

Soil Rating Polygons



High



Moderate



Low



Not rated or not available

Soil Rating Lines



High



Moderate



Low



Not rated or not available

Soil Rating Points



High



Moderate



Low



Not rated or not available

Water Features



Streams and Canals

Transportation



Rails



Interstate Highways



US Routes



Major Roads



Local Roads

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at scales ranging from 1:20,000 to 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: Warm Springs Indian Reservation, Oregon

Survey Area Data: Version 19, Aug 30, 2024

Soil Survey Area: Wasco County, Oregon, Northern Part

Survey Area Data: Version 19, Aug 30, 2024

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

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

Date(s) aerial images were photographed: Sep 16, 2022—Sep 26, 2022

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background

MAP LEGEND

MAP INFORMATION

imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Table—Corrosion of Concrete

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
11	Boardflower loam, 2 to 20 percent slopes	Low	41.8	0.4%
12	Bodell very cobbly loam, 30 to 55 percent slopes	Low	4.3	0.0%
57	Jorn-Bodell complex, 30 to 55 percent slopes	Low	0.6	0.0%
85	Mutton gravelly loam, 12 to 30 percent slopes	Low	16.3	0.1%
86	Mutton gravelly loam, 30 to 55 percent slopes	Low	79.5	0.7%
113	Rockly extremely gravelly silt loam, 2 to 20 percent slopes	Low	152.4	1.3%
Subtotals for Soil Survey Area			294.9	2.6%
Totals for Area of Interest			11,372.3	100.0%

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
2D	Bakeoven very cobbly loam, 2 to 20 percent slopes	Low	501.1	4.4%
4C	Bakeoven-Maupin complex, 0 to 12 percent slopes	Low	465.9	4.1%
5C	Bakeoven-Watama complex, 0 to 12 percent slopes	Low	3,505.3	30.8%
6E	Bald cobbly loam, 5 to 45 percent slopes	Low	322.3	2.8%
10E	Bodell cobbly loam, 5 to 45 percent slopes	Low	521.9	4.6%
11F	Bodell very cobbly loam, 45 to 75 percent slopes	Low	35.5	0.3%
27F	Hesslan complex, 30 to 70 percent slopes	Low	149.2	1.3%
28E	Hesslan-Skyline complex, 5 to 40 percent slopes	Low	82.6	0.7%
29E	Ketchly loam, 3 to 30 percent slopes	Low	104.3	0.9%
29F	Ketchly loam, 30 to 65 percent slopes	Low	28.8	0.3%
30E	Lickskillet very stony loam, 15 to 40 percent slopes	Low	22.9	0.2%

Custom Soil Resource Report

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
32A	Maupin loam, 0 to 5 percent slopes	Low	199.9	1.8%
35	Pedigo silt loam	Moderate	53.6	0.5%
40E	Sherar cobbly loam, 5 to 45 percent slopes	Low	25.3	0.2%
42F	Sinamox silt loam, 45 to 70 percent slopes	Low	34.1	0.3%
43F	Skyline-Hesslan complex, 40 to 65 percent slopes	Low	1.5	0.0%
44	Tygh fine sandy loam	Low	36.1	0.3%
49B	Wamic loam, 1 to 5 percent slopes	Low	138.4	1.2%
49C	Wamic loam 5 to 12 percent north slopes	Low	6.5	0.1%
50E	Wamic loam, 20 to 40 percent slopes	Low	3.9	0.0%
51D	Wamic-Skyline complex, 2 to 20 percent slopes	Low	50.5	0.4%
52B	Wapinitia variant silt loam, 1 to 7 percent slopes	Low	1,061.8	9.3%
54B	Watama-Wapinitia silt loams, 0 to 5 percent slopes	Low	3,218.9	28.3%
54C	Watama-Wapinitia silt loams, 5 to 12 percent slopes	Low	37.7	0.3%
54D	Watama-Wapinitia silt loams, 12 to 20 percent slopes	Low	19.9	0.2%
54E	Watama-Wapinitia silt loams, 20 to 35 percent slopes	Low	6.4	0.1%
58E	Mutton gravelly loam, 12 to 30 percent slopes	Low	95.3	0.8%
58F	Mutton gravelly loam, 30 to 55 percent slopes	Low	152.6	1.3%
59D	Rockly extremely gravelly silt loam, 2 to 20 percent slopes	Low	189.2	1.7%
W	Water		5.9	0.1%
Subtotals for Soil Survey Area			11,077.4	97.4%
Totals for Area of Interest			11,372.3	100.0%

Rating Options—Corrosion of Concrete

Aggregation Method: Dominant Condition

Aggregation is the process by which a set of component attribute values is reduced to a single value that represents the map unit as a whole.

A map unit is typically composed of one or more "components". A component is either some type of soil or some nonsoil entity, e.g., rock outcrop. For the attribute being aggregated, the first step of the aggregation process is to derive one attribute value for each of a map unit's components. From this set of component attributes, the next step of the aggregation process derives a single value that represents the map unit as a whole. Once a single value for each map unit is derived, a thematic map for soil map units can be rendered. Aggregation must be done because, on any soil map, map units are delineated but components are not.

For each of a map unit's components, a corresponding percent composition is recorded. A percent composition of 60 indicates that the corresponding component typically makes up approximately 60% of the map unit. Percent composition is a critical factor in some, but not all, aggregation methods.

The aggregation method "Dominant Condition" first groups like attribute values for the components in a map unit. For each group, percent composition is set to the sum of the percent composition of all components participating in that group. These groups now represent "conditions" rather than components. The attribute value associated with the group with the highest cumulative percent composition is returned. If more than one group shares the highest cumulative percent composition, the corresponding "tie-break" rule determines which value should be returned. The "tie-break" rule indicates whether the lower or higher group value should be returned in the case of a percent composition tie. The result returned by this aggregation method represents the dominant condition throughout the map unit only when no tie has occurred.

Component Percent Cutoff: None Specified

Components whose percent composition is below the cutoff value will not be considered. If no cutoff value is specified, all components in the database will be considered. The data for some contrasting soils of minor extent may not be in the database, and therefore are not considered.

Tie-break Rule: Higher

The tie-break rule indicates which value should be selected from a set of multiple candidate values, or which value should be selected in the event of a percent composition tie.

Corrosion of Steel

ENG

Engineering

AGR

Agronomy

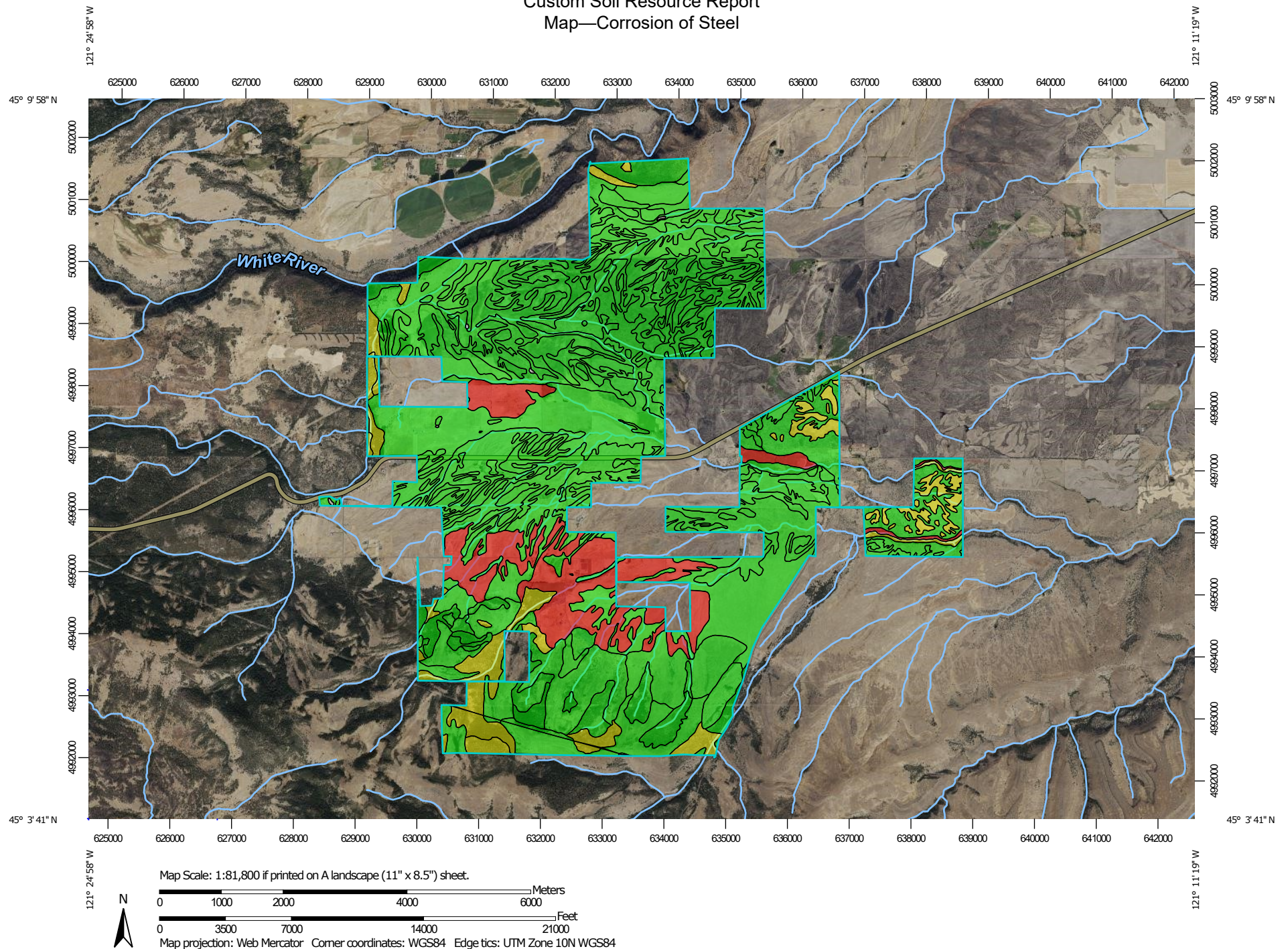
"Risk of corrosion" pertains to potential soil-induced electrochemical or chemical action that corrodes or weakens uncoated steel. The rate of corrosion of uncoated

Custom Soil Resource Report

steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. Special site examination and design may be needed if the combination of factors results in a severe hazard of corrosion. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than the steel in installations that are entirely within one kind of soil or within one soil layer.

The risk of corrosion is expressed as "low," "moderate," or "high."

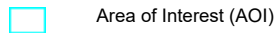
Custom Soil Resource Report Map—Corrosion of Steel



Custom Soil Resource Report

MAP LEGEND

Area of Interest (AOI)



Area of Interest (AOI)

Background



Aerial Photography

Soils

Soil Rating Polygons



High



Moderate



Low



Not rated or not available

Soil Rating Lines



High



Moderate



Low



Not rated or not available

Soil Rating Points



High



Moderate



Low



Not rated or not available

Water Features



Streams and Canals

Transportation



Rails



Interstate Highways



US Routes



Major Roads



Local Roads

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at scales ranging from 1:20,000 to 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: Warm Springs Indian Reservation, Oregon

Survey Area Data: Version 19, Aug 30, 2024

Soil Survey Area: Wasco County, Oregon, Northern Part

Survey Area Data: Version 19, Aug 30, 2024

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

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

Date(s) aerial images were photographed: Sep 16, 2022—Sep 26, 2022

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background

MAP LEGEND

MAP INFORMATION

imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Table—Corrosion of Steel

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
11	Boardflower loam, 2 to 20 percent slopes	Moderate	41.8	0.4%
12	Bodell very cobbly loam, 30 to 55 percent slopes	Low	4.3	0.0%
57	Jorn-Bodell complex, 30 to 55 percent slopes	High	0.6	0.0%
85	Mutton gravelly loam, 12 to 30 percent slopes	Moderate	16.3	0.1%
86	Mutton gravelly loam, 30 to 55 percent slopes	Moderate	79.5	0.7%
113	Rockly extremely gravelly silt loam, 2 to 20 percent slopes	Low	152.4	1.3%
Subtotals for Soil Survey Area			294.9	2.6%
Totals for Area of Interest			11,372.3	100.0%

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
2D	Bakeoven very cobbly loam, 2 to 20 percent slopes	Low	501.1	4.4%
4C	Bakeoven-Maupin complex, 0 to 12 percent slopes	Low	465.9	4.1%
5C	Bakeoven-Watama complex, 0 to 12 percent slopes	Low	3,505.3	30.8%
6E	Bald cobbly loam, 5 to 45 percent slopes	Low	322.3	2.8%
10E	Bodell cobbly loam, 5 to 45 percent slopes	Low	521.9	4.6%
11F	Bodell very cobbly loam, 45 to 75 percent slopes	Low	35.5	0.3%
27F	Hesslan complex, 30 to 70 percent slopes	Low	149.2	1.3%
28E	Hesslan-Skyline complex, 5 to 40 percent slopes	Low	82.6	0.7%
29E	Ketchly loam, 3 to 30 percent slopes	Low	104.3	0.9%
29F	Ketchly loam, 30 to 65 percent slopes	Low	28.8	0.3%
30E	Lickskillet very stony loam, 15 to 40 percent slopes	Moderate	22.9	0.2%

Custom Soil Resource Report

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
32A	Maupin loam, 0 to 5 percent slopes	Moderate	199.9	1.8%
35	Pedigo silt loam	High	53.6	0.5%
40E	Sherar cobbly loam, 5 to 45 percent slopes	High	25.3	0.2%
42F	Sinamox silt loam, 45 to 70 percent slopes	Moderate	34.1	0.3%
43F	Skyline-Hesslan complex, 40 to 65 percent slopes	Low	1.5	0.0%
44	Tygh fine sandy loam	Low	36.1	0.3%
49B	Wamic loam, 1 to 5 percent slopes	Moderate	138.4	1.2%
49C	Wamic loam 5 to 12 percent north slopes	Moderate	6.5	0.1%
50E	Wamic loam, 20 to 40 percent slopes	Moderate	3.9	0.0%
51D	Wamic-Skyline complex, 2 to 20 percent slopes	Moderate	50.5	0.4%
52B	Wapinitia variant silt loam, 1 to 7 percent slopes	High	1,061.8	9.3%
54B	Watama-Wapinitia silt loams, 0 to 5 percent slopes	Low	3,218.9	28.3%
54C	Watama-Wapinitia silt loams, 5 to 12 percent slopes	Low	37.7	0.3%
54D	Watama-Wapinitia silt loams, 12 to 20 percent slopes	Low	19.9	0.2%
54E	Watama-Wapinitia silt loams, 20 to 35 percent slopes	Low	6.4	0.1%
58E	Mutton gravelly loam, 12 to 30 percent slopes	Moderate	95.3	0.8%
58F	Mutton gravelly loam, 30 to 55 percent slopes	Moderate	152.6	1.3%
59D	Rockly extremely gravelly silt loam, 2 to 20 percent slopes	Low	189.2	1.7%
W	Water		5.9	0.1%
Subtotals for Soil Survey Area			11,077.4	97.4%
Totals for Area of Interest			11,372.3	100.0%

Rating Options—Corrosion of Steel

Aggregation Method: Dominant Condition

Aggregation is the process by which a set of component attribute values is reduced to a single value that represents the map unit as a whole.

A map unit is typically composed of one or more "components". A component is either some type of soil or some nonsoil entity, e.g., rock outcrop. For the attribute being aggregated, the first step of the aggregation process is to derive one attribute value for each of a map unit's components. From this set of component attributes, the next step of the aggregation process derives a single value that represents the map unit as a whole. Once a single value for each map unit is derived, a thematic map for soil map units can be rendered. Aggregation must be done because, on any soil map, map units are delineated but components are not.

For each of a map unit's components, a corresponding percent composition is recorded. A percent composition of 60 indicates that the corresponding component typically makes up approximately 60% of the map unit. Percent composition is a critical factor in some, but not all, aggregation methods.

The aggregation method "Dominant Condition" first groups like attribute values for the components in a map unit. For each group, percent composition is set to the sum of the percent composition of all components participating in that group. These groups now represent "conditions" rather than components. The attribute value associated with the group with the highest cumulative percent composition is returned. If more than one group shares the highest cumulative percent composition, the corresponding "tie-break" rule determines which value should be returned. The "tie-break" rule indicates whether the lower or higher group value should be returned in the case of a percent composition tie. The result returned by this aggregation method represents the dominant condition throughout the map unit only when no tie has occurred.

Component Percent Cutoff: None Specified

Components whose percent composition is below the cutoff value will not be considered. If no cutoff value is specified, all components in the database will be considered. The data for some contrasting soils of minor extent may not be in the database, and therefore are not considered.

Tie-break Rule: Higher

The tie-break rule indicates which value should be selected from a set of multiple candidate values, or which value should be selected in the event of a percent composition tie.

Shallow Excavations

ENG - Engineering

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for graves, utility lines, open ditches, or other purposes. The ratings are based on the soil properties that influence the ease of digging and the resistance to sloughing. Depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, the amount of large stones, and dense layers influence the ease of digging, filling, and compacting. Depth to the seasonal high water table, flooding, and ponding may restrict the period when excavations can be made. Slope

influences the ease of using machinery. Soil texture, depth to the water table, and linear extensibility (shrink-swell potential) influence the resistance to sloughing.

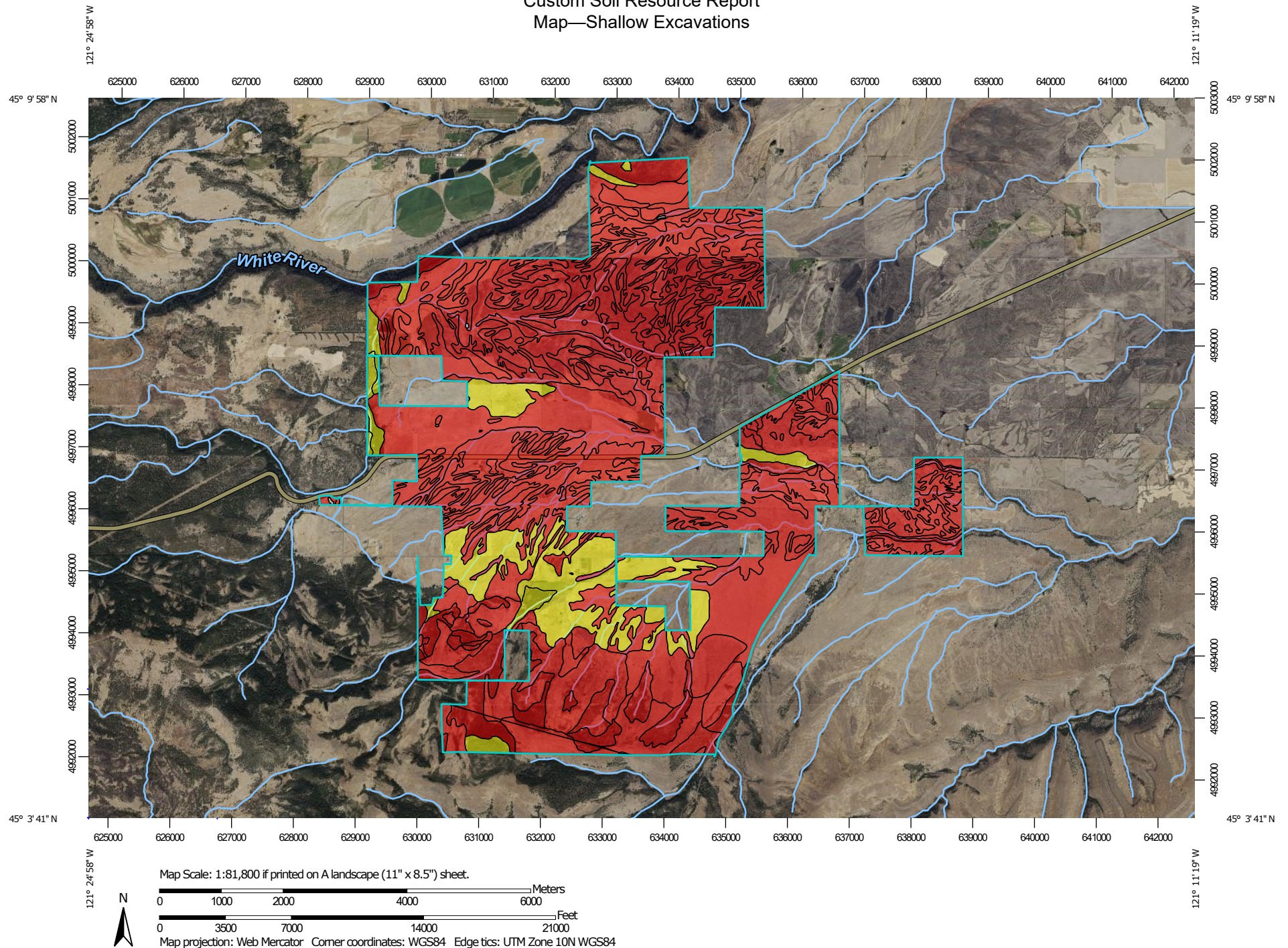
The ratings are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect the specified use. "Not limited" indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. "Somewhat limited" indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. "Very limited" indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

The map unit components listed for each map unit in the accompanying Summary by Map Unit table in Web Soil Survey or the Aggregation Report in Soil Data Viewer are determined by the aggregation method chosen. An aggregated rating class is shown for each map unit. The components listed for each map unit are only those that have the same rating class as listed for the map unit. The percent composition of each component in a particular map unit is presented to help the user better understand the percentage of each map unit that has the rating presented.

Other components with different ratings may be present in each map unit. The ratings for all components, regardless of the map unit aggregated rating, can be viewed by generating the equivalent report from the Soil Reports tab in Web Soil Survey or from the Soil Data Mart site. Onsite investigation may be needed to validate these interpretations and to confirm the identity of the soil on a given site.

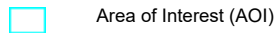
Custom Soil Resource Report Map—Shallow Excavations



Custom Soil Resource Report

MAP LEGEND

Area of Interest (AOI)



Area of Interest (AOI)

Background



Aerial Photography

Soils

Soil Rating Polygons



Very limited



Somewhat limited



Not limited



Not rated or not available

Soil Rating Lines



Very limited



Somewhat limited



Not limited



Not rated or not available

Soil Rating Points



Very limited



Somewhat limited



Not limited



Not rated or not available

Water Features



Streams and Canals

Transportation



Rails



Interstate Highways



US Routes



Major Roads



Local Roads

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at scales ranging from 1:20,000 to 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: Warm Springs Indian Reservation, Oregon

Survey Area Data: Version 19, Aug 30, 2024

Soil Survey Area: Wasco County, Oregon, Northern Part

Survey Area Data: Version 19, Aug 30, 2024

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

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

Date(s) aerial images were photographed: Sep 16, 2022—Sep 26, 2022

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background

MAP LEGEND

MAP INFORMATION

imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Tables—Shallow Excavations

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
11	Boardflower loam, 2 to 20 percent slopes	Somewhat limited	Boardflower (85%)	Slope (0.37)	41.8	0.4%
				Dusty (0.14)		
				Too clayey (0.13)		
				Unstable excavation walls (0.01)		
12	Bodell very cobbly loam, 30 to 55 percent slopes	Very limited	Bodell (85%)	Depth to hard bedrock (1.00)	4.3	0.0%
				Slope (1.00)		
				Dusty (0.16)		
				Unstable excavation walls (0.01)		
57	Jorn-Bodell complex, 30 to 55 percent slopes	Very limited	Jorn (50%)	Slope (1.00)	0.6	0.0%
				Depth to soft bedrock (0.90)		
				Unstable excavation walls (0.51)		
				Dusty (0.25)		
				Too clayey (0.13)		
			Bodell (35%)	Depth to hard bedrock (1.00)		
				Slope (1.00)		
				Dusty (0.16)		
				Unstable excavation walls (0.01)		
85	Mutton gravelly loam, 12 to 30 percent slopes	Very limited	Mutton (80%)	Slope (1.00)	16.3	0.1%
				Dusty (0.15)		
				Unstable excavation walls (0.01)		
86	Mutton gravelly loam, 30 to 55 percent slopes	Very limited	Mutton (85%)	Slope (1.00)	79.5	0.7%
				Dusty (0.15)		
				Unstable excavation walls (0.01)		
113	Rockly extremely gravelly silt loam, 2 to 20 percent slopes	Very limited	Rockly (90%)	Depth to hard bedrock (1.00)	152.4	1.3%
				Large stones (0.88)		

Custom Soil Resource Report

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
				Dusty (0.47)		
				Slope (0.37)		
				Unstable excavation walls (0.01)		
Subtotals for Soil Survey Area					294.9	2.6%
Totals for Area of Interest					11,372.3	100.0%

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
2D	Bakeoven very cobbly loam, 2 to 20 percent slopes	Very limited	Bakeoven (85%)	Depth to hard bedrock (1.00)	501.1	4.4%
				Large stones (0.56)		
				Slope (0.37)		
				Dusty (0.32)		
				Unstable excavation walls (0.01)		
4C	Bakeoven-Maupin complex, 0 to 12 percent slopes	Very limited	Bakeoven (65%)	Depth to hard bedrock (1.00)	465.9	4.1%
				Large stones (0.56)		
				Dusty (0.32)		
				Unstable excavation walls (0.01)		
			Maupin (20%)	Depth to hard bedrock (1.00)		
				Depth to thin cemented pan (0.35)		
				Dusty (0.28)		
				Unstable excavation walls (0.01)		
5C	Bakeoven-Watama complex, 0 to 12 percent slopes	Very limited	Bakeoven (65%)	Depth to hard bedrock (1.00)	3,505.3	30.8%
				Large stones (0.56)		
				Dusty (0.32)		
				Unstable excavation walls (0.01)		
			Watama (20%)	Depth to hard bedrock (1.00)		

Custom Soil Resource Report

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
				Dusty (0.35)		
				Unstable excavation walls (0.01)		
6E	Bald cobbly loam, 5 to 45 percent slopes	Very limited	Bald (85%)	Depth to hard bedrock (1.00)	322.3	2.8%
				Slope (1.00)		
				Large stones (0.64)		
				Dusty (0.12)		
				Unstable excavation walls (0.01)		
10E	Bodell cobbly loam, 5 to 45 percent slopes	Very limited	Bodell (85%)	Depth to hard bedrock (1.00)	521.9	4.6%
				Large stones (1.00)		
				Slope (1.00)		
				Dusty (0.12)		
				Unstable excavation walls (0.01)		
11F	Bodell very cobbly loam, 45 to 75 percent slopes	Very limited	Bodell (85%)	Depth to hard bedrock (1.00)	35.5	0.3%
				Slope (1.00)		
				Large stones (1.00)		
				Dusty (0.12)		
				Unstable excavation walls (0.01)		
27F	Hesslan complex, 30 to 70 percent slopes	Very limited	Hesslan, stony (60%)	Slope (1.00)	149.2	1.3%
				Depth to soft bedrock (0.95)		
				Dusty (0.16)		
				Unstable excavation walls (0.01)		
			Hesslan (20%)	Slope (1.00)		
				Depth to soft bedrock (0.95)		
				Dusty (0.16)		
				Unstable excavation walls (0.01)		
28E	Hesslan-Skyline complex, 5 to	Very limited	Hesslan (45%)	Slope (1.00)	82.6	0.7%

Custom Soil Resource Report

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
	40 percent slopes			Depth to soft bedrock (0.95)		
				Dusty (0.16)		
				Unstable excavation walls (0.01)		
			Skyline (35%)	Depth to soft bedrock (1.00)		
				Slope (1.00)		
				Dusty (0.16)		
				Large stones (0.06)		
				Unstable excavation walls (0.01)		
29E	Ketchly loam, 3 to 30 percent slopes	Very limited	Ketchly (85%)	Slope (1.00)	104.3	0.9%
				Depth to hard bedrock (0.84)		
				Dusty (0.02)		
				Unstable excavation walls (0.01)		
29F	Ketchly loam, 30 to 65 percent slopes	Very limited	Ketchly (85%)	Slope (1.00)	28.8	0.3%
				Depth to hard bedrock (0.84)		
				Dusty (0.02)		
				Unstable excavation walls (0.01)		
30E	Lickskillet very stony loam, 15 to 40 percent slopes	Very limited	Lickskillet (85%)	Depth to hard bedrock (1.00)	22.9	0.2%
				Slope (1.00)		
				Dusty (0.29)		
				Large stones (0.08)		
				Unstable excavation walls (0.01)		
32A	Maupin loam, 0 to 5 percent slopes	Very limited	Maupin (90%)	Depth to hard bedrock (1.00)	199.9	1.8%
				Depth to thin cemented pan (0.35)		
				Dusty (0.28)		
				Unstable excavation walls (0.01)		

Custom Soil Resource Report

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
35	Pedigo silt loam	Somewhat limited	Pedigo (90%)	Depth to saturated zone (0.95)	53.6	0.5%
				Flooding (0.80)		
				Dusty (0.50)		
				Unstable excavation walls (0.01)		
40E	Sherar cobbly loam, 5 to 45 percent slopes	Very limited	Sherar (85%)	Slope (1.00)	25.3	0.2%
				Unstable excavation walls (0.51)		
				Dusty (0.39)		
				Too clayey (0.13)		
				Depth to soft bedrock (0.10)		
42F	Sinamox silt loam, 45 to 70 percent slopes	Very limited	Sinamox (85%)	Slope (1.00)	34.1	0.3%
				Dusty (0.40)		
				Unstable excavation walls (0.01)		
				Too clayey (0.01)		
43F	Skyline-Hesslan complex, 40 to 65 percent slopes	Very limited	Skyline (60%)	Depth to soft bedrock (1.00)	1.5	0.0%
				Slope (1.00)		
				Dusty (0.15)		
				Large stones (0.06)		
				Unstable excavation walls (0.01)		
			Hesslan (20%)	Slope (1.00)		
				Depth to soft bedrock (0.95)		
				Dusty (0.14)		
				Unstable excavation walls (0.01)		
44	Tygh fine sandy loam	Very limited	Tygh (90%)	Depth to saturated zone (1.00)	36.1	0.3%
				Flooding (0.80)		
				Dusty (0.06)		
				Unstable excavation walls (0.01)		

Custom Soil Resource Report

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
49B	Wamic loam, 1 to 5 percent slopes	Somewhat limited	Wamic (95%)	Depth to hard bedrock (0.88)	138.4	1.2%
				Dusty (0.18)		
				Unstable excavation walls (0.01)		
49C	Wamic loam 5 to 12 percent north slopes	Somewhat limited	Wamic, north (90%)	Depth to hard bedrock (0.88)	6.5	0.1%
				Dusty (0.18)		
				Slope (0.04)		
50E	Wamic loam, 20 to 40 percent slopes	Very limited	Wamic (90%)	Unstable excavation walls (0.01)	3.9	0.0%
				Slope (1.00)		
				Depth to hard bedrock (0.88)		
51D	Wamic-Skyline complex, 2 to 20 percent slopes	Somewhat limited	Wamic (60%)	Dusty (0.18)	50.5	0.4%
				Unstable excavation walls (0.01)		
				Slope (0.37)		
52B	Wapinitia variant silt loam, 1 to 7 percent slopes	Somewhat limited	Wapinitia, variant (90%)	Depth to hard bedrock (0.18)	1,061.8	9.3%
				Too clayey (0.13)		
				Unstable excavation walls (0.14)		
54B	Watama-Wapinitia silt loams, 0 to 5 percent slopes	Very limited	Watama (60%)	Depth to hard bedrock (1.00)	3,218.9	28.3%
				Dusty (0.33)		
				Unstable excavation walls (0.01)		
54C	Watama-Wapinitia silt loams, 5 to 12 percent slopes	Very limited	Watama (60%)	Depth to hard bedrock (1.00)	37.7	0.3%
				Dusty (0.33)		
				Slope (0.04)		

Custom Soil Resource Report

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
				Unstable excavation walls (0.01)		
54D	Watama-Wapinitia silt loams, 12 to 20 percent slopes	Very limited	Watama (60%)	Depth to hard bedrock (1.00)	19.9	0.2%
				Slope (1.00)		
				Dusty (0.33)		
				Unstable excavation walls (0.01)		
			Wapinitia (25%)	Slope (1.00)		
				Depth to hard bedrock (0.42)		
				Dusty (0.41)		
				Unstable excavation walls (0.01)		
54E	Watama-Wapinitia silt loams, 20 to 35 percent slopes	Very limited	Watama (60%)	Slope (1.00)	6.4	0.1%
				Depth to hard bedrock (1.00)		
				Dusty (0.33)		
				Unstable excavation walls (0.01)		
			Wapinitia (25%)	Slope (1.00)		
				Depth to hard bedrock (0.42)		
				Dusty (0.41)		
				Unstable excavation walls (0.01)		
58E	Mutton gravelly loam, 12 to 30 percent slopes	Very limited	Mutton (100%)	Slope (1.00)	95.3	0.8%
				Dusty (0.15)		
				Unstable excavation walls (0.01)		
58F	Mutton gravelly loam, 30 to 55 percent slopes	Very limited	Mutton (100%)	Slope (1.00)	152.6	1.3%
				Dusty (0.15)		
				Unstable excavation walls (0.01)		
59D	Rockly extremely gravelly silt loam, 2 to 20 percent slopes	Very limited	Rockly (100%)	Depth to hard bedrock (1.00)	189.2	1.7%
				Large stones (0.88)		
				Dusty (0.46)		

Custom Soil Resource Report

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
				Slope (0.37)		
				Unstable excavation walls (0.01)		
W	Water	Not rated	Water (100%)		5.9	0.1%
Subtotals for Soil Survey Area					11,077.4	97.4%
Totals for Area of Interest					11,372.3	100.0%

Rating	Acres in AOI	Percent of AOI
Very limited	10,013.8	88.1%
Somewhat limited	1,352.5	11.9%
Null or Not Rated	5.9	0.1%
Totals for Area of Interest	11,372.3	100.0%

Rating Options—Shallow Excavations

Aggregation Method: Dominant Condition

Aggregation is the process by which a set of component attribute values is reduced to a single value that represents the map unit as a whole.

A map unit is typically composed of one or more "components". A component is either some type of soil or some nonsoil entity, e.g., rock outcrop. For the attribute being aggregated, the first step of the aggregation process is to derive one attribute value for each of a map unit's components. From this set of component attributes, the next step of the aggregation process derives a single value that represents the map unit as a whole. Once a single value for each map unit is derived, a thematic map for soil map units can be rendered. Aggregation must be done because, on any soil map, map units are delineated but components are not.

For each of a map unit's components, a corresponding percent composition is recorded. A percent composition of 60 indicates that the corresponding component typically makes up approximately 60% of the map unit. Percent composition is a critical factor in some, but not all, aggregation methods.

The aggregation method "Dominant Condition" first groups like attribute values for the components in a map unit. For each group, percent composition is set to the sum of the percent composition of all components participating in that group. These groups now represent "conditions" rather than components. The attribute value associated with the group with the highest cumulative percent composition is returned. If more than one group shares the highest cumulative percent composition, the corresponding "tie-break" rule determines which value should be returned. The "tie-break" rule indicates whether the lower or higher group value should be returned in the case of a percent composition tie. The result returned by this aggregation method represents the dominant condition throughout the map unit only when no tie has occurred.

Custom Soil Resource Report

Component Percent Cutoff: None Specified

Components whose percent composition is below the cutoff value will not be considered. If no cutoff value is specified, all components in the database will be considered. The data for some contrasting soils of minor extent may not be in the database, and therefore are not considered.

Tie-break Rule: Higher

The tie-break rule indicates which value should be selected from a set of multiple candidate values, or which value should be selected in the event of a percent composition tie.

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Custom Soil Resource Report

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United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210. http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052290.pdf

Attachment I

Investigation Photo Log



Media 1: TP-SS-02

Media 2: BESS-02

Weather: Partly Cloudy

Weather: Partly Cloudy

Lat/Lng: 45.0885, -121.282

Taken By: Miranda Bisho

Bearing: E

Tags: Test Pit

Date Taken: 10/16/2024

Lat/Lng: 45.0898, -121.282

Taken By: Miranda Bisho

Bearing: E

Tags: Test Pit

Date Taken: 10/16/2024



Media 3: TP-Bess-02

Media 4: BESS-01a (right) BESS-01 (left)

Weather: Partly Cloudy

Weather: Partly Cloudy

Lat/Lng: 45.0898, -121.282

Taken By: Miranda Bisho

Bearing: SE

Tags: Test Pit

Date Taken: 10/16/2024

Lat/Lng: 45.0907, -121.284

Taken By: Miranda Bisho

Bearing: NW

Tags: Test Pit

Date Taken: 10/16/2024



Project Name: Brightnight - Deschutes

Project Location: 3MPR+Q2 Pine Grove, OR, USA

Client:

Project Code:

Preparer: Sanjay Nanda

Reviewer: Miranda Bishop

Report Date: 2024-10-24

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Media 5:

Media 6: TP-BESS-01

Weather: Cloudy

Weather: Partly Cloudy

Lat/Lng: 45.0908, -121.284

Taken By: Miranda Bisho

Lat/Lng: 45.0908, -121.284

Taken By: Miranda Bisho

Bearing: N

Tags: Site Conditions, From
Gallery

Bearing: SW

Tags: Test Pit

Date Taken: 10/16/2024

Date Taken: 10/16/2024



Media 7: TP_SS-01

Media 8: SS-03

Weather: Partly Cloudy

Weather: Overcast

Lat/Lng: 45.0890, -121.284

Taken By: Miranda Bisho

Lat/Lng: 45.0879, -121.285

Taken By: Miranda Bisho

Bearing: S

Tags: Test Pit

Bearing: SW

Tags: Test Pit

Date Taken: 10/16/2024

Date Taken: 10/16/2024



Project Name: Brightnight - Deschutes

Project Location: 3MPR+Q2 Pine Grove, OR, USA

Client:

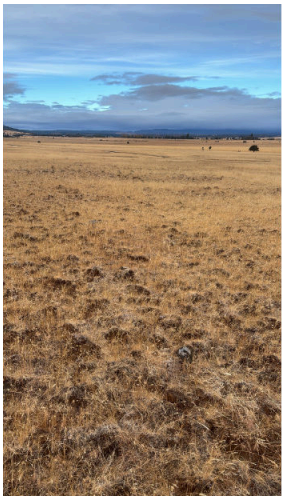
Project Code:

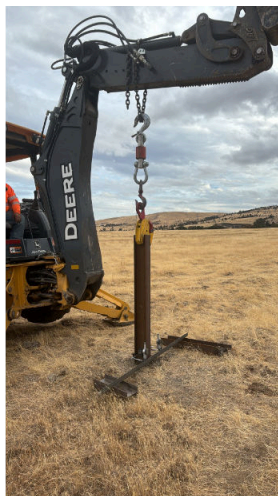
Preparer: Sanjay Nanda

Reviewer: Miranda Bishop

Report Date: 2024-10-24

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Media 9: TP-SS-03 pre		Media 10: Plt-13	
Weather: Overcast		Weather: Overcast	
Lat/Lng: 45.0879, -121.285 Bearing: W Date Taken: 10/16/2024	Taken By: Miranda Bisho Tags: Site Conditions	Lat/Lng: 45.0931, -121.279 Bearing: W Date Taken: 10/16/2024	Taken By: Miranda Bisho Tags: Extraction
			
Media 11: PLT-13 had to cut pile off at top of rock at 32"		Media 12:	
Weather:		Weather: Cloudy	
Lat/Lng: 45.0930, -121.279 Bearing: E Date Taken: 10/16/2024	Taken By: Courtney Andr Tags: Test Pit	Lat/Lng: 45.0931, -121.279 Bearing: N Date Taken: 10/15/2024	Taken By: Miranda Bisho Tags: Site Conditions, From Gallery
	Project Name: Brightnight - Deschutes		
	Project Location: 3MPR+Q2 Pine Grove, OR, USA		
	Client:	Project Code:	
	Preparer: Sanjay Nanda	Reviewer: Miranda Bishop	
	Report Date: 2024-10-24	Page Number: 3 of 37	



Media 13: Plt-13

Media 14: Plt-13

Weather: Partly cloudy

Weather: Partly cloudy

Lat/Lng: 45.0931, -121.279

Taken By: Miranda Bisho

Bearing: S

Tags: Lateral

Date Taken: 10/15/2024

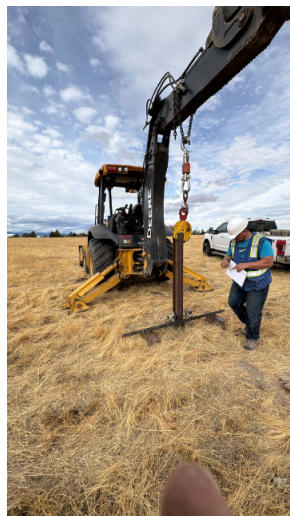
Lat/Lng: 45.0931, -121.279

Taken By: Miranda Bisho

Bearing: S

Tags: Uplift

Date Taken: 10/15/2024



Media 15: Plt-12

Media 16: PLT-12

Weather: Partly cloudy

Weather: Partly cloudy

Lat/Lng: 45.0930, -121.315

Taken By: Miranda Bisho

Bearing: W

Tags: Lateral

Date Taken: 10/15/2024

Lat/Lng: 45.0930, -121.315

Taken By: Courtney Andr

Bearing: N

Tags: Uplift

Date Taken: 10/15/2024



Project Name: Brightnight - Deschutes

Project Location: 3MPR+Q2 Pine Grove, OR, USA

Client:

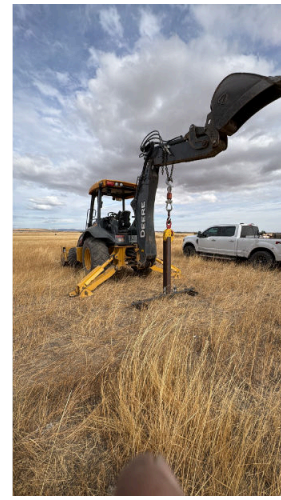
Project Code:

Preparer: Sanjay Nanda

Reviewer: Miranda Bishop

Report Date: 2024-10-24

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Media 17: PLT-11

Media 18: PLT-11

Weather: Overcast

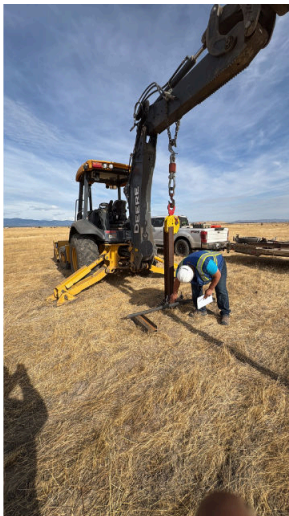
Weather: Overcast

Lat/Lng: 45.1009, -121.312
Bearing: SE
Date Taken: 10/15/2024

Taken By: Courtney Andr
Tags: Lateral

Lat/Lng: 45.1009, -121.312
Bearing: NE
Date Taken: 10/15/2024

Taken By: Courtney Andr
Tags: Uplift



Media 19: PLT-10

Media 20: TP-20

Weather: Overcast

Weather: Mist

Lat/Lng: 45.1050, -121.333
Bearing: N
Date Taken: 10/15/2024

Taken By: Courtney Andr
Tags: Uplift

Lat/Lng: 45.0975, -121.298
Bearing: NE
Date Taken: 10/15/2024

Taken By: Miranda Bisho
Tags: Test Pit



Project Name: Brightnight - Deschutes

Project Location: 3MPR+Q2 Pine Grove, OR, USA

Client:

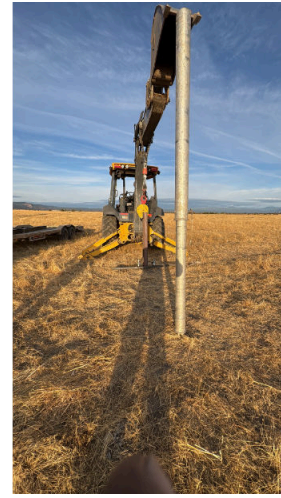
Project Code:

Preparer: Sanjay Nanda

Reviewer: Miranda Bishop

Report Date: 2024-10-24

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Media 21:

Weather: Mist

Lat/Lng: 45.1090, -121.271
Bearing: N
Date Taken: 10/15/2024

Taken By: Miranda Bisho
Tags: Log, Install

Media 22: PLT-14

Weather: Mist

Lat/Lng: 45.1091, -121.271
Bearing: W
Date Taken: 10/15/2024

Taken By: Courtney Andr
Tags: Uplift



Media 23: PLT-09 Backfilled

Weather: Partly cloudy

Lat/Lng: 45.1092, -121.322
Bearing: N
Date Taken: 10/14/2024

Taken By: Collin Lester
Tags:

Media 24: PLT-9

Weather: Partly cloudy

Lat/Lng: 45.1093, -121.323
Bearing: SE
Date Taken: 10/14/2024

Taken By: Courtney Andr
Tags: Lateral



Project Name: Brightnight - Deschutes

Project Location: 3MPR+Q2 Pine Grove, OR, USA

Client:

Project Code:

Preparer: Sanjay Nanda

Reviewer: Miranda Bishop

Report Date: 2024-10-24

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Media 25: PLT-9

Weather: Partly cloudy

Lat/Lng: 45.1093, -121.323

Bearing: NE

Date Taken: 10/14/2024

Taken By: Courtney Andr

Tags: Uplift

Media 26: PLT-09 Field Conditions (Gated area inside the field)

Weather: Partly cloudy

Lat/Lng: 45.1093, -121.323

Bearing: SE

Date Taken: 10/14/2024

Taken By: Collin Lester

Tags:



Media 27: PLT-09 Field Conditions (Gated area inside the field)

Weather: Partly cloudy

Lat/Lng: 45.1092, -121.323

Bearing: SW

Date Taken: 10/14/2024

Taken By: Collin Lester

Tags:

Media 28: PLT-09 Field Conditions (Gated area inside the field)

Weather: Partly cloudy

Lat/Lng: 45.1092, -121.323

Bearing: N

Date Taken: 10/14/2024

Taken By: Collin Lester

Tags:



Project Name: Brightnight - Deschutes

Project Location: 3MPR+Q2 Pine Grove, OR, USA

Client:

Project Code:

Preparer: Sanjay Nanda

Reviewer: Miranda Bishop

Report Date: 2024-10-24

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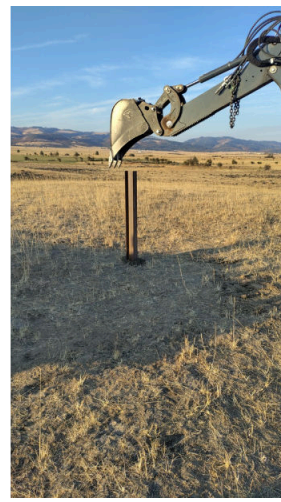


Media 29: PLT-05 Backfilled

Weather: Partly cloudy

Lat/Lng: 45.1219, -121.300
Bearing: SW
Date Taken: 10/14/2024

Taken By: Collin Lester
Tags:



Media 30: PLT-05 Before Test Pit

Weather: Partly cloudy

Lat/Lng: 45.1220, -121.300
Bearing: SW
Date Taken: 10/14/2024

Taken By: Collin Lester
Tags:



Media 31: PLT-5

Weather: Sunny

Lat/Lng: 45.1219, -121.300
Bearing: W
Date Taken: 10/13/2024

Taken By: Courtney Andr
Tags: Lateral



Media 32: PLT-5

Weather: Sunny

Lat/Lng: 45.1220, -121.300
Bearing: SE
Date Taken: 10/13/2024

Taken By: Courtney Andr
Tags: Uplift



Project Name: Brightnight - Deschutes

Project Location: 3MPR+Q2 Pine Grove, OR, USA

Client:

Project Code:

Preparer: Sanjay Nanda

Reviewer: Miranda Bishop

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Media 33: Continuation of rock and drainage line

Weather: Sunny

Lat/Lng: 45.1236, -121.302
Bearing: NW
Date Taken: 10/13/2024

Taken By: Collin Lester
Tags:



Media 34: Continuation of rock and water line

Weather: Sunny

Lat/Lng: 45.1232, -121.301
Bearing: W
Date Taken: 10/13/2024

Taken By: Collin Lester
Tags:



Media 35: Continuation of rock and water line

Weather: Sunny

Lat/Lng: 45.1231, -121.301
Bearing: W
Date Taken: 10/13/2024

Taken By: Collin Lester
Tags:



Media 36: Continuation of rock and water line

Weather: Sunny

Lat/Lng: 45.1227, -121.301
Bearing: NW
Date Taken: 10/13/2024

Taken By: Collin Lester
Tags:



Project Name: Brightnight - Deschutes

Project Location: 3MPR+Q2 Pine Grove, OR, USA

Client:

Project Code:

Preparer: Sanjay Nanda

Reviewer: Miranda Bishop

Report Date: 2024-10-24

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Media 37: Access to original PLT-05 location has heavy rutting, mud pit, with a line of water and rocks running north and south

Weather: Sunny

Lat/Lng: 45.1221, -121.301

Bearing: NW

Date Taken: 10/13/2024

Taken By: Collin Lester

Tags:



Media 38: Access to original PLT-05 location has heavy rutting, mud pit, with a line of water and rocks running north and south

Weather: Sunny

Lat/Lng: 45.1221, -121.301

Bearing: N

Date Taken: 10/13/2024

Taken By: Collin Lester

Tags:



Media 39: Access to original PLT-05 location has heavy rutting, mud pit, with a line of water and rocks running north and south

Weather: Sunny

Lat/Lng: 45.1222, -121.301

Bearing: S

Date Taken: 10/13/2024

Taken By: Collin Lester

Tags:



Media 40: Access to original PLT-05 location has heavy rutting, mud pit, with a line of water and rocks running north and south

Weather: Sunny

Lat/Lng: 45.1221, -121.301

Bearing: W

Date Taken: 10/13/2024

Taken By: Collin Lester

Tags:



Project Name: Brightnight - Deschutes

Project Location: 3MPR+Q2 Pine Grove, OR, USA

Client:

Project Code:

Preparer: Sanjay Nanda

Reviewer: Miranda Bishop

Report Date: 2024-10-24

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Media 61: PLT-02 Extraction Attempt
(Unsuccessful at 24,000 lbs.)

Weather: Sunny

Lat/Lng: 45.1401, -121.280
Bearing: E
Date Taken: 10/13/2024

Taken By: Collin Lester
Tags:

Media 62: PLT-02 Field Conditions (Rock Hollows Present)

Weather: Mist

Lat/Lng: 45.1401, -121.279
Bearing: N
Date Taken: 10/13/2024

Taken By: Collin Lester
Tags:



Media 63: PLT-02 Field Conditions (Rock Hollows Present)

Weather: Mist

Lat/Lng: 45.1401, -121.279
Bearing: NE
Date Taken: 10/13/2024

Taken By: Collin Lester
Tags:

Media 64: PLT-02 Field Conditions (Rock Hollows Present)

Weather: Mist

Lat/Lng: 45.1401, -121.279
Bearing: SE
Date Taken: 10/13/2024

Taken By: Collin Lester
Tags:



Project Name: Brightnight - Deschutes

Project Location: 3MPR+Q2 Pine Grove, OR, USA

Client:

Project Code:

Preparer: Sanjay Nanda

Reviewer: Miranda Bishop

Report Date: 2024-10-24

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Media 65: PLT-2

Media 66: PLT-2

Weather: Mist

Weather: Mist

Lat/Lng: 45.1401, -121.279

Bearing: NW

Date Taken: 10/13/2024

Taken By: Courtney Andr

Tags: Lateral

Lat/Lng: 45.1401, -121.279

Bearing: SW

Date Taken: 10/13/2024

Taken By: Courtney Andr

Tags: Uplift



Media 67: PLT-02 Uplift Test Example

Media 68: PLT-02 Uplift Test Example

Weather: Mist

Weather: Mist

Lat/Lng: 45.0870, -121.310

Bearing: N

Date Taken: 10/13/2024

Taken By: Collin Lester

Tags: From Gallery

Lat/Lng: 45.0870, -121.310

Bearing: N

Date Taken: 10/13/2024

Taken By: Collin Lester

Tags: From Gallery



Project Name: Brightnight - Deschutes

Project Location: 3MPR+Q2 Pine Grove, OR, USA

Client:

Project Code:

Preparer: Sanjay Nanda

Reviewer: Miranda Bishop

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Media 69: PLT-02 Uplift Test Example

Weather: Mist

Lat/Lng: 45.0870, -121.310
Bearing: N
Date Taken: 10/13/2024

Taken By: Collin Lester
Tags: From Gallery



Media 70: PLT-02 Uplift Test Example

Weather: Mist

Lat/Lng: 45.0870, -121.310
Bearing: N
Date Taken: 10/13/2024

Taken By: Collin Lester
Tags: From Gallery



Media 71: PLT-02 Access Gate (no lock)

Weather: Mist

Lat/Lng: 45.1430, -121.287
Bearing: S
Date Taken: 10/13/2024

Taken By: Collin Lester
Tags:



Media 72: PLT-09 Access Gate

Weather: Partly cloudy

Lat/Lng: 45.1101, -121.318
Bearing: W
Date Taken: 10/14/2024

Taken By: Collin Lester
Tags:



Project Name: Brightnight - Deschutes

Project Location: 3MPR+Q2 Pine Grove, OR, USA

Client:

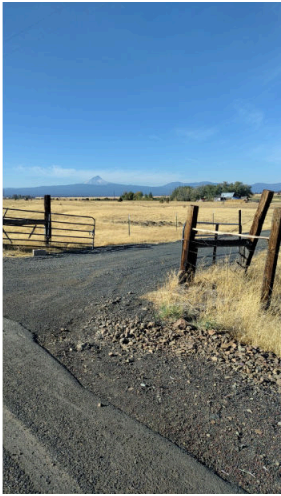
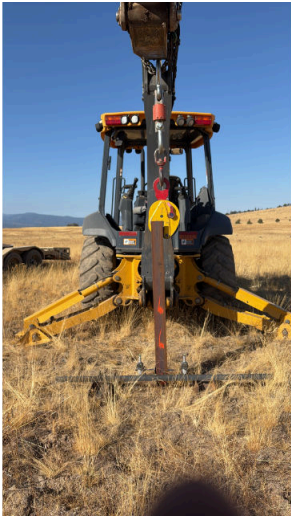
Project Code:

Preparer: Sanjay Nanda

Reviewer: Miranda Bishop

Report Date: 2024-10-24

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Media 73: PLT-05 Access Gate (Unlocked)		Media 74: PLT-05 Access Gate (Found open, usually locked)	
Weather: Sunny		Weather: Sunny	
Lat/Lng: 45.1173, -121.299	Taken By: Collin Lester	Lat/Lng: 45.1140, -121.297	Taken By: Collin Lester
Bearing: E	Tags:	Bearing: NW	Tags:
Date Taken: 10/13/2024		Date Taken: 10/13/2024	
			
Media 75: PLT-1		Media 76: PLT-01 Field Conditions (basalt rocks beds are relatively prevalent in this area)	
Weather: Sunny		Weather: Sunny	
Lat/Lng: 45.1451, -121.307	Taken By: Courtney Andr	Lat/Lng: 45.1451, -121.307	Taken By: Collin Lester
Bearing: N	Tags: Uplift	Bearing: E	Tags:
Date Taken: 10/12/2024		Date Taken: 10/12/2024	
	Project Name: Brightnight - Deschutes		
	Project Location: 3MPR+Q2 Pine Grove, OR, USA		
	Client:	Project Code:	
	Preparer: Sanjay Nanda	Reviewer: Miranda Bishop	
	Report Date: 2024-10-24	Page Number: 19 of 37	



Media 77: PLT-01 Field Conditions (basalt rocks beds are relatively prevalent in this area)

Media 78: PLT-01 Field Conditions (basalt rocks beds are relatively prevalent in this area)

Weather: Sunny

Weather: Sunny

Lat/Lng: 45.1451, -121.307
Bearing: SW
Date Taken: 10/12/2024

Taken By: Collin Lester
Tags:

Lat/Lng: 45.1451, -121.307
Bearing: NW
Date Taken: 10/12/2024

Taken By: Collin Lester
Tags:



Media 79: PLT-01 Field Conditions (basalt rocks beds are relatively prevalent in this area)

Media 80: PLT-1

Weather: Sunny

Weather: Sunny

Lat/Lng: 45.1451, -121.307
Bearing: N
Date Taken: 10/12/2024

Taken By: Collin Lester
Tags:

Lat/Lng: 45.1451, -121.307
Bearing: E
Date Taken: 10/12/2024

Taken By: Courtney Andr
Tags: Lateral



Project Name: Brightnight - Deschutes

Project Location: 3MPR+Q2 Pine Grove, OR, USA

Client:

Project Code:

Preparer: Sanjay Nanda

Reviewer: Miranda Bishop

Report Date: 2024-10-24

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Media 81: PLT-01 Backfill

Media 82: PLT-3

Weather: Sunny

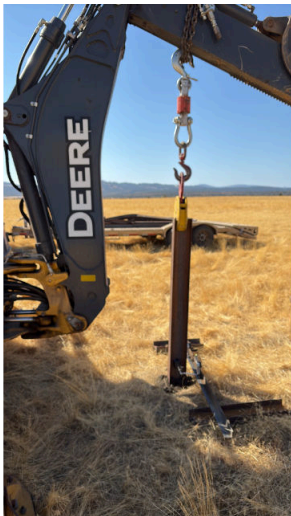
Weather: Sunny

Lat/Lng: 45.1451, -121.307
Bearing: SW
Date Taken: 10/12/2024

Taken By: Collin Lester
Tags:

Lat/Lng: 45.1303, -121.320
Bearing: W
Date Taken: 10/12/2024

Taken By: Courtney Andr
Tags: Lateral



Media 83: PLT-3

Media 84: PLT-03 Field Conditions

Weather: Sunny

Weather: Sunny

Lat/Lng: 45.1303, -121.320
Bearing: SW
Date Taken: 10/12/2024

Taken By: Courtney Andr
Tags: Uplift

Lat/Lng: 45.1303, -121.320
Bearing: W
Date Taken: 10/12/2024

Taken By: Collin Lester
Tags:



Project Name: Brightnight - Deschutes

Project Location: 3MPR+Q2 Pine Grove, OR, USA

Client:

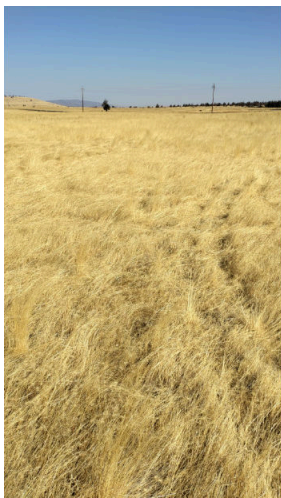
Project Code:

Preparer: Sanjay Nanda

Reviewer: Miranda Bishop

Report Date: 2024-10-24

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Media 85: PLT-03 Field Conditions

Media 86: Gate to PLT-03

Weather: Sunny

Weather: Sunny

Lat/Lng: 45.1303, -121.320

Taken By: Collin Lester

Lat/Lng: 45.1292, -121.336

Taken By: Collin Lester

Bearing: NE

Tags:

Bearing: NW

Tags:

Date Taken: 10/12/2024

Date Taken: 10/12/2024



Media 87: Gate to TP-18 and PLT-04

Media 88: Gate to PLT-04 and TP-18

Weather: Sunny

Weather: Sunny

Lat/Lng: 45.1330, -121.336

Taken By: Collin Lester

Lat/Lng: 45.1334, -121.337

Taken By: Collin Lester

Bearing: W

Tags:

Bearing: NW

Tags:

Date Taken: 10/12/2024

Date Taken: 10/12/2024



Project Name: Brightnight - Deschutes

Project Location: 3MPR+Q2 Pine Grove, OR, USA

Client:

Project Code:

Preparer: Sanjay Nanda

Reviewer: Miranda Bishop

Report Date: 2024-10-24

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Media 89: TP-18 before Test Pit

Media 90: PLT-04 Test Pit Backfill

Weather: Sunny

Weather: Sunny

Lat/Lng: 45.1420, -121.331

Taken By: Collin Lester

Lat/Lng: 45.1341, -121.336

Taken By: Collin Lester

Bearing: SE

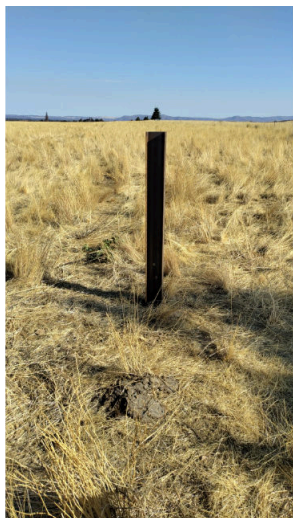
Tags:

Bearing: N

Tags:

Date Taken: 10/12/2024

Date Taken: 10/12/2024



Media 91: PLT-04 Before Test Pit

Media 92: PLT-4

Weather: Sunny

Weather: Sunny

Lat/Lng: 45.1341, -121.336

Taken By: Collin Lester

Lat/Lng: 45.1341, -121.336

Taken By: Courtney Andr

Bearing: NE

Tags:

Bearing: E

Tags: Lateral

Date Taken: 10/12/2024

Date Taken: 10/12/2024



Project Name: Brightnight - Deschutes

Project Location: 3MPR+Q2 Pine Grove, OR, USA

Client:

Project Code:

Preparer: Sanjay Nanda

Reviewer: Miranda Bishop

Report Date: 2024-10-24

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Media 93: PLT-04 Field Conditions

Weather: Sunny

Lat/Lng: 45.1341,-121.337

Bearing: N

Date Taken: 10/12/2024

Taken By: Collin Lester

Tags:

Media 94: PLT-04 Field Conditions

Weather: Sunny

Lat/Lng: 45.1340,-121.337

Bearing: W

Date Taken: 10/12/2024

Taken By: Collin Lester

Tags:



Media 95: PLT-4

Weather: Sunny

Lat/Lng: 45.1340,-121.336

Bearing: NE

Date Taken: 10/12/2024

Taken By: Courtney Andr

Tags: Uplift

Media 96: TP-19 Backfilled

Weather: Sunny

Lat/Lng: 45.1171,-121.330

Bearing: SW

Date Taken: 10/12/2024

Taken By: Collin Lester

Tags:



Project Name: Brightnight - Deschutes

Project Location: 3MPR+Q2 Pine Grove, OR, USA

Client:

Project Code:

Preparer: Sanjay Nanda

Reviewer: Miranda Bishop

Report Date: 2024-10-24

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Media 97: TP-19 Field Conditions

Media 98: TP-19 Field Conditions

Weather: Sunny

Weather: Sunny

Lat/Lng: 45.1170, -121.330

Taken By: Collin Lester

Bearing: W

Date Taken: 10/12/2024

Tags:

Lat/Lng: 45.1170, -121.330

Taken By: Collin Lester

Bearing: E

Date Taken: 10/12/2024

Tags:



Media 99: Access Gate to TP-19 (No lock, found opened)

Media 100: Access Gate to TP-19 (No lock, found opened)

Weather: Sunny

Weather: Sunny

Lat/Lng: 45.1174, -121.327

Taken By: Collin Lester

Bearing: NW

Date Taken: 10/12/2024

Tags:

Lat/Lng: 45.1175, -121.327

Taken By: Collin Lester

Bearing: W

Date Taken: 10/12/2024

Tags:



Project Name: Brightnight - Deschutes

Project Location: 3MPR+Q2 Pine Grove, OR, USA

Client:

Project Code:

Preparer: Sanjay Nanda

Reviewer: Miranda Bishop

Report Date: 2024-10-24

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Media 101: PLT-06 Backfilled

Media 102: PLT-6

Weather: Overcast

Weather: Overcast

Lat/Lng: 45.1263, -121.328

Taken By: Collin Lester

Bearing: NW

Date Taken: 10/11/2024

Tags:

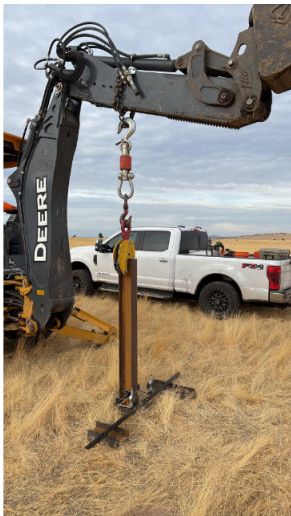
Lat/Lng: 45.1263, -121.328

Taken By: Courtney Andr

Bearing: NE

Date Taken: 10/11/2024

Tags: Lateral



Media 103: PLT-6

Media 104: PLT-06 Field Conditions

Weather: Overcast

Weather: Overcast

Lat/Lng: 45.1263, -121.328

Taken By: Courtney Andr

Bearing: N

Date Taken: 10/11/2024

Tags: Uplift

Lat/Lng: 45.1263, -121.328

Taken By: Collin Lester

Bearing: E

Date Taken: 10/11/2024

Tags:



Project Name: Brightnight - Deschutes

Project Location: 3MPR+Q2 Pine Grove, OR, USA

Client:

Project Code:

Preparer: Sanjay Nanda

Reviewer: Miranda Bishop

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Media 105: PLT-06 Field Conditions

Media 106: PLT-06/04 Gate (No lock)

Weather: Overcast

Weather: Overcast

Lat/Lng: 45.1263, -121.328

Taken By: Collin Lester

Lat/Lng: 45.1251, -121.323

Taken By: Collin Lester

Bearing: NW

Tags:

Bearing: NE

Tags:

Date Taken: 10/11/2024

Date Taken: 10/11/2024



Media 107: PLT-07 Backfill

Media 108: PLT-07 Before Test Pit

Weather: Overcast

Weather: Overcast

Lat/Lng: 45.1321, -121.351

Taken By: Collin Lester

Lat/Lng: 45.1321, -121.351

Taken By: Collin Lester

Bearing: SE

Tags:

Bearing: E

Tags:

Date Taken: 10/11/2024

Date Taken: 10/11/2024



Project Name: Brightnight - Deschutes

Project Location: 3MPR+Q2 Pine Grove, OR, USA

Client:

Project Code:

Preparer: Sanjay Nanda

Reviewer: Miranda Bishop

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Media 109: PLT-7

Media 110: PLT-07 Field Conditions

Weather: Overcast

Weather: Overcast

Lat/Lng: 45.1320, -121.351

Taken By: Courtney Andr

Lat/Lng: 45.1320, -121.351

Taken By: Collin Lester

Bearing: NE

Tags: Uplift

Bearing: W

Tags:

Date Taken: 10/11/2024

Date Taken: 10/11/2024



Media 111: PLT-07 Field Conditions

Media 112: PLT-07 Access Wire Gate

Weather: Overcast

Weather: Cloudy

Lat/Lng: 45.1321, -121.351

Taken By: Collin Lester

Lat/Lng: 45.1323, -121.357

Taken By: Collin Lester

Bearing: S

Tags:

Bearing: N

Tags:

Date Taken: 10/11/2024

Date Taken: 10/11/2024



Project Name: Brightnight - Deschutes

Project Location: 3MPR+Q2 Pine Grove, OR, USA

Client:

Project Code:

Preparer: Sanjay Nanda

Reviewer: Miranda Bishop

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Media 113: PLT-08 Backfill

Media 114: PLT-8

Weather: Cloudy

Weather: Overcast

Lat/Lng: 45.1173, -121.343

Taken By: Collin Lester

Lat/Lng: 45.1173, -121.343

Taken By: Courtney Andr

Bearing: N

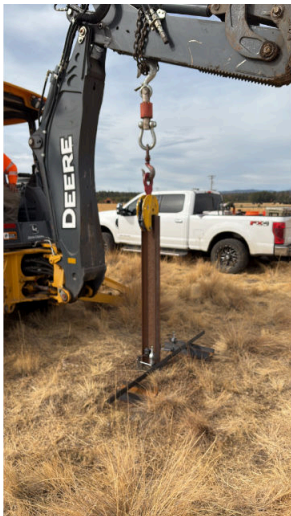
Tags:

Bearing: NW

Tags: Lateral

Date Taken: 10/11/2024

Date Taken: 10/11/2024



Media 115: PLT-8

Media 116: PLT-08 Pre-PLT

Weather: Overcast

Weather: Overcast

Lat/Lng: 45.1173, -121.343

Taken By: Courtney Andr

Lat/Lng: 45.1173, -121.343

Taken By: Collin Lester

Bearing: W

Tags: Uplift

Bearing: W

Tags:

Date Taken: 10/11/2024

Date Taken: 10/11/2024



Project Name: Brightnight - Deschutes

Project Location: 3MPR+Q2 Pine Grove, OR, USA

Client:

Project Code:

Preparer: Sanjay Nanda

Reviewer: Miranda Bishop

Report Date: 2024-10-24

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Media 117: PLT-08 Field Conditions

Media 118: PLT-08 Field Conditions

Weather: Overcast

Weather: Overcast

Lat/Lng: 45.1173, -121.343

Taken By: Collin Lester

Bearing: SW

Date Taken: 10/11/2024

Tags:

Lat/Lng: 45.1173, -121.343

Taken By: Collin Lester

Bearing: NE

Date Taken: 10/11/2024

Tags:



Media 119: PLT-08 Field

Media 120: PLT-08 Field

Weather: Overcast

Weather: Overcast

Lat/Lng: 45.1144, -121.343

Taken By: Collin Lester

Bearing: NE

Date Taken: 10/11/2024

Tags:

Lat/Lng: 45.1144, -121.343

Taken By: Collin Lester

Bearing: N

Date Taken: 10/11/2024

Tags:



Project Name: Brightnight - Deschutes

Project Location: 3MPR+Q2 Pine Grove, OR, USA

Client:

Project Code:

Preparer: Sanjay Nanda

Reviewer: Miranda Bishop

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Media 121: PLT-08 Gate (Locked)

Media 122: Access gate to PLT-16 (No lock)

Weather: Overcast

Weather: Partly cloudy

Lat/Lng: 45.1141, -121.343

Taken By: Collin Lester

Bearing: N

Tags:

Date Taken: 10/11/2024

Lat/Lng: 45.0861, -121.311

Taken By: Collin Lester

Bearing: NW

Tags:

Date Taken: 10/11/2024



Media 123: PLT-16 Backfilled

Media 124: PLT-16 before test pit

Weather: Partly cloudy

Weather: Sunny

Lat/Lng: 45.0877, -121.306

Taken By: Collin Lester

Bearing: W

Tags:

Date Taken: 10/11/2024

Lat/Lng: 45.0877, -121.306

Taken By: Collin Lester

Bearing: N

Tags:

Date Taken: 10/11/2024



Project Name: Brightnight - Deschutes

Project Location: 3MPR+Q2 Pine Grove, OR, USA

Client:

Project Code:

Preparer: Sanjay Nanda

Reviewer: Miranda Bishop

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Media 125: PLT-16

Media 126: PLT-16 Field Conditions

Weather: Partly cloudy

Weather: Partly cloudy

Lat/Lng: 45.0877, -121.306

Taken By: Courtney Andr

Lat/Lng: 45.0875, -121.306

Taken By: Collin Lester

Bearing: NE

Tags: Lateral

Bearing: W

Tags:

Date Taken: 10/11/2024

Date Taken: 10/11/2024



Media 127: PLT-16 Field Conditions

Media 128: PLT-16 PLT Test

Weather: Partly cloudy

Weather: Partly cloudy

Lat/Lng: 45.0875, -121.306

Taken By: Collin Lester

Lat/Lng: 45.0877, -121.306

Taken By: Collin Lester

Bearing: NE

Tags:

Bearing: N

Tags:

Date Taken: 10/11/2024

Date Taken: 10/11/2024



Project Name: Brightnight - Deschutes

Project Location: 3MPR+Q2 Pine Grove, OR, USA

Client:

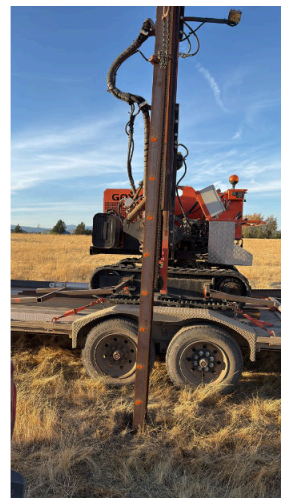
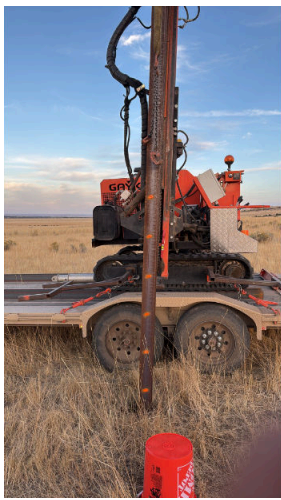
Project Code:

Preparer: Sanjay Nanda

Reviewer: Miranda Bishop

Report Date: 2024-10-24

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Media 129: PLT-16

Media 130: PLT-12

Weather: Partly cloudy

Weather: Sunny

Lat/Lng: 45.0878, -121.306

Taken By: Courtney Andr

Lat/Lng: 45.0931, -121.315

Taken By: Courtney Andr

Bearing: E

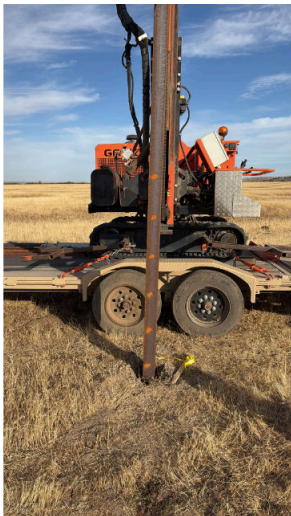
Tags: Install

Bearing: N

Tags: Install

Date Taken: 10/10/2024

Date Taken: 10/10/2024



Media 131: PLT-13

Media 132: PLT-14

Weather: Sunny

Weather: Sunny

Lat/Lng: 45.0931, -121.279

Taken By: Courtney Andr

Lat/Lng: 45.1091, -121.272

Taken By: Courtney Andr

Bearing: E

Tags: Install

Bearing: W

Tags: Install

Date Taken: 10/10/2024

Date Taken: 10/10/2024



Project Name: Brightnight - Deschutes

Project Location: 3MPR+Q2 Pine Grove, OR, USA

Client:

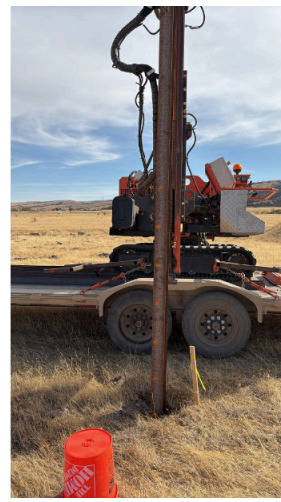
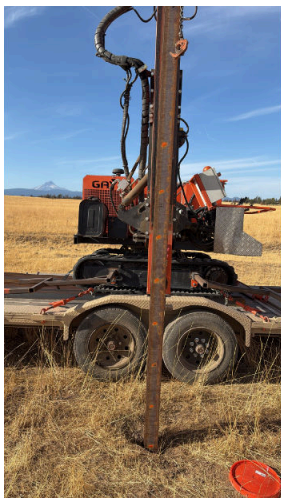
Project Code:

Preparer: Sanjay Nanda

Reviewer: Miranda Bishop

Report Date: 2024-10-24

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Media 133: PLT-15

Media 134: PLT-10

Weather: Sunny

Weather: Sunny

Lat/Lng: 45.1183, -121.266

Bearing: NW

Date Taken: 10/10/2024

Taken By: Courtney Andr

Tags: Install

Lat/Lng: 45.1050, -121.334

Bearing: SE

Date Taken: 10/10/2024

Taken By: Courtney Andr

Tags: Install



Media 135: Many rocks at PLT-09 location

Media 136: Many rocks at PLT-09 location

Weather: Partly cloudy

Weather: Partly cloudy

Lat/Lng: 45.1092, -121.322

Bearing: E

Date Taken: 10/10/2024

Taken By: Collin Lester

Tags:

Lat/Lng: 45.1093, -121.322

Bearing: E

Date Taken: 10/10/2024

Taken By: Collin Lester

Tags:



Project Name: Brightnight - Deschutes

Project Location: 3MPR+Q2 Pine Grove, OR, USA

Client:

Project Code:

Preparer: Sanjay Nanda

Reviewer: Miranda Bishop

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Media 137: Many rocks at PLT-09 location

Weather: Partly cloudy

Lat/Lng: 45.1093, -121.322

Bearing: W

Date Taken: 10/10/2024

Taken By: Collin Lester

Tags:



Media 138: Access to PLT-05 original location

Weather: Partly cloudy

Lat/Lng: 45.1222, -121.301

Bearing: W

Date Taken: 10/10/2024

Taken By: Collin Lester

Tags:



Media 139: Access to PLT-05 original location

Weather: Partly cloudy

Lat/Lng: 45.1221, -121.301

Bearing: SW

Date Taken: 10/10/2024

Taken By: Collin Lester

Tags:



Media 140: Example of basalt beds around PLT-01

Weather: Partly cloudy

Lat/Lng: 45.1451, -121.307

Bearing: E

Date Taken: 10/10/2024

Taken By: Collin Lester

Tags:



Project Name: Brightnight - Deschutes

Project Location: 3MPR+Q2 Pine Grove, OR, USA

Client:

Project Code:

Preparer: Sanjay Nanda

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Media 141: Strongly supported wooden bridge at PLT-07 Access Path

Weather: Partly cloudy

Lat/Lng: 45.1324, -121.357

Bearing: SE

Date Taken: 10/10/2024

Taken By: Collin Lester

Tags:



Media 142: Sprinkler blocking access to original PLT-07 location

Weather: Partly cloudy

Lat/Lng: 45.1322, -121.351

Bearing: SE

Date Taken: 10/10/2024

Taken By: Collin Lester

Tags:



Media 143: PLT-6

Weather: Partly cloudy

Lat/Lng: 45.1264, -121.328

Bearing: SE

Date Taken: 10/09/2024

Taken By: Courtney Andr

Tags: Install



Media 144: PLT-3

Weather: Partly cloudy

Lat/Lng: 45.1303, -121.320

Bearing: SE

Date Taken: 10/09/2024

Taken By: Courtney Andr

Tags: Install



Project Name: Brightnight - Deschutes

Project Location: 3MPR+Q2 Pine Grove, OR, USA

Client:

Preparer: Sanjay Nanda

Report Date: 2024-10-24

Project Code:

Reviewer: Miranda Bishop

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Media 145: PLT-2

Weather: Partly cloudy

Lat/Lng: 45.1401,-121.280
Bearing: SE
Date Taken: 10/09/2024

Taken By: Courtney Andr
Tags: Install



Project Name: Brightnight - Deschutes

Project Location: 3MPR+Q2 Pine Grove, OR, USA

Client:

Project Code:

Preparer: Sanjay Nanda

Reviewer: Miranda Bishop

Report Date: 2024-10-24

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ATTACHMENT 4 PROBABILISTIC SEISMIC HAZARD DEAGGREGATION AT 2,475 AND 475-YEAR INTERVALS

Unified Hazard Tool



Please do not use this tool to obtain ground motion parameter values for the design code reference documents covered by the [U.S. Seismic Design Maps web tools](#) (e.g., the International Building Code and the ASCE 7 or 41 Standard). The values returned by the two applications are not identical.

Please also see the new [USGS Earthquake Hazard Toolbox](#) for access to the most recent NSHMs for the conterminous U.S. and Hawaii.

^ Input

Edition

Conterminous U.S. 2014 (v4.0.x)

Spectral Period

Peak Ground Acceleration

Latitude

Decimal degrees

45.114

Time Horizon

Return period in years

2475

Longitude

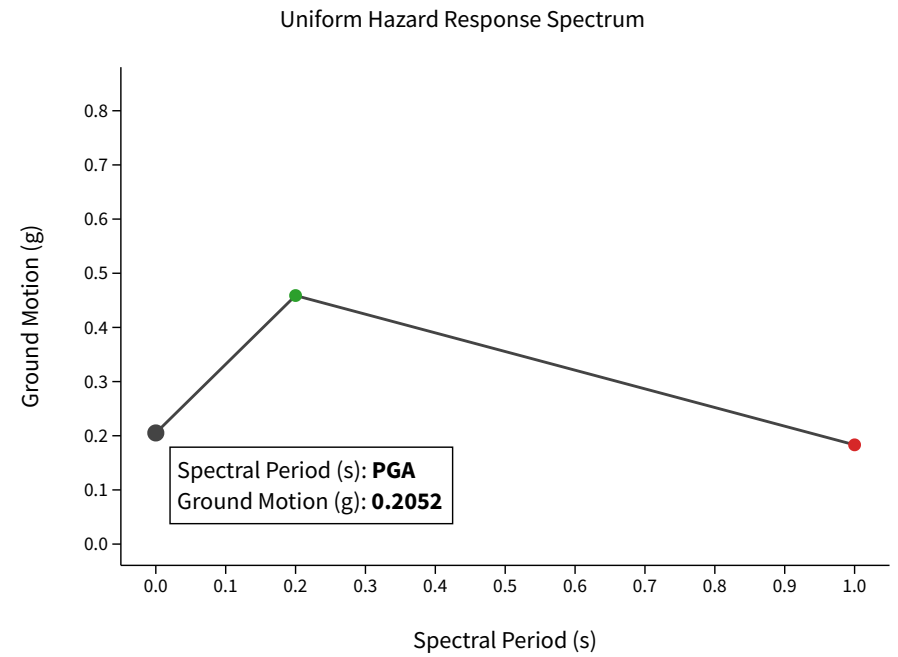
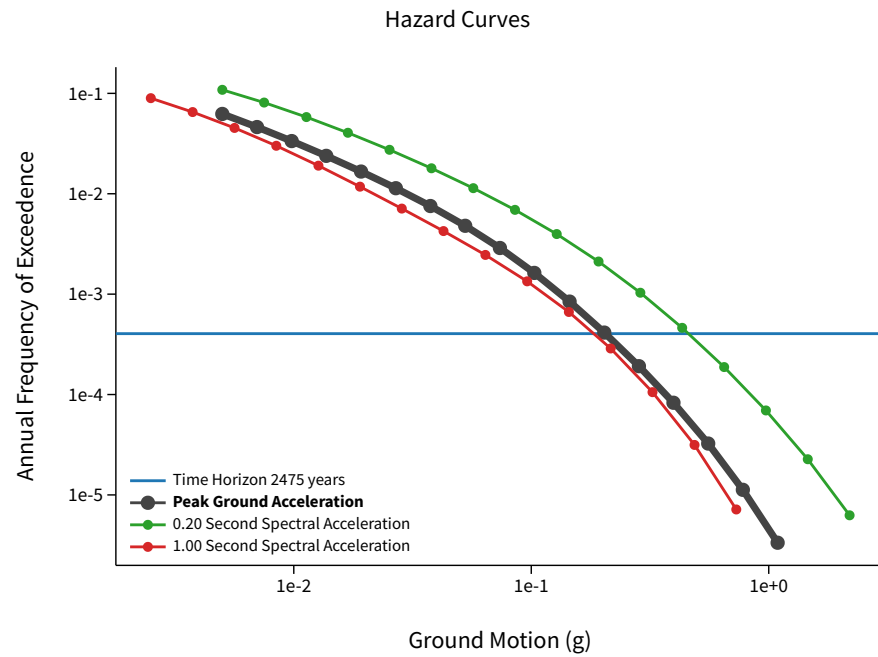
Decimal degrees, negative values for western longitudes

-121.295

Site Class

760 m/s (B/C boundary)

^ Hazard Curve



[View Raw Data](#)

^ Deaggregation



Deaggregation calculations are not available for the selected edition.

Unified Hazard Tool



Please do not use this tool to obtain ground motion parameter values for the design code reference documents covered by the [U.S. Seismic Design Maps web tools](#) (e.g., the International Building Code and the ASCE 7 or 41 Standard). The values returned by the two applications are not identical.

Please also see the new [USGS Earthquake Hazard Toolbox](#) for access to the most recent NSHMs for the conterminous U.S. and Hawaii.

^ Input

Edition

Conterminous U.S. 2014 (v4.0.x)

Spectral Period

Peak Ground Acceleration

Latitude

Decimal degrees

45.114

Time Horizon

Return period in years

475

Longitude

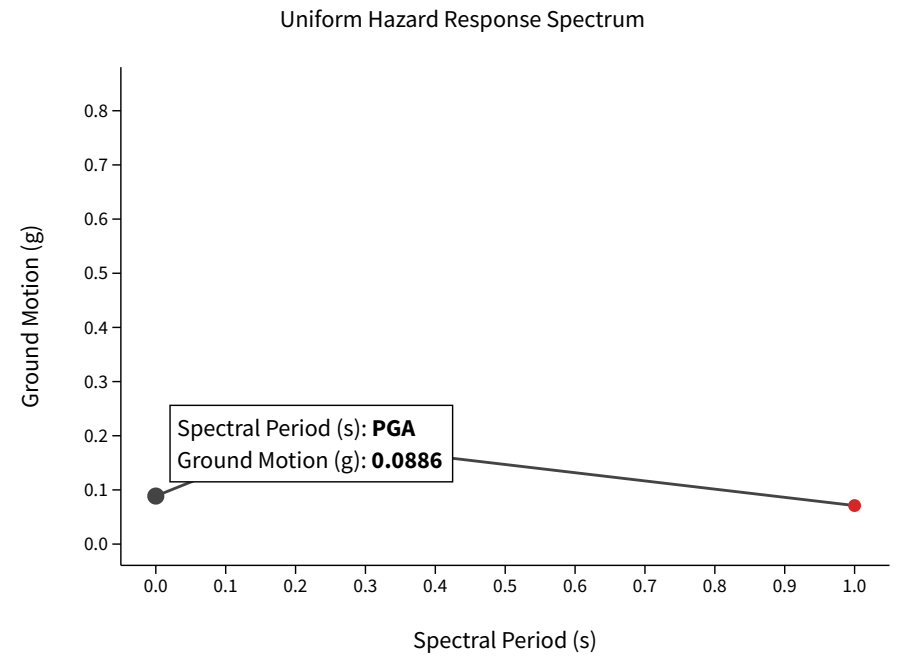
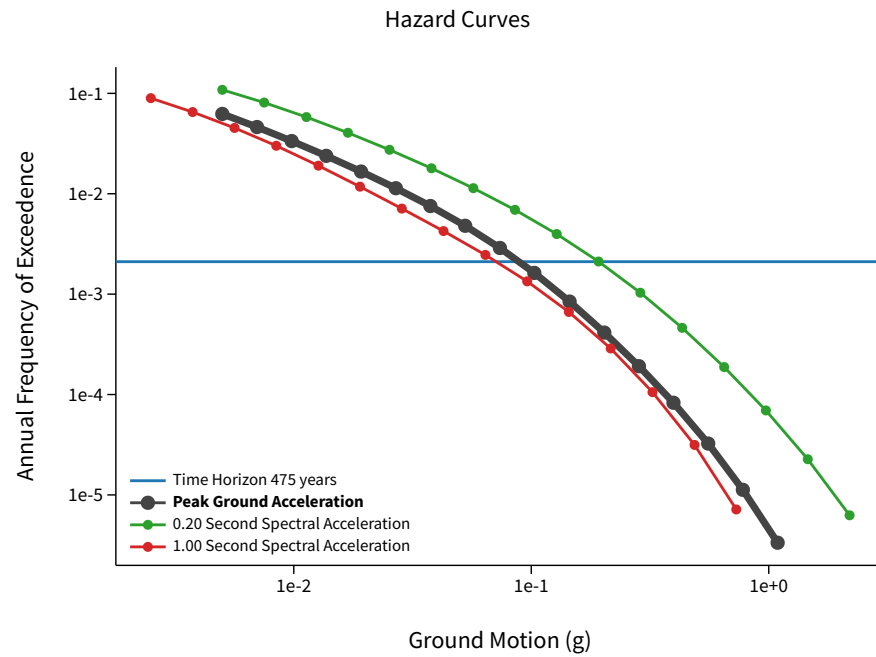
Decimal degrees, negative values for western longitudes

-121.295

Site Class

760 m/s (B/C boundary)

^ Hazard Curve



[View Raw Data](#)



ATTACHMENT 5 SIGNIFICANT HISTORICAL EARTHQUAKES WITHIN 50 MILES OF THE FACILITY

Time	Latitude	Longitude	Depth (km)	Magnitude
1972-11-04T23:55:24.710Z	45.611	-121.6711667	43.007	2
1974-12-13T03:28:54.200Z	45.265	-121.599	22	4.1
1976-03-29T12:36:19.690Z	45.1221667	-120.8903333	14.828	3
1976-04-13T00:47:14.490Z	45.0756667	-120.8588333	14.685	4.6
1976-04-17T02:11:44.200Z	45.1585	-120.8473333	14.685	4
1976-08-25T23:12:45.440Z	45.0318333	-120.9766667	14.685	2.7
1976-09-04T12:05:04.330Z	45.1405	-120.9216667	14.685	2.9
1976-10-10T05:41:11.410Z	45.2703333	-120.4995	14.685	3.6
1977-04-14T19:55:07.560Z	45.1061667	-120.9455	14.685	2.8
1980-02-04T16:11:43.520Z	44.8941667	-121.829	2.698	2.6
1980-02-07T20:09:04.240Z	45.1571667	-121.8238333	2.688	2.4
1980-07-07T01:17:06.170Z	45.2	-121.7343333	12.199	3.2
1980-07-08T18:39:46.770Z	45.3256667	-121.6783333	6.489	2.9
1980-07-08T18:45:09.890Z	45.3246667	-121.6715	6.639	2.2
1980-07-10T03:26:06.180Z	45.5753333	-121.7251667	2.426	2.1
1980-09-17T23:46:02.130Z	45.2713333	-121.7418333	4.81	2.3
1981-05-02T19:51:23.510Z	45.1173333	-121.4431667	4.642	2.1
1981-07-02T18:16:14.030Z	45.2621667	-121.4328333	4.915	2.6
1981-10-29T19:12:22.930Z	45.7363333	-121.478	2.972	2.2
1981-12-04T23:44:30.500Z	44.52	-121.5806667	11.552	2.2
1982-02-19T19:04:42.440Z	45.3638333	-121.7348333	5.067	2.1
1982-04-21T18:02:13.790Z	45.355	-121.131	4.725	2.3
1982-06-04T19:00:28.560Z	45.0018333	-120.464	-1.339	2.1
1982-07-22T20:35:11.950Z	44.9656667	-121.9725	1.083	2
1982-08-18T11:50:37.500Z	45.3716667	-121.6966667	4.13	3.4
1982-09-10T01:16:38.420Z	44.9673333	-121.9731667	-1.172	2
1983-02-23T05:39:44.480Z	45.3666667	-121.7041667	3.521	2.7
1984-02-24T23:28:15.950Z	45.393	-120.807	24.821	2.1
1984-03-18T20:16:36.530Z	45.3391667	-121.7153333	5.441	2
1984-05-07T07:12:02.220Z	45.3125	-121.5936667	14.574	2.9
1985-06-22T02:36:58.140Z	44.8246667	-121.1561667	21.882	2.8
1985-10-03T16:46:38.010Z	45.6781667	-121.467	7.269	2.2
1985-10-24T22:49:41.760Z	45.6056667	-121.2041667	-1.061	2.4
1985-11-07T01:07:29.890Z	45.6121667	-121.2148333	-1.081	2.3
1986-12-22T18:56:54.830Z	45.3591667	-122.24	19.477	2.2
1987-06-30T02:04:26.950Z	44.9645	-120.9928333	7.971	2.8
1987-07-27T16:18:33.740Z	45.3111667	-121.656	5.111	2.4
1987-08-09T03:32:09.960Z	45.1445	-120.8603333	26.625	2.4
1987-08-18T05:15:47.760Z	45.1438333	-120.8608333	23.825	2.1
1987-11-09T17:27:55.730Z	45.3378333	-121.6888333	4.631	2
1988-01-09T20:29:17.080Z	45.6555	-121.9423333	3.084	2
1988-01-14T09:37:54.240Z	44.638	-121.3363333	19.201	2.4
1988-05-15T04:22:14.840Z	45.375	-121.7068333	5.356	2.5

Time	Latitude	Longitude	Depth (km)	Magnitude
1989-09-15T10:15:06.410Z	45.368	-121.7131667	3.151	2.2
1989-09-15T10:22:25.520Z	45.3681667	-121.7028333	4.081	2.1
1989-09-15T10:28:00.840Z	45.3726667	-121.7068333	3.791	3.5
1989-09-15T10:39:37.180Z	45.361	-121.7021667	4.271	2
1990-05-28T08:52:55.460Z	45.371	-121.6956667	2.421	2.2
1990-07-01T19:46:01.220Z	45.02	-120.9531667	16.785	2.4
1990-07-01T20:12:35.220Z	45.0198333	-120.9565	16.325	2.4
1990-10-02T23:12:58.990Z	45.5793333	-121.6115	5.187	2.1
1990-10-19T14:13:58.160Z	45.341	-121.6858333	4.611	3.5
1991-08-18T01:10:22.290Z	45.3276667	-121.688	4.601	2.1
1991-08-19T16:38:24.770Z	45.2345	-121.3286667	-1.372	2.1
1991-08-30T16:49:14.100Z	45.243	-121.3358333	-1.382	2.1
1992-10-02T21:57:20.470Z	45.8133333	-121.4415	5.919	2.3
1993-10-19T04:17:18.760Z	45.3273333	-121.6913333	5.893	2
1994-04-13T19:24:26.100Z	45.1416667	-120.848	16.665	2.8
1994-04-16T09:50:32.260Z	45.1361667	-120.843	17.795	2.6
1994-04-20T12:01:24.700Z	45.1496667	-120.8445	12.275	2.5
1994-12-14T21:40:05.950Z	44.6563333	-121.1548333	-1.557	2.3
1995-03-28T19:36:12.820Z	44.7771667	-120.9398333	1.831	2
1996-04-07T13:17:14.600Z	45.3588333	-121.7153333	3.235	3
1996-04-07T13:30:00.830Z	45.3695	-121.7106667	5.805	2.4
1996-04-08T23:50:29.220Z	45.3185	-121.714	5.567	2.4
1996-07-01T10:46:42.660Z	44.9338333	-121.1953333	10.465	2.3
1996-07-22T16:09:07.820Z	45.3221667	-121.7388333	5.049	2
1996-07-22T16:19:35.530Z	45.3201667	-121.7335	4.599	2
1997-07-16T21:38:44.500Z	45.02	-121.8785	2.254	2.6
1997-09-20T22:44:57.000Z	45.5201667	-121.7103333	-1.393	2.1
1998-02-02T19:16:42.460Z	45.3063333	-121.7238333	3.701	2.3
1998-02-02T21:56:54.080Z	45.3088333	-121.7203333	0.851	2.1
1998-02-05T05:59:52.490Z	45.3103333	-121.7208333	4.195	2.6
1998-02-05T17:32:38.100Z	45.3206667	-121.728	5.053	2.5
1998-04-10T07:12:17.870Z	45.3548333	-121.6961667	3.81	2.6
1998-09-10T21:56:41.730Z	44.6616667	-121.1383333	1.535	2.9
1998-10-31T23:07:29.650Z	45.1023333	-120.8225	-1.115	2.7
1998-11-01T00:17:58.270Z	45.1	-120.8331667	-1.115	2.9
1998-11-01T10:47:48.060Z	45.1026667	-120.8138333	-1.153	2.1
1999-01-11T13:25:55.750Z	45.323	-121.6613333	3.811	2.1
1999-01-11T13:48:46.290Z	45.3245	-121.6555	6.111	2.5
1999-01-11T16:54:11.960Z	45.3231667	-121.6543333	5.591	3
1999-01-11T22:04:14.590Z	45.3195	-121.6545	5.491	3.2
1999-01-11T22:11:09.820Z	45.3185	-121.6566667	5.221	2
1999-01-14T11:56:47.020Z	45.3303333	-121.6698333	6.131	3.2
1999-01-14T16:13:42.320Z	45.3241667	-121.6638333	4.491	3

Time	Latitude	Longitude	Depth (km)	Magnitude
1999-01-15T14:33:52.170Z	45.3278333	-121.6728333	4.348	2.2
1999-02-15T15:37:07.610Z	45.3195	-121.6563333	6.065	2.6
1999-06-01T13:14:07.860Z	45.3701667	-121.705	3.531	2
1999-06-01T13:25:08.130Z	45.3636667	-121.7091667	4.071	2.2
1999-06-03T19:24:33.510Z	44.7495	-120.9778333	-1.365	2.7
1999-06-18T11:29:35.010Z	45.3146667	-121.6465	5.341	2.1
1999-06-21T02:18:55.870Z	45.3196667	-121.6621667	4.371	2
1999-11-21T11:33:45.870Z	45.4656667	-122.0751667	12.598	2.6
2000-01-14T21:44:48.290Z	45.317	-121.718	4.48	2.2
2000-05-14T08:09:49.190Z	45.3325	-121.6863333	5.625	2.1
2000-07-25T11:22:51.370Z	45.3371667	-121.6758333	4.631	2.6
2000-08-16T21:25:19.560Z	45.579	-121.5891667	4.167	2.3
2001-01-19T17:45:34.100Z	45.321	-121.6471667	5.721	2
2001-03-09T03:36:30.240Z	45.587	-121.6696667	7.382	2.3
2001-05-04T05:28:10.320Z	45.1238333	-120.9468333	17.91	2.2
2001-09-12T20:38:21.770Z	45.3051667	-121.7255	1.281	2
2001-09-12T21:26:43.190Z	45.3038333	-121.7255	3.091	2.3
2001-09-14T10:52:14.170Z	45.3031667	-121.728	3.711	2.1
2001-09-14T11:22:57.980Z	45.3071667	-121.7306667	3.731	2.9
2001-09-15T12:21:09.640Z	45.3058333	-121.7293333	2.821	2.5
2001-10-19T13:49:52.290Z	45.545	-121.4083333	3.416	2
2001-12-02T14:10:05.380Z	45.3346667	-121.7355	1.095	2.4
2001-12-03T00:54:26.950Z	45.3356667	-121.7355	0.825	2.1
2001-12-03T07:19:55.330Z	45.3348333	-121.7343333	4.015	2.6
2002-05-06T04:45:53.170Z	45.319	-121.6898333	0.034	2.1
2002-05-06T04:47:53.250Z	45.3245	-121.6856667	3.884	2.5
2002-05-06T11:21:58.040Z	45.3296667	-121.688	4.164	2.8
2002-05-06T13:08:27.270Z	45.3295	-121.6878333	3.614	2.5
2002-05-24T22:41:16.310Z	45.333	-121.6828333	2.114	2
2002-06-29T14:36:04.790Z	45.3348333	-121.6863333	4.915	4.5
2002-06-29T14:41:21.270Z	45.3275	-121.6815	1.299	3.2
2002-06-29T14:45:15.750Z	45.334	-121.6865	3.469	2.2
2002-06-29T15:27:52.130Z	45.3295	-121.6883333	5.249	2.3
2002-06-29T16:20:03.820Z	45.3213333	-121.6863333	4.629	2.4
2002-06-29T16:29:22.960Z	45.3338333	-121.684	4.319	2
2002-06-29T18:49:58.830Z	45.3423333	-121.6798333	4.959	3.8
2002-06-29T19:31:57.350Z	45.3201667	-121.6875	5.039	2.5
2002-06-30T10:20:50.310Z	45.3276667	-121.6765	5.026	2
2002-06-30T11:16:23.280Z	45.3441667	-121.677	4.426	2.7
2002-07-01T17:27:40.610Z	45.369	-121.6913333	2.576	2.3
2002-07-02T00:37:27.060Z	45.3395	-121.6775	4.757	2
2002-07-02T01:26:31.160Z	45.3433333	-121.6876667	3.337	2.4
2002-07-02T23:35:23.120Z	45.3405	-121.6798333	4.841	2.9

Time	Latitude	Longitude	Depth (km)	Magnitude
2002-07-06T10:00:07.380Z	45.3296667	-121.6903333	4.727	2.2
2002-07-11T18:54:30.620Z	45.3356667	-121.6815	4.817	2.5
2002-07-16T08:09:48.900Z	45.3386667	-121.6778333	4.717	2.3
2002-08-09T20:16:16.440Z	45.3283333	-121.6891667	5.481	2.3
2002-08-09T20:56:12.720Z	45.3288333	-121.6826667	5.251	2.6
2002-10-25T00:44:39.980Z	44.8438333	-120.8871667	-1.336	2.4
2002-12-12T03:13:45.530Z	45.3643333	-121.6986667	2.757	2.7
2003-01-19T17:34:30.500Z	45.3403333	-121.6865	3.068	2.2
2003-01-19T17:34:53.960Z	45.3313333	-121.6766667	4.807	2.2
2003-07-07T12:40:12.620Z	45.3273333	-121.6856667	5.158	3.3
2003-12-31T17:03:14.400Z	45.3668333	-121.6885	2.467	2.4
2004-01-15T09:30:25.850Z	45.3638333	-121.6891667	1.757	2.5
2004-10-04T13:59:39.980Z	45.3421667	-121.7005	3.517	2.1
2005-04-06T22:57:40.510Z	45.3728333	-121.7063333	-0.113	2.8
2005-06-14T01:32:50.670Z	45.052	-121.0415	18.295	2.1
2005-08-19T08:52:37.990Z	45.2735	-122.2115	14.452	2.17
2006-07-11T22:38:01.120Z	45.3261667	-121.6893333	5.058	2.1
2006-09-27T17:58:21.650Z	45.5751667	-121.5913333	5.422	2.4
2006-12-18T07:18:35.080Z	45.1136667	-120.9381667	15.522	2.1
2006-12-24T22:03:52.020Z	45.1196667	-120.9305	15.192	2
2006-12-29T06:13:47.200Z	45.1176667	-120.9323333	13.442	2.2
2006-12-30T11:28:38.090Z	45.1215	-120.9371667	15.182	2.6
2007-01-01T14:46:12.990Z	45.1203333	-120.9333333	18.542	2.5
2007-01-04T08:30:11.360Z	45.1188333	-120.9323333	16.142	3
2007-01-20T08:12:40.870Z	45.1281667	-120.9486667	20.152	3
2007-01-29T15:58:45.330Z	45.1178333	-120.9441667	13.192	2.1
2007-02-02T04:58:52.580Z	45.1216667	-120.9501667	14.212	2.5
2007-02-13T18:39:32.630Z	45.1236667	-120.9416667	19.232	2.9
2007-02-13T18:42:38.720Z	45.119	-120.9306667	18.802	2.7
2007-02-23T14:43:46.820Z	45.1256667	-120.9326667	16.222	2
2007-03-01T10:07:31.860Z	45.1238333	-120.9341667	22.762	3.6
2007-03-24T03:13:21.410Z	45.1253333	-120.9506667	14.892	2.4
2007-03-26T06:36:28.750Z	45.1178333	-120.9281667	15.032	2
2007-03-31T11:05:40.310Z	45.1216667	-120.9311667	15.662	2
2007-04-01T15:44:30.960Z	45.127	-120.9486667	18.865	2.6
2007-04-04T00:42:53.550Z	45.1203333	-120.93	15.538	2.1
2007-04-08T09:40:41.380Z	45.1271667	-120.9556667	21.102	3.2
2007-04-29T07:22:00.780Z	45.1181667	-120.931	18.162	2.4
2007-05-02T11:16:16.130Z	45.1271667	-120.942	17.852	3.3
2007-05-08T14:00:17.120Z	45.3146667	-121.6665	5.884	2.2
2007-05-08T20:00:29.730Z	45.122	-120.9395	13.125	2.3
2007-05-16T02:21:49.520Z	45.1316667	-120.9526667	17.422	2.5
2007-05-22T15:53:35.000Z	45.1168333	-120.93	13.482	2

Time	Latitude	Longitude	Depth (km)	Magnitude
2007-06-01T13:27:56.750Z	45.1246667	-120.9415	13.392	2.1
2007-06-03T16:02:42.600Z	45.1273333	-120.9573333	17.895	2.7
2007-06-10T01:36:12.860Z	45.1238333	-120.9346667	18.402	2.6
2007-06-14T21:57:57.090Z	45.1256667	-120.944	17.652	3.8
2007-07-10T06:35:32.560Z	45.1351667	-120.9466667	14.648	2
2007-07-16T09:15:26.080Z	45.1225	-120.9373333	16.802	2.5
2007-07-19T19:37:48.090Z	45.1213333	-120.9486667	15.482	2.6
2007-08-06T11:56:05.520Z	45.124	-120.9336667	16.732	2.3
2007-08-08T13:55:16.800Z	45.139	-120.9523333	14.272	2.3
2007-08-20T04:27:31.520Z	45.1256667	-120.946	19.295	2.9
2007-08-31T11:17:29.250Z	45.1301667	-120.9323333	16.722	2.2
2007-10-29T01:45:38.760Z	45.1205	-120.9356667	20.252	2.4
2007-10-30T03:10:51.040Z	45.1231667	-120.9361667	17.248	2.2
2007-11-02T19:45:39.560Z	45.126	-120.9335	17.102	2.1
2007-11-05T04:36:33.620Z	45.1135	-120.941	15.875	2.2
2007-11-11T23:33:50.990Z	45.1221667	-120.934	18.882	2.4
2007-11-21T15:02:06.580Z	45.1298333	-120.9413333	19.022	3.3
2008-01-03T04:21:53.350Z	45.127	-120.946	16.162	2.7
2008-02-04T02:15:53.530Z	45.1288333	-120.9423333	19.392	3.3
2008-03-10T18:06:53.640Z	45.128	-120.9533333	16.615	2.5
2008-03-14T01:15:06.100Z	45.1281667	-120.9428333	13.842	2.3
2008-03-19T19:47:47.350Z	45.1281667	-120.938	16.052	2.2
2008-03-20T20:03:58.690Z	45.1295	-120.9428333	17.772	3.1
2008-03-25T17:32:29.250Z	45.132	-120.9483333	15.032	2.4
2008-03-26T02:33:31.600Z	45.1256667	-120.9363333	15.552	2.2
2008-03-29T15:28:24.200Z	45.1238333	-120.9373333	14.288	2.3
2008-04-05T23:38:53.120Z	45.13	-120.9425	17.588	3.6
2008-04-16T02:57:52.380Z	45.1308333	-120.947	11.708	2.9
2008-04-20T10:01:33.790Z	45.1355	-120.9545	12.853	2.4
2008-04-24T07:20:48.550Z	45.1281667	-120.9495	15.533	2.3
2008-04-28T07:39:07.430Z	45.1258333	-120.9538333	19.875	3.1
2008-04-29T11:26:44.930Z	45.1215	-120.9391667	18.558	2.3
2008-04-30T13:27:43.940Z	45.1233333	-120.9525	16.738	2.4
2008-05-09T00:36:03.800Z	45.1231667	-120.9616667	17.188	2.3
2008-05-09T03:33:20.310Z	45.1366667	-120.9598333	12.528	2.7
2008-05-09T19:52:48.910Z	45.1271667	-120.9168333	15.712	2
2008-05-22T11:51:47.920Z	45.1283333	-120.9338333	13.343	2.2
2008-05-27T03:37:14.060Z	45.1305	-120.9463333	13.541	2.2
2008-05-28T14:04:10.680Z	45.1251667	-120.9221667	14.516	2.1
2008-06-01T16:46:28.030Z	45.132	-120.9535	15.848	3.4
2008-06-05T14:33:27.910Z	45.1436667	-120.9535	12.458	2.6
2008-06-14T04:33:16.310Z	45.1383333	-120.9583333	12.888	2.2
2008-06-20T08:46:08.610Z	45.1293333	-120.9386667	19.288	3.2

Time	Latitude	Longitude	Depth (km)	Magnitude
2008-07-14T18:45:55.170Z	45.1286667	-120.95	16.378	4.2
2008-07-14T18:54:45.110Z	45.134	-120.8963333	10.185	2
2008-07-18T04:11:18.710Z	45.1306667	-120.9378333	17.268	2.4
2008-08-05T04:51:03.060Z	45.1261667	-120.9481667	12.968	2
2008-08-18T03:58:57.040Z	45.1308333	-120.9713333	16.917	2.2
2008-09-16T22:36:58.620Z	45.1295	-120.9491667	16.705	2.7
2008-10-18T02:41:52.790Z	45.1175	-120.9416667	18.443	2.1
2008-10-19T05:22:21.120Z	45.144	-120.9586667	9.098	2.4
2008-10-29T12:34:01.260Z	45.1301667	-120.9235	10.168	2
2008-10-29T13:09:37.700Z	45.1386667	-120.9118333	12.468	2.1
2008-11-08T01:35:48.870Z	45.1383333	-120.9561667	14.158	2.3
2008-11-16T15:54:30.650Z	45.1306667	-120.9535	13.178	3.4
2008-11-16T15:58:22.930Z	45.1246667	-120.9608333	17.82	2.2
2008-11-22T19:54:15.890Z	45.686	-120.9358333	6.367	2.2
2008-11-25T19:31:03.980Z	45.125	-120.9286667	13.248	2.1
2008-12-10T18:15:03.110Z	45.1321667	-120.9441667	12.75	2.1
2008-12-27T23:32:35.630Z	45.131	-120.9513333	15.488	3.6
2009-03-20T22:44:50.720Z	45.1351667	-120.959	13.958	3
2009-04-20T21:41:52.380Z	45.1335	-120.955	15.328	3.6
2009-04-20T21:59:18.300Z	45.1301667	-120.9463333	15.478	2.5
2009-06-06T17:45:10.620Z	45.1225	-120.9428333	18.305	2.6
2009-06-07T08:37:26.540Z	45.1225	-120.9626667	16.677	2.4
2009-06-08T14:29:27.620Z	45.1415	-120.9121667	12.211	2.2
2009-07-18T09:23:13.680Z	45.1291667	-120.9626667	16.515	2.8
2009-07-19T10:51:21.120Z	45.1225	-120.9215	15.116	2
2009-07-28T18:32:11.010Z	45.1321667	-120.9653333	15.867	2.4
2009-09-12T16:52:37.040Z	45.1223333	-120.9628333	16.135	2.4
2009-09-26T05:37:53.140Z	45.3676667	-121.6836667	2.343	2
2009-10-24T21:15:47.820Z	45.1258333	-120.9456667	18.597	2.5
2009-11-04T19:22:49.520Z	45.122	-120.927	15.448	2.1
2010-01-02T16:36:45.910Z	45.137	-120.9555	14.468	3.6
2010-01-22T23:27:09.980Z	44.9838333	-121.1465	13.813	2
2010-04-20T13:23:31.480Z	45.1206667	-120.9431667	20.125	2.3
2010-04-21T12:42:00.230Z	45.3608333	-121.7591667	4.206	2.1
2010-05-14T17:09:42.210Z	45.357	-121.7545	4.103	2.4
2010-05-14T17:10:24.770Z	45.3566667	-121.7618333	3.463	2
2010-05-14T19:03:04.090Z	45.3595	-121.7521667	3.743	3
2010-12-30T09:17:46.240Z	45.1315	-120.932	15.995	3.6
2011-03-02T12:12:09.010Z	45.3556667	-121.7606667	3.128	2.6
2011-03-27T11:37:11.330Z	45.1306667	-120.9381667	15.772	2.5
2011-04-05T21:05:52.920Z	45.122	-120.9543333	18.284	2.7
2011-05-13T23:17:56.490Z	45.3663333	-121.6988333	3.268	2.1
2011-07-08T08:35:42.890Z	45.122	-120.938	18.095	2.1

Time	Latitude	Longitude	Depth (km)	Magnitude
2011-10-18T12:25:30.850Z	45.1231667	-120.9386667	20.155	2.9
2011-11-07T14:18:57.320Z	45.3125	-121.6808333	6.073	2.1
2012-02-05T17:27:52.460Z	45.124	-120.95	17.518	2.46
2012-04-08T15:19:17.370Z	45.1923333	-121.6998333	5.198	2.29
2012-04-08T17:16:27.980Z	45.1853333	-121.7085	4.508	2.66
2012-10-13T08:15:19.690Z	45.3246667	-121.6673333	6.294	2.07
2013-08-14T17:35:29.520Z	45.2976667	-121.7538333	6.207	2.73
2013-11-22T22:36:30.550Z	45.3718333	-121.7065	-0.177	2.22
2014-03-24T16:25:21.710Z	45.308	-121.753	5.873	2.32
2014-03-24T19:42:09.880Z	45.3013333	-121.7493333	5.323	2
2014-06-28T00:32:00.890Z	45.5986667	-121.7875	7.247	2.19
2014-09-04T08:52:01.220Z	45.3665	-121.7138333	2.193	2.56
2014-10-08T16:18:54.330Z	45.3731667	-121.707	0.343	2
2014-11-09T02:17:55.240Z	45.0798333	-121.0666667	16.48	2.16
2014-11-27T07:21:05.590Z	45.7388333	-121.792	7.652	2.24
2014-12-05T22:07:20.690Z	44.9675	-121.0268333	17.279	2.02
2014-12-27T06:49:27.940Z	45.3136667	-121.7493333	6.603	2.02
2015-01-02T06:10:44.680Z	45.0795	-121.7608333	4.384	2.15
2015-05-15T22:42:43.620Z	45.2021667	-121.2685	12.983	2.92
2016-05-16T23:52:46.360Z	45.1283333	-120.9405	16.68	2.3
2016-05-18T07:38:54.750Z	45.3195	-121.7016667	3.25	2.47
2016-05-18T07:40:00.010Z	45.3218333	-121.6981667	3.71	2.36
2016-05-18T08:23:40.270Z	45.3193333	-121.7018333	3.46	2.02
2017-10-09T23:06:21.340Z	45.3153333	-121.6911667	7.16	2.27
2017-10-10T02:45:37.050Z	45.3206667	-121.6861667	6.84	2.75
2018-08-30T23:38:18.160Z	44.8213333	-122.2221667	3.78	2.57
2019-03-29T13:43:23.260Z	45.54383333	-121.6576667	-1.52	2.16
2019-07-09T16:56:15.400Z	45.32583333	-121.7325	3.66	2.08
2019-07-09T16:57:15.680Z	45.31883333	-121.73	3.63	2.06
2019-07-09T17:02:53.150Z	45.32333333	-121.7321667	3.82	2.07
2019-07-09T17:06:09.220Z	45.32533333	-121.7363333	3.76	2.05
2019-07-09T17:23:49.060Z	45.30316667	-121.7223333	4.1	2
2019-07-09T17:23:52.690Z	45.3275	-121.7293333	3.86	2
2019-07-10T04:23:34.360Z	45.31216667	-121.7243333	3.99	2.1
2019-12-09T01:00:25.490Z	45.36016667	-121.6956667	1.9	2.43
2020-11-23T07:02:52.650Z	45.11783333	-120.7648333	20.32	2.42
2020-11-23T07:09:48.050Z	45.12116667	-120.7968333	16.31	2.12
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2021-01-17T23:26:21.970Z	45.33283333	-121.6936667	4.98	2.54
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2021-01-17T23:38:31.710Z	45.3205	-121.6998333	5.64	2.71
2021-01-18T02:15:26.090Z	45.3305	-121.6908333	4.85	2.23
2021-02-09T05:34:17.170Z	45.51583333	-121.5883333	5.75	3.47

Time	Latitude	Longitude	Depth (km)	Magnitude
2021-06-06T03:51:37.740Z	45.34233333	-121.6935	4.3	3.94
2021-06-06T03:55:36.370Z	45.34416667	-121.6891667	4.98	2.22
2021-06-18T12:14:43.070Z	45.32899857	-121.6928329	5.96999979	2
2021-10-18T02:42:00.460Z	45.36583333	-121.7021667	2.4	2.49
2021-10-27T17:50:05.610Z	45.57466667	-121.6723333	7.83	2.44
2023-04-05T01:57:30.570Z	45.364	-121.702	1.94	2.23
2023-06-06T21:35:15.190Z	45.37116667	-121.7011667	0.65	3.04
2023-06-06T21:36:03.470Z	45.36833333	-121.7005	2	2.2
2023-06-06T21:36:06.750Z	45.35866667	-121.7126667	3.09	2.56
2023-10-31T16:34:59.430Z	45.30316667	-121.6576667	5.65	2.48
2024-02-05T03:17:56.030Z	45.31083333	-121.6483333	6.37	2.23



ATTACHMENT 6 FEMA FIRM MAPS



CLIENT: DECH bn, LLC

PROJECT NO: Oregon Energy Facility Siting Council

DATE: December 2025

VERSION: 01



FEMA



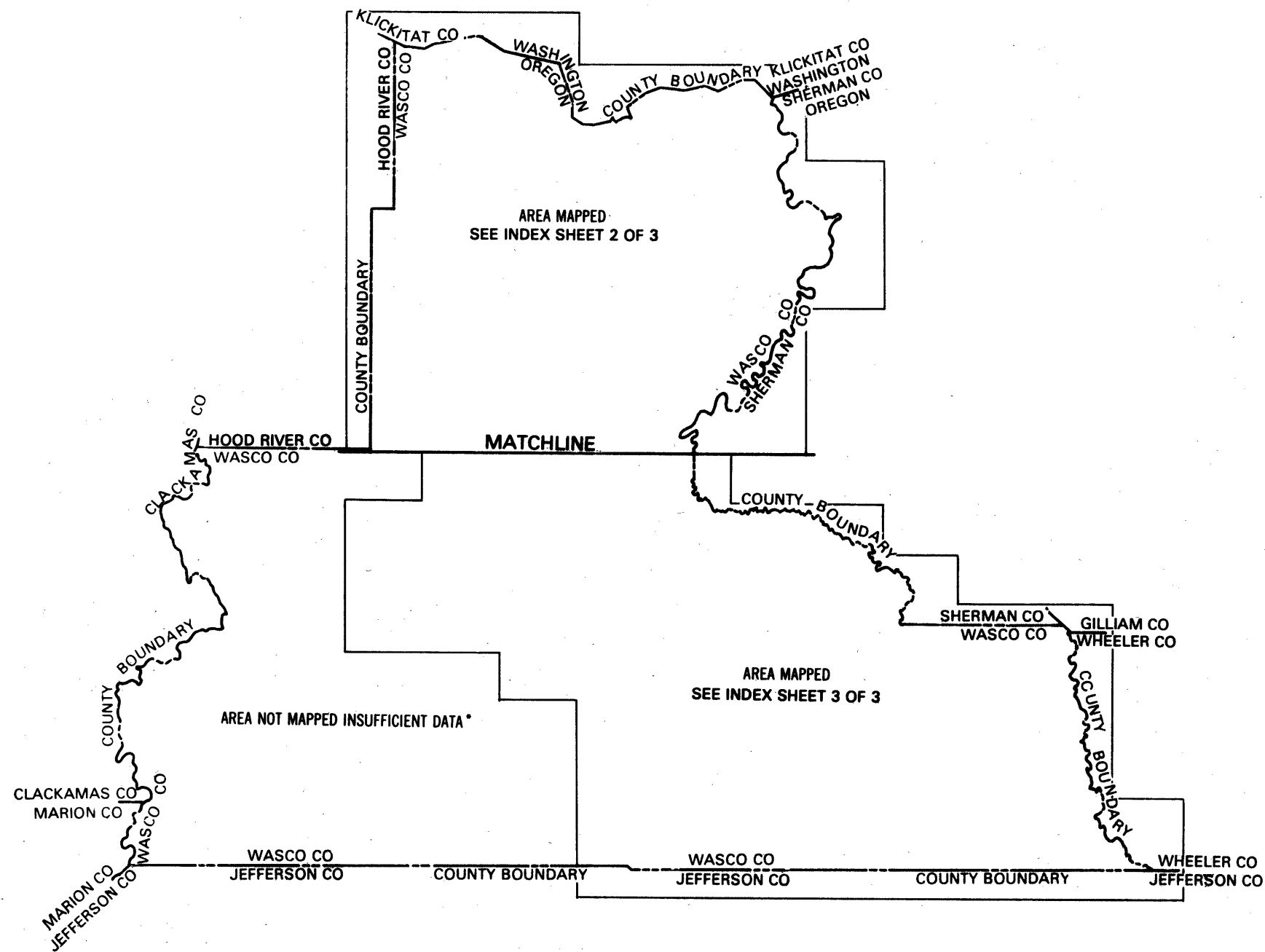
FEMA Digital Flood Map Products

- **FIRM Panel Image:** Flood Insurance Rate Maps (FIRM) are digital images of flood hazard maps. The images are digital pictures of entire flood map panels that can be viewed and printed from a computer. Most communities and counties have many map panels to cover the entire jurisdiction and an index map that shows the location of each map panel.
- **FIRM Worldfile:** A TFW or PGW file may accompany your flood hazard map. They are used to help view the flood maps in GIS applications.

FIRM Panel Images are TIF or PNG image files and have file names with a Community or County ID followed by a 4-digit panel number and letter suffix representing a version (e.g. 12345C0123F.tif). The FIRM worldfiles will have the same filenames but with a .tfw or .pgw extension.

FIRM Panel Images can be viewed using most freely available image viewer applications. You can also use the FIRMette-Desktop software available from the FEMA Flood Map Service Center (MSC) website at msc.fema.gov/portal/resources/firmettes. FIRM images can also be viewed in specialized GIS software where the worldfiles are used to make the images compatible with other GIS data. See the [MSC Products and Tools Overview page](#) for more information on available data and tools for using FEMA's flood risk data.

For more information on available digital products, visit FEMA's Map Service Center website at <https://msc.fema.gov> or call the FEMA Map Information eXchange (FMIX) at 877-336-2627.



*PANELS NOT PRINTED - AREA IN ZONE D



KEY TO MAP

SPECIAL FLOOD HAZARD
AREA



Elevation Reference Mark

RM7 X

Zone D Boundary

River Mile

• M .5

EXPLANATION OF ZONE DESIGNATIONS

ZONE	EXPLANATION
A	Areas of 100-year flood base flood elevations and flood hazard factors not determined.
B	Areas between limits of the 100-year flood and 500-year flood; or certain areas subject to 100-year flooding with average depths less than one foot or where the contributing drainage area is less than one square mile; or areas protected by levees from the base flood.
C	Areas of minimal flooding.
D	Areas of undetermined, but possible flood hazards.
V	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors not determined.

NOTES TO USER

INITIAL IDENTIFICATION
FEBRUARY 21, 1975

FLOOD HAZARD BOUNDARY MAP REVISIONS:
NOVEMBER 1, 1977

FLOOD INSURANCE RATE MAP EFFECTIVE
SEPTEMBER 24, 1984

To determine if flood insurance is available in this community contact your insurance agent, or call the National Flood Insurance Program, at (800) 638-6620.

FEDERAL EMERGENCY MANAGEMENT AGENCY

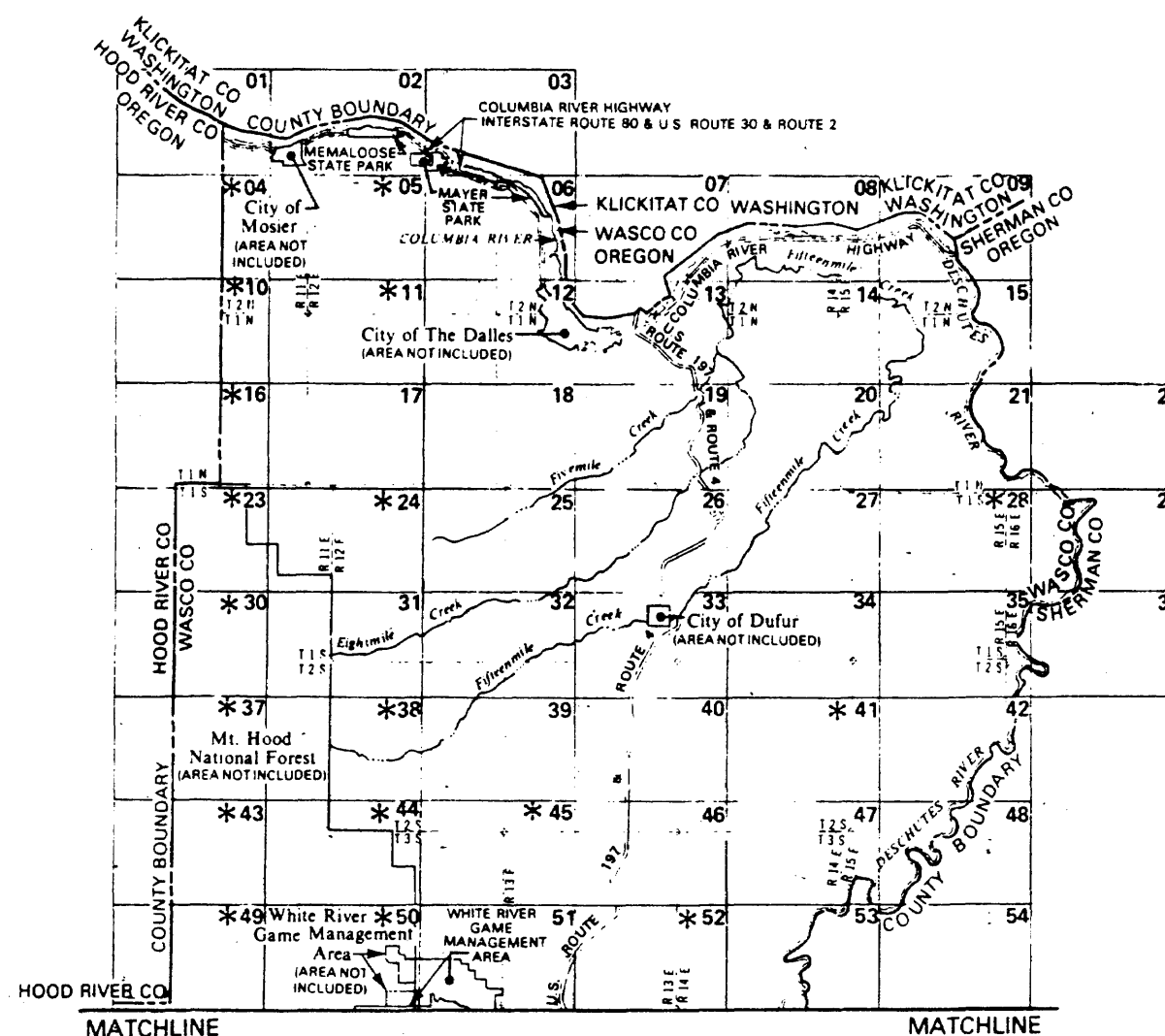


FLOOD INSURANCE RATE MAP
PANEL(S) 01-121

MAP INDEX
1 OF 3

WASCO CO., OR
(UNINC. AREA)

COMMUNITY NO. 410229 B



*PANEL NOT PRINTED - AREA IN ZONE C

KEY TO MAP

SPECIAL FLOOD HAZARD
AREA

ZONE A

ZONE B

Elevation Reference Mark

RM7_x

Zone D Boundary

River Mile

+M1.5

EXPLANATION OF ZONE DESIGNATIONS

ZONE	EXPLANATION
A	Areas of 100-year flood; base flood elevations and flood hazard factors not determined.
B	Areas between limits of the 100-year flood and 500-year flood; or certain areas subject to 100-year flooding with average depths less than one (1) foot or where the contributing drainage area is less than one square mile; or areas protected by levees from the base flood.
C	Areas of minimal flooding.
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FEDERAL EMERGENCY MANAGEMENT AGENCY



FLOOD INSURANCE RATE MAP
PANEL(S) 01-121

MAP INDEX
2 OF 3

WASCO CO., OR
(UNINC. AREA)

COMMUNITY NO. 410229 B

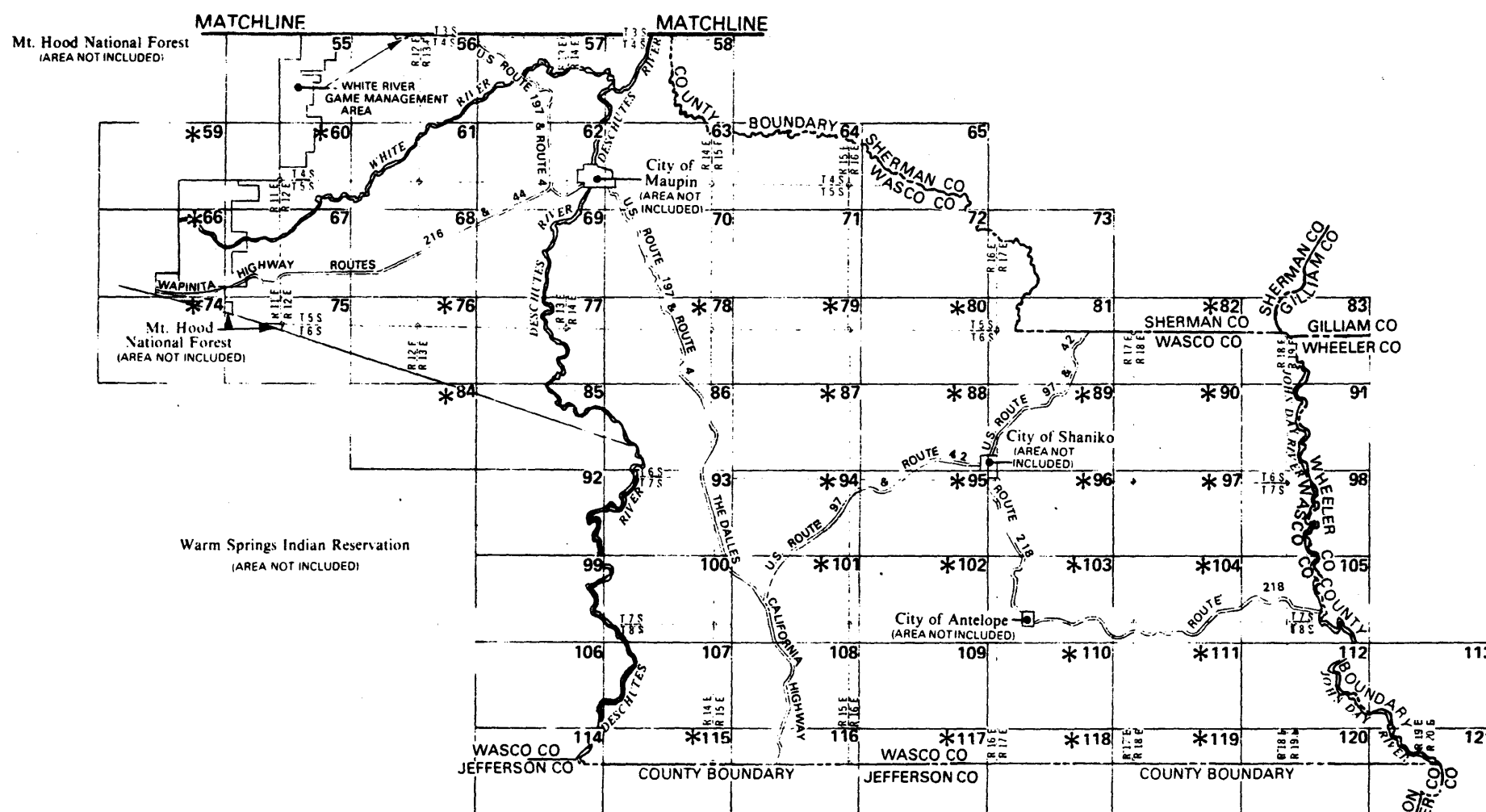


Diagram showing two zones: ZONE A (top) and ZONE B (bottom).

COMMUNITY NO. 410229 B

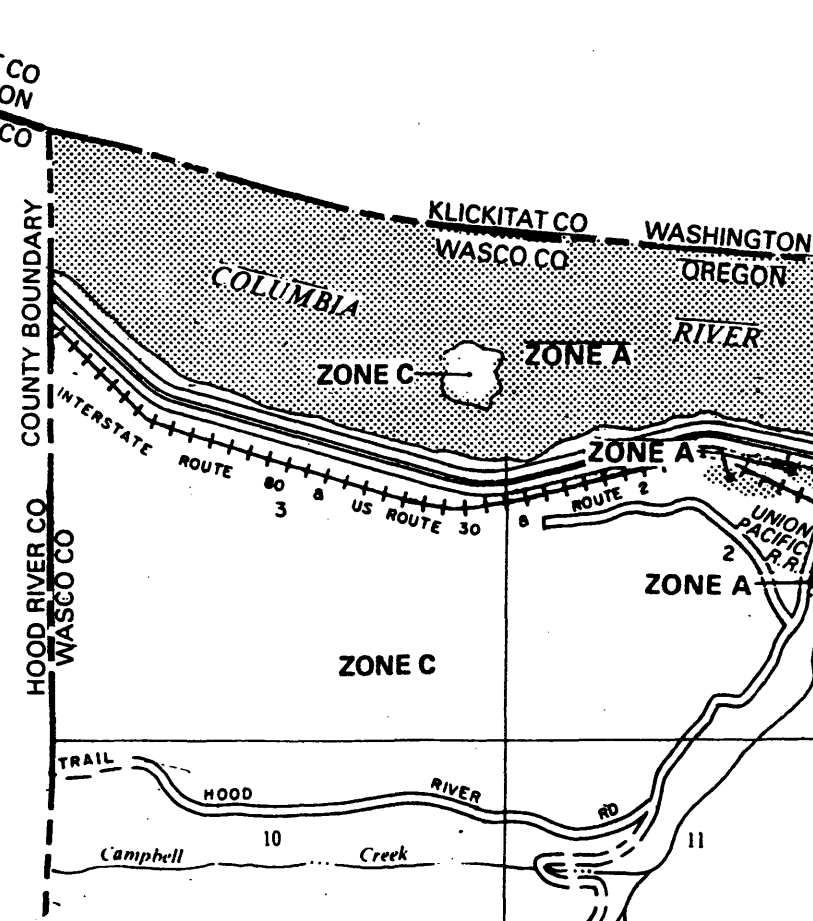
SEPTEMBER 24, 1984

REVISION DATE

10000 FEET



Klickitat Co
Washington
Hood River Co
Oregon



JOINS 02

APPROXIMATE SCALE



EFFECTIVE DATE

SEPTEMBER 24, 1984

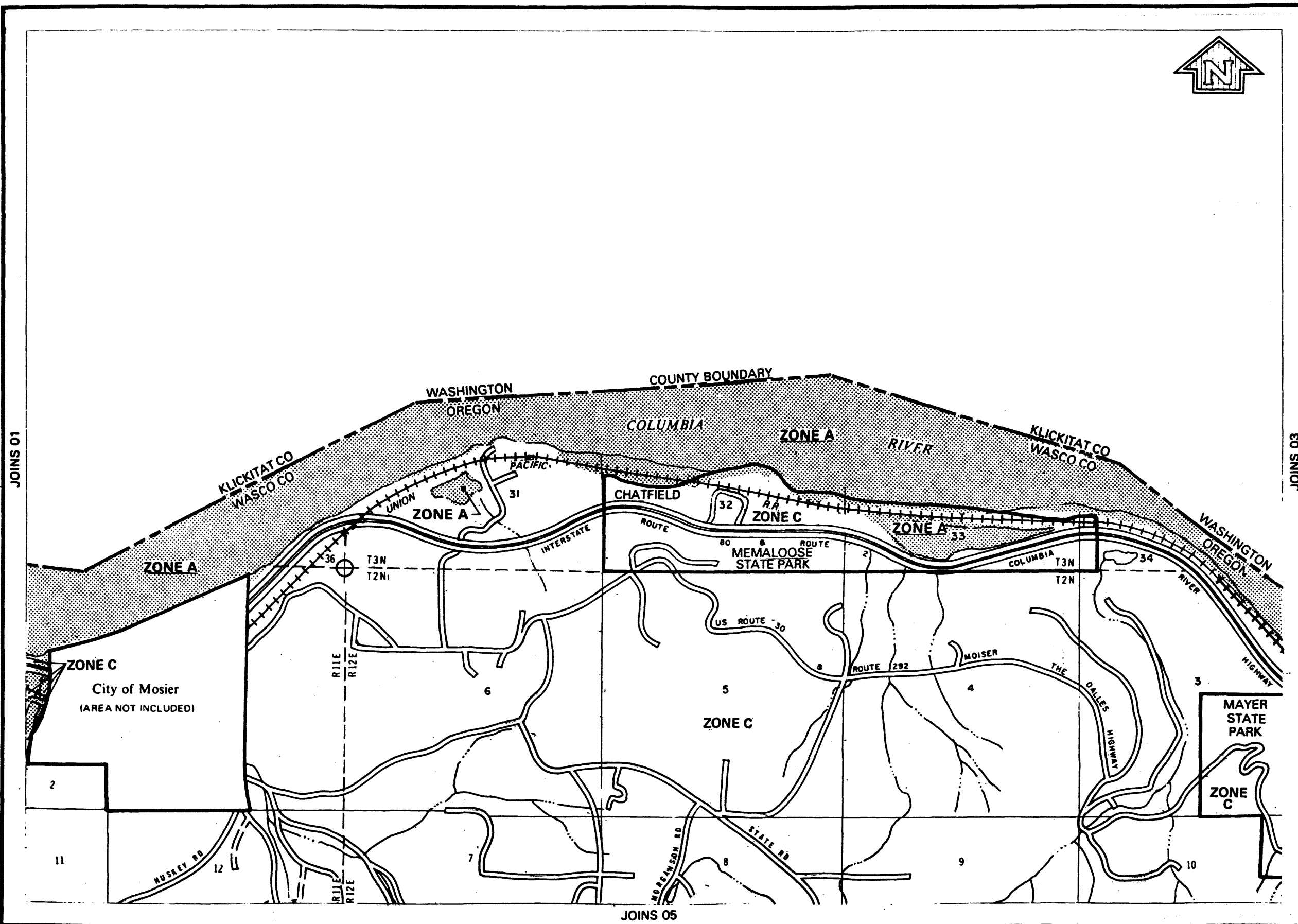
FLOOD INSURANCE RATE MAP

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASCO CO., OR
(UNINC. AREA)

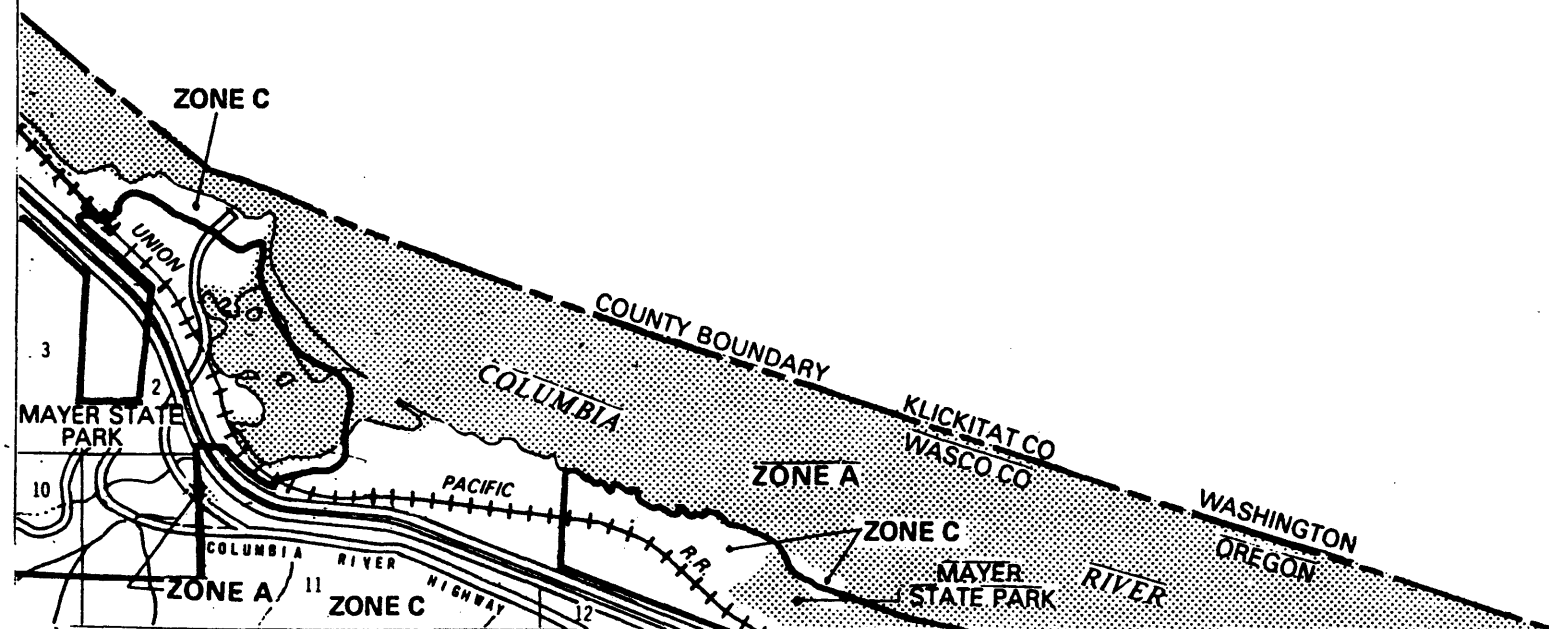
01

JOINS 04



APPROXIMATE SCALE 0 2000 4000 6000 FEET	EFFECTIVE DATE SEPTEMBER 24, 1984
	FLOOD INSURANCE RATE MAP
FEDERAL EMERGENCY MANAGEMENT AGENCY	WASCO CO., OR (UNINC. AREA)
02	

JOINS 02



JOINS 06



APPROXIMATE SCALE

2000 0 2000 4000 6000 FEET

FLOOD INSURANCE RATE MAP

EFFECTIVE DATE

SEPTEMBER 24, 1984

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASCO CO., OR
(UNINC. AREA)

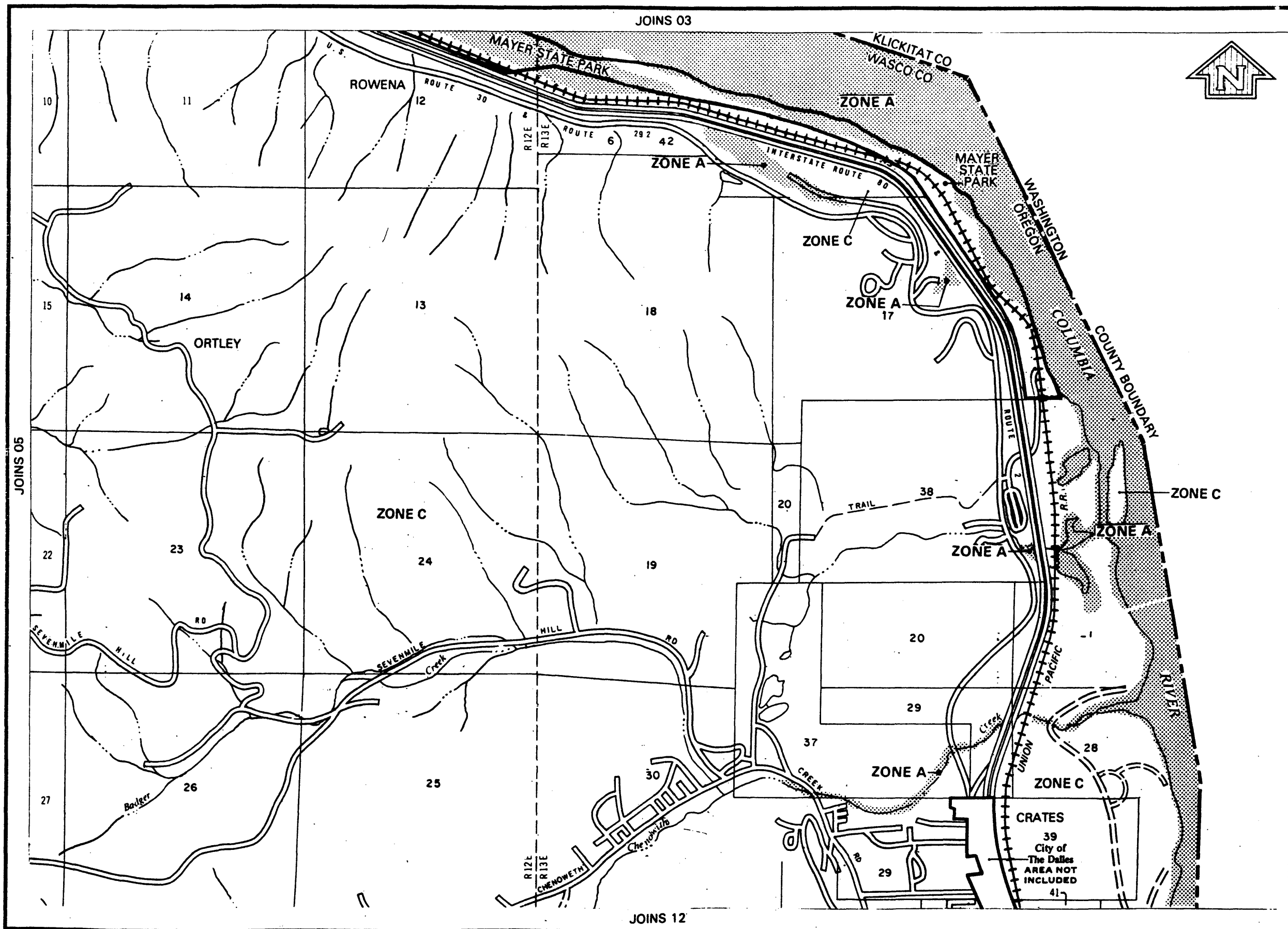
03

JOINS 03

JOINS 12

JOINS 05

JOINS 07



APPROXIMATE SCALE



EFFECTIVE DATE

SEPTEMBER 24, 1984

FLOOD INSURANCE RATE MAP

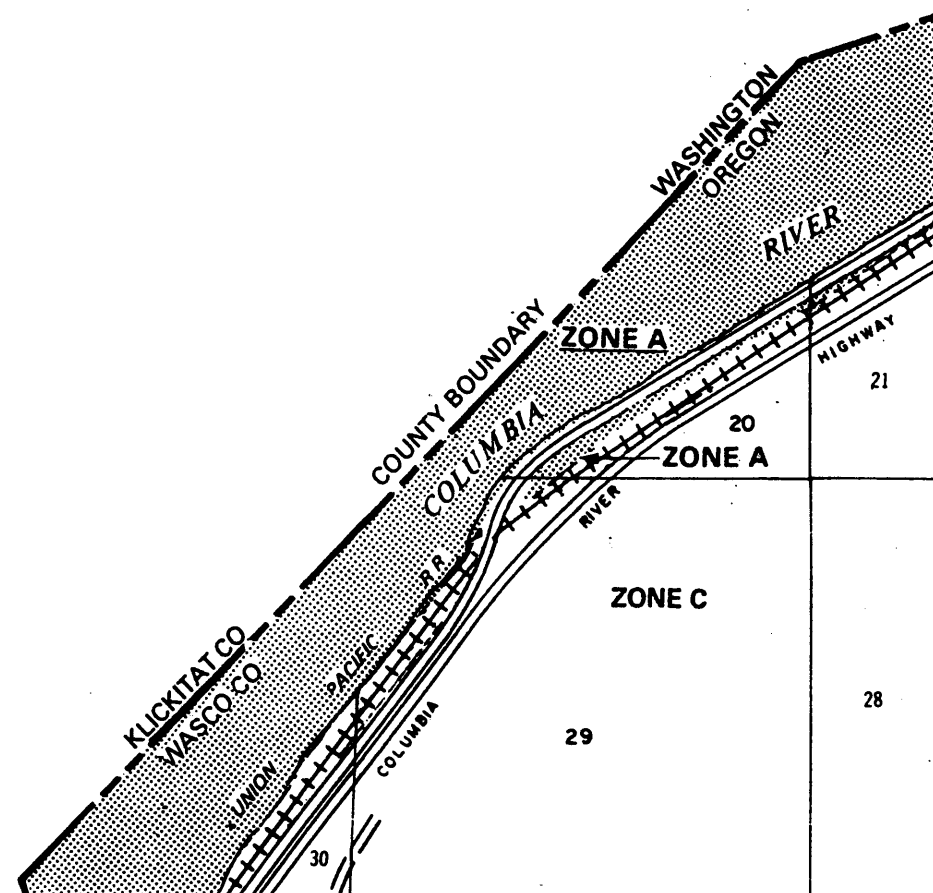
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WASCO CO., OR
(UNINC. AREA)

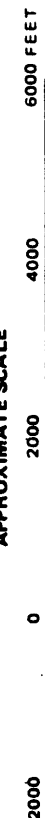
06

JOINS 06

JOINS 13



APPROXIMATE SCALE



FEDERAL EMERGENCY MANAGEMENT AGENCY

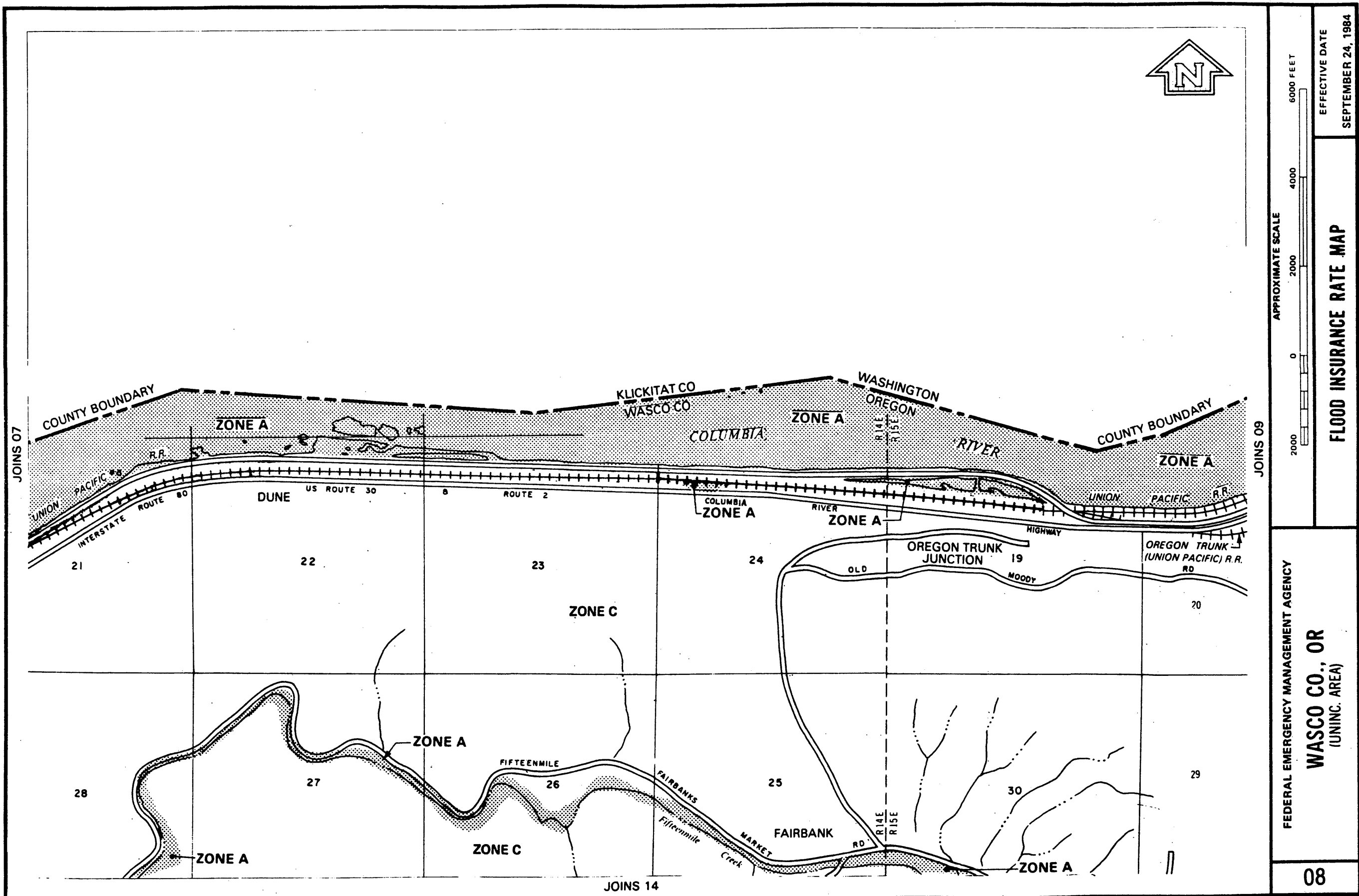
WASCO CO., OR
(UNINC. AREA)

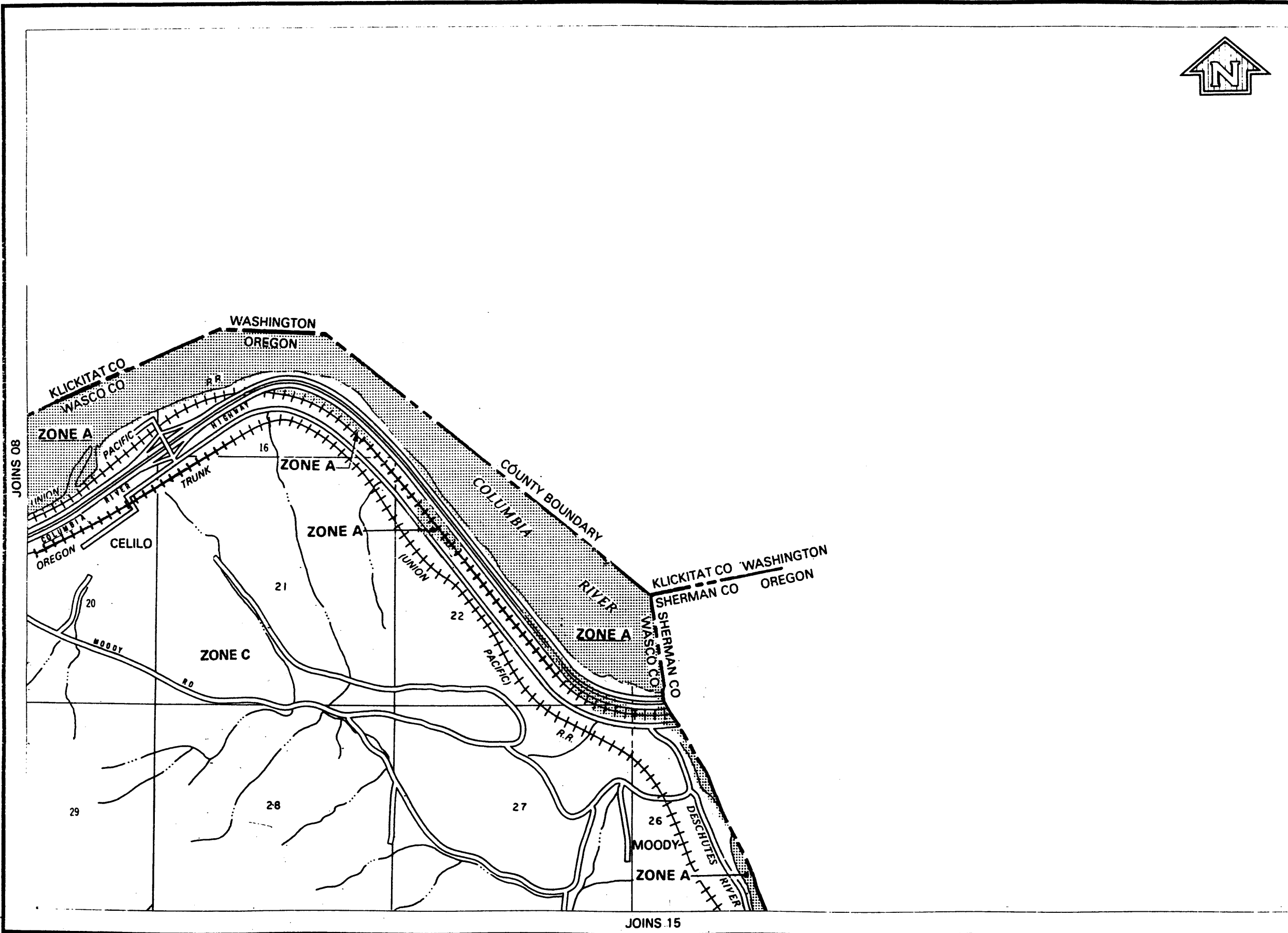
FLOOD INSURANCE RATE MAP

EFFECTIVE DATE

SEPTEMBER 24, 1984

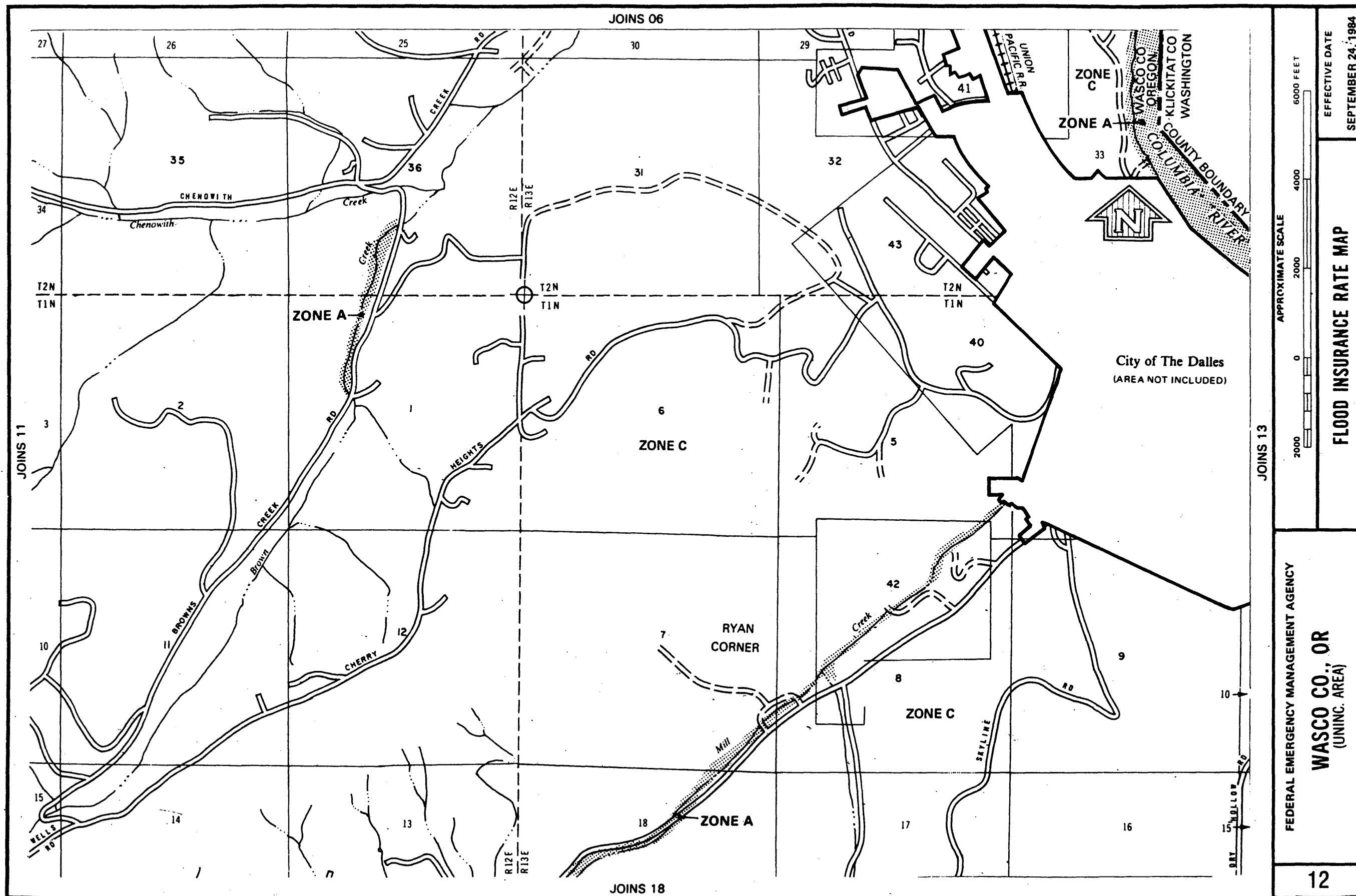
07





FEDERAL EMERGENCY MANAGEMENT AGENCY WASCO CO., OR (UNINC. AREA)	FLOOD INSURANCE RATE MAP	EFFECTIVE DATE SEPTEMBER 24, 1984

09



FEDERAL EMERGENCY MANAGEMENT AGENCY	WASCO CO., OR (UNINC. AREA)	FLOOD INSURANCE RATE MAP	EFFECTIVE DATE
			SEPTEMBER 24, 1984

APPROXIMATE SCALE

6000 FEET
4000
2000
0
2000

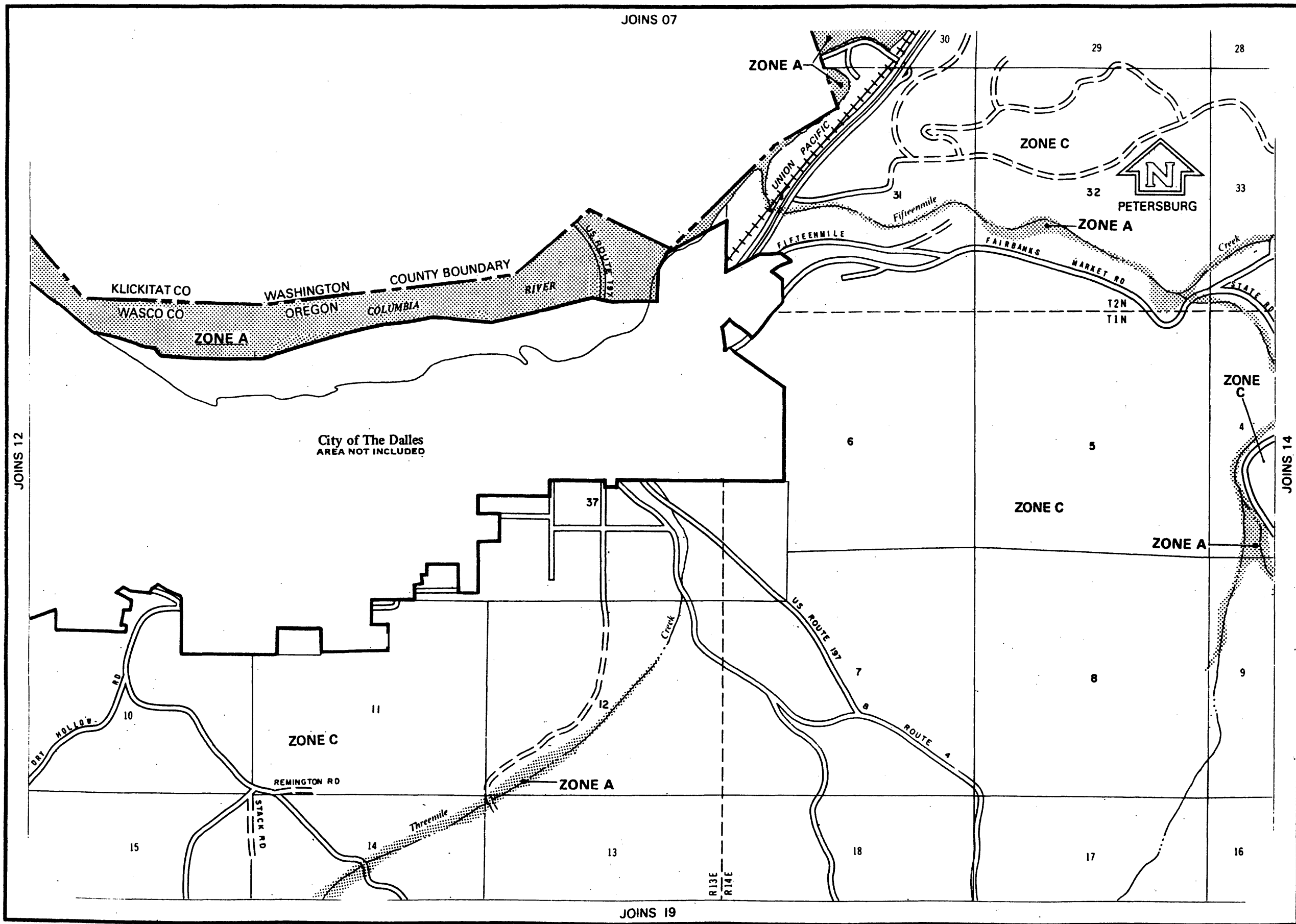
JOINS 11

JOINS 13

JOINS 18

JOINS 06

JOINS 12



JOINS 07

ZONE A

ZONE C



PETERSBURG

ZONE A

ZONE C

ZONE A

City of The Dalles
AREA NOT INCLUDED

ZONE C

ZONE A



EFFECTIVE DATE
SEPTEMBER 24, 1984

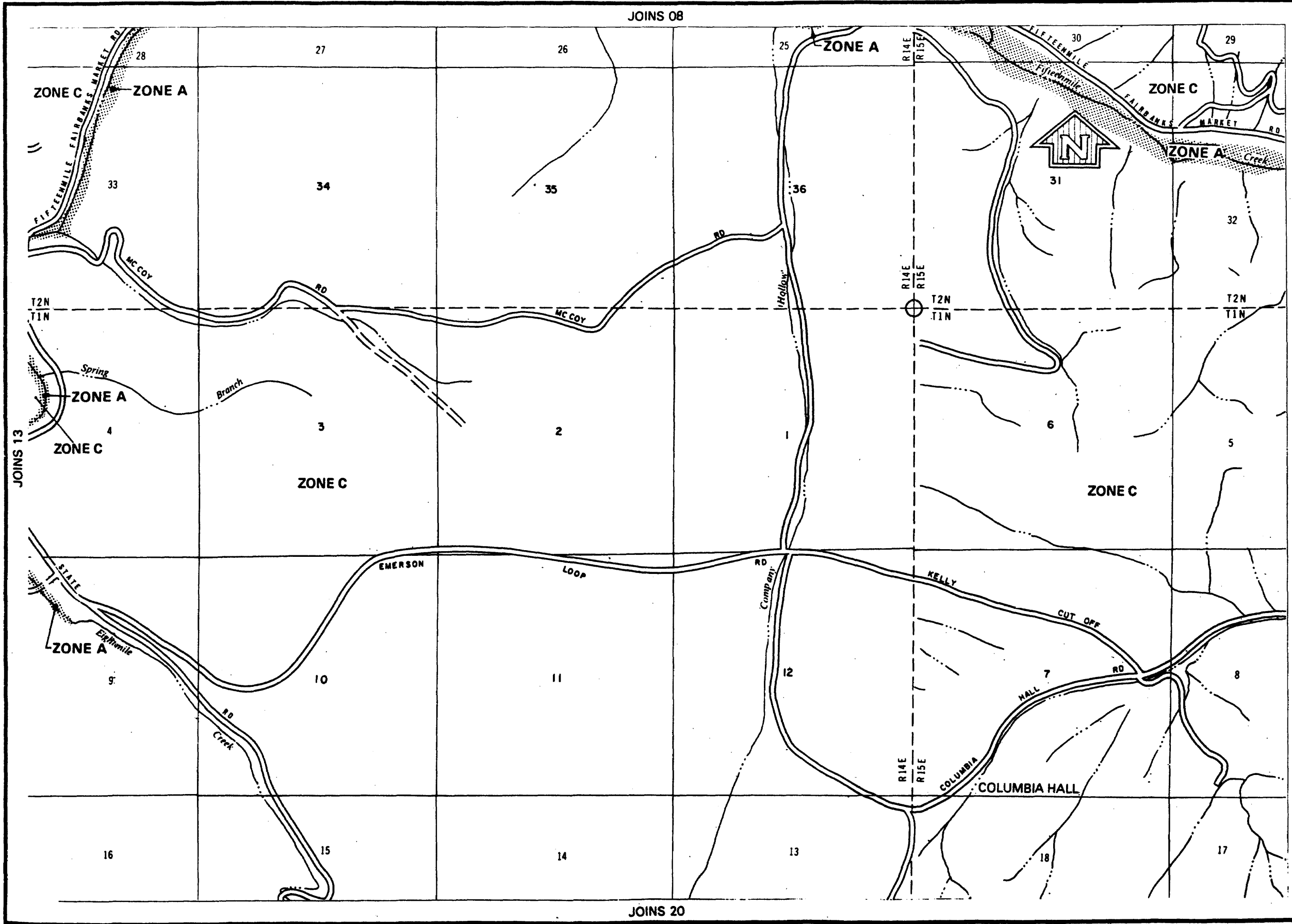
FLOOD INSURANCE RATE MAP

FEDERAL EMERGENCY MANAGEMENT AGENCY

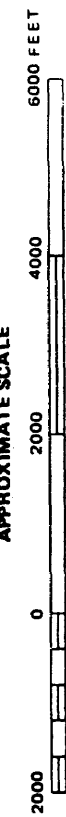
WASCO CO., OR
(UNINC. AREA)

JOINS 08

JOINS 20



APPROXIMATE SCALE

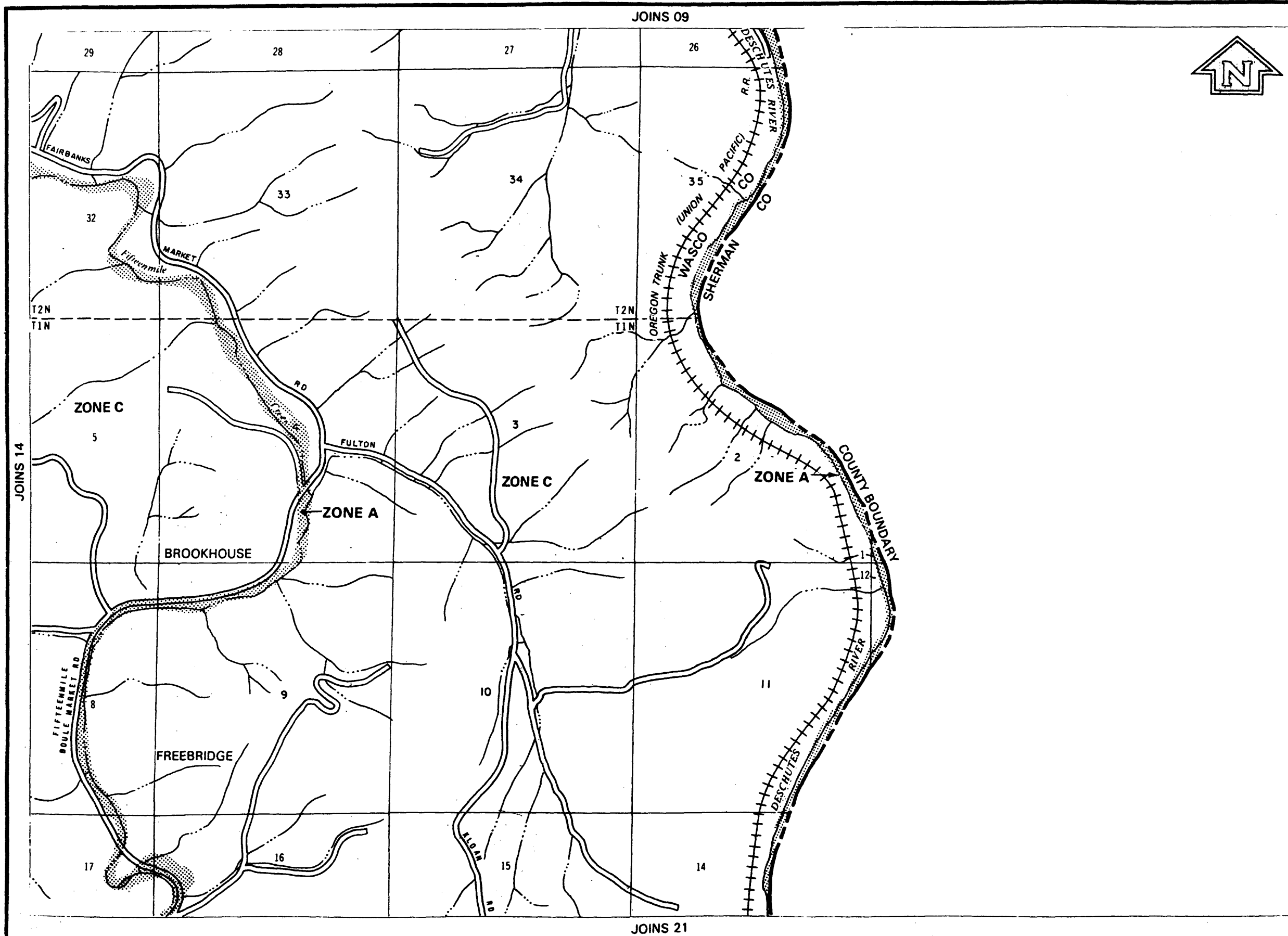


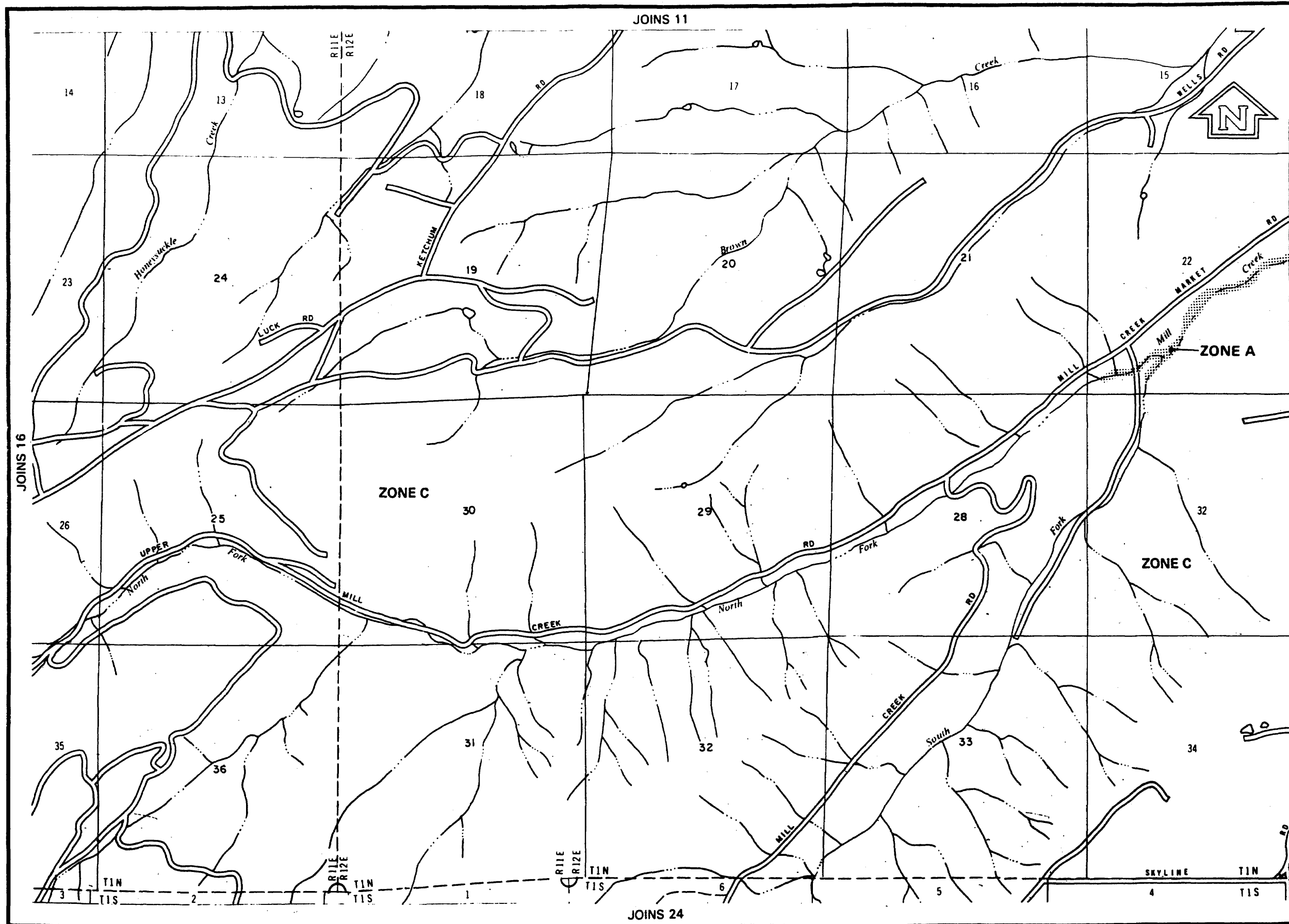
EFFECTIVE DATE
SEPTEMBER 24, 1984

FLOOD INSURANCE RATE MAP

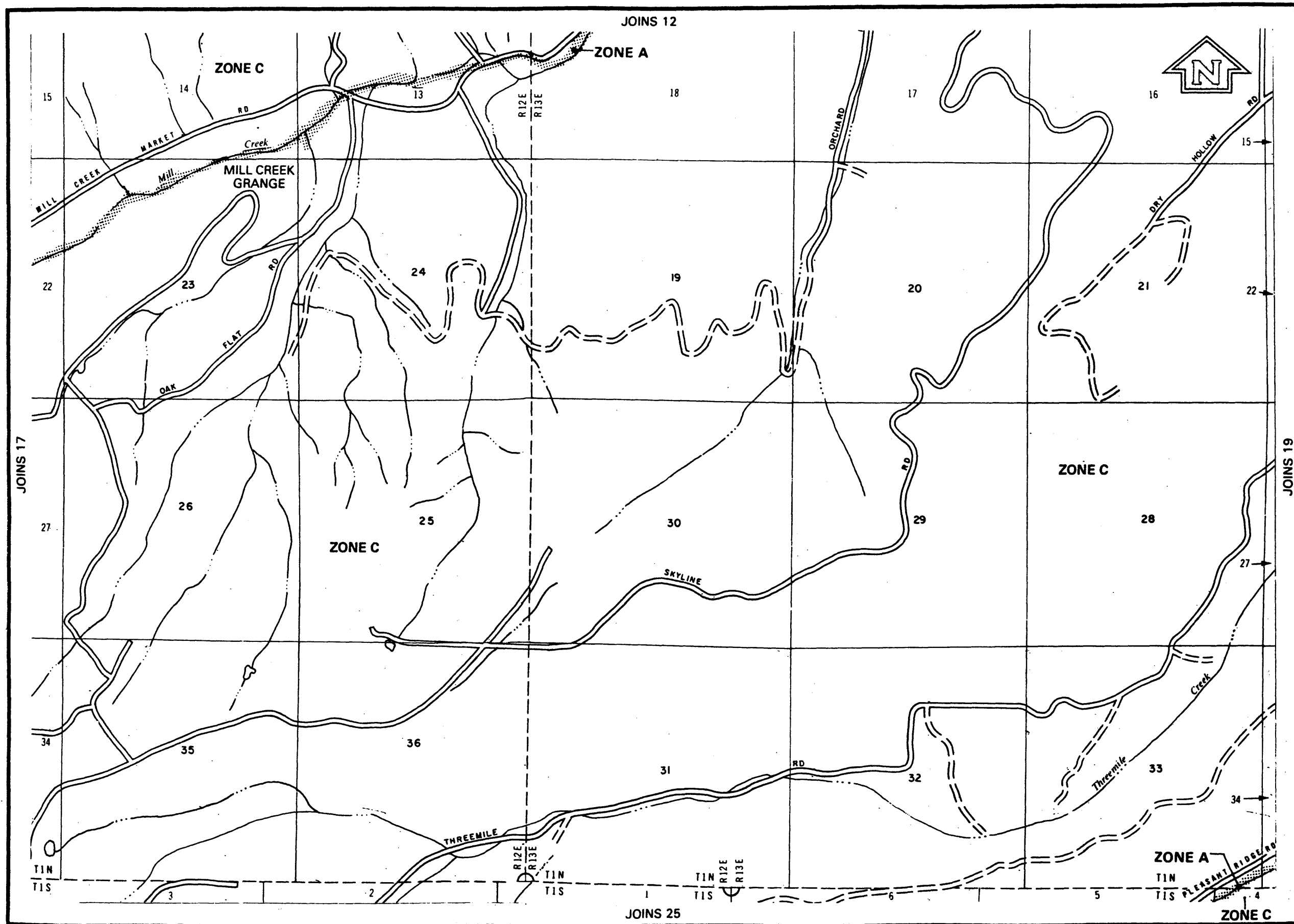
FEDERAL EMERGENCY MANAGEMENT AGENCY

WASCO CO., OR
(UNINC. AREA)

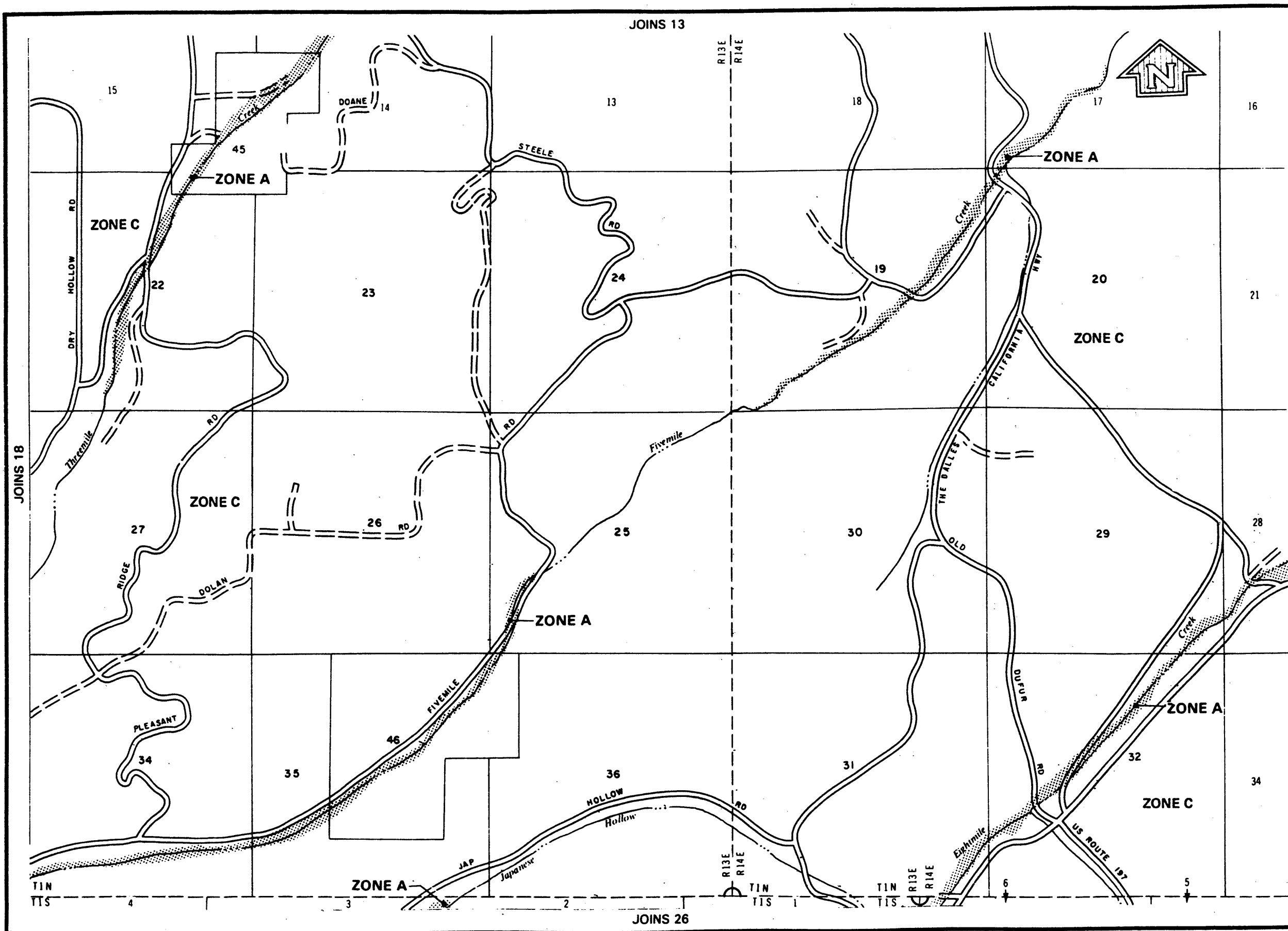




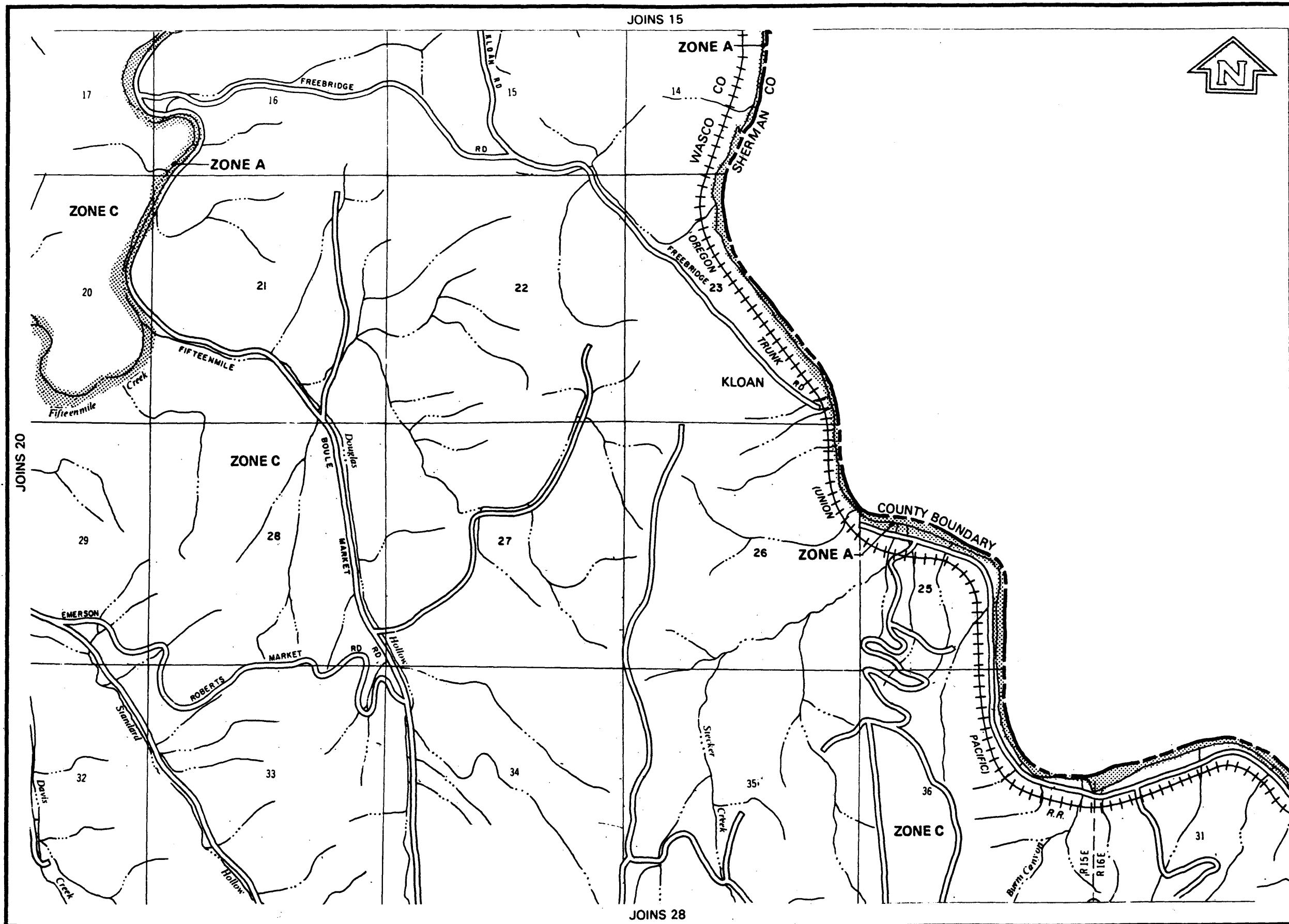
APPROXIMATE SCALE 6000 FEET 4000 2000 0 2000	EFFECTIVE DATE SEPTEMBER 24, 1984
FEDERAL EMERGENCY MANAGEMENT AGENCY WASCO CO., OR (UNINC. AREA)	FLOOD INSURANCE RATE MAP



FEDERAL EMERGENCY MANAGEMENT AGENCY WASCO CO., OR (UNINC. AREA)	FLOOD INSURANCE RATE MAP	EFFECTIVE DATE SEPTEMBER 24, 1984
	APPROXIMATE SCALE 0 2000 4000 6000 FEET	
18		



FEDERAL EMERGENCY MANAGEMENT AGENCY	FLOOD INSURANCE RATE MAP		EFFECTIVE DATE SEPTEMBER 24, 1984
	WASCO CO., OR (UNINC. AREA)		
19			



APPROXIMATE SCALE 2000 0 2000 4000 6000 FEET		FLOOD INSURANCE RATE MAP EFFECTIVE DATE SEPTEMBER 24, 1984
FEDERAL EMERGENCY MANAGEMENT AGENCY WASCO CO., OR (UNINC. AREA)		
21		

NS 21

ZONE A

COUNTY BOUNDARY

31

32

DESCHUTES RIVER
OREGON TRUNK (UNION PACIFIC) R.R.

ZONE C

JOINS 29



APPROXIMATE SCALE

2000 0 2000 4000 6000 FEET

FEDERAL EMERGENCY MANAGEMENT AGENCY

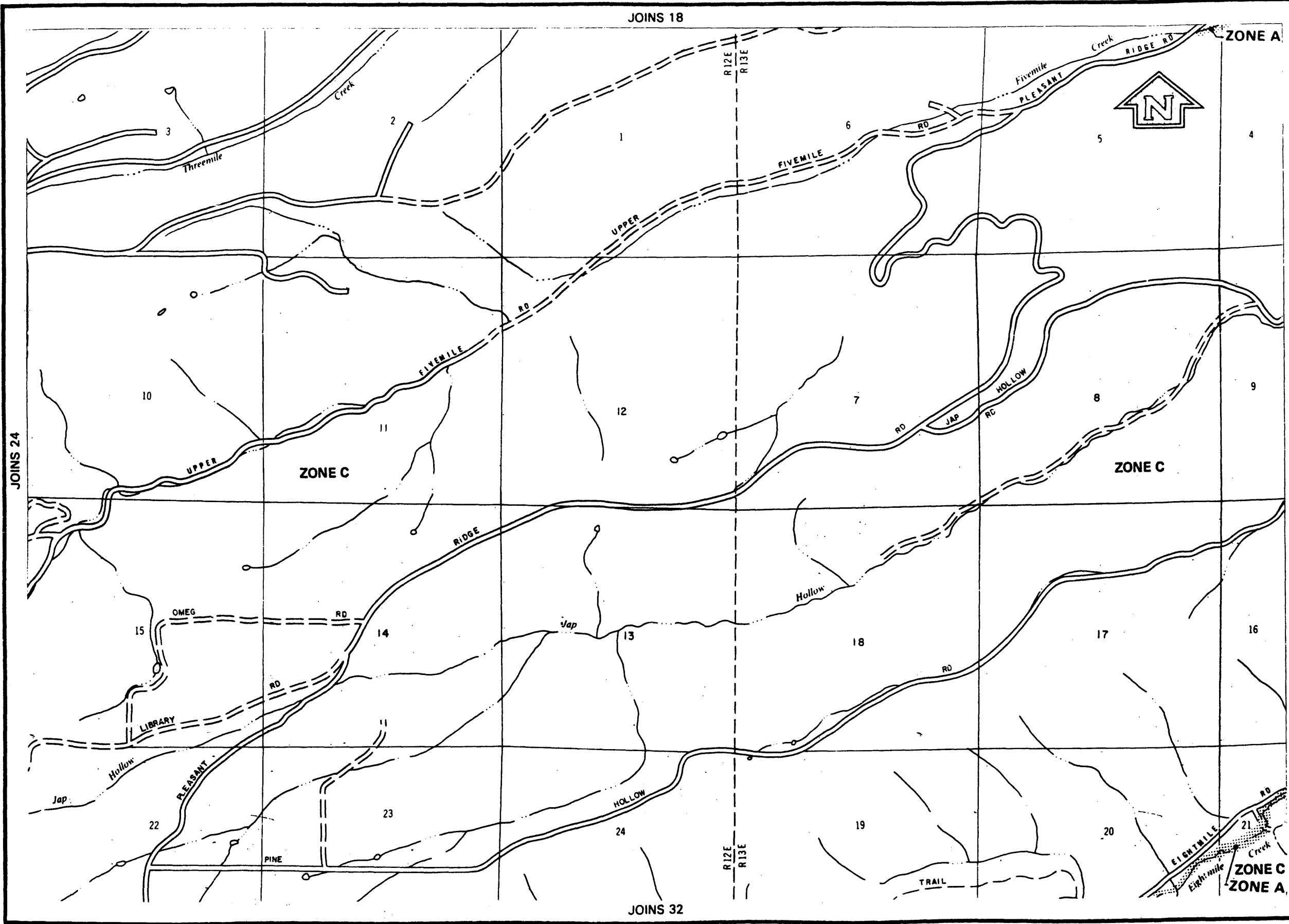
WASCO CO., OR
(UNINC. AREA)

FLOOD INSURANCE RATE MAP

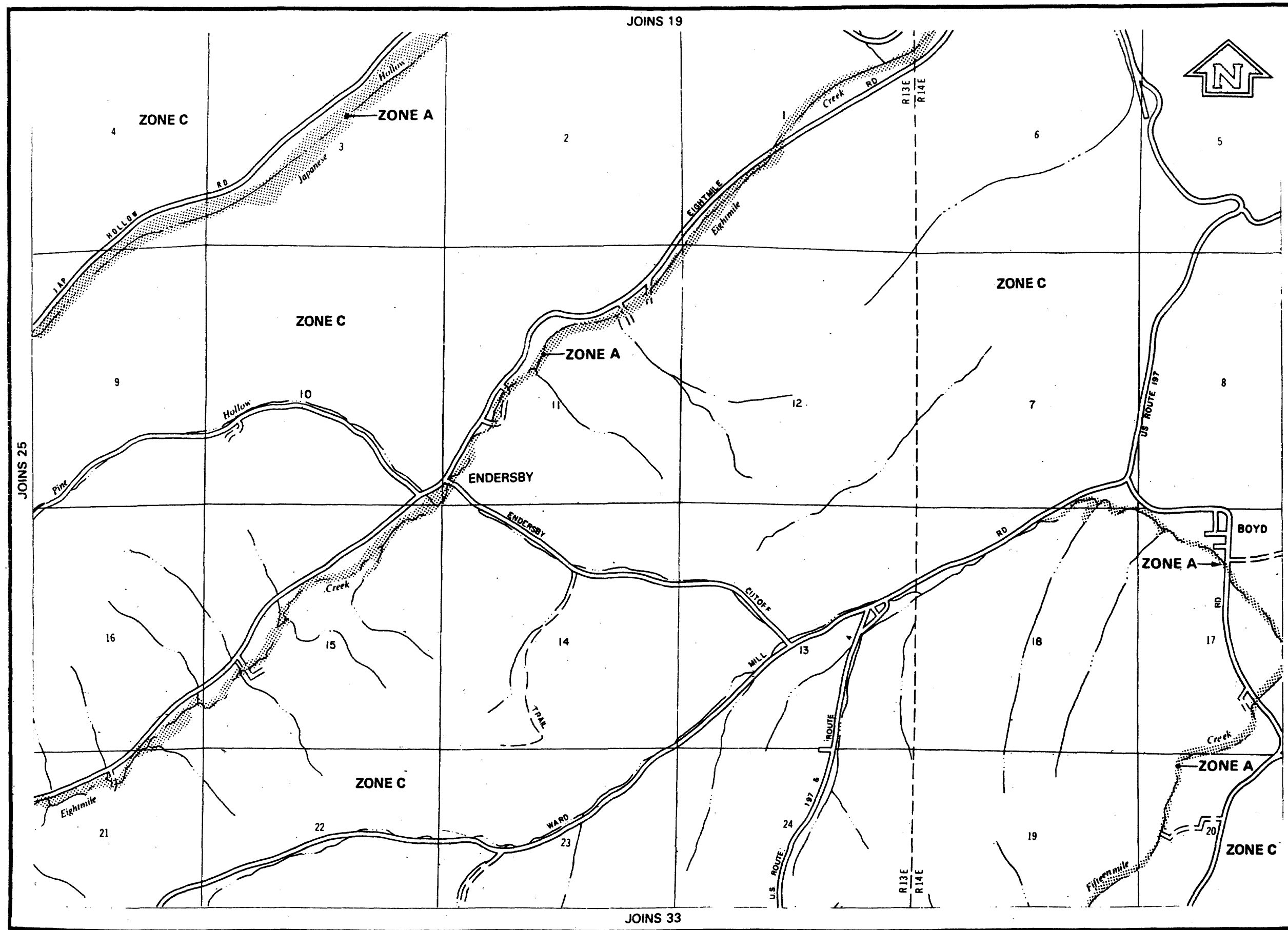
EFFECTIVE DATE

SEPTEMBER 24, 1984

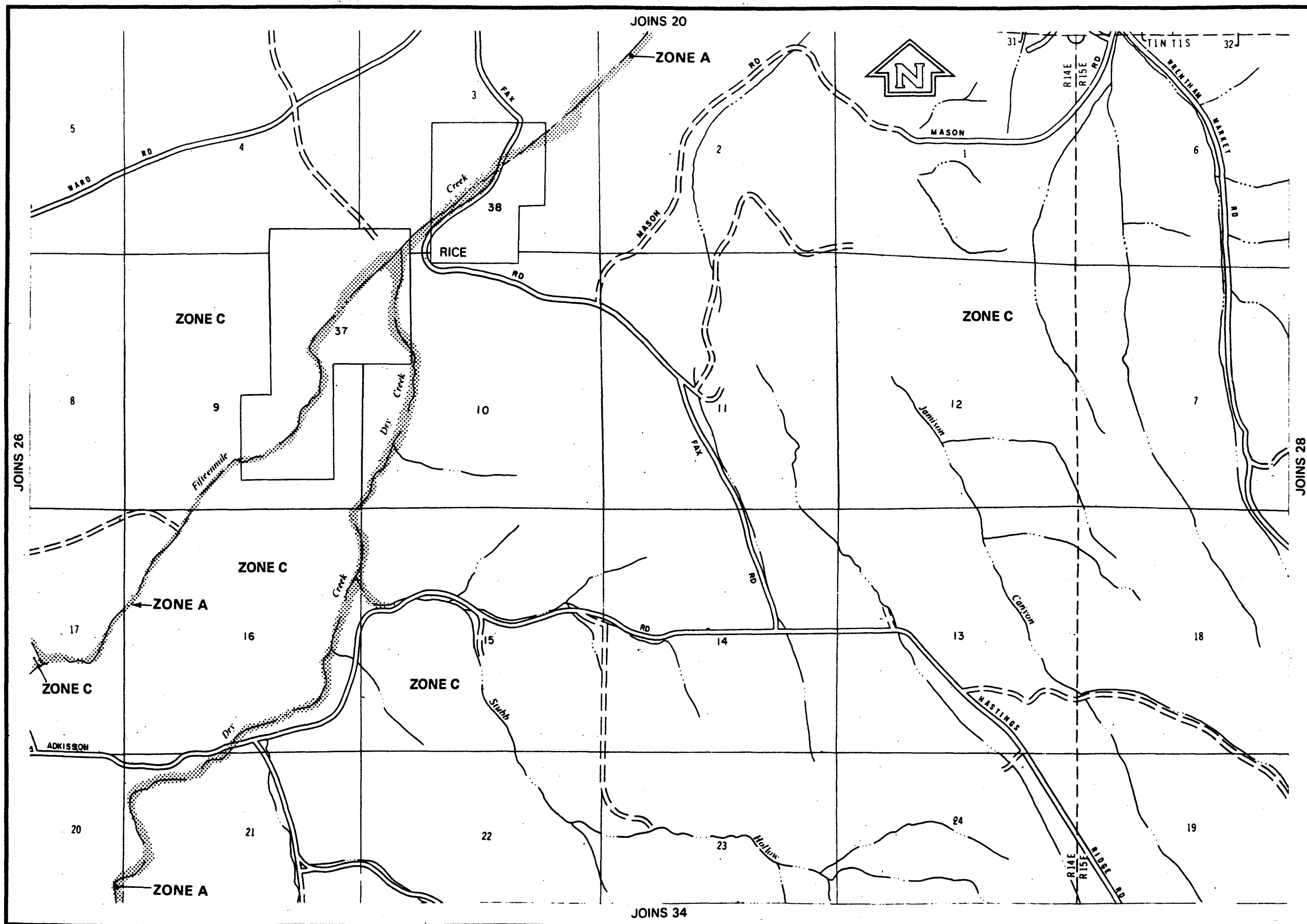
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FEDERAL EMERGENCY MANAGEMENT AGENCY WASCO CO., OR (UNINC. AREA)	FLOOD INSURANCE RATE MAP	EFFECTIVE DATE SEPTEMBER 24, 1984
	APPROXIMATE SCALE 6000 FEET 4000 2000 0 2000	
25		

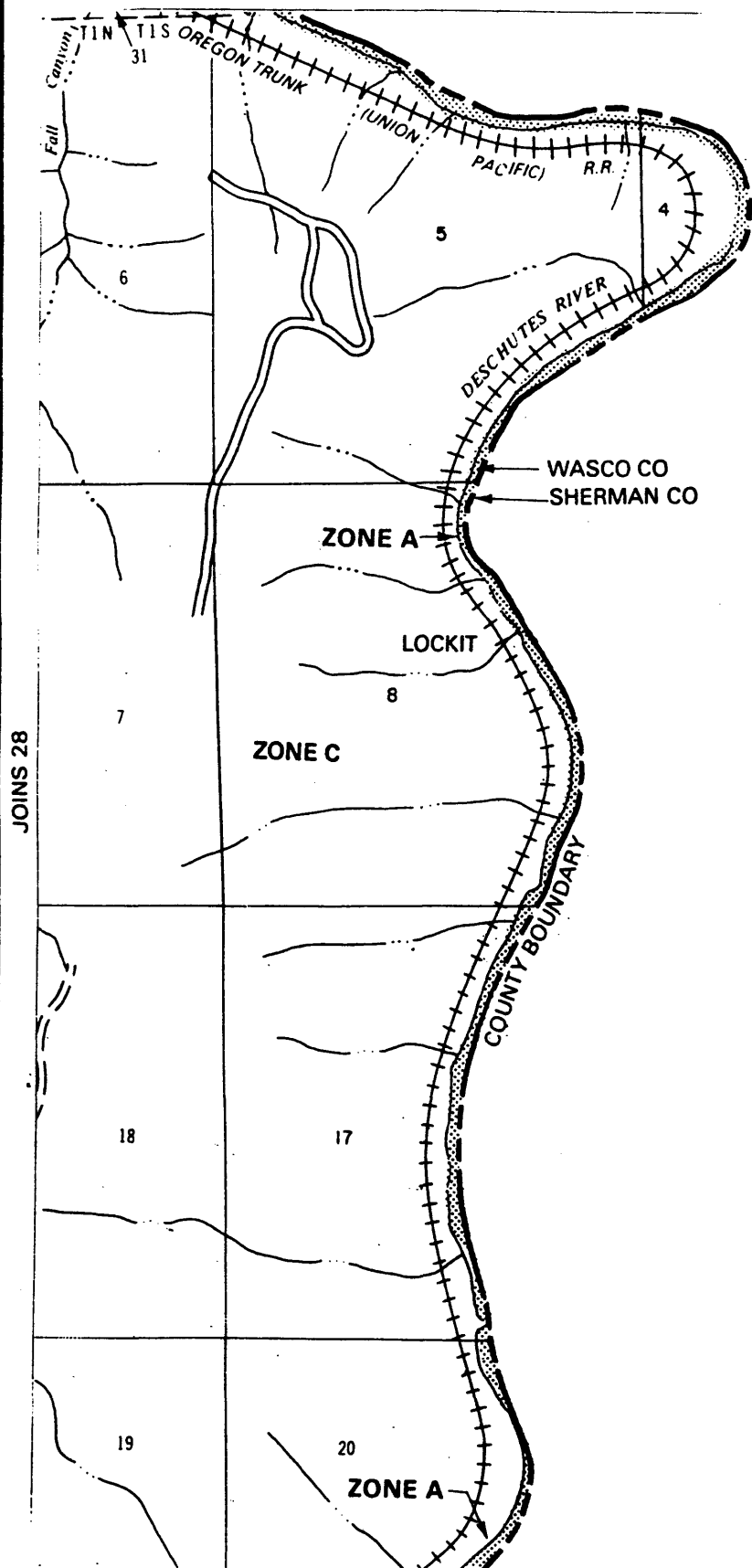


FEDERAL EMERGENCY MANAGEMENT AGENCY WASCO CO., OR (UNINC. AREA)	APPROXIMATE SCALE 6000 FEET 4000 2000 0 2000	FLOOD INSURANCE RATE MAP EFFECTIVE DATE SEPTEMBER 24, 1984
	26	



FEDERAL EMERGENCY MANAGEMENT AGENCY WASCO CO., OR (UNINC. AREA)	APPROXIMATE SCALE 0 2000 4000 6000 FEET		EFFECTIVE DATE SEPTEMBER 24, 1984
	FLOOD INSURANCE RATE MAP		

JOINS 22



JOINS 28

JOINS 36

APPROXIMATE SCALE



FLOOD INSURANCE RATE MAP

EFFECTIVE DATE
SEPTEMBER 24, 1984

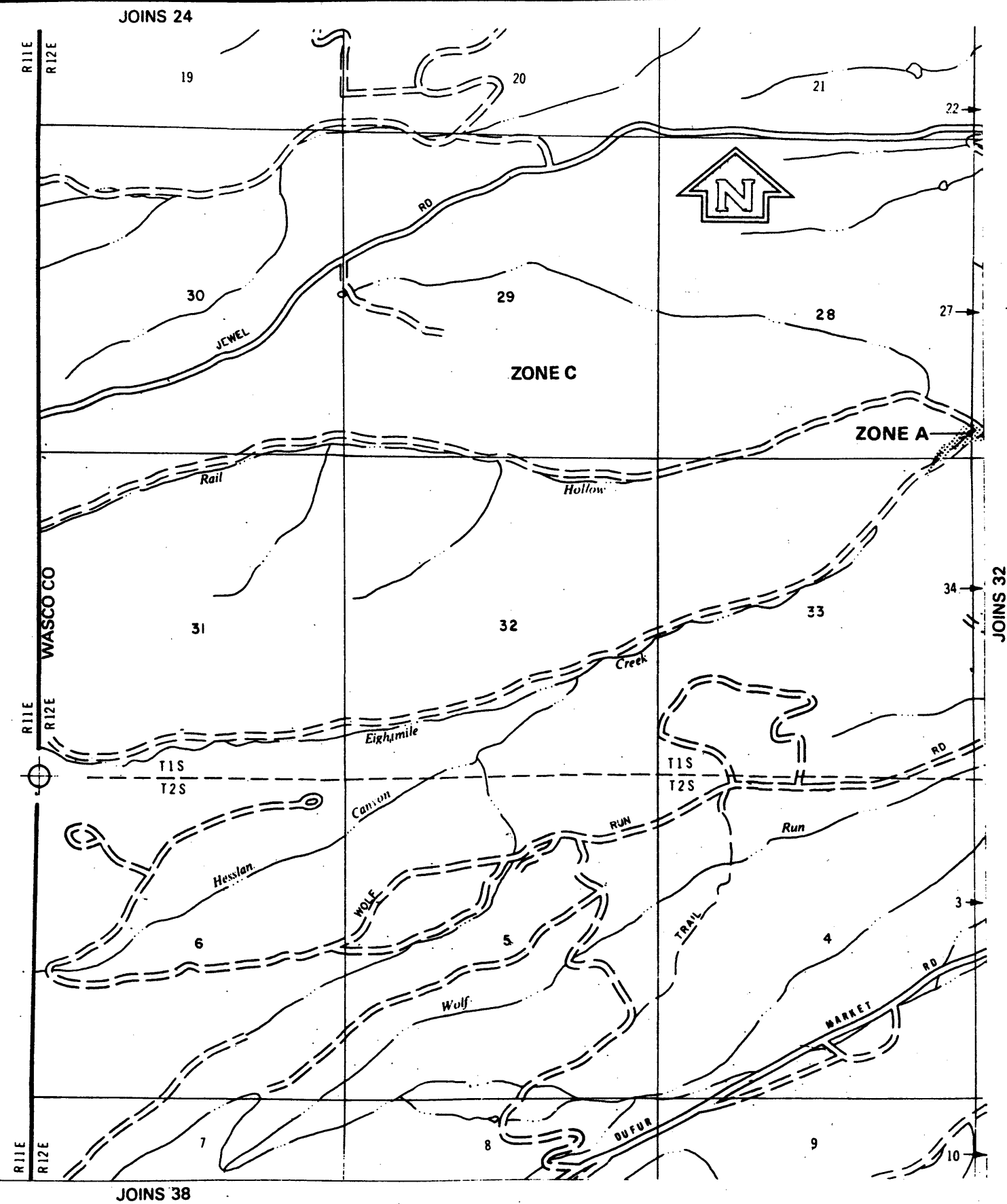
FEDERAL EMERGENCY MANAGEMENT AGENCY

WASCO CO., OR
(UNINC. AREA)

29

JOINS 30

Mt. Hood National Forest
(AREA NOT INCLUDED)



APPROXIMATE SCALE

6000 FEET

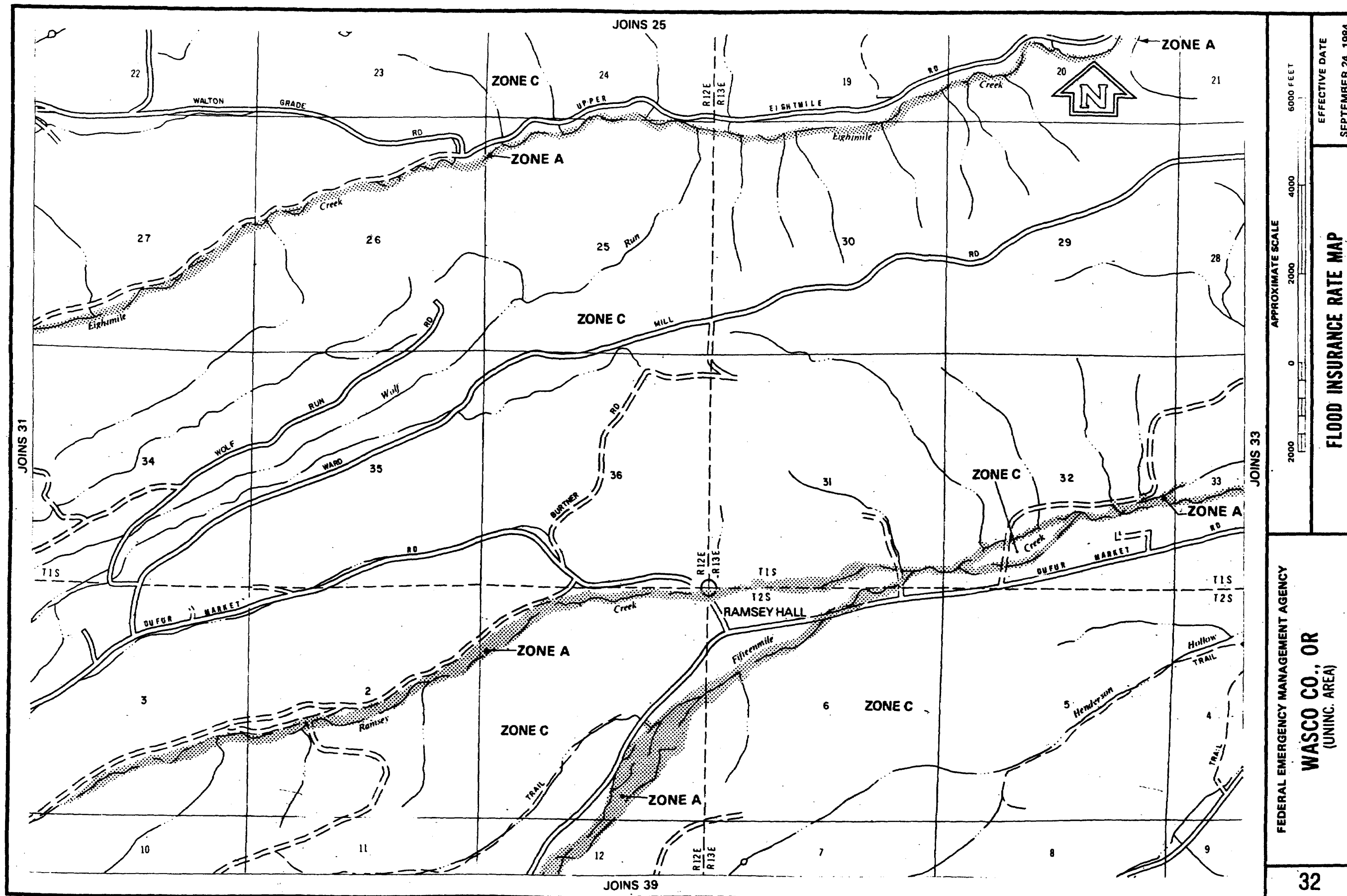
EFFECTIVE DATE
SEPTEMBER 24, 1984

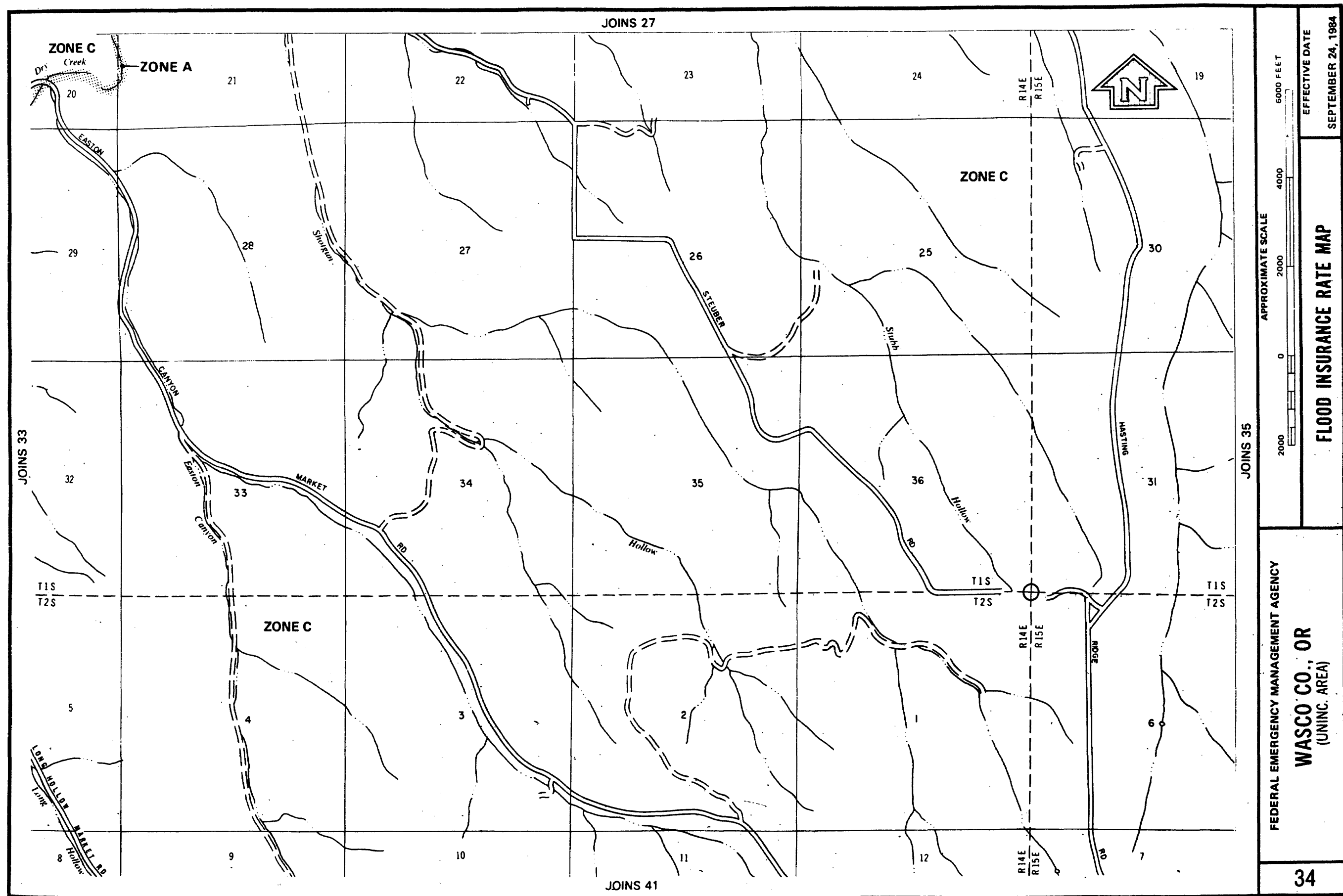
FLOOD INSURANCE RATE MAP

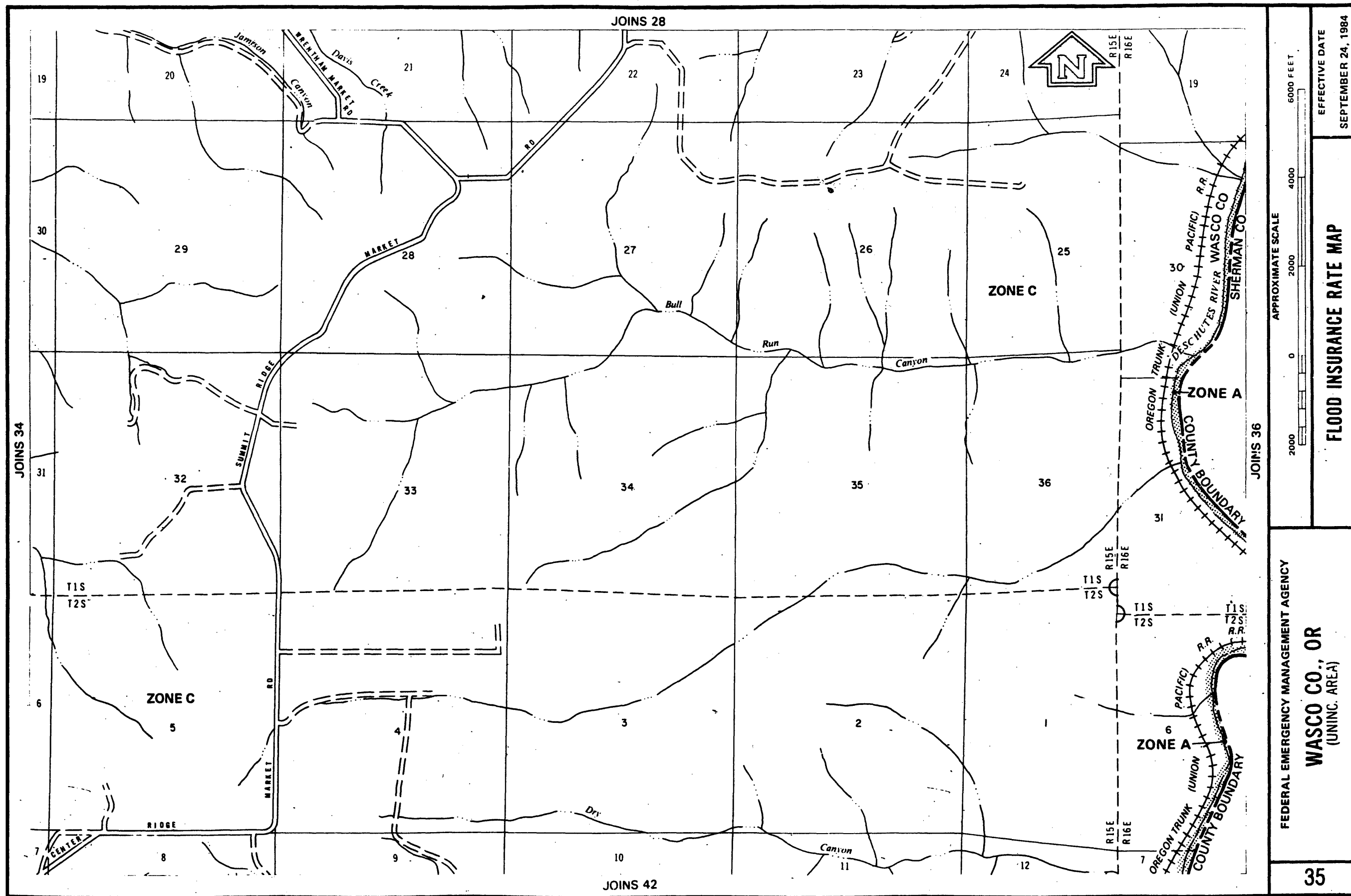
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WASCO CO., OR
(UNINC. AREA)

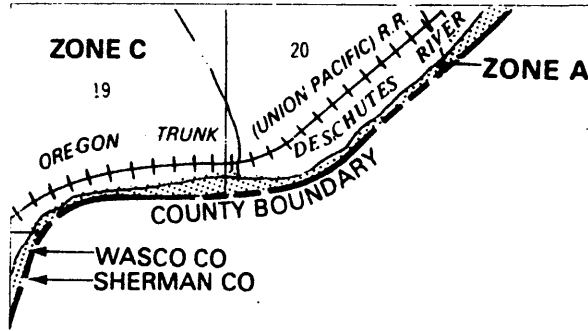
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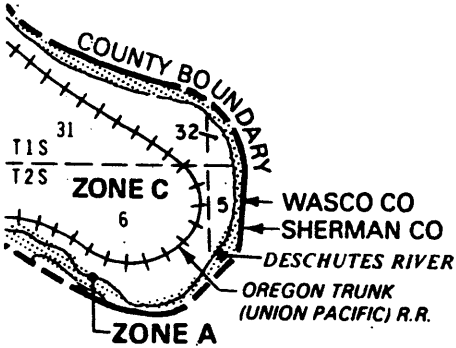




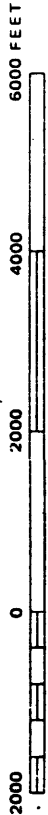
JOINS 29



JOINS 35



APPROXIMATE SCALE



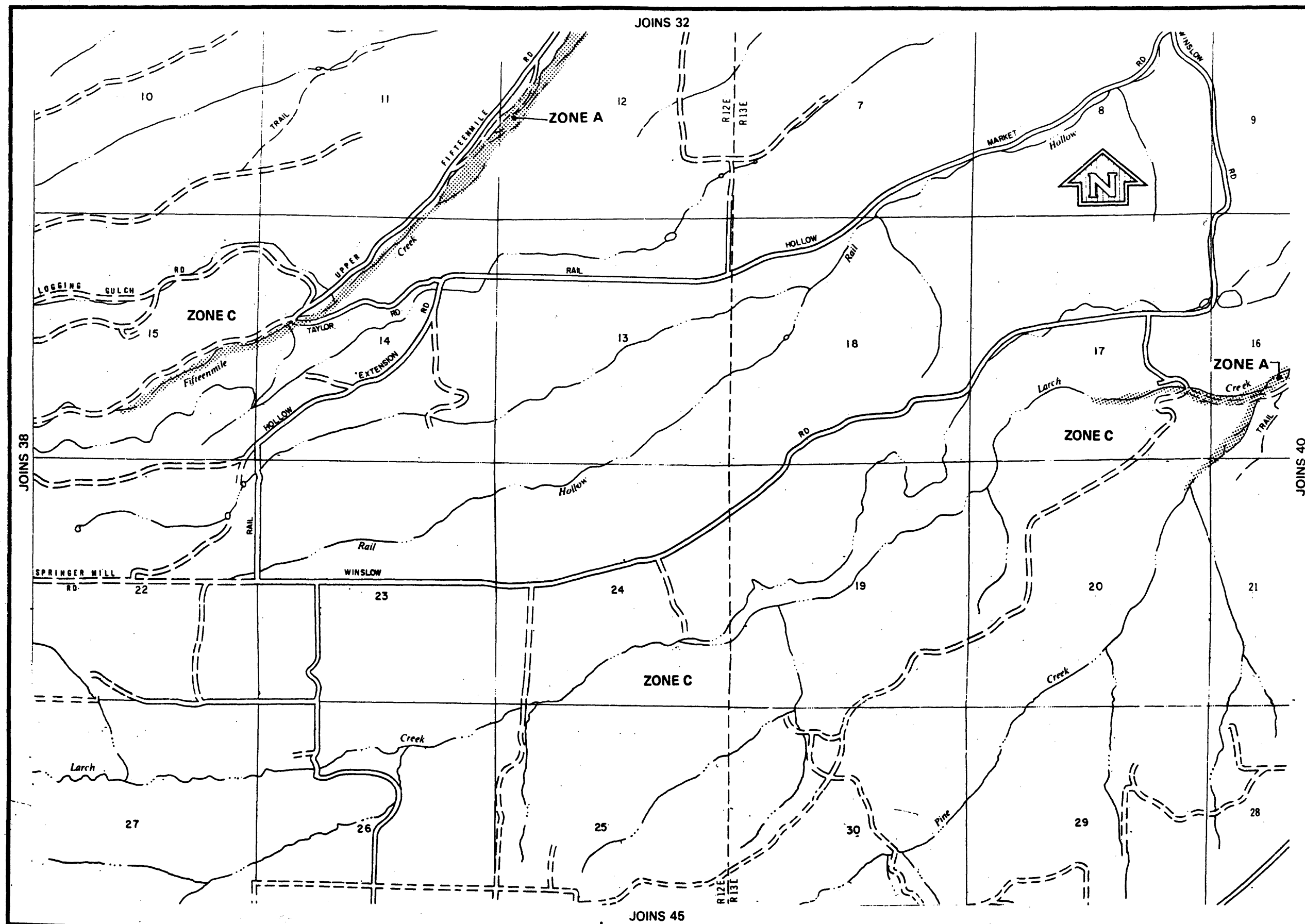
FLOOD INSURANCE RATE MAP

EFFECTIVE DATE

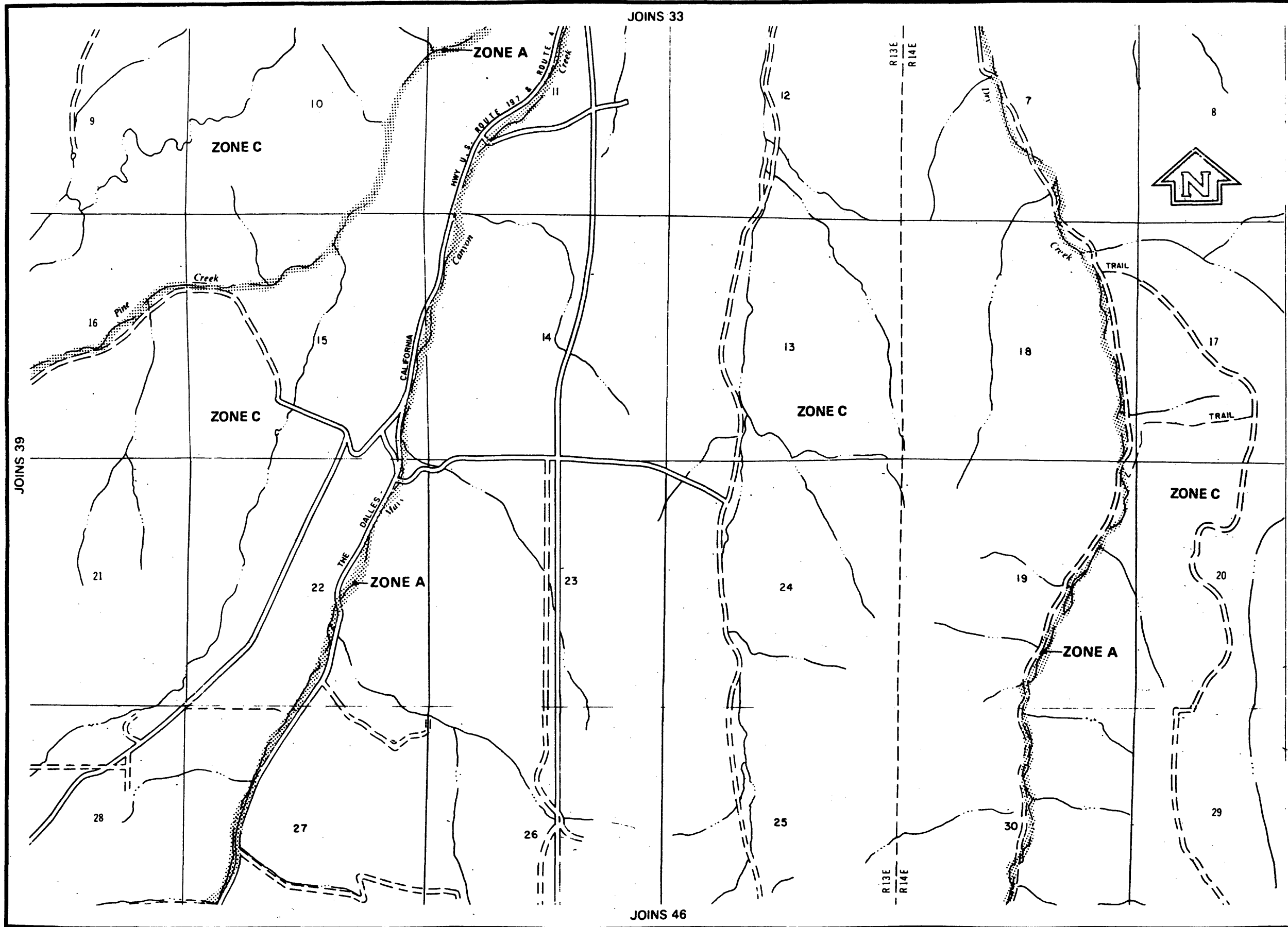
SEPTEMBER 24, 1984

FEDERAL EMERGENCY MANAGEMENT AGENCY

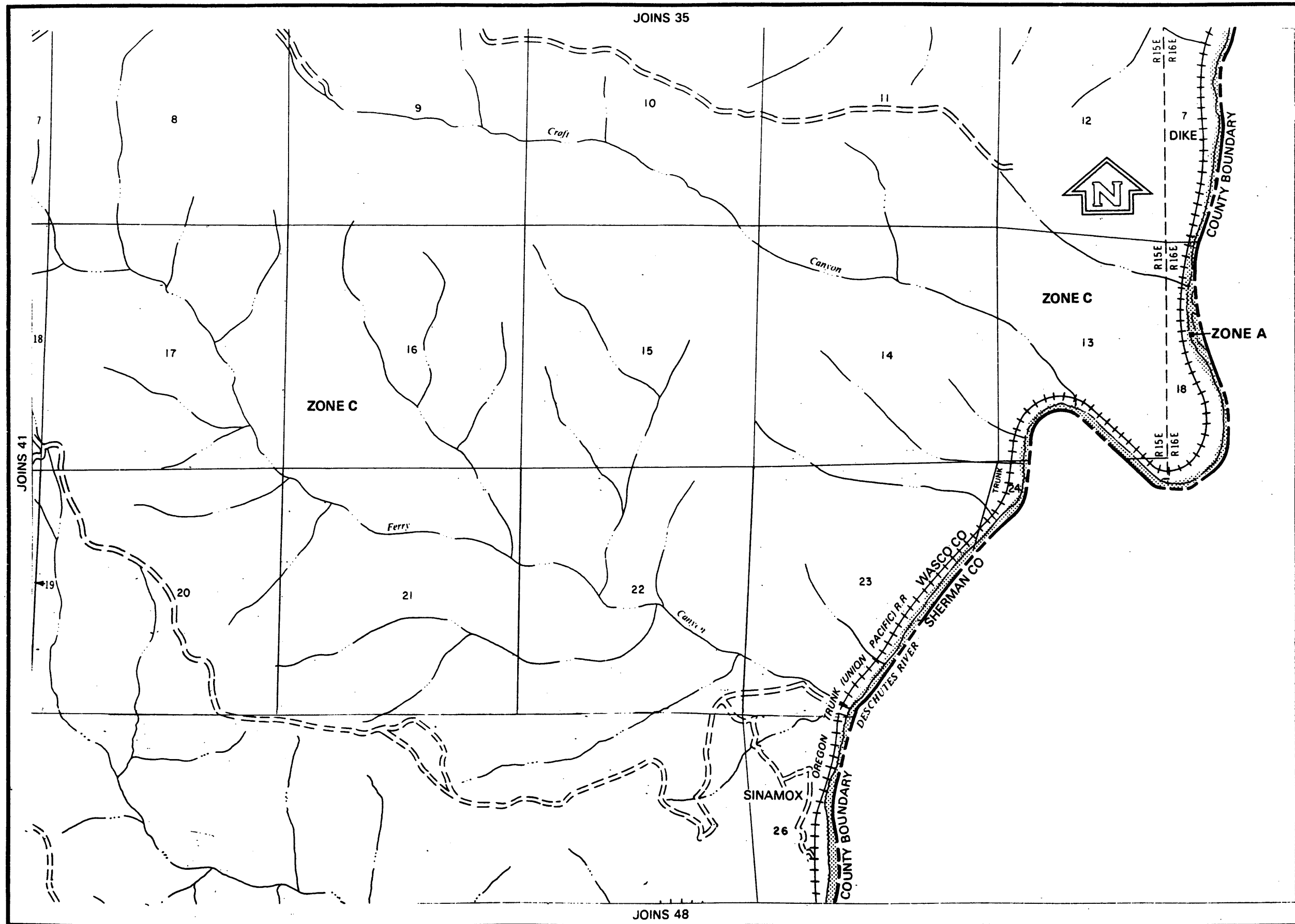
WASCO CO., OR
(UNINC. AREA)



FEDERAL EMERGENCY MANAGEMENT AGENCY WASCO CO., OR (UNINC. AREA)	APPROXIMATE SCALE 0 2000 4000 6000 FEET		EFFECTIVE DATE SEPTEMBER 24, 1984
	FLOOD INSURANCE RATE MAP		

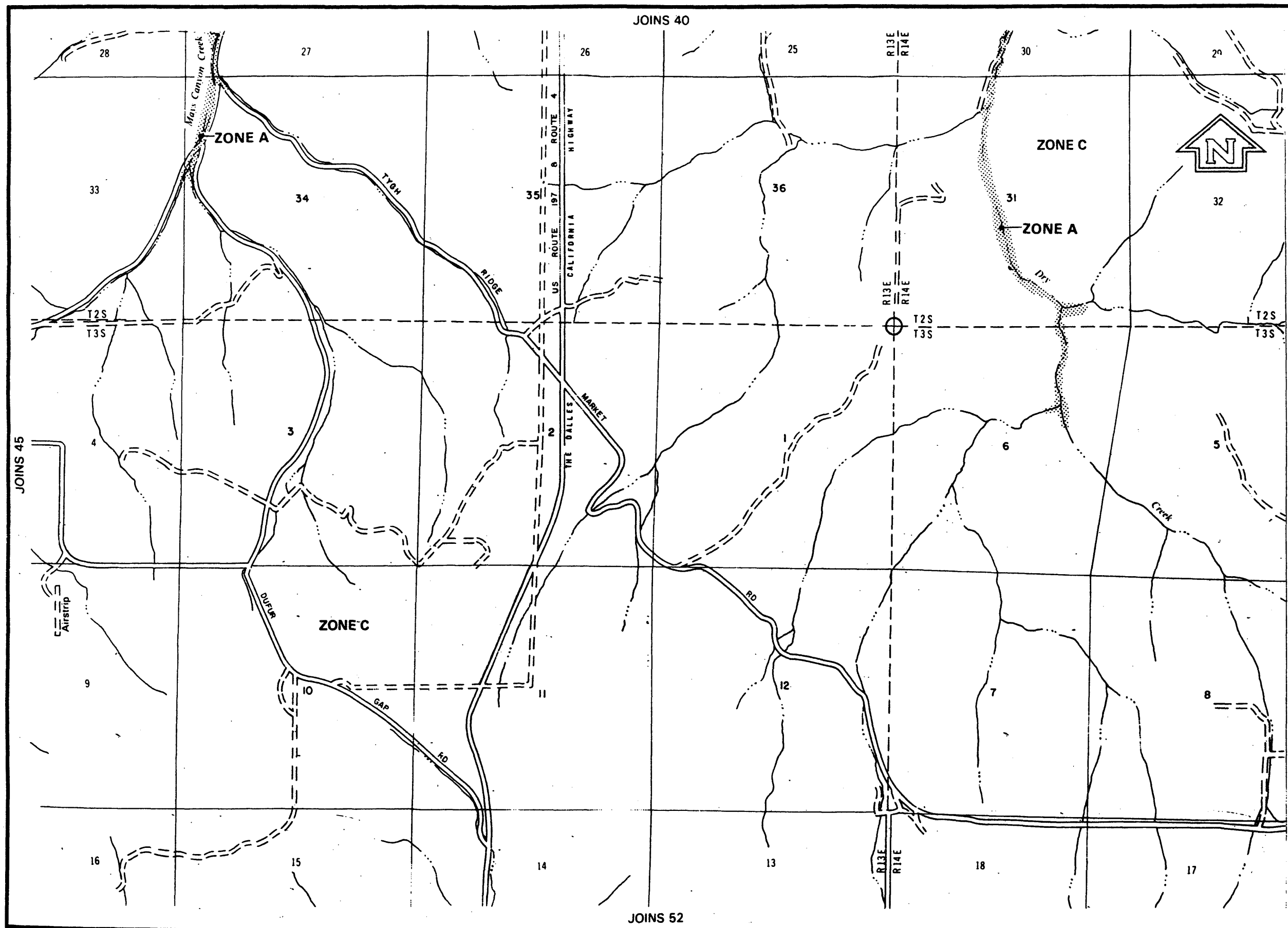


FEDERAL EMERGENCY MANAGEMENT AGENCY WASCO CO., OR (UNINC. AREA)	FLOOD INSURANCE RATE MAP	EFFECTIVE DATE SEPTEMBER 24, 1984
40		

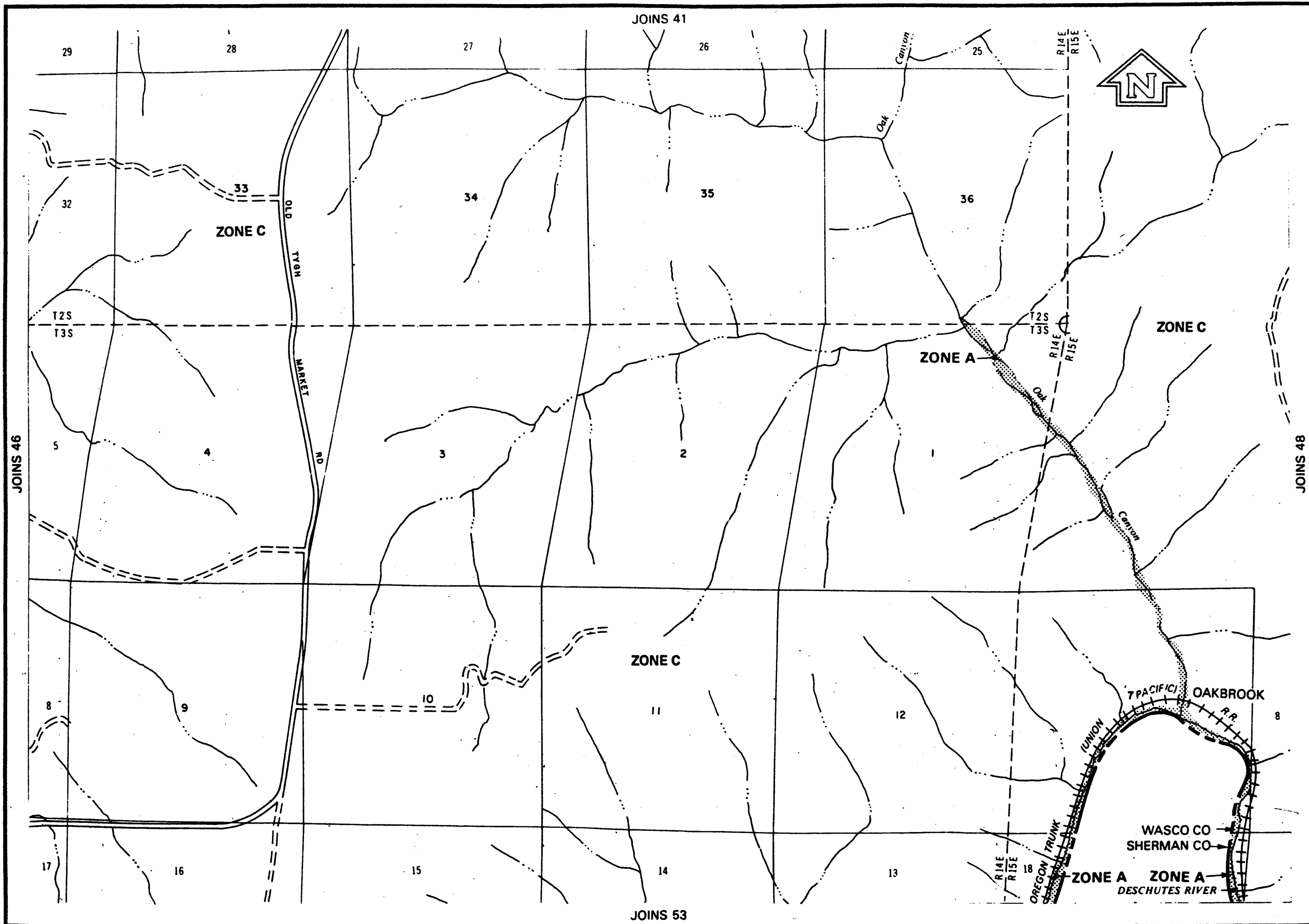


FEDERAL EMERGENCY MANAGEMENT AGENCY WASCO CO., OR (UNINC. AREA)	APPROXIMATE SCALE 2000 0 2000 4000 6000 FEET		EFFECTIVE DATE SEPTEMBER 24, 1984
	FLOOD INSURANCE RATE MAP		

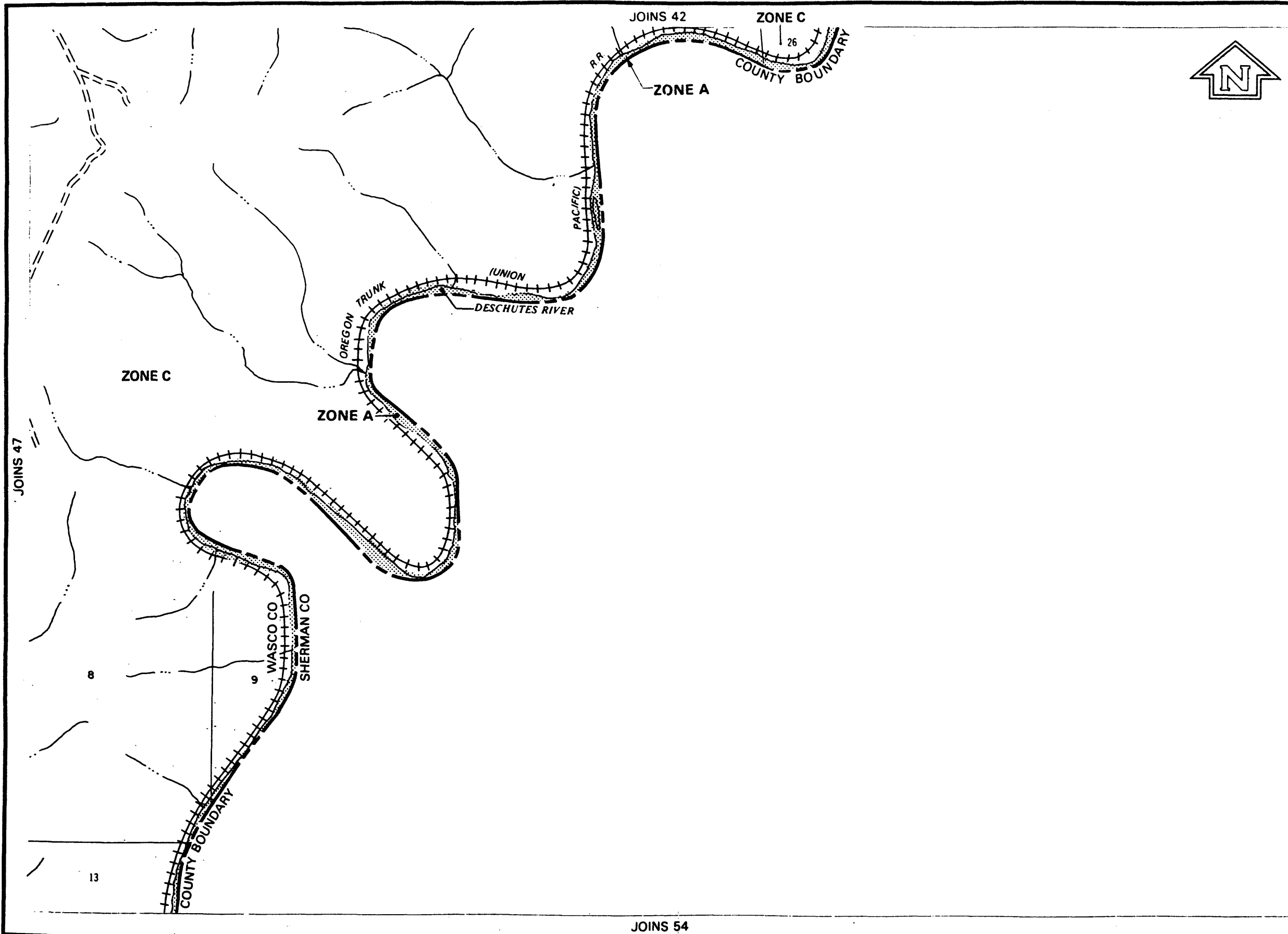
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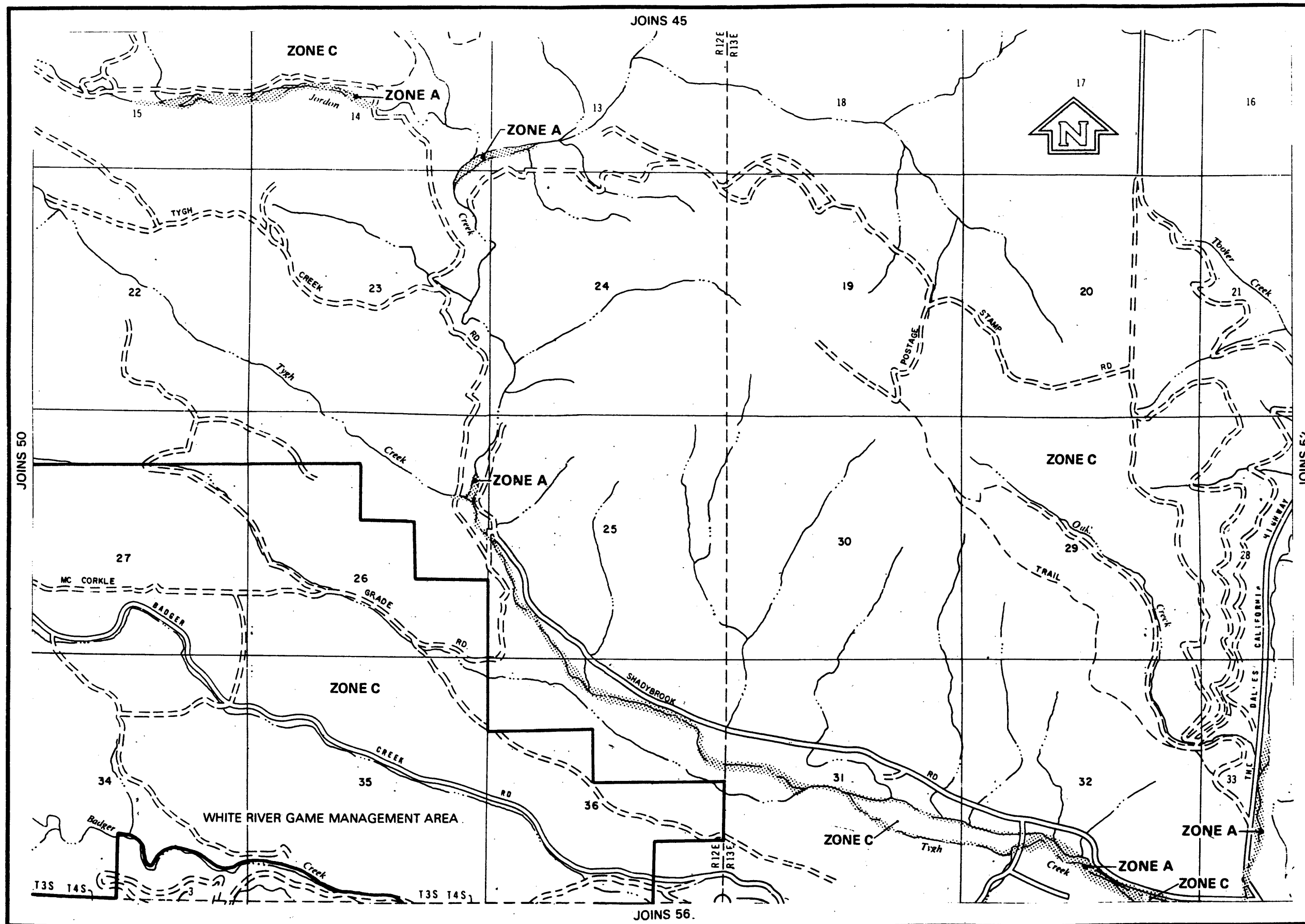
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	EFFECTIVE DATE SEPTEMBER 24, 1984	



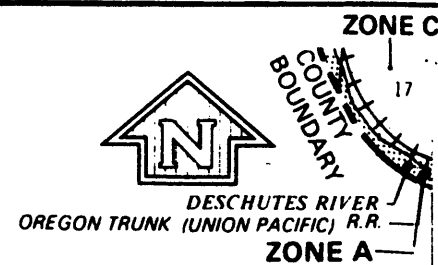
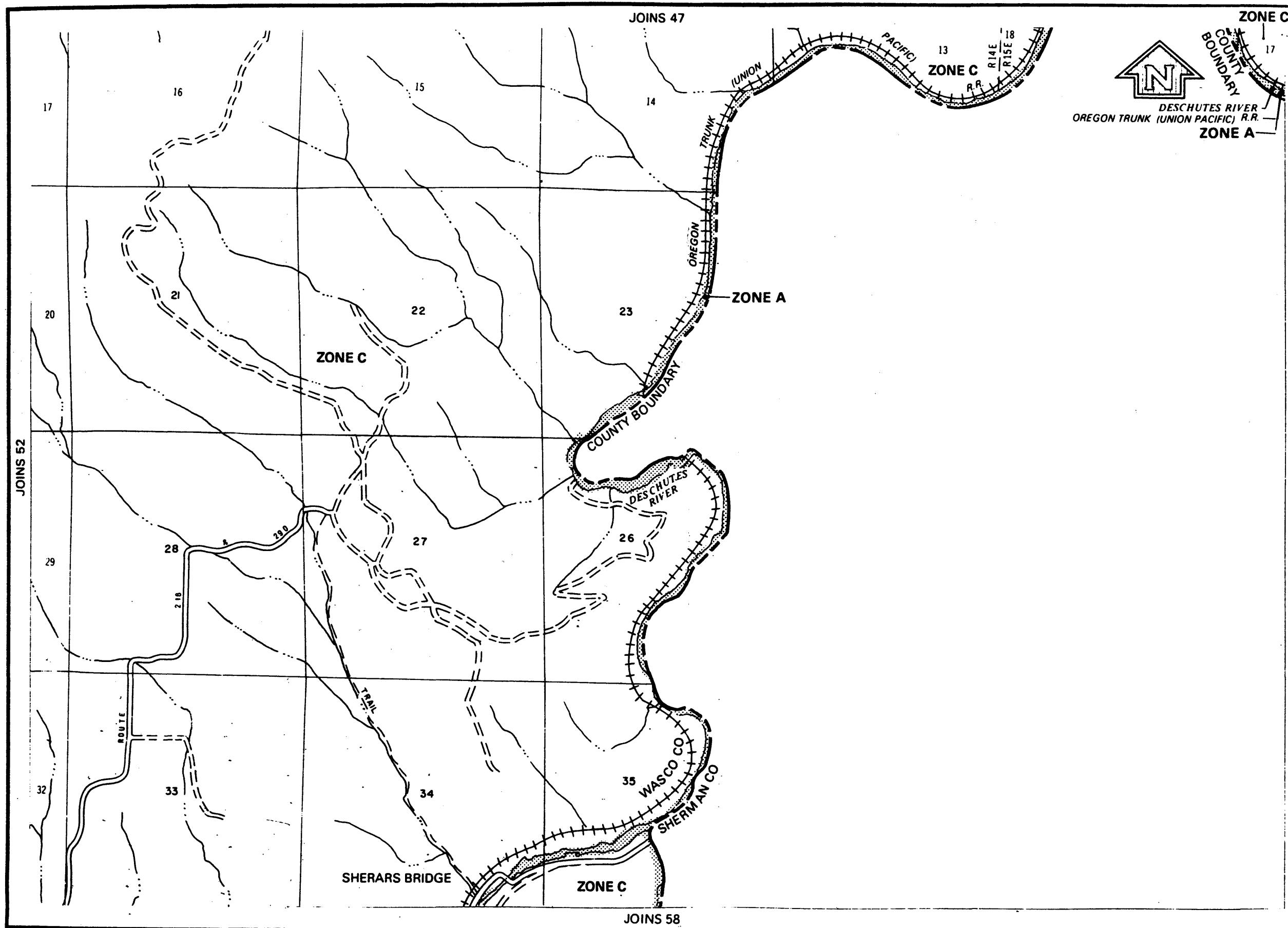
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FLOOD INSURANCE RATE MAP EFFECTIVE DATE SEPTEMBER 24, 1984	



FEDERAL EMERGENCY MANAGEMENT AGENCY WASCO CO., OR (UNINC. AREA)	APPROXIMATE SCALE 2000 0 2000 4000 6000 FEET	FLOOD INSURANCE RATE MAP EFFECTIVE DATE SEPTEMBER 24, 1984



APPROXIMATE SCALE 0 2000 4000 6000 FEET	EFFECTIVE DATE SEPTEMBER 24, 1984
	FEDERAL EMERGENCY MANAGEMENT AGENCY WASCO CO., OR (UNINC. AREA)
51	



APPROXIMATE SCALE 0 2000 4000 6000 FEET	EFFECTIVE DATE SEPTEMBER 24, 1984
FEDERAL EMERGENCY MANAGEMENT AGENCY WASCO CO., OR (UNINC. AREA)	FLOOD INSURANCE RATE MAP

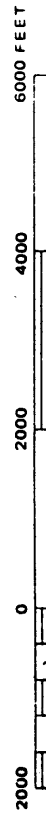
JOINS 53

JOINS 48

ZONE 17
C ZONE A
WASCO CO
SHERMAN CO
DESCHUTES RIVER
OREGON TRUNK (UNION PACIFIC) R.R.



APPROXIMATE SCALE



FEDERAL EMERGENCY MANAGEMENT AGENCY

WASCO CO., OR
(UNINC. AREA)

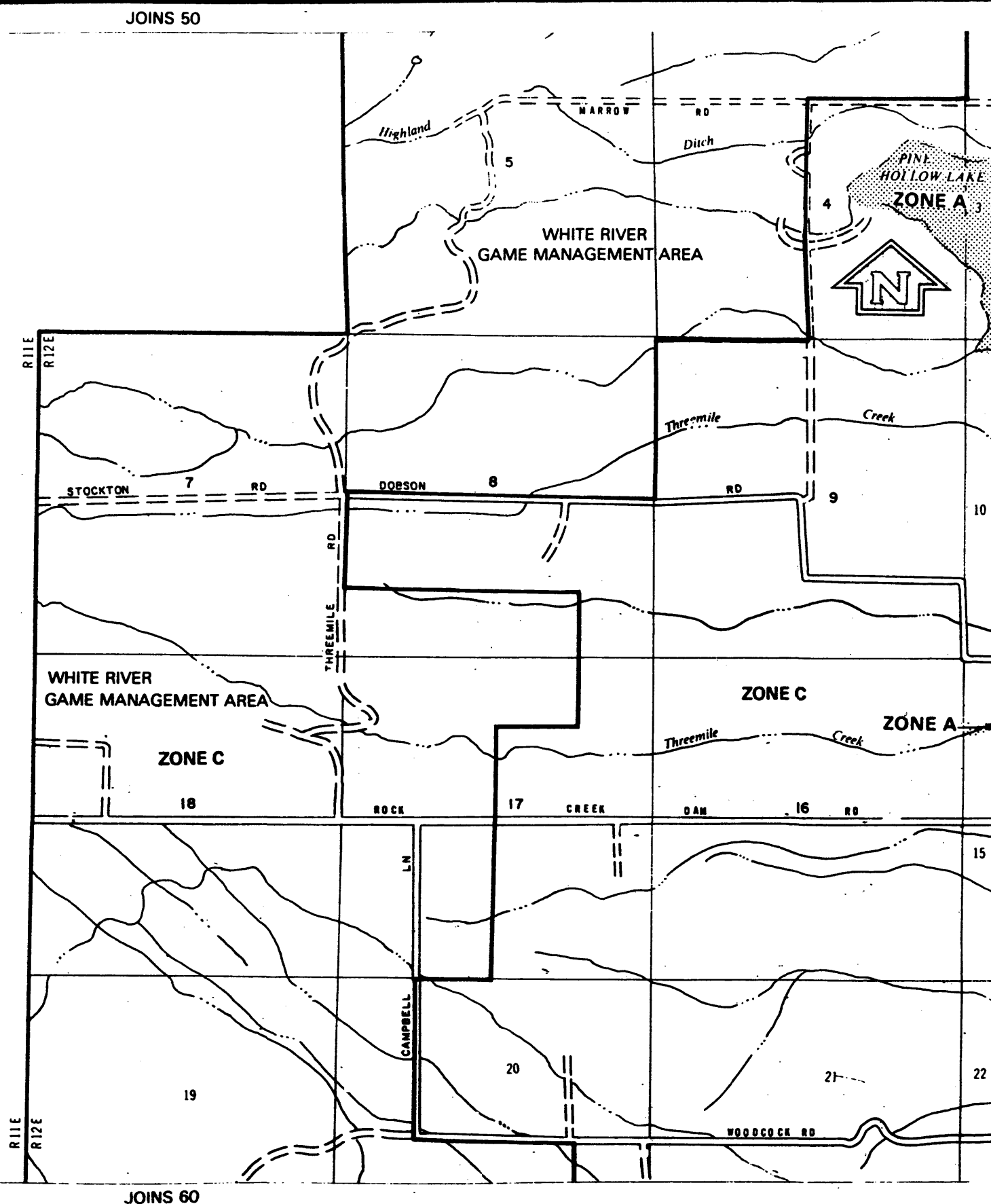
FLOOD INSURANCE RATE MAP

EFFECTIVE DATE

SEPTEMBER 24, 1984

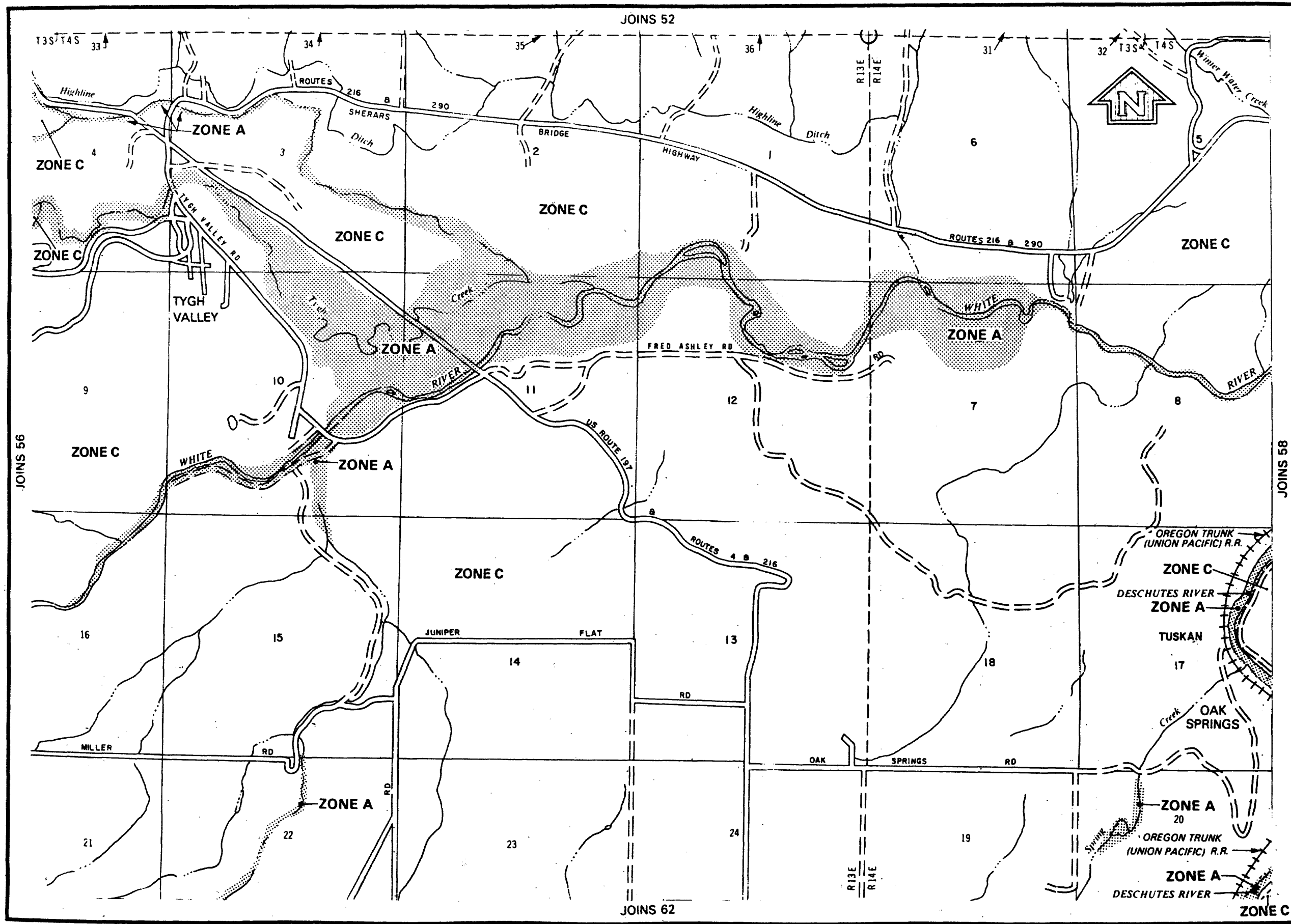
54

Mt. Hood National Forest
(AREA NOT INCLUDED)

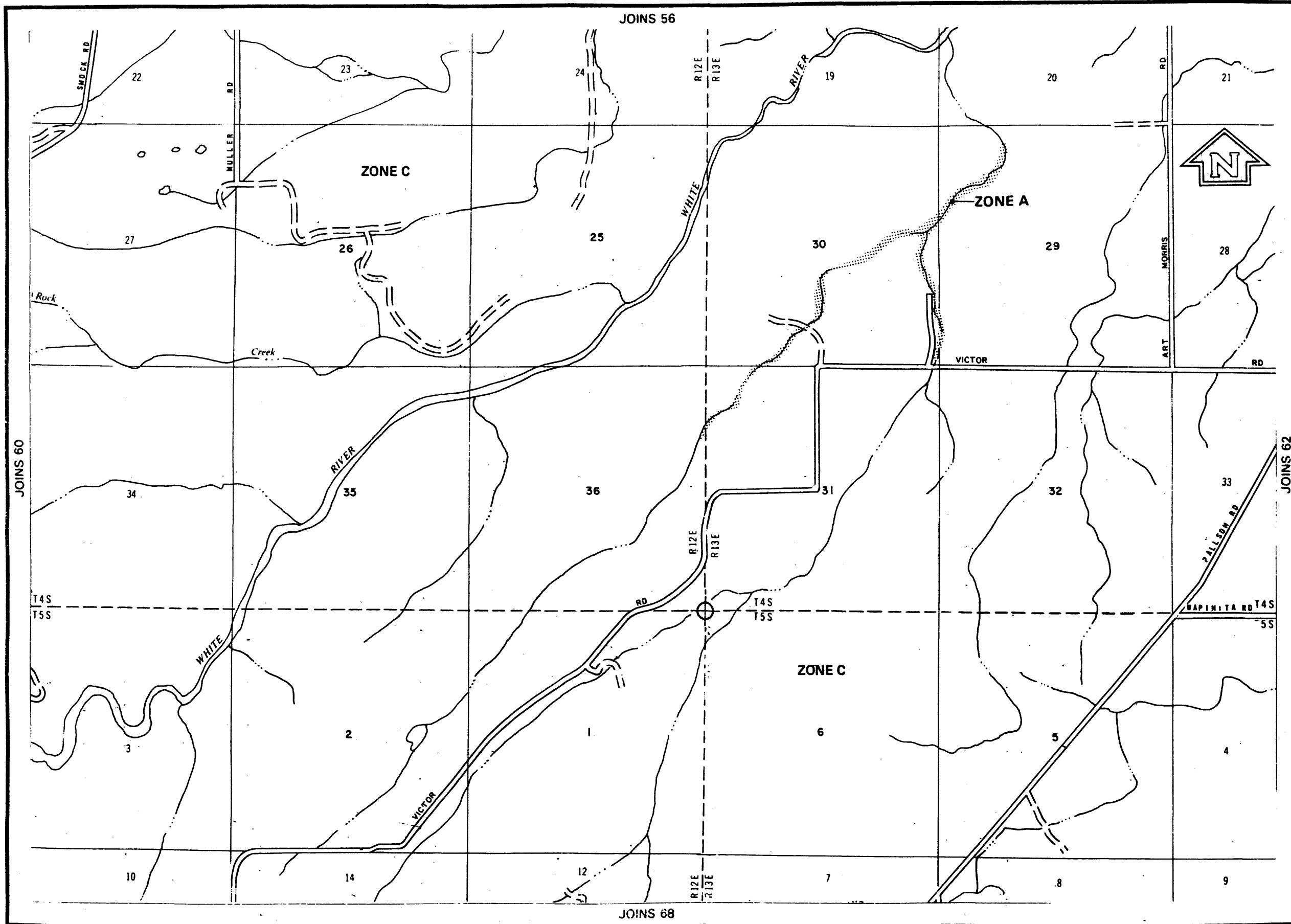


FEDERAL EMERGENCY MANAGEMENT AGENCY WASCO CO., OR (UNINC. AREA)	FLOOD INSURANCE RATE MAP	EFFECTIVE DATE SEPTEMBER 24, 1984
	55	

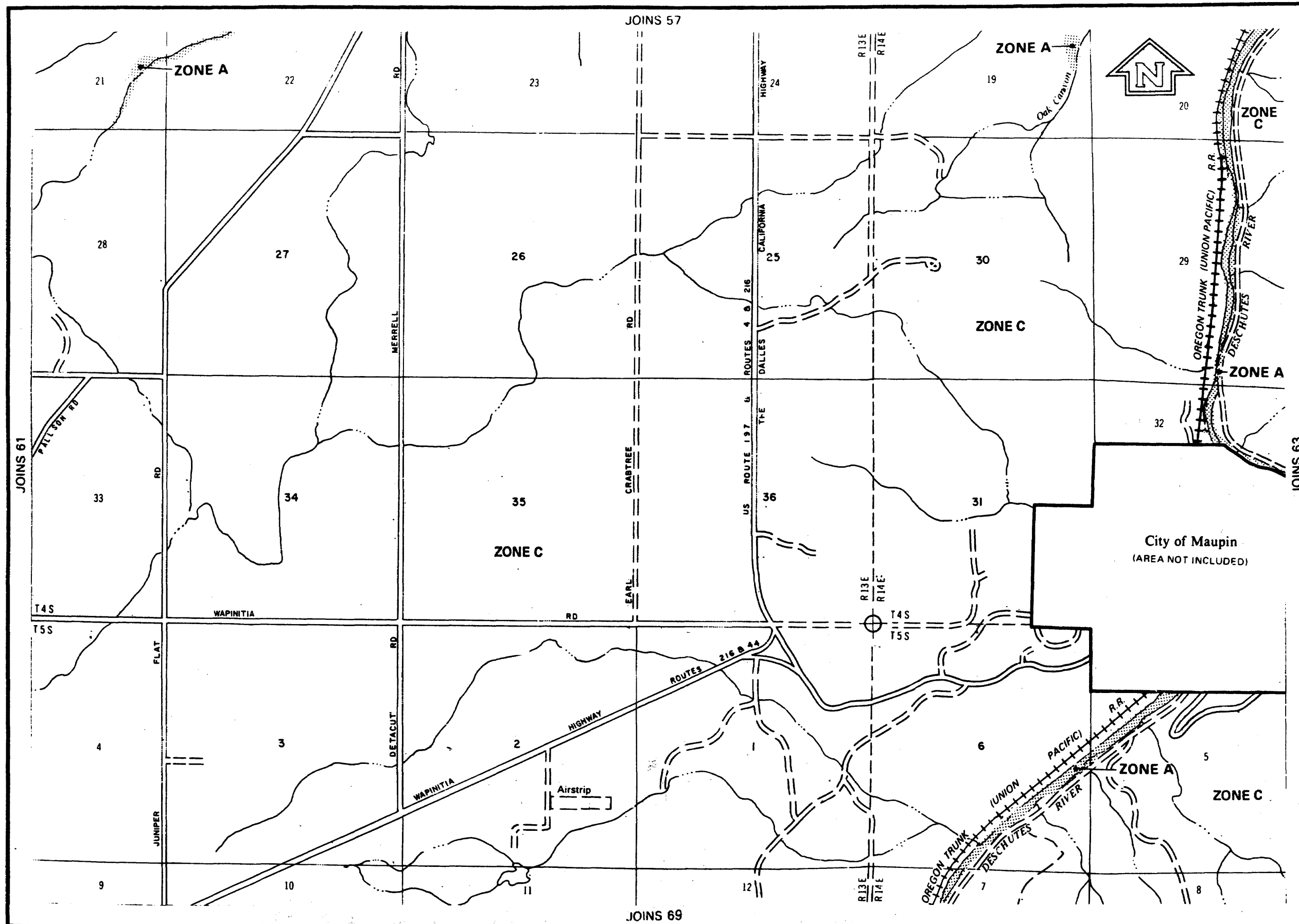
APPROXIMATE SCALE
0 2000 4000 6000 FEET

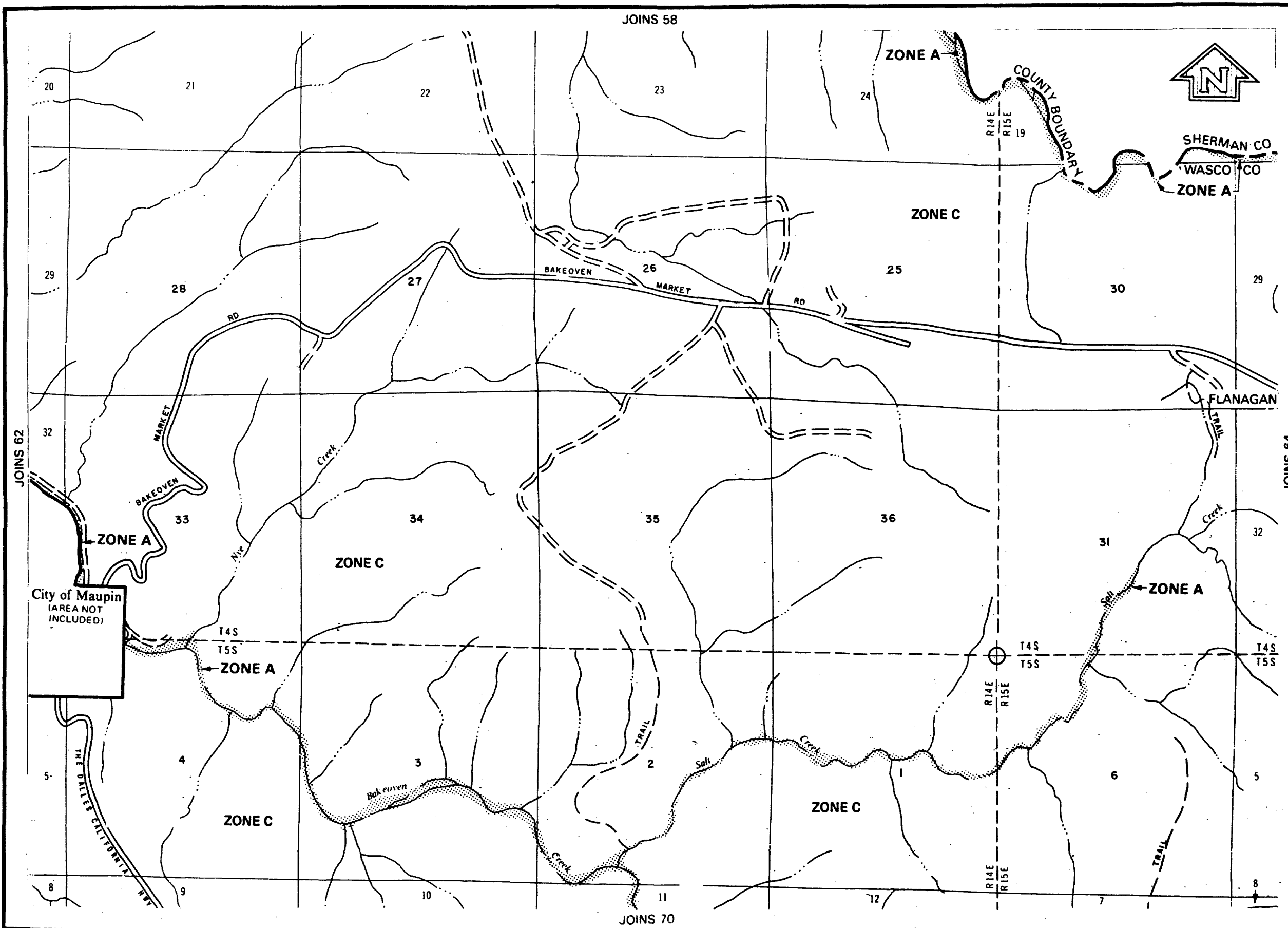


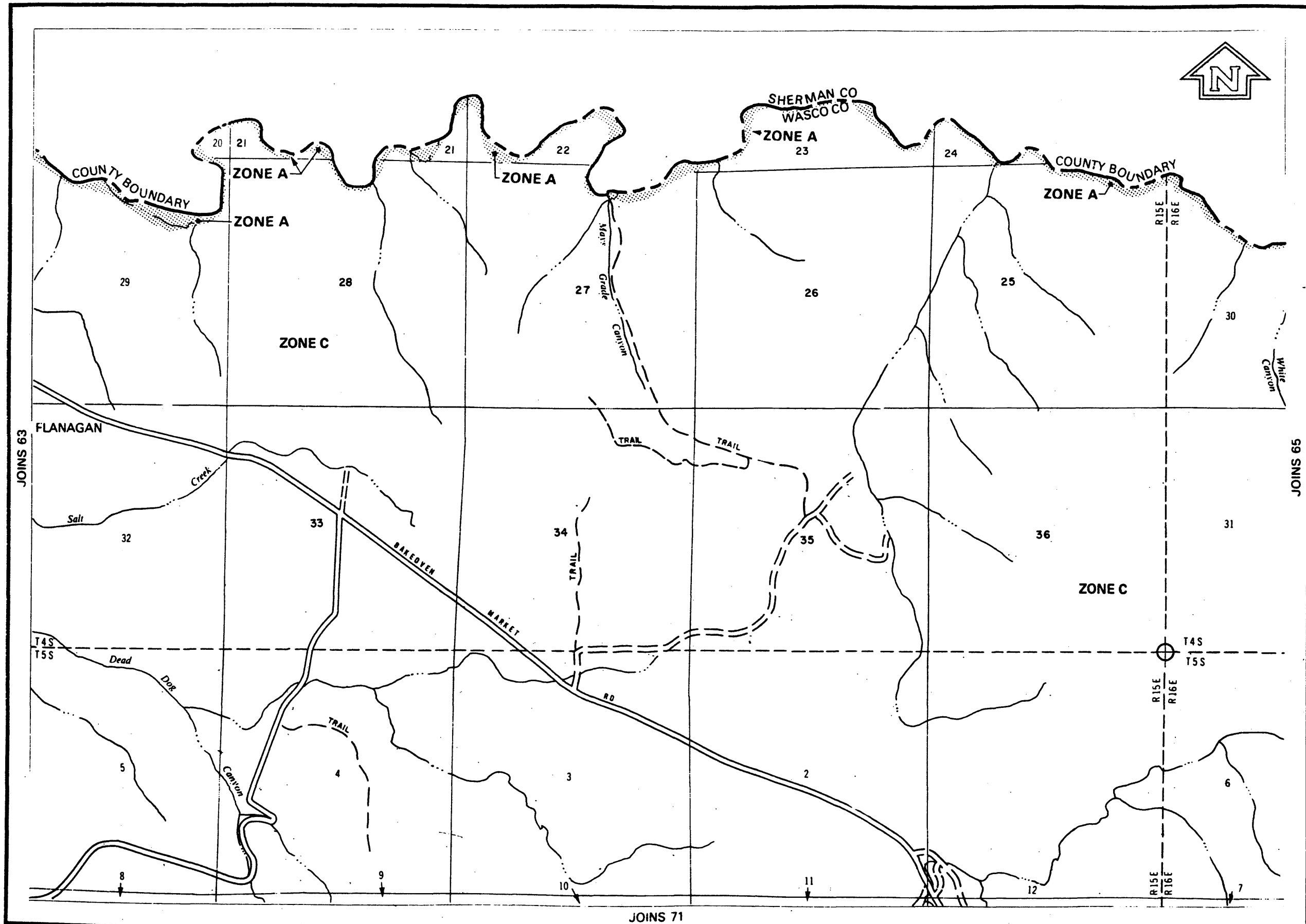
APPROXIMATE SCALE 6000 FEET 4000 2000 0 2000	EFFECTIVE DATE SEPTEMBER 24, 1984
	FLOOD INSURANCE RATE MAP
FEDERAL EMERGENCY MANAGEMENT AGENCY WASCO CO., OR (UNINC. AREA)	
57	



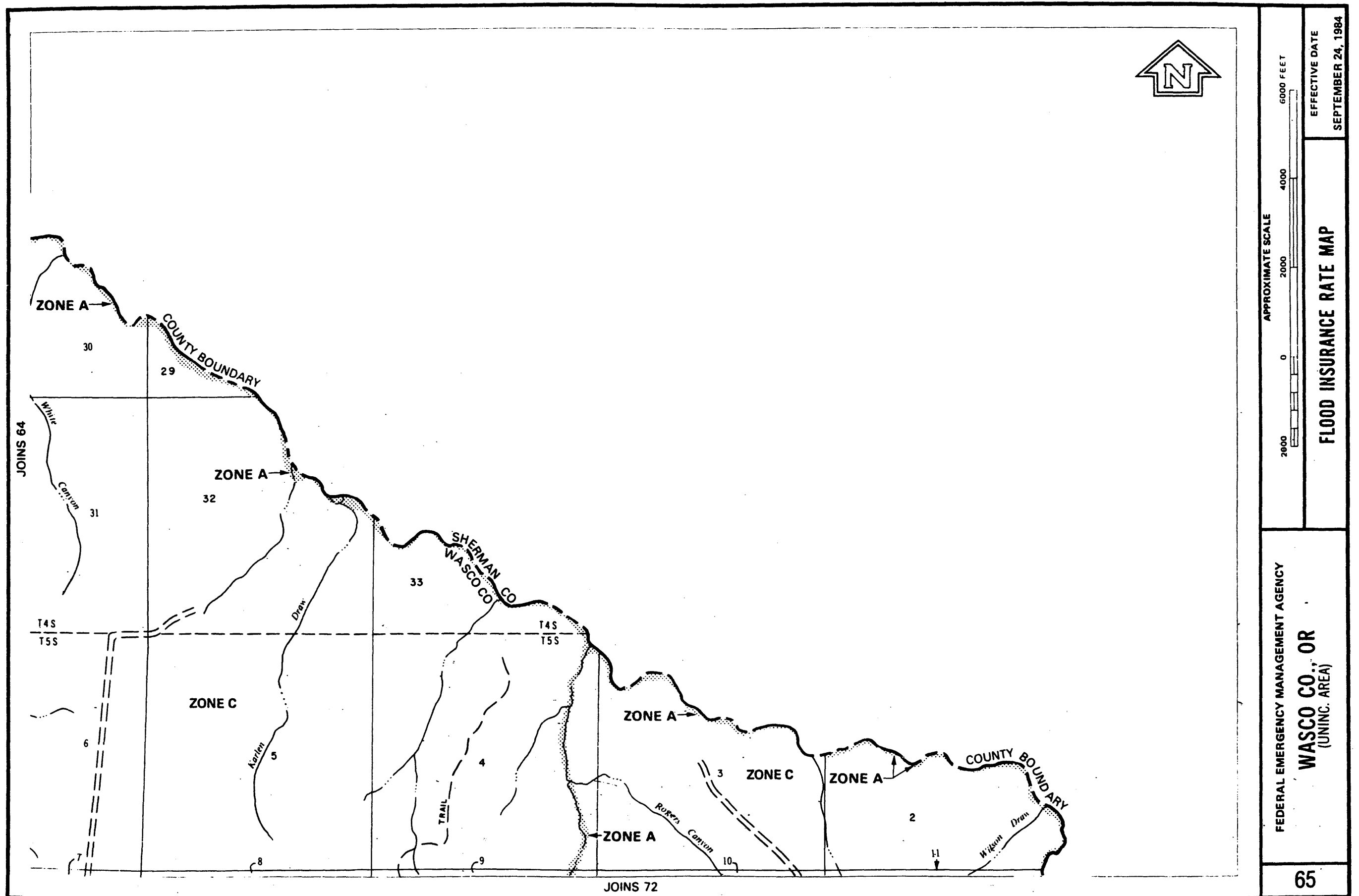
FEDERAL EMERGENCY MANAGEMENT AGENCY WASCO CO., OR (UNINC. AREA)	FLOOD INSURANCE RATE MAP		EFFECTIVE DATE SEPTEMBER 24, 1984
	APPROXIMATE SCALE 6000 FEET 4000 2000 0 2000		
61			

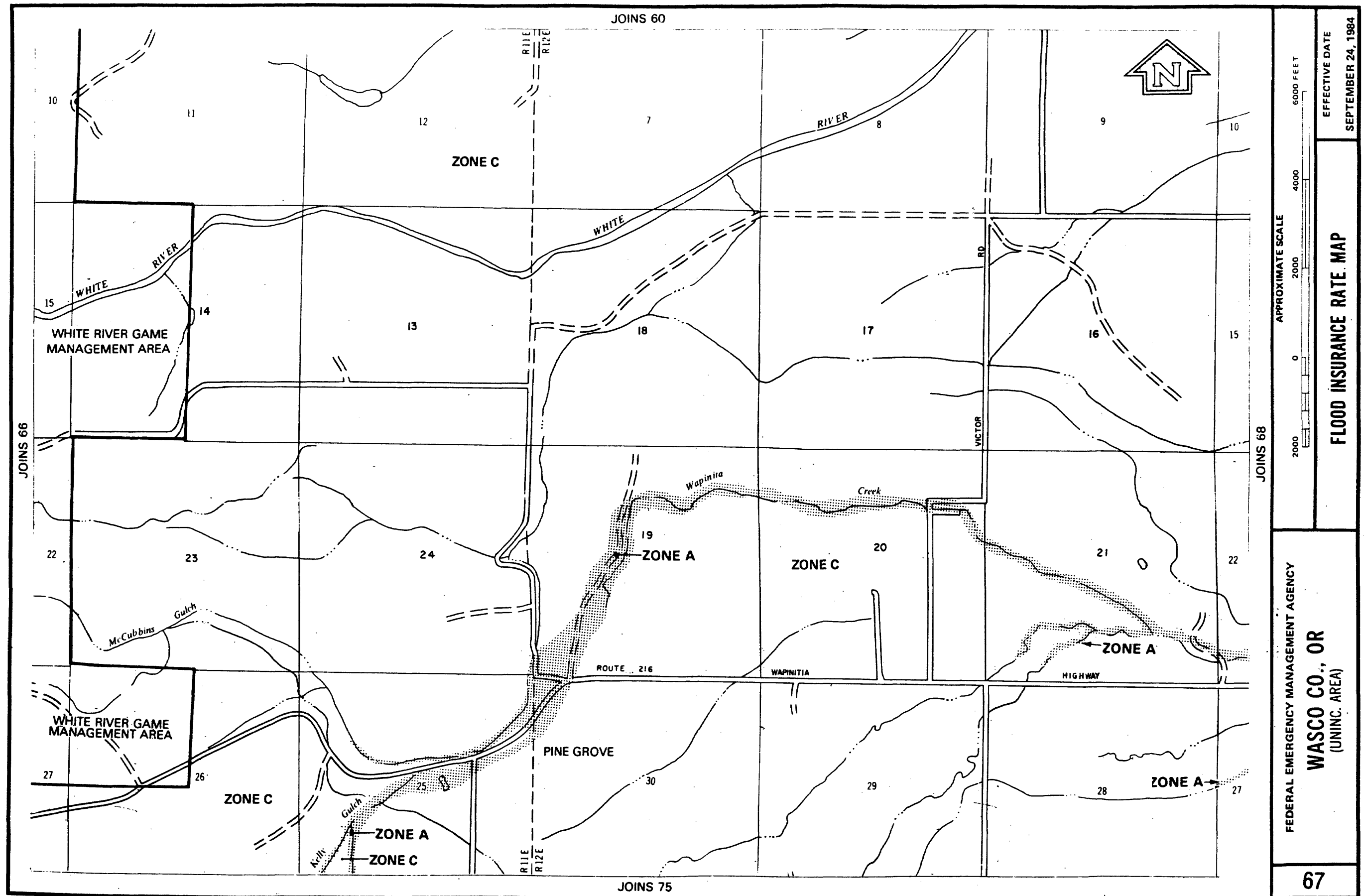


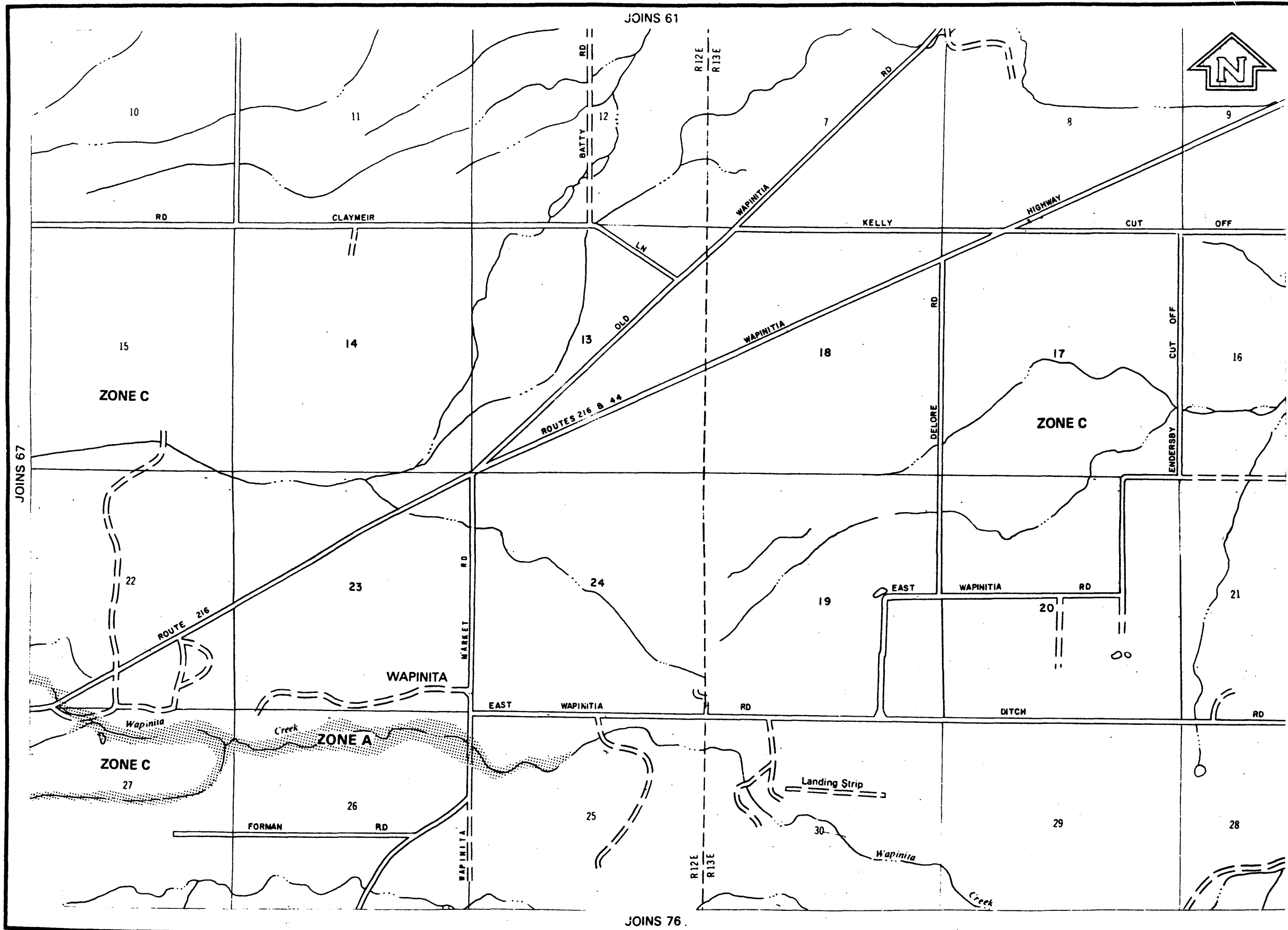




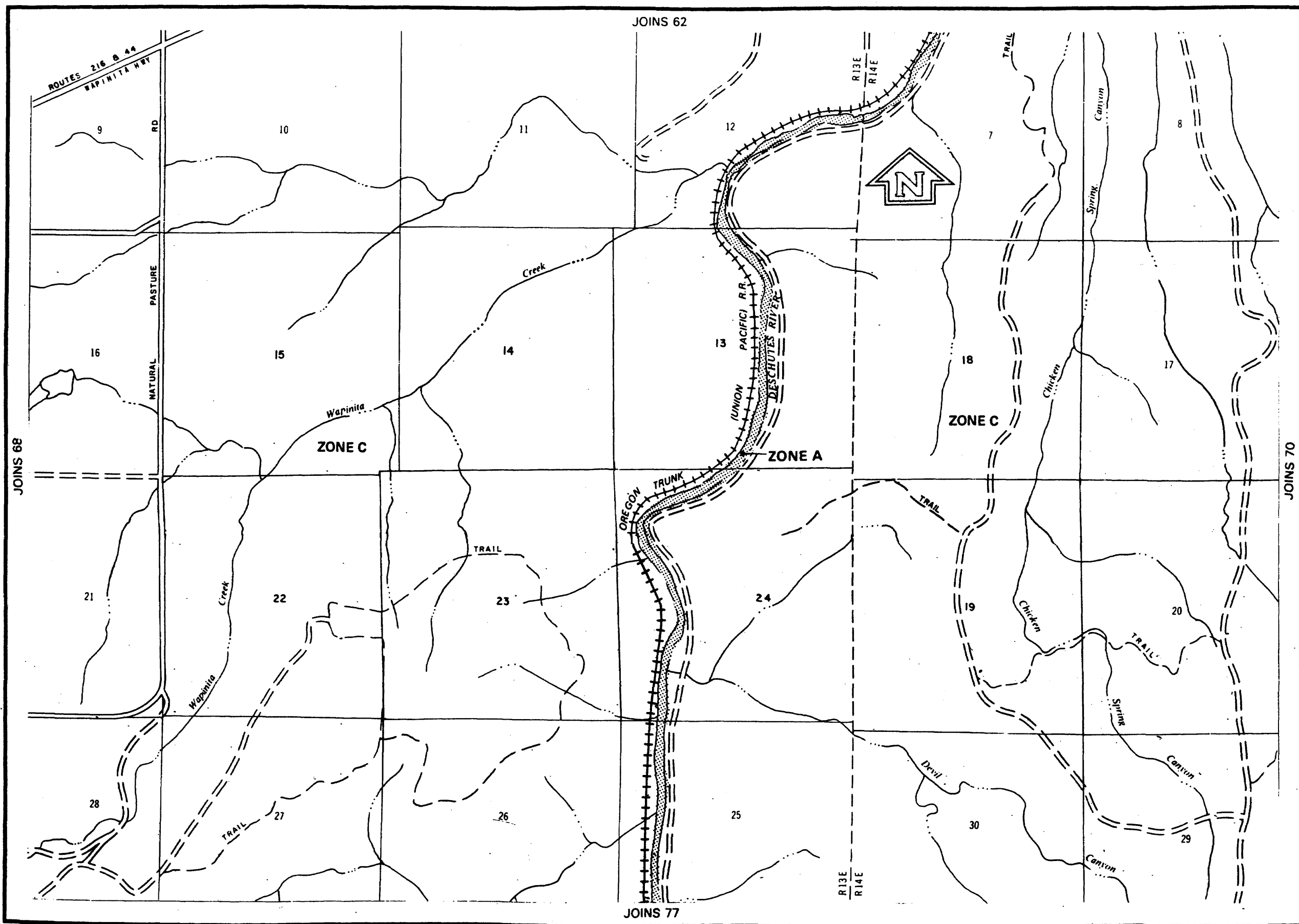
FEDERAL EMERGENCY MANAGEMENT AGENCY WASCO CO., OR (UNINC. AREA)	FLOOD INSURANCE RATE MAP		EFFECTIVE DATE SEPTEMBER 24, 1984
	APPROXIMATE SCALE 0 2000 4000 6000 FEET		
64			



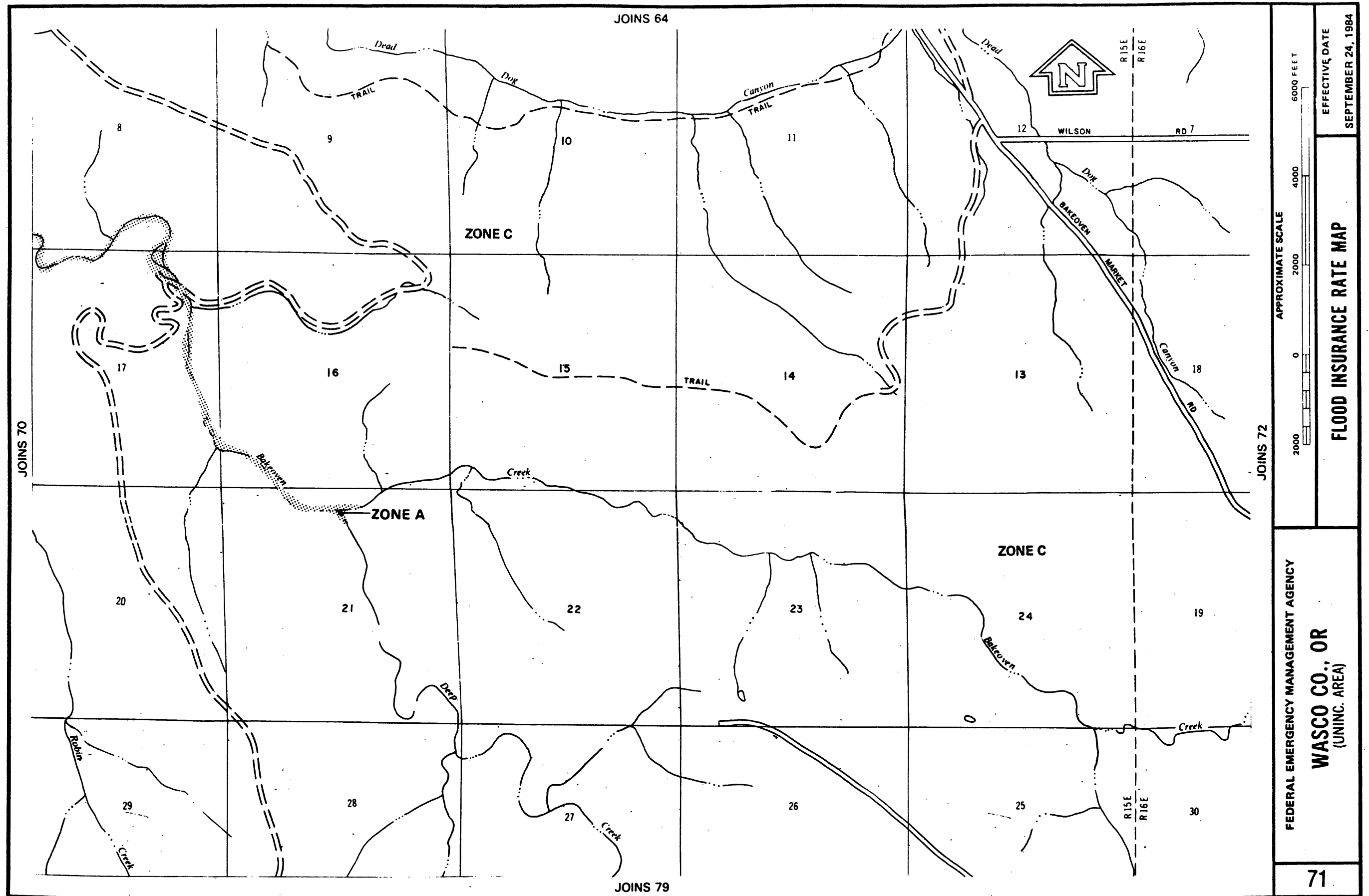


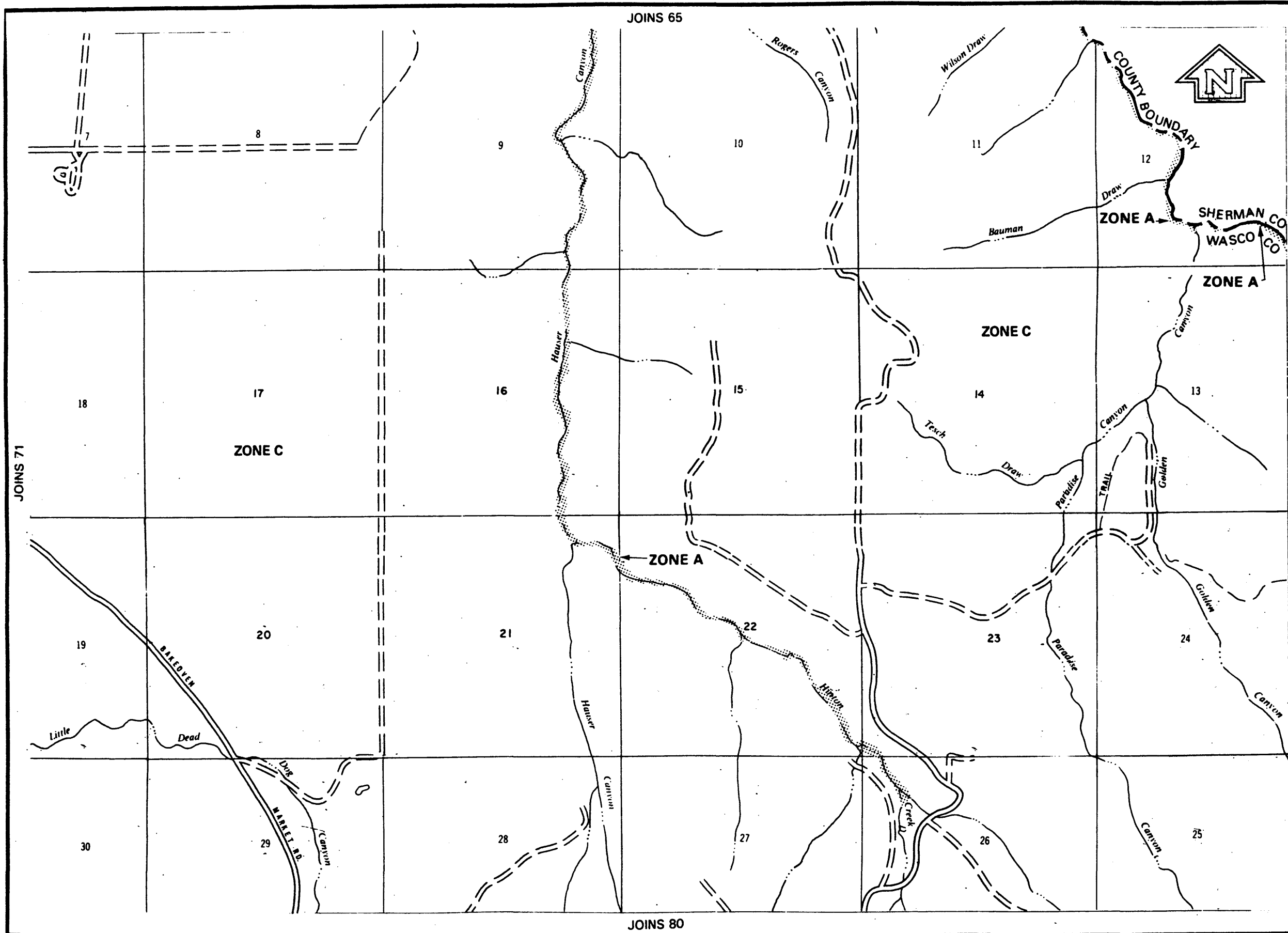


FEDERAL EMERGENCY MANAGEMENT AGENCY WASCO CO., OR (UNINC. AREA)	APPROXIMATE SCALE 0 2000 4000 6000 FEET	EFFECTIVE DATE SEPTEMBER 24, 1984
	FLOOD INSURANCE RATE MAP	

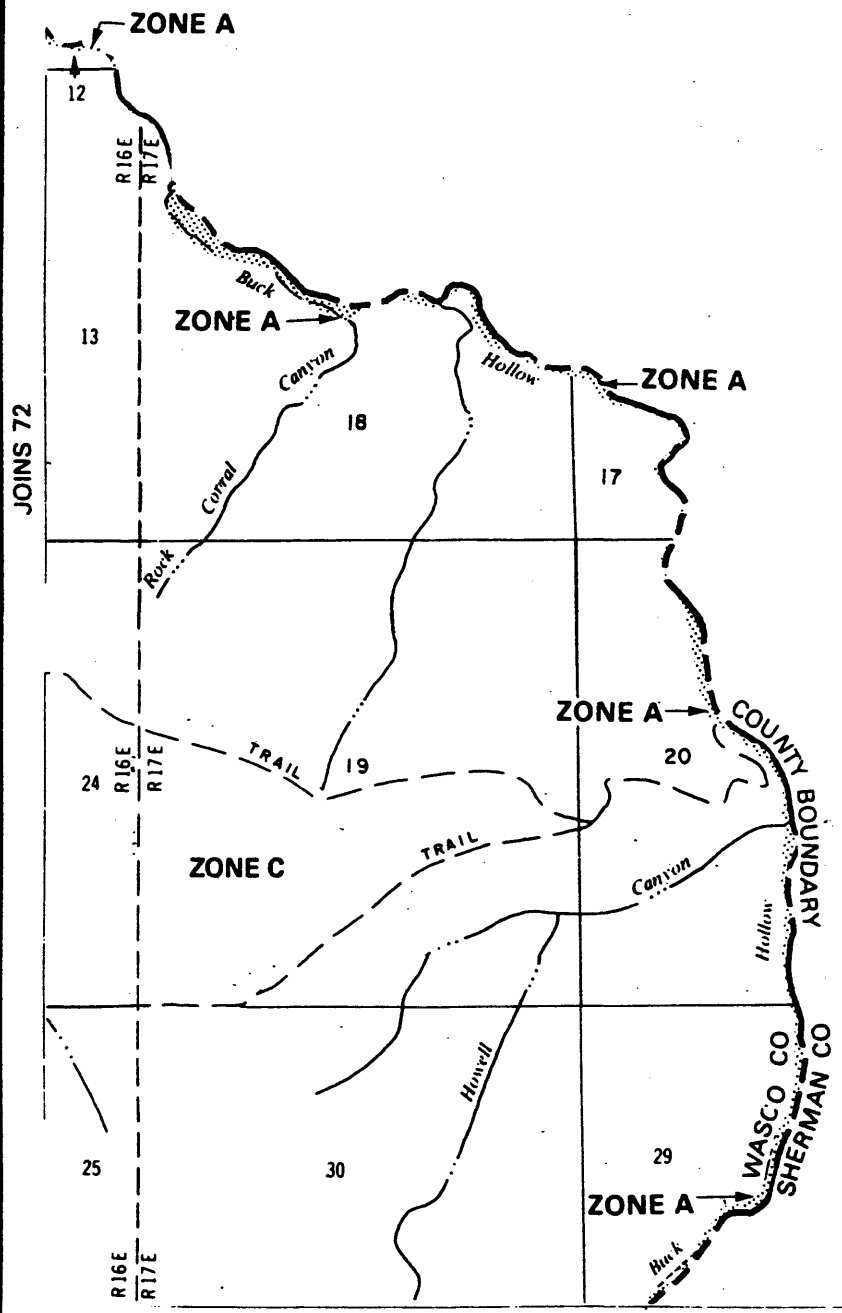


FEDERAL EMERGENCY MANAGEMENT AGENCY WASCO CO., OR (UNINC. AREA)	APPROXIMATE SCALE 2000 0 2000 4000 6000 FEET	
	EFFECTIVE DATE SEPTEMBER 24, 1984	



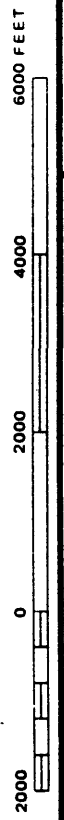


FEDERAL EMERGENCY MANAGEMENT AGENCY WASCO CO., OR (UNINC. AREA)	FLOOD INSURANCE RATE MAP		EFFECTIVE DATE SEPTEMBER 24, 1984
	APPROXIMATE SCALE 6000 FEET 4000 2000 0 2000		
72			



JOINS 81

APPROXIMATE SCALE



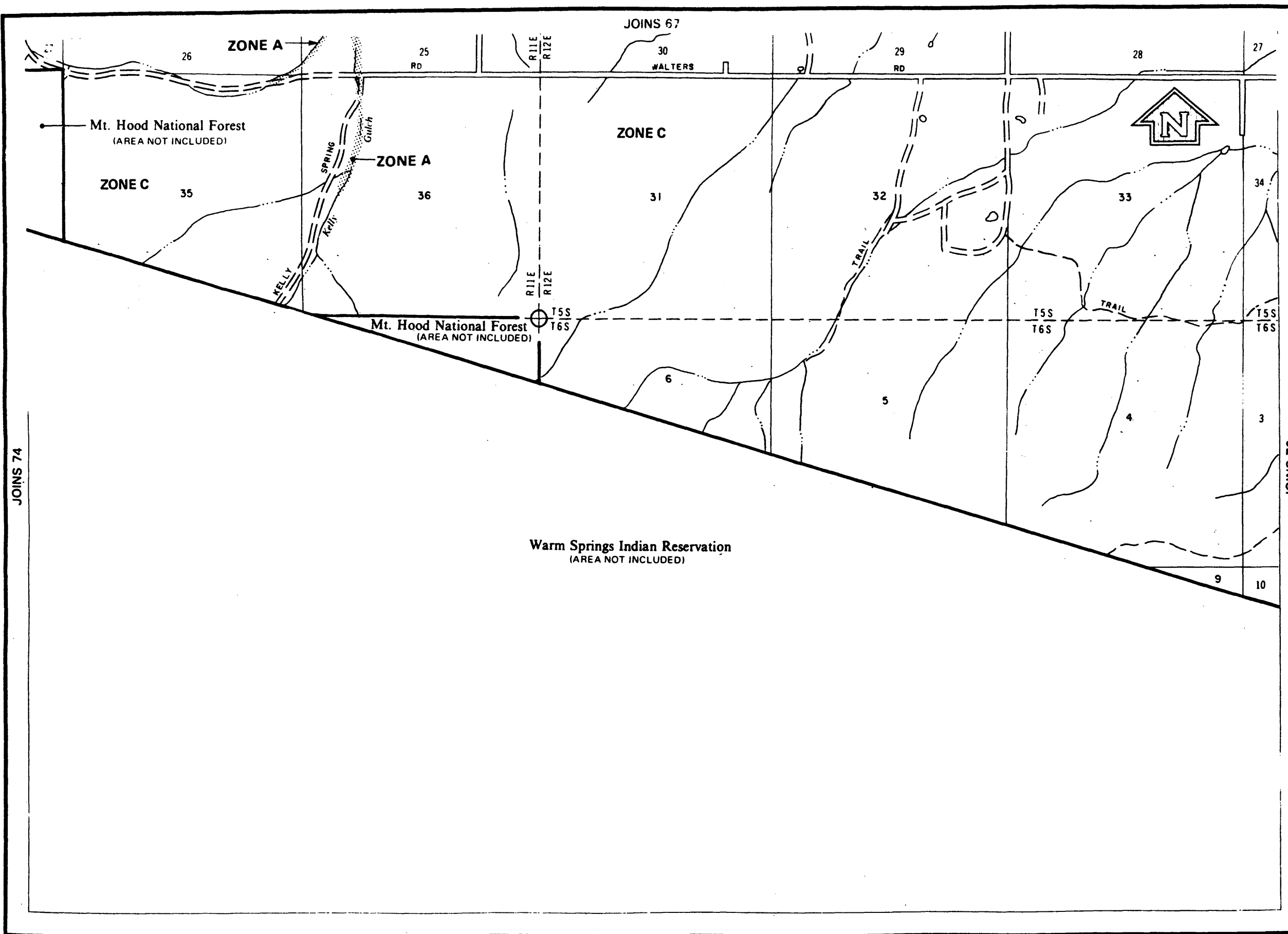
EFFECTIVE DATE

SEPTEMBER 24, 1984

FLOOD INSURANCE RATE MAP

FEDERAL EMERGENCY MANAGEMENT AGENCY

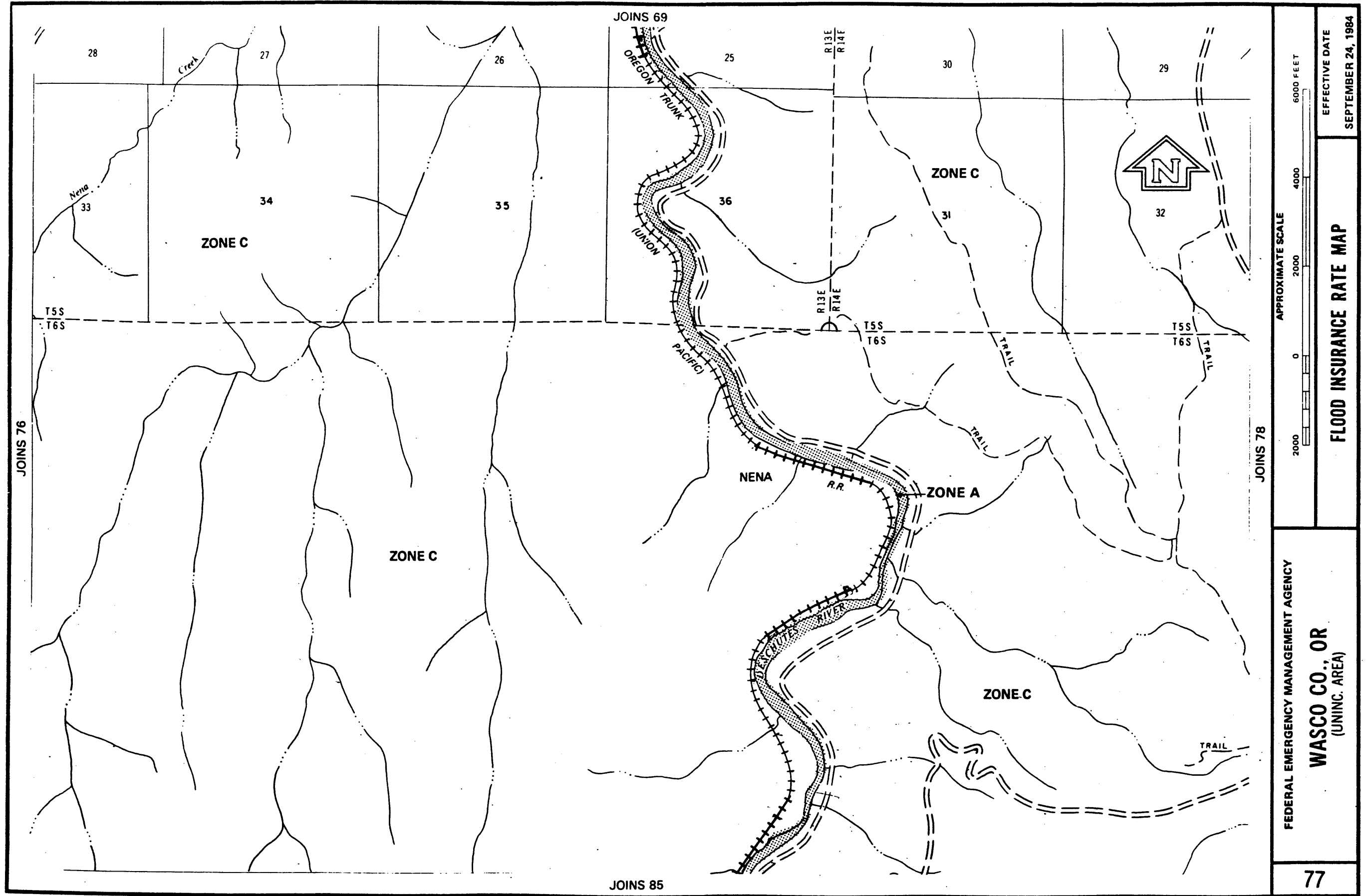
WASCO CO., OR
(UNINC. AREA)



FEDERAL EMERGENCY MANAGEMENT AGENCY WASCO CO., OR (UNINC. AREA)	FLOOD INSURANCE RATE MAP	EFFECTIVE DATE SEPTEMBER 24, 1984

APPROXIMATE SCALE
0 2000 4000 6000 FEET

75



FEDERAL EMERGENCY MANAGEMENT AGENCY

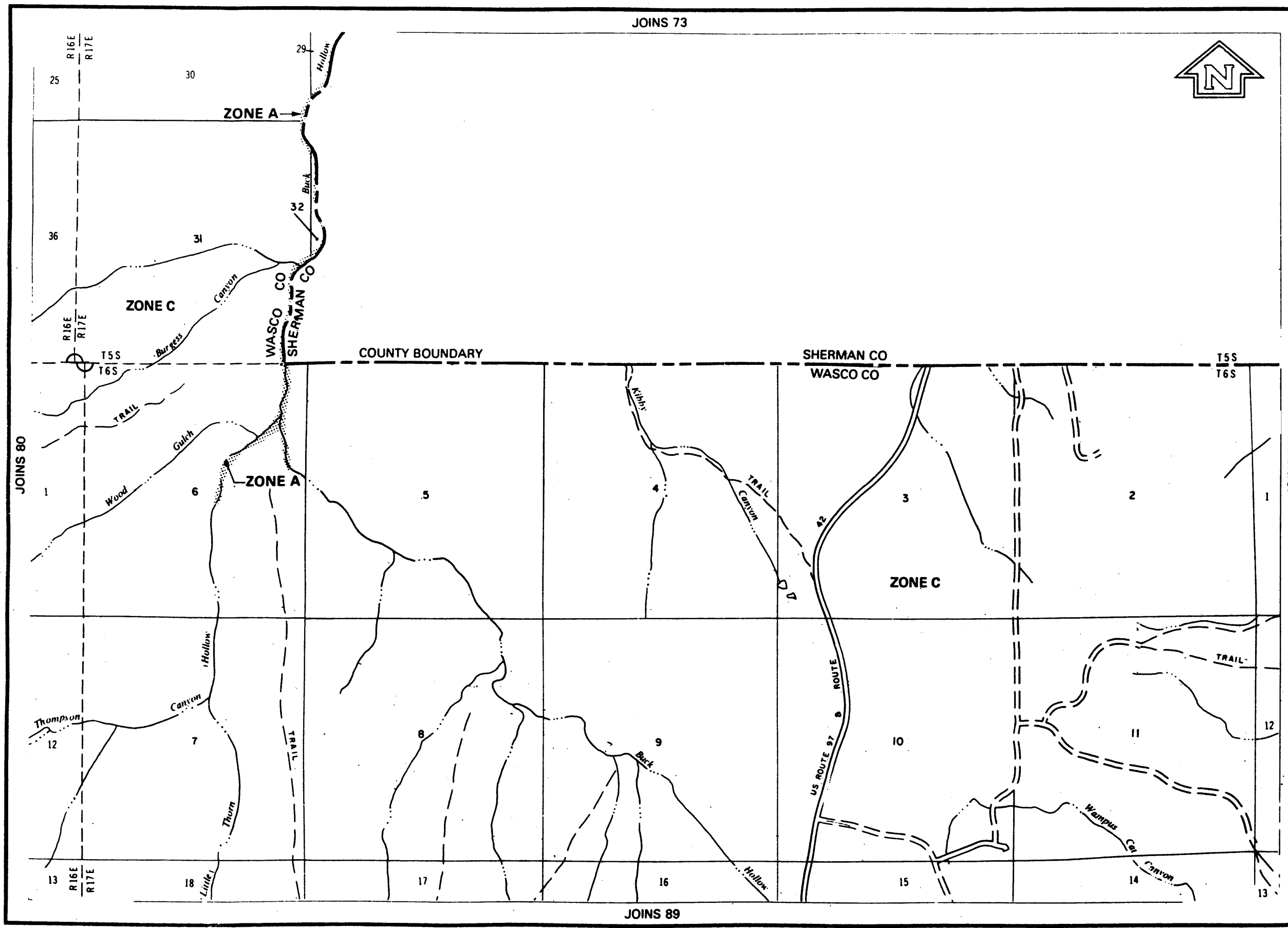
WASCO CO., OR
(UNINC. AREA)

FLOOD INSURANCE RATE MAP

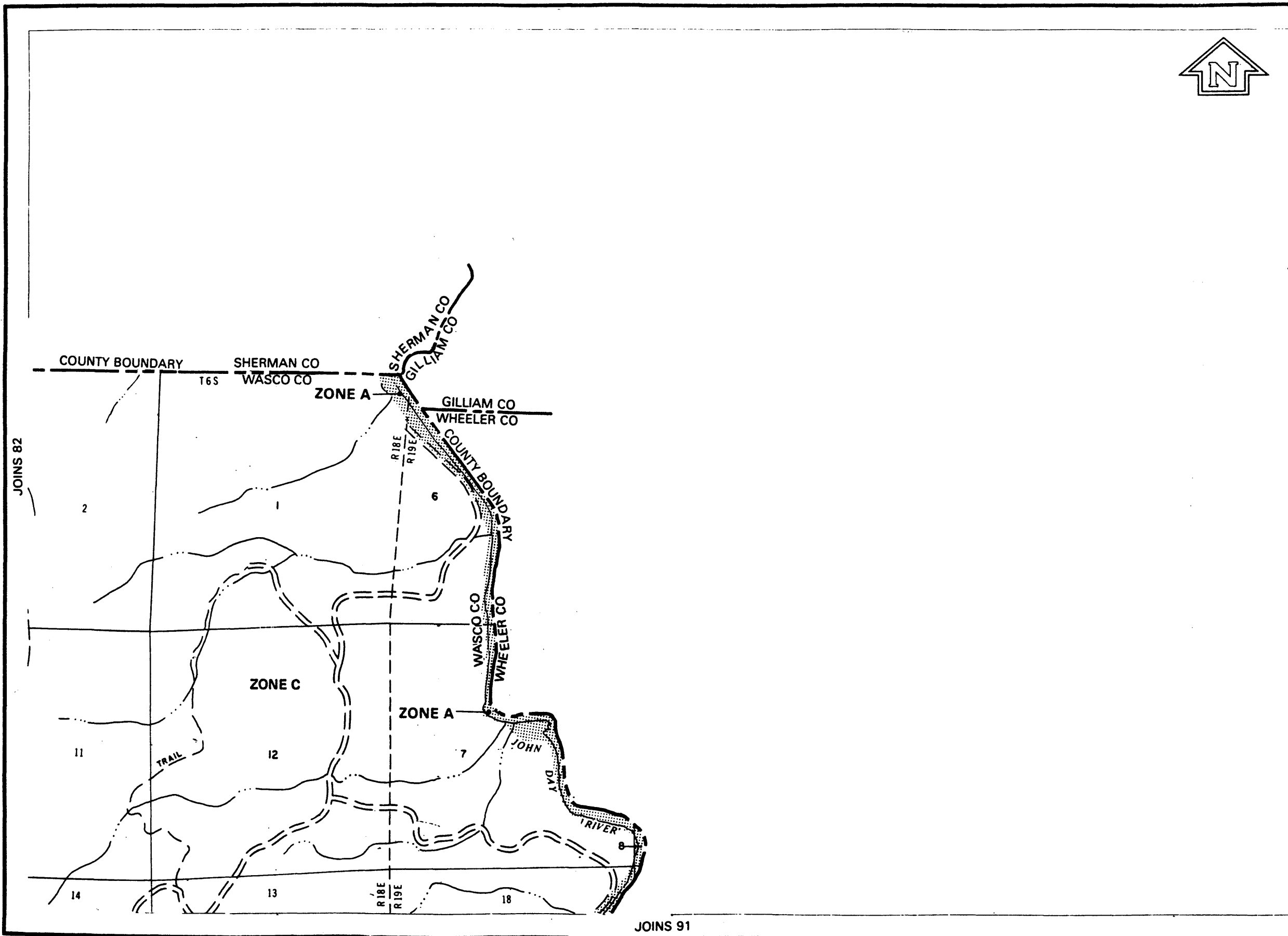
EFFECTIVE DATE

SEPTEMBER 24, 1984

JOINS 73



FEDERAL EMERGENCY MANAGEMENT AGENCY WASCO CO., OR (UNINC. AREA)	FLOOD INSURANCE RATE MAP	APPROXIMATE SCALE 6000 FEET 4000 2000 0 2000	EFFECTIVE DATE SEPTEMBER 24, 1984
		81	



FEDERAL EMERGENCY MANAGEMENT AGENCY WASCO CO., OR (UNINC. AREA)	FLOOD INSURANCE RATE MAP		EFFECTIVE DATE SEPTEMBER 24, 1984
	APPROXIMATE SCALE 2000 0 2000 4000 6000 FEET		

JOINS 84

JOINS 77

ZONE C

ZONE C

ZONE A

DANT

TRAIL

Creek

Eagle

OREGON TRUNK

UNION



APPROXIMATE SCALE



JOINS 86

Warm Springs Indian Reservation
(AREA NOT INCLUDED)

JOINS 92

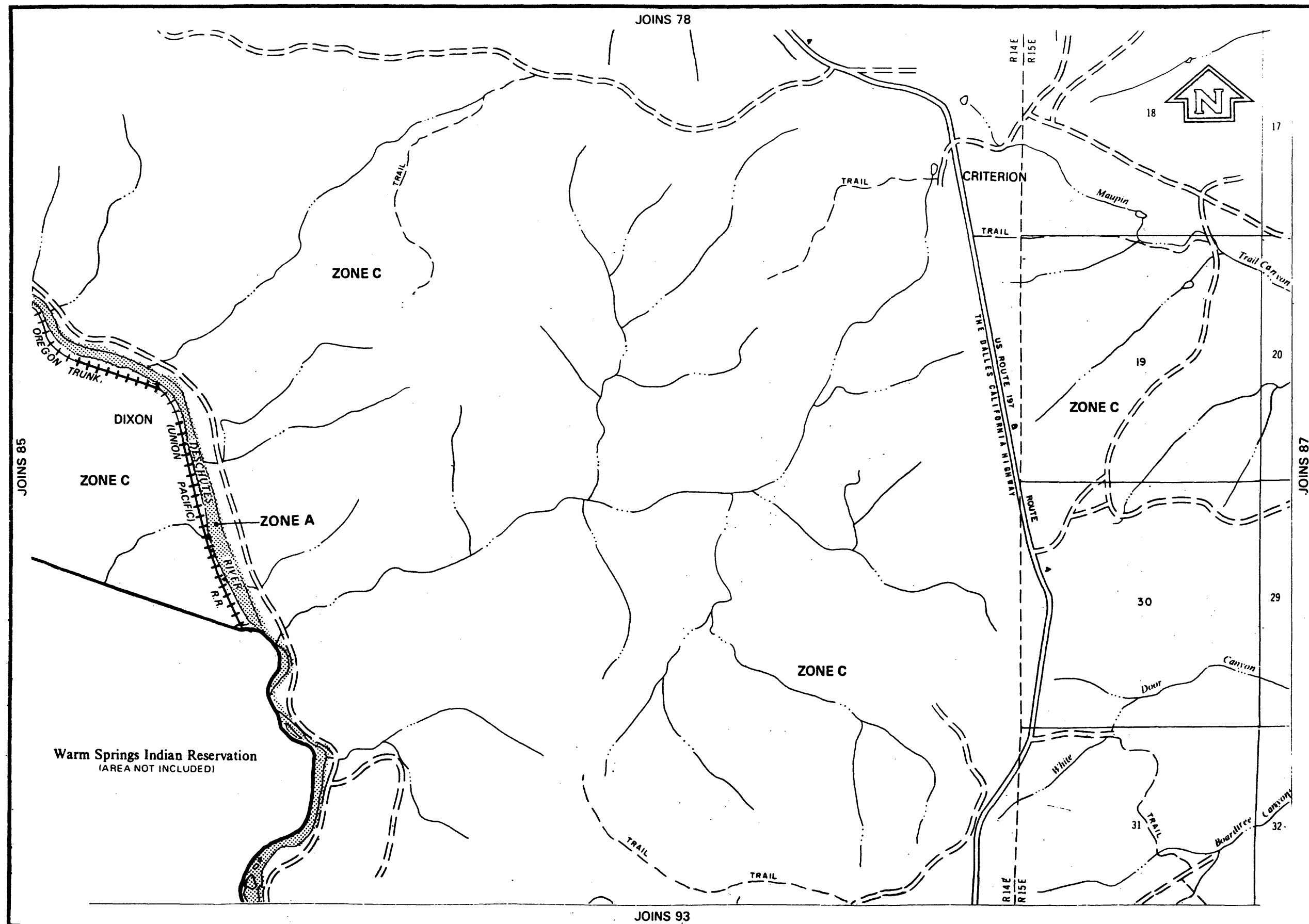
FEDERAL EMERGENCY MANAGEMENT AGENCY

WASCO CO., OR
(UNINC. AREA)

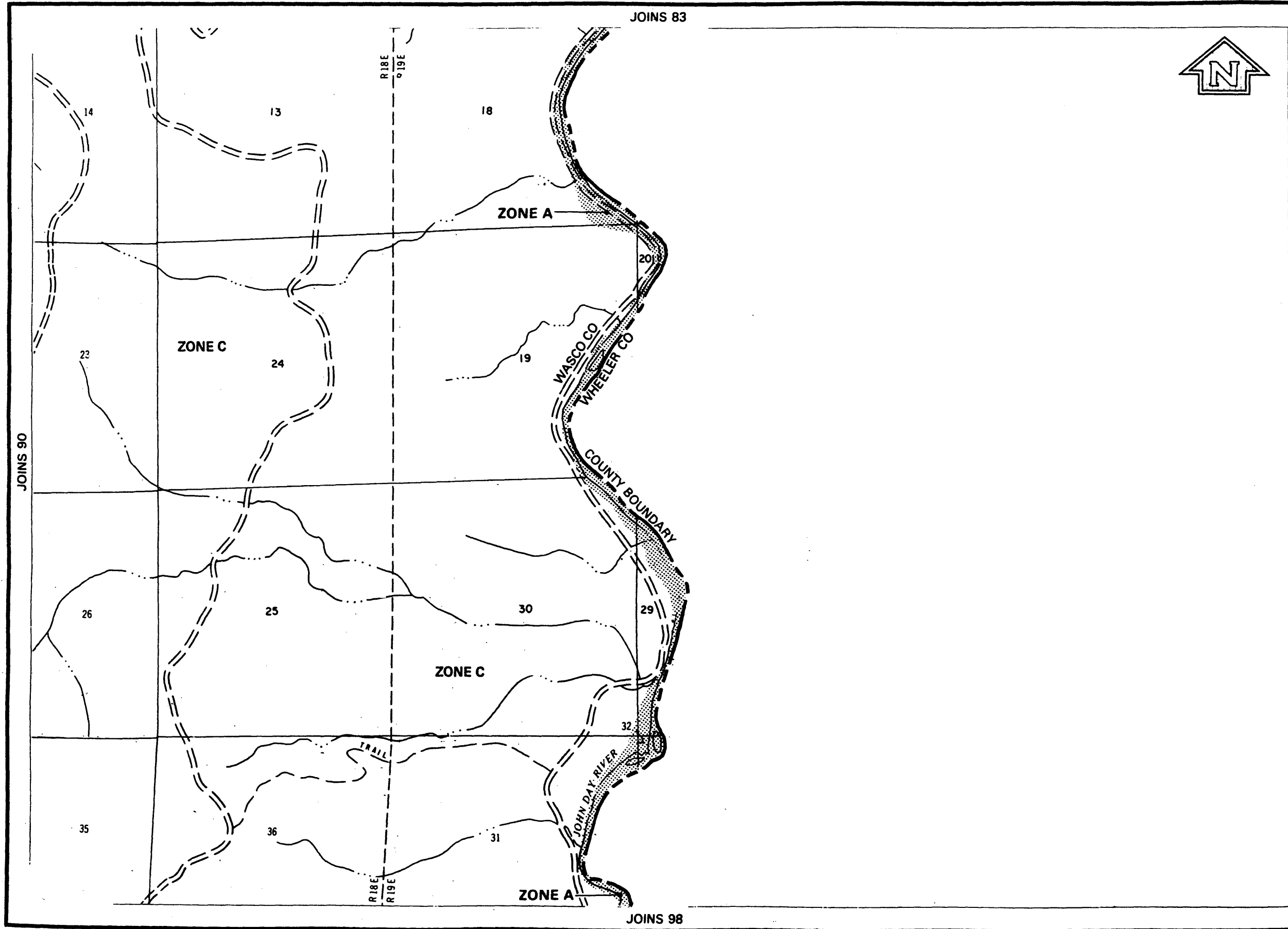
FLOOD INSURANCE RATE MAP

EFFECTIVE DATE
SEPTEMBER 24, 1984

85



FEDERAL EMERGENCY MANAGEMENT AGENCY WASCO CO., OR (UNINC. AREA)	86
FLOOD INSURANCE RATE MAP EFFECTIVE DATE SEPTEMBER 24, 1984	

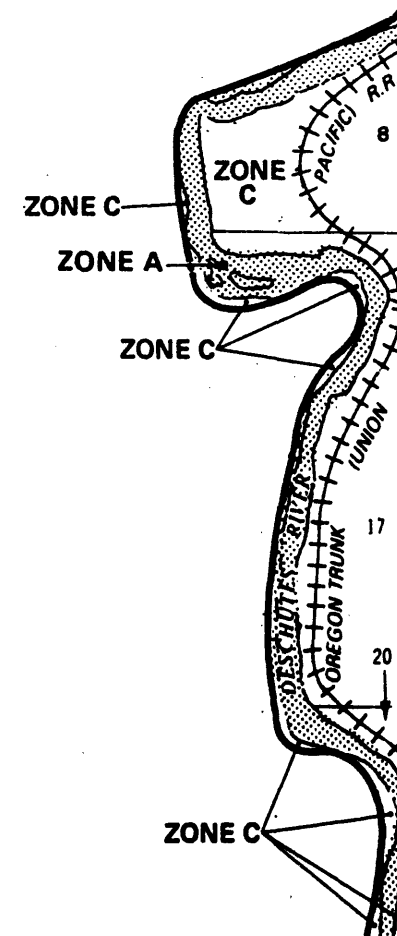


FEDERAL EMERGENCY MANAGEMENT AGENCY	WASCO CO., OR (UNINC. AREA)	FLOOD INSURANCE RATE MAP	EFFECTIVE DATE
			SEPTEMBER 24, 1984

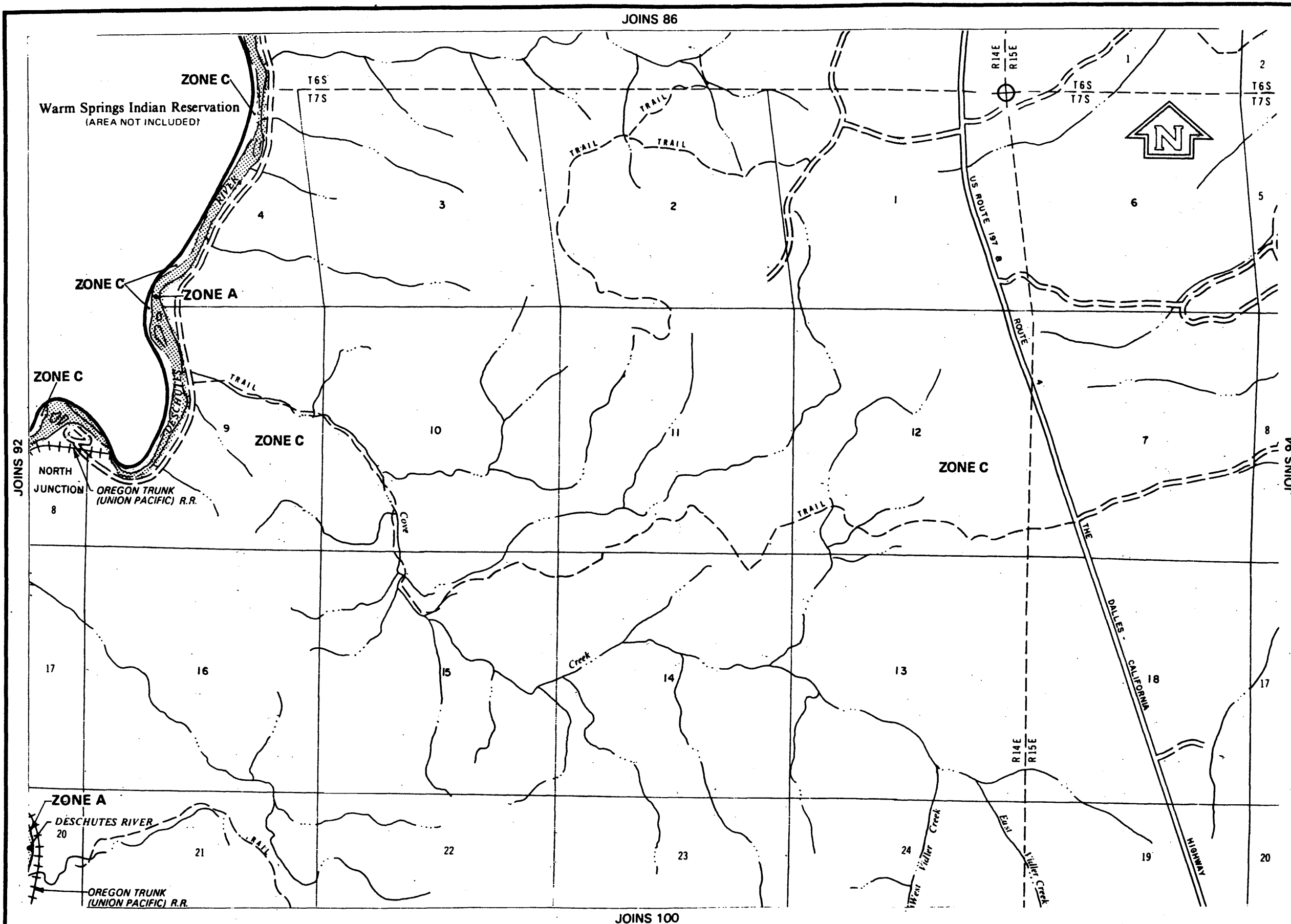
JOINS 85

Warm Springs Indian Reservation
(AREA NOT INCLUDED)

JOINS 99

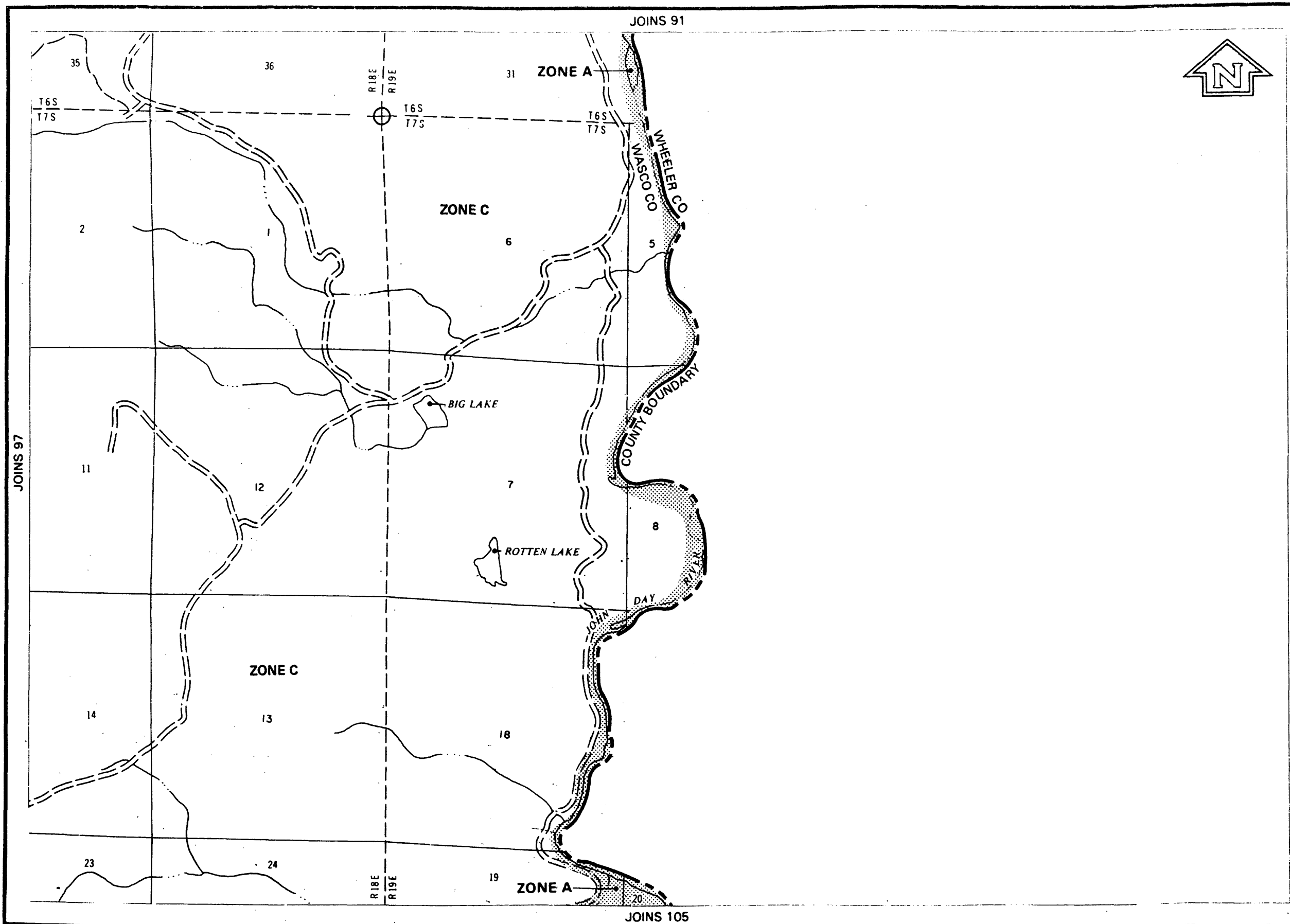


APPROXIMATE SCALE		EFFECTIVE DATE	
2000 4000 6000 FEET		SEPTEMBER 24, 1984	
FEDERAL EMERGENCY MANAGEMENT AGENCY		FLOOD INSURANCE RATE MAP	
WASCO CO., OR (UNINC. AREA)			
92			



FEDERAL EMERGENCY MANAGEMENT AGENCY WASCO CO., OR (UNINC. AREA)	APPROXIMATE SCALE 2000 0 2000 4000 6000 FEET	EFFECTIVE DATE SEPTEMBER 24, 1984
	FLOOD INSURANCE RATE MAP	

93

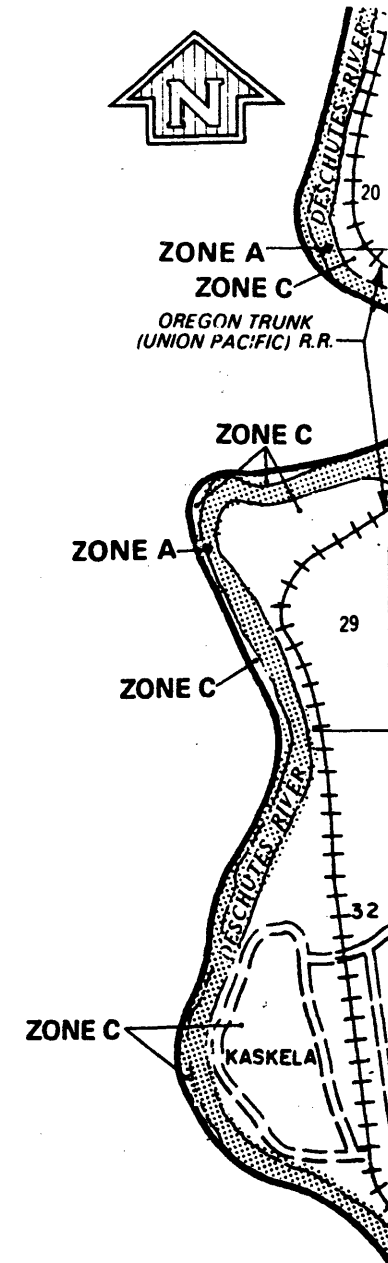


FEDERAL EMERGENCY MANAGEMENT AGENCY WASCO CO., OR (UNINC. AREA)	FLOOD INSURANCE RATE MAP		EFFECTIVE DATE SEPTEMBER 24, 1984
	APPROXIMATE SCALE 2000 0 2000 4000 6000 FEET		
98			

JOINS 92

Warm Springs Indian Reservation
(AREA NOT INCLUDED)

JOINS 106



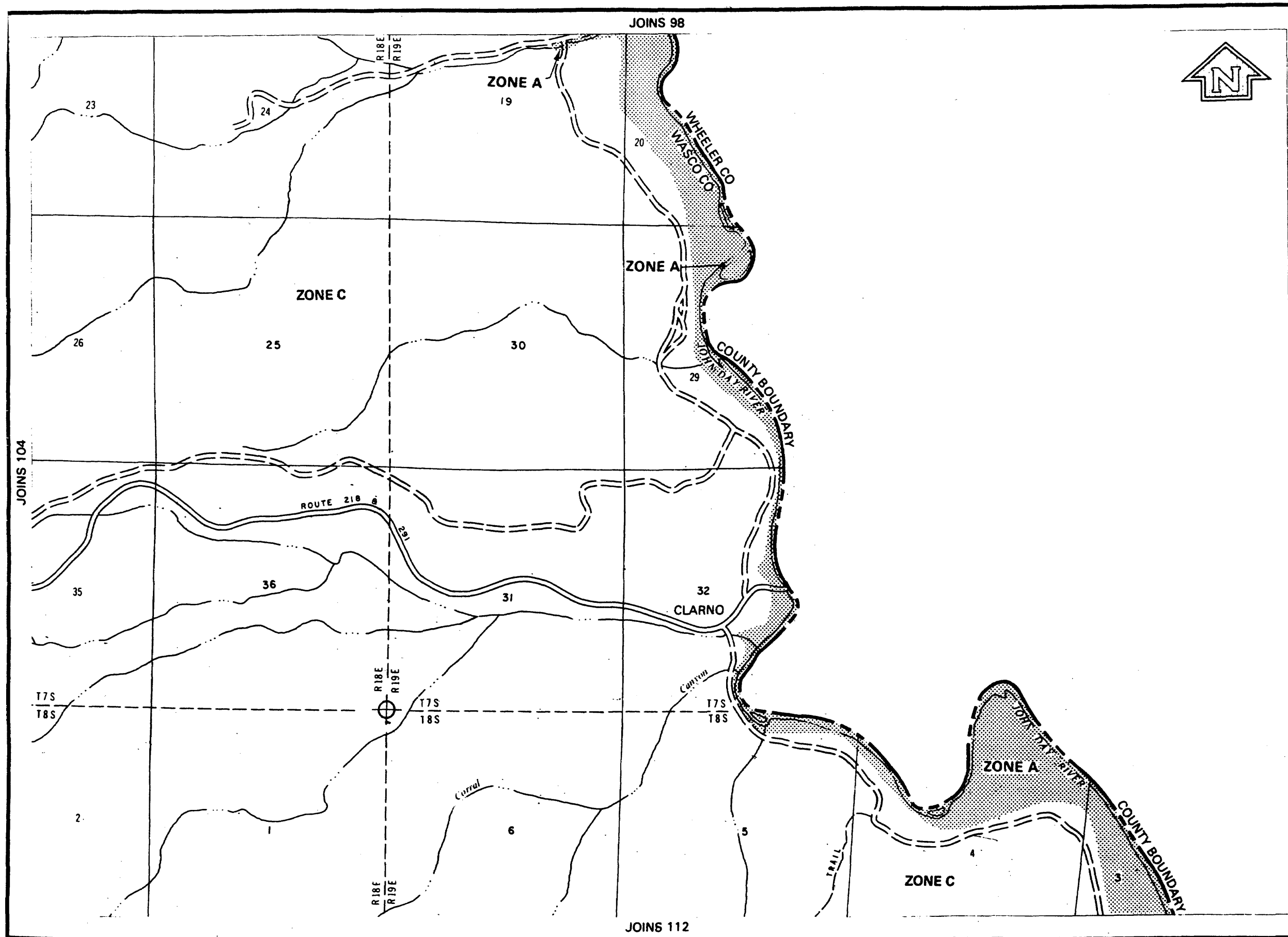
FEDERAL EMERGENCY MANAGEMENT AGENCY

WASCO CO., OR
(UNINC. AREA)

EFFECTIVE DATE
SEPTEMBER 24, 1984

FLOOD INSURANCE RATE MAP

99

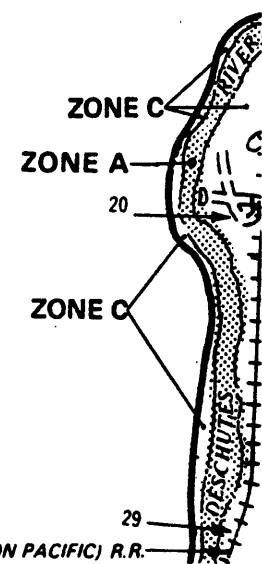


FEDERAL EMERGENCY MANAGEMENT AGENCY WASCO CO., OR (UNINC. AREA)	APPROXIMATE SCALE 2000 0 2000 4000 6000 FEET	EFFECTIVE DATE SEPTEMBER 24, 1984
	FLOOD INSURANCE RATE MAP	

JOINS 99

Warm Springs Indian Reservation
(AREA NOT INCLUDED)

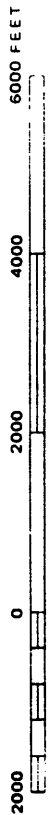
JOINS 114



OREGON TRUNK (UNION PACIFIC) R.R.

JOINS 107

APPROXIMATE SCALE



FLOOD INSURANCE RATE MAP

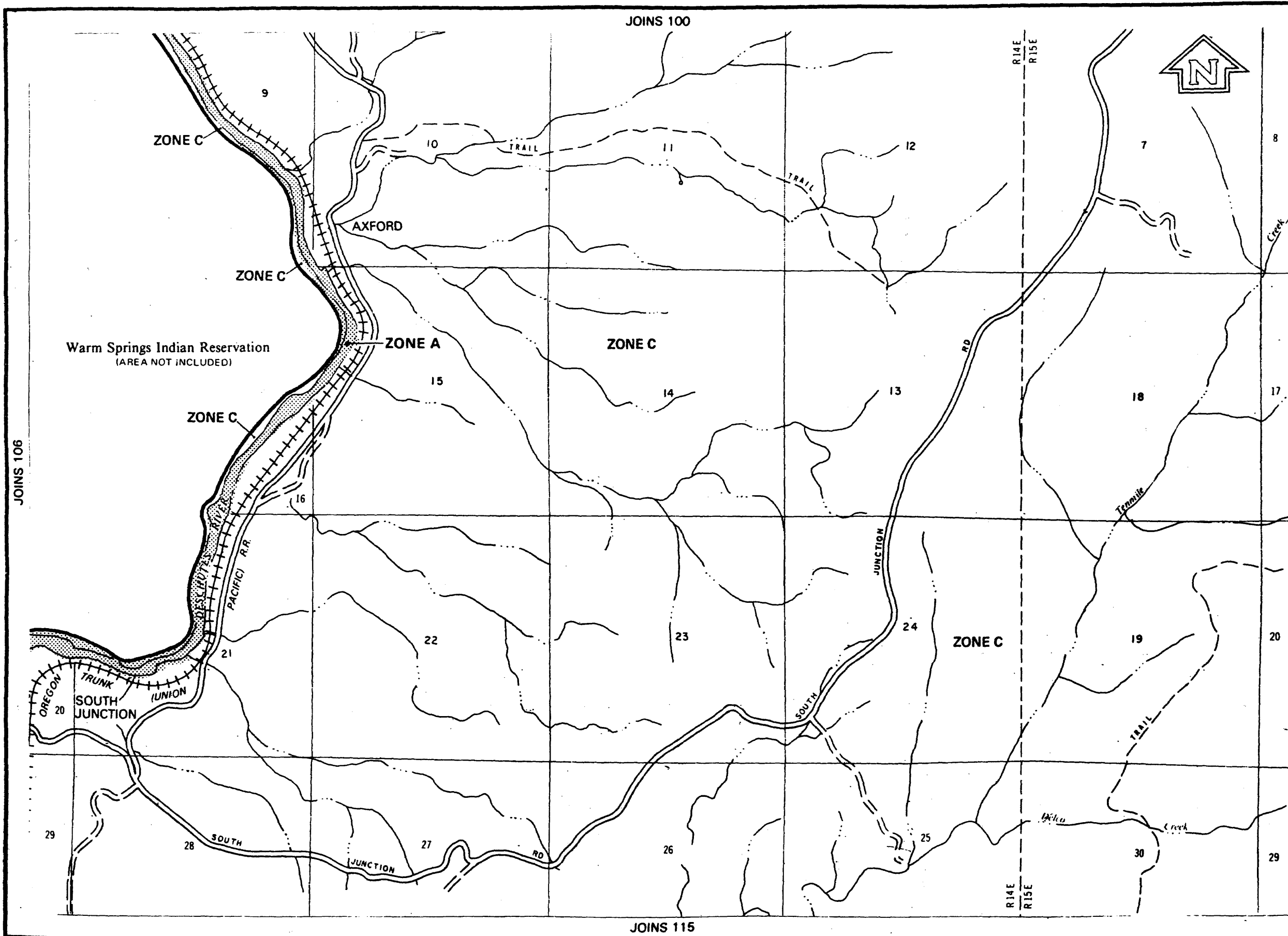
EFFECTIVE DATE

SEPTEMBER 24, 1984

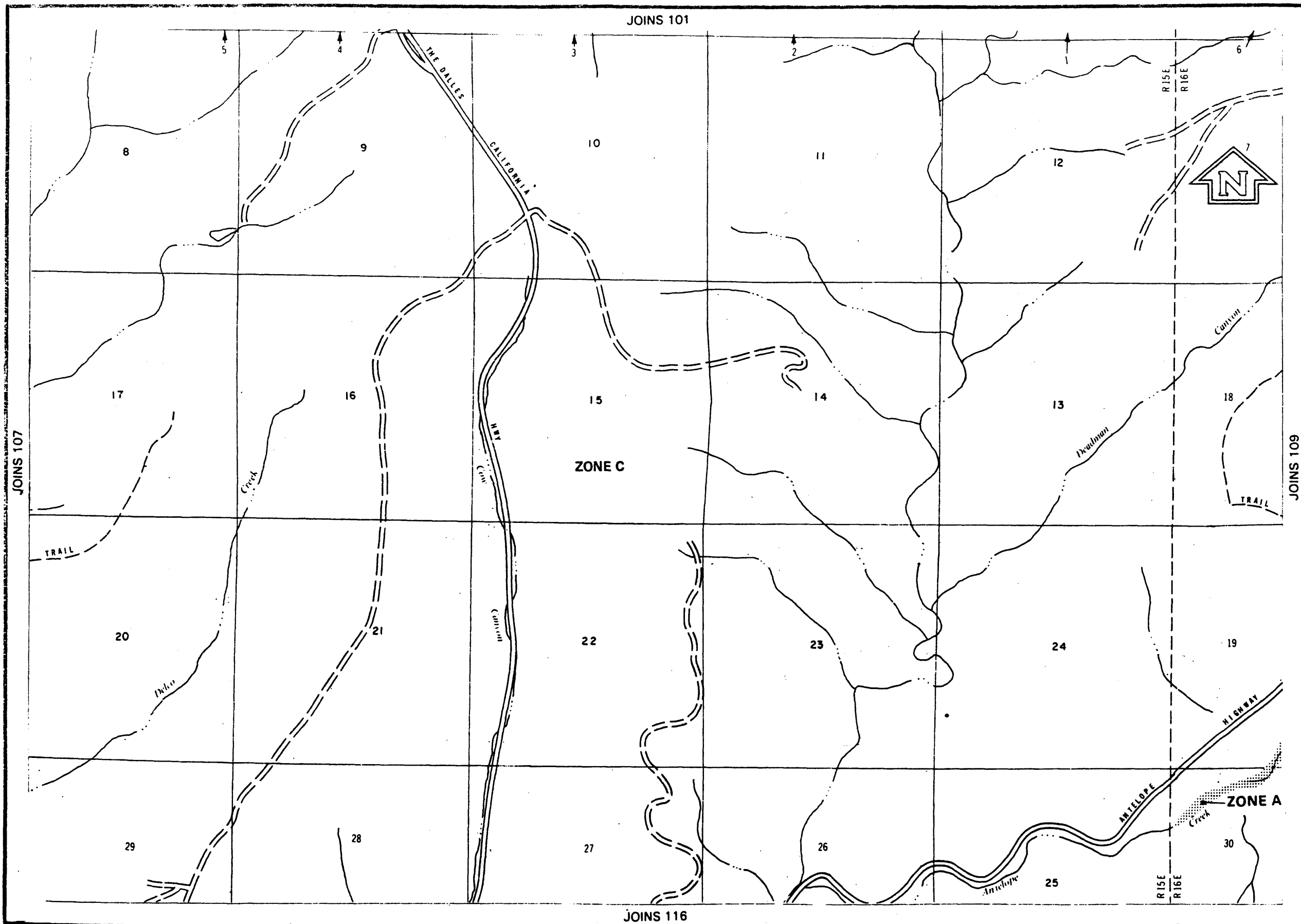
FEDERAL EMERGENCY MANAGEMENT AGENCY

WASCO CO., OR
(UNINC. AREA)

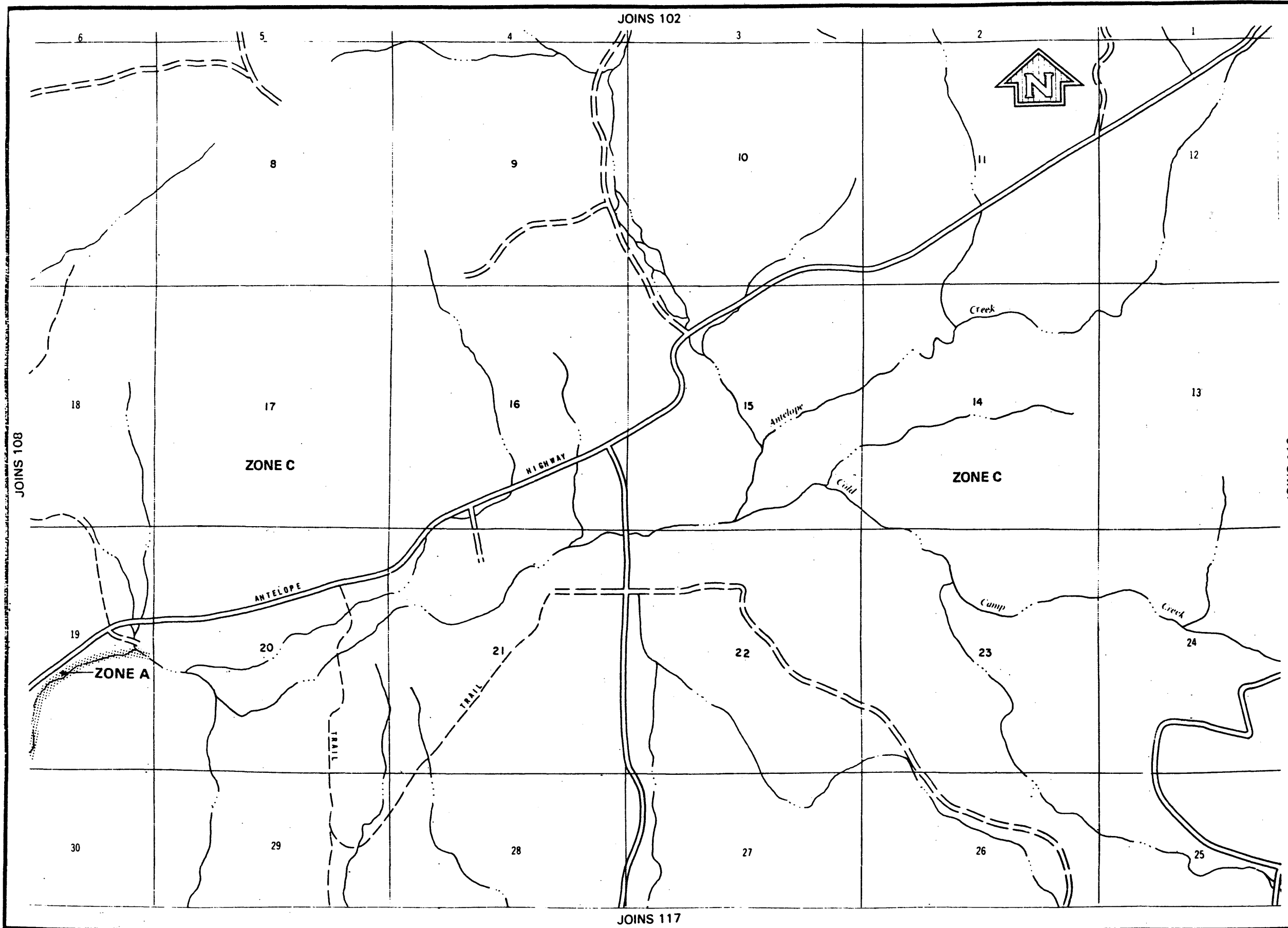
106



FEDERAL EMERGENCY MANAGEMENT AGENCY WASCO CO., OR (UNINC. AREA)	FLOOD INSURANCE RATE MAP	EFFECTIVE DATE SEPTEMBER 24, 1984
	APPROXIMATE SCALE 2000 0 2000 4000 6000 FEET	
107		



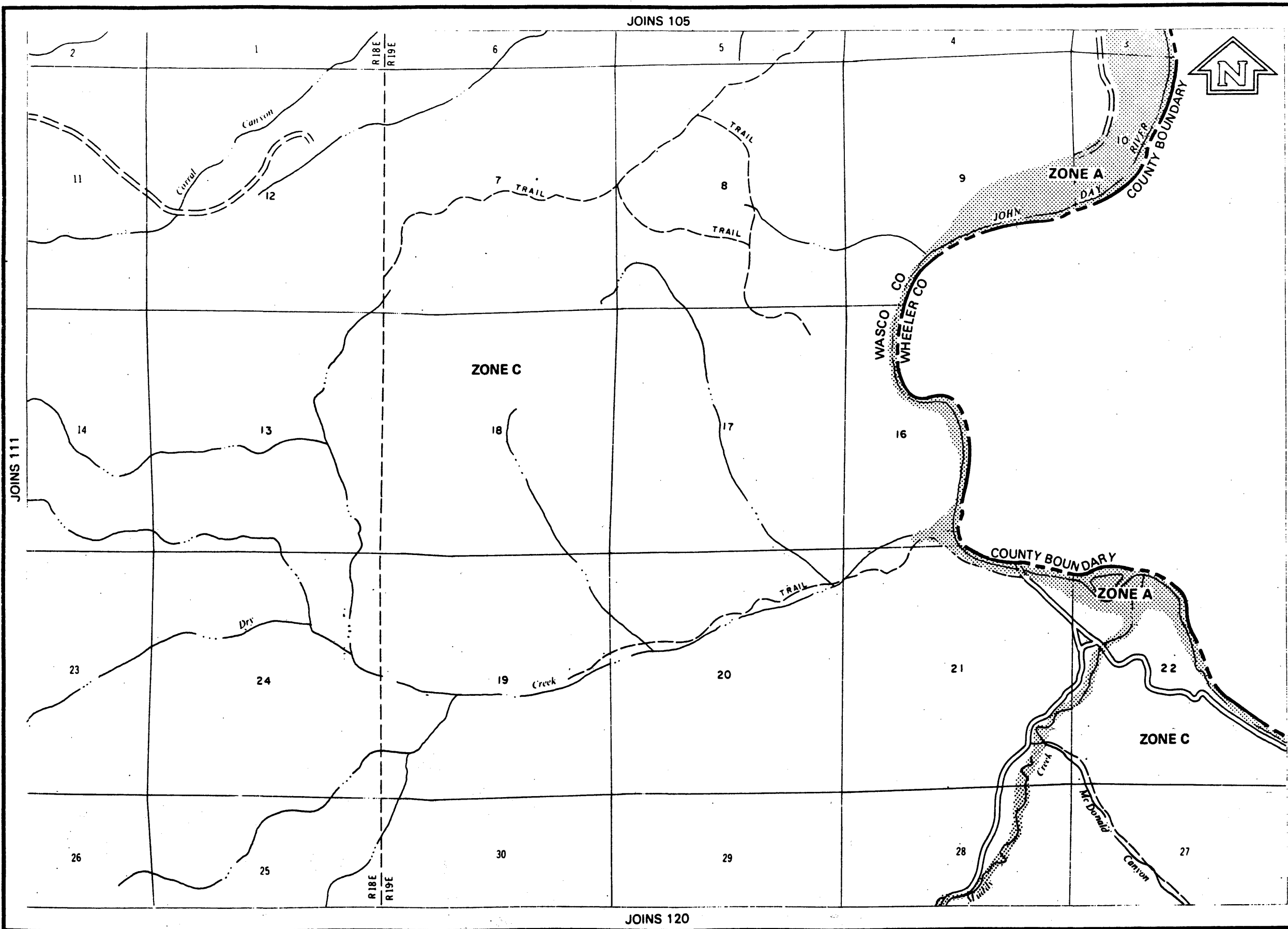
FEDERAL EMERGENCY MANAGEMENT AGENCY	APPROXIMATE SCALE 2000 4000 6000 FEET	EFFECTIVE DATE SEPTEMBER 24, 1984
	FLOOD INSURANCE RATE MAP	
WASCO CO., OR (UNINC. AREA)		
108		



FEDERAL EMERGENCY MANAGEMENT AGENCY. WASCO CO., OR (UNINC. AREA)	FLOOD INSURANCE RATE MAP	EFFECTIVE DATE SEPTEMBER 24, 1984

APPROXIMATE SCALE
6000 FEET
4000
2000
0

109

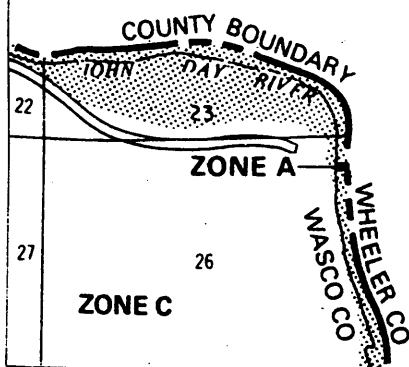


FEDERAL EMERGENCY MANAGEMENT AGENCY WASCO CO., OR (UNINC. AREA)	FLOOD INSURANCE RATE MAP	EFFECTIVE DATE SEPTEMBER 24, 1984

APPROXIMATE SCALE
2000 0 2000 4000 6000 FEET

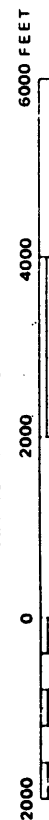
112

JOINS 112



JOINS 121

APPROXIMATE SCALE



EFFECTIVE DATE

SEPTEMBER 24, 1984

FLOOD INSURANCE RATE MAP

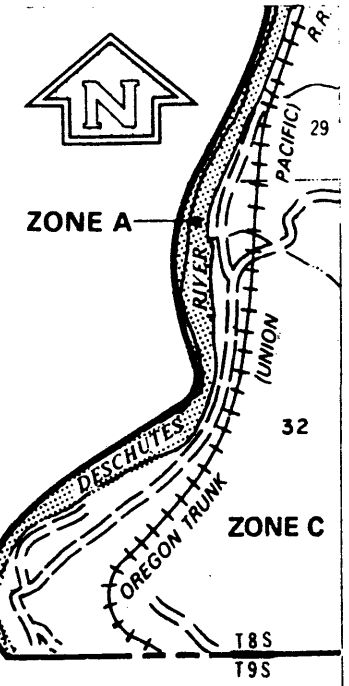
FEDERAL EMERGENCY MANAGEMENT AGENCY

WASCO CO., OR
(UNINC. AREA)

113

JOINS 106

Warm Springs Indian Reservation
(AREA NOT INCLUDED)



JOINS 115

FEDERAL EMERGENCY MANAGEMENT AGENCY

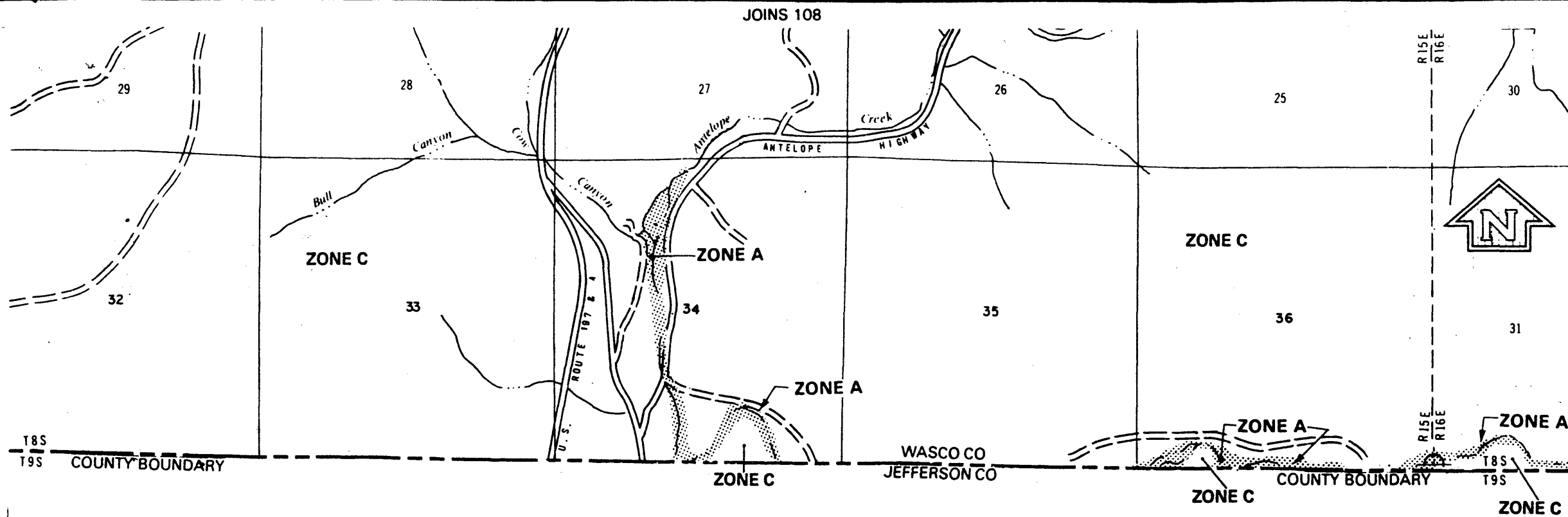
WASCO CO., OR
(UNINC. AREA)

114

FLOOD INSURANCE RATE MAP

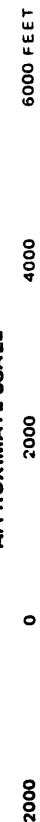
EFFECTIVE DATE
SEPTEMBER 24, 1984

JOINS 115



JOINS 117

APPROXIMATE SCALE



FEDERAL EMERGENCY MANAGEMENT AGENCY

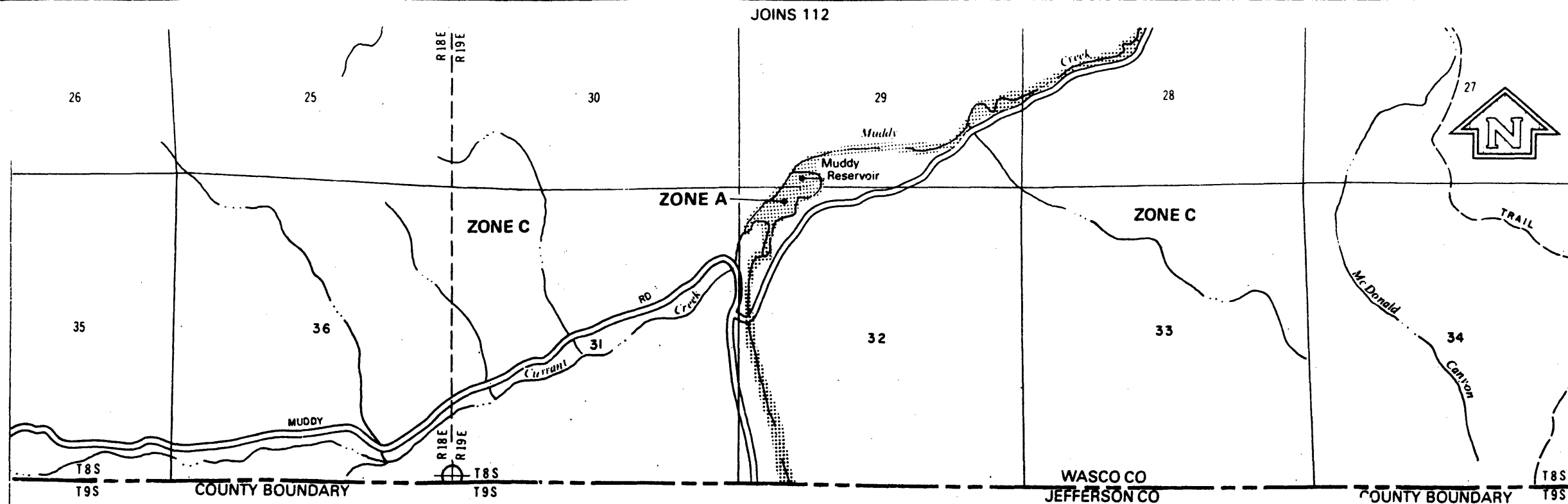
WASCO CO., OR
(UNINC. AREA)

FLOOD INSURANCE RATE MAP

EFFECTIVE DATE

SEPTEMBER 24, 1984

JOINS 119



JOINS 121

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASCO CO., OR
(UNINC. AREA)

120

APPROXIMATE SCALE

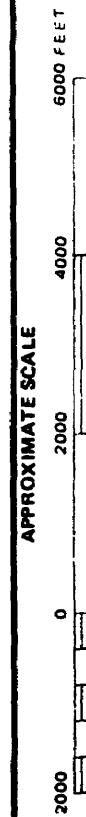
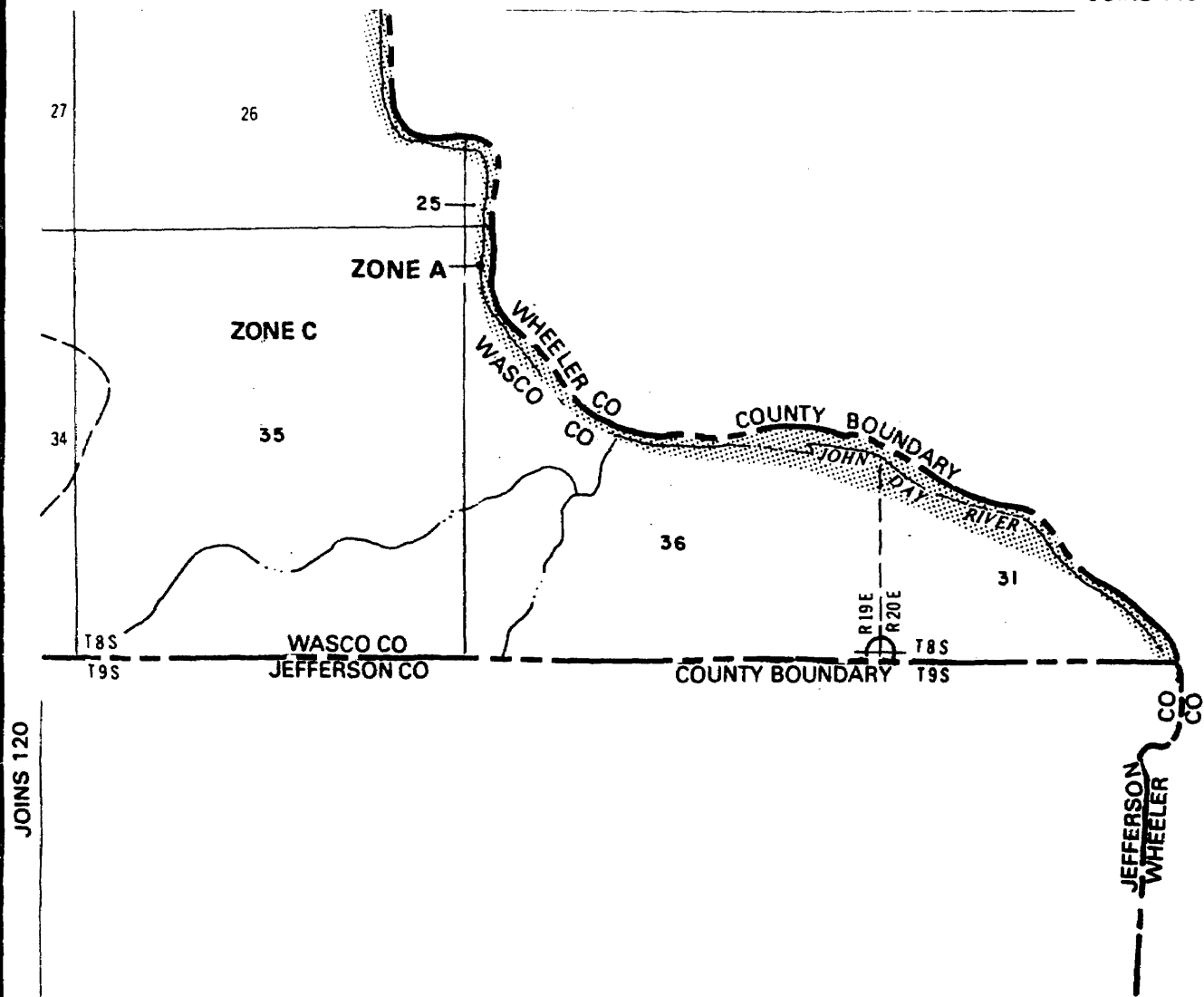
2000 0 2000 4000 6000 FEET

FLOOD INSURANCE RATE MAP

EFFECTIVE DATE

SEPTEMBER 24, 1984

JOINS 113



EFFECTIVE DATE
SEPTEMBER 24, 1984

FLOOD INSURANCE RATE MAP

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASCO CO., OR
(UNINC. AREA)