

TILLAMOOK COUNTY PLANNING COMMISSION

LOCATION

Port of Tillamook Bay Conference Center
4000 Blimp Boulevard, Tillamook, OR 97141

HEARING DATE

December 8, 2022- Beginning at 6:30p.m.

VIRTUAL & TELECONFERENCE MEETING INFORMATION

*For teleconference access the evening of the hearing, please call 971-254-3149. Conference ID: 887 242 77#. Virtual Meeting Access: <https://www.co.tillamook.or.us/commdev>. Click on Virtual Teams Link. *Microsoft Teams Meeting Format.*

- I. CALL TO ORDER
- II. ROLL CALL
- III. OLD BUSINESS:
- IV. NEW BUSINESS:

#851-22-000388-PLNG & #851-22-000373-PLNG Consolidated review of a Conditional Use request and Floodplain Development Permit request for the installation of a utility (submarine fiber optic cable) on a property accessed via WiNeMa Road, a County road, north of the Unincorporated Community of Neskowin addressed as 5195 WiNeMa Road, Cloverdale, Oregon. The subject property is zoned Recreation Management (RM) and is also within the Flood Hazard Overlay (FH) zone, Shoreland Overlay (SH) zone, Tsunami Hazard Overlay (TH) zone and Beach and Dune Overlay (BD) zone, and is designated as Tax Lot 6200 of Section 12DC, Township 5 South, Range 11 West of the Willamette Meridian, Tillamook County, Oregon. Applicant is AMCS LLA with deeded easement to Astound for development location. Property Owner is Wi-Ne-Ma Christian Camp.

#851-22-000402-PLNG TCLUO Section 5.110: Accessory Dwelling Unit (ADU) Standards Legislative text amendment request to amend Article 5: Special Use Standards and Exception of the Tillamook County Land Use Ordinance (TCLUO) to include Section 5.110 to establish use and development standards for construction of an Accessory Dwelling Unit (ADU) on residentially zoned properties located within Tillamook County Unincorporated Communities. The Planning Commission may take action at the hearing on December 8, 2022, or may continue the matter to a date and time announced at the hearing. The Planning Commission will ultimately make a recommendation to the Board of County Commissioners who will hear this matter at 9:00am on January 30, 2023. Ordinance Amendment request #851-22-000402-PLNG will become effective upon adoption by the Tillamook County Board of Commissioners, which will occur no sooner than January 30, 2023.

- V. AUTHORIZATION FOR CHAIR TO SIGN APPROPRIATE ORDERS, IF NECESSARY
- VI. ADMINISTRATIVE DECISIONS: Administrative Decisions are available for public review on the Tillamook County Department of Community Development website: <https://www.co.tillamook.or.us/commdev/landuseapps>
- VII. HOUSING COMMISSION UPDATE
- VIII. DEPARTMENT OF COMMUNITY DEVELOPMENT REPORT
- IX. ADJOURNMENT

The Port of Tillamook Bay Conference Center is accessible to citizens with disabilities. If special accommodations are needed for persons with hearing, visual, or manual impairments that wish to participate in the meeting, please contact 1-800-488-8280x3423 at least 24 hours prior to the meeting in order that appropriate communications assistance can be arranged.



Land of Cheese, Trees and Ocean Breeze

**CONSOLIDATED REVIEW OF A CONDITIONAL USE REQUEST & FLOODPLAIN
DEVELOPMENT PERMIT:
#851-22-000388-PLNG & #851-22-000373-PLNG**

Staff Report Date: December 1, 2022

Planning Commission Hearing Dates: December 8, 2022 & January 12, 2023

Report Prepared By: Sarah Absher, CFM, Director

I. GENERAL INFORMATION:

- Request:** Consolidated review of a Conditional Use request and Floodplain Development Permit request for the installation of a utility (submarine fiber optic cable) and beach manhole (landing station) (Exhibit B).
- Location:** Accessed via WiNeMa Road, a County road, north of the Unincorporated Community of Neskowin addressed as 5195 WiNeMa Road, Cloverdale, Oregon (Exhibit A).
- Zone:** Recreation Management (RM) Zone (Exhibit A).
- Applicant:** AMCS LLC, 410 Terry Avenue North, Seattle, WA 98109
- Property Owner:** Camp Wi-Ne-Ma Christian Camp, 5195 Winema Road, Cloverdale, OR 97112

Property Description: The subject property encompasses approximately 28.34 acres, is irregular in shape and improved with the Wi-Ne-Ma Christian Camp facilities. The subject property is bisected by Winema Road, a County road, and is bordered by residential properties to the north and southeast. The subject property is bordered by the Pacific Ocean to the west, extension of the camp to the south and Farm (F-1) zoned property to the east. The subject property is one of many properties in this area located within the Beach and Dune Overlay (BD) zone on a section of a dune/beach complex that is vegetated with dune grass, shrubs and trees typically identified in coastal dune areas (Exhibit A).

The most westerly portion of the subject property is located within the VE (Coastal High Hazard Area) Flood Zone as depicted on FEMA Flood Insurance Rate Map Panel #41057C0865F, dated September 28, 2018 (Exhibit A). The subject property is also located in the Tsunami Hazard Overlay (TH) zone.

The subject property is located within the Shoreland Overlay (SH) zone as it is subject to ocean flooding and is within 100-feet of the ocean shore, however these shorelands are not identified as estuarine or significant coastal shorelands within the Goal 17 Element of the Tillamook County Comprehensive Plan.

Review of the National Wetland Inventory Mapper indicates natural features such as wetlands are not present on the subject property.

Due to the location of the subject property, the subject property is located within the Beach and Dune Overlay (BD) zone, the Shoreland Overlay (SH) zone and the Flood Hazard Overlay (FH) zone (Exhibit A). Compliance of applicable standards with these overlay zones is discussed in Section III of this report.

The applicant is seeking Conditional Use approval for the installation a fiber-optic cable system and landing site (Exhibit B).

Fiber-optic cable system also referred to as a “fiber-optic cable” and beach manhole (landing station) are common terms throughout the report.

II. ORDINANCE SIMILAR USE DETERMINATION

“Utility facilities” are defined in Article 11 of the TCLUO as *structures, pipes, or transmission lines which provide the public with electricity, gas, heat, steam, communication, water, sewage collection, or other similar service.* Tillamook County initially considered the installation of a fiber-optic cable in 2019 through Conditional Use request #851-19-000105-PLNG together with a similar use determination that a fiber-optic cable and beach manhole are “public utility facilities, including utility substations and power transmission lines”.

The County’s similar use determination was appealed to the Land Use Board of Appeals (LUBA No. 2020-014). LUBA’s Final Order and Opinion affirmed the County’s interpretation that a fiber-optic cable is “substantially similar” to the undefined term “public utility facilities, including utility substations and power transmission lines”.

III. APPLICABLE ORDINANCE AND COMPREHENSIVE PLAN PROVISIONS:

The desired use is governed through the following Sections of the Tillamook County Land Use Ordinance (TCLUO). The suitability of the proposed use, in light of these criteria, is discussed in Section III of this report:

- A. Section 3.040: Recreation Management Zone (RM)
- B. Section 3.510: Flood Hazard Overlay Zone (FH)
- C. Section 3.545: Shoreland Overlay Zone (SH)
- D. Section 3.530: Beach and Dune Overlay Zone (BD)
- E. Section 3.580: Tsunami Hazard Overlay Zone (TH)
- F. Article VI: Conditional Use Procedures and Criteria
- G. Article X: Administrative Provisions

IV. ANALYSIS:

A. SECTION 3.040: RECREATION MANAGEMENT (RM) ZONE: *The purpose of the RM zone is to designate areas for public and private parks and day-use facilities, including such areas that contain significant natural or scenic values. The RM zone is intended to accommodate the type of recreational developments that preserve an area's natural values; it is not intended for intensive recreational developments that do not retain substantial open space on the property.*

Findings: The applicant is seeking Conditional Use approval for the installation of the Bifrost Submarine Cable System (Bifrost), an ultra-high speed fiber optic cable telecommunication cable system providing large capacity direct link between the continental U.S. (Oregon and California) and Asia (Singapore), crossing the Pacific Ocean via Guam (Exhibit B).

Utility lines are listed as a use permitted outright in the Recreation Management (RM) zone, and utility substations and power transmission lines are listed as uses permitted conditionally in the RM zone. Following the established review process for Conditional Use request #851-19-000105-PLNG, staff finds that the proposed installation of a submarine fiber-optic cable and beach manhole is subject to Conditional Use review and the provisions of Article 6 of the TCLUO.

Given LUBA's affirmation contained Final Order and Opinion (LUBA No. 2020-014), a fiber-optic cable and beach manhole are similar in use to "public utility facilities, including utility substations and power transmission lines", and a new similar use determination is not required for this request.

B. ARTICLE VI CONDITIONAL USE PROCEDURES AND CRITERIA

Article VI of the Tillamook County Land Use Ordinance contains the procedures and review criteria for processing a Conditional Use request. These criteria, along with Staff's findings, are indicated below.

1. TCLUO Section 10.040(2) allows the Director of Community Development to refer a Type II application to the Planning Commission for decision under Type III review procedures. TCLUO Article 10, 'Development Approval Procedures', describes Type III review procedures.

Findings: This request has been referred to the Tillamook County Planning Commission for decision, following the review process already established for consideration of installation of a fiber-optic cable and beach manhole through Conditional Use request #851-19-000105-PLNG. Notice of the request was mailed to property owners within 250 feet of the subject properties and affected agencies on November 14, 2022, in accordance with Article 10 of the TCLUO. Notice of the hearing was published in the Headlight Herald on November 14, 2022. One public comment to date was received and has been included as "Exhibit C". Comments are primarily focused on concerns related to existing road conditions and responsibilities to fix any additional damages resulting from this project (Exhibit C).

2. Section 6.040 Review Criteria

1. *The use is listed as a conditional use in the underlying zone, or in an applicable overlying zone.*

Findings: Given LUBA's affirmation contained Final Order and Opinion (LUBA No. 2020-014), a fiber-optic cable and beach manhole (landing station) are similar in use to "public utility facilities, including utility substations and power transmission lines", and a new similar use determination is not required for this request.

As mentioned previously, utility lines are listed as a use permitted outright in the Recreation Management (RM) zone, and utility substations and power transmission lines are listed as uses permitted conditionally in the RM zone. Following an established review process for this type of request, it has been determined that Conditional Use review subject to the provisions of Article 6 is required.

2. *The use is consistent with the applicable goals and policies of the comprehensive plan.*

Findings: The Applicant's submittal contains a description of why they believe the proposed project is consistent with the applicable goals and policies of the Tillamook County Comprehensive Plan (Exhibit B). The applicant's response specifically identifies compliance with Goal Elements 6, 11 and 18 (Exhibit B). A summarization of each goal element is described below with staff findings.

The TCLUO is an implementing document of the Tillamook County Comprehensive Plan. In the absence of evidence to the contrary, uses allowed conditionally in the Land Use Ordinance can be presumed to be consistent with the Tillamook County Comprehensive Plan.

The following Goal Summaries are a combination of excerpts from the Department of Land Conservation and Development's introductory information on Oregon's statewide planning goals which can be found on their website at <http://www.oregon.gov/LCD/docs/goals/goalsummary.PDF> and the Tillamook County Comprehensive Plan <https://www.co.tillamook.or.us/gov/ComDev/Planning/compplan.htm>. These summaries are intended to provide a general context for discussion of the general compatibility of this conditional use request with the goal elements of the Tillamook County Comprehensive Plan.

- Tillamook County Comprehensive Plan Goal 1 Element: The Planning Process
Summary: Goal 1 calls for "the opportunity for citizens to be involved in all phases of the planning process." It requires each city and county to have a citizen involvement program containing six components specified in the goal. It also requires local governments to have a committee for citizen involvement (CCI) to monitor and encourage public participation in planning.
- Tillamook County Comprehensive Plan Goal 2 Element: THE LAND USE PLAN
Summary: Goal 2 outlines the basic procedures of Oregon's statewide planning program and describes the development of Tillamook County's Comprehensive Plan including justification for identifying exception areas.
- Tillamook County Comprehensive Plan Goal 3 Element: AGRICULTURAL LANDS
Summary: Goal 3 defines "agricultural lands." It then requires counties to inventory such lands and to "preserve and maintain" them through farm zoning. Details on the uses allowed in farm zones are found in ORS Chapter 215 and in Oregon Administrative Rules, Chapter 660, Division 33.
- Tillamook County Comprehensive Plan Goal 4 Element: FOREST LANDS
Summary: This goal defines forest lands and requires counties to inventory them and adopt policies and ordinances that will "conserve forest lands for forest uses."
- Tillamook County Comprehensive Plan Goal 5 Element: NATURAL RESOURCES
Summary: The purpose of Goal 5 is to protect natural resources, and conserve scenic and historic areas and open space. Goal 5 covers more than a dozen natural and cultural resources such as wildlife habitats and wetlands. It establishes a process for each resource to be inventoried and evaluated. If a resource or site is found to be significant, a local government has three policy choices: preserve the resource, allow proposed uses that conflict with it, or strike some sort of a balance between the resource

and the uses that would conflict with it.

Findings: The proposed installation of the fiber-optic cable system and landing site (beach manhole) does not conflict with the five Tillamook County Comprehensive Plan goal elements described above. Specifically, the public hearing and prescribed land use review process is consistent with the goals and policies of the Goal 1 and 2 elements. This area is not identified as agricultural or forest lands where strict policies are upheld to preserve and protect agricultural and resource uses. The subject property is not inventoried in the Goal 5 element confirming the absence of natural or cultural resources on this property.

- Tillamook County Comprehensive Plan Goal 6 Element: AIR, WATER AND LAND RESOURCES QUALITY

Summary: This goal requires local comprehensive plans and implementing measures to be consistent with state and federal regulations on matters such as groundwater pollution and noise control in Tillamook County.

Findings: Applicant states the methodology proposed for the HDD activities are consistent with the methodology outlined in the Oregon Department of Environmental Quality (DEQ's) Groundwater Monitoring Well Drilling, Construction, and Decommissioning (OAR-690-240-0035) (Exhibit B). Standard excavating equipment, an HDD drill rig and small diesel generators that meet both State and Federal air quality standards and will meet all applicable air quality standards will be utilized for project construction (Exhibit B).

A geophysical and geotechnical site investigation consisting of a combination of marine and terrestrial based surveys for the subject property have been completed for project development (Exhibit B). Investigation of potential impacts to groundwater from the HDD activities was assessed. It was concluded that there are no surface waters onsite (excluding the Pacific Ocean) and that there are no surface waters immediately adjacent to the project area (Exhibit B).

Applicant summarized several findings and conclusions contained within the geotechnical study. It was also determined that the potential for HDD activities to cause any impacts to the water, land on the subject property on in the adjacent area is low (Exhibit B).

Applicant has developed an inadvertent return contingency plan included as "Appendix 4". "Appendix 5" of the application is a "Drill Break Avoidance and Response Plan" with consideration of potential impacts to the surrounding environment should a drill break or another scenario require project equipment be abandoned under the seafloor (Exhibit B). "Appendix 5" also includes a reaction and response plan should a sinkhole be detected (Exhibit B).

In 1971, the Legislature gave the Environmental Quality Commission power, through the Department of Environmental Quality, to adopt statewide standards for permitted noise emissions in the State of Oregon and to implement and enforce compliance with these adopted standards. Standards have been set in four areas: for new motor vehicles sold in the state, for motor vehicles presently in use, for industry and commerce, and for new and existing airports (Goal 6, Section 4.2).

Noise sources from industry and commerce must meet ambient noise standards measured at the nearest noise sensitive property. Noise sensitive property is defined as residences, schools, churches, libraries and other places where people normally sleep. The definition for industry is very broad. However, some activities are exempted for reasons of lack of control technology, lack of an adequate standard or preemption by federal regulations. Industrial and commercial noise standards are based upon protection of

speech communications during the daytime (7am to 10pm) and protection of sleep at night (10pm to 7am). During the day, noise is generally any sounds that disturb normal speech.

It should be noted that these noise thresholds do not mention or include construction activities that commonly occur throughout Tillamook County. It should also be noted that noise decibels for standard construction equipment largely exceed the thresholds noted above. In review of OSHA and the Federal Highway Administration Construction Noise Handbook list the average equipment noise level for construction equipment typically found at job sites, the noise level of these types of equipment exceeds 70 decibels and can also exceed 90 decibels.

Projected timeline for construction is approximately 4-5 weeks (Exhibit B). Applicant states they have worked closely with the Wi-Ne-Ma Christian Camp to ensure project activities are conducted at a time and in a manner that minimizes disturbance to camp activities, and that activities would occur during County approved days and times to avoid peak activities at the camp (Exhibit B).

Findings and policies within the Goal 6 element outlined in Section 4.3 state the Tillamook DEQ office and Tillamook County Sheriff enforce state noise standards in Tillamook County. Off-road vehicles are noted as the biggest source of noise complaints in Tillamook County. The policy within this element of the Comprehensive Plan is that Tillamook County shall continue to support and cooperate with state and federal programs of noise control.

- Tillamook County Comprehensive Plan Goal 7 Element: HAZARDS

Summary: Goal 7 deals with development in places subject to natural hazards such as floods or landslides. It requires that jurisdictions apply "appropriate safeguards" (floodplain zoning, for example) when planning for development there. In Tillamook County, the purpose of addressing hazards is not meant to restrict properties from development, but to institute policies concerning potential problems, so they can be considered before financial losses and possible injury which may be avoided by the application of the policies formulated in the Comprehensive Plan.

Findings: The most westerly portion of the subject property abutting the beach is located within the Flood Hazard Overlay Zone as described previously in this report. Development permit approval to confirm development on the subject property complies with the requirements outlined TCLUO Section 3.510: Flood Hazard Overlay Zone (a reflection of floodplain regulations as outlined in Title 44 of the Code of Federal Regulations; Part 60 as enforced by the Federal Emergency.

Floodplain Development Permit #851-22-000373-PLNG has been submitted for proposed development activities that are within the Area of Special Flood Hazard and is part of this consolidated review process (Exhibit B). A site-specific geotechnical investigation report is also included in the application submittal and is included as "Appendix 3" (Exhibit B).

The subject property is also located within the Beach and Dune Overlay (BD) Zone as well as the Tsunami Hazard Overlay (TH) zone. A geotechnical investigation report has been included in the Applicant's submittal. Uses permitted outright and conditionally in the underlying zone are permitted in the Tsunami Hazard Overlay (TH) zone, with the exception of prohibited uses set forth in Subsection 5 of TCLUO Section 3.580. These prohibited uses are largely critical facilities, educational facilities, buildings with capacity for more than 250 persons and detention facilities. The proposed project is not listed in the prohibited uses of Section 3.580(5).

- Tillamook County Comprehensive Plan Goal 8 Element: RECREATION

Summary: This goal calls for each community to evaluate its areas and facilities for recreation and develop plans to deal with the projected demand for them. It also sets forth detailed standards for

expedited siting of destination resorts. In Tillamook County, the main issue surrounding recreation is that of quantity, location and orientation. This Goal element recognizes that the tourism sector of the County's economy is rapidly growing and some feel tourism places too large a burden on local public facilities and services.

- **Tillamook County Comprehensive Plan Goal 9 Element: POPULATION AND ECONOMY**
Summary: Goal 9 calls for diversification and improvement of the economy. It asks communities to inventory commercial and industrial lands, project future needs for such lands, and plan and zone enough land to meet those needs. Projections in this Element of the Comprehensive Plan extend to year 2000. The importance of cottage industry, rural industry and light industry is recognized throughout this Element, stating that regulations be adopted to permit low-impact light manufacturing activity in suitable rural zones.
- **Tillamook County Comprehensive Plan Goal 10 Element: HOUSING**
Summary: This goal specifies that each city must plan for and accommodate needed housing types, such as multifamily and manufactured housing. It requires each city to inventory its buildable residential lands, project future needs for such lands, and plan and zone enough buildable land to meet those needs. It also prohibits local plans from discriminating against needed housing types. This Goal element within the Tillamook County Comprehensive Plan focuses on the separation of housing needs and opportunities in both rural and urban areas. There is a strong tie to the Goal 11: Public Facilities and Goal 14: Urbanization elements of the Comprehensive Plan in this section.

Findings: The proposed installation of the fiber-optic cable and beach manhole (landing site) does not conflict with the Tillamook County Comprehensive Plan goal elements described above. The proposed project does not impede County efforts to meet the needs of commerce and industry, and project development could be found consistent with the goals and priorities of the Goal 9 element. It is important to note that the subject property is zoned Recreation Management (RM), and non-residential uses can be permitted without conflicting with the goals and policies of the Goal 10 Housing Element.

- **Tillamook County Comprehensive Plan Goal 11 Element: PUBLIC FACILITIES**
Summary: Goal 11 calls for efficient planning of public services such as sewers, water, law enforcement, and fire protection. The goal's central concept is that public services should be planned in accordance with a community's needs and capacities rather than be forced to respond to development as it occurs. This Element of the Comprehensive Plan outline types and levels of urban and rural facilities and services, with guidance to ensure timely, orderly and efficient arrangement of public facilities and services in Tillamook County.

Findings: Applicant states that the installation and operation of the proposed buried utility line will not impact public facilities present in or around the area (Exhibit B). The Goal 11 element of the Tillamook County Comprehensive Plan serves to, "To plan and develop a timely, orderly and efficient arrangement of public facilities and services to serve as a framework for urban and rural development. Urban and rural development shall be guided and supported by types and levels of urban and rural public facilities and services appropriate for, but limited to, the needs and requirements of the urban, urbanizable and rural areas to be served."

Public facilities and services are defined by the goals as 'projects activities and facilities which the planning agency determines to be necessary for the public health, safety and welfare.' This does not mean that the service or facilities are publicly owned but that they are necessary for public health, safety and welfare. For example, there are several water systems in the County that are privately owned but are essential for the health of the general public."

In consideration of protection of resource values and resource lands in relation to the installation of public facilities, the proposed installation of the fiber-optic cable and beach manhole (landing site) is not located within a resource zone or resource inventoried area, and should the Planning Commission agree, do not conflict with the goals and policies contained within this goal element.

- **Tillamook County Comprehensive Plan Goal 12 Element: TRANSPORTATION**
Summary: The goal aims to provide "a safe, convenient and economic transportation system." It asks for communities to address the needs of the "transportation disadvantaged." Policies outlined in this Goal element of the Tillamook County Comprehensive Plan require the County to protect the function, operation and safety of existing and planned roadways as identified in the County's Transportation Plan, consider land use impacts on existing or planned transportation facilities in all land use decisions, plan for multi-modal networks, and coordinate transportation planning efforts with other jurisdictions to assure adequate connections to streets and transportation systems between incorporated and unincorporated areas.
- **Tillamook County Comprehensive Plan Goal 13 Element: ENERGY CONSERVATION**
Summary: Goal 13 declares that "land and uses developed on the land shall be managed and controlled so as to maximize the conservation of all forms of energy, based upon sound economic principles." Planning for energy conservation and opportunities to promote the installation of renewable energy systems are discussed in this Goal element of the Tillamook County Comprehensive Plan.
- **Tillamook County Comprehensive Plan Goal 14 Element: URBANIZATION**
Summary: This goal requires cities to estimate future growth and needs for land and then plan and zone enough land to meet those needs. It calls for each city to establish an "urban growth boundary" (UGB) to "identify and separate urbanizable land from rural land." It specifies seven factors that must be considered in drawing up a UGB. It also lists four criteria to be applied when undeveloped land within a UGB is to be converted to urban uses. This Goal element of the Tillamook County Comprehensive Plan focuses largely on development within unincorporated communities, public facility limitations to rural areas, and impacts of urban sprawl on resource lands.

Findings: The proposed project is limited to installation of a fiber-optic cable and beach manhole (landing site). Location of project activities is contained in the Applicant's submittal (Exhibit B). The proposed location of development is not within a roadway, does not impede location of existing energy systems in the area and does not result in urban sprawl. Permitting requirements for installation of utilities in road right-of-way is under the jurisdiction of the Tillamook County Public Works Department.

Should the Planning Commission agree, the proposed installation of the fiber-optic cable and beach manhole (landing site) do not conflict with the goals and policies of the three Tillamook County Comprehensive Plan goal elements described above.

- **Tillamook County Comprehensive Plan Goal 16 Element: ESTUARINE RESOURCES**
Summary: This goal requires local governments to classify Oregon's 22 major estuaries in four categories: natural, conservation, shallow-draft development, and deep-draft development. It then describes types of land uses and activities that are permissible in those "management units." Five estuaries are inventoried and described in this element of the Tillamook County Comprehensive Plan, the Nehalem Estuary, Tillamook Estuary, Netarts Estuary, Sandlake Estuary and Nestucca Estuary.

Findings: The subject property does not abut an estuary and is not located within any boundary of the five estuarine resources identified above. Due to the location of the subject property and location of improvements, the proposed project is not in conflict with the goals and policies of the Goal 16: Estuarine

Resources element of the Tillamook County Comprehensive Plan, provided the Planning Commission concurs.

- **Tillamook County Comprehensive Plan Goal 17 Element: COASTAL SHORELANDS**

Summary: The goal defines a planning area bounded by the ocean beaches on the west and the coast highway (State Route 101) on the east. It specifies how certain types of land and resources there are to be managed: major marshes, for example, are to be protected. Sites best suited for unique coastal land uses (port facilities, for example) are reserved for "water-dependent" or "water related" uses. Coastal Shorelands inventoried in Tillamook County as described in this element are Nehalem Estuary Shorelands, Tillamook Estuary Shorelands, Netarts Estuary Shorelands, Sandlake Estuary Shorelands, and Nestucca Estuary Shorelands.

Findings: The Shoreland Overlay Zone, TCLUO Section 3.545, contains the regulatory language that administers and upholds the policies of the Goal 17 Shoreland element of the Tillamook County Comprehensive Plan. Staff has reviewed the significant shoreland inventory contained in the Goal 17 element of the Comprehensive Plan as well as all other applicable provisions of Goal Elements 5 and 17 confirming the proposed development is not located within an identified area inventoried in the as an aesthetic resource area or an area identified as a significant shoreland.

TCLUO Section 3.545(6) STANDARDS: Uses within the SHORELAND OVERLAY ZONE are subject to the provisions and standards of the underlying zone and of this section. Where the standards of the SHORELANDS OVERLAY ZONE and the underlying zone conflict, the more restrictive provisions shall apply.

(a) Riparian vegetation shall be protected and retained according to the provisions outlined in Section 4.140, REQUIREMENTS FOR PROTECTION OF WATER QUALITY AND STREAMBANK STABILIZATION.

(b) Development in flood hazard areas shall meet the requirements of Section 3.510, FLOOD HAZARD OVERLAY ZONE.

(c) Development in beach and dune and other geologic hazard areas shall meet the requirements of Section 3.085, BEACH AND DUNE OVERLAY ZONE and Section 4.130, DEVELOPMENT REQUIREMENTS FOR GEOLOGIC HAZARD AREAS.

The applicant's submittal demonstrates compliance with the applicable provisions outlined above (Exhibit B).

- **Tillamook County Comprehensive Plan Goal 18 Element: BEACHES AND DUNES**

Summary: Goal 18 sets planning standards for development on various types of dunes. It prohibits residential development on beaches and active foredunes, but allows some other types of development if they meet key criteria. The goal also deals with dune grading, groundwater drawdown in dunal aquifers, and the breaching of foredunes. Several categories of dunes are described and discussed in this element of the Tillamook County Comprehensive Plan, and includes discussion about where residential, commercial and industrial uses are prohibited. Goal 18 Exception areas are also inventoried within this element which allow for residential, industrial and commercial uses in dune areas that would otherwise be prohibited.

Findings: Site investigation reports are necessary prior to approval of development in beachfront areas identified on FEMA FIRM flood hazards maps as a Velocity (VE) zone. Management practices necessary to minimize hazards of developing on foredunes include revegetation of open sand areas and protect existing vegetation; minimize dune alteration and disturbance of vegetation, employ temporary measures to protect disturbed areas and revegetate as soon as possible; locate structures

and facilities as far from the beach as possible; and elevate structures.

In accordance with TCLUO Section 3.530: Beach and Dune (BD) Overlay zone and the policies of the Goal 18 Element, a geotechnical report is included with this submittal (Exhibit B).

3. *The parcel is suitable for the proposed use considering its size, shape, location, topography, existence of improvements and natural features.*

Findings: Applicant states that the proposed installation of the fiber-optic cable and landing site (beach manhole) meets all requirements of the RM zone, the proposed area of construction minimizes impacts to trees and vegetation on the property, and the beach manhole location is sited in a previously disturbed area with scattered pastural grasses (Exhibit B). Applicant adds that post construction the site will be restored in grade and vegetated ground cover consisted with surrounding lands, and project infrastructure will be entirely contained below grade (Exhibit B).

The subject property encompasses approximately 28.34 acres, is irregular in shape and improved with the Wi-Ne-Ma Christian Camp facilities. The subject property is bisected by Winema Road, a County road, and is bordered by residential properties to the north and southeast. Camp facilities are north and south of the proposed project location, and residential properties are at least 500-feet from the project site (Exhibit B).

The subject property is bordered by the Pacific Ocean to the west, extension of the camp to the south and Farm (F-1) zoned property to the east. Review of the National Wetland Inventory Mapper indicates natural features such as wetlands are not present on the subject property. The most westerly portion of the subject property is located within the VE (Coastal High Hazard Area) Flood Zone as depicted on FEMA Flood Insurance Rate Map Panel #41057C0865F, dated September 28, 2018 (Exhibit A).

The subject property is also located within the Shoreland Overlay (SH) zone as it is subject to ocean flooding and is within 100-feet of the ocean shore, however these shorelands are not identified as estuarine or significant coastal shorelands within the Goal 17 Element of the Tillamook County Comprehensive Plan.

The subject property is one of many properties in this area located within the Beach and Dune Overlay (BD) zone and is located due east of the beach on a section of a dune/beach complex that is vegetated with dune grass, shrubs and trees typically identified in coastal dune areas (Exhibit A).

A geotechnical investigation report dated August 10, 2022, was completed by Kleinfelder as is included as "Appendix 3" of the Applicant's submittal (Exhibit B). The purpose of the study was to evaluate subsurface conditions near the proposed trenchless installation alignments to characterize the subsurface materials likely to be encountered during HDD drilling (Exhibit B). The report assesses the potential for horizontal direct drilling (HDD) to cause hydraulic fracturing and potential contamination to the soil and groundwater (Exhibit B). It is the firm's professional opinion that the proposed cable landing installation should be feasible, provided the geotechnical recommendations presented in the report are incorporated into project design and construction (Exhibit B).

The report also includes recommendations for construction and monitoring of the project site (Exhibit B).

4. *The proposed use will not alter the character of the surrounding area in a manner which substantially limits, impairs or prevents the use of surrounding properties for the permitted uses listed in the underlying zone.*

Findings: Applicant states the project has been sited away from residences to reduce potential construction-related impacts, with the nearest residences being located approximately 500-feet from the proposed drilling location. Applicant adds that any noise associated with the project will be dampened for beach uses by the vegetation and dunes located between the horizontal direction drilling equipment and the beach. Applicant acknowledges the HDD equipment does generate noise during operation, however research and planning efforts ensure the local community experiences minimal impact (if any) during construction activities. Upon completion of the beach manhole and fiber-optic cable conduit installation, Applicant intends to restore the site to its pre-construction elevations and vegetation (Exhibit B).

During construction crews will be mindful of noise, sightlines, property line boundaries and any applicable vegetative buffers. Upon project completion, Applicant states the site will be restored to pre-construction conditions. Applicant concludes that overall, the project will not alter, limit, impair or prevent the use of surrounding properties for their permitted uses (Exhibit B).

Based upon the applicant's submittal, all uses will remain on the subject property (Exhibit B). Should the Planning Commission choose to approve this Conditional Use request, staff recommends an on-going Condition of Approval be made to require landscaping and existing natural vegetation be maintained in all areas. This proposed condition ensure compliance with the standards of the Beach and Dune Overlay (BD) zone and also ensures that the appearance of the subject property is not changed in a manner that substantially alters the character of the area.

5. *The proposed use will not have a detrimental effect on existing solar energy systems, wind energy conversion systems or windmills.*

Findings: Applicant states no solar energy or wind energy conversion systems exist in proximity to the site; therefore, none will be affected by the proposed use (Exhibit B).

Staff did not observe these facilities when visiting the site in October 2022.

6. *The proposed use is timely, considering the adequacy of public facilities and services existing or planned for the area affected by the use.*

Findings: Applicant states the proposed installation of the fiber-optic cable and landing site is in response to the large demand for high-speed internet services worldwide, creating the largest capacity high-speed transmission across the Pacific Ocean. Applicant adds this project supports and accelerates the connectivity needs of the two regions by providing seamless direct connectivity. Applicant adds that the proposed use does not impinge on existing internet services in the area (Exhibit B).

As stated by the applicant, post construction the site will be restored in grade and vegetated consisted with surrounding properties, and that the proposed use does not require expansion of public services.

Should the Planning Commission choose to approve this request, it is recommended that a Condition of Approval be made requiring documentation of a legal water source confirming water availability for drilling operations be submitted to the Department prior to development activities, if water for drilling activities is needed by the local water service provider.

C. **DEVELOPMENT PERMIT REQUEST #851-22-000373-PLNG (DEVELOPMENT CRITERIA FOR DEVELOPMENT WITHIN THE FLOOD HAZARD OVERLAY ZONE)**

A. TCLUO Section 3.510: Flood Hazard Overlay (FH) Zone

PURPOSE: It is the purpose of the FH zone to promote the public health, safety and general welfare and to minimize public and private losses or damages due to flood conditions in specific areas of unincorporated Tillamook County by provisions designed to:

- (a) Protect human life and health;*
- (b) Minimize expenditure of public money for costly flood control projects;*
- (c) Minimize the need for rescue and relief efforts associated with flooding and generally undertaken at the expense of the public;*
- (d) Minimize prolonged business interruptions;*
- (e) Minimize damage to public facilities and utilities such as water and gas mains, electric, telephone and sewer lines, streets and bridges located in areas of special flood hazards;*
- (f) Help maintain a stable tax base by providing for the sound use and development of areas of special flood hazard so as to minimize future flood blight areas;*
- (g) Ensure that potential buyers are notified that property is in an area of special flood hazard; and*
- (h) Ensure that those who occupy the areas of special flood hazard assume responsibility for their actions.*
- (i) Maintain the functions and values associated with Special Flood Hazard Areas which reduce the risk of flooding.*

Findings: Staff finds that Development Permit review for compliance with the relevant development standards and criteria outlined in the Flood Hazard Overlay (FH) zone is required for the construction of a beachfront protective structure within a Coastal High Hazard Area.

B. TCLUO Section 3.510(5): General Standards

ANCHORING

- (b) All new construction and substantial improvements shall be anchored to prevent flotation, collapse or lateral movement of the structure.*
- (c) All manufactured dwellings must likewise be anchored to prevent flotation, collapse or lateral movement, and shall be installed using methods and practices that minimize flood damage. Anchoring methods may include, but are not limited to, use of over-the-top or frame ties to ground anchors (See FEMA's "Manufactured Home Installation in Flood Hazard Areas" guidebook for techniques). A certificate signed by a registered architect or engineer which certifies that the anchoring system is in conformance with FEMA regulations shall be submitted prior to final inspection approval.*

CONSTRUCTION MATERIALS AND METHODS

- (d) All new construction and substantial improvements shall be constructed with materials and utility equipment resistant to flood damage.*
- (e) All new construction and substantial improvements shall be constructed using methods and practices that minimize flood damage.*
- (f) Electrical, heating, ventilation, plumbing, and air-conditioning equipment and other service facilities shall be elevated to prevent water from entering or accumulating within the components during conditions of flooding. In Flood Zones A, A1-A30, AE, V, V1-V30 or VE, such facilities shall be elevated three feet above base flood elevation. In Flood Zone AO, such facilities shall be elevated above the highest grade adjacent to the building, a minimum of one foot above the depth number specified on the FIRM (at least two feet above the highest adjacent grade if no depth number is specified).*

UTILITIES

- (g) *All new and replacement water supply systems shall be designed to minimize or eliminate infiltration of flood water into the system.*
- (h) *New and replacement sanitary sewage systems shall be designed to minimize or eliminate infiltration of flood waters into the systems and discharge from the systems into flood waters.*
- (i) *On-site waste disposal systems shall be located to avoid impairment to them or contamination from them during flooding, consistent with Oregon Department of Environmental Quality (DEQ) standards.*

Findings: Applicant's submittal confirms activities for utility installation are underground (Exhibit B). Applicant states project has been designed to minimize impacts to air, water, land, public facilities, beaches, dunes, and nearby residential properties. Underground facilities have been designed to minimize possible disturbances to the beach area and nearshore environment and the HDD profile will be at least 30-feet below grade (Exhibit B). Upon completion of the HDD operations, areas surrounding the beach manhole (landing site) will be restored to pre-construction conditions (Exhibit B).

C. TCLUO Section 3.510(10): Specific Standards for Coastal High Hazard Areas

(10) SPECIFIC STANDARDS FOR COASTAL HIGH HAZARD AREAS (V, VE or VI-V30 ZONES): Located within areas of special flood hazard established in Section 3.510(2) are Coastal High Hazard Areas. These areas have special flood hazards associated with high velocity waters from tidal surges and, therefore, in addition to meeting all provisions in this Section the following provisions shall apply to residential, non-residential, manufactured dwellings and other development in Coastal High Hazard Areas:

- (a) *All new construction and substantial improvements in Zones VI-V30, VE and V shall be elevated on pilings and columns so that:*
 - (1) *The bottom of the lowest horizontal structural member of the lowest floor (excluding the pilings or columns) is elevated to or above one foot above the base flood level; and*
 - (2) *The pile or column foundation and structure attached thereto is anchored to resist flotation, collapse and lateral movement due to the effects of wind and water loads acting simultaneously on all building components. Wind and water loading values shall each have a one percent chance of being equaled or exceeded in any given year (100-year mean recurrence interval).*
- (b) *A registered professional engineer or architect shall develop or review the structural design, specifications and plans for the construction and shall certify that the design and methods of construction to be used are in accordance with accepted standards of practice for meeting the provisions of (a)(1) and (a)(2) above. A certificate shall be submitted, signed by the registered professional engineer or architect that the requirements of this Section will be met.*
- (c) *Obtain the elevation (in relation to mean sea level) of the bottom of the lowest structural member of the lowest floor (excluding pilings and columns) of all new and substantially improved structures in Zones VI-30, VE, and V and whether or not such structures contain a basement. The Community Development Director shall maintain a record of all such information.*
- (d) *All new construction shall be located landward of the reach of mean high tide.*
- (e) *Provide that all new construction and substantial improvements have the space below the lowest floor either free of obstruction or constructed with non-supporting breakaway walls, open wood lattice-work, or insect screening intended to collapse under wind and water loads without causing collapse, displacement, or other structural damage to the elevated portion of the building or supporting foundation system. For the purpose of this Section a breakaway wall shall have a design safe loading resistance of not less than 10 and no more than 20 pounds per square foot. Use of breakaway walls which exceed a design safe loading resistance of 20 pounds per square foot (either by design or when so required by local or state codes) may be permitted only if a*

registered professional engineer or architect certifies that the designs proposed meet the following conditions:

- (1) Breakaway wall collapse shall result from a water load less than that which would occur during the base flood; and
 - (2) The elevated portion of the building and supporting foundation system shall not be subject to collapse, displacement, or other structural damage due to the effects of wind and water loads acting simultaneously on all building components (structural and nonstructural). Maximum wind and water loading values to be used in this determination shall each have a one percent chance of being equaled or exceeded in any given year (100-year mean recurrence interval).
- (f) If breakaway walls are utilized, such enclosed space shall be usable solely for parking of vehicles, building access, or storage. Such space shall not be used for human habitation.
- (g) Prohibit the use of fill for structural support of buildings.
- (h) Prohibit man-made alteration of sand dunes, including vegetation removal, which would increase potential flood damage.

Findings: The specific standards for development in Coastal High Hazard Areas are largely focused to above ground structures and development activities.

(13) DEVELOPMENT PERMIT PROCEDURES: A development permit shall be obtained before construction or development begins within any area of special flood hazard zone. The permit shall be for all structures including manufactured dwellings, and for all development including fill and other development activities, as set forth in the Definitions contained in this Section of the Land Use Ordinance.

(a) Application for a development permit shall be made on forms furnished by the Community Development Director and shall include but not necessarily be limited to: plans in duplicate drawn to scale showing the nature, location, dimensions, and elevations of the area in question, existing or proposed structures, fill, storage of materials, drainage facilities, and the location of the foregoing. Specifically, the following information in 3.510(13)(a)(1)–(4) is required and Development Permits required under this Section are subject to the Review Criteria put forth in Section 3.510(13)(b):

- (1) Elevation in relation to a specific datum of the lowest floor, including basement, of all structures as documented on an Elevation Certificate;*
- (2) Elevation in relation to a specific datum to which any proposed structure will be floodproofed as documented on an Elevation Certificate;*
- (3) If applicable, certification by a registered professional engineer or architect that the floodproofing methods for any nonresidential structure meet the floodproofing criteria in Subsection (6)(c)(3) of this Section; and*
- (4) Description of the extent to which any watercourse will be altered or relocated as a result of proposed development.*

Findings: The proposal is not for a residential structure (Exhibit B).

(b) Development Permit Review Criteria

- (1) The fill is not within a floodway, Coastal High Hazard Area, wetland, riparian area or other sensitive area regulated by the Tillamook County Land Use Ordinance.*
- (2) The fill is necessary for an approved use on the property.*
- (3) The fill is the minimum amount necessary to achieve the approved use.*
- (4) No feasible alternative upland locations exist on the property.*
- (5) The fill does not impede or alter drainage or the flow of floodwaters.*

Findings: Staff finds as follows:

- The subject area is not within a floodway (Exhibits A & B).
 - No fill is involved in the construction and excess fill will be removed offsite (Exhibit B).
 - Given the nature of the proposed project, no feasible upland locations exist (Exhibit B).
 - The proposed project is not a critical facility (Exhibit B).
 - The proposed project is not a new or modified Flood Refuge Platform (Exhibit B).

V. RECOMMENDED CONDITIONS OF APPROVAL:

Should the Planning Commission choose to approve this request, the following Conditions of Approval are proposed for your consideration.

Sections 6.070: COMPLIANCE WITH CONDITIONS, and 6.080: TIME LIMIT requires compliance with approved plans and conditions of this decision, and all other ordinance provisions.

If approved, failure by the applicant to comply with the Conditions of Approval and ordinance provisions could result in nullification of approval.

1. The applicant/property owner shall obtain all Federal, State, and Local permits, as applicable, including but not limited to required utility permits from the Tillamook County Public Works Department.
2. Artificial lighting shall not create or reflect substantial glare onto any adjacent residential properties including artificial lighting along the access roads.
3. The property owner shall not develop within the Special Flood Hazard Area without prior land use approvals.
4. As an ongoing condition of operation, all areas not used for cable improvements shall be permanently landscaped or maintain existing natural vegetation. The landscaping shall be maintained in good condition by the property owner or their designee and shall be in accordance with the landscape plan required herein.
5. This approval is for the installation of one (1) fiber-optic cable and beach manhole (landing site) on the subject property. Development of additional fiber-optic cable is subject to a Type III Conditional Use process in accordance with Article 6 of the TCLUO.
6. Prior to the start of construction, a monitoring, maintenance and damage response plan shall be submitted to the Department of Community Development. This plan shall be available for community inspection at least 7 days prior to the start of construction.
7. Construction activities will take place only during daylight hours of 8:00am to 5:00pm Monday through Friday, except holidays, during the construction period, except as necessary to perform periodic maintenance of the boring hole.
8. During construction, the Applicant shall post at the property's entrance a 24-hour contact phone number for the on-site project manager and to Applicant, to enable the Applicant to quickly respond to and resolve and construction-related issues.

9. Development of the property shall adhere to the relevant development standards of the Flood Hazard Overlay (FH) Zone, TCLUO Section 3.510.
10. This approval shall be void two years from the date of this decision, unless construction of approved plans has begun, or an extension is requested from, and approved by the Planning Director.

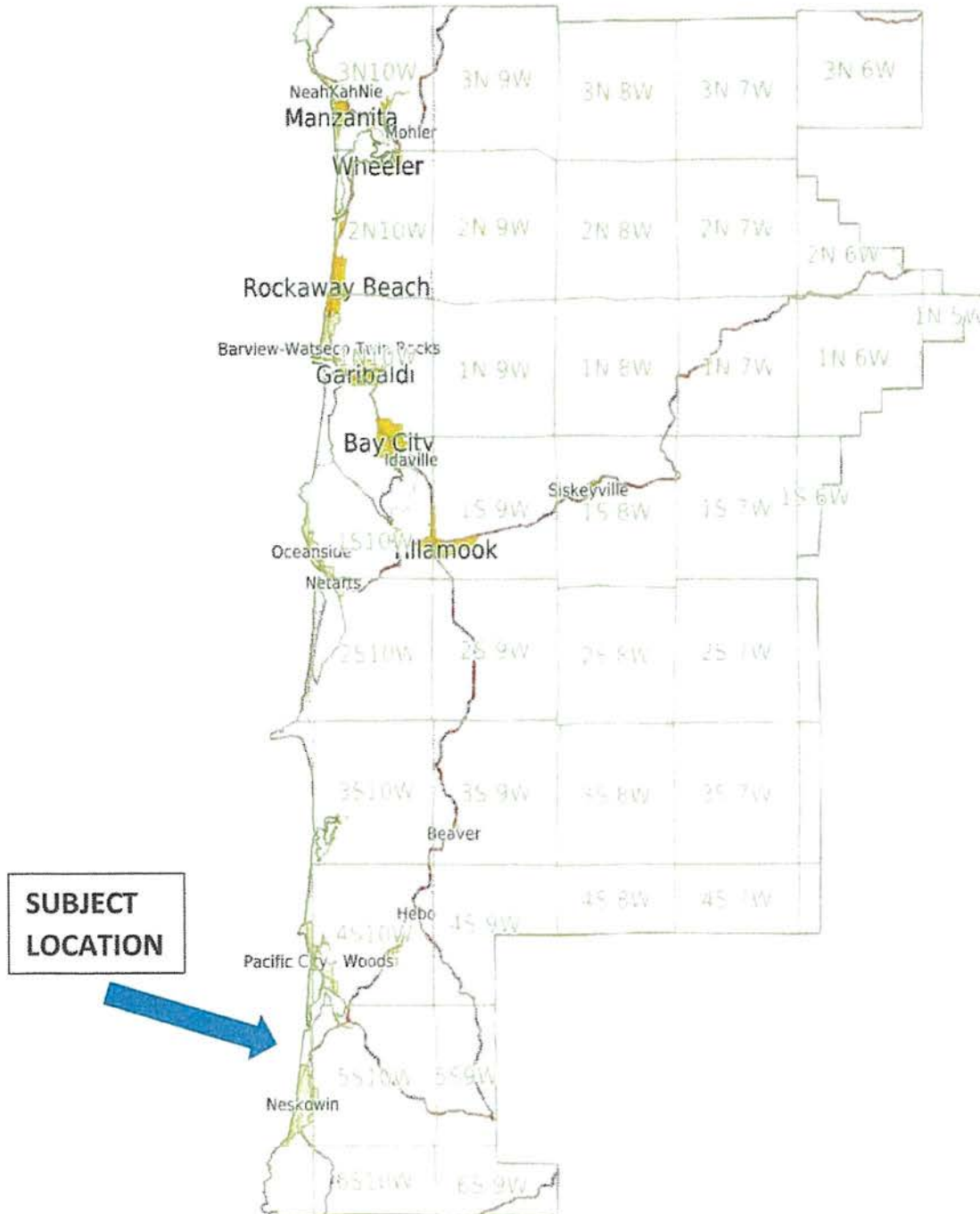
VI. EXHIBITS

All Exhibits referred to herein are, by this reference, made a part hereof:

- A. Location map, Assessor map, Zoning map, FEMA FIRM, NWI Wetlands map
- B. Applicants/Property Owner's submittal
- C. Public Comments
- D. TCLUO Section 5.040: Recreation Management (RM) Zone

EXHIBIT A

VICINITY MAP

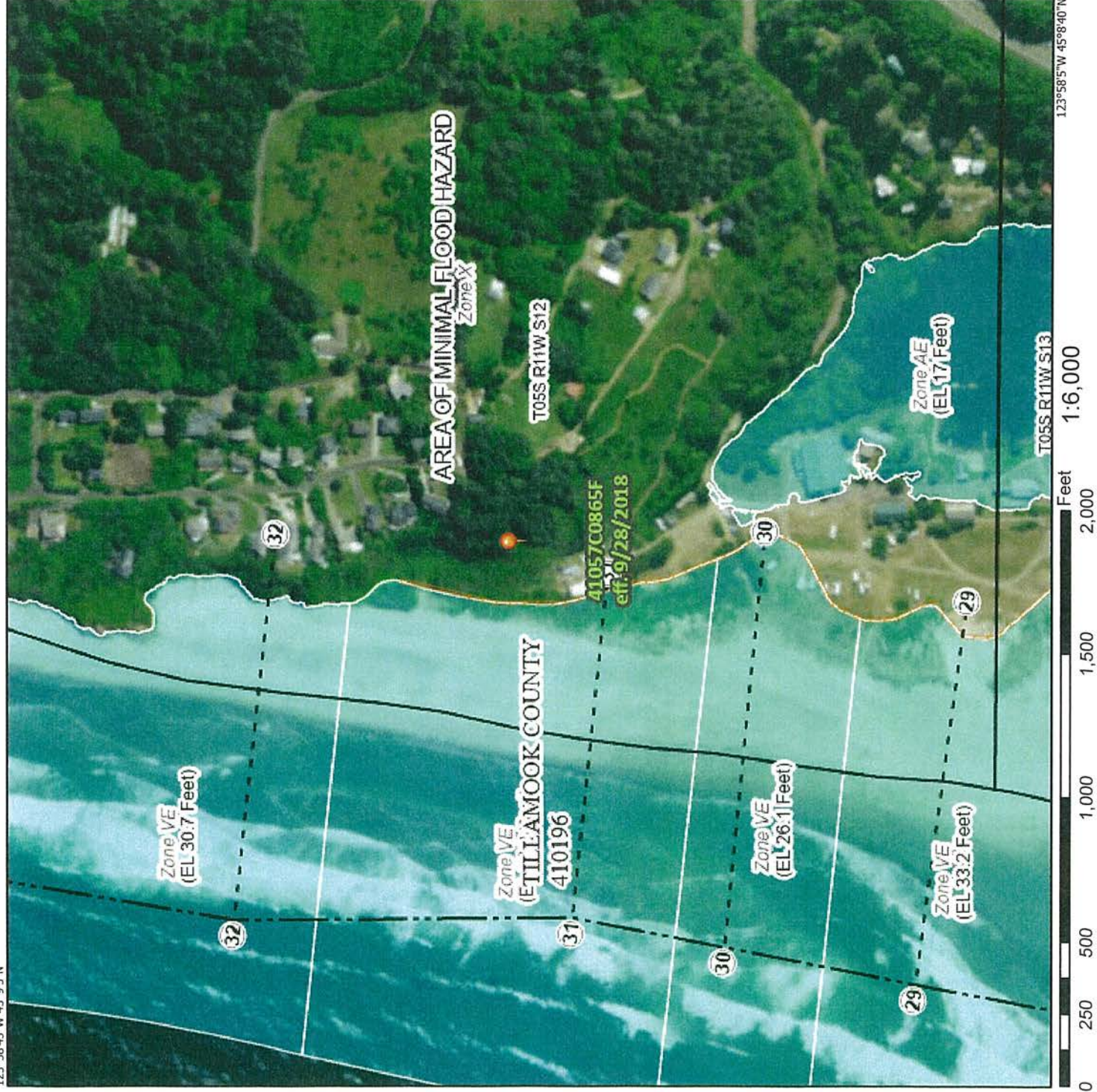


#851-22-000388-PLNG & #851-22-000373-PLNG:
AMCD LLA/Astound/Wi-Ne-Ma Christian Camp

National Flood Hazard Layer FIRMette



123°58'43"W 45°9'5"N



Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

- SPECIAL FLOOD HAZARD AREAS**
 - Without Base Flood Elevation (BFE) *Zone A, V, A99*
 - With BFE or Depth *Zone AE, AO, AH, VE, AR*
 - Regulatory Floodway
- OTHER AREAS OF FLOOD HAZARD**
 - 0.2% Annual Chance Flood Hazard, Area of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
 - Future Conditions 1% Annual Chance Flood Hazard *Zone X*
 - Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
 - Area with Flood Risk due to Levee *Zone L*
- OTHER AREAS**
 - NO SCREEN *Zone X*
 - Area of Minimal Flood Hazard *Zone X*
 - Effective LOMRS
 - Area of Undetermined Flood Hazard *Zone X*
- GENERAL STRUCTURES**
 - Channel, Culvert, or Storm Sewer
 - Levee, Dike, or Floodwall
- OTHER FEATURES**
 - Cross Sections with 1% Annual Chance Water Surface Elevation
 - Coastal Transect
 - Base Flood Elevation Line (BFE)
 - Limit of Study
 - Jurisdiction Boundary
 - Coastal Transect Baseline
 - Profile Baseline
 - Hydrographic Feature
- MAP PANELS**
 - Digital Data Available
 - No Digital Data Available
 - Unmapped



The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 11/30/2022 at 2:45 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

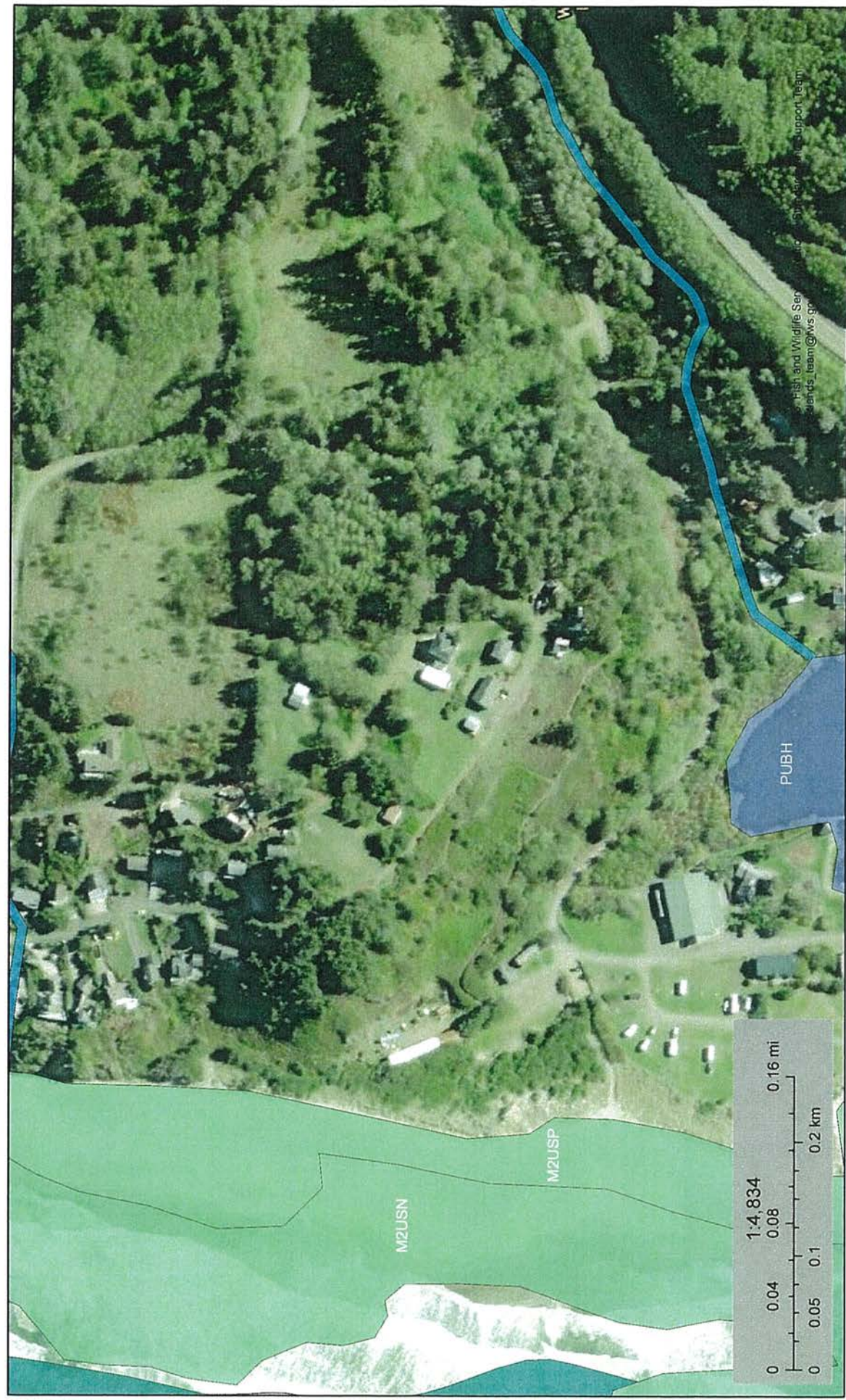
This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.



U.S. Fish and Wildlife Service

National Wetlands Inventory

851-22-000388-PLNG: AMCS LLC

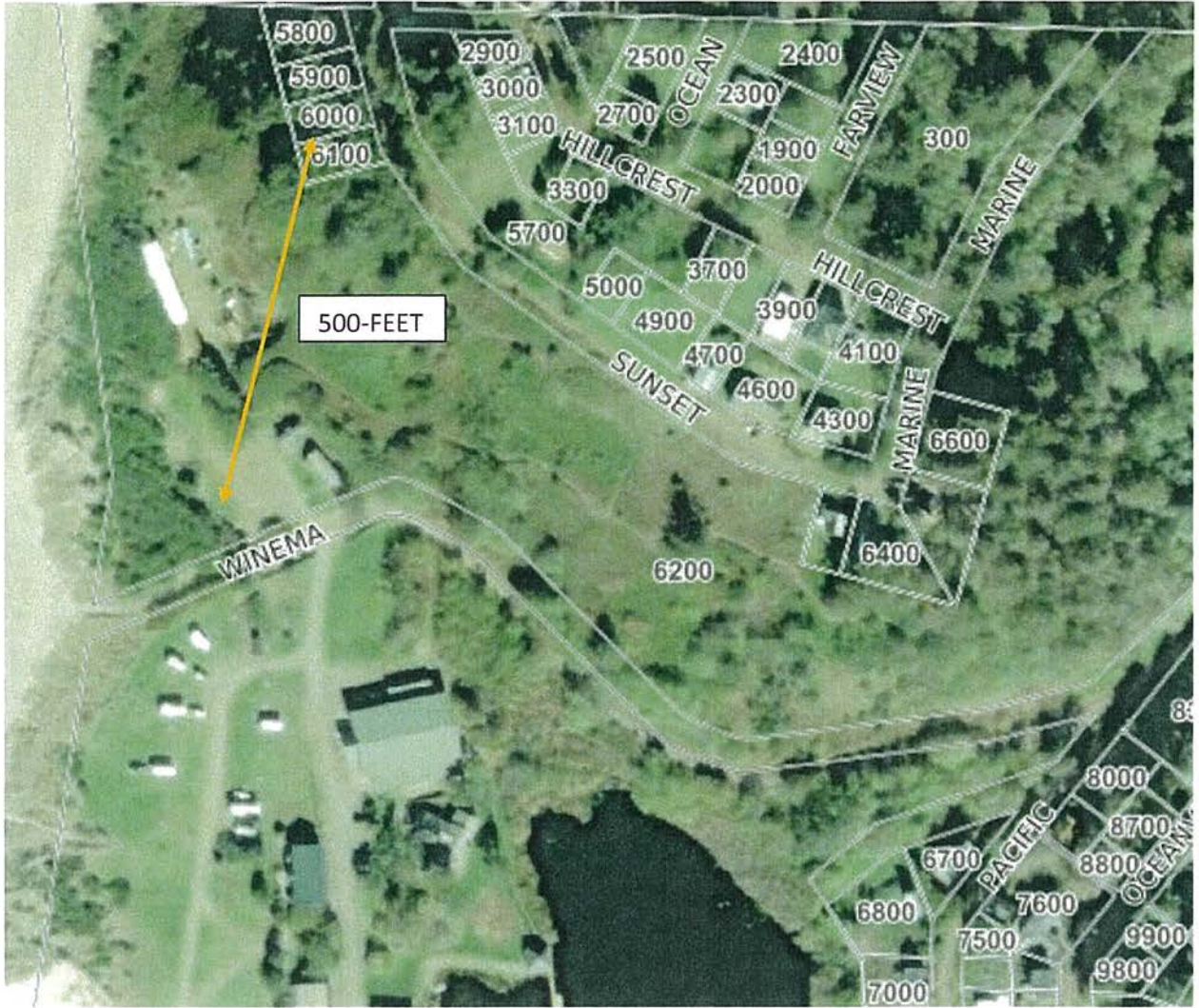


November 30, 2022

Wetlands

-  Estuarine and Marine Deepwater
-  Estuarine and Marine Wetland
-  Freshwater Emergent Wetland
-  Freshwater Forested/Shrub Wetland
-  Freshwater Pond
-  Lake
-  Other
-  Riverine

This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.



**#851-22-000388-PLNG:
AMCS LLC**

EXHIBIT B



Tillamook County Department of Community Development
1510-B Third Street, Tillamook, OR 97141 | Tel: 503-842-3408 Fax: 503-842-1819
www.co.tillamook.or.us

PLANNING APPLICATION

OFFICE USE ONLY	
Date Stamp	
<input type="checkbox"/> Approved <input type="checkbox"/> Denied	
Received by:	
Receipt #:	
Fees: 1300.00	
Permit No: 851-22-000388 >LNG	

Applicant (Check Box if Same as Property Owner)

Name: AMCS LLC Phone: (206) 577-6684
Address: 410 Terry Avenue North
City: Seattle State: WA Zip: 98109
Email: subsea-interest@amazon.com; infrastructure-contract-notices@amazon.com

Property Owner

Name: Astound Phone: (541) 760-9822
Address: 151 E. Olive Street
City: Newport State: OR Zip: 97365
Email: matthew.updenkelder@astound.com

Request: Request a Conditional Use approval to install a utility(submarine fiber optic cable) on a private lot (Lot 6200).
Please see attached narrative for more detail.

- | Type II | Type III | Type IV |
|--|--|---|
| <input type="checkbox"/> Farm/Forest Review | <input type="checkbox"/> Appeal of Director's Decision | <input type="checkbox"/> Appeal of Planning Commission Decision |
| <input checked="" type="checkbox"/> Conditional Use Review | <input type="checkbox"/> Extension of Time | <input type="checkbox"/> Ordinance Amendment |
| <input type="checkbox"/> Variance | <input type="checkbox"/> Detailed Hazard Report | <input type="checkbox"/> Large-Scale Zoning Map Amendment |
| <input type="checkbox"/> Exception to Resource or Riparian Setback | <input type="checkbox"/> Conditional Use (As deemed by Director) | <input type="checkbox"/> Plan and/or Code Text Amendment |
| <input type="checkbox"/> Nonconforming Review (Major or Minor) | <input type="checkbox"/> Ordinance Amendment | |
| <input type="checkbox"/> Development Permit Review for Estuary Development | <input type="checkbox"/> Map Amendment | |
| <input type="checkbox"/> Non-farm dwelling in Farm Zone | <input type="checkbox"/> Goal Exception | |
| <input type="checkbox"/> Fore-dune Grading Permit Review | | |
| <input type="checkbox"/> Neskowin Coastal Hazards Area | | |

Location:

Site Address: 5195 Wi Ne Ma Rd, Cloverdale, OR 97112

Map Number:	05S	11W	12	6200
	Township	Range	Section	Tax Lot(s)

Clerk's Instrument #: _____

Authorization

This permit application does not assure permit approval. The applicant and/or property owner shall be responsible for obtaining any other necessary federal, state, and local permits. The applicant verifies that the information submitted is complete, accurate, and consistent with other information submitted with this application.

DocuSigned by: Matt Updenkelder 9/22/2022 Date

Property Owner Signature (Required) David Selby September 21, 2022 | 9: Date

Applicant Signature _____



Permit Narrative

Conditional Use Permit Application

Bifrost Submarine Cable Beach Manhole Installation – Tillamook County, Oregon

Project Description:

AMCS LLC (AMCS), an affiliate of Amazon Web Services (AWS), proposes to install the Bifrost Submarine Cable System (or “Bifrost”), an ultra-high speed fiber optic cable telecommunication cable system providing large capacity direct link between the continental U.S. (Oregon and California) and Asia (Singapore), crossing the Pacific Ocean via Guam. The proposed installation and operation of this utility line has been designed to minimize impacts to air, water, land, public facilities, beaches, dunes, and nearby residential properties. The cable would be trenched in the seafloor where possible, landing via a horizontal directional drill (HDD) bore at 5611 Wi Ne Ma Road in Cloverdale, Oregon (**Figure 1**). Upon landing, the cable would be fed into a newly installed upland beach manhole (BMH), and then from the BMH into a local telecommunications conduit system via a short (235-foot [71.6-meter [m]]) terrestrial conduit link (**Appendix 1**).

The single HDD bore would start at the newly installed BMH located on a private lot (Lot 6200; **Figure 2**) and extend to 4,100 feet (1,250 m) offshore. This bore would result in the placement of a 7-inch (18-centimeter [cm]) submarine bore pipe for the Bifrost cable to feed through.

This HDD effort would provide the terrestrial-to-marine interface to minimize possible disturbances to the beach area and nearshore environment. The HDD profiles would be at least 30 feet (9 m) below grade, in accordance with Oregon State requirements, while also providing maximum protection to the cable in the surf zone (**Appendix 2**). It would take approximately 4-5 weeks to complete the BMH installation and HDD activities, however, deviations from standard operating pace, such as equipment breakdowns or delays in shipments, could add to this timeline. Upon completion of the HDD operations, areas surrounding the BMH would be restored to pre-construction conditions.

The project has been sited away from residences to reduce potential construction-related impacts, with the nearest residences being located approximately 500 feet (152 m) from the proposed drilling location (see **Photolog**). Furthermore, any noise associated with the project would be dampened for beach users by the vegetation and dunes located between the HDD equipment and the beach. While HDD does generate noise during operation, AMCS’ comprehensive research and planning would ensure the local community experiences minimal impact (if any) during construction activities.

The HDD set up area on Lot 6200 would encompass 0.5 acres of vacant private property dominated by pastoral grasses with scrub/shrub along the dunes. Site preparations would include grading to install a new, underground BMH. All proposed construction activities would be at or below grade:

1. For the BMH, approximately 12 feet (length) x 6 feet (width) x 7 feet (depth) (3.7m x 1.8m x 2.1m) would be excavated, removing 20.1 cubic yards (yd³; 15.3 cubic meters [m³]) of fill. Any excess excavated material would be disposed of offsite.
2. The temporary excavation for the HDD bore pit would measure approximately 6-feet (length) x 6-feet (width) x 3-feet (depth) (1.8 m x 1.8 m x 0.9 m) requiring the removal of approximately 4 yd³ (3 m³) of material. The bore pit would be backfilled with the excavated material upon installation of the BMH.



3. Upon completion of the BMH and conduit installation, the intent is to restore the site to its pre-construction elevations and vegetation.



TILLAMOOK COUNTY LAND USE ORDINANCE ARTICLE VI: CONDITIONAL USE REVIEW PROCEDURES AND CRITERIA:

SECTION 6.040: REVIEW CRITERIA

Any CONDITIONAL USE authorized according to this Article shall be subject to the following criteria, where applicable:

1. **The use is listed as a CONDITIONAL USE in the underlying zone, or in an applicable overlying zone.**

Response:

Lot 6200 is located seaward of Highway 101 in Cloverdale, Oregon. The parcel is zoned as Recreation Management Zone (RM). As per TCLUO 3.040 (2), the development request contains the following use that is PERMITTED OUTRIGHT:

- TCLUO Section 3.040(2)(d): Utility lines, excluding power transmission lines.

2. **The use is consistent with the applicable goals and policies of the Comprehensive Plan.**

Response:

The proposed use of the site within the boundaries and applicable setbacks of the existing tax lot is consistent with the applicable *Goals and Policies of the Tillamook County Comprehensive Plan*. The most applicable Goals are:

- Goal 6: Air, Water, Land
- Goal 11: Public Facilities
- Goal 18: Beaches and Dunes

Goal 6: Air, Water, Land

The installation of the BMH and conduit from the BMH to Wi Ne Ma Road would use standard excavating equipment (e.g., excavator), an HDD drill rig, and small diesel generators, that meet both State and Federal air quality standards. As a result, the project would meet all applicable air quality standards.

The applicant has completed a thorough geophysical and geotechnical site investigation, consisting of a combination of marine and terrestrial based surveys (Lot 6200) to improve understanding of the geology within the drill profile. As part of this study, the potential impact to groundwater from the HDD activities was assessed. The report notes that there are no surface waters onsite, and excluding the Pacific Ocean, there are no surface waters immediately adjacent the project area. The findings of this geotechnical investigation are included as **Appendix 3**.

Note, also, that the methodology proposed for this HDD effort is consistent with the methodology outlined in the Oregon Department of Environmental Quality's (DEQ) *Groundwater Monitoring Well Drilling, Construction, and Decommissioning* (OAR 690-240-0035).

Based on the geotechnical study, the potential for the HDD to cause any impacts to the water, land on Lot 6200, or in the adjacent area is low. The geotechnical study specifically concludes that:

- *Inadvertent Return: The proposed plan of a 10-degree pipe installation angle within the site soil conditions would make an inadvertent return highly unlikely. The contractor would*



continually monitor fluid pressures during drilling operations and adjust operations in the event of fluid fluctuations.

- *Ground-Borne Vibration: The risk of vibratory damage to adjacent buildings and infrastructure located 500 feet or more from the HDD drill rig should be considered negligible. We will maintain movable equipment and stationary equipment that generate vibration at least 25 feet from any structure to maintain vibration levels well below the threshold values.*
- *Bentonite Mud: Bentonite is generally considered inert and approved by DEQ and the Oregon Water Resource Department for use in different drilling applications, including as a permanent plug to seal boreholes. An additive mixture will be needed to stabilize the mud in the saltwater conditions.*
- *Bentonite Mud Dispersion: Drilling mud is intended to remain within a narrow annulus of the HDD borehole and will not migrate any significant distance within the surrounding soil media, above or below groundwater.*
- *Surface Soil Stability: The site is not part of the active dune and beach shoreline, and the property is well vegetated with grasses, shrubs, and trees, which significantly reduces the susceptibility to wide-spread erosion across the property (see **Photolog**). Construction, laydown and access areas requiring clearing of vegetation will be planned; the amounts and exposures will be limited to the practical extent possible and protected.*

HDD would be utilized because it is widely considered the most environmentally friendly and preferred method of construction; it has been used for decades with high levels of success. Ground disturbance is confined to the drill entry site and the exit site, avoiding impacts to vegetation or sensitive habitats along the bore path. The bentonite mud used during HDD operations would consist of non-toxic materials, predominantly water (92-94% of the mixture, which would adhere to safe drinking standards) and bentonite (6-7%), a naturally occurring, nontoxic clay that is commonly used in farming practices. Biodegradable additives (1% or less) would be used in the bentonite mud. Safety data sheets (SDS) can be provided upon request. During typical operations, this bentonite mud would be fully contained; it would only be released in the event of an unpreventable inadvertent return.

In the event of an unavoidable inadvertent return of bentonite mud, it would be addressed as outlined in the Inadvertent Return Contingency Plan (**Appendix 4**). Upon completion of installation operations, all materials and equipment would be retrieved, and the site area would be cleaned, cleared, and returned to previous conditions.

In the unlikely event of a drill break or another scenario that requires project equipment to be abandoned under the seafloor, potential impacts to the surrounding environment have been considered (**Appendix 5**). The applicant has concluded that no adverse environmental, scenic, recreational, or economic impacts would result from a drill break or the presence of any other remaining materials below the seafloor, nor is there a reasonably conceived scenario (e.g., earthquake, tsunami, long-term coastal erosion) that would expose the materials to the surrounding environment and result in future impacts. For this reason, the recommended environmentally preferred alternative is to leave the materials in place.

The steel bore pipe is designed to remain in the environment and protect the submarine cable and therefore has long-term durability. According to the safety data sheets (SDS) for a steel bore pipe, the solid alloy is not expected to migrate into sediments. Additionally, an internal plastic coating would further prevent corrosion. Eventually, the steel would begin to react with oxygen and corrode in place. However, corrosion would occur at a very slow rate given the



low levels of oxygen and seawater at such depths. Furthermore, the pipe would be encased in hardened bentonite mud, creating a shell around the metal and preventing migration to the seafloor or seawater. To the same degree that a utilized bore pipe with cable would not affect the surrounding environment, an abandoned bore pipe would have no effect.

The drill head and associated components are all solid metal pieces and would not be expected to migrate if abandoned under the seafloor. If these components were broken down to their constituent parts, which would occur over an indeterminate period of time, they would still be encased in the hardened mud borehole, preventing migration to the seafloor or seawater, and therefore preventing impacts to water quality and natural resources.

Overall, all project materials are built for stability and durability and would not be expected to migrate to any degree if the project were forced to abandon them under the seafloor. There would be no impacts to any species from a drill break incident due to the lack of an exposure route from the borehole to the ecological receptors. Any unexpected construction incident and abandoned materials would be promptly reported to the appropriate agencies.

Although rare, sinkhole formation may occur due to ground vibrations from heavy equipment or HDD activities. These voids are likely the result of sand collapsing into the space created by the removal of the guide casing used during the installation of the permanent bore pipe that houses the submarine telecommunication cable. Induced sinkholes are typically small, spanning only a few feet wide and deep.

If a sinkhole is detected, it would be addressed promptly (**Appendix 5**). Agencies would be notified within 24 hours of when the sinkhole is detected, and corrective action would be taken as necessary. The area would be assessed for additional voids, cavities, or sinkhole features under the beach. Prior to the start of any remedial action, the team would create a clearly defined perimeter around the work area while still allowing free flow of public traffic along the beach. A handheld compactor or a skid steer with a vibratory roller would be used to compact the beach sand immediately following high tide while the sand is saturated to directly address closure of any spaces around the bore pipe and eliminate the propagation of voids to the surface. Smaller (less than 3 feet [0.9 m] in diameter) sinkholes may be filled in by hand. Even in the event of sinkholes developing, no long-term impacts are expected and, upon completion of any corrective action, the beach is anticipated to return to pre-construction conditions. AMCS would provide updates to OPRD staff if any additional sinkholes were observed in the future.

In recognition of the low-impact approach to installation of this utility line, we expect DEQ to issue a Water Quality Certification for the Bifrost Cable System. Furthermore, due to the project's proximity to the beach, no groundwater impacts would likely result from the HDD.

The projected timeline for construction is approximately 4-5 weeks. Activities on the site would include mobilization and setup within the work area, earth excavation for the BMH, and a 1–2-week HDD boring effort. Typical mobilization and demobilization construction traffic would include 5-6 semi-truck loads of equipment and materials, including a water truck (daily), work pickup and utility vehicles (daily), fuel truck (every 2-3 days), and dump truck (every 2-3 days).

AMCS has worked closely with the Wi-Ne-Ma Christian Camp to ensure project activities are conducted at a time and in a manner that minimizes disturbance to camp activities. Construction activities would occur during Tillamook County-approved days and times and have been scheduled to avoid peak activities at the camp. Prior to construction, signs would be posted notifying users of beach activities and scheduled days. Work would be performed quickly and efficiently to minimize potential disturbances.



A traffic impact analysis would be conducted prior to construction activities, and a traffic control plan would be implemented prior to construction. The local community would be notified of the project prior to construction activities and the construction site clearly signposted. The project has been sited away from residences to reduce potential construction-related impacts. Construction-related noise would be dampened for beach users because of the vegetation and dunes located between the HDD equipment and the beach.

Goal 11: Public Facilities

The installation and operation of the proposed buried utility line would not impact any of the following Public Facilities present in or around the community:

- Sewage Treatment
- Solid Waste Disposal
- Fire Protection
- Public Schools
- Police Protection
- Storm Drainage
- Planning, Zoning, and Subdivision Control
- Community Health
- Energy Utilities
- Community Government

Goal 18: Beaches and Dunes

Regarding Goal 18 (Beaches and Dunes), the County's comprehensive plan indicates that Lot 6200 and the area adjacent to it is classified as "Recently Stabilized Foredunes" (or "FD"). The applicant's geotechnical report confirmed that the site is not part of an active dune or beach shoreline, and that the property is well vegetated with grasses, shrubs, and trees, which significantly reduce the susceptibility to erosion across the site. Construction activities would be subject to an approved temporary erosion and sedimentation control plan (TESC), subject to best management practices (BMPs). As a result, the risk of any impacts to adjacent beaches and dunes would be low and monitored through an approved construction management plan.

Upon completion of the BMH and conduit installation, the proposed use would be non-detrimental and non-invasive to the adjacent established residential uses. The proposed use does not prohibit nor preclude the future use of the parcel. Furthermore, the proposed use is consistent with the designations of the Oregon Territorial Seas Plan, Part 5.

3. **The parcel is suitable for the proposed use considering its size, shape, location, topography, existence of improvements and natural features.**

Response:

The parcel is fully suitable for the proposed use as per criteria:

- **Size, Shape Location:** The proposed use meets all the regulations of a parcel within the RM Zoning designation.
- **Topography and Natural features:** The parcel is relatively level and covered with vegetative ground, shrub, and tree cover. The proposed area of construction minimizes impacts to trees and vegetation on the lot; the BMH location is sited in a previously disturbed area with scattered pastural grasses (see **Photolog**).



Post construction the site would be restored in grade and vegetated ground cover consistent with surrounding land. Project infrastructure would be entirely contained below grade.

- **Existing Improvements:** The proposed use does not require the expansion of public services such as water, sewer, and power. Construction equipment would utilize the paved Wi Ne Ma Road for access to the site, however, upon completion, no additional demands on public infrastructure would be placed. AMCS and their subcontractors would not need to visit the site regularly.

4. **The proposed use will not alter the character of the surrounding area in a manner which substantially limits, impairs or prevents the use of surrounding properties for the permitted uses listed in the underlying zone.**

Response:

Any (temporary) impacts of the proposed use are limited to the duration of installation of the BMH and the short (approximately 235-foot [71.6-m]) terrestrial conduit link, both of which would be entirely confined within the boundaries of Lot 6200. Entry and egress to the site would be from Wi-Ne-Ma Road and would not infringe on any adjacent land uses. Typical mobilization and demobilization construction traffic would include 5-6 semi-truck loads of equipment and materials, including a water truck (daily), work pickup and utility vehicles (daily), fuel truck (every 2-3 days), and dump truck (every 2-3 days).

The local community would be notified of the project prior to construction activities and the construction site clearly signposted. The project has been sited away from residences to reduce potential construction-related impacts.

As the proposed use is entirely contained below grade, the character of the parcel would not be altered by the proposed project. During construction, crews would be mindful of noise, sightlines, property line boundaries, and any applicable vegetative buffers. Upon completion of the BMH installation, the site would be restored to pre-construction conditions. Overall, the proposed project would not alter, limit, impair, or prevent the use of surrounding properties for the permitted uses.

5. **The proposed use will not have detrimental effect on existing solar energy systems, wind energy conversion systems or windmills.**

Response:

No solar energy or wind energy conversion systems exist in proximity to the site; therefore, none would be affected by the proposed use.

6. **The proposed use is timely, considering the adequacy of public facilities and services existing or planned for the area affected by the use.**

Response:

The proposed use is in response to the large demand for high-speed internet services worldwide. Bifrost would connect AWS' U.S. West Coast region in eastern Oregon to its Asia Pacific region in Singapore, creating the largest capacity high-speed transmission across the Pacific Ocean. This would support and accelerate the connectivity needs of the two regions by providing seamless direct connectivity. The project would utilize the very latest fiber optic cable technologies to assure extremely high reliability, low latency, network diversity, and long system life.



Additionally, the project would employ a variety of local contractors during construction, bringing jobs to the community.

The proposed subsea cable would not impinge on existing internet services in the area. Onward connectivity from Wi Ne Ma Road to the Hillsboro area would be via an existing terrestrial fiber optic cable route. In the future, Astound intends to construct a new terrestrial route using a mix of new and existing conduits within established ODOT ROW, which would enable route enhancement for Bifrost between the landing and Hillsboro. There would be multiple potential customers to this new route, which would include providing and facilitating high-speed internet access to rural residents and promote economic development both within the Tillamook region, as well as many remote areas between Tillamook and Hillsboro, that are not currently connected.



Figures





Fig. No. 1

Vicinity Map

Cloverdale, Oregon
Bifrost Submarine Cable

Prepared by:



Legend

- Beach Manhole
- Proposed Submarine Route

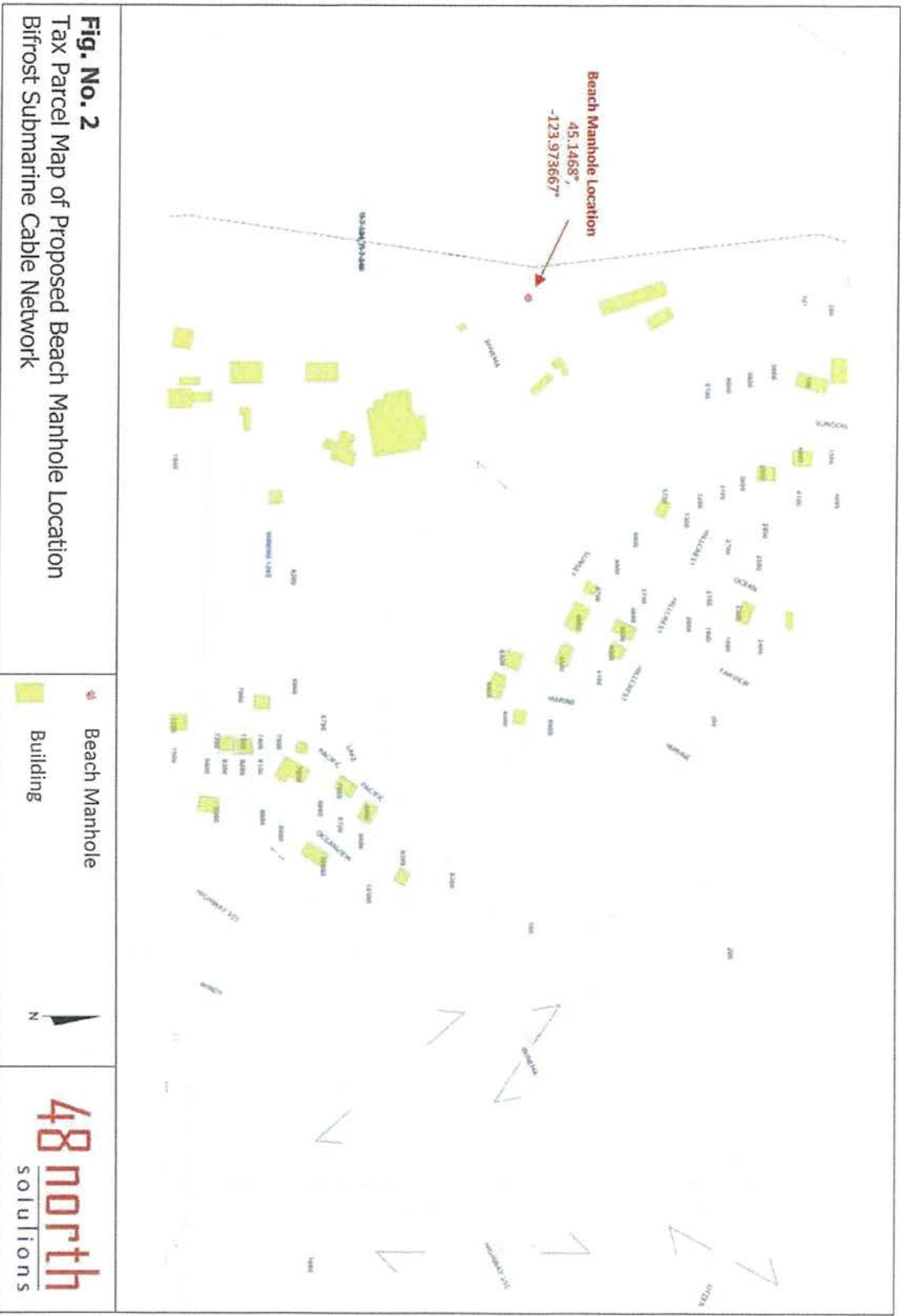


Scale: 1:160,000
 Source: ASN, 48 NORTH
 Date: 5/30/2022 11:59 AM
 Spatial Reference:
 PCS: NAD 1983 UTM Zone 10N

DISCLAIMER

The accuracy of source information cannot be verified; therefore, all linework, labeling, and markings appearing on this figure may be subject to errors or omissions in positions, classifications, and interpretations. This figure should only be used as a visual guide for general overview purposes.

H.B. Van Duzer



Photolog

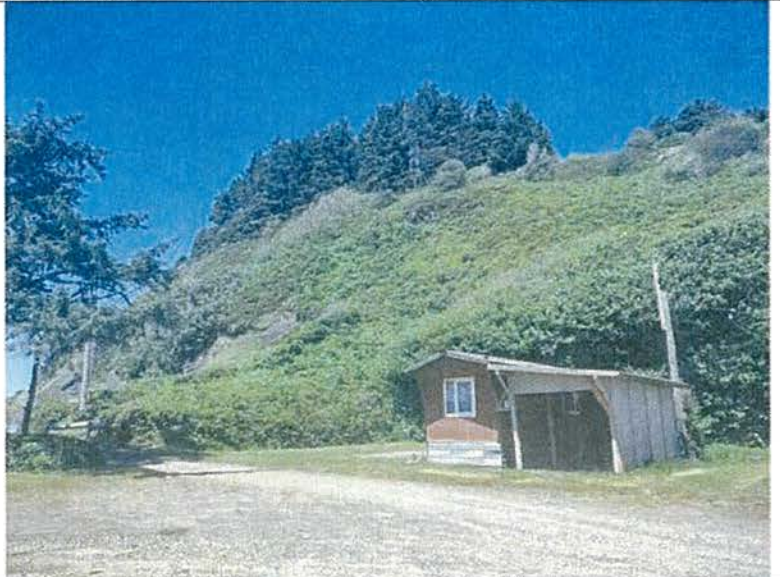



PHOTOGRAPHIC LOG: 1		
Client name: RTI Solutions	Site Location: Winema, Oregon	Project No.: 2108-RTI-01
Date: June 27, 2022		
Direction of Photo: West		
Description: General site conditions of BMH location.		

PHOTOGRAPHIC LOG: 2		
Client name: RTI Solutions	Site Location: Winema, Oregon	Project No.: 2108-RTI-01
Date: June 27, 2022		
Direction of Photo: West		
Description: Staging/OGBs site		




PHOTOGRAPHIC LOG: 3		
Client name: RTI Solutions	Site Location: Winema, Oregon	Project No.: 2108-RTI-01
Date: June 27, 2022		
Direction of Photo: Southeast		
Description: Entrance to BMH site, facing Wi Ne Ma Road.		


PHOTOGRAPHIC LOG: 4		
Client name: RTI Solutions	Site Location: Winema, Oregon	Project No.: 2108-RTI-01
Date: June 27, 2022		
Direction of Photo: Northeast		
Description: Cliffs adjacent the BMH site. (Note: building in picture is the BMH property owners)		

PHOTOGRAPHIC LOG: 5		
Client name: RTI Solutions	Site Location: Winema, Oregon	Project No.: 2108-RTI-01
Date: June 27, 2022		
Direction of Photo: Southeast		
Description: Residences to the southeast of the proposed BMH location		

PHOTOGRAPHIC LOG: 6		
Client name: RTI Solutions	Site Location: Winema, Oregon	Project No.: 2108-RTI-01
Date: June 27, 2022		
Direction of Photo: North		
Description: Beach adjacent the BMH location		



PHOTOGRAPHIC LOG: 7		
Client name: RTI Solutions	Site Location: Winema, Oregon	Project No.: 2108-RTI-01
Date: June 27, 2022		
Direction of Photo: West		
Description: Beach adjacent the BMH location		

PHOTOGRAPHIC LOG: 8		
Client name: RTI Solutions	Site Location: Winema, Oregon	Project No.: 2108-RTI-01
Date: June 27, 2022		
Direction of Photo: South		
Description: Beach adjacent the BMH location		

Appendix 1

Project Components



DESCRIPTION OF PROJECT COMPONENTS

Introduction

The proposed Bifrost Subsea Cable Project (Project) includes the installation of a submarine fiber optic cable with state waters in the Pacific Ocean, making landfall and connecting to a Cable Landing Station (CLS) in Winema, Oregon. The Project is described herein and includes both terrestrial and marine components. This project implementation will include both marine and terrestrial works as described herein.

Terrestrial Project Components

The following terrestrial Project components will be needed on land above the ordinary high-water mark:

- Cable Landing Site. The fiber optic cable coming from the ocean would land in a vacant area lot on the Wi-Ne-Ma Christian Camp (Lot 6200). Approximately 0.5-acre of space will be needed to stage the various activities necessary to complete the terrestrial portions of the work.
- Landing Pipe (LP). One landing pipe, approximately 6 to 7 inches in diameter and 4,100 feet in length, will be installed from the beach manhole (BMH) to offshore using the horizontal directional drilling (HDD) construction method. Using HDD methods allows the LP to be installed below the beach and surf zone and out into the ocean without surface disturbance along the alignment. The HDD process utilizes a large bore machine to drill a bore hole, starting at the ground surface, down to a depth of at least 30 feet, then leveling off until it needs to be guided back up to the ocean floor.
- Beach Landing Manhole. A buried BMH, also known as a landing manhole, will be installed at the landward end of the LP once it is installed. The BMH will serve as the access point to the LP and contain the splice between the marine fiber optic cable system and the terrestrial system. It will also provide access to the landing pipe for maintenance-related activities. An excavator will be used to excavate the hole into which the BMH will be placed. Once installed the BMH will be completely buried with only an access lid visible at ground level.
- Ocean Ground Bed (OGB). Since the fiber optic cable will be energized, it will need to be grounded. The OGB will be installed near the BMH on Lot 6200. The OGB system will consist of four to six ground anodes placed in a row and be connected by a ground cable to the CLS. Using an auger bit attached to an excavator, a hole approximately 12-inch in diameter, will be drilled into the ground to a depth of approximately 30 feet below surface. A grounding anode will be installed into the hole and connected back to the BMH. This would be repeated for each anode.



- **Underground Conduit System.** An underground conduit approximately 235 feet in length, will connect the BMH to a telecommunications conduit system along Winema Road. This underground conduit system will be a conduit bundle (approximately 8 to 10 inches in diameter) buried at least 3 feet deep using standard utility trenching methods.
- **Cable Landing Station.** A CLS is needed to support the submarine fiber optic cable. The CLS will be located approximately one-half miles from the BMH, near the intersection of Winema Road and Highway 101. The CLS will house power generation, telecommunications and ancillary equipment needed to operate the marine cable. From here, the telecommunications traffic will be connected into the broader telecommunications network with onward connectivity to major metropolitan areas such as Hillsboro.

Marine Project Components

The marine components include the LP and the submarine fiber optic cable.

- **Landing Pipe (LP).** The LP begins on land and ends in the ocean. It is addressed under the terrestrial section above.
- **Marine Fiber Optic Cable.** The marine fiber optic cable will be buried beneath the seafloor to a depth of approximately 3 to 5 feet while on the Continental Shelf. Beyond the shelf, the cable is laid directly on the ocean floor. The cable on the shelf will measure approximately 1- to 1.5-inches in diameter and consist of the fiber optic cores, a copper conductor, stainless steel strength members, and waterproofing. The cable will be installed using either a plow or remote operated vehicle (ROV):
 - **Cable Plowing:** Most of the cable will be installed using a plow. The plow is supported by four skids that rest on the ocean floor. As the plow is towed by the cable ship, a plow shank on the back of the plow slices a furrow into the ocean floor to a depth of approximately three to five feet. The fiber optic cable is installed immediately behind the plow shank and into the plow furrow.
 - **Remote Operated Vehicle:** For areas where the plow cannot operate, the cable is buried using an ROV. The ROV is tethered to the cable ship and is placed on the ocean floor directly over the cable. The ROV tracks along the cable under its own power and uses water jets to bury the cable.



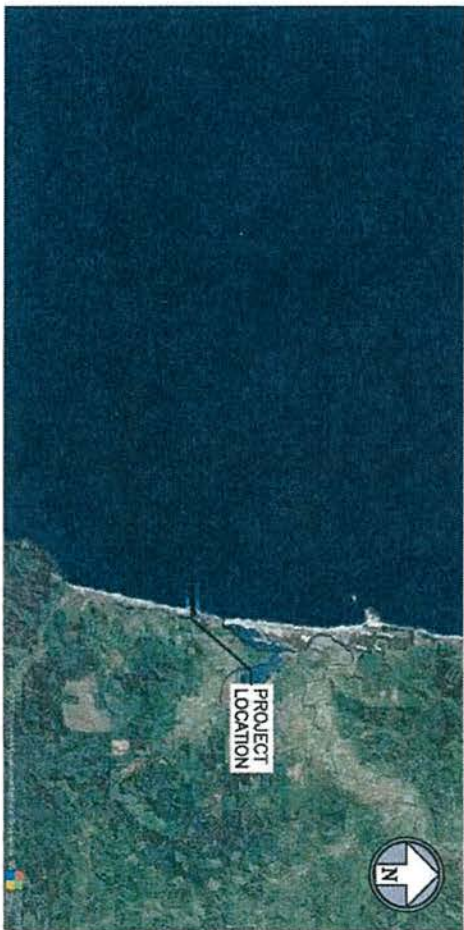
Appendix 2 Engineering Designs



BIFROST SUBSEA CABLE PROJECT LANDING PIPE, BHM, AND OGB DRAWINGS

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- 3 HOD PROFILE AND OGB EXHIBIT
- 4 LANDING PIPE DETAIL
- 5 SAND PIPE AND DETAILS
- 6 AIR HOSE PIPE AND CABLE ANCHOR
- 7 BEACH MANHOLE DETAIL



WINEMA, OREGON

RTI-1

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JUNE 14 2022



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 Overland Park, Kansas 66210
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PROJECT CONTACTS

OWNER'S REPRESENTATIVE
WAVE NETWORKS
MATT UPENKELDER, PMP
PHONE: (541)-760-9822

TAX LOT:
05S11W120C-0200

SYMBOLOLOGY

- BURIED ELECTRICAL LINE
- BURIED TELECOM LINE
- BURIED WATER LINE
- PROPERTY LINE
- EASEMENT
- TEMPORARY STAGING AREA

CONTRACTOR IS RESPONSIBLE FOR CALLING OREGON 811 AT LEAST 48 HOURS PRIOR TO ANY EXCAVATION AND FOR LOCATING ALL EXISTING UTILITIES PRIOR TO CONSTRUCTION. CONTRACTOR SHALL TAKE ALL NECESSARY PRECAUTIONS TO PROTECT EXISTING UTILITIES AND ANY DAMAGE TO THE UTILITIES SHALL BE IMMEDIATELY REPAIRED AT THE CONTRACTORS EXPENSE.

RIGHT OF WAY INFORMATION SHOWN IS APPROXIMATE.

ALL EXCAVATIONS AND WORK IN CONFINED SPACES SHALL BE PERFORMED IN ACCORDANCE WITH CURRENT OSHA REQUIREMENTS AND REGULATIONS.

THE CONTRACTOR SHALL COMPLY WITH ALL REQUIREMENTS OF THE VARIOUS PERMITS OBTAINED FOR THE PROJECT. MAINTAIN 36" MINIMUM CLEARANCE OVER OR UNDER WATER, STORM & SANITARY SEWERS.

THE CONTRACTOR SHALL BE RESPONSIBLE AT ALL TIMES FOR THE MAINTENANCE OF STREETS AND OTHER UTILITIES AFFECTED BY CONSTRUCTION OPERATIONS. DEBRIS AND RUBBISH SHALL NOT BE PERMITTED TO ACCUMULATE, AND ALL PREMISES SHALL BE MAINTAINED IN A NEAT AND WORKMANLIKE CONDITION.

THERE SHALL BE ADEQUATE VEHICLE AND PEDESTRIAN ACCESS FOR INGRESS AND EGRESS FROM THE PROPERTIES ADJACENT TO THE PROJECT AT ALL TIMES.

DURING NON-WORKING HOURS, THE CONTRACTOR SHALL KEEP THE EXISTING TRAFFIC LANES CLEAR FOR TRAFFIC WITHOUT INTERFERENCE FROM HIS OPERATIONS INCLUDING ALL APPROACHES AND INTERSECTIONS.

THE REQUIREMENTS OF THE OCCUPATIONAL SAFETY AND HEALTH ACT (OSHA) APPLY TO ALL EXCAVATION, TRENCHING, AND DITCHING OPERATIONS ON THIS PROJECT. ALL TRENCHES FOUR (4) FEET IN DEPTH SHALL BE SHORED IN COMPLIANCE WITH APPLICABLE FEDERAL AND/OR STATE REGULATIONS AS A GENERAL RULE. SHORING SHALL BE REQUIRED IN ALL STREET AREA EXCAVATIONS, AND STOPPING TO THE ANGLE OF REPOSE WILL BE PERMITTED ONLY IN NON-CRITICAL OFF-STREET AREAS.

NO TRENCH OR EXCAVATION IN PUBLIC RIGHT OF WAY SHALL BE LEFT OPEN OVERNIGHT OR UNATTENDED.

ANY STREETS OR SIDEWALKS DISTURBED BY CONSTRUCTION SHALL BE REPAIRED OR REPLACED AND THE SURROUNDING AREA SEEDED AT THE DIRECTION OF THE LOCAL AUTHORITY SPECIFICATIONS

REV	DATE	DESCRIPTION	BY	SCALE

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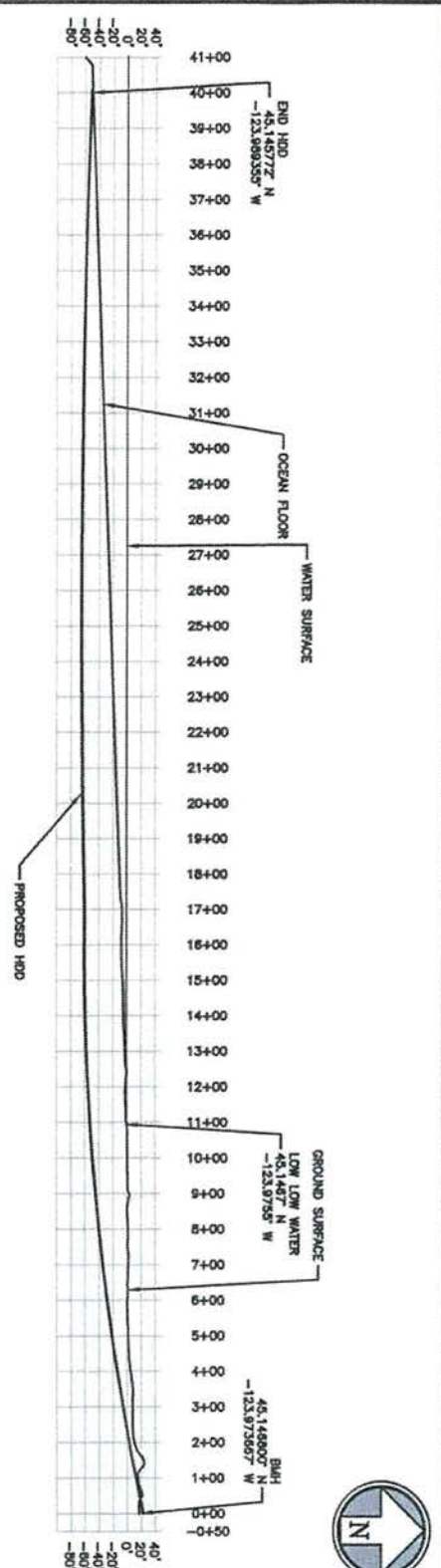
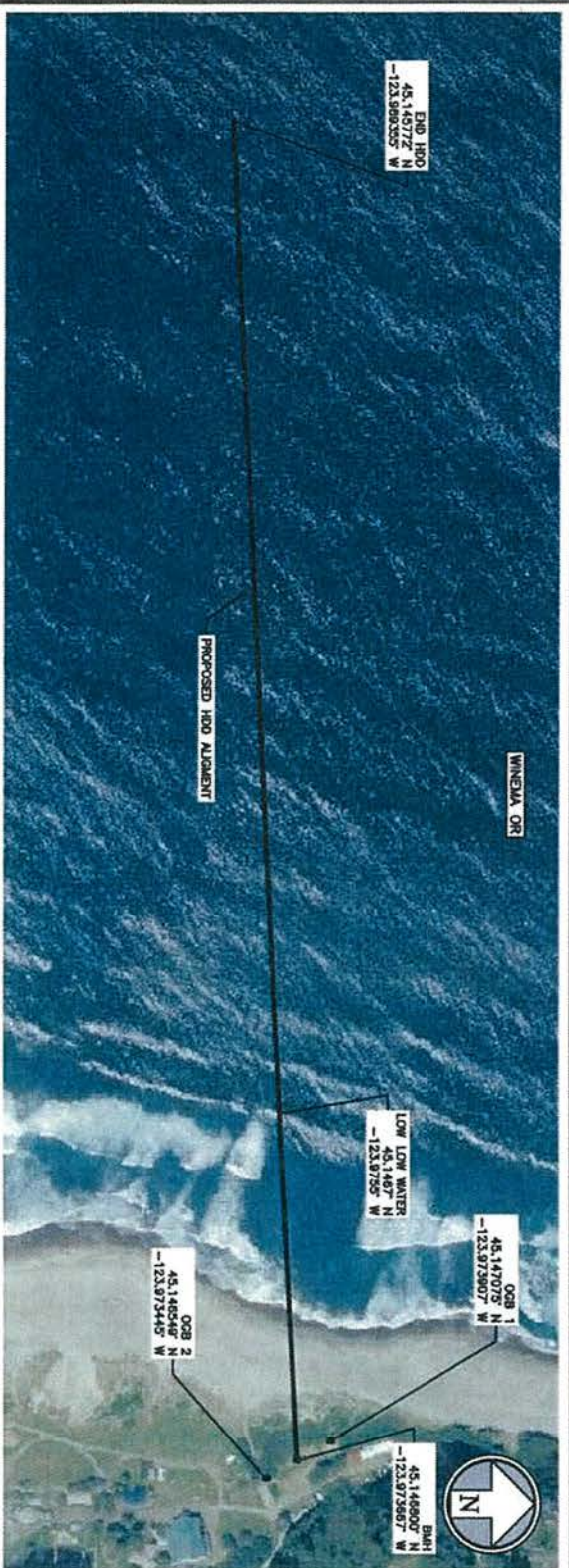


Project: BIFROST
SUSSEX CABLES
WINEMA OREGON

Site Address:
 45.146800° N
 -123.913687° W

Sheet Title:
GENERAL NOTES AND SYMBOLOLOGY

Drawn	Shawn
Checked	
Approved	
Scale:	



Rev	Date	Description	By	Check	App

RTI-1

BHCO
CIVIL ENGINEERING / PLANNING / UTILITIES

Project: BERFOST
SUBSEA CABLES
WINEMA OREGON

Site Address: 45,146900' N
-123,973687' W

Sheet Title: HDD AND LANDING SITE

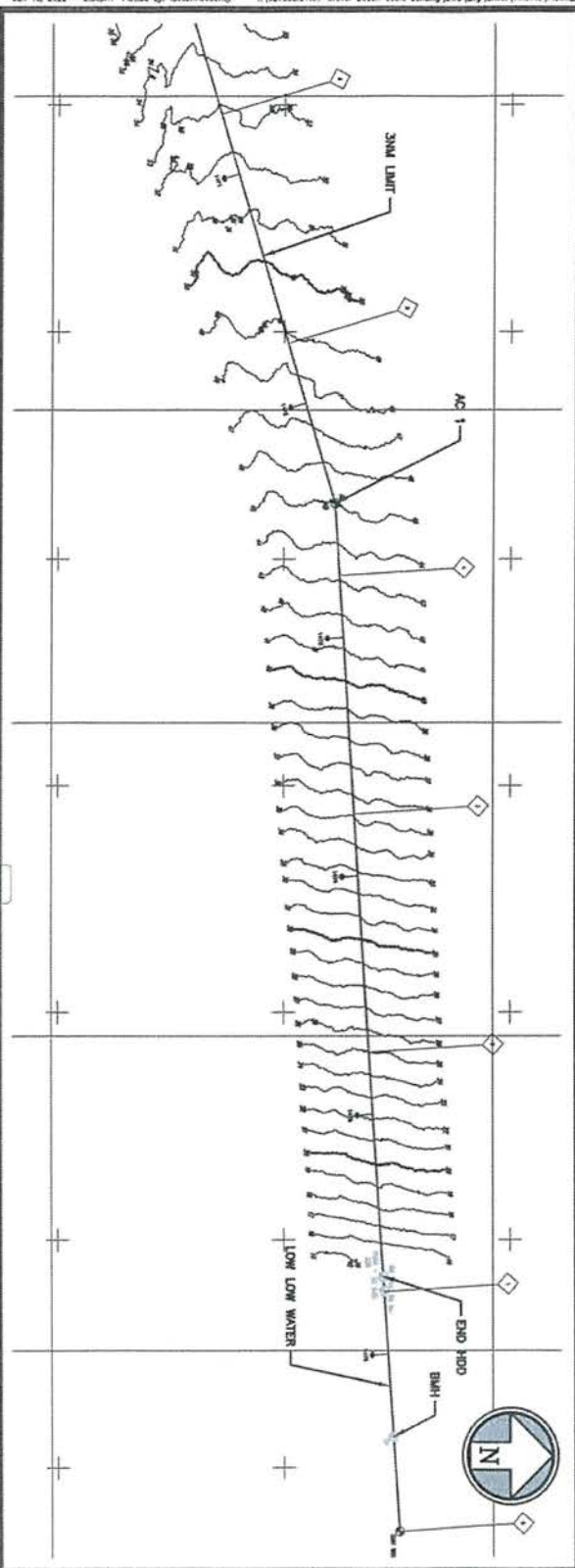
Project No.:
Drawn By:
Checked By:
Approved By:
Scale: 3 of 7

RTI

3 of 7

WINEMA OR

SEGMENT	START LATITUDE	START LONGITUDE	END LATITUDE	END LONGITUDE
LOW/LOW WATER TO END HDD	45.1467° N	-123.9755° W	45.1458° N	-123.9894° W
END HDD TO AC 1	45.1458° N	-123.9894° W	45.1420° N	-124.0321° W
AC 1 TO 3NM	45.1420° N	-124.0321° W	45.1386° N	-124.0513° W



Rev	Date	Description	By	Check
1	11/21/22			
2	11/21/22			
3	11/21/22			
4	11/21/22			

RTI-1



Project: EBFROST
SUSSEA CABLES
WINEMA OREGON

Site Address: 45.146800° N
-123.973687° W

Sheet Title: SHORE TO 3NM

Small Title: _____

Project No: _____

Date Drawn: _____

Drawn: _____

Checked: _____

Approved: _____

Scale: _____

4
of 7

Appendix 3

Site Specific Geotechnical Report





**GEOTECHNICAL INVESTIGATION REPORT
OFFSHORE CABLE LANDING
HORIZONTAL DIRECTIONAL DRILL INSTALLATIONS
WINEMA BEACH, OREGON**

August 10, 2022

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20230058.001A/FRE22R143767
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Page i of v

August 10, 2022
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August 10, 2022
Project No. 20230058.001A

Mr. Chris Brungardt
RTI Solutions, Inc.
7 Turtleback Lane
Westport, CT 06880

**Subject: Geotechnical Investigation Report
Offshore Cable Landing
Horizontal Directional Drill Installations at Winema Beach
Cloverdale, Oregon**

Dear Mr. Brungardt:

Kleinfelder is pleased to present the results of a geotechnical investigation for the proposed cable duct installations that are part of the offshore cable landing project at Winema Beach near Cloverdale, Oregon. The new cable ducts are planned to be installed using horizontal directional drill (HDD) techniques.

The purpose of this study was to evaluate the subsurface conditions near the proposed trenchless installation alignments to characterize the subsurface materials likely to be encountered during HDD drilling. At this time, a pipeline alignment has not been finalized. Therefore, Kleinfelder has prepared a conceptual bore profile for HDD and completed appropriate analyses to evaluate a constructable bore path for this cable landing. Based on our evaluation of the data discussed in this report, it is our professional opinion that the proposed cable landing installation should be feasible provided the geotechnical recommendations presented are incorporated into design and construction. The primary geotechnical design and construction issue associated with the project is the presence of clean sands, gravels, cobbles and boulders above the bedrock surface that may cause instability in the borehole and difficult drilling conditions. The designer(s) and contractor(s) should be aware this issue and all other subsurface conditions as they will affect design and construction, as described herein.





Kleinfelder appreciates the opportunity to provide services for this project. If you have questions regarding this report, please contact the undersigned.

Respectfully submitted,

KLEINFELDER, INC.

Pedro Rivas
Staff Engineer II

Tyler S. DeSouza
Project Engineer / Project Manager

Kenneth G. Sorensen
Sr. Principal Geotechnical Engineer

Samuel R. Christie, PE, GE
Principal Geotechnical Engineer

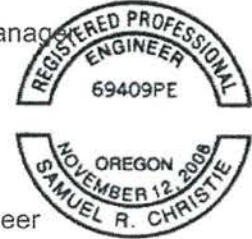




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1 INTRODUCTION

1.1 GENERAL

This report presents the results of a geotechnical investigation conducted for the proposed cable duct installations for the offshore cable landing project at Winema Beach near Cloverdale, Oregon. The purpose of this investigation was to evaluate the subsurface conditions near the project alignment and to characterize the subsurface materials likely to be encountered during trenchless construction activities. The approximate location of the cable landing alignment is shown on Figure 1, Site Vicinity Map.

This report includes our recommendations related to the geotechnical aspects of project planning, design, and construction of the proposed trenchless cable landing installation. Conclusions and recommendations presented in this report are based on the subsurface conditions encountered at the locations of the explorations at the project site and geophysical surveys performed along the alignment. Recommendations presented herein should not be extrapolated to other areas or used for other projects without our prior review.

1.2 PROJECT DESCRIPTION

Kleinfelder understands that the proposed project includes the installation of a cable landing at Winema Beach, Oregon. It is proposed to install 2 or more cable ducts from the shore housing (Manhole) to about 4,000 feet out to sea using HDD techniques. In this case, the hollow steel drill rods used for HDD will be left in place for use as conduits, so there is no reaming or hole opening once the pilot hole is drilled. The HDD bottom hole assemblies (BHAs) will be removed once the bores exit. This does not require pulling in of conduit after the bore is drilled. After removal of the BHAs, the cables will be pulled into the open drill rod conduits.

1.3 SCOPE OF SERVICES

As authorized by RTI Solutions Inc., our scope of services included providing a report with the following items:

- A description of the proposed project, including a site vicinity map and a site plan showing the location of the subsurface explorations and proposed entry and exit points for the HDD alignments.





- A description of the site geologic setting and potentially adverse geologic hazards that could impact the project such as soil liquefaction, ground shaking and ground rupture due to earthquake activity.
- A site geology map along the proposed HDD crossing alignment depicting the anticipated geologic conditions as revealed by the boring and geophysical investigations.
- A description of the site surface and subsurface conditions encountered during the field investigation, including boring logs
- A summary of the field exploration and laboratory testing programs
- Analysis of the potential for hydraulic fracturing and inadvertent fluid releases from the HDD bore
- Recommendations related to the geotechnical aspects of HDD including:
 - Anticipated drilling conditions
 - Soil characteristics, bit, and tool selection
 - Drilling fluid considerations including effects of saline water
 - Solids and fluid volume
 - Equipment support
 - Recommendations for control of inadvertent fluid releases and related contingency planning
- Recommendations for Contractor selection and pre-bid services
- Appendices with logs of borings and laboratory test results
- Appendix including finding of geophysical work.





2 FIELD INVESTIGATION AND LABORATORY TESTING

2.1 SITE DESCRIPTION

The proposed cable landing alignment is located adjacent to Winema Beach, west of Highway 101 in Cloverdale, Oregon. The proposed entry point for the HDD and manhole is located in a private lot north of Winema Road, east of the beach foredune. The alignment will run in a southwesterly direction from the manhole area and extend offshore underneath the Pacific Ocean for about 4,000 feet before reaching the pipe exit point. The topography is generally flat to gently rolling near the foredune located between the beach and manhole location. This area has the highest ground surface elevation along the alignment. From the foredune, the ground slopes away to the west. The project location is shown on Figure 1.

2.2 FIELD EXPLORATION PROGRAM

The field exploration program included both terrestrial and over-water explorations, as discussed below. The terrestrial field exploration program was conducted between May and June, 2022. The exploration program included drilling one (1) geotechnical boring at the proposed manhole location and conducting a geophysical survey, including MASW, ERT, and downhole seismic surveys. These exploration locations are shown on Figure 2, Exploration Location Map. Daily field report logs and available exploration equipment specification and/or calibration sheets are shown in Appendices A & B, respectively.

2.2.1 Exploratory Boring

The subsurface conditions at the site were explored on May 16th through 19th, 2022 by drilling one (1) boring utilizing a CME-75 truck-mounted drill rig equipped for mud rotary drilling and rock coring techniques. The boring was drilled near the proposed cable landing manhole location to a depth of approximately 151½ feet below the ground surface. Further, upon completion of the boring, downhole seismic testing was completed within the boring. This survey method is discussed in further detail in Section 2.2.3 below.

The boring was located in the field with a GPS unit, as well as visual sighting and/or pacing from existing site features. Therefore, the location of the boring shown on Figure 2 should be considered approximate and may vary slightly from those indicated.





A Kleinfelder professional maintained a log of the boring, visually classified the soils encountered according to the Unified Soil Classification System (American Society for Testing and Materials International [ASTM] D2488 visual-manual procedure) and obtained samples of the subsurface materials. Kleinfelder field personnel also completed logs of the bedrock by visually classifying the types of rock encountered according to the Rock Classification Systems for Engineering Purposes (American Society for Testing and Materials International [ASTM] STP984-EB visual-manual procedure) and obtained relatively undisturbed rock core samples. A Soil Description Key is provided on Figure C-2. A Rock Description Key is provided on Figure C-3. The boring log is presented on Figure C-4.

2.2.2 Sampling Procedures

Relatively undisturbed samples were obtained from the borings at selected depths by driving a 2.5-inch inside diameter (I.D.), split-barrel, California sampler containing stainless steel and brass liners into undisturbed soil with a 140-pound automatic hammer free-falling a distance of 30 inches. The California sampler was in general conformance with ASTM D3550. Soil sampled using this method may have experienced some minor disturbance due to hammer impact, retrieval, and handling. Disturbed samples were also obtained at selected depths by driving a 1.4-inch I.D. Standard Penetration Test (SPT) sampler into undisturbed soil with a 140-pound automatic hammer free-falling a distance of 30 inches. The SPT sampler was in general conformance with ASTM D1586. The rock core samples were obtained from the boring using a NQ core bit with a borehole diameter of 3.0 inches.

Blow counts were recorded at 6-inch depth intervals for each driven sample attempt and are reported on the logs. Blow counts shown on the boring logs have not been corrected for the effects of overburden pressure, rod length, sampler size, or hammer efficiency. Sampler size correction factors were applied to estimate the sample apparent density noted on the boring logs. The consistency terminology used in soil descriptions for cohesive soils is based on field observations (see Figure B-2). Disturbed soil samples and relatively undisturbed rock samples obtained from the boring were packaged and sealed in the field to reduce moisture loss and disturbance and returned to our laboratory for further testing. After the boring was completed, it was backfilled with neat cement grout.

The boring location was intentionally offset from the proposed HDD alignment in order to reduce the risk of creating a preferential conduit for inadvertent return of drilling fluid to the ground surface during HDD drilling operations. Upon completion, the boring was abandoned by placing a cement and bentonite grout mix from the bottom of the hole to the ground surface using tremie methods.





Following grouting, the boring was covered with native soil. The HDD contractor should monitor the exploration borehole location for fluid returns during HDD drilling.

Photographs of the samples recovered were taken in the field during the drilling program. A compilation of the sample photos taken in the field are provided in Figures C-5 to C-19.

2.2.3 Onshore Geophysical Survey

A geophysical survey was performed onshore between May 16th and 18th, 2022 and June 11th by Global Geophysics of Redmond, Washington. Geophysical survey methods, including Multichannel Analysis of Surface Waves (MASW), Electrical Resistivity Tomography (ERT) and Downhole Seismic Survey, were utilized along the terrestrial portion of the HDD alignment to evaluate the depth to bedrock and to characterize soil and rock stiffness and excavation characteristics. The MASW method determines variations in surface wave velocities with increasing distances and wavelengths. The data from these measurements are used to model the shear waves velocities of the subsurface. This information can then be used to infer rock/soil types, stratigraphy and soil conditions. The ERT maps differences in the electrical properties of geologic materials. These differences can result from variations in lithology, water content, pore-water chemistry, or voids. The seismic downhole method provides a designer with information pertinent to the seismic wave velocities of the materials in question. The S-wave velocities are directly related to important geotechnical properties such as of Poisson's ratio, shear modulus, bulk modulus, and Young's modulus.

The results of the ERT and the shear wave velocity measurements were used along with soil boring and geologic data to characterize the site for geotechnical design. Results of the geophysical survey are provided in Appendix E of this report.

2.2.4 Offshore Geophysical Survey

An offshore geophysical survey was performed between July 7th and 9th by Global Geophysics. The geophysical survey methods for the offshore section of the alignment included ERT and overwater profiling. These methods were used to evaluate the depth to bedrock and characterize soil and rock characteristics. The offshore ERT is performed in a similar manner as the terrestrial survey, however the measured values are much lower in sea water due to large current output. Overwater Profiling provides a continuous subsurface image of the seabed, the underlying stratigraphy and major structure features in the bedrock.

In general, higher resistivity readings indicate finer-grained and/or clayey material in soil or rock.





The results of the offshore ERT and overwater profiling are provided in Appendix E of this report.

2.3 LABORATORY TESTING

Laboratory tests are currently being performed on selected samples recovered from the boring to evaluate physical and engineering properties. The geotechnical laboratory testing program includes the following tests:

- Unit Weight (ASTM D2937)
- Moisture Content (ASTM D2216)
- Percent Finer Than No.200 Sieve (ASTM D1140)
- Sieve Analysis (ASTM D6913)
- Atterberg Limits (ASTM D4318)
- Uniaxial Compressive Strength of Intact Rock (ASTM D7012 Method C)

Unit weight, moisture content, percent passing the No. 200 sieve, and Atterberg limits results are summarized on the boring logs presented in Appendix C. The results of all laboratory tests are included in Appendix D.





3 SITE CONDITIONS

3.1 REGIONAL GEOLOGY

The site is located within the Coast Range geologic province of Central Oregon. Along the west margin of Oregon, the oceanic Juan de Fuca Plate is undergoing subduction by the continental North American plate along the Cascadia Subduction Zone, located offshore approximately 70 miles to the west of the site. The Cascadia Subduction Zone extends south from Queen Charlotte Sound in British Columbia, through Washington and Oregon, terminating at the Mendocino Triple Junction in Northern California. The basement rock in the central portion of this province consists dominantly of the Siletz Terrane (Siletz River Volcanics), an accreted island arc composed dominantly of early Eocene age (approximately 50 to 56 million years old) pillow basalt, volcanic breccia with interbedded sedimentary units. Subsequent to accretion of the Siletz Terrane, the Cascadia Subduction Zone shifted westward, generating a volcanic arc across the eastern two thirds of the state. Volcanism continued throughout the Oligocene and Miocene epochs (approximately 34 to 5 million years ago), depositing abundant volcanic flows along with interlayered lake and river deposits throughout the area. Concurrent with, and following conclusion of the volcanism, the forearc basin west of the shoreline infilled with oceanic sedimentary deposits. The Cascadia Subduction Zone has created a compressional tectonic regime, resulting in regional uplift east of the subduction zone. This regional uplift in concert with eustatic sea level change has exposed the forearc oceanic sediments throughout much of the Coast Range province. In the vicinity of the site, the deposits are overlain by and/or juxtaposed with mid to late Tertiary age (approximately 40 to 2.6 million years old) volcanic and non-marine deposits, and by younger Quaternary (approximately 2.6 million years old to present day) landslide, colluvial, alluvial, dune and beach deposits.

3.2 SITE GEOLOGY

Geologic mapping compiled by the USGS (Snively et al, 1996) presents the surficial site geology as Holocene and Pleistocene aged beach and dune sands. The underlying bedrock at the crossing location is mapped as basaltic sandstone of the Alsea Formation. The native soils and bedrock encountered at the site during our field investigation are consistent with published geologic mapping. The Geology Map can be seen in Figure 3 and detailed description of the soils and bedrock encountered in our boring is contained on the boring log in Appendix C of this report.





3.3 SEISMICITY AND FAULTING

Hazard mapping completed by the Oregon Department of Geology and Mineral Industries indicates that the proposed crossing location is in an area of earthquake hazards, specifically ground shaking. The Cascadia fold and fault belt is located approximately 2¼ miles west of the project site. The site is expected to experience very strong to severe ground shaking during a seismic event. Discussion of associated liquefaction and lateral spreading potential at the site is discussed in Section 4 below.

3.4 SUBSURFACE CONDITIONS

The following descriptions provide a general summary of the subsurface conditions encountered during the field exploration program, as well as detailed descriptions of the conditions at the crossing location. For more detailed descriptions of the actual conditions encountered at specific boring locations, refer to the boring logs presented in Appendix C.

Based on information gathered from the boring, geophysical survey, and geologic review, the site subsurface conditions are generally consistent with the mapped surficial geology referenced in the site geology section of this report. At Boring B-1, located just north of the proposed cable landing manhole, surficial soils consist of medium dense sands in the upper 20 feet, which were then underlain by dense poorly-graded gravels to a depth of about 38 feet. Very dense sands were then encountered to a depth of 60 feet before transitioning to sandstone bedrock to the boring termination depth of about 151½ feet.

The MASW survey performed onshore indicates approximately 50 to 70 feet of overburden material underlain rock with a shear wave velocity of approximately 1,400 to 2,100 feet per second (fps). Based on the geophysical results of the survey line, the overburden and bedrock transitional zone is generally more gradual, occurring over a vertical distance of approximately 20 to 40 feet. The onshore ERT results suggest a similar thickness of overburden, approximately 55 to 70 feet.

The results of the offshore geophysical survey indicate approximately 35 to 50 feet of overburden material along the alignment underlain by the basal sandstone layer. Additionally, the ERT results show variation in resistivity of the basal layer which could indicate changes in lithology such as density or composition of the rock along the alignment.

It should be noted that interbedded lenses of cobbles and boulders up to 18 inches across were encountered within the gravel layer found between approximately 20 feet to 38 feet below the ground surface within Boring B-1. Caving and/or fluid loss conditions were not noted during drilling





within this layer but are common occurrences during HDD construction in such conditions. It is not known if this layer persists along the entire alignment. Further discussion on the impact of these conditions with regard to HDD design and construction is provided in Section 4.

3.5 GROUNDWATER CONDITIONS

Groundwater levels at the site were about 11 feet below the ground surface during the drilling of Boring B-1. It is possible that groundwater conditions at the site could change due to variations in sea tides, or other factors not apparent at the time the explorations were performed.





4 DISCUSSIONS, CONCLUSIONS AND DESIGN CONSIDERATIONS

4.1 GENERAL CONCLUSIONS

Based on our geotechnical investigation and evaluation of the data discussed in this report, it is our professional opinion that the proposed trenchless crossing should be feasible provided the geotechnical recommendations presented in this report are incorporated into design and construction. Conclusions and recommendations for trenchless design and construction are provided below.

4.2 LIQUEFACTION AND LATERAL SPREADING POTENTIAL

4.2.1 Liquefaction

Liquefaction describes a condition in which saturated soil loses shear strength and deforms as a result of increased pore water pressure induced by strong ground shaking during an earthquake. Dissipation of the excess pore water pressures will produce volume changes within the liquefied soil layer, which causes settlement. Factors known to influence liquefaction potential include soil type, structure, grain size, relative density, confining pressure, depth to groundwater and the intensity and duration of ground shaking. Soils most susceptible to liquefaction are saturated, loose sandy soils, and low plasticity clays and silts. If liquefaction occurs, structures above the liquefiable layers may undergo settlement.

For layers that meet the compositional criteria, liquefaction triggering (factor of safety) analyses were performed using methodologies proposed by Youd et al. (2001), Cetin et al. (2004), and Idriss & Boulanger (2006, 2008). The analyses utilized sample blow count data from the rotary-wash borings drilled for this study. In order to perform liquefaction analysis, estimates of earthquake magnitude and peak ground acceleration (PGA_M) are needed. Using the U.S. Geological Survey (USGS) interactive deaggregation website, the modal earthquake magnitude $M_w = 9.1$ was estimated. It should be noted that the simplified liquefaction triggering analysis is valid for earthquake magnitudes of $M_w = 8.5$ or less and therefore a Magnitude of $M_w = 8.5$ was used in the simplified analysis. The peak ground acceleration (PGA_M) value for our analyses was calculated based on Equation 11.8-1 in Section 11.8.3 of ASCE 7-16 for the Risk-Targeted Maximum Considered Earthquake (MCE_R). The PGA_M value was calculated using the US Seismic Design Maps application assuming a Site Class C. The calculated PGA_M value is 0.88g for the MCE_R .





The results of the liquefaction analysis and shear wave velocity measurements indicate the potential for liquefaction at the site is low.

4.2.2 Lateral Spreading

Lateral spreading is a term describing the permanent deformation of sloping ground that occurs during earthquake shaking as a result of soil liquefaction. This typically occurs on sloping ground and adjacent to free faces such as river or canal banks. Based on the conditions encountered in the boring, the risk of lateral spreading deformation affecting the conduit due to a design-level earthquake is characterized as low due to the absence of liquefiable soils and the relatively level ground surface.

4.3 HDD CONSIDERATIONS

4.3.1 General Discussion

The proposed HDD alignment is currently planned to be approximately 4,000 feet long. Kleinfelder created a conceptual profile (shown on Figure 4a), which considers the HDD profile to cross primarily through the sandstone. This preliminary profile utilizes the stationing and approximate topographic and bathymetric survey data provided by Global Geophysics in the geophysical survey report in Appendix E. Based on our review of the pipeline alignment, subsurface conditions, and our preliminary inadvertent returns analysis, the HDD bore path appears technically feasible. However, there are several design and constructability issues that should be addressed. Discussion of these issues can be found in the sections below.

4.3.2 Anticipated Drilling Conditions

As stated previously, presence of coarse gravel to cobble-sized material with probable boulders increases the risk of loss of circulation and difficulty advancing the drill string during drilling in these materials. The installation of conductor casings extending through these large granular near-surficial soils could help to mitigate these issues. The Contractor should ultimately determine means and methods of construction. When driving external casings, the contractor should be prepared with appropriate contingency plans, including remedial actions (e.g., having multiple casing sizes on hand, lead sections with reinforcement or cutting edges, concentric auger assemblies, etc.), to install the casing through the coarse gravel to probable boulder sized materials encountered in the boring.





Mud motors will be needed in the very dense sands and gravels, and within the sandstone rock unit. The soil and rock conditions encountered in the exploratory boring is shown on the boring log in Appendix C. The Contractor should carefully evaluate the ground conditions identified in this report and should use means and methods including drilling fluid additives and drill bits that are appropriate for these ground conditions.

4.3.3 Drill Bit Selection

Drill bits should be selected based on anticipated subsurface conditions and previous experience. The drilling contractor should be prepared with a variety of bits that have worked well in similar soil and rock conditions. The use of mud motors should be considered in soils with Standard Penetration Test blow counts exceeding 50 blows per foot. The radius of the pilot hole curves should be no less than 1,000 feet to accommodate the use of a mud motor unless the characteristics of the mud motor that will be used during construction allow for a tighter turning radius.

4.3.4 Steering

The density and consistency of soils encountered at the proposed crossing site were variable and would be expected to cause difficult steering conditions for HDD drilling. The use of conductor casings advanced through the upper soils will help to reduce risk associated with steering or maintaining tangent through the large granular materials encountered.

The sandstone bedrock at the proposed crossing includes an upper, decomposed zone encountered in Boring B-1. In general, degree of weathering, and strength (including potential anisotropic rock strength, or differing strength in vertical vs horizontal direction) will be variable along the bore path as geometry transitions between tangents, vertical and horizontal curves. Localized, "mixed face" or transition conditions may result at the drill head and cause difficulty in steering or maintaining a tangent.

4.3.5 Borehole Instability

The surficial poorly graded sands and underlying poorly-graded gravels may be prone to instability in the HDD borehole. As recommended previously in Section 4.3.2, the use of conductor casing installed through these soils will mitigate these concerns. The materials appear to become denser at a depth of about 20 feet. We suggest that be considered when evaluating casing needs. The contractor should carefully evaluate the subsurface conditions identified in this report and should use means and methods including drilling fluids appropriate for these ground conditions.





4.3.6 Loss of Circulation

Loss of circulation and/or fluid loss typically occurs when the drill bit encounters large interstitial pore spaces in coarse soil materials (i.e., gravels, cobbles and boulders). Loss of returns is recognized by a decrease of drilling fluid returns, or a drop in drilling fluid pressure. If interstitial pore spaces are small or discontinuous, they may fill with solids contained in the drilling fluid returns as drilling progresses beyond them. Once the pore spaces are filled, fluid will return up the bore hole again and fluid pressure will increase until another gravel layer is encountered. If open-graded layers are continuous to the surface, drilling fluid may inadvertently return to the surface.

As shown on the boring log in Appendix C, surficial layers of loose poorly graded sand and underlying poorly graded gravels with varying amounts of sand, cobbles and boulders were encountered near the proposed HDD entry point in the upper 40 feet. The use of conductor casing installed through these soil layers will help to mitigate the risk of loss of circulation in these materials.

The consolidated rock units that were encountered consist primarily of sandstone. During our exploration program, the rock was cored to a depth of approximately 151 feet. The rock was generally slightly fractured with some joints and bedding planes. RQD values were variable (31% to 100%) due to the variable rock strength, weathering, and mechanical disturbance along the horizontal bedding planes due to the drilling process.

The drilling contractor should be prepared with drilling fluid additives to address the potential for loss of circulation in the consolidated rock. Some small lenses of granular material or fractures within the rock may be encountered, resulting in temporary loss of circulation or fluid loss. Larger gravel layers or bedrock fractures may present greater difficulty in maintaining circulation. Product data sheets and Material Safety Data Sheets for loss of circulation materials should be submitted to the owner for approval by jurisdictional regulators prior to mobilization.

4.3.7 Drilling Fluid Construction Considerations

An appropriate drilling fluid mix is necessary to maintain a clean borehole and reduce the potential for borehole instability issues which can result in poor drilling returns and partial or complete plugging of the borehole. This results in higher fluid pressures within the bore and can lead to hydraulic fracturing and inadvertent fluid returns to the ground surface. Furthermore, hydraulic fracturing is likely to occur near the bore exit point as the drill bit approaches the ground surface. This is a common risk of HDD and countermeasures should be in place to mitigate this condition.





A proper drilling fluid pressure should be maintained throughout the entire length of the bore and should be reduced as much as practical near the exit point. A pressure sensing sub several feet behind the drill bit can be used to monitor drilling fluid pressures in the bore hole and compare them to the maximum predicted allowable pressures. This can be used to help avoid inadvertent fluid releases. The pressure sub provides real-time monitoring of fluid pressures within the borehole and is useful in detecting a spike in drilling pressure that may result from a borehole that is not well cleaned and/or becomes blocked with the drilling solids. Furthermore, the pressure data allows the driller to understand when modifications to the drilling method may be needed to avoid a fluid release.

4.3.8 Inadvertent Returns of Drilling Fluid

Hydraulic fracturing occurs when borehole pressure causes plastic deformation of the soil surrounding the borehole, initiating and propagating fractures in the soil mass. The resistance to plastic deformation and fracturing is a function of soil strength, overburden pressure, and pore water pressure. Hydraulic fracturing can result in drilling fluid inadvertently returning to the ground surface or running horizontally away from the borehole. Allowable borehole pressure was evaluated using the Delft Geotechnics equation and the methods presented in the NASTT Good Practices Guidelines, 4th edition. The estimated allowable borehole pressure was compared to predicted borehole pressure in our analyses.

A preliminary hydraulic fracturing analysis was performed for the proposed alignment, as shown on Figure 4. A pilot-hole diameter of 12¼ inches, a drill rod diameter of 5-7/8 inches, and a mud pump output of up to 400 gallons per minute was used. Target up-hole fluid velocities in the analyses range from about 85 to 95 feet per minute in our analysis. The drilling fluid density was estimated to be about 10 to 12 pounds per gallon. Changes in the drilling fluid properties and drilling equipment affect the analysis results.

Once layout of the alignment is complete and the contractor's equipment has been selected, finalized inadvertent returns and pipe stress analyses to confirm the adequacy of the selected bore path should be performed.

Borehole instability issues and/or the contractor not maintaining a clean borehole can result in poor drilling returns and partial or complete plugging of the borehole. This will result in higher fluid pressures within the bore and can lead to hydraulic fracturing and inadvertent fluid returns to the ground surface.





Based on our preliminary inadvertent returns analysis (see Appendix C), the HDD profiles are technically feasible. However, hydraulic fracturing could occur and would be expected to occur near the bore exit point as the drill bit approaches the ground surface. This is a common risk of HDD and countermeasures should be in place to mitigate this condition. Measures such as drilling without fluid for the last few rod joints, using air as a drilling fluid, or not exiting the bore hole and digging down to it from the sea floor are several ways to approach this issue. The contractor should select the appropriate methods to use based on their equipment and project constraints.

4.4 DRILLING FLUID PROGRAM

4.4.1 General

The drilling contractor should develop a Drilling Fluid Program (DFP) as part of the HDD Bore Plan. A properly designed drilling fluid program can substantially reduce losses due to hydraulic fracturing, stuck product pipe, or loss of tooling. The drilling fluid program should account for anticipated soil conditions, fluid selection, drill bit and reamer selection, and volume calculations. For this project we recommend a drilling fluid engineer be on site during drilling to make needed adjustments in drilling fluid properties based on the encountered conditions.

4.4.2 Borehole Slurry Density

The density of the slurry in the borehole directly affects the buoyancy force and therefore the normal force between the pipe and the wall of the borehole. The density of drilling returns is a function of ground conditions, penetration rate, mud flow rate, drilling fluid composition, and efficiency of the mud cleaning system. In general, drilling return density with about 20% solids varies between 9 and 11 pounds per gallon in soil and up to about 12 pounds per gallon in rock. In coarse gravel and cobbles, drilling fluid densities can approach 13 pounds per gallon.

For this project we anticipate drilling fluid return density will be on the order of 10 to 12 pounds per gallon where good returns are achieved, and drilling is performed in accordance with the NASTT's HDD Good Practices Guidelines (2017).

4.4.3 Soil Conditions for Drilling Fluid Design

For the purpose of drilling fluid design, earth materials are divided into two categories: Inert, including sand and gravel; and reactive, including clay. Information regarding subsurface conditions likely to be encountered at the site is provided in the Subsurface Conditions section of this report as well as in the boring log for the exploration performed for this study in Appendix C.





4.4.4 Drilling Fluid Selection

Drilling fluid program base fluid should be designed for site-specific soil conditions. The base fluid may consist of either a bentonite or polymer and water, with additives to achieve specific fluid properties.

The drilling contractor should submit a base fluid design with a list of additives, loss of circulation materials, and grouting materials that may be used on the project and SDS sheets for approval at least two (2) weeks prior to mobilization. Assistance with drilling fluid selection can be obtained from reputable drilling fluid suppliers.

4.4.5 Soil and Fluid Volume

The volume of soil to be removed can be estimated as follows:

$$\frac{(\text{Hole Diameter in Inches})^2}{25} = \text{Volume in Gallons per Foot}$$

Sufficient fluid should be pumped during drilling and reaming operations to maintain flow. Drilling rates and drilling fluid flow rates may be adjusted in the field to match varying site conditions. However, an estimate of drilling fluid demand is useful when sizing drilling equipment, mud pumps, and solids removal systems, and can be particularly helpful in determining realistic drilling rates. Drilling fluid demand can be estimated based on the bore hole volume and the following ratios:

<u>Fluid Volume: Soil Volume</u>	<u>Ratio</u>
Sand, Gravel, Cobble, Rock	1:1
Above, mixed with Clay	2:1
Clay or reactive Shale	3-5:1

Drilling rates can be estimated based on the drilling fluid demand and the pump output at the design base fluid viscosity.

4.5 SOLIDS SEPARATION PLANT

Fine-grained silts and clays are generally the most difficult to remove from drilling fluids. Silts and clays are present on this site and use of desilters/centrifuges may be needed to remove the fine soils from the drilling fluids.





4.6 DRILL PAD SUPPORT

Surface conditions in the vicinity of the HDD entry points likely consists of medium dense sands and are not likely to provide adequate support for HDD drilling equipment. The contractor should conduct a pre-bid site visit to determine the suitability of site conditions for their equipment. Use of a gravel surface course underlain by a geotextile is recommended where heavy truck and equipment traffic is planned. This may also be needed for a storm water pollution prevention plan (SWPPP). We recommend the contractor evaluate the site access for their equipment and select an appropriate base course for the access road and rig area.

4.7 UTILITIES AND WELL CLEARANCE

The location of existing utilities and water wells was beyond the scope of this report. There should be an attempt to locate all underground utilities near the alignment during the design phase and certainly prior to construction. These utilities should be protected by the Contractor so as not to be impacted by the trenchless crossings. The bore profiles should be designed to allow sufficient clearance from all underground utilities to avoid entering an existing utility trench or pipe zone materials or causing excessive settlement of the utilities above the bore. If existing utilities are within about 25 feet of the bore entry and exit pits, conductor casings should be used to help contain HDD drilling fluids and keep them out of adjacent utility areas.

Nearby water wells may exist and must be located and protected to prevent being impacted by HDD construction. The HDD bore profile should be designed to allow sufficient clearance from nearby wells to avoid drilling fluid releases contaminating them. In general, we recommend wells be located at least 100 feet from the HDD bore path for this type of HDD installation. If a well becomes impacted with drilling fluid, the well may need to be re-developed or replaced.

4.8 CONTRACTOR SELECTION

The success of the project will be substantially dependent on the experience and performance of the specialty contractor retained to perform the work. We recommend the use of a specialty contractor with a minimum of three (3) years construction experience in the field of horizontal directional drilling in similar drilling conditions on projects of similar scope (i.e. diameter, length, and depth). The HDD contractor should be familiar with the use of drilling mud and additives and conductor casings and should provide examples of projects they have successfully completed installing similar utilities in similar conditions.





5 ADDITIONAL SERVICES

5.1 PLANS AND SPECIFICATIONS

It is recommended that Kleinfelder conduct a general review of final plans and specifications to evaluate that our recommendations have been properly interpreted and implemented during design. In the event Kleinfelder is not retained to perform this recommended review, no responsibility will be assumed for misinterpretation of the given recommendations.

5.2 PROJECT BID DOCUMENTS

Kleinfelder's experience is that contractors bidding on the project often contact us to discuss the geotechnical aspects of the project. Informal contacts between Kleinfelder and an individual contractor could result in misleading or incomplete information being provided to the contractor. Therefore, it is recommended that a pre-bid meeting be held to answer any questions about the report prior to submittal of bids. If this is not possible, questions or clarifications regarding this report should be directed to the project owner or his/her designated representative. After consultation with Kleinfelder, the project owner (or his/her representative) should provide clarifications or additional information to all contractors bidding the job.

5.3 EXECUTION PLAN AND PERMIT ASSISTANCE

In order to facilitate best management practices and obtaining the required permits for the trenchless crossings, a project execution plan should be developed prior to construction. The plan should include layout of equipment, MSDS sheets for all proposed drilling fluids and additives, development of a drilling fluid containment and contingency plan in case of inadvertent fluid returns, and discussion of any other site-specific constraints relative to the project.

5.4 CONSTRUCTION OBSERVATION AND TESTING

It is recommended that all trenchless construction be monitored by a representative from Kleinfelder. The purpose of these services is to observe the soil and drill mud conditions encountered during construction, evaluate the applicability of the recommendations presented in this report to the soil conditions encountered, and recommend appropriate changes to the owner in design or construction procedures if conditions differ from those described herein.





6 LIMITATIONS

This work was performed in a manner consistent with that level of care and skill ordinarily exercised by other members of Kleinfelder's profession practicing in the same locality, under similar conditions and at the date the services are provided. Our conclusions, opinions, and recommendations are based on a limited number of observations and data. It is possible that conditions could vary between or beyond the data evaluated. Kleinfelder makes no other representation, guarantee, or warranty, express or implied, regarding the services, communication (oral or written), report, opinion, or instrument of service provided.

This report may be used only by the Client and the registered design professional in responsible charge and only for the purposes stated for this specific engagement within a reasonable time from its issuance, but in no event later than two (2) years from the date of the report. The work performed was based on project information provided by Client. If Client does not retain Kleinfelder to review any plans and specifications, including any revisions or modifications to the plans and specifications, Kleinfelder assumes no responsibility for the suitability of our recommendations. In addition, if there are any changes in the field to the plans and specifications, Client must obtain written approval from Kleinfelder's engineer that such changes do not affect our recommendations. Failure to do so will vitiate Kleinfelder's recommendations.

Kleinfelder offers various levels of investigative and engineering services to suit the varying needs of different clients. Although risk can never be eliminated, more detailed and extensive studies yield more information, which may help understand and manage the level of risk. Since detailed study and analysis involves greater expense, our clients participate in determining levels of service, which provide information for their purposes at acceptable levels of risk. The client and key members of the design team should discuss the issues covered in this report with Kleinfelder, so that the issues are understood and applied in a manner consistent with the owner's budget, tolerance of risk and expectations for future performance and maintenance.

Recommendations contained in this report are based on our field observations and subsurface explorations, limited laboratory tests, and our present knowledge of the proposed construction. It is possible that soil and/or groundwater conditions could vary between or beyond the points explored. If soil or groundwater conditions are encountered during construction that differ from those described herein, Kleinfelder should be notified immediately so that we may re-evaluate the recommendations of this report as appropriate. If the scope of the proposed construction, including the estimated building loads, and the design depths or locations of the foundations changes from that described in this report, the conclusions and recommendations contained in





this report are not considered valid unless the changes are reviewed, and the conclusions of this report are modified or approved in writing, by Kleinfelder.

As the geotechnical engineering firm that performed the geotechnical evaluation for this project, Kleinfelder should be retained to confirm that the recommendations of this report are properly incorporated in the design of this project, and properly implemented during construction. This may avoid misinterpretation of the information by other parties and will allow us to review and modify our recommendations if variations in the soil conditions are encountered.





7 REFERENCES

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FIGURES

LIST OF ATTACHMENTS

The following figures are attached and complete this appendix.

- | | |
|----------|--------------------------|
| Figure 1 | Site Vicinity Map |
| Figure 2 | Exploration Location Map |
| Figure 3 | Geologic Map |





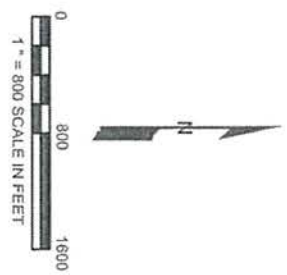
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PROJECT NO.
20220606.001A
DRAWN BY: Kdesouza
CHECKED BY: T.Desouza
DATE: 06-06-2022

SITE VICINITY MAP
OFFSHORE CABLE LANDING
HORIZONTAL DIRECTIONAL DRILL INSTALLATIONS
WINNEMAH BEACH, CLOVERDALE, OREGON

FIGURE
1



LEGEND

- MANHOLE LOCATION
- EXPLORATORY BORING
- END OF PIPE
- CABLE LANDING HDD ALIGNMENT

NOTE:
 BASE MAPPING AND VICINITY MAP CREATED FROM LAYERS COMPILED BY ESRI PRODUCTS AND 2022 MICROSOFT CORPORATION.
 COORDINATE SYSTEM: NAD 1983 2011 STATEPLANE OREGON NORTH FIPS 3601





The information included on this graphic representation has been compiled from a variety of sources and is intended to provide a general overview of the project. It is not intended to be used as a final design or construction document. The user of this information is responsible for verifying the information.



PROJECT NO: 20230068 001A
 DRAWN BY: Wdesouza
 CHECKED BY: T Desouza
 DATE: 06-06-2022

EXPLORATION LOCATION MAP
 OFFSHORE CABLE LANDING
 HORIZONTAL DIRECTIONAL DRILL INSTALLATIONS
 WINNEMA BEACH, CLATSOP COUNTY, OREGON

FIGURE 2

VICINITY MAP

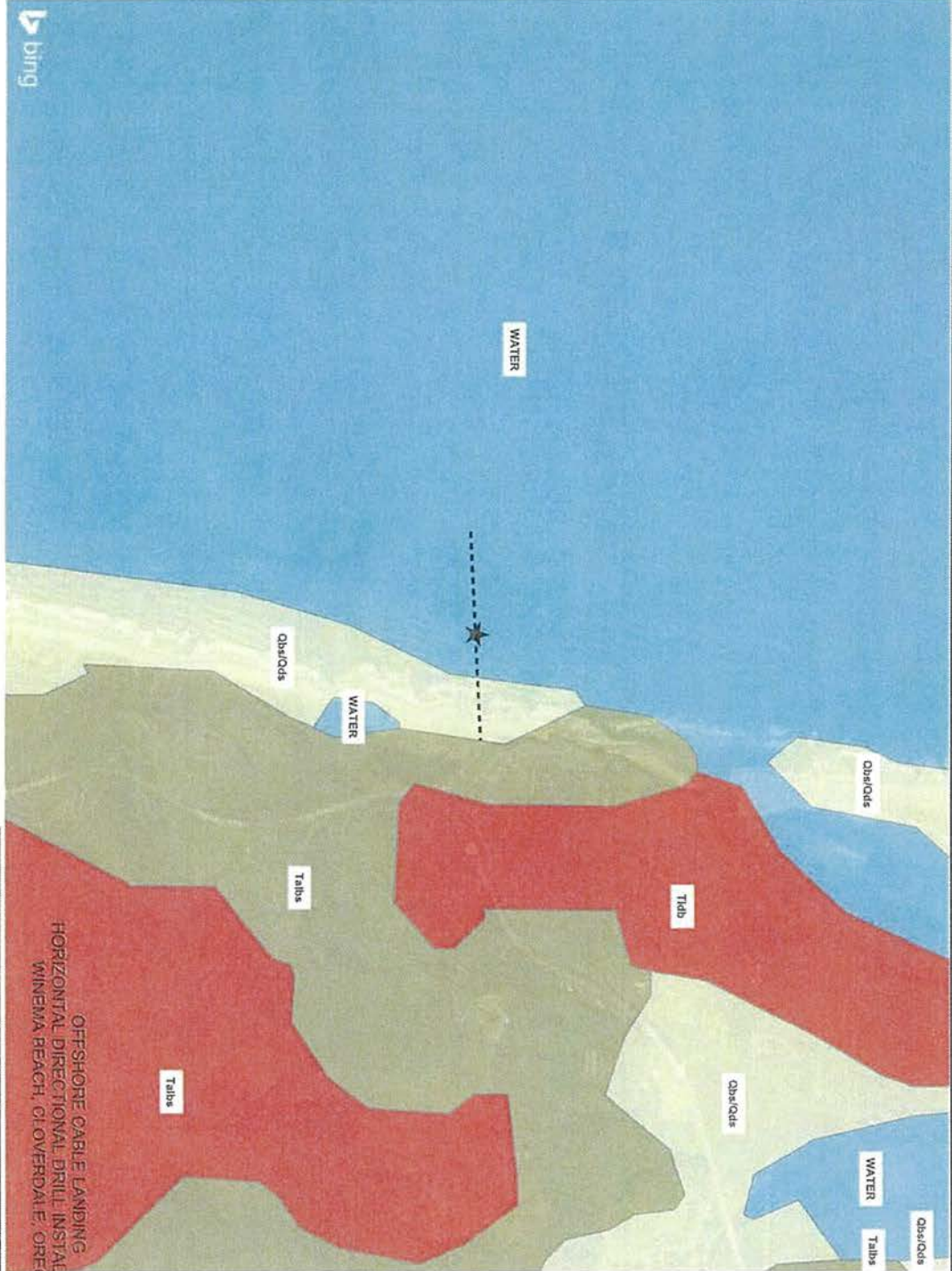
NOTE:
 BASE MAPPING AND VICINITY MAP CREATED FROM LAYERS COMPILED BY ESRI PRODUCTS AND 2022 MICROSOFT CORPORATION, STEW. MAD 1983 2011 STATEPLANE OREGON NORTH FIPS 3601

LEGEND

- MANHOLE LOCATION
- EXPLORATORY BORING
- TERRESTRIAL GEOPHYSICAL SURVEY AREA
- CABLE LANDING HDD ALIGNMENT

1" = 100 SCALE IN FEET

This information included on this graphic representation has been compiled from a variety of sources and is intended to provide a general overview of the project area. It is not intended to be used as a legal document. The user or viewer of this information conditioned on this graphic representation is at the sole risk of the party using or relying on this information.



KLEINFELDER
 Bright People. Right Solutions.

PROJECT NO. 20220606.001A
 DRAWN BY: MORGAN
 CHECKED BY: T. DESOLVA
 DATE: 06-06-2022

OFFSHORE CABLE LANDING
 HORIZONTAL DIRECTIONAL DRILL INSTALLATIONS
 WINEMA BEACH, CLOVERDALE, OREGON

GEOLOGY MAP

FIGURE 3

LEGEND

- Cable Landing HDD Alignment
- Tdb Depose Bay Basalt
- Tals Basaltic Sandstone (Alsea Formation)
- Obsidols Alluvial Beach and Dune Sands
- WATER Water

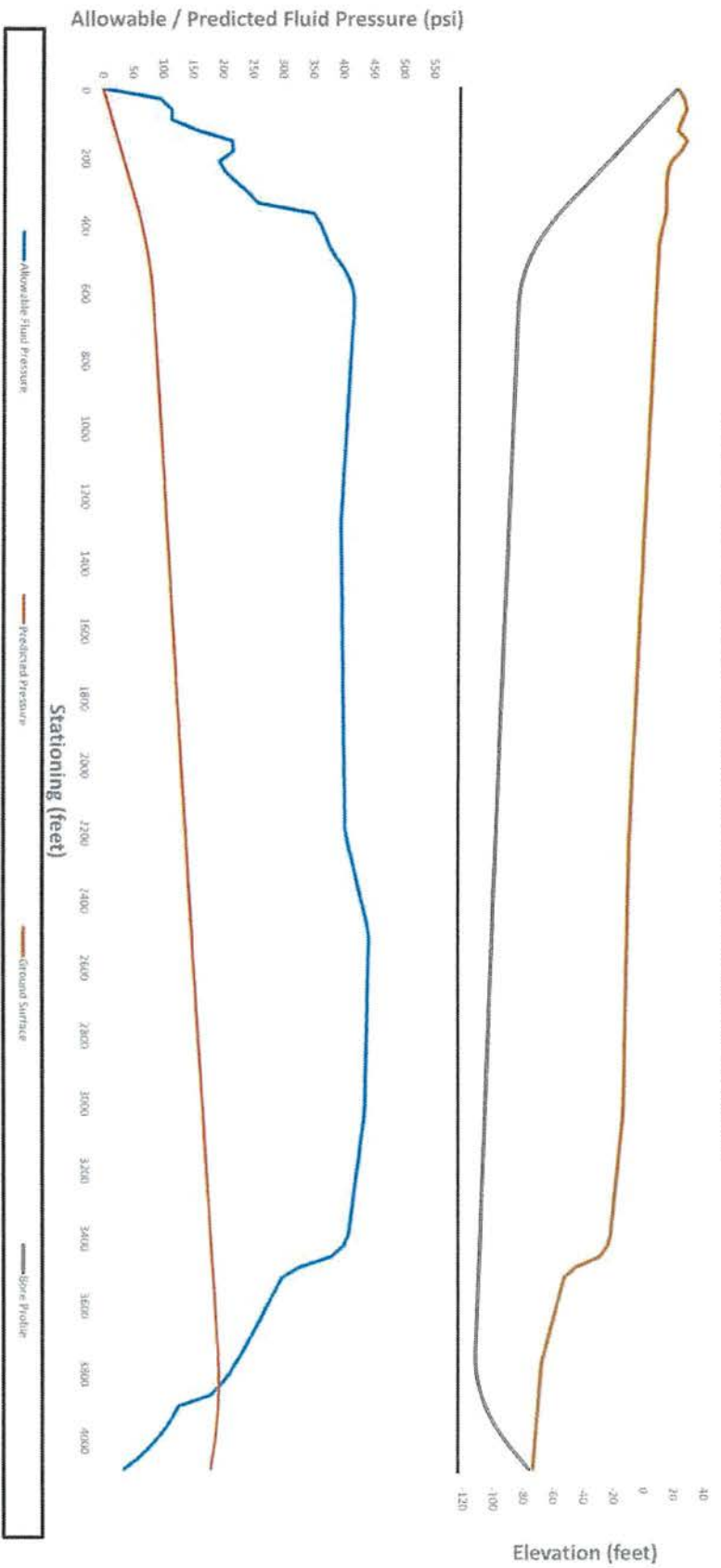
NOTE:
 BASE MAPPING AND VICINITY MAP CREATED FROM LAYERS COMPILED BY ESRI PRODUCTS AND 2022 MICROSOFT CORPORATION.
 COORDINATE SYSTEM: NAD 1983 2011 STATEPLANE OREGON NORTH FIPS 3801
 THE STATE GEOLOGIC MAP COMPILED BY THE CONTINUOUS UNITED STATES WAS DEVELOPED BY THE U.S. GEOLOGICAL SURVEY MINERAL RESOURCES PROGRAM (MRP).

SCALE:
 1" = 2000 SCALE IN FEET

2000 4000

North Arrow

Hydrofracture Risk Analysis for the Pilot Bore with Alignment Profile



ASSUMPTIONS

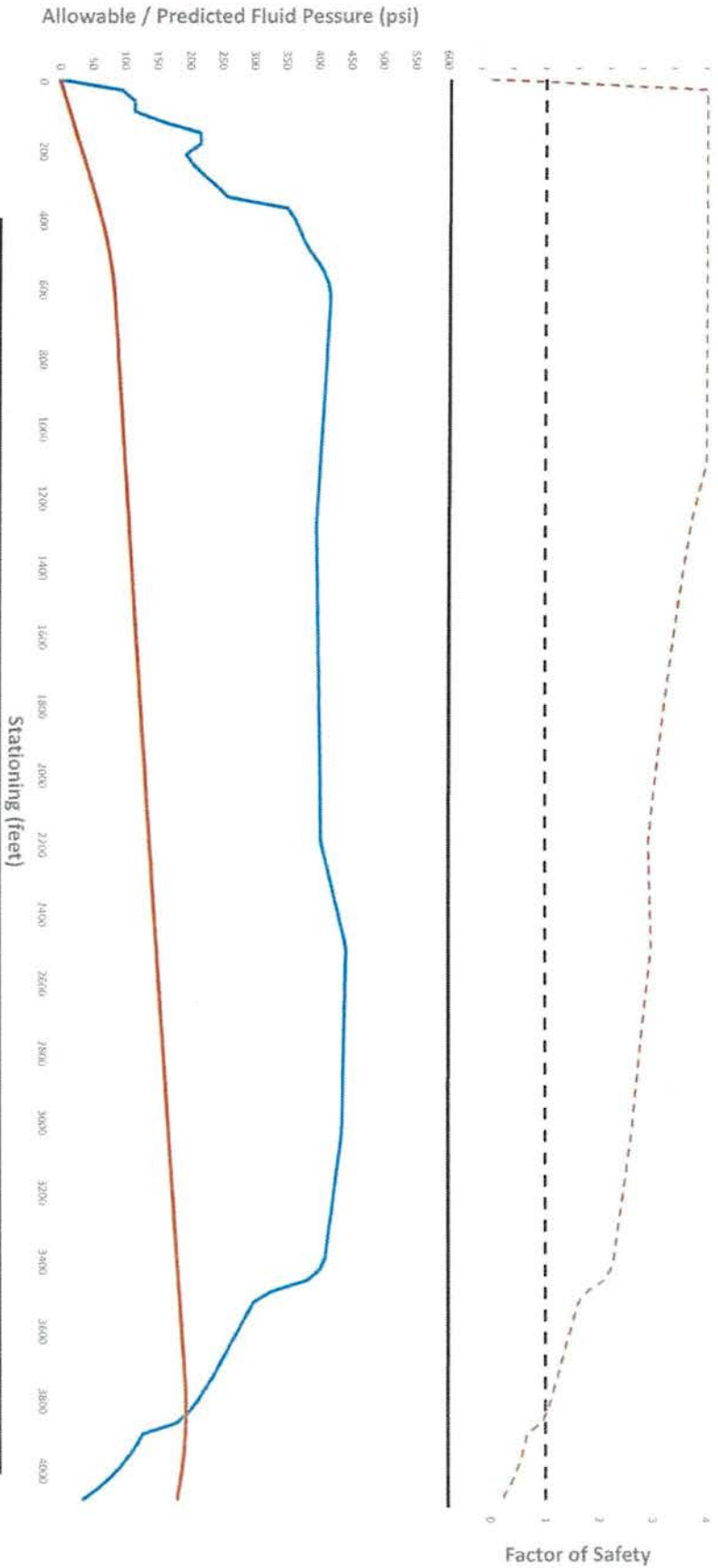
- ANALYSIS WAS BASED ON:
- A. ENTRY ANGLE OF 12 DEGREES.
 - B. EXIT ANGLE OF 13 DEGREES.
 - C. A PILOT HOLE DIAMETER OF 12.25 INCHES.
 - D. A DRILL ROD DIAMETER OF 5.875 INCHES.
 - E. A MUD PUMP OUTPUT OF UP TO 400 GALLONS PER MINUTE.
 - F. A MUD UNIT WEIGHT OF 12 POUNDS PER GALLON.
 - G. TARGET UP-HOLE VELOCITIES IN THIS ANALYSIS ARE APPROXIMATELY 85 FEET PER MINUTE.
 - H. CHANGES IN THE DRILLING FLUID PROPERTIES AND DRILLING EQUIPMENT WILL AFFECT THE ANALYSIS RESULTS.
 - I. A FACTOR OF 5 WAS APPLIED TO CALCULATE THE RADIUS OF THE PLASTIC ZONE USING THE DELFT EQUATION.
- Calculation performed with HDD CALC Version v.3.0.0.



Prof. No.	2020004204	HYDROFRACTURE RISK ANALYSIS OF THE PILOT BORE OFFSHORE CABLE LANDING HORIZONTAL DIRECTIONAL DRILL WINEMA BEACH, OREGON
Drawn By	PR	
Check By	KS	
Date	7/29/2022	

FIGURE
4a

Hydrofracture Risk Analysis for the Pilot Bore with Factor of Safety Plot



ASSUMPTIONS

ANALYSIS WAS BASED ON:

- A. ENTRY ANGLE OF 12 DEGREES.
- B. EXIT ANGLE OF 11 DEGREES.
- C. A PILOT HOLE DIAMETER OF 12.25 INCHES.
- D. A DRILL ROD DIAMETER OF 5.875 INCHES.
- E. A MUD PUP OUTPUT OF UP TO 400 GALLONS PER MINUTE.
- F. A MUD UNIT WEIGHT OF 12 POUNDS PER GALLON.
- G. TARGET UP-HOLE FLUID VELOCITIES IN THIS ANALYSIS ARE APPROXIMATELY 85 FEET PER MINUTE.
- H. CHANGES IN THE DRILLING FLUID PROPERTIES AND DRILLING EQUIPMENT WILL AFFECT THE ANALYSIS RESULTS.
- I. A FACTOR OF 5 WAS APPLIED TO CALCULATE THE RADIUS OF THE PLASTIC ZONE USING THE DUFFY EQUATION.

Calculation performed with HDD CALC Version v.3.0.0.

	Proj. No. 2022004014	HYDROFRACTURE RISK ANALYSIS OF THE PILOT BORE OFFSHORE CABLE LANDING HORIZONTAL DIRECTIONAL DRILL WINEMA BEACH, OREGON	FIGURE 4b
	Drawn By PR Check By KS Date 7/29/2022		



APPENDIX A
FIELD INVESTIGATION DAILY FIELD REPORTS





Daily Field Report

Project Name	<u>Winema HDD Cable Landing</u>	Date	<u>5/16/2022</u>
Project No.	<u>20230058.001A</u>	Bldg. Permit No.	<u></u>
Location	<u>Winema Beach, Oregon</u>	Time Arrived	<u>0820</u>
Client	<u>RTI</u>	Time Departed	<u>1700</u>
Contractor	<u>Western States, Global Geophysics</u>	Travel Time	<u>1 hr</u>
Equipment Observed	<u>CME 75 Truck Rig</u>	Mileage	<u></u>
Reviewed By	<u>T. DeSouza</u>	Date Reviewed	<u>5/17/2022</u>
		Weather	<u>Sunny</u>

Observations/Remarks:

0820: Arrive on site.

0840: Western States crew arrives on site. Western States crew comprised of Adonis Pablo and Collin.

0845: Evangeline Johnston with Global Geophysics arrives on site.

0900: Meet with Nathan Stoller of Winema Church Camp to discuss plan for the week and access to site

0905: Safety kickoff with entire crew. Frank Cuccio with DRG and Matt Updenkeld with Wave present onsite.

0920: Begin setting up drill rig. Global Geophysics begins clearing a path through vegetation to beach for ERT line.

1010: Begin drilling using mud rotary techniques.

1300: Global begins setting up ERT line.

1400: Discussion with Frank, Matt and Evangeline. Decided to move geophysics line closer to proposed manhole which will require making a new access path through vegetation. Begin clearing new path.

1600: Finish drilling for the day at a depth of 70 ft. Will resume tomorrow using rock coring techniques. Drillers offsite.

1700: New path cleared for geophysics lines, ready to set up in the morning. Offsite.



Daily Field Report

Project Name	<u>Winema HDD Cable Landing</u>	Date	<u>5/17/22</u>
Project No.	<u>20230058.001A</u>	Bldg. Permit No.	<u></u>
Location	<u>Winema Beach, Oregon</u>	Time Arrived	<u>0630</u>
Client	<u>RTI</u>	Time Departed	<u>1700</u>
Contractor	<u>Western States, Global Geophysics</u>	Travel Time	<u>1 hr</u>
Equipment Observed	<u>CME 75 Truck Rig</u>	Mileage	<u></u>
Reviewed By	<u>T. DeSouza</u>	Date Reviewed	<u>5/18/2022</u>
		Weather	<u>Sunny</u>

Observations/Remarks:

0630: Arrive on site. Evangeline with Global Geophysics already on site setting up ERT line from proposed manhole to the beach.

0720: Western states crew arrives on site. Begin setting up outer casing to 65' prepare for coring.

0840: Outer casing set. Begin coring.

1300: Finished ERT, clean up and set up MASW line from manhole to the beach.

1430: Global geophysics on standby waiting for drill rig to finish since the vibrations from the rig provide too much noise on data to continue work.

1515: Drill crew runs out of water for drill rig. End drilling for the day at a depth of 120 ft. to go and refill water tank.

Resume geophysics work.

1530: Drillers offsite.

1645: Finish MASW, clean up.

1700: Everyone offsite.



Daily Field Report

Project Name	<u>Winema HDD Cable Landing</u>	Date	<u>5/18/22</u>
Project No.	<u>20230058.001A</u>	Bldg. Permit No.	<u></u>
Location	<u>Winema Beach, Oregon</u>	Time Arrived	<u>0700</u>
Client	<u>RTI</u>	Time Departed	<u>1900</u>
Contractor	<u>Western States, Global Geophysics</u>	Travel Time	<u>1 hr</u>
Equipment Observed	<u>CME 75 Truck Rig</u>	Mileage	<u></u>
Reviewed By	<u>T. DeSouza</u>	Date Reviewed	<u>5/19/2022</u>
		Weather	<u>Rain</u>

Observations/Remarks:

0700: Arrive on site.
0710: Global geophysics arrives on site and sets up MASW on the beach during low tide. Informed that ERT work performed yesterday did not successfully obtain data due to equipment issues. Will perform ERT during second mobilization for offshore work.
0715: Western States arrives on site and prepares to resume drilling.
0740: Resume coring.
1000: Terminate boring at a depth of 151.5'. Begin removing inner drill rods.
1100: Drill crew on standby waiting for Global geophysics to perform downhole MASW test in boring.
1200: Begin downhole test.
1530: Finish downhole MASW. Global Geophysics cleans up. Western States sets up to grout boring.
1630: Finished grouting boring with a bentonite grout mix pumped via tremie pipe for entire depth of boring. Begin cleaning up. Global Geophysics offsite
1830: Boring topped off with native soil and site restored to original condition. Met with Nathan Stoller with the church camp and received his approval of the site conditions prior to leaving.
1900: Offsite.





Daily Progress Report

Project Name	<u>Winema HDD Cable Landing</u>	Date	<u>6/11/22</u>
Project No.	<u>20230058.001A</u>	DPR No.	<u>001</u>
Location	<u>Winema Beach, Oregon</u>	Time Arrived	<u> </u>
Client	<u>RTI</u>	Time Departed	<u> </u>
Contractor	<u>Global Geophysics</u>	Travel Time	<u> </u>
Equipment Observed	<u>N/A</u>	Mileage	<u> </u>
ASN Representative	<u>Dave Edgington</u>	Date Reviewed	<u>6/11/22</u>
		Weather	<u> </u>

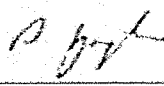
Observations/Remarks:

Summary:

Last 24 hours: N/A
Progress to Date: N/A
Next 24 hours: Perform ERT test on the beach

Notes:

No work carried out. DPR started to maintain consistency with ASN's DPR numbers. On hire from 6/12/22

	
_____ ASN Representative	_____ Pedro Rivas Kleinfelder Representative



Daily Progress Report

Project Name	<u>Winema HDD Cable Landing</u>	Date	<u>6/12/22</u>
Project No.	<u>20230058.001A</u>	DPR No.	<u>002</u>
Location	<u>Winema Beach, Oregon</u>	Time Arrived	<u>0530</u>
Client	<u>RTI</u>	Time Departed	<u>0930</u>
Contractor	<u>Global Geophysics</u>	Travel Time	<u>1 hr</u>
Equipment Observed	<u>N/A</u>	Mileage	<u></u>
ASN Representative	<u>Dave Edgington</u>	Date Reviewed	<u>6/12/22</u>
		Weather	<u>Light Rain</u>

Observations/Remarks:

Summary:

Last 24 hours: Mobilize to project site
 Progress to Date: Perform ERT test on the beach
 Next 24 hours: Demobilize

Personnel Onsite:

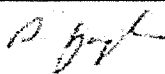
Name	Association	Phone	Hours Worked
Pedro Rivas	Kleinfelder	559.360.0247	4
John Liu	Global Geophysics	425.890.4321	4
Matthew Updenkelder	Wave	541.760.9822	4
Total Hours Worked			12

Events Log:

0530: Tailboard meeting
 0540: Begin set up of onshore ERT test
 0720: Finish set up and begin test
 0830: Finish test, clean up
 0930: Offsite

Notes:

Offshore geophysics was delayed per boat captain noting conditions not being suitable for work. Date for remobilization to be determined


 ASN Representative

Pedro Rivas

Kleinfelder Representative





Weather Forecast

	TODAY				TOMORROW								TUE, JUN 14							
Time	14	17	20	23	02	05	08	11	14	17	20	23	02	05	08	11	14	17	20	23
Wind direction	↘	↘	↘	↘	↘	↘	↘	→	→	→	→	→	→	→	↘	↘	↘	↘	↘	↘
Wind speed (knots)	13	12	11	13	14	10	9.7	7.8	9.3	8.5	8.1	8.1	8.9	8.3	11	10	8.7	8.0	4.8	2.9
Wind gusts (knots)	14	14	15	17	17	15	13	11	12	11	12	12	13	13	15	12	9.5	8.5	6.0	3.7
Temperature (°C)	13	13	12	11	11	10	11	11	13	13	12	11	11	11	11	12	13	13	12	9.7
Cloud coverage																				
Precipitation (mm/3h)	0.3	0.2	0.3	0.8	2.4	1.8	0.7	0.9	1.2	0.8	0.4	0.6	0.8	0.7	0.8	0.9	0.4	0.2	-	-
Waves direction																				
Waves height (m)	1.4	1.4	1.5	1.6	1.6	1.6	1.6	1.5	1.5	1.5	1.4	1.4	1.4	1.4	1.5	1.4	1.4	1.4	1.4	1.3
Waves period (s)	7s	7s	8s	8s	6s	6s	6s	5s	6s	6s	6s	6s	6s	6s	6s	6s	6s	6s	6s	6s





ERT test set up on the beach





Daily Progress Report

Project Name	<u>Winema HDD Cable Landing</u>	Date	<u>7/7/22</u>
Project No.	<u>20230058.001A</u>	DPR No.	<u>003</u>
Location	<u>Winema Beach, Oregon</u>	Time Arrived	<u>0545</u>
Client	<u>RTI</u>	Time Departed	<u>1400</u>
Contractor	<u>Global Geophysics</u>	Travel Time	<u>2 hr</u>
Equipment Observed	<u>N/A</u>	Mileage	<u></u>
ASN Representative	<u>N/A</u>	Date Reviewed	<u></u>
		Weather	<u>Overcast/Cool</u>

Observations/Remarks:

Summary:

Last 24 hours: Mobilize to project site
 Progress to Date: Attempted ERT test offshore
 Next 24 hours: Continue ERT test offshore

Personnel Onsite:

Name	Association	Phone	Hours Worked
Pedro Rivas	Kleinfelder	559.360.0247	8
John Liu	Global Geophysics	425.890.4321	8
Evangeline Johnston	Global Geophysics	-	8
Demar Hagger	Big Bites Charters	503.333.4634	8
David Tindall	Big Bites Charters	-	8
Aaron McCann	Big Bites Charters	-	8
Total Hours Worked			48

Events Log:

0545: Onsite, charter boat being offloaded at the marina
 0600: Tailboard meeting with Global Geophysics and Big Bites Charters crews.
 0610: Geophysics equipment is loaded onto boats
 0630: Boats depart marina
 0930: Crew arrives at project site. Had difficulty traversing high waves. Scopes out and verifies alignment.
 1000: Begin setting up to perform ERT
 1140: Crew mentions having trouble anchoring.
 1200: Due to anchoring problem, ERT cable head is pulled into the water and possibly damaged. Unable to continue for the day. Head back to marina
 1330: Arrive at marina, offload equipment
 1400: Offsite

Notes:

ERT cable was pulled into ocean due to the boat not being anchored properly. Sensitive sensors at the cable head were submerged underwater and deemed unusable until fixed. Work is planning to continue with backup cables. Charter boat plans to acquire heavier anchors by tomorrow to keep the boat stable and continue work.

ASN Representative

Pedro Rivas

Kleinfelder Representative





Weather Forecast

	TODAY			TOMORROW						SAT, JUL 9									
Time	17	20	23	02	05	08	11	14	17	20	23	02	05	08	11	14	17	20	23
Wind direction	↘	↘	↘	↘	↘	↘	↘	↘	↘	↓	↓	↙	↙	↘	↘	↘	↘	↓	↓
Wind speed (knots)	6.2	1.9	2.9	3.9	3.5	2.5	4.3	6.6	7.0	4.8	3.9	2.7	3.1	2.1	5.6	7.2	8.1	5.8	2.7
Wind gusts (knots)	6.4	2.5	2.7	3.7	3.5	2.5	3.5	6.6	8.1	7.0	4.5	3.1	3.1	2.7	6.4	7.8	10	8.5	3.3
Temperature (°C)	17	16	14	14	13	15	17	18	18	17	15	14	13	15	17	18	17	16	14
Cloud coverage																			
Precipitation (mm/3h)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Waves direction	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Waves height (m)	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.7	0.7
Waves period (s)	7s	7s	7s	7s	7s	6s	6s	6s	6s	6s	6s	6s	6s	6s	6s	6s	6s	6s	6s



Daily Progress Report

Project Name	<u>Winema HDD Cable Landing</u>	Date	<u>7/7/22</u>
Project No.	<u>20230058.001A</u>	DPR No.	<u>003</u>
Location	<u>Winema Beach, Oregon</u>	Time Arrived	<u>0545</u>
Client	<u>RTI</u>	Time Departed	<u>1400</u>
Contractor	<u>Global Geophysics</u>	Travel Time	<u>2 hr</u>
Equipment Observed	<u>Charter Boats</u>	Mileage	<u></u>
ASN Representative	<u>N/A</u>	Date Reviewed	<u></u>
		Weather	<u>Overcast/Cool</u>

Observations/Remarks:

Summary:

Last 24 hours: Mobilize to project site
 Progress to Date: Attempted ERT test offshore
 Next 24 hours: Continue ERT test offshore

Personnel Onsite:

Name	Association	Phone	Hours Worked
Pedro Rivas	Kleinfelder	559.360.0247	8
John Liu	Global Geophysics	425.890.4321	8
Evangeline Johnston	Global Geophysics	-	8
Demar Hagger	Big Bites Charters	503.333.4634	8
David Tindall	Big Bites Charters	-	8
Aaron McCann	Big Bites Charters	-	8
Total Hours Worked			48

Events Log:

0545: Onsite, charter boat being offloaded at the marina
 0600: Tailboard meeting with Global Geophysics and Big Bites Charters crews.
 0610: Geophysics equipment is loaded onto boats
 0630: Boats depart marina
 0930: Crew arrives at project site. Slow travel due to difficulty traversing high waves. Scopes out and verifies alignment.
 1000: Begin setting up to perform ERT
 1140: Crew mentions having trouble anchoring.
 1200: Due to anchoring problem, ERT cable head is pulled into the water and possibly damaged. Unable to continue for the day. Head back to marina
 1330: Arrive at marina, offload equipment
 1400: Offsite

Notes:

ERT cable was pulled into ocean due to the boat not being anchored properly. Sensitive sensors at the cable head were submerged underwater and deemed unusable until fixed. Work is planning to continue with backup cables. Charter boat plans to acquire heavier anchors by tomorrow to keep the boat stable and continue work.

ASN Representative

Pedro Rivas

Kleinfelder Representative



Weather Forecast

	TODAY			TOMORROW						SAT, JUL 9									
Time	17	20	23	02	05	08	11	14	17	20	23	02	05	08	11	14	17	20	23
Wind direction	↘	↘	↘	↘	↘	↘	↘	↘	↘	↓	↓	↙	↙	↔	↘	↘	↘	↓	↓
Wind speed (knots)	6.2	1.9	2.9	3.9	3.5	2.5	4.3	6.6	7.0	4.8	3.9	2.7	3.1	2.1	5.6	7.2	8.1	5.8	2.7
Wind gusts (knots)	6.4	2.5	2.7	3.7	3.5	2.5	3.5	6.6	8.1	7.0	4.5	3.1	3.1	2.7	6.4	7.8	10	8.5	3.3
Temperature (°C)	17	16	14	14	13	15	17	18	18	17	15	14	13	15	17	18	17	16	14
Cloud coverage																			
Precipitation (mm/3h)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Waves direction	↘	↘	↘	↘	↘	↘	↘	↘	↘	↘	↘	↘	↘	↘	↘	↘	↘	↘	↘
Waves height (m)	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.7	0.7
Waves period (s)	7s	7s	7s	7s	7s	6s	6s	6s	6s	6s	6s	6s	6s	6s	6s	6s	6s	6s	6s



Daily Progress Report

Project Name	<u>Winema HDD Cable Landing</u>	Date	<u>7/8/22</u>
Project No.	<u>20230058.001A</u>	DPR No.	<u>004</u>
Location	<u>Winema Beach, Oregon</u>	Time Arrived	<u>0600</u>
Client	<u>RTI</u>	Time Departed	<u>1400</u>
Contractor	<u>Global Geophysics</u>	Travel Time	<u>2 hr</u>
Equipment Observed	<u>Charter Boats</u>	Mileage	<u></u>
ASN Representative	<u>N/A</u>	Date Reviewed	<u></u>
		Weather	<u>Clear/Sunny</u>

Observations/Remarks:

Summary:

Last 24 hours: Attempted ERT test offshore
 Progress to Date: Completed ERT test offshore
 Next 24 hours: Perform offshore seismic profiling

Personnel Onsite:

Name	Association	Phone	Hours Worked
Pedro Rivas	Kleinfelder	559.360.0247	9.5
John Liu	Global Geophysics	425.890.4321	9.5
Evangeline Johnston	Global Geophysics	-	9.5
Demar Hagger	Big Bites Charters	503.333.4634	9.5
David Tindall	Big Bites Charters	-	9.5
Aaron McCann	Big Bites Charters	-	9.5
Total Hours Worked			57

Events Log:

0600: Tailboard meeting with Global Geophysics and Big Bites Charters crews and equipment is loaded onto boats.
 0610: Boats depart marina
 0730: Crew arrives at project site. Begin setting up to perform ERT test
 1345: Finish ERT tests. Head back to marina
 1500: Arrive at marina, offload equipment
 1530: Offsite

Notes:

 ASN Representative Pedro Rivas
Kleinfelder Representative



Weather Forecast

	TODAY				TOMORROW							
Time	14	17	20	23	02	05	08	11	14	17	20	23
Wind direction	↘	↘	↓	↓	↗	↗	↗	↘	↘	↘	↘	↗
Wind speed (knots)	8.1	8.5	8.3	6.8	4.7	3.9	2.7	6.2	6.4	7.2	4.8	1.9
Wind gusts (knots)	7.6	11	12	9.5	6.8	4.3	4.3	7.8	7.0	8.5	7.2	2.1
Temperature (°C)	18	17	16	14	14	13	14	17	17	17	16	15
Cloud coverage												
Precipitation (mm/3h)	-	-	-	-	-	-	-	-	-	-	-	-
Waves direction	←	→	→	→	→	→	→	→	→	→	→	→
Waves height (m)	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.6
Waves period (s)	7s	7s	7s	7s	7s	7s	7s	7s	6s	6s	6s	6s



ERT Testing performed along proposed alignment





Daily Progress Report

Project Name	Winema HDD Cable Landing	Date	7/9/22
Project No.	20230058.001A	DPR No.	005
Location	Winema Beach, Oregon	Time Arrived	0600
Client	RTI	Time Departed	1330
Contractor	Global Geophysics	Travel Time	2 hr
Equipment Observed	Charter Boat	Mileage	
ASN Representative	N/A	Date Reviewed	
		Weather	Clear/Sunny

Observations/Remarks:

Summary:

Last 24 hours: Completed ERT test offshore
 Progress to Date: Completed offshore seismic profiling
 Next 24 hours: N/A

Personnel Onsite:

Name	Association	Phone	Hours Worked
Pedro Rivas	Kleinfelder	559.360.0247	8
John Liu	Global Geophysics	425.890.4321	8
Evangeline Johnston	Global Geophysics	-	8
Demar Hagger	Big Bites Charters	503.333.4634	8
Total Hours Worked			32

Events Log:

0600: Tailboard meeting with Global Geophysics and Big Bites Charters crews and equipment is loaded onto boat.
 0645: Charter boat departs marina
 0800: Crew arrives at project site. Begin setting up to perform seismic profiling
 1215: Finish test. Head back to marina
 1330: Arrive at marina, offload equipment
 1400: Offsite

Notes:

ASN Representative

Pedro Rivas

Kleinfelder Representative



Seismic profiling performed offshore along proposed alignment





Daily Progress Report

Project Name	Winema HDD Cable Landing	Date	7/9/22
Project No.	20230058.001A	DPR No.	005
Location	Winema Beach, Oregon	Time Arrived	0600
Client	RTI	Time Departed	1400
Contractor	Global Geophysics	Travel Time	2 hr
Equipment Observed	Charter Boat	Mileage	
ASN Representative	N/A	Date Reviewed	
		Weather	Clear/Sunny

Observations/Remarks:

Summary:

Last 24 hours: Completed ERT test offshore
 Progress to Date: Completed offshore seismic profiling
 Next 24 hours: N/A

Personnel Onsite:

Name	Association	Phone	Hours Worked
Pedro Rivas	Kleinfelder	559.360.0247	8
John Liu	Global Geophysics	425.890.4321	8
Evangeline Johnston	Global Geophysics	-	8
Demar Hagger	Big Bites Charters	503.333.4634	8
Total Hours Worked			32

Events Log:

0600: Tailboard meeting with Global Geophysics and Big Bites Charters crews and equipment is loaded onto boat.
 0645: Charter boat departs marina
 0800: Crew arrives at project site. Begin setting up to perform seismic profiling
 1215: Finish test. Head back to marina
 1330: Arrive at marina, offload equipment
 1400: Offsite

Notes:

ASN Representative	Pedro Rivas
Kleinfelder Representative	Kleinfelder Representative



Seismic profiling performed offshore along proposed alignment





APPENDIX B

AVAILABLE FIELD EXPLORATION EQUIPMENT DOCUMENTATION

LIST OF ATTACHMENTS

The following sheets are attached and complete this appendix.

Appendix B-1	Drill Rig Specifications
Appendix B-2	Drill Rig Hammer Efficiency Calibration
Appendix B-3	Geophysical Survey Equipment Specifications





APPENDIX B-1

Drill Rig Specifications

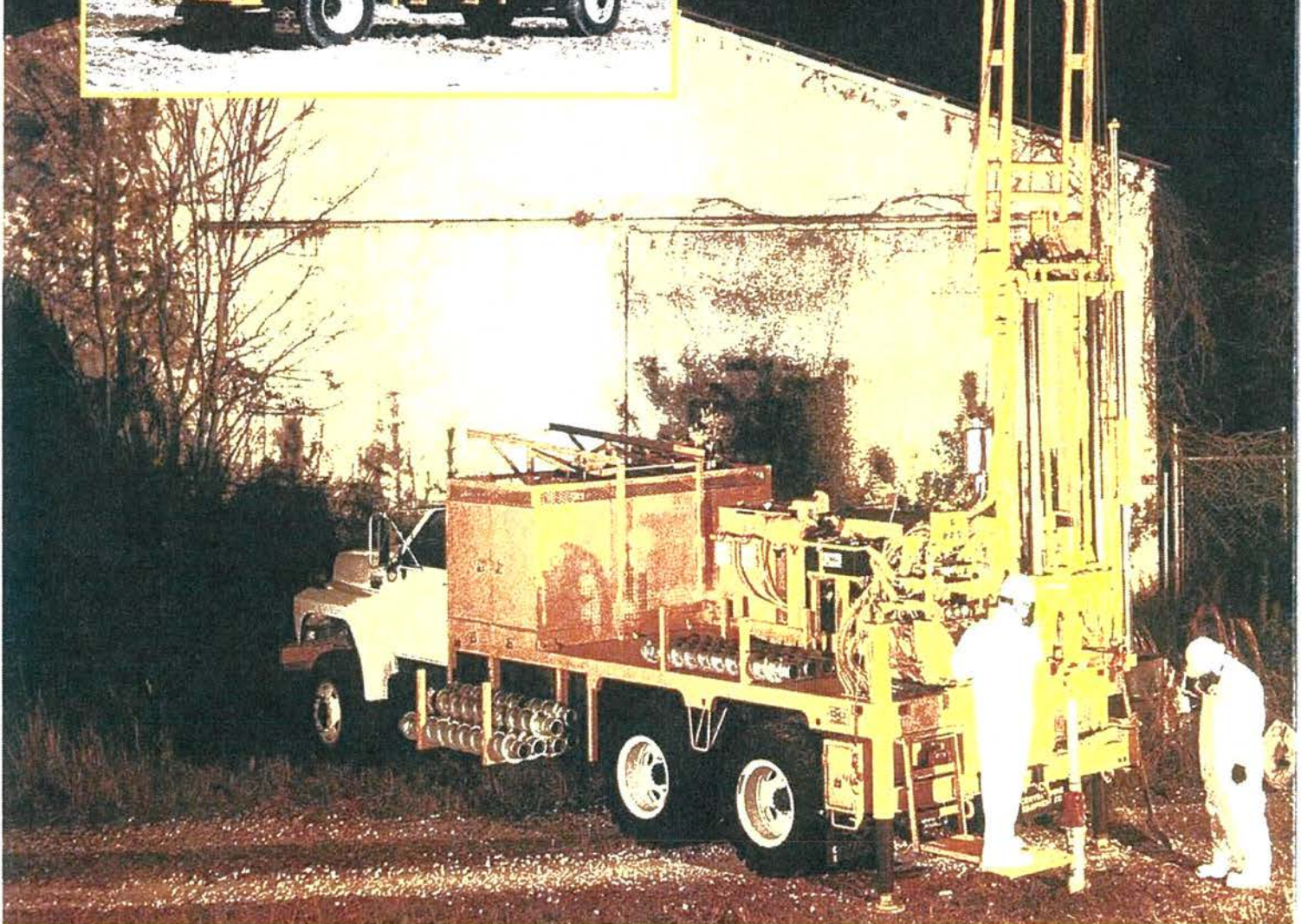


CME-75



Versatility...

Available mounted on single
or tandem rear axle truck



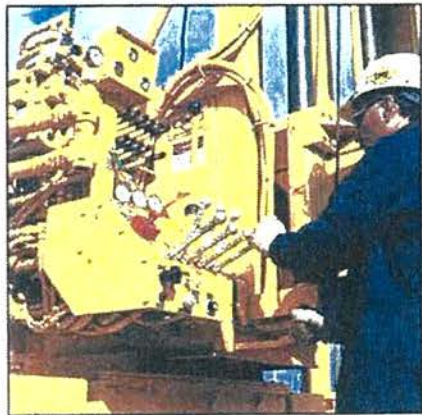
Performance and Dependability, the CME-75 delivers

Ever wonder why you see so many CME-75 drills out there in the field? It's really quite simple. With over 45 years of field experience, the CME-75 has earned a reputation second to none for outstanding performance and dependability.

Hydraulic feed and retract system provides 30,000 pounds of retract force and 20,000 pounds of down pressure.

The twin 72 inch stroke feed cylinders of the hydraulic vertical drive system are in line with the drill spindle providing precise control of force on the drilling tools.

The split, two piece, feed slide bushings are easily



replaced after normal wear intervals. And the standard upright gives you clearance to drill with 12 1/4 inch I.D. hollow augers.

For exceptional drilling efficiency the feed system has two separate controls. One gives you manual control of

feed and retract and features both normal and fast retract positions. Retract rates of up to 95 feet per minute let you add or remove drilling tools quickly.

The other is used exclusively for feed and has a detent engaged position. Pressure controls let you dial in specific feed rate and feed pressure. This system is extremely advantageous in core drilling and other operations that require precise control of feed.

And since the two controls are isolated, you can use the manual control for rapid retract without changing pressure settings for the detent feed control.

Control logic - the key to operator productivity

Drilling and set-up controls are logically arranged on a control panel located at the driller's station. The most frequently used controls, such as the feed, hydraulic hoists and sliding base levers, are staggered for easier identification and operation. A lock-out position for the clutch lever helps prevent accidental engagement.

Rugged mechanical rotary drive provides over 10,400 foot pounds of torque, plus high rotation speed when you need it

You get the torque you need for auger drilling, as well as rotation speeds over 745 rpm for rotary or core drilling applications. Other optional rotation speed and torque combinations are also available, including a high-torque rotary drive that gives you 13,200 foot pounds of torque.

With five forward gears and one reverse, there's a rotation speed and torque combination available for just about any situation. The transmission is connected to the drill engine through a heavy duty 13 inch clutch.

Patented spindle brake stops rotation in an instant

Our emergency spindle brake can stop rotation in less than a revolution. This system is activated by two conveniently located push button switches as well as by strategically located, multi-directional wobble switches.



Safety...
it's a habit you can live with.

Optional Equipment for even more productivity

Automatic SPT hammer*

Our 140-pound (63.5 kg) automatic hammer gives you extremely consistent and accurate Standard Penetration Test results, meeting all ASTM-D-1586-99 requirements. There are no ropes or cables to impede the free-fall of the weight. A viewing slot allows you to verify the 30 inch (76 cm) fall height.

The hammer swings on a hydraulic cylinder, from the stored position to on-hole position. And the six foot vertical travel also allows you to use the hammer to drive casing or probes. Since raising and lowering is done hydraulically, set-up is quick and almost effortless.

To improve safety, all moving parts are enclosed, including the impact area between weight and anvil.

Other hammers with internationally accepted weight and fall height configurations are available, including a combination 340/140 pound (154/63.5 kg) model.



Hydraulic rod holder and breakout wrench*

The hydraulic rod holder makes your job quicker and safer. It not only pivots from on-hole to off-hole positions, but also hydraulically telescopes in and out. It is especially compatible with the optional in-out and sideways slide bases.



Slide bases make the job easier and quicker

Slide base options are available for both in-out and sideways movement of the drill on the platform.

An 18 inch in-out movement allows you to quickly move the drill off the borehole and align the sheaves for lifting tools with the cathead or any of the hoists.

An 16 inch sideways movement gives you even more versatility. Aligning augers or rods when making connections is easy. Or, if the bit drifts off at an angle when you start a hole, you can quickly straighten it to a vertical position.

If you've ever tried to line up your rig on an existing borehole, you've probably already recognized another benefit of the slide bases.

Quick mast disconnect

This feature allows you to quickly disconnect the optional mast when working inside buildings, underneath bridges or in other low overhead drilling locations. Since the mast is completely separated from the uprights, it doesn't interfere with other drill functions such as the optional slide bases.



With the mast in a horizontal position, you simply clamp it to its storage rack and extend the drill's in-out slide base. This pulls the sockets on the upright drill frame away from the large tapered pins on the mast.

Angle drilling system for special applications*

This unique system is especially effective for drilling underneath ponds, storage tanks or other structures. When used with our patented Continuous Sample Tube System, you can even take soil samples while drilling angle holes.

And, since the kelly drive is directly connected to the right angle drive box, you can raise or lower the mast with the drive-train already connected and ready to go.



Fluted kelly and chuck assembly

If your drilling operations include a substantial amount of core or rotary drilling, the CME fluted kelly and chuck assembly can save you a lot of time. The 5 foot stroke of the kelly, combined with the 6 foot stroke of the feed system, gives you a total stroke of 11 feet. You can use 10 foot drill rods, which means fewer rod connections and less rod handling.

The kelly has two vertical slots and two horizontal slots which are engaged by the chuck to provide rotary torque and thrust. The CME fluted kelly can even be rotated without engaging the thrust plungers. This gives you the option of using the weight of the drill string to provide down pressure on the bit.

The 2 5/8 inch fluted kelly and chuck assembly is available in either manual or hydraulically actuated configurations. Or, for larger diameter holes, a 3 1/2 inch O.D. fluted kelly and hydraulic chuck assembly is available.



Plenty of auger storage available

Above deck auger storage areas are provided with the optional drill platform. The CME-75 is also available with several under body auger rack configurations, including hydraulically operated racks that slide in and out for easy access to augers.



Water tank / tool box combinations

You can choose a 250 gallon or a 500 gallon water tank. Numerous water tank/tool box configurations are available, including models with rod storage capacity underneath and an expanded metal rack on top.



Additional optional equipment

- Drill platform
- Continuous Sample Tube System
- High torque or high speed rotary drive
- CPT controls
- Mast, 22 ft. or 26 ft.
(from base of frame to sheaves)
- Underside sheave
- Low clearance sheave
- Cathead, 8 in. diameter
- 8,500 lb. hydraulic hoist
max line speed...72 ft./min. up - 310 ft./min. dwn
- 7,000 lb. hydraulic hoist
max line speed...85 ft./min. up - 340 ft./min. dwn
- 3,200 lb. hydraulic hoist
max line speed...100 ft./min.
- 1,800 lb. hydraulic hoist
max line speed...200 ft./min.
- Hydraulic wireline hoist (1800 lb. pull)
max line speed...200 ft./min.
- Auger and rod guides for angle drilling
- Probe hammer
- Spindle Adapter
- Water pumps:

Moyno 3L6.....	36 gpm/225 psi
Moyno 3L8.....	84 gpm/225 psi
Bean.....	25 gpm/500 psi
Bean.....	35 gpm/500 psi
Gardner Denver 4 1/2x5.....	1.48 gpm/197 psi
Gardner Denver 5x6.....	200 gpm/310 psi

 (Other pumps available)

CME-75



Specifications

Power

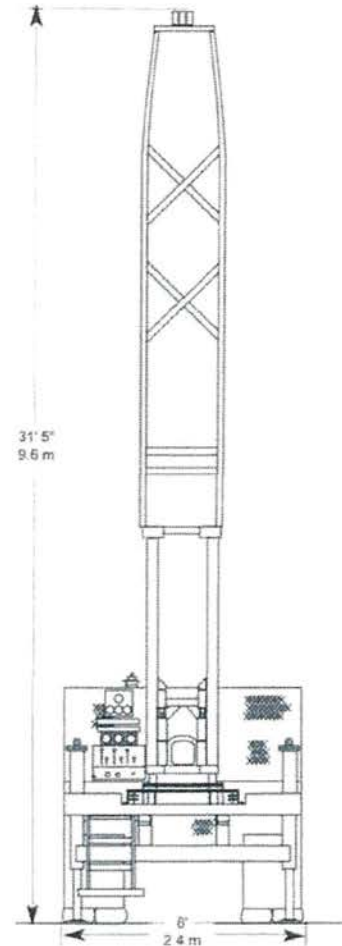
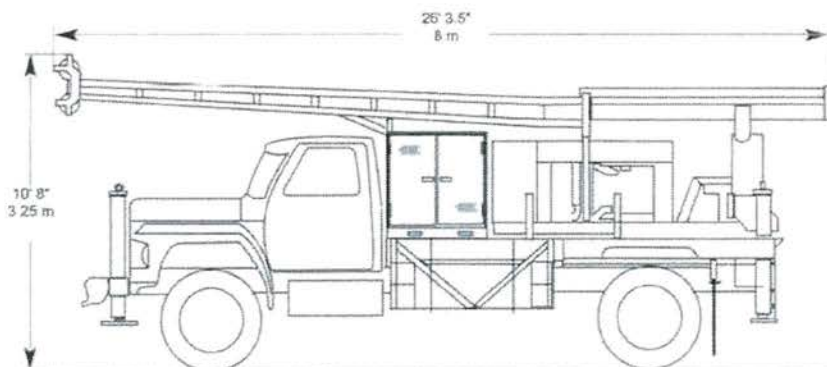
Cummins QSB 4.5L turbo charged Tier-4f diesel engine

Rotary Drive

Clutch, heavy duty.....13 in. (33 cm)
 Transmission5 speed fwd., 1 speed rev.
 Rotary torque10,445 ft. lbs. (14,160 Nm)
 Rotary torque (optional).....13,225 ft. lbs. (17,930 Nm)
 Rotary speed745 rpm max
 Rotary speed (optional).....930 rpm max
 Hollow spindle I.D.....2 3/4 in. (7 cm) {3 3/4 in.(9.5 cm) avail.}

Hydraulic Feed System

Retract force30,000 lbs. (13,608 Kg)
 Pulldown force20,000 lbs. (9,072 Kg)
 Retract rate (max).....95 ft./min. (29 m/min)
 Feed rate (max).....52 ft./min. (16 m/min)
 Stroke.....72 in. (1.8 m)



Typical single rear axle truck configuration with 26' mast and optional deck platform.

Dimensions will vary, depending on truck wheel base and all-wheel drive or tandem rear axle applications.

Central Mine Equipment Company manufactures a complete line of drilling equipment for the environmental, geotechnical and water well drilling industries of the world. We have been a leader in drilling product quality, innovation and service for over ninety years.



CENTRAL MINE EQUIPMENT COMPANY

4215 Rider Trail North, Earth City (St. Louis), Missouri, 63045 USA

Phone: 314-291-7700 • 1-800-325-8827 • FAX: 314-291-4880

E-mail: info@cmeco.com • Website: www.cmeco.com



APPENDIX B-2

Drill Rig Hammer Efficiency Calibration



Table 1. Energy Transfer Ratio and Correction Factors

Rig No.	Energy Transfer Ratio	Correction Factor
Track Rig #2	75.1	1.252
Track Rig #3	77.2	1.287
Truck Rig #4	77.5	1.292
Truck Rig #5	85.5	1.425
Track Rig #7	71.6	1.193
Track Rig #8	74.3	1.238
Truck Rig #9	77.7	1.295
Track Rig #10	77.0	1.283
Track Rig #12	81.4	1.357

The transfer energy can vary as a result of changes to rig operating rate and lubrication, rod verticality, rig anvil dimensions, the subassembly, and other varying factors. The dynamic test data and representative wave forms for the SPT hammer systems are presented in Attachment A. ASTM D4633 recommends that the equipment used to perform the calibrations be calibrated every three years or as recommended by the manufacturer. Calibration information for the equipment is presented in Attachment B.

◆ ◆ ◆

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SPT Analyzer Results

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WSSC-8-06

RIG #5

GJS

Interval start: 12/23/2021

WSSC

AR: 1.43 in²

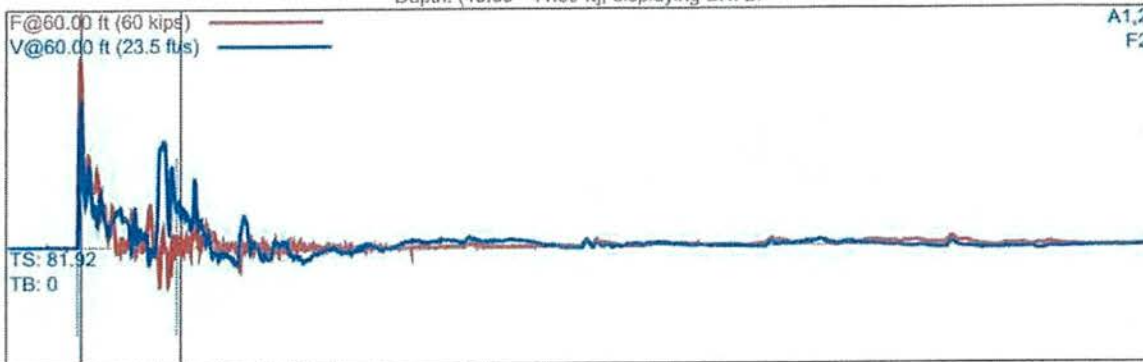
SP: 0.492 k/ft³

LE: 60.00 ft

EM: 30000 ksi

WS: 16807.9 ft/s

Depth: (40.00 - 41.50 ft), displaying BN: 27



F2: [SPT B2] 213.8 PDICAL (1) FF1

A1 (PR): [K0035] 295 mv/6.4v/5000g (1) VF1

A2 (PR): [K0232] 318 mv/6.4v/5000g (1) VF1

FMX: Maximum Force
VMX: Maximum Velocity
BPM: Blows/Minute

EFV: Maximum Energy
ETR: Energy Transfer Ratio - Rated

BL#	BC /ft	FMX kips	VMX ft/s	BPM bpm	EFV ft-lb	ETR %
1	4	52	15.0	1.9	303	86.5
2	4	48	14.2	42.9	293	83.6
3	4	50	14.7	44.0	310	88.5
4	4	51	14.7	47.0	311	88.8
5	10	51	14.7	50.7	301	86.0
6	10	49	14.7	51.9	302	86.3
7	10	53	15.0	51.7	314	89.7
8	10	49	14.5	52.4	311	89.0
9	10	54	14.8	52.0	310	88.5
10	10	48	14.4	51.8	306	87.4
11	10	50	14.6	52.2	310	88.6
12	10	47	14.3	51.7	297	84.9
13	10	49	14.4	52.3	309	88.4
14	10	50	14.6	51.9	314	89.7
15	15	50	14.5	51.7	312	89.1
16	15	49	14.4	52.4	311	88.8
17	15	47	14.2	51.9	293	83.8
18	15	50	14.8	52.2	315	89.9
19	15	48	14.6	52.3	307	87.6
20	15	51	14.8	51.5	315	90.1
21	15	50	15.0	52.5	311	88.7
22	15	48	14.7	52.1	303	86.5
23	15	50	14.8	51.6	313	89.3
24	15	54	15.2	52.0	314	89.6
25	15	52	14.9	52.0	314	89.7
26	15	54	15.0	52.0	316	90.4
27	15	48	14.7	52.2	303	86.5
28	15	48	14.8	51.9	308	88.0



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SPT Analyzer Results

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29	15	48	14.2	52.1	299	85.4
	Average	50	14.7	52.0	308	88.1
	Std Dev	2	0.2	0.4	6	1.7
	Maximum	54	15.2	52.5	316	90.4
	Minimum	47	14.2	50.7	293	83.8

N-value: 25

Sample Interval Time: 32.87 seconds.



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SPT Analyzer Results

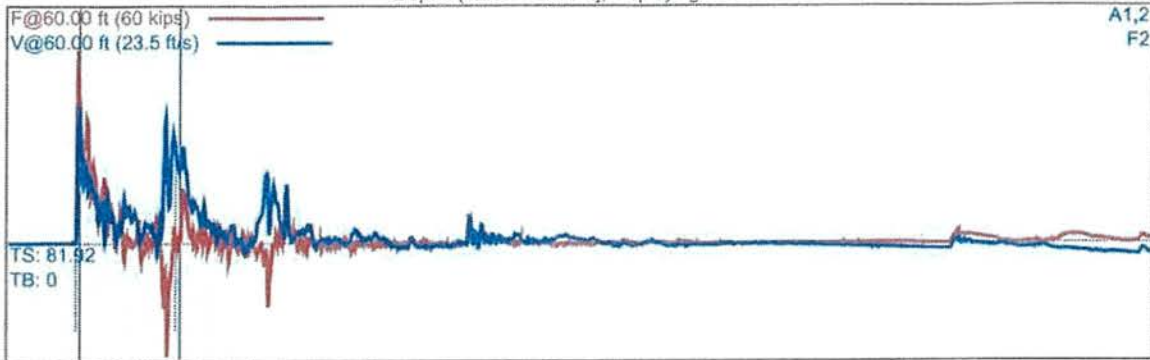
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WSSC-8-06
GJS
WSSC
AR: 1.43 in²
LE: 60.00 ft
WS: 16807.9 ft/s

RIG #5
Interval start: 12/23/2021

SP: 0.492 k/ft³
EM: 30000 ksi

Depth: (42.50 - 44.00 ft), displaying BN: 57



F2 : [SPT B2] 213.8 PDICAL (1) FF1

A1 (PR): [K0035] 295 mv/6.4v/5000g (1) VF1
A2 (PR): [K0232] 318 mv/6.4v/5000g (1) VF1

BL#	BC /6"	FMX kips	VMX ft/s	BPM bpm	EFV ft-lb	ETR %
30	8	47	14.3	1.9	302	86.2
31	8	50	14.7	51.2	305	87.1
32	8	52	14.8	52.0	304	86.8
33	8	49	14.6	51.9	309	88.4
34	8	49	14.3	51.7	309	88.3
35	8	48	14.1	51.9	305	87.0
36	8	47	14.3	52.0	306	87.5
37	8	51	14.3	51.6	307	87.8
38	10	50	14.1	52.1	300	85.8
39	10	49	14.2	52.0	301	85.9
40	10	49	14.2	51.5	302	86.2
41	10	50	14.0	51.8	305	87.2
42	10	51	14.1	52.1	300	85.8
43	10	51	13.8	52.0	298	85.0
44	10	47	14.1	51.8	299	85.5
45	10	47	14.0	52.0	298	85.2
46	10	51	13.8	51.7	298	85.0
47	10	50	13.7	52.4	296	84.5
48	12	48	14.0	51.4	300	85.6
49	12	49	13.8	52.2	299	85.4
50	12	50	14.0	51.9	298	85.2
51	12	48	13.9	52.1	299	85.3
52	12	48	13.8	51.3	304	86.9
53	12	51	13.6	52.5	291	83.3
54	12	48	13.8	51.8	297	84.8
55	12	45	14.0	51.5	296	84.6
56	12	48	14.0	52.2	302	86.3
57	12	49	13.7	52.0	299	85.4
58	12	50	13.5	52.2	292	83.3
59	12	49	13.9	51.8	301	85.9



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SPT Analyzer Results

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Average	49	13.9	51.9	299	85.4
Std Dev	1	0.2	0.3	3	0.9
Maximum	51	14.2	52.5	305	87.2
Minimum	45	13.5	51.3	291	83.3

N-value: 22

Sample Interval Time: 33.48 seconds.



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SPT Analyzer Results

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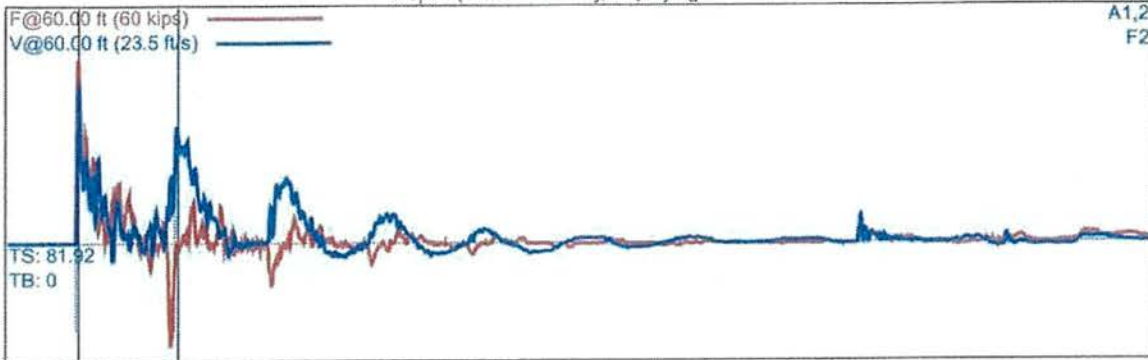
WSSC-8-06
GJS
WSSC

RIG #5
Interval start: 12/23/2021

AR: 1.43 in²
LE: 60.00 ft
WS: 16807.9 ft/s

SP: 0.492 k/ft³
EM: 30000 ksi

Depth: (47.50 - 49.00 ft), displaying BN: 74



F2 : [SPT B2] 213.8 PDICAL (1) FF1

A1 (PR): [K0035] 295 mv/6.4v/5000g (1) VF1
A2 (PR): [K0232] 318 mv/6.4v/5000g (1) VF1

BL#	BC /B"	FMX kips	VMX ft/s	BPM bpm	EFV ft-lb	ETR %
60	2	46	14.6	1.9	312	89.2
61	2	46	14.4	51.2	306	87.3
62	6	45	14.8	51.9	301	86.1
63	6	49	15.2	51.7	306	87.5
64	6	45	14.8	51.9	296	84.5
65	6	46	15.1	51.8	302	86.4
66	6	46	15.3	51.7	312	89.0
67	6	46	15.4	51.9	310	88.6
68	9	46	15.5	51.9	310	88.5
69	9	45	15.2	51.8	299	85.3
70	9	45	15.2	51.8	301	86.0
71	9	45	15.1	51.8	299	85.4
72	9	45	15.2	51.6	301	86.0
73	9	44	15.3	52.1	300	85.6
74	9	47	15.7	51.7	315	90.0
75	9	46	15.4	52.0	306	87.5
76	9	45	15.3	51.8	301	85.9
Average		46	15.2	51.8	304	86.8
Std Dev		1	0.2	0.1	5	1.6
Maximum		49	15.7	52.1	315	90.0
Minimum		44	14.8	51.6	296	84.5

N-value: 15

Sample Interval Time: 18.50 seconds.



Pile Dynamics, Inc.
SPT Analyzer Results

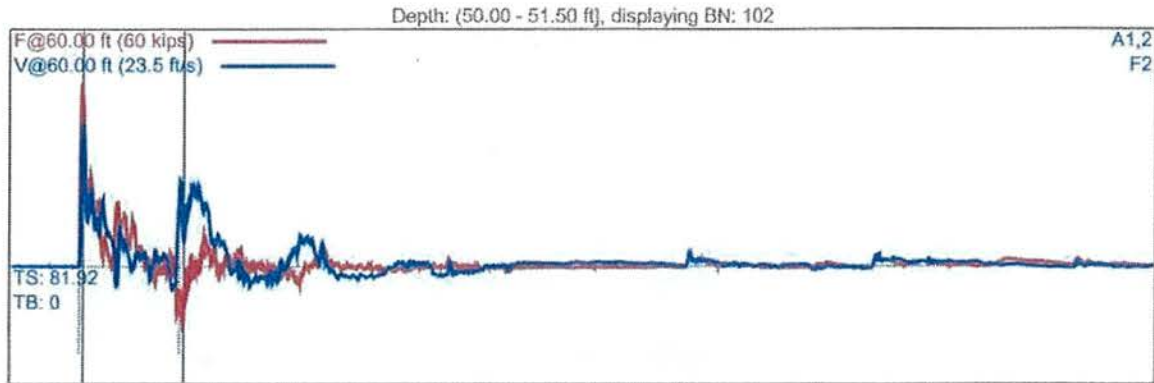
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WSSC-8-06
GJS
WSSC

RIG #5
Interval start: 12/23/2021

AR: 1.43 in²
LE: 60.00 ft
WS: 16807.9 ft/s

SP: 0.492 k/ft³
EM: 30000 ksi



F2 : [SPT B2] 213.8 PDICAL (1) FF1

A1 (PR): [K0035] 295 mv/6.4v/5000g (1) VF1
A2 (PR): [K0232] 318 mv/6.4v/5000g (1) VF1

BL#	BC /6"	FMX kips	VMX ft/s	BPM bpm	EFV ft-lb	ETR %
77	6	0	2.1	1.9	0	0.0
78	6	49	15.5	59.7	296	84.5
79	6	49	15.0	51.2	311	88.9
80	6	46	15.0	51.6	312	89.2
81	6	50	15.3	52.0	306	87.5
82	6	52	15.5	51.7	307	87.7
83	9	50	14.9	51.8	307	87.8
84	9	48	14.8	51.7	309	88.2
85	9	50	15.1	51.5	301	86.1
86	9	50	15.0	52.0	298	85.2
87	9	49	14.9	52.0	300	85.8
88	9	52	15.4	51.4	302	86.4
89	9	50	14.7	51.9	311	89.0
90	9	49	14.4	52.0	307	87.9
91	9	49	14.4	51.9	300	85.7
92	13	50	14.5	51.3	302	86.4
93	13	47	14.2	52.4	293	83.6
94	13	0	1.0	70.0	2	0.6
95	13	49	14.4	41.0	290	82.8
96	13	47	14.2	52.2	300	85.6
97	13	47	14.2	51.5	291	83.1
98	13	46	14.2	51.8	300	85.8
99	13	46	14.2	51.7	304	86.8
100	13	47	14.2	52.2	301	85.9
101	13	47	14.4	51.8	289	82.5
102	13	46	14.2	51.8	287	82.0
103	13	49	14.4	51.9	303	86.5
104	13	46	14.3	51.9	291	83.2



Pile Dynamics, Inc.
SPT Analyzer Results

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Average	46	13.9	52.2	286	81.7
Std Dev	10	2.8	4.5	62	17.8
Maximum	52	15.4	70.0	311	89.0
Minimum	0	1.0	41.0	2	0.6

N-value: 22

Sample Interval Time: 30.97 seconds.



Pile Dynamics, Inc.
SPT Analyzer Results

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Summary of SPT Test Results

Project: WSSC-8-06, Test Date: 12/23/2021

FMX: Maximum Force

VMX: Maximum Velocity

BPM: Blows/Minute

EFV: Maximum Energy
ETR: Energy Transfer Ratio - Rated

Instr.	Blows Applied	N Value	N60 Value	Average FMX klps	Average VMX ft/s	Average BPM bpm	Average EFV ft-lb	Average ETR %
60.00	4-10-15	25	35	50	14.7	52.0	308	88.4
60.00	8-10-12	22	31	49	13.9	51.9	299	85.4
60.00	2-6-9	15	21	46	15.2	51.8	304	85.8
60.00	6-9-13	22	31	49	13.9	52.2	286	81.7
Overall Average Values:				48	14.4	52.0	299	85.5
Standard Deviation:				6	1.6	2.3	33	3.5
Overall Maximum Value:				54	15.7	70.0	316	80.4
Overall Minimum Value:				0	1.0	41.0	2	0.6





APPENDIX B-3

Geophysical Survey Equipment Specifications



Geostuff

Wall-Lock Borehole Geophones

- 3-component tri-axial sensors
- Motor-driven clamp mechanism
- Fits in 2-inch (51-mm) boreholes
- Automatic orientation of horizontal geophones to any azimuth (Model BHG-3)
- Cable disconnects for convenient surface handling and extending depth
- Works in wet or dry holes

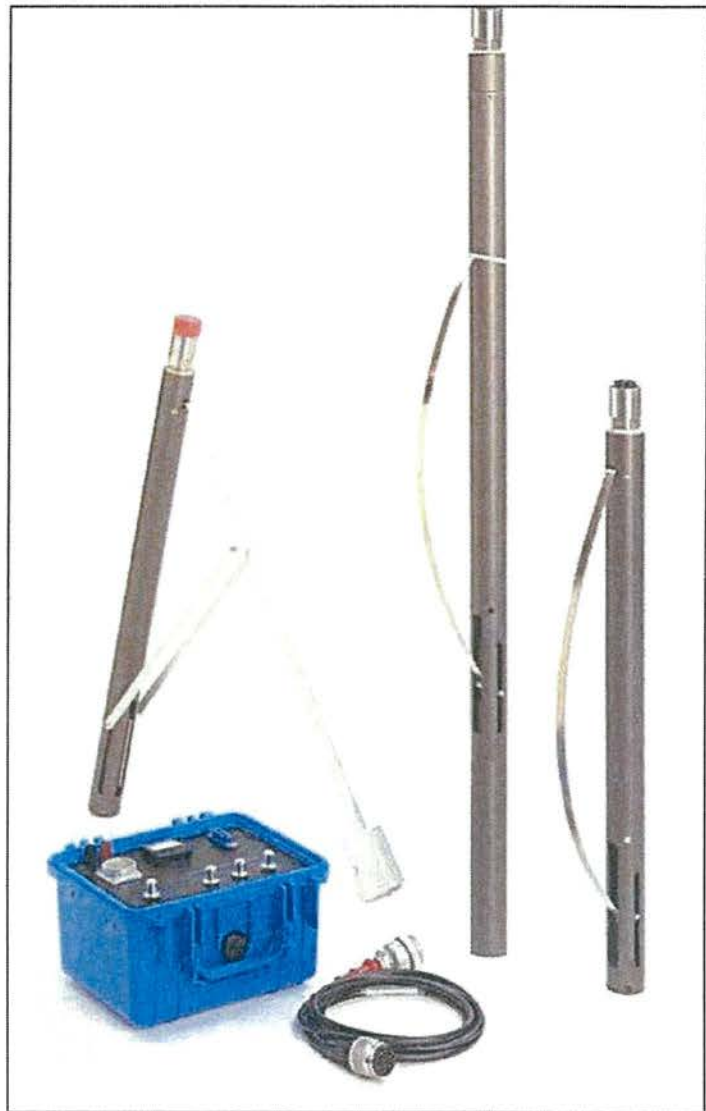
Geostuff's BHG series, 3-component borehole geophones are designed for shallow seismic velocity measurements. Both units include a motor-driven clamp to hold the sensor in position in the borehole.

These geophones are applicable to a wide variety of shallow surveys, including shothole logging, downhole shear wave measurements, static corrections for petroleum shear-wave reflection surveys, cross-hole, tomographic, seam wave, and shallow VSP surveys for coal, minerals, and rock mechanics.

Model BHG-3 includes a fluxgate compass and servo mechanism which automatically orients the horizontal geophones to any magnetic azimuth selected by the operator. Thus, the longitudinal sensor can be aligned with the polarization of the shear wave source.

While downhole shear wave surveys have traditionally been done with random orientation, being able to precisely align one of the horizontal geophones with the plank or energy source provides significant advantages. Anisotropy appears to be much more common than originally thought, and the velocities of horizontally polarized shear waves vary with azimuth. With an orientable geophone, these velocity variations may be measured or simply avoided. By maintaining orientation of the source-receiver combination all the way down the borehole, the user can maintain better control and recognition of shear wave arrivals.

The clamping mechanism is a steel leaf spring, compressed by a motor-driven piston. When compressed, the spring expands, forcing the geophone



against the borehole wall.

The tool may be used in soft-wall, uncased holes as well as cased holes. In the unlikely event of a failure to release, the tool may be dragged up the hole against the spring friction. The motor-driven spring is faster, more reliable, and less cumbersome than the common alternative using an inflated bladder.

Download a free copy of our tutorial paper "Borehole Shear-Wave Surveys for Engineering Site Investigations" at <http://www.geostuff.com>



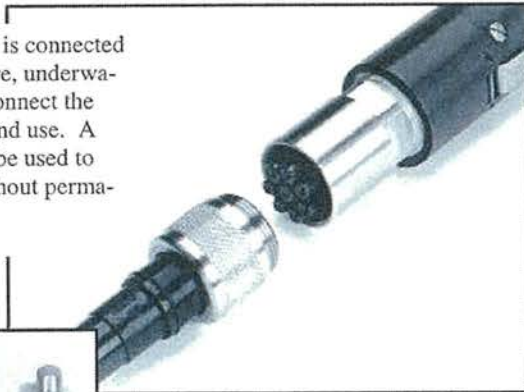


Control Electronics:

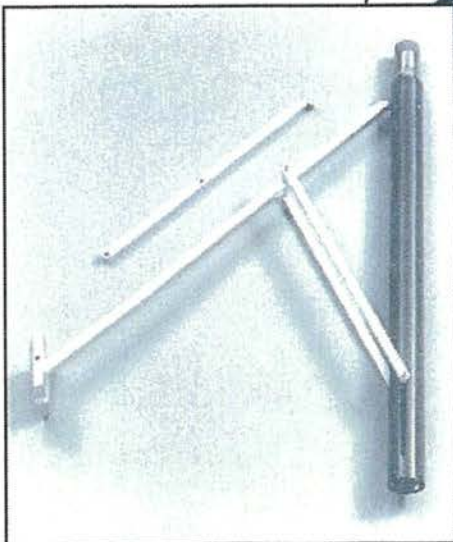
The BHGC-1b controller directs the voltages to control the clamping mechanism and servo mechanism. A meter monitors motor current to indicate the clamping action and force. This unit is usable with either model.

A rechargeable, internal, 24-volt battery is supplied, along with a 110/220 volt charger.

A Model BHGC-4 which can control up to four borehole geophones is also available.



Removable connector: The cable is connected to the geophone by a high-pressure, underwater connector. The ability to disconnect the sensor makes it easier to handle and use. A male-female extension cable can be used to temporarily extend the length without permanently



Big Hole Adaptor: An optional mechanical arm and pressure foot (shown here on the BHG-2) can be substituted for the spring to clamp the tool in large diameter boreholes. Conversion is easily done by the user in minutes. Multiple arms provide for various diameter holes. Largest arm extends diameter up to 480 mm (19 inches). When retracted, will fit inside a 75-mm (3-inch) diameter borehole.

Common Specifications

Number of geophones: 1 vertical and 2 horizontal in an X-Y-Z configuration

Natural Frequency: 15-Hz high-output omnidirectional is standard; 10, 28 and 40 Hz optional

Pressure rating: 300 meters (1000 ft) water depth, consult factory for deeper options

Clamp mechanism: DC motor. Requires 24 volts DC on surface (or more, depending on cable length). Requires 1/2 amp when moving spring (1 amp peak at clamping)

Expanded diameter: 18 cm (7 in) total diameter including probe body.

BHG-2 Borehole Geophone

Diameter: 48 mm (1.9 in)

Length: 700 mm (27.5 in)

Weight: 2 kg (4 lb)

BHG-3 Borehole Geophone

Diameter: 48 mm (1.9 in)

Length: 1.1 m (44 in)

Weight: 3.4 kg (7 lb)

Compass: fluxgate sensor, powered from same DC voltage as clamp mechanism.

Maximum inclination: +/- 90 degrees from vertical with standard 15-Hz sensors, much less with optional sensors.

Orientation Accuracy: better than 5 degrees

The flux gate compass will not function in steel-cased boreholes.

Cable

7-conductor, with two copper and 5 copperweld conductors, Kevlar-reinforced, polyurethane-jacket cable, with Reed Products SU-8 female connector molded on wet end.

Specifications are subject to change without notice for product improvement or other considerations. For more information, contact:

GEOSTUFF

1579 Lupine Lane
Lincoln, CA 95648
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info@geostuff.com
www.geostuff.com



Geode

Exploration Seismograph



It is no wonder that over 2,700 Geodes have been sold. It is the most versatile and flexible seismograph available. Small and lightweight enough to pack in your suitcase, it expands easily for full-scale 2D and 3D surveys at a cost your bottom line will love. When you are not using the Geode for reflection, refraction, MASW/MAM, or tomography surveys, use it for monitoring earthquakes and other passive sources. The Geode will even do marine profiling or continuous recording. It is the most popular engineering seismograph in the world, and is widely used throughout the academic and research community.

For light-duty applications, you can use your laptop to view, record and even process your data. In harsh conditions, control your Geodes with Geometrics' StrataVisor NZ/C series computers and seismographs. You can connect Geodes together to build systems of over 1,000 channels. Geodes are shock-proof, dust-proof, submersible and able to withstand extreme temperatures.

Fifteen years on, we can say with confidence that the Geode is the most reliable seismograph we have ever produced. Because of this, we can offer a 3-year warranty backed by Geometrics, now in our 48th year of providing prompt, knowledgeable customer support.

FEATURES & BENEFITS

- **Bulletproof** - Not really, but almost. Survives 1.5m drop onto concrete in 14 orientations. The Geode comes standard with a 3-year warranty.
- **Distributed architecture** - Use standard 24-pair geophone cables, no matter how many channels.
- **Ultra-wide bandwidth** - Useful for everything from crosshole surveys to earthquake monitoring.
- **Geophone and line testing** - No need for time-consuming "tap test".
- **Versatile** - Configure systems ranging from 8 to 1000 channels.*
- **Waterproof and dustproof** - No need to pick up the system in a sudden rain or dust storm.
- **High temperature range** - Use in the Sahara, Amazon or at the North Pole.
- **GPS synchronization** - Sub-sample timing accuracy so you know exactly when an event occurs.

* Systems can be expanded temporarily via Geometrics' rental pool or existing loaner networks.

SPECIFICATIONS | Geode Exploration Seismograph

Configurations: 8, 12, 16, or 24 channels in weatherproof field-deployable Geode module. Geode is operated from either Windows XP/7/10-based laptop or by Geometrics' ruggedized StrataVisor NZ field computer/seismograph. Basic operating software controls one Geode. It can also be optionally expanded to control multiple Geodes, as well as do marine surveying, continuous recording, GPS synchronization, and seismic surveillance.

A/D Conversion: 24-bit result using Crystal Semiconductor sigma-delta converters and Geometrics proprietary oversampling.

Dynamic Range: 144 dB (system), 110 dB (instantaneous, measured) at 2 ms, 24 dB.

Distortion: 0.0005% @ 2 ms, 1.75 to 208 Hz.

Bandwidth: 1.75 Hz to 20 kHz. 0.6 and DC. low frequency option available.

Common Mode Rejection: > 100 dB at <= 100 Hz, 36 dB.

Crosstalk: -125 dB at 23.5 Hz, 24 dB, 2 ms.

Noise Floor: 0.20 μ V, RFI at 2 ms, 36 dB, 1.75 to 208 Hz.

Stacking Trigger Accuracy: 1/32 of sample interval.

Maximum Input Signal: 2.8 V PP, 0 dB.

Input Impedance: 20 kOhm, 0.02 μ f.

Preamplifier Gains: Standard factory configuration is 24 and 36 dB. Optional configurations include 12 and 24 dB or 0 dB.

Anti-alias Filters: -3 dB at 83% of Nyquist frequency.

Acquisition and Display Filters:

- **Low Cut:** OUT, 10, 15, 25, 35, 50, 70, 100, 140, 200, 280, 400 Hz, 24 or 48 dB/octave, Butterworth.
- **Notch:** 50, 60, 150, 180 Hz and OUT, with the 50 dB rejection bandwidth 2% of center frequency.
- **High Cut:** OUT, 32, 64, 125, 250, 500 or 1000 Hz, 24 or 48 dB/octave.

Sample Interval: 0.02, 0.03125, 0.0625, 0.125, 0.25, 0.5, 1.0, 2.0, 4.0, 8.0, 16.0 ms.

Correlation: Optional (with SGOS, standard with MGOS) high-speed hardware correlator available in each Geode for fast cycle time with vibrators and pseudo-random sources. Correlates 16K record, unlimited channels, in under 1 second.

Record Length: 16,384 samples standard, 65,536 samples optional.

Pre-trigger Data: Up to full record length.

Delay: Full record length to +100 sec.

Data Transmission: Uses Ethernet transmission standard over CAT-5 copper or multimode fiber-optic cable. Distance between boxes: CAT 5 cable up to 0.25 km; fiber-optic cable up to 1.5 km.

Event Trigger: Based on seismic event; criteria set by user.

Continuous Recording (optional): Record GPS-synchronized, gapless data in SEG-2 format.

Auxiliary Channels: All Geode channels can be programmed as either AUX or DATA.

Roll-along: Built-in, no external roll box required.

Geophone Testing: Pulse test measures resistance, sensitivity, natural frequency, and damping.

Instrument Tests: Optional analog testing available. Measure noise, crosstalk, CMR, dynamic range, gain similarity and trigger accuracy. Additional built-in oscillator required.

Data Formats: SEG-2 standard. SEG-D and SEG-Y available as options.

System Software: Basic operating software includes full compliment of acquisition, display, plotting, filtering and storage features. Numerous optional features available; see SCS data sheet.

Bundled Applications Software: SeisImager/2D Lite refraction analysis software from OYO.

Data Storage: Stores data locally in SEG-2 on laptop/PC media. Drivers available for tape/disk storage in SEG-2/D/Y.

Plotters: Drives any Windows-compatible plotter or printer.

Triggering: Positive/negative TTL or contact closure, software adjustable threshold. STA/LTA-like algorithm for triggering on seismic waveform.

Power: Requires 12V external battery. Uses 0.5 W/channel during acquisition (0.25 ms sample rate). A single 12 Amp-hour battery is sufficient for a typical day of data acquisition; standby mode reduces power consumption by 70%.

Environmental: Operates from -50°C to +70°C (-58°F to +158°F). Waterproof and submersible. Withstands a 1m drop onto concrete on 6 sides and 8 corners. Passes MIL810E/F vibration.

Physical: L: 25.4 cm; W: 30.5 cm; H: 17.75 cm; Weight: 3.6 kg (10x12x7 in; 8 lb). Uses waterproof Bendix 61-pin connector for geophone input.

Operating System: Windows XP/7/10.

Warranty: Three years standard, extended warranty available.

Optional Built-In Test Functions

Instrument:		Geophone:
• Noise	• Distortion	• Natural Frequency
• DC Offset	• Crossfeed	• Resistance
• Gain Accuracy	• CMR	• Damping
• Gain and Phase Similarity	• Bandwidth	• Sensitivity
	• Timing Accuracy	

Specifications subject to change without notice. GeodeDS_v1 (0518)



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APPENDIX C BORING LOGS

LIST OF ATTACHMENTS




The following figures are attached and complete this appendix.

Figure C-1	Graphics Key
Figure C-2	Soil Description Key
Figure C-3	Rock Description Key
Figure C-4	Boring Log B-1
Figure C-5 to C-19	Sample Photos



PLOTTED: 04/08/2022 10:02 AM BY: TDeSveva





SAMPLE/SAMPLER TYPE GRAPHICS

-  CALIFORNIA SAMPLER
(3 in. (76.2 mm.) outer diameter)
-  CORE SAMPLER
-  STANDARD PENETRATION SPLIT SPOON SAMPLER
(2 in. (50.8 mm.) outer diameter and 1-3/8 in. (34.9 mm.) inner diameter)

ROCK LITHOLOGY GRAPHICS

-  SANDSTONE

GROUND WATER GRAPHICS

-  WATER LEVEL (level where first observed)
-  WATER LEVEL (level after exploration completion)
-  WATER LEVEL (additional levels after exploration)
-  OBSERVED SEEPAGE

NOTES
























- The report and graphics key are an integral part of these logs. All data and interpretations in this log are subject to the explanations and limitations stated in the report.
- Lines separating strata on the logs represent approximate boundaries only. Actual transitions may be gradual or differ from those shown.
- No warranty is provided as to the continuity of soil or rock conditions between individual sample locations.
- Logs represent general soil or rock conditions observed at the point of exploration on the date indicated.
- In general, Unified Soil Classification System designations presented on the logs were based on visual classification in the field and were modified where appropriate based on gradation and index property testing.
- Fine grained soils that plot within the hatched area on the Plasticity Chart, and coarse grained soils with between 5% and 12% passing the No. 200 sieve require dual USCS symbols, i.e., GW-GM, GP-GM, GW-GC, GP-GC, GC-GM, SW-SM, SP-SM, SW-SC, SP-SC, SC-SM.

- If sampler is not able to be driven at least 6 inches then 50/X indicates number of blows required to drive the identified sampler X inches with a 140 pound hammer falling 30 inches.

ABBREVIATIONS


- WOH - Weight of Hammer
- WOR - Weight of Rod

UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D 2487)

GRAVELS (More than half of coarse fraction is larger than the #4 sieve)	CLEAN GRAVEL WITH <5% FINES	Cu ≥ 4 and 1 ≤ Cc ≤ 3		GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE OR NO FINES
		Cu < 4 and/or 1 > Cc > 3		GP	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE OR NO FINES
	GRAVELS WITH 5% TO 12% FINES	Cu ≥ 4 and 1 ≤ Cc ≤ 3		GW-GM	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE FINES
				GW-GC	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE CLAY FINES
		Cu < 4 and/or 1 > Cc > 3		GP-GM	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE FINES
			GP-GC	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE CLAY FINES	
	GRAVELS WITH > 12% FINES			GM	SILTY GRAVELS, GRAVEL-SILT-SAND MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
				GC-GM	CLAYEY GRAVELS, GRAVEL-SAND-CLAY-SILT MIXTURES
	COARSE GRAINED SOILS (More than half of material is smaller than the #4 sieve)	CLEAN SANDS WITH <5% FINES	Cu ≥ 6 and 1 ≤ Cc ≤ 3		SW
		Cu < 6 and/or 1 > Cc > 3		SP	POORLY GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE OR NO FINES
SANDS WITH 5% TO 12% FINES		Cu ≥ 6 and 1 ≤ Cc ≤ 3		SW-SM	WELL-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE FINES
				SW-SC	WELL-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE CLAY FINES
		Cu < 6 and/or 1 > Cc > 3		SP-SM	POORLY GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE FINES
			SP-SC	POORLY GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE CLAY FINES	
SANDS WITH > 12% FINES				SM	SILTY SANDS, SAND-GRAVEL-SILT MIXTURES
				SC	CLAYEY SANDS, SAND-GRAVEL-CLAY MIXTURES
				SC-SM	CLAYEY SANDS, SAND-SILT-CLAY MIXTURES
FINE GRAINED SOILS (Half or more of material is smaller than the #200 sieve)		SILTS AND CLAYS (Liquid Limit less than 50)			ML
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				CL-ML	INORGANIC CLAYS-SILTS OF LOW PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
	SILTS AND CLAYS (Liquid Limit 50 or greater)			OL	ORGANIC SILTS & ORGANIC SILTY CLAYS OF LOW PLASTICITY
				MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILT
				CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
		OH	ORGANIC CLAYS & ORGANIC SILTS OF MEDIUM-TO-HIGH PLASTICITY		

NOTE: USE MATERIAL DESCRIPTION ON THE LOG TO DEFINE A GRAPHIC THAT MAY NOT BE PROVIDED ON THIS LEGEND.

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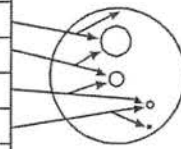
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	DRAWN BY: CHECKED BY: DATE:		



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 OFFICE FILTER: FRESNO
 PLOTTED: 06/09/2022 08:06:AM BY: TDG/SGL/EA

GRAIN SIZE

DESCRIPTION	SIEVE SIZE	GRAIN SIZE	APPROXIMATE SIZE
Boulders	>12 in. (304.8 mm.)	>12 in. (304.8 mm.)	Larger than basketball-sized
Cobbles	3 - 12 in. (76.2 - 304.8 mm.)	3 - 12 in. (76.2 - 304.8 mm.)	Fist-sized to basketball-sized
Gravel	coarse 3/4 - 3 in. (19 - 76.2 mm.)	3/4 - 3 in. (19 - 76.2 mm.)	Thumb-sized to fist-sized
	fine #4 - 3/4 in. (#4 - 19 mm.)	0.19 - 0.75 in. (4.8 - 19 mm.)	Pea-sized to thumb-sized
Sand	coarse #10 - #4	0.079 - 0.19 in. (2 - 4.9 mm.)	Rock salt-sized to pea-sized
	medium #40 - #10	0.017 - 0.079 in. (0.43 - 2 mm.)	Sugar-sized to rock salt-sized
	fine #200 - #40	0.0029 - 0.017 in. (0.07 - 0.43 mm.)	Flour-sized to sugar-sized
Fines	Passing #200	<0.0029 in. (<0.07 mm.)	Flour-sized and smaller



SECONDARY CONSTITUENT

Term of Use	AMOUNT	
	Secondary Constituent is Fine Grained	Secondary Constituent is Coarse Grained
Trace	<5%	<15%
With	≥5 to <15%	≥15 to <30%
Modifier	≥15%	≥30%

MOISTURE CONTENT

DESCRIPTION	FIELD TEST
Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible free water, usually soil is below water table

CEMENTATION

DESCRIPTION	FIELD TEST
Weakly	Crumbles or breaks with handling or slight finger pressure
Moderately	Crumbles or breaks with considerable finger pressure
Strongly	Will not crumble or break with finger pressure

CONSISTENCY - FINE-GRAINED SOIL

CONSISTENCY	SPT - N ₆₀ (# blows / ft)	Pocket Pen (tsf)	UNCONFINED COMPRESSIVE STRENGTH (Q _u)(psf)	VISUAL / MANUAL CRITERIA
Very Soft	<2	PP < 0.25	<500	Thumb will penetrate more than 1 inch (25 mm). Extrudes between fingers when squeezed.
Soft	2 - 4	0.25 ≤ PP < 0.5	500 - 1000	Thumb will penetrate soil about 1 inch (25 mm). Remolded by light finger pressure.
Medium Stiff	4 - 8	0.5 ≤ PP < 1	1000 - 2000	Thumb will penetrate soil about 1/4 inch (6 mm). Remolded by strong finger pressure.
Stiff	8 - 15	1 ≤ PP < 2	2000 - 4000	Can be imprinted with considerable pressure from thumb.
Very Stiff	15 - 30	2 ≤ PP < 4	4000 - 8000	Thumb will not indent soil but readily indented with thumbnail.
Hard	>30	4 ≤ PP	>8000	Thumbnail will not indent soil.

REACTION WITH HYDROCHLORIC ACID

DESCRIPTION	FIELD TEST
None	No visible reaction
Weak	Some reaction, with bubbles forming slowly
Strong	Violent reaction, with bubbles forming immediately

APPARENT / RELATIVE DENSITY - COARSE-GRAINED SOIL

APPARENT DENSITY	SPT-N ₆₀ (# blows/ft)	MODIFIED CA SAMPLER (# blows/ft)	CALIFORNIA SAMPLER (# blows/ft)	RELATIVE DENSITY (%)
Very Loose	<4	<4	<5	0 - 15
Loose	4 - 10	5 - 12	5 - 15	15 - 35
Medium Dense	10 - 30	12 - 35	15 - 40	35 - 65
Dense	30 - 50	35 - 60	40 - 70	65 - 85
Very Dense	>50	>60	>70	85 - 100

FROM TERZAGHI AND PECK, 1948

PLASTICITY

DESCRIPTION	LL	PI
Non-Plastic	NP	NP
Low	< 30	< 15
Medium	30 - 50	15 - 25
High	> 50	> 25

LL is from Casagrande, 1948. PI is from Holtz, 1959.

STRUCTURE

DESCRIPTION	CRITERIA
Stratified	Alternating layers of varying material or color with layers at least 1/4-in. thick, note thickness.
Laminated	Alternating layers of varying material or color with the layer less than 1/4-in. thick, note thickness.
Fissured	Breaks along definite planes of fracture with little resistance to fracturing.
Stickensided	Fracture planes appear polished or glossy, sometimes striated.
Blocky	Cohesive soil that can be broken down into small angular lumps which resist further breakdown.
Lensed	Inclusion of small pockets of different soils, such as small lenses of sand scattered through a mass of clay, note thickness.

ANGULARITY

DESCRIPTION	CRITERIA
Angular	Particles have sharp edges and relatively plane sides with unpolished surfaces.
Subangular	Particles are similar to angular description but have rounded edges.
Subrounded	Particles have nearly plane sides but have well-rounded corners and edges.
Rounded	Particles have smoothly curved sides and no edges.

	PROJECT NO.: 20230058.001A DRAWN BY: CHECKED BY: DATE:	SOIL DESCRIPTION KEY OFFSHORE CABLE LANDING HORIZONTAL DIRECTIONAL DRILL INSTALLATIONS WINEMA BEACH, CLOVERDALE, OREGON	C-2

PLOTTED: 08/09/2022 08:08:AM BY: TD:Smazza

INFILLING TYPE

NAME	ABBR	NAME	ABBR
Albite	Al	Muscovite	Mus
Apatite	Ap	None	No
Biotite	Bi	Pyrite	Py
Clay	Cl	Quartz	Qz
Calcite	Ca	Sand	Sd
Chlorite	Ch	Sericite	Ser
Epidote	Ep	Silt	Si
Iron Oxide	Fe	Talc	Ta
Manganese	Mn	Unknown	Uk

BEDDING CHARACTERISTICS

TERM	Thickness (in.)	Thickness (mm.)
Very Thick Bedded	> 36	> 915
Thick Bedded	12 - 36	305 - 915
Moderately Bedded	4 - 12	102 - 305
Thin Bedded	1 - 4	25 - 102
Very Thin Bedded	0.4 - 1	10 - 25
Laminated	0.1 - 0.4	2.5 - 10
Thinly Laminated	< 0.1	< 2.5

Bedding Planes Planes dividing the individual layers, beds, or stratigraphy of rocks.
 Joint Fracture in rock, generally more or less vertical or traverse to bedding.
 Seam Applies to bedding plane with unspecified degree of weather.

DENSITY/SPACING OF DISCONTINUITIES

DESCRIPTION	SPACING CRITERIA
Unfractured	> 6 ft. (> 1.83 meters)
Slightly Fractured	2 - 6 ft. (.061 - 1.83 meters)
Moderately Fractured	8 in - 2 ft. (203.20 - 609.60 mm.)
Highly Fractured	2 - 8 in. (50.80 - 203.30 mm.)
Intensely Fractured	< 2 in. (< 50.80 mm.)

APERTURE

DESCRIPTION	CRITERIA [in.(mm.)]
Tight	< 0.04 (< 1)
Open	0.04 - 0.20 (1 - 5)
Wide	> 0.20 (> 5)

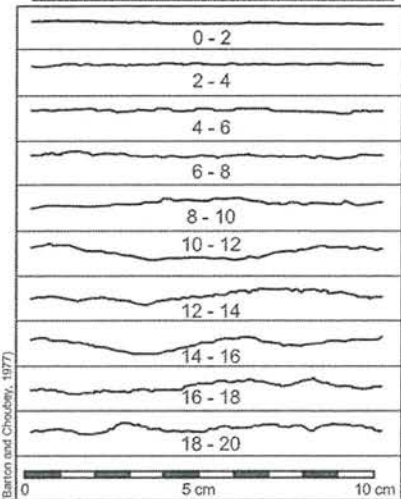
ADDITIONAL TEXTURAL ADJECTIVES

DESCRIPTION	RECOGNITION
Pit (Pitted)	Pinhole to 0.03 ft. (3/8 in.) (>1 to 10 mm.) openings
Vug (Vuggy)	Small openings (usually lined with crystals) ranging in diameter from 0.03 ft. (3/8 in.) to 0.33 ft. (4 in.) (10 to 100 mm.)
Cavity	An opening larger than 0.33 ft. (4 in.) (100 mm.), size descriptions are required, and adjectives such as small, large, etc., may be used
Honeycombed	If numerous enough that only thin walls separate individual pits or vugs, this term further describes the preceding nomenclature to indicate cell-like form
Vesicle (Vesicular)	Small openings in volcanic rocks of variable shape and size formed by entrapped gas bubbles during solidification

DISCONTINUITY TYPE

DESCRIPTION
Fault
Joint
Shear
Foliation
Vein
Bedding

JOINT ROUGHNESS COEFFICIENT (JRC)



INFILLING AMOUNT

DESCRIPTION
Surface Stain
Spotty
Partially Filled
Filled
None

ROCK QUALITY DESIGNATION (RQD)

DESCRIPTION	RQD (%)
Very Poor	0 - 25
Poor	25 - 50
Fair	50 - 75
Good	75 - 90
Excellent	90 - 100

RQD Rock-quality designation (RQD) Rough measure of the degree of jointing or fracture in a rock mass, measured as a percentage of the drill core in lengths of 10 cm, or more.


DEGREES OF WEATHERING

DESCRIPTION	CRITERIA
Unweathered	No evidence of chemical/mechanical alteration; rings with hammer blow.
Slightly Weathered	Slight discoloration on surface; slight alteration along discontinuities; <10% rock volume altered.
Moderately Weathered	Discoloring evident; surface pitted and alteration penetration well below surface; Weathering "halos" evident; 10-50% rock altered.
Highly Weathered	Entire mass discolored; Alteration pervading most rock, some slight weathering pockets; some minerals may be leached out.
Decomposed	Rock reduced to soil with relic rock texture/structure; Generally molded and crumbled by hand.

RELATIVE HARDNESS / STRENGTH DESCRIPTIONS - FOR WEAKER SEDIMENTARY ROCKS IN COLORADO

SPT N ₆₀	HARDNESS
< 20	Very Weak to Weathered
20 - 39	Weak
40 - 49	Moderately Strong
50 - 50/6"	Strong
> 50/6"	Very Strong

This table was developed by Kleinfelder based on project experience in Colorado for shale, claystone, siltstone, poorly cemented sandstone, and other weaker sedimentary rocks.

	PROJECT NO.: 20230058.001A	ROCK DESCRIPTION KEY	C-3
	DRAWN BY: CHECKED BY: DATE:	OFFSHORE CABLE LANDING HORIZONTAL DIRECTIONAL DRILL INSTALLATIONS WINEMA BEACH, CLOVERDALE, OREGON	



GINT FILE: K:_gint_musbrk_2023 PROJECT NUMBER: 20230058.001A OFFICE FILTER: FRESAHO
 GINT TEMPLATE: E:\KLEINFELDER\GINT_LIBRARY_2021\GLB_KLEINFELDER_GINT_LIBRARY\ROCK KEY

PLOTTED 08/01/2022 11:56:AM BY: P60088

INFILLING TYPE³

NAME	ABBR	NAME	ABBR
Albite	Al	Muscovite	Mus
Apatite	Ap	None	No
Biotite	Bi	Pyrite	Py
Clay	Cl	Quartz	Qz
Calcite	Ca	Sand	Sd
Chlorite	Ch	Sericite	Ser
Epidote	Ep	Silt	Si
Gypsum	Gy	Talc	Ta
Iron Oxide	Fe	Unknown	Uk
Manganese	Mn		

DENSITY/SPACING OF DISCONTINUITIES⁵

DESCRIPTION	SPACING CRITERIA
Unfractured	>6 ft. (>1.83 meters)
Slightly Fractured	2 - 6 ft. (0.61 - 1.83 meters)
Moderately Fractured	8 in - 2 ft. (203.20 - 609.60 mm)
Highly Fractured	2 - 8 in (50.80 - 203.30 mm)
Intensely Fractured	<2 in (<50.80 mm)

ADDITIONAL TEXTURAL ADJECTIVES⁵

DESCRIPTION	RECOGNITION
Pit (Pitted)	Pinhole to 0.03 ft. (3/8 in.) (>1 to 10 mm.) openings
Vug (Vuggy)	Small openings (usually lined with crystals) ranging in diameter from 0.03 ft. (3/8 in.) to 0.33 ft. (4 in.) (10 to 100 mm.)
Cavity	An opening larger than 0.33 ft. (4 in.) (100 mm.), size descriptions are required, and adjectives such as small, large, etc., may be used
Honeycombed	If numerous enough that only thin walls separate individual pits or vugs, this term further describes the preceding nomenclature to indicate cell-like form.
Vesicle (Vesicular)	Small openings in volcanic rocks of variable shape and size formed by entrapped gas bubbles during solidification.

WEATHERING⁵

DESCRIPTION	CRITERIA
Unweathered	No evidence of chemical / mechanical alteration; rings with hammer blow.
Slightly Weathered	Slight discoloration on surface; slight alteration along discontinuities; <10% rock volume altered.
Moderately Weathered	Discoloring evident; surface pitted and alteration penetration well below surface; Weathering "halos" evident; 10-50% rock altered.
Highly Weathered	Entire mass discolored; Alteration pervading most rock, some slight weathering pockets; some minerals may be leached out.
Decomposed	Rock reduced to soil with relic rock texture/structure; Generally mottled and crumbled by hand.

RELATIVE HARDNESS / STRENGTH DESCRIPTIONS⁴

GRADE	UCS	FIELD TEST
R0	Extremely Weak	0.25 - 1.0
R1	Very Weak	1.0 - 5.0
R2	Weak	5.0 - 25
R3	Medium Strong	25 - 50
R4	Strong	50 - 100
R5	Very Strong	100 - 250
R6	Extremely Strong	> 250

ROCK QUALITY DESIGNATION (RQD)²

DESCRIPTION	RQD (%)
Very Poor	0 - 25
Poor	25 - 50
Fair	50 - 75
Good	75 - 90
Excellent	90 - 100

APERTURE¹

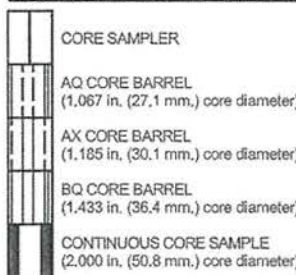
DESCRIPTION	CRITERIA [in (mm)]
Tight	<0.04 (<1)
Open	0.04 - 0.20 (1 - 5)
Wide	>0.20 (>5)

BEDDING CHARACTERISTICS⁶

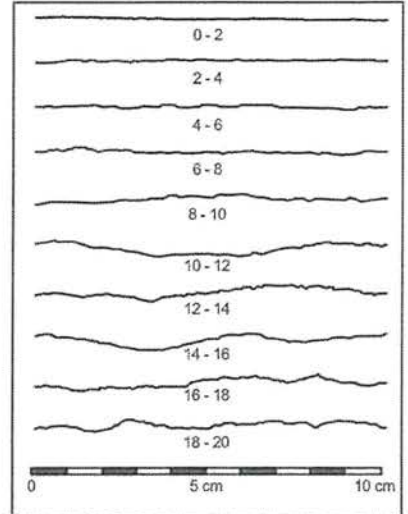
DESCRIPTION	Thickness [in (mm)]
Very Thick Bedded	>36 (>915)
Thick Bedded	12 - 36 (305 - 915)
Moderately Bedded	4 - 12 (102 - 305)
Thin Bedded	1 - 4 (25 - 102)
Very Thin Bedded	0.4 - 1 (10 - 25)
Laminated	0.1 - 0.4 (2.5 - 10)
Thinly Laminated	<0.1 (<2.5)

Bedding Planes Planes dividing the individual layers, beds, or stratigraphy of rocks.
 Joint Fracture in rock, generally more or less vertical or traverse to bedding.
 Seam Applies to bedding plane with unspecified degree of weather.

CORE SAMPLER TYPE GRAPHICS



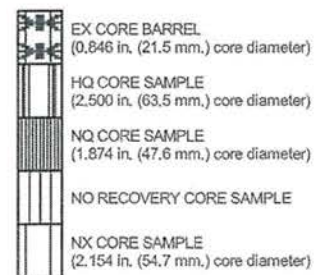
JOINT ROUGHNESS COEFFICIENT (JRC)⁴



RQD Rock-quality designation (RQD) Rough measure of the degree of jointing or fracture in a rock mass, measured as a percentage of the drill core in lengths of 4 in. (10 cm.) or more.

REFERENCES

1. Bieniawski, Z.T., 1989, Engineering Rock Mass Classifications. John Wiley & Sons, New York. (Mod. by Kleinfelder).
2. Deere, D.U., and Deere, D.W., 1989, Rock Quality Designation (RQD) After Twenty Years, USACE Contract Report GL-89-1.
3. Federal Highway Administration (FHWA), 2002, Subsurface Investigations, FHWA-NHI-01-031. (Mod. by Kleinfelder).
4. International Society for Rock Mechanics (ISRM), 1978, "Suggested Methods for the Quantitative Description of Discontinuities in Rock Masses," International Joint Rock Mechanics and Mining Sciences & Geomechanics Abstracts, Vol. 15.
5. United States Army Corps of Engineers (USACE), 1994, Rock Foundations, EM 1110-1-2908, November 30, 1994.
6. United States Department of the Interior Bureau of Reclamation (USBR), 1998, Engineering Geology Field Manual, Volume 1.



PROJECT NO.: 20230058.001A
 DRAWN BY:
 CHECKED BY:
 DATE:

ROCK DESCRIPTION KEY
 OFFSHORE CABLE LANDING
 HORIZONTAL DIRECTIONAL DRILL
 WINEMA BEACH, CLOVERDALE, OREGON

C-3



PROJECT NUMBER: 20230058.001A
 GINT LIBRARY: 2023.05B L_KLF_GEO_LEG3_ROCK_DESC_KEY
 GINT FILE: KLF_gint_pwrshw_2023
 GINT TEMPLATE: E-KLF_STANDARD

PLOTTED 08/01/2022 11:56:AM BY: P60088

Date Begin - End: <u>5/16/2022 - 5/18/2022</u>	Drilling Company: <u>Western States</u>	ROCK CORING LOG B-1	
Logged By: <u>P. Rivas</u>	Drill Crew: <u>Adonis, Collin</u>		
Hor.-Vert. Datum: <u>WGS 1984</u>	Drilling Equipment: <u>CME-75</u>		Hammer Type - Drop: <u>140 lb. Auto - 30 in.</u>
Plunge: <u>-90 degrees</u>	Drilling Method: <u>Mud Rotary</u>		Hammer Efficiency: <u>85.5%</u>
Weather: <u>Cloudy</u>	Exploration Diameter: <u>4 in. O.D.</u>	Hammer Cal. Date: <u>12/23/2021</u>	

Approximate Elevation (feet)	Depth (feet)	Graphical Log	FIELD EXPLORATION				LABORATORY RESULTS							
			Lithologic Description	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf RDP=%	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
			Latitude: 45,14690° N Longitude: -123,97376° E Approximate Ground Surface Elevation (ft.): 21.00 Surface Condition: Bare Earth											
	20		Alluvial Beach and Dune Deposits Silty SAND with Gravel (SM): fine to coarse sand, brown, moist											
	5		Poorly Graded SAND (SP): fine sand, gray, moist, medium dense	BC=9 12 16			11.1	111.0		0.9				
	15		Clayey SAND (SC): fine sand, low plasticity, dark brown, organic odor, wet, very loose	BC=2 1 1										
	10		Poorly Graded SAND (SP): fine sand, gray, wet, dense											
	5			BC=13 23 29			20.3	107.4		4.0				
	20		Poorly Graded GRAVEL with Silt and Sand (GP-GM): fine to coarse gravel, gray, wet, very dense, fine to coarse sand, cobbles and boulders up to 18 in.	BC=15 27 22					GP-GM		47	8.6		
	25		dense	BC=27 18 22					GP-GM		33	5.9		
	30		no boulders	BC=31 50/6"										

<p>KLEINFELDER Bright People. Right Solutions.</p>	PROJECT NO.: 20230058.001A	ROCK CORING LOG B-1	FIGURE C-3
	DRAWN BY: PR CHECKED BY: TD DATE: 5/24/2022		

PLOTTED: 08/01/2022 11:47 AM BY: PRAWAS
 PROJECT NUMBER: 20230058.001A
 OFFICE: FILTER - FRESNO
 GINT FILE: KLF_GINT_maxsig_2023
 GINT TEMPLATE: EKLF_STANDARD_GINT_LIBRARY_2023.GLB
 GINT LIBRARY: 2023.GLB
 GINT BORING/TEST PIT SOIL LOG



PLOTTED: 09/01/2022 01:47 AM BY: PR/PR

Date Begin - End: 5/16/2022 - 5/18/2022	Drilling Company: Western States	ROCK CORING LOG B-1	
Logged By: P. Rivas	Drill Crew: Adonis, Collin		
Hor.-Vert. Datum: WGS 1984	Drilling Equipment: CME-75		Hammer Type - Drop: 140 lb. Auto - 30 in.
Plunge: -90 degrees	Drilling Method: Mud Rotary		Hammer Efficiency: 85.5%
Weather: Cloudy	Exploration Diameter: 4 in. O.D.		Hammer Cal. Date: 12/23/2021

Approximate Elevation (feet)	Depth (feet)	Graphical Log	FIELD EXPLORATION				LABORATORY RESULTS							
			Lithologic Description	Sample Type	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/Remarks	
			Latitude: 45.14690° N Longitude: -123.97376° E Approximate Ground Surface Elevation (ft.): 21.00 Surface Condition: Bare Earth											
-15			Poorly Graded SAND with Silt (SP): fine to coarse sand, brown, wet, very dense, fine to coarse gravel, seashells present	BC=32 26 20										
-20			Clayey SAND (SC): fine sand, medium plasticity, dark gray, wet, medium dense, trace fine gravel	BC=3 3 4		SC				17	53	26		
-25			Poorly Graded SAND (SP): fine to medium sand, dark brown, wet, very dense, trace fine gravel	BC=25 50/4"			15.2	122.9		3.6				
-30			yellowish brown, no gravel	BC=30 39 41						5.4				
-35				BC=24 35 38										
-40			ALSEA FORMATION SANDSTONE: brown, fine-grained sand, highly weathered, R0, intensely fractured	BC=41 41 50/6"										
-45			Brown to dark brown	BC=50/6"										

OFFICE FILTER: FRESH

PROJECT NUMBER: 20230058.001A

DRILL FILE: KLF_BORING_LIBR_2023
DRILL TEMPLATE: E:KLF_STANDARD_GINT_LIBRARY_2023.GLB
KLF_BORINGTEST.PIT_SOIL.LOG



PROJECT NO.: 20230058.001A
DRAWN BY: PR
CHECKED BY: TD
DATE: 5/24/2022

ROCK CORING LOG B-1

OFFSHORE CABLE LANDING
HORIZONTAL DIRECTIONAL DRILL
WINEMA BEACH, CLOVERDALE, OREGON

FIGURE
C-3
PAGE: 2 of 5


PLOTTED: 01/01/2022 01:53 AM BY: PIRV08

Date Begin - End: <u>5/16/2022 - 5/18/2022</u>	Drilling Company: <u>Western States</u>	ROCK CORING LOG B-1
Logged By: <u>P. Rivas</u>	Drill Crew: <u>Adonis/Collin</u>	
Hor.-Vert. Datum: <u>WGS 1984</u>	Drilling Equipment: <u>CME-75</u>	
Plunge: <u>-90 degrees</u>	Coring Method: <u>Coring</u>	
Weather: <u>Cloudy</u>	Core Bit Type: <u>NQ Core</u>	

Approximate Elevation (feet)	Depth (feet)	Graphical Log	ROCK CORING INFORMATION						Discontinuity Description
			Box Number	Run Number	Sample Type	Recovery (NR=No Recovery)	Drill Rate (min/ft)	RQD (%)	
Latitude: 45.14690° N Longitude: -123.97376° E Approximate Ground Surface Elevation (ft.): 21.00									
Formation and Rock Type, Color, Grain/Particle Size, Weathering, Bedding, Density or Spacing									
-50		SANDSTONE: dark gray, fine-grained sand, moderately weathered, moderately bedded, intensely fractured, contains small shell fragments, silt matrix prevalent Slightly weathered, moderately fractured 4 in. layer of intensely fractured to brecciated 5 in. layer of intensely fractured and rehealed Thickly bedded Highly fractured Moderately fractured Convolute siltstone rip-up clasts, bed remnants UCS = 5610 psi Moderately fractured Gray to dark gray, moderately fractured Localized calcareous mineralization within joints UCS = 5050 psi Localized mass highly fractured and partially rehealed	1	1		12"	N/A	0	R2
			1	2		56"	N/A	75	(71.6'), joint, 55°, moderately fractured, none, No, tight, JRC=16-18
									(73.2'), joint, 3°, highly fractured, none, No, slightly open, JRC=10-12
									(73.4'), joint, 0°, moderately fractured, none, No, slightly open, JRC=10-12
									(76.5'), joint, 50°, none, No, slightly open, JRC=8-10
									(76.9'), joint, 40°, none, No, slightly open, JRC=6-8
									(77.7'), joint, 55°, none, No, tight, JRC=4-6
									(78.7'), joint, 55°, none, No, slightly open, JRC=10-12
									(79'), joint, 40°, highly fractured, none, No, slightly open, JRC=8-10
									(79.3'), joint, 65°, moderately fractured, none, No, slightly open, JRC=12-14
			2	4		60"	N/A	91	(80'), joint, 45°, none, No, slightly open, JRC=8-10
								(84.4'), joint, 45°, slightly fractured, none, No, slightly open, JRC=4-6	
								(85.1'), joint, 60°, moderately fractured, none, No, slightly open, JRC=4-6	
								(85.8'), joint, 30°, none, No, slightly open, JRC=2-4	
								(86.1'), joint, 70°, highly fractured, none, No, slightly open, JRC=10-12	
								(88'), joint, 30°, none, No, slightly open, JRC=2-4	
								(88.2'), joint, 50°, none, No, slightly open, JRC=10-12	
								(88.8'), joint, 50°, none, No, slightly open, JRC=4-6	
								(89.3'), joint, 65°, moderately fractured, none, No, slightly open, JRC=14-16	
								(90.5'), joint, 25°, slightly fractured, none, No, slightly open, JRC=2-4	
								(93'), joint, 30°, moderately fractured, none, No, slightly open, JRC=4-6	
								(93.5'), joint, 80°, none, No, slightly open, JRC=14-16	
								(94'), joint, 30°, highly fractured, none, No, slightly open, JRC=4-6	
								(94.2'), joint, 60°, none, No, slightly open, JRC=8-10	
								(94.5'), joint, 60°, none, No, slightly open, JRC=8-10	
								(95.1'), joint, 50°, moderately fractured, none, No, slightly open, JRC=14-16	
								(98'), slightly fractured	
								(100.6'), joint, 45°, none, No, slightly open, JRC=8-10	

OFFICE FILTER: FRESNO

PROJECT NUMBER: 20230058.001A
 GINT FILE: K:\GINT\master_2023
 GINT TEMPLATE: E:\KLF_STANDARD_GINT_LIBRARY_2023.GLB [KLF - ROCK CORING LOG]

 KLEINFELDER <i>Bright People. Right Solutions.</i>	PROJECT NO.: 20230058.001A	ROCK CORING LOG B-1	FIGURE
	DRAWN BY: PR CHECKED BY: TD DATE: 5/24/2022	OFFSHORE CABLE LANDING HORIZONTAL DIRECTIONAL DRILL WINEMA BEACH, CLOVERDALE, OREGON	C-3

PLOTTED 10/01/2022 11:53 AM BY PRVWR

Date Begin - End: <u>5/16/2022 - 5/18/2022</u>	Drilling Company: <u>Western States</u>	ROCK CORING LOG B-1
Logged By: <u>P. Rivas</u>	Drill Crew: <u>Adonis/Collin</u>	
Hor.-Vert. Datum: <u>WGS 1984</u>	Drilling Equipment: <u>CME-75</u>	
Plunge: <u>-90 degrees</u>	Coring Method: <u>Coring</u>	
Weather: <u>Cloudy</u>	Core Bit Type: <u>NQ Core</u>	

Approximate Elevation (feet)	Depth (feet)	Graphical Log	ROCK CORING INFORMATION							Discontinuity Description
			Box Number	Run Number	Sample Type	Recovery (NR=No Recovery)	Drill Rate (min/ft)	RQD (%)	Relative Strength	
Latitude: 45.14690° N Longitude: -123.97376° E Approximate Ground Surface Elevation (ft.): 21.00										Fracture#: (Depth), Type, Relative Dip, Density or Spacing. Degree of Infilling, Infilling Type, Aperture, Surface Weathering, JRC
Formation and Rock Type, Color, Grain/Particle Size, Weathering, Bedding, Density or Spacing										
-85		SANDSTONE: gray to dark gray, fine-grained sand, slightly weathered, moderately bedded, moderately fractured, contains fine calcareous shell fragments, silt matrix prevalent Decrease in shell fragments present UCS = 4210 psi Slightly fractured, abundant fine calcareous shell fragments Shell fragments to 0.75 in. present UCS = 4990 psi Intensely fractured zone with sand and clay fracture infill	4	8		60* (cont.)	N/A	86 (cont.)	R2	(100.9'), joint, 70°, spotty, Ca, slightly open, JRC=4-6
			5	9		60*	N/A	75		(104.1'), joint, 35°, none, No, slightly open, JRC=12-14
										(105.1'), joint, 80°, spotty, Ca, slightly open, JRC=10-12
										(106.1'), joint, 25°, highly fractured, none, No, slightly open, JRC=8-10
										(106.5'), joint, 15°, none, No, slightly open, JRC=6-8
										(107.5'), joint, 85°, moderately fractured, none, No, slightly open, JRC=0-2
										(107.9'), joint, 20°, none, No, slightly open, JRC=2-4
										(109.1'), joint, 30°, none, No, slightly open, JRC=2-4
										(109.8'), joint, 10°, none, No, slightly open, JRC=2-4
										(110.5'), joint, 20°, moderately fractured, spotty, Ca, slightly open, JRC=4-6
										(111.7'), joint, 55°, highly fractured, none, No, slightly open, JRC=4-6
										(112.2'), joint, 70°, slightly fractured, none, No, slightly open, JRC=4-6
										(115.2'), joint, 40°, highly fractured, none, No, slightly open, JRC=2-4
										(115.4'), joint, 40°, moderately fractured, none, No, slightly open, JRC=2-4
										(116.5'), joint, 60°, slightly fractured, none, No, slightly open, JRC=6-8
								(120.5'), bedding, 5°, moderately fractured, none, No, tight, JRC=2-4		
								(121.5'), bedding, 5°, slightly fractured, none, No, tight, JRC=0-2		
								(123.3'), bedding, 5°, none, No, tight, JRC=2-4		
								(127'), joint, 40°, moderately fractured, spotty, Ca, slightly open, JRC=6-8		
								(127.8'), joint, 10°, none, No, slightly open, JRC=2-4		
								(129.5'), joint, 20°, none, No, slightly open, JRC=6-8		
								(131.1'), joint, 15°, highly fractured, partially filled, Cl, slightly open, JRC=4-6		
								(131.5'), joint, 15°, none, No, slightly open, JRC=6-8		
								(131.8'), bedding, 5°, slightly fractured, none, No, slightly open, JRC=6-8		
								(136.5'), joint, 80°, none, No, slightly open, JRC=14-16		
								(136.8'), joint, 45°, partially filled, Ca, slightly open, JRC=2-4		

OFFICE FILTER FRESNO

PROJECT NUMBER: 20230058.001A
GINT LIBRARY_2023.GLB [XLF ROCK CORING LOG]

GINT FILE: KLF_gint_master_2021
GINT TEMPLATE: E:\XLF_STANDARDS_GINT_LIBRARY_2023.GLB



PROJECT NO.: 20230058.001A
DRAWN BY: PR
CHECKED BY: TD
DATE: 5/24/2022

ROCK CORING LOG B-1

OFFSHORE CABLE LANDING
HORIZONTAL DIRECTIONAL DRILL
WINEMA BEACH, CLOVERDALE, OREGON

FIGURE
C-3

PAGE: 4 of 5



Date Begin - End: <u>5/16/2022 - 5/18/2022</u>	Drilling Company: <u>Western States</u>	ROCK CORING LOG B-1
Logged By: <u>P. Rivas</u>	Drill Crew: <u>Adonis/Collin</u>	
Hor.-Vert. Datum: <u>WGS 1984</u>	Drilling Equipment: <u>CME-75</u>	
Plunge: <u>-90 degrees</u>	Coring Method: <u>Coring</u>	
Weather: <u>Cloudy</u>	Core Bit Type: <u>NQ Core</u>	

Approximate Elevation (feet)	Depth (feet)	Graphical Log	ROCK CORING INFORMATION							Discontinuity Description	
			Box Number	Run Number	Sample Type	Recovery (NR=No Recovery)	Drill Rate (min/ft)	RQD (%)	Relative Strength		
			Latitude: 45.14690° N Longitude: -123.97376° E Approximate Ground Surface Elevation (ft.): 21.00							Fracture#: (Depth), Type, Relative Dip, Density or Spacing, Degree of Infilling, Infilling Type, Aperture, Surface Weathering, JRC	
			Formation and Rock Type, Color, Grain/Particle Size, Weathering, Bedding, Density or Spacing								
-120		[Graphical Log: Dotted pattern]	SANDSTONE: gray to dark gray, fine-grained sand, slightly weathered, thickly to very thickly bedded, moderately fractured, contains fine calcareous shell fragments, silt matrix prevalent, locally aligned with bedding and crossbedding		8	15		60" (cont.)	N/A	31 (cont.)	R2 (136.9'), joint, 20°, highly fractured, partially filled, Ca, slightly open, JRC=2-4 (137.6'), joint, 80°, intensely fractured, partially filled, Ci, slightly open, JRC=10-12 (139.8'), joint, 70°, moderately fractured, partially filled, Ci, slightly open, JRC=2-4 (142.2'), joint, 50°, slightly fractured, none, No, slightly open, JRC=8-10 (145.6'), joint, 60°, moderately fractured, none, No, slightly open, JRC=16-18 (146.5'), joint, 55°, none, No, slightly open, JRC=6-8 (148.3'), joint, 60°, highly fractured, partially filled, Ca, slightly open, JRC=6-8 (148.6'), joint, 60°, slightly fractured, none, No, slightly open, JRC=4-6 (151.3'), joint, 80°, none, No, slightly open, JRC=10-12
			8	16		59"	N/A	71			
-125			Intensely fractured and partially rehealed layer		9	17		59"	N/A	71	
-130											
-135											
-140											
-145											
-150											

OFFICE FILTER: PRESHD

PROJECT NUMBER: 20230058.001A
L:\KLF_LIBR\ARY_2123\GLB_L\KLF_ROCK CORING LOG1

DWT FILE: KLF_RIV_NUMBER_2023
DWT TEMPLATE: E:\KLF_STANDARD\GINT_LIBRARY_2123\GLB_L\KLF_ROCK CORING LOG1



PROJECT NO.:
20230058.001A

DRAWN BY: PR

CHECKED BY: TD

DATE: 5/24/2022

ROCK CORING LOG B-1

OFFSHORE CABLE LANDING
HORIZONTAL DIRECTIONAL DRILL
WINEMA BEACH, CLOVERDALE, OREGON

FIGURE
C-3

PAGE: 5 of 5

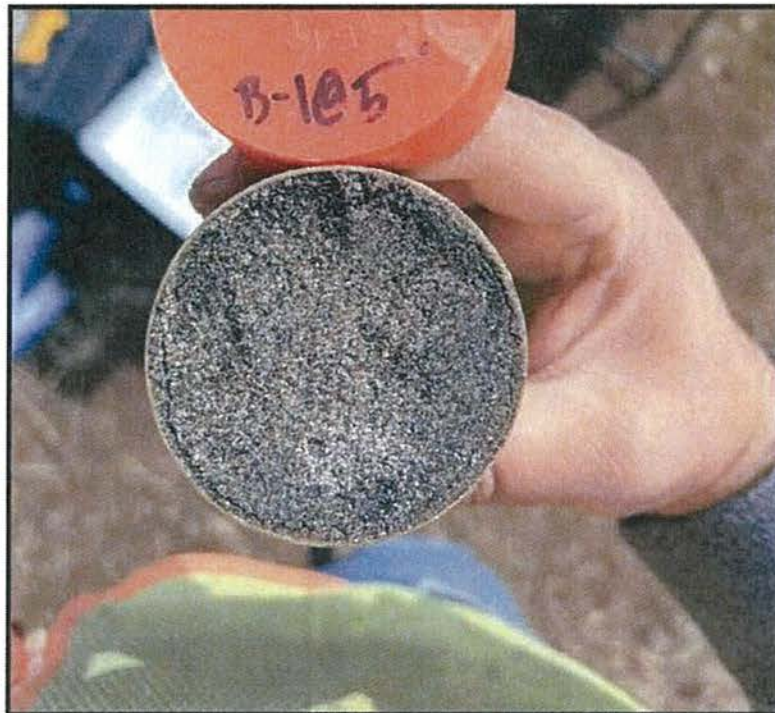


PHOTO 1: BORING B-1, 5 FT SAMPLE



PHOTO 2: BORING B-1, 10 FT SAMPLE

	PROJECT NO. 20230058.001A	PHOTO SUMMARY	FIGURE: C-5
	DRAWN: 06/2022		
	DRAWN BY: TD	OFFSHORE CABLE LANDING HORIZONTAL DIRECTIONAL DRILL INSTALLATIONS WINEMA BEACH, CLOVERDALE, OREGON	
	CHECKED BY: KS/SC		
	FILE NAME: PHOTO SUMMARY		



PHOTO 3: BORING B-1, 15 FT SAMPLE

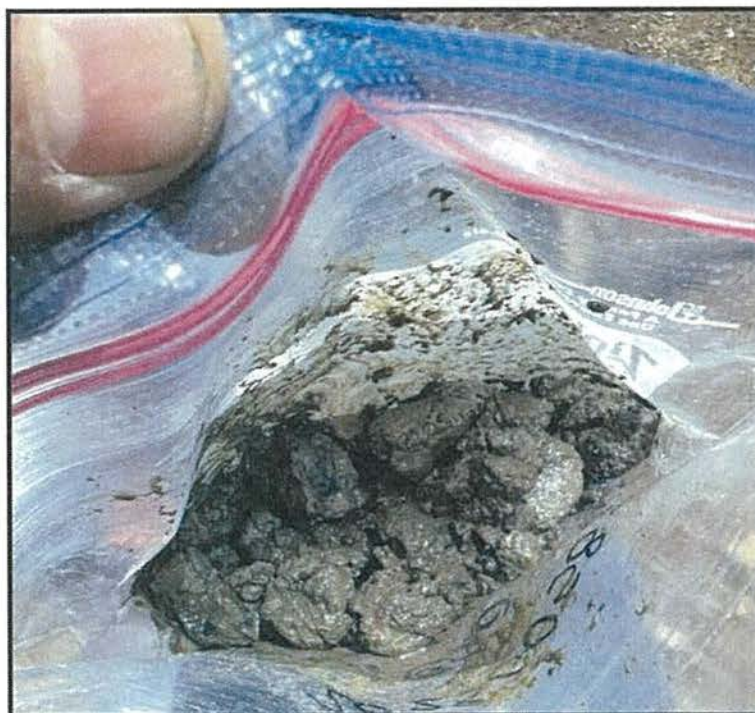


PHOTO 4: BORING B-1, 20 FT SAMPLE

	PROJECT NO. 20230058.001A	PHOTO SUMMARY	FIGURE: C-6
	DRAWN: 06/2022		
	DRAWN BY: TD	OFFSHORE CABLE LANDING HORIZONTAL DIRECTIONAL DRILL INSTALLATIONS WINEMA BEACH, CLOVERDALE, OREGON	
	CHECKED BY: KS/SC		
	FILE NAME: PHOTO SUMMARY		



PHOTO 5: BORING B-1, 25 FT SAMPLE

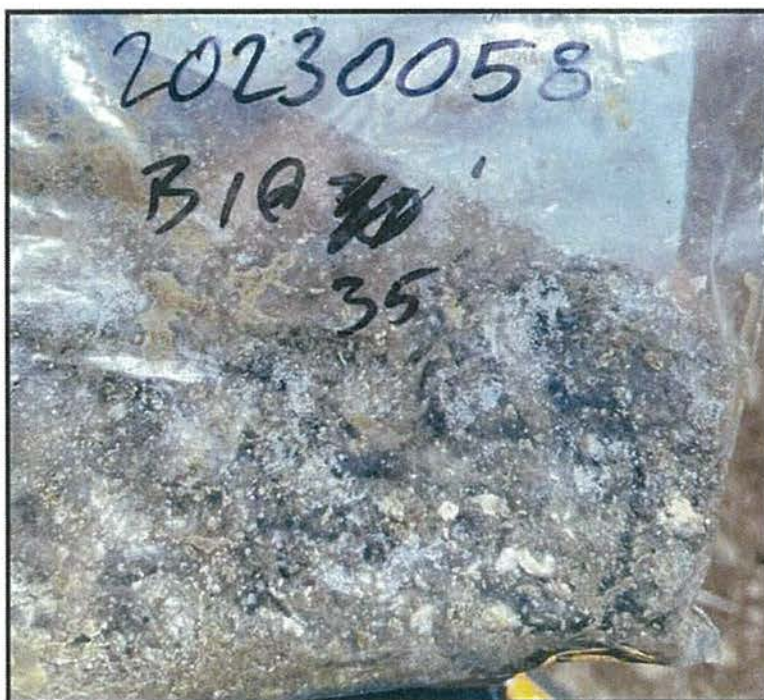


PHOTO 6: BORING B-1, 35 FT SAMPLE


	PROJECT NO. 20230058.001A	PHOTO SUMMARY OFFSHORE CABLE LANDING HORIZONTAL DIRECTIONAL DRILL INSTALLATIONS WINEMA BEACH, CLOVERDALE, OREGON	FIGURE:
	DRAWN: 06/2022		C-7
	DRAWN BY: TD		
	CHECKED BY: KS/SC		
FILE NAME: PHOTO SUMMARY			



PHOTO 7: BORING B-1, 40 FT SAMPLE

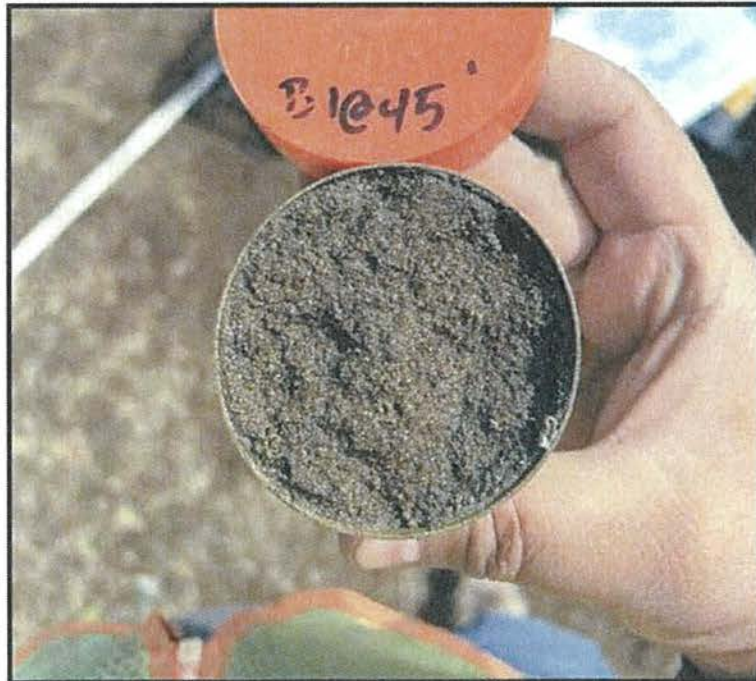



PHOTO 8: BORING B-1, 45 FT SAMPLE

	PROJECT NO. 20230058.001A	PHOTO SUMMARY	FIGURE: C-8
	DRAWN: 06/2022		
	DRAWN BY: TD	OFFSHORE CABLE LANDING HORIZONTAL DIRECTIONAL DRILL INSTALLATIONS WINEMA BEACH, CLOVERDALE, OREGON	
	CHECKED BY: KS/SC		
FILE NAME: PHOTO SUMMARY			

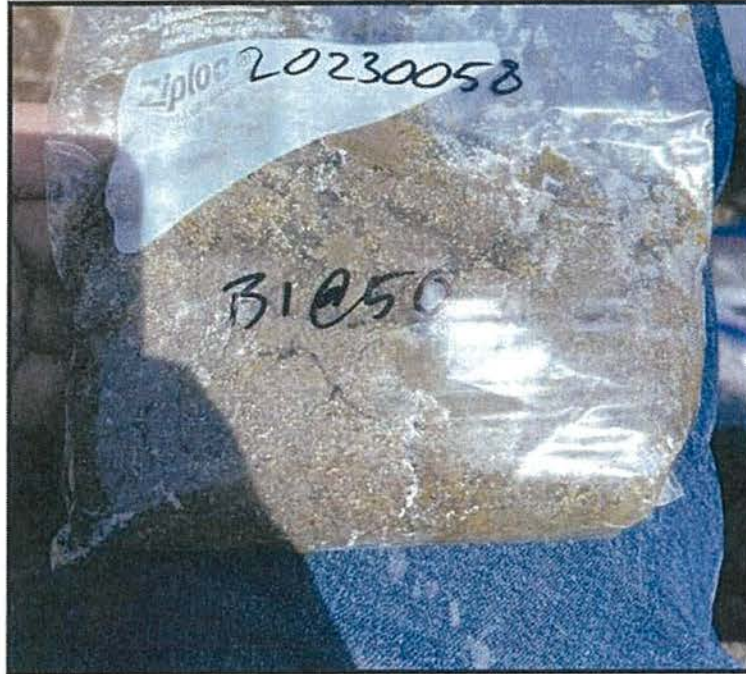


PHOTO 9: BORING B-1, 50 FT SAMPLE

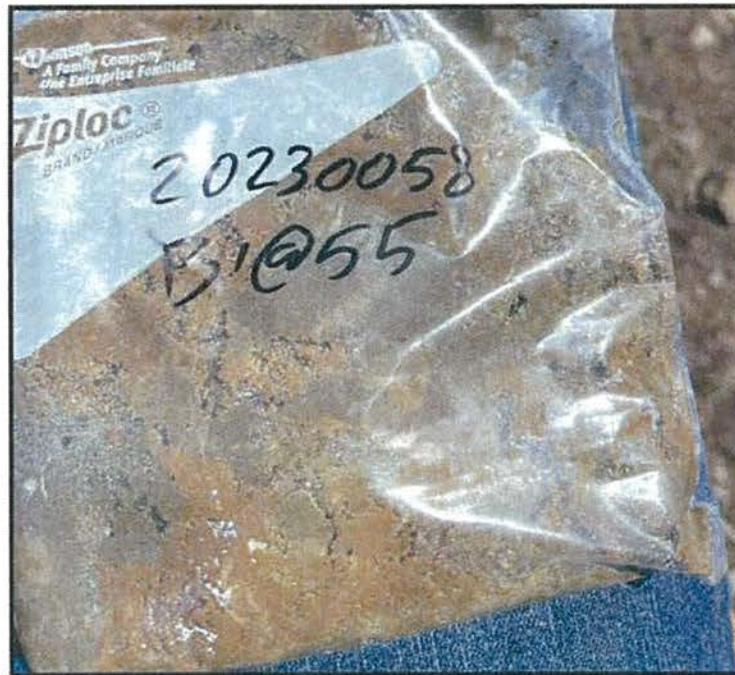



PHOTO 10: BORING B-1, 55 FT SAMPLE

 <p>KLEINFELDER Bright People. Right Solutions. www.kleinfelder.com</p>	PROJECT NO. 20230058.001A	PHOTO SUMMARY	FIGURE:
	DRAWN: 06/2022		C-9
	DRAWN BY: TD		
	CHECKED BY: KS/SC		
	FILE NAME: PHOTO SUMMARY		



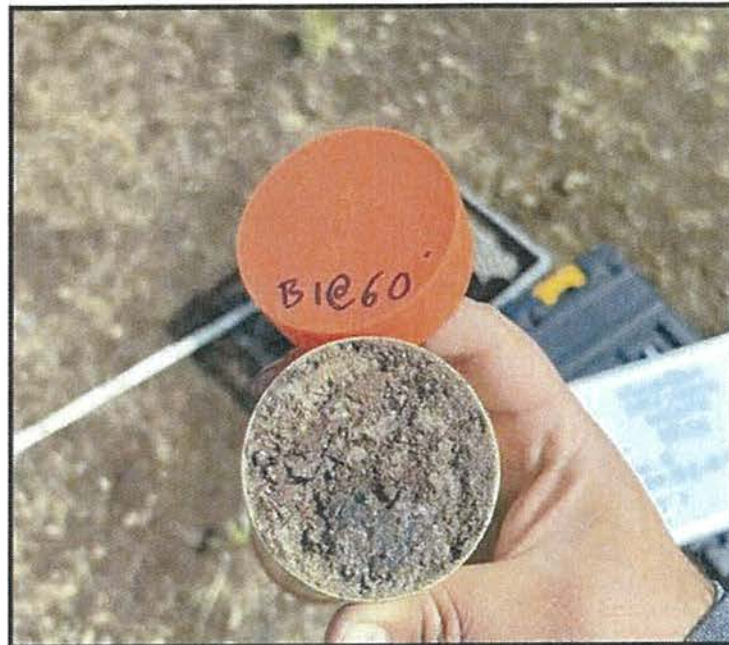


PHOTO 11: BORING B-1, 60 FT SAMPLE



PHOTO 12: BORING B-1, 65FT SAMPLE


	PROJECT NO. 20230058.001A	PHOTO SUMMARY OFFSHORE CABLE LANDING HORIZONTAL DIRECTIONAL DRILL INSTALLATIONS WINEMA BEACH, CLOVERDALE, OREGON	FIGURE:
	DRAWN: 06/2022		C-10
	DRAWN BY: TD		
	CHECKED BY: KS/SC		
FILE NAME: PHOTO SUMMARY			



PHOTO 13: BORING B-1, CORE RUN 1: 70 FT - 71.5 FT



PHOTO 14: BORING B-1, CORE RUN 2: 71.5 FT - 76.5 FT


	PROJECT NO. 20230058.001A	PHOTO SUMMARY	FIGURE: C-11
	DRAWN: 06/2022		
	DRAWN BY: TD	OFFSHORE CABLE LANDING HORIZONTAL DIRECTIONAL DRILL INSTALLATIONS WINEMA BEACH, CLOVERDALE, OREGON	
	CHECKED BY: KS/SC		
	FILE NAME: PHOTO SUMMARY		



PHOTO 15: BORING B-1, CORE RUN 3: 76.5 FT -81.5 FT



PHOTO 16: BORING B-1, CORE RUN 4: 81.5 FT - 86.5 FT



	PROJECT NO. 20230058.001A	PHOTO SUMMARY	FIGURE:
	DRAWN: 06/2022		C-12
	DRAWN BY: TD		
	CHECKED BY: KS/SC	OFFSHORE CABLE LANDING HORIZONTAL DIRECTIONAL DRILL INSTALLATIONS WINEMA BEACH, CLOVERDALE, OREGON	
FILE NAME: PHOTO SUMMARY			



PHOTO 17: BORING B-1, CORE RUN 5: 86.5 FT - 91.5 FT



PHOTO 18: BORING B-1, CORE RUN 6: 91.5 FT - 96.5 FT


	PROJECT NO. 20230058.001A	PHOTO SUMMARY	FIGURE: C-13
	DRAWN: 06/2022		
	DRAWN BY: TD	OFFSHORE CABLE LANDING HORIZONTAL DIRECTIONAL DRILL INSTALLATIONS WINEMA BEACH, CLOVERDALE, OREGON	
	CHECKED BY: KS/SC		
	FILE NAME: PHOTO SUMMARY		



PHOTO 19: BORING B-1, CORE RUN 7: 96.5 FT -101.5 FT



PHOTO 20: BORING B-1, CORE RUN 8: 101.5 FT - 106.5 FT


	PROJECT NO. 20230058.001A	PHOTO SUMMARY OFFSHORE CABLE LANDING HORIZONTAL DIRECTIONAL DRILL INSTALLATIONS WINEMA BEACH, CLOVERDALE, OREGON	FIGURE:
	DRAWN: 06/2022		C-14
	DRAWN BY: TD		
	CHECKED BY: KS/SC		
	FILE NAME: PHOTO SUMMARY		



PHOTO 21: BORING B-1, CORE RUNE 9: 106.5 FT -111.5 FT



PHOTO 22: BORING B-1, CORE RUN 10: 111.5 FT - 116.5 FT


	PROJECT NO. 20230058.001A	PHOTO SUMMARY	FIGURE:
	DRAWN: 06/2022		C-15
	DRAWN BY: TD	OFFSHORE CABLE LANDING HORIZONTAL DIRECTIONAL DRILL INSTALLATIONS WINEMA BEACH, CLOVERDALE, OREGON	
	CHECKED BY: KS/SC		
	FILE NAME: PHOTO SUMMARY		



PHOTO 23: BORING B-1, CORE RUNE 11: 116.5 FT -121.5 FT



PHOTO 24: BORING B-1, CORE RUN 12: 121.5 FT - 126.5 FT


 <p>KLEINFELDER Bright People. Right Solutions. www.kleinfelder.com</p>	PROJECT NO. 20230058.001A	PHOTO SUMMARY	FIGURE:
	DRAWN: 06/2022		C-16
	DRAWN BY: TD		
	CHECKED BY: KS/SC	OFFSHORE CABLE LANDING HORIZONTAL DIRECTIONAL DRILL INSTALLATIONS WINEMA BEACH, CLOVERDALE, OREGON	
	FILE NAME: PHOTO SUMMARY		



PHOTO 25: BORING B-1, CORE RUNE 13: 126.5 FT - 131.5 FT



PHOTO 26: BORING B-1, CORE RUN 14: 131.5 FT - 136.5 FT


 <p>KLEINFELDER Bright People. Right Solutions. www.kleinfelder.com</p>	PROJECT NO. 20230058.001A	<p>PHOTO SUMMARY</p> <p>OFFSHORE CABLE LANDING HORIZONTAL DIRECTIONAL DRILL INSTALLATIONS WINEMA BEACH, CLOVERDALE, OREGON</p>	FIGURE:
	DRAWN: 06/2022		<p>C-17</p>
	DRAWN BY: TD		
	CHECKED BY: KS/SC		
	FILE NAME: PHOTO SUMMARY		





PHOTO 27: BORING B-1, CORE RUN 15: 136.5 FT -141.5 FT



PHOTO 28: BORING B-1, CORE RUN 16: 141.5 FT - 146.5 FT



	PROJECT NO. 20230058.001A	PHOTO SUMMARY	FIGURE: C-18
	DRAWN: 06/2022		
	DRAWN BY: TD	OFFSHORE CABLE LANDING HORIZONTAL DIRECTIONAL DRILL INSTALLATIONS WINEMA BEACH, CLOVERDALE, OREGON	
	CHECKED BY: KS/SC		
	FILE NAME: PHOTO SUMMARY		



PHOTO 29: BORING B-1, CORE RUNE 17: 146.5 FT -151.5 FT

	PROJECT NO. 20230058.001A	PHOTO SUMMARY	FIGURE:
	DRAWN: 06/2022		C-19
	DRAWN BY: TD	OFFSHORE CABLE LANDING HORIZONTAL DIRECTIONAL DRILL INSTALLATIONS WINEMA BEACH, CLOVERDALE, OREGON	
	CHECKED BY: KS/SC		
	FILE NAME: PHOTO SUMMARY		





APPENDIX D

LABORATORY TEST RESULTS

LIST OF ATTACHMENTS

The following figures are attached and complete this appendix.

- Figure D-1 – Laboratory Test Result Summary
- Figure D-2 – Rock Laboratory Test Result Summary
- Figure D-3 – Atterberg Limits Test Results
- Figure D-4 – Sieve Analysis Test Results
- Figures D-5 to D-8 – Uniaxial Compressive Strength Results



Exploration ID	Depth (ft.)	Sample Description	Water Content (%)	Dry Unit Wt. (pcf)	Sieve Analysis (%)			Atterberg Limits			Additional Tests
					Passing 3/4"	Passing #4	Passing #200	Liquid Limit	Plastic Limit	Plasticity Index	
B-1	5.0	POORLY GRADED SAND (SP)	11.1	111.0			0.9				
B-1	15.0	POORLY GRADED SAND (SP)	20.3	107.4			4.0				
B-1	20.0	POORLY GRADED GRAVEL WITH SILT AND SAND (GP-GM)			91	47	8.6				
B-1	25.0	POORLY GRADED GRAVEL WITH SILT AND SAND (GP-GM)			73	33	5.9				
B-1	40.0	CLAYEY SAND (SC)					17	53	27	26	
B-1	45.0	POORLY GRADED SAND (SP)	15.2	122.9			3.6				
B-1	50.0	POORLY GRADED SAND (SP)					5.4				

Refer to the Geotechnical Evaluation Report or the supplemental plates for the method used for the testing performed above.
 NP = NonPlastic

 <p>KLEINFELDER Bright People. Right Solutions.</p>	PROJECT NO.: 20230058.001A	LABORATORY TEST RESULT SUMMARY	FIGURE D-1
	DRAWN BY: CHECKED BY: DATE:		



Exploration ID	Depth (ft.)	Sample Description	Unconfined Compressive Strength (psi)	UCS with Young's Modulus (tsf)	Triaxial Compressive Strength (tsf)	Triaxial with Young's Modulus (tsf)	Triaxial with Poisson's Ratio	Point Load Index (MPa)	Direct Shear Strength on Saw-Cut Surface (tsf)	Direct Shear Strength on Fracture Surface (tsf)	Direct Shear Strength Apparent Friction	Brazilian Splitting Tensile Strength (MPa)	Dry Unit Weight (pcf)	Specific Gravity	Moh's Hardness	Slake Durability	Cerhar Abrasivity Index
B-1	82.0	SANDSTONE	5610										146.0				
B-1	91.5	SANDSTONE	5050										157.0				
B-1	112.4	SANDSTONE	4210										153.0				
B-1	132.5	SANDSTONE	4990										152.0				



KLEINFELDER
Bright People. Right Solutions.

PROJECT NO.:
20230058.001A

DRAWN BY:
CHECKED BY:
DATE:

ROCK LABORATORY TEST
RESULT SUMMARY

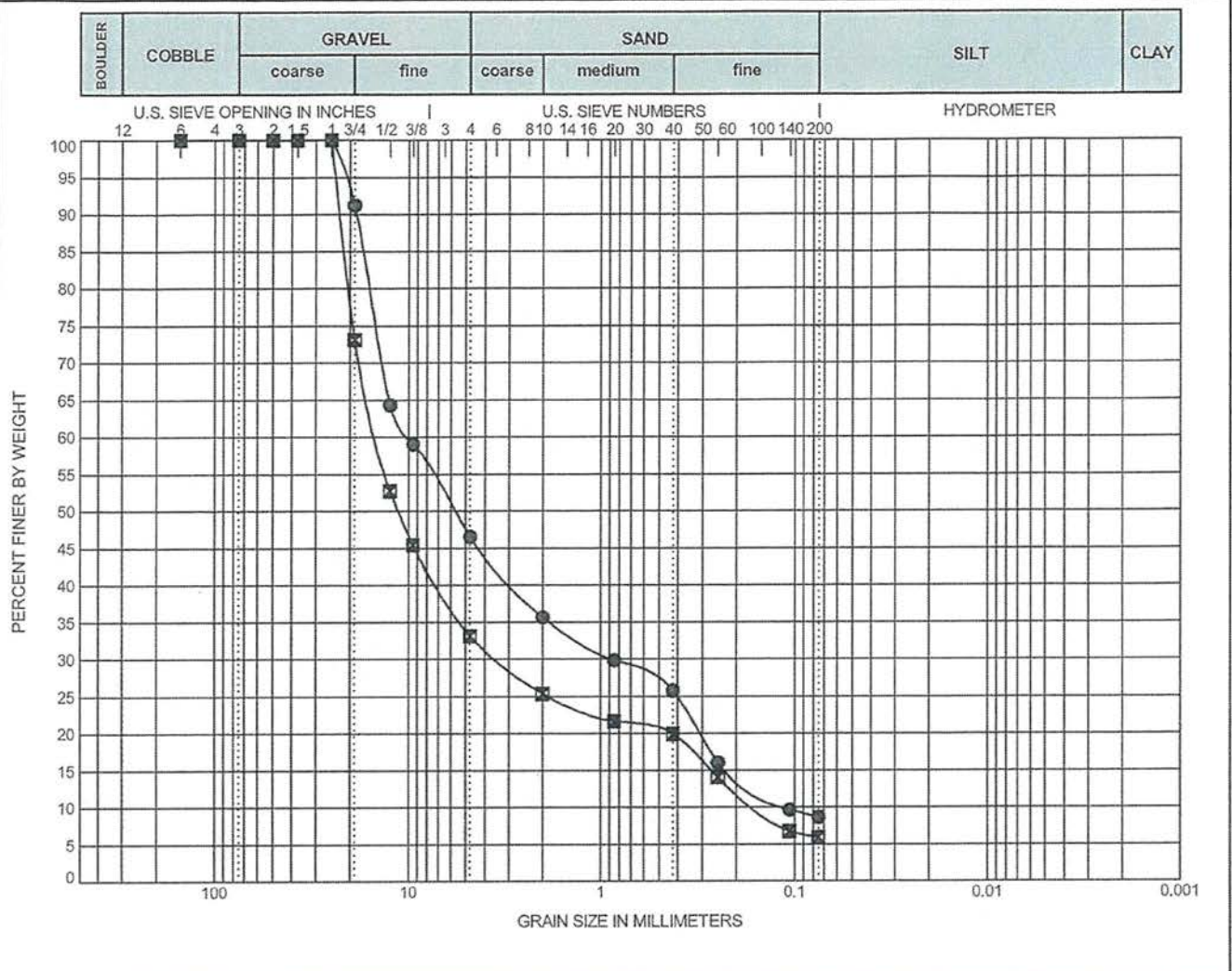
FIGURE
D-2

OFFSHORE CABLE LANDING
HORIZONTAL DIRECTIONAL DRILL
WINEMA BEACH, CLOVERDALE, OREGON

Refer to the Geotechnical Investigation Report or the supplemental plates for the method used for the testing performed above.
NA = Not Available

legal

PLOTTED: 08/01/2022 01:26 AM BY: dfriva



Exploration ID	Depth (ft.)	Sample Description	LL	PL	PI
● B-1	20	POORLY GRADED GRAVEL WITH SILT AND SAND (GP-GM)	NM	NM	NM
☒ B-1	25	POORLY GRADED GRAVEL WITH SILT AND SAND (GP-GM)	NM	NM	NM

Exploration ID	Depth (ft.)	D ₁₀₀	D ₆₀	D ₃₀	D ₁₀	C _c	C _u	Passing #3/4"	Passing #4	Passing #200	%Silt*	%Clay*
● B-1	20	150	10.005	0.875	0.112	0.68	89.46	91	47	8.6	NM	NM
☒ B-1	25	150	14.52	3.368	0.156	5.00	92.94	73	33	5.9	NM	NM

*These numbers represent silt-sized and clay-sized content but may not indicate the percentage of the material with the engineering properties of silt or clay. Sieve Analysis and Hydrometer Analysis testing performed in general accordance with ASTM D6913(Sieve Analysis) and ASTM D7928 (Hydrometer Analysis).
 NP = Nonplastic
 NM = Not Measured

Coefficients of Uniformity - $C_u = D_{60} / D_{10}$
 Coefficients of Curvature - $C_c = (D_{30})^2 / D_{60} D_{10}$
 D₆₀ = Grain diameter at 60% passing
 D₃₀ = Grain diameter at 30% passing
 D₁₀ = Grain diameter at 10% passing

	PROJECT NO.: 20230058.001A	SIEVE ANALYSIS OFFSHORE CABLE LANDING HORIZONTAL DIRECTIONAL DRILL WINEMA BEACH, CLOVERDALE, OREGON	FIGURE D-4
	DRAWN BY: CHECKED BY: DATE:		

PROJECT NUMBER: 20230058.001A
 OFFICE: FRESNO
 OFFICE FILTER: FRESNO
 PRINT FILE: K:\dml_misc\2023
 PRINT TEMPLATE: E:\KLP_STANDAR0_GMI_LIB\GARY_2023.GLB [KLP_SIEVE_ANALYSIS]





Specimen Preparation in accordance with ASTM D4543

Remarks:

Diameter, in	D _o	2.39
Height, in	H _o	5.42
Moisture Condition		As Received
Unit Weight, pcf	ρ _d	146
Uniaxial Compressive Strength (psi)	σ _u	5,610
Time to Failure, mm:ss		2:18

Description of Specimen: --

Test Method: ASTM D7012, Method C

Boring:	B-1
Run:	4
Depth, ft:	82
Test Date:	6/9/22



9969 Horn Rd., Sacramento, CA 95827

PROJECT NO.: 20230058
 ENTRY BY: S. Winn
 CHECKED BY: C. Pollack
 DATE: 6/14/2022

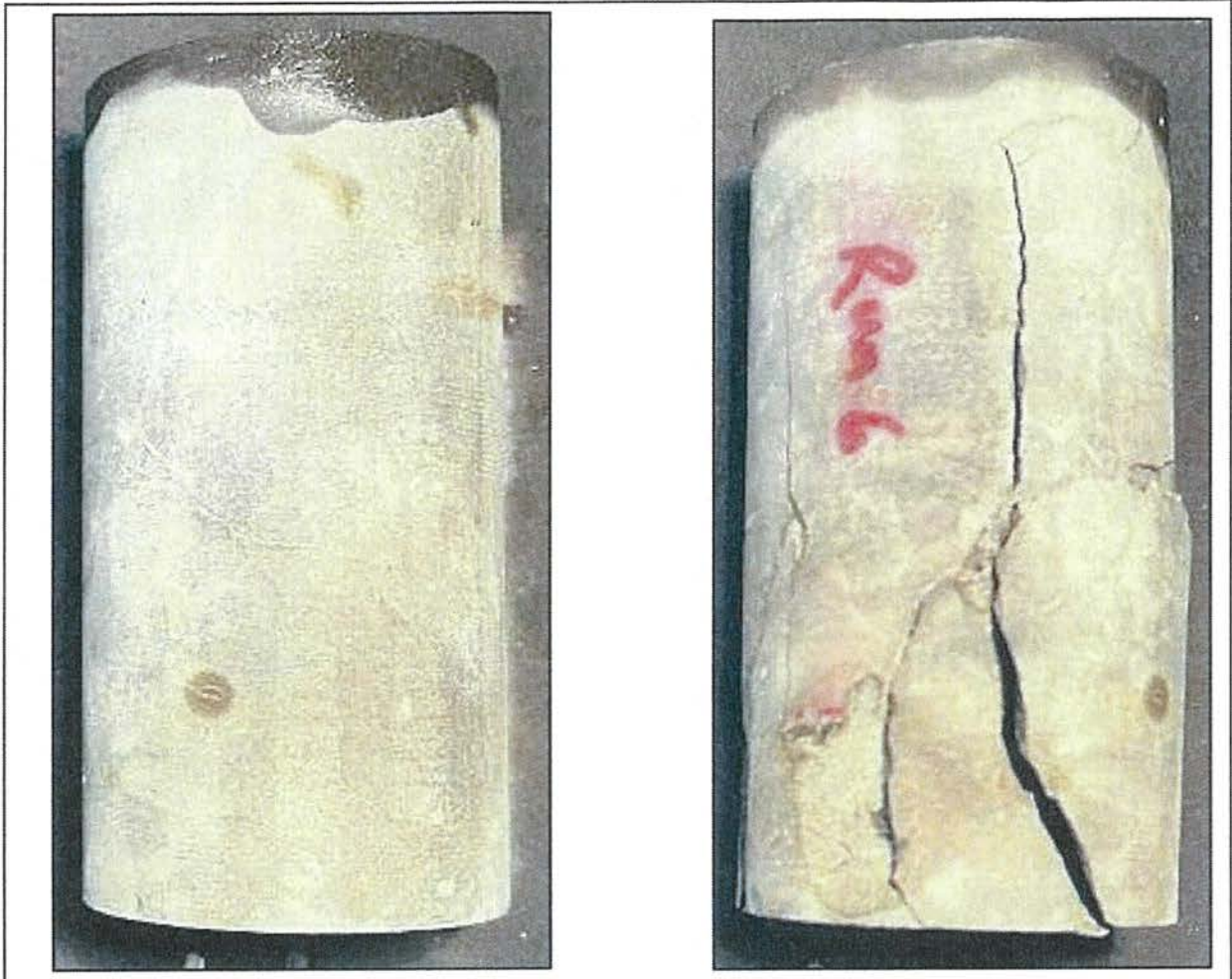
UNIAXIAL COMPRESSION TEST
 OFFSHORE CABLE LANDING
 HORIZONTAL DIRECTIONAL DRILL
 WINEMA BEACH, CLOVERDALE, OREGON

FIGURE

D-5

PAGE: 1 of 1






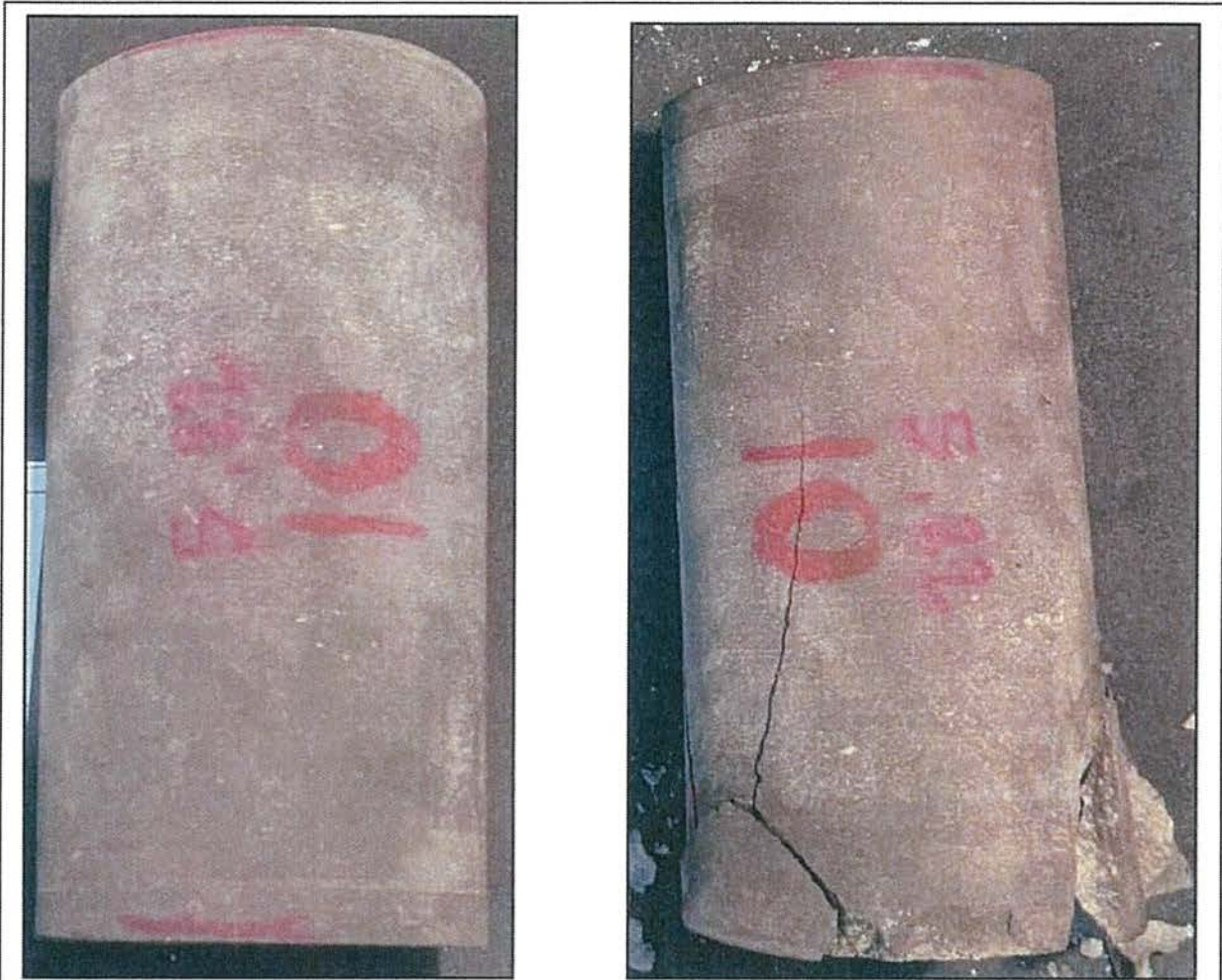
Specimen Preparation in accordance with ASTM D4543 Remarks:	Diameter, in	D _o	2.39
	Height, in	H _o	5.04
	Moisture Condition		As Received
	Unit Weight, pcf	ρ _d	157
	Uniaxial Compressive Strength (psi)	σ _u	5,050
	Time to Failure, mm:ss		3:12

Description of Specimen: - Test Method: ASTM D7012, Method C

Boring:	B-1
Run:	6
Depth, ft:	91.5
Test Date:	6/9/2022

 <p>9969 Horn Rd., Sacramento, CA 95827</p>	PROJECT NO.: 20230058 ENTRY BY: A. Auvinen CHECKED BY: C. Pollack DATE: 6/14/2022	UNIAXIAL COMPRESSION TEST OFFSHORE CABLE LANDING HORIZONTAL DIRECTIONAL DRILL WINEMA BEACH, CLOVERDALE, OREGON	FIGURE D-6
			PAGE: 1 of 1





Specimen Preparation in accordance with ASTM D4543 Remarks:	Diameter, in	D _o	2.39
	Height, in	H _o	5.17
	Moisture Condition		As Received
	Unit Weight, pcf	ρ _d	153
	Uniaxial Compressive Strength (psi)	σ _u	4,210
	Time to Failure, mm:ss		2:16

Description of Specimen: -- Test Method: ASTM D7012, Method C

Boring:	B-1
Run:	10
Depth, ft:	112.4
Test Date:	6/9/2022

<p>9909 Horn Rd., Sacramento, CA 95827</p>	PROJECT NO.: 20230058 ENTRY BY: S. Winn CHECKED BY: C. Pollack DATE: 6/14/2022	UNIAXIAL COMPRESSION TEST	FIGURE D-7
		OFFSHORE CABLE LANDING HORIZONTAL DIRECTIONAL DRILL WINEMA BEACH, CLOVERDALE, OREGON	





Specimen Preparation in accordance with ASTM D4543 Remarks:	Diameter, in	D _o	2.40
	Height, in	H _o	5.03
	Moisture Condition		As Received
	Unit Weight, pcf	ρ _d	152
	Uniaxial Compressive Strength (psi)	σ _u	4,990
	Time to Failure, mm:ss		5:49

Description of Specimen: -- Test Method: ASTM D7012, Method C

Boring:	B-1
Run:	14
Depth, ft:	132.5-133.8
Test Date:	6/9/2022

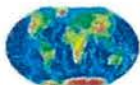
<p>9969 Horn Rd., Sacramento, CA 95827</p>	PROJECT NO.: 20230058 ENTRY BY: S. Winn CHECKED BY: C. Pollack DATE: 6/14/2022	UNIAXIAL COMPRESSION TEST OFFSHORE CABLE LANDING HORIZONTAL DIRECTIONAL DRILL WINEMA BEACH, CLOVERDALE, OREGON	FIGURE D-8
			PAGE: 1 of 1





APPENDIX E
GEOPHYSICAL INVESTIGATION RESULTS





P. O. Box 2229
Redmond, WA 98053

Global Geophysics

Tel: 425-890-4321
Fax: 206-582-0838

July 14, 2022

Our ref: 112-0228.000

Kleinfelder
3731 W. Ashcroft Ave,
Fresno, CA 93722

Attention: Mr. Pedro Rivas

**RE: REPORT FOR THE GEOPHYSICAL SURVEYS FOR WINEMA HDD,
OREGON**

Dear Mr. Rivas:

Global Geophysics LLC. conducted downhole seismic, multi-channel analysis of surface wave (MASW), electrical resistivity tomography (ERT), and overwater seismic profiling surveys near Winema, OR in May, June and July, 2022. The objective of the studies is to the stratigraphy along the proposed HDD alignment.

1. GEOPHYSICAL METHODS, INSTRUMENTATION AND FIELD PROCEDURES

The following paragraphs describe the methods and procedures.

1.1. Downhole Seismic Survey

The seismic downhole method provides a designer with information pertinent to the seismic wave velocities of the materials in question. The P-wave and S-wave velocities are directly related to the important geotechnical elastic constants of Poisson's ratio, shear modulus, bulk modulus, and Young's modulus. Accurate in-situ P-wave and S-wave velocity profiles are essential in geotechnical foundation designs. These parameters are used in both analyses of soil behavior under both static and dynamic loads where the elastic constants are input variables into the models defining the different states of deformations such as elastic, elasto-plastic, and failure. Another important use of estimated shear wave velocities in geotechnical design is in the liquefaction assessment of soils.

The downhole seismic survey was carried out using a Geometrics 32-bit Geode, a 24-channel seismograph. The receiver package employed was a Geostuff BHG-2 tri-axial package containing one vertical geophone for recording compressional wave (P-wave) and the two horizontal geophones for recording shear waves (S-wave). A lumber secured under vehicle

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front wheels was used for S-wave source. The lumber was impacted by a 20 lb sledge hammer horizontally on both sides of the lumber to generate S-wave with opposite polarities. The receiver was lowered in the borehole at 3-foot interval, and data was collected and stored for further interpretation.

1.2. Multichannel Analysis of Surface Wave (MASW)

The MASW method determines variations in surface wave velocities with increasing distances and wavelengths. The data from these measurements are used to model the shear wave velocities of the subsurface. This information can then be used to infer rock/soil types, stratigraphy and soil conditions.

The MASW survey requires a seismic source, to generate surface-waves, and at least 24 geophones, to measure the ground response at increasing distances from the source. Surface waves are a special type of seismic wave whose propagation is confined to the near surface medium. The depth of subsurface penetration of a surface-wave is directly proportional to its wavelength. In a non-homogeneous medium, surface-waves are dispersive, i.e. each wavelength has a characteristic velocity stemming from subsurface heterogeneities. The relationship between surface-wave velocity and wavelength is used to calculate the shear-wave velocity of the medium with increasing depth.

The seismic source will be an excavator. Examples of passive sources are drill rigs, road traffic, micro-tremors, and water-wave action (in near-shore environments). Geophone measures the arrival time of the various components of the surface wave-train traveling from the seismic source.

The surface-wave velocity with respect to frequency (called the 'dispersion curve') is determined by measuring the delay time in wave propagation between the geophones. The dispersion curve is then matched to a theoretical dispersion curve using an iterative forward-modeling procedure. The result is a profile of shear-wave velocity versus depth. This shear wave profile can be with used other parameters such as density, to estimate the dynamic shear modulus of the medium as a function of depth.

The MASW survey was conducted using 24 geophone spaced at 10 ft.

1.3. Electrical Resistivity Tomography

The electrical resistivity tomography (ERT) technique maps differences in the electrical properties of geologic materials. These differences can result from variations in lithology, water content, pore-water chemistry, or voids. The method involves transmitting an electric current into the ground between two electrodes and measuring the voltage between two other electrodes. The direct measurement is the apparent resistivity of the area beneath the electrodes. The measurements include deeper layers as the electrode spacing is increased. Recent advances in technology permit rapid collection of multiple soundings, using up to 56 electrodes for each spread. The data are modeled to create a 2-D geo-electric cross-section that is useful for mapping both vertical and horizontal variations of the subsurface strata.

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The data was acquired with an AGI SuperSting R8 system using up to 56 electrodes spaced at a 10-20 feet interval on the ground surface/sea floor along the proposed HDD alignment. Once the electrode array was installed in the ground, multiple soundings were automatically carried out by the control unit. The data was downloaded on site into a computer and processed using specialized inversion software to determine if all of the objectives had been met.

1.4. Overwater Profiling

Overwater profiling provides a continuous subsurface image of the seabed, the underlying stratigraphy and major structural features in the bedrock. The subsurface acoustic image are produced in real-time on a computer screen which displays the data as a profile or cross-section view along the transect. Subsurface reflection data is acquired every 1 to 2 meters and the location of each data point is determined with the global position satellite system. Preliminary interpretation of the data can be done in the field without the need for additional processing.

The reflection survey used a low frequency seismic reflection system, with a frequency band-pass of 450 to 1500 Hz to obtain maximum subsurface penetration in fine-grained to coarse-grained sediment. The acoustic energy source was mounted on the side of the vessel and a 20 ft long hydrophone is towed approximately 10 ft astern of the acoustic transducer.

A DGPS system will be used to navigate along proposed HDD alignment. The reflection data is processed and stored on a digital acquisition system.

2. RESULTS

The line locations are shown in Figure 1. The s-wave profile MASW 1 (on land) is presented in Figure 2 together with resistivity profile ERT 2 (on land). The borehole B1 is approximately 65 north of the transect. The interpreted top of the sandstone is shown in dashed magenta line. MASW and ERT measure different soil properties with different electrode/geophone/shot spacings, their contour lines may not match.

In addition, the measured soil resistivity values are in very different ranges when collected on land and in sea water. The resistivity range is much lower in sea water due to large current output. The ERT 1 profile is shown in Figure 3. The interpreted overburden and basal layer (assuming sandstone) is highlighted with the dashed magenta line. The overburden thickness varies between 35 ft to 50 ft. However, there is a big data gap between ERT1 and ERT2, and different materials have similar resistivity ranges, the interpreted geological units can be different from ground truthing.

The overwater seismic profiling data were collected back and forth between (45°8.750'N, -123°59.366') and (45°8.783', -123°58.816') as close to the shore as possible (approximately 15 ft water depth). The track lines and profiles are shown in Figure 4. The interpreted basal layer based on the resistivity profile is shown in dashed purple line.

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The shear velocities measured at borehole B1 is listed in the table below:

Table 1: Calculated shear wave velocity at B1

Depth (ft)	Arrival (ms)	S-wave Velocity (ft/s)
3	21.72	
6	24.96	610
9	28.21	766
12	31.45	834
15	34.70	867
18	37.94	885
21	41.18	896
24	44.43	903
27	47.67	908
30	49.81	1378
33	51.96	1382
36	54.10	1385
39	56.25	1387
42	58.39	1389
45	60.54	1390
48	62.68	1391
51	64.82	1392
54	66.97	1393
57	69.11	1393
60	71.26	1394
63	73.40	1395
66	74.94	1942
69	76.48	1943
72	78.02	1943
75	79.56	1944
78	81.10	1944
81	82.64	1944
84	83.85	2466
87	85.07	2466
90	86.28	2466
93	87.50	2466
96	88.71	2467
99	89.93	2467
102	91.14	2467
105	92.36	2467
108	93.57	2467

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111	94.79	2467
114	96.00	2468
117	97.18	2536
120	98.36	2536
123	99.55	2536
126	100.73	2536
129	101.91	2537
132	103.09	2537
135	104.27	2537
138	105.45	2537
141	106.64	2537
144	107.82	2537
147	109.00	2537

S-wave source to borehole distance = 5 ft

LIMITATION OF GEOPHYSICAL METHODS

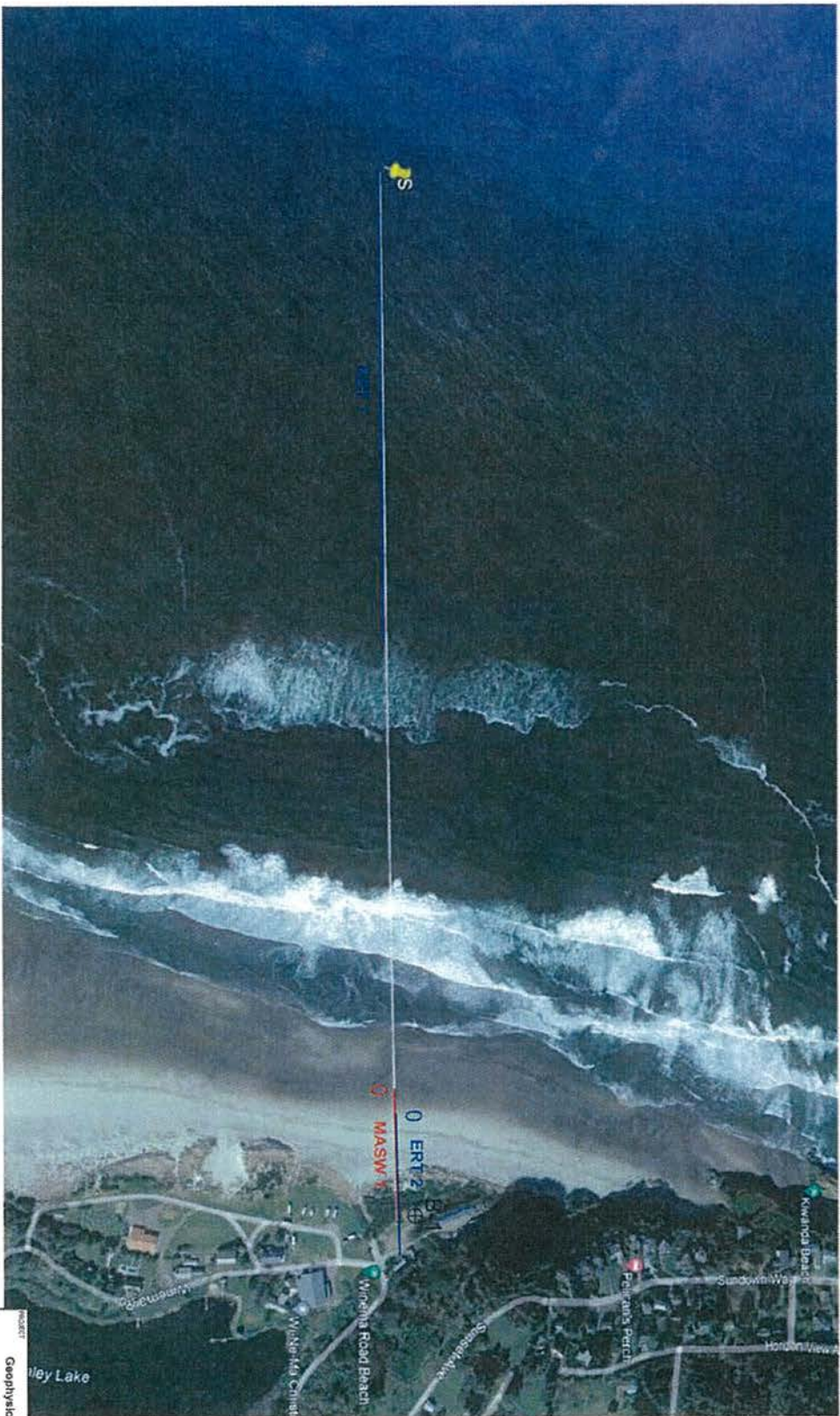
Global geophysics services are conducted in a manner consistent with the level of care and skill ordinarily exercised by other members of the geophysical community currently practicing under similar conditions subject to the time limits and financial and physical constraints applicable to the services. MASW, ERT, seismic profiling are remote sensing geophysical methods that may not detect all subsurface conditions due to the limitations of the methods, soil conditions, size of the features and their depths. Different soil/rock types have wide overlapping velocity and resistivity ranges, the interpreted geological units may be proven to be different by ground truthing.

Sincerely,

Global Geophysics



John Liu, Ph.D., R.G.
Principal Geophysicist

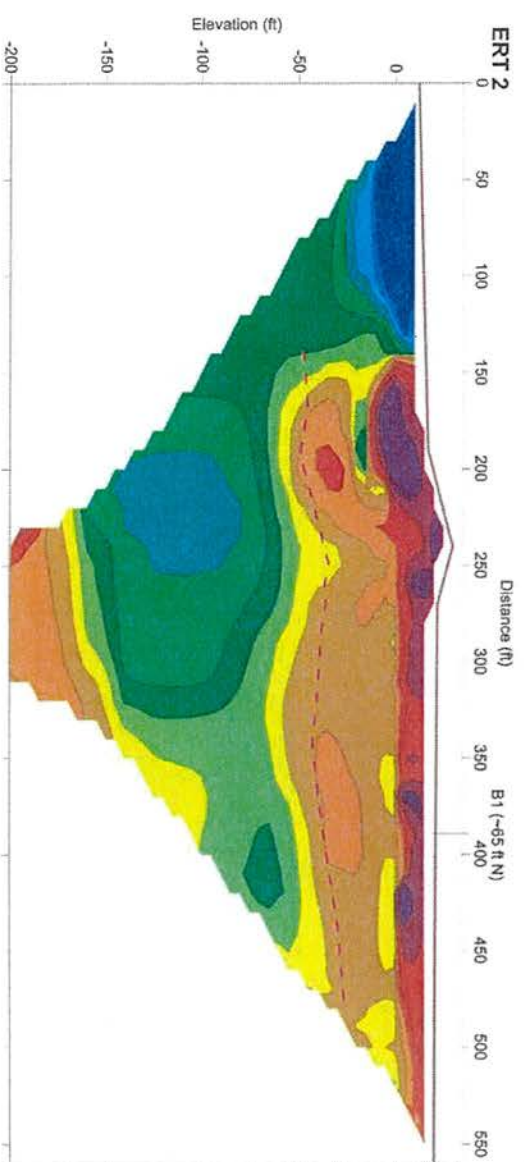
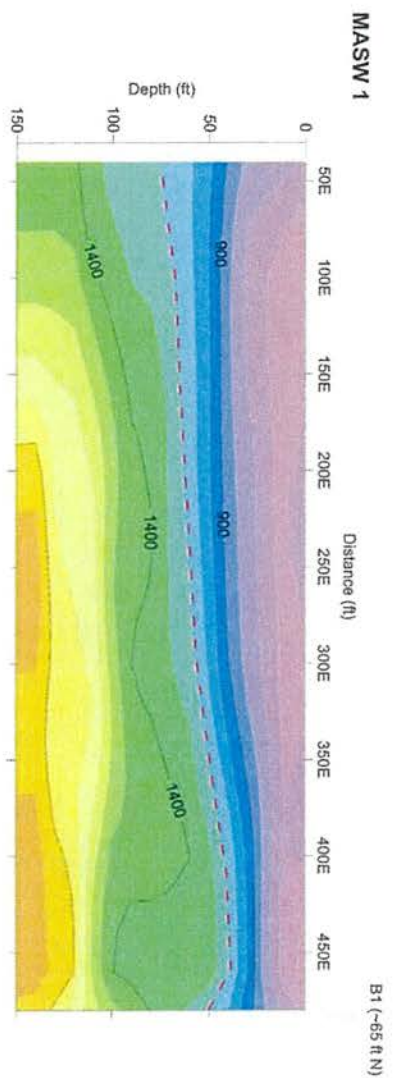


PROJECT
Geophysical Survey Along Winema HDD
Winema, OR

TITLE
Site Map

PROJECT	PROJECT NUMBER	DATE
Global Geophysics	220	11/15/2022
PROJECT LOCATION	SCALE	DATE
0.0 Mile 220	1:10,000	11/15/2022
141.425.800.4321		

FIGURE 1

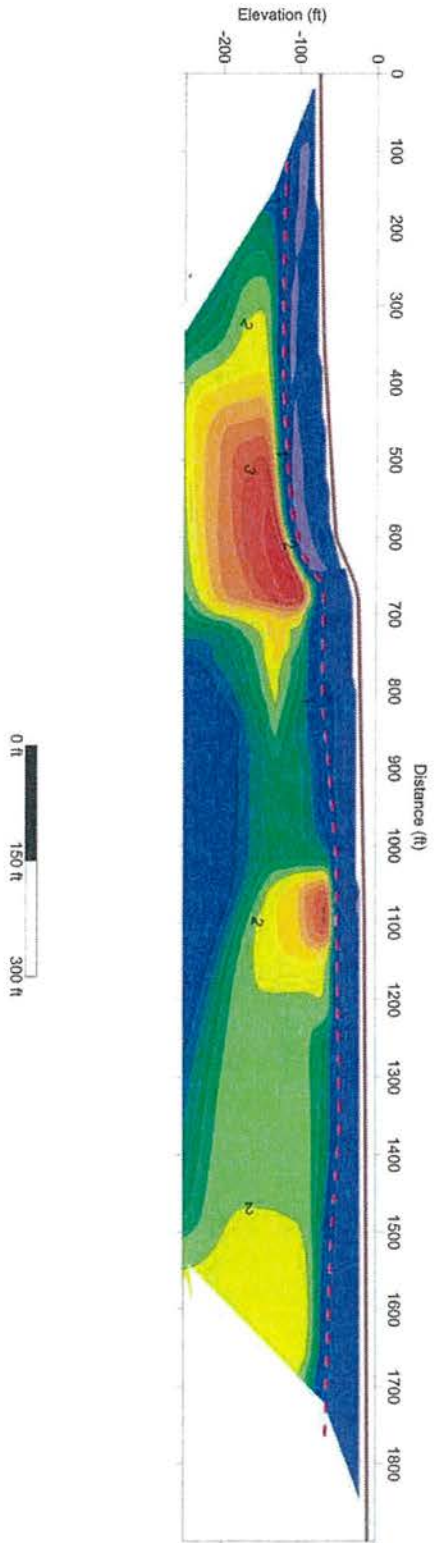


Legend:

--- Interpreted top of the sandstone



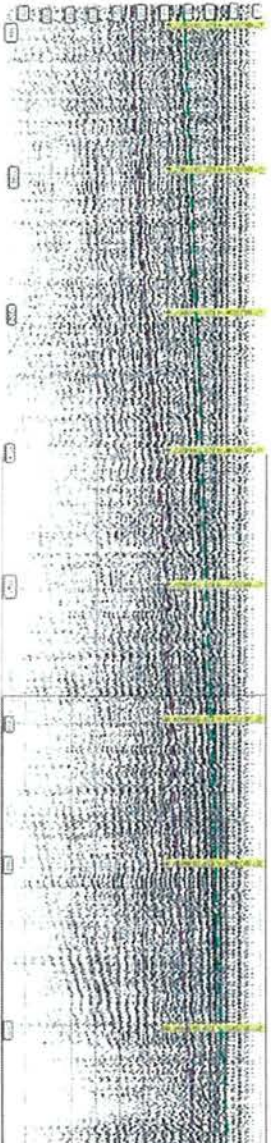
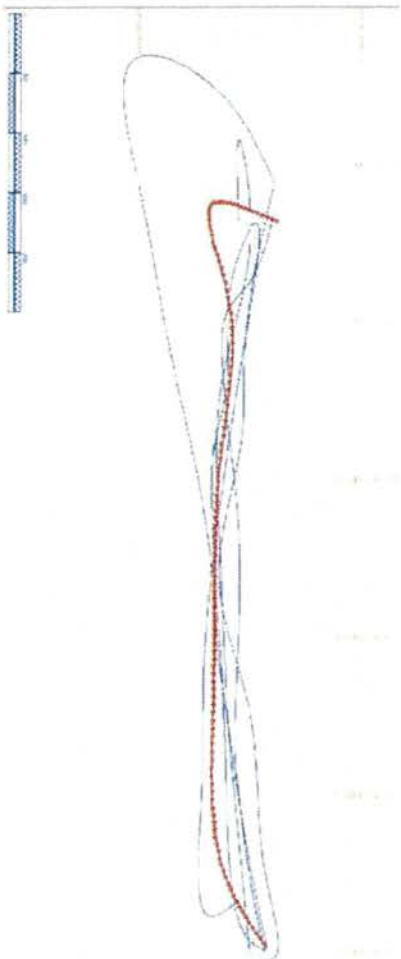
PROJECT		Geophysical Survey Along Winema HDD	
TITLE		Winema, OR	
DATE			
Global Geophysics			
P.O. Box 202			
46979-2029			
Tel: 425-950-4321			
PROJECT	NO. 10220202	DATE	11/11/20
CLIENT	U	SCALE	1:1
DATE	A	FILE	ERT 2
BY		FIGURE	2



Legend:
 - - - - - Interpreted top of the sandstone

PROJECT		Global Geophysics	
TITLE		Geophysical Survey Along Winema HDD Winema, OR	
DATE		Global Geophysics	
SCALE		AS SHOWN	
FIGURE		FIGURE 3	
CONTACT		P.O. Box 2228 Astoria, OR 97103-2228 Tel: 425-500-4281	

Track Lines



Seismic record images are not scaled

Legend:

- - - Sea floor
- - - Interpreted basal layer

PROJECT		Global Geophysics	
TITLE		Geophysical Survey Along Winema HDD	
WINEMA, OR		Winema, OR	
Seismic Profile			
PROJ	DATE	SCALE	FILE
Global Geophysics	10/11/2022	1:1	ALBANY
P.O. Box 228	Winema, OR 97597		
Ph: 531-228-2228	Fax: 531-228-2229		
Web: www.globe.com			
FIGURE 4			



APPENDIX F
GBA INFORMATION SHEET



Important Information about This Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, you can benefit from a lowered exposure to problems associated with subsurface conditions at project sites and development of them that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed herein, contact your GBA-member geotechnical engineer. Active engagement in GBA exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Understand the Geotechnical-Engineering Services Provided for this Report

Geotechnical-engineering services typically include the planning, collection, interpretation, and analysis of exploratory data from widely spaced borings and/or test pits. Field data are combined with results from laboratory tests of soil and rock samples obtained from field exploration (if applicable), observations made during site reconnaissance, and historical information to form one or more models of the expected subsurface conditions beneath the site. Local geology and alterations of the site surface and subsurface by previous and proposed construction are also important considerations. Geotechnical engineers apply their engineering training, experience, and judgment to adapt the requirements of the prospective project to the subsurface model(s). Estimates are made of the subsurface conditions that will likely be exposed during construction as well as the expected performance of foundations and other structures being planned and/or affected by construction activities.

The culmination of these geotechnical-engineering services is typically a geotechnical-engineering report providing the data obtained, a discussion of the subsurface model(s), the engineering and geologic engineering assessments and analyses made, and the recommendations developed to satisfy the given requirements of the project. These reports may be titled investigations, explorations, studies, assessments, or evaluations. Regardless of the title used, the geotechnical-engineering report is an engineering interpretation of the subsurface conditions within the context of the project and does not represent a close examination, systematic inquiry, or thorough investigation of all site and subsurface conditions.

Geotechnical-Engineering Services are Performed for Specific Purposes, Persons, and Projects, and At Specific Times

Geotechnical engineers structure their services to meet the specific needs, goals, and risk management preferences of their clients. A geotechnical-engineering study conducted for a given civil engineer

will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client.

Likewise, geotechnical-engineering services are performed for a specific project and purpose. For example, it is unlikely that a geotechnical-engineering study for a refrigerated warehouse will be the same as one prepared for a parking garage; and a few borings drilled during a preliminary study to evaluate site feasibility will not be adequate to develop geotechnical design recommendations for the project.

Do not rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project or purpose;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, the reliability of a geotechnical-engineering report can be affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If you are the least bit uncertain* about the continued reliability of this report, contact your geotechnical engineer before applying the recommendations in it. A minor amount of additional testing or analysis after the passage of time – if any is required at all – could prevent major problems.

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read the report in its entirety. Do not rely on an executive summary. Do not read selective elements only. *Read and refer to the report in full.*

You Need to Inform Your Geotechnical Engineer About Change

Your geotechnical engineer considered unique, project-specific factors when developing the scope of study behind this report and developing the confirmation-dependent recommendations the report conveys. Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the elevation, configuration, location, orientation, function or weight of the proposed structure and the desired performance criteria;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project or site changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept*

responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.

Most of the "Findings" Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site's subsurface using various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing is performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgement to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team through project completion to obtain informed guidance quickly, whenever needed.

This Report's Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, they are not final, because the geotechnical engineer who developed them relied heavily on judgement and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* exposed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

This Report Could Be Misinterpreted

Other design professionals' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a continuing member of the design team, to:

- confer with other design-team members;
- help develop specifications;
- review pertinent elements of other design professionals' plans and specifications; and
- be available whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction-phase observations.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note*

conspicuously that you've included the material for information purposes only. To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. This happens in part because soil and rock on project sites are typically heterogeneous and not manufactured materials with well-defined engineering properties like steel and concrete. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually provide environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures.* If you have not obtained your own environmental information about the project site, ask your geotechnical consultant for a recommendation on how to find environmental risk-management guidance.

Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, the engineer's services were not designed, conducted, or intended to prevent migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, *proper implementation of the geotechnical engineer's recommendations will not of itself be sufficient to prevent moisture infiltration.* Confront the risk of moisture infiltration by including building-envelope or mold specialists on the design team. *Geotechnical engineers are not building-envelope or mold specialists.*



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Appendix 4

Inadvertent Return Contingency Plan



Inadvertent Return Contingency Plan For Horizontal Directional Drilling



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1. Introduction

Horizontal Directional Drill (HDD) operations, also known as directional bores, have the potential to release drilling fluids into the surface environment through inadvertent returns, or the condition where drilling mud is released through fractured bedrock into the surrounding rock and sand and travels toward the surface. Because drilling muds consist largely of a bentonite clay-water mixture, they are not classified as toxic or hazardous substances. However, if it is released into restricted water bodies in large quantities, bentonite has the potential to adversely impact fish and invertebrate species.

While drilling fluid seepage associated with an inadvertent return is most likely to occur near the bore entry and exit points where the drill head is shallow, inadvertent returns can occur in any location along a directional bore. This Inadvertent Return Contingency Plan (IRCP) establishes operational procedures and responsibilities for the prevention, containment, and clean-up of inadvertent returns associated with the proposed directional drilling utility project. All onsite personnel, including subcontractors, responsible for the work must adhere to this plan during the directional drilling process.

The specific objectives of this plan are to:

1. Minimize the potential for an inadvertent return associated with directional drilling activities.
2. Provide for the timely detection of inadvertent returns.
3. Protect the environmentally sensitive seabed/riverbed and associated riparian vegetation.
4. Provide for an organized, timely, and "minimum-impact" response in the event of an inadvertent return.
5. Provide for all appropriate notifications are made immediately to the management and safety personnel, as well as the applicable regulatory agencies.

2. Responsibilities

The Site Supervisor has overall responsibility for implementing this IRCP. The Site Supervisor will ensure that all employees are trained prior to all drilling. The Site Supervisor shall be notified immediately when an inadvertent return is detected. The Site Supervisor will be responsible for ensuring that the safety department is aware of the inadvertent return, coordinating personnel, response, cleanup, regulatory agency notification and coordination to ensure proper clean-up, disposal of recovered material, and timely reporting of the incident. The Site Supervisor shall also ensure all waste materials are properly containerized, labeled, and removed from the site to an approved disposal facility by personnel experienced in the removal, transport, and disposal of drilling mud.

The Site Supervisor shall be familiar with all aspects of the drilling activity, the contents of this IRCP and the conditions of approval under which the activity is permitted to take place. The Site Supervisor shall have the authority to stop work and commit the resources (personnel and equipment) necessary to implement this plan. The Site Supervisor shall assure that a copy of this plan is available (onsite) and accessible to all construction personnel during all construction. The Site Supervisor shall ensure that all workers are properly trained and familiar with the necessary procedures for response to an inadvertent return, prior to commencement of drilling operations.

The Site Supervisor shall ensure that:

- All equipment and vehicles are be checked and maintained daily to prevent leaks of hazardous materials.
- Spill kits and spill containment materials are always available on-site and that the equipment is in good working order.
- Equipment required to contain and clean up an inadvertent return will either be available at the work site or readily available at an offsite location within 15 minutes of the bore site.
- If equipment is required to be operated near a riverbed, absorbent pads, and plastic sheeting for placement beneath motorized equipment shall be used to protect the riverbed from engine fluids.



Prior to the start of construction, the Site Supervisor shall ensure that the crew members receive training in the following:

- The provisions of the IRCP, equipment maintenance, and site-specific permit and monitoring requirements.
- Inspection procedures for release prevention and containment equipment and materials.
- Contractor/crew obligation to immediately stop the drilling operation upon first evidence of the occurrence of an inadvertent return and to immediately report any releases.
- Contractor/crew member responsibilities in the event of a release.
- Operation of release prevention and control equipment and the location of release control materials, as necessary and appropriate.
- Protocols for communication with agency representatives who might be on-site during the clean-up effort.

The Site Supervisor shall ensure that a Job Briefing meeting is held at the start of each day of drilling to review the appropriate procedures to be followed in case of an inadvertent return. Questions shall be answered, and clarification given on any point over which the drilling crew or other project staff has concerns.

3. HDD Operations

3.1 HDD Rig

The HDD rig will be placed in position and prepared for bore pipe installation. The individual segments of bore pipe will be placed on the HDD rig by either a small crane, forklift or a back-hoe stationed next to the drill rig.



Figure 1: Example of HDD Rig

3.2 Fluid Mixing & Recycling Unit

A mixing & recycling unit will be used to mix the drilling fluid and to remove the drill cuttings and recycle the drilling fluid during the drilling process. The bentonite clay and water are mixed in the large tank for use in the drilling process. As the drilling fluids are returned to the bore site through the annular space between the drill pipe and the bore hole, it is pumped back to the mixing/recycling unit where the cuttings (soil and rock) from the drill hole are separated from the drilling fluid. The cuttings are stockpiled for removal to an approved landfill and the drilling fluid

reused as the bore process continues. This recycling process will minimize the use of freshwater for the mixing and reduce the risk of drilling fluid leak in the surrounding area.

The recycling unit chosen for these operations typically has a 280 m³ / hour clean mud recycling capacity and utilizes three stages of recycling: a preliminary shaker, a de-sander, and a de-silter. The de-silter employs two sets of meshes and hydro cyclones to clean the fluid from solids up to 20 µm. An example of this unit is illustrated in Figure 2.



Figure 2. Example of a Drilling Fluid Mixing & Recycling Unit

3.3 Vac-Truck

A vacuum truck shall be staged at the site, allowing it to be mobilized and relocated at any place along the (terrestrial) drill shot within 10 minutes of an inadvertent return detection.

3.4 Drilling Fluid

3.4.1 Drilling Mud Mixing and Preparation

The drilling fluid, called drilling mud, to be used typically consists of approximately 92% water, 7% bentonite clay and less than 1% other non-toxic additives. The drilling mud is prepared by mixing the water, bentonite clay and additives in the mixing unit. The dust that would be produced when pouring the bentonite in the mixing unit poses an inhalation hazard for the worker that does the mixing. Appropriate Personal Protection Equipment, including dust masks and eye protection, will be worn by personnel near the mixing process.

There are various components that may be added to the drilling mud that enhance borehole stabilization, fluid carrying capacity, and water characteristics. A polymer additive would be available on-site to be employed in the drilling fluid in negligible concentration (0.5 kg per m³ of drilling fluid) as (and only if) required to enhance the bore stability by strengthening the filter-cake being formed on the bore walls during the drilling operation.

All components are biodegradable and non-toxic/environmentally friendly. MSDS of the drilling fluid powder and the polymer additive are included in Appendices A-C.

The drilling mud to be used for each day's work will be prepared in the beginning of the day with adequate time provided for thorough mixing and adjustment of the mud's properties according to the previous day's findings and the

manufacturer's specification. Typically, approximately 30 minutes is needed for proper hydration of the mud components and homogenization of the mix.

3.4.2 Rheological Adjustments

Assigned personnel will monitor the return fluids from the borehole to determine percentage of hole cleaning and drilling mud carrying capacities. Modifications in the drilling mud composition or rheological characteristics may be required as the drill passes through different substrates to ensure proper borehole stabilization and filter-cake formation.

3.4.3 Sludge Removal

The volume of fluids and cuttings produced will be removed from the drilling pit during regular intervals, or continuously if required, and be prepared for recycling when possible. Solids can be optically assessed with accuracy after the fluid turbidity clears and the volume of fluids can be calculated so that comparisons can take place between the calculated volume accruing from the borehole length / drilled cross-sectional area, and the actual recycled quantity. Solid and liquid sludge that cannot be recycled further will be transported off-site by a vacuum truck and disposed of at an approved facility.

3.4.4 Drilling Fluid Containment

The produced sediment does not constitute harmful substance to the environment and the surrounding area as bentonite is a naturally occurred substance whilst all the additives employed for saltwater tolerance are biodegradable. However, the employment of the recycling unit will ensure that the drilling fluid be of a minimum amount and, therefore, the risk of non-containment is minimized.

Additionally, due to the "Drill and Leave" nature of the installation, the last 30 to 40 meters of the pilot bore will be mud-free, with fresh water being fed in the bore, flushing out the drilling fluid so that there will be no mud escaping the bore at the punch out position. The exact length of flushing shall be decided on site, depending on the drilling findings and the actual drilled material at the end of the pilot bore. Having assessed the above, a calculation of the drilling rate combined with the drilling fluid volume in the pipeline will be made to start pumping water in the system to displace the entire amount of mud from the drill-string by the time that punch out occurs.

4. Inadvertent Return Contingency Plan

4.1 Bore Status Monitoring and Site Preparation

Prevention of inadvertent returns begins at the bore site and with the bore machinery and site preparation. During the bore process, the drilling operator will closely monitor the drilling fluid volumes and pressures, the bore thrust force, the volume of fluids returning to the site (returns) and other variables. The drill operator will balance these variables to achieve the most efficient formation penetration rate. Pressure levels will be set at a minimum level necessary to advance the bore while reducing the probability of inadvertent returns most efficiently. During the bore process, the drilling operator will work to keep the annular space between the bore pipe and the drill hole open to allow for the drilling fluids to return to the bore site for reuse. However, this is not always possible given the bore conditions and lengths of the bore.

Terrestrial exit and entry pits will be enclosed to contain the drilling fluid. Typically, sandbags are used but effective containment can also be achieved by straw bales or silt fences. A spill kit will be maintained on-site and used if an inadvertent return occurs. A vacuum truck, trailer or portable suction pumps will be on-site during all drilling operations. Containment materials (e.g., straw, silt fencing, sandbags, spill kits) will be staged on-site, readily available, and easily mobilized for immediate use in the event of an accidental release of drilling mud. If necessary, barriers (e.g., straw bales, sandbags, sedimentation fences) between the bore site and the edge of the water will be

constructed prior to drilling to prevent released bentonite material from reaching the water. Other ancillary items readily available during drilling operations include a light tower in case clean-up operations are needed after dark.

Water containing mud, silt, bentonite, or other pollutants from equipment washing or other activities will not be allowed to enter the water (sea, lake, or stream/river). The bentonite used in the drilling process will be either disposed of at an approved disposal facility or recycled in an appropriate manner. Other construction materials and wastes shall be recycled or disposed of, as appropriate.

4.2 Fracture Detection

Most obvious signs of an inadvertent return are the visible pooling of drilling mud on the ground surface or discoloration in the water, sudden decrease in mud volume returns during drilling operations, or loss in drilling mud pump pressure. Drilling personnel will observe the volume of drilling fluid return and immediately report reductions to the Site Supervisor. The mud system operator will monitor actual drilling fluid volumes from the pumps and the return flow from the borehole. The operator will alert the on-site personnel if there is a significant variance. In the event of partial circulation loss, pumping of drilling fluid may be reduced to lessen pressure applied to native formation materials.

The Site Supervisor and the drill rig operator(s) will work to coordinate the likely location of the inadvertent return. The location of the inadvertent return will be recorded, notes made on the location, and measures taken to address the concern.

If required by local authorities and/or project site morphology and conditions, a dye shall be employed and added to the drilling fluid to enhance its detectability, especially when such event takes place underwater. This would ensure that the release can be spotted/assessed easier and therefore much faster by the observers dispatched around the site in case that such release is suspected by the parameters' monitoring.

4.3 Corrective Actions

The response of the field crew to an inadvertent return will be immediate and in accordance with procedures outlined in this IRCP. All appropriate emergency actions that do not pose additional threats to sensitive resources will be taken, as follows:

4.3.1 Terrestrial Inadvertent Returns

1. Direction boring and mud circulation will cease immediately as practical.
2. The bore stem will be pulled back to relieve pressure on the inadvertent return.
3. The Site Supervisor will notify the project team of the response actions to be taken and notifications to agencies will be made.
4. If inadvertent return is minor, easily contained, has not reached the surface, and is not threatening sensitive resources, a leak stopping compound will be used to block it. If the use of leak stopping compound is not fully successful, the bore stem will be redirected to a new location along the desired drill path where an inadvertent return has not occurred.
5. If the inadvertent return of drilling fluid has reached the ground surface, it will be recovered back to the bore site by pumping or by physical removal. A dike or berm may be constructed around the inadvertent return to entrap released drilling fluid, if necessary. Clean sand will be added to the area and smoothed to pre-project contours.
6. If the inadvertent return reaches the surface and becomes widespread, the Site Supervisor will authorize a readily accessible vacuum truck and mechanical equipment to the site. The vacuum truck may be either



positioned at either end of the line of the drill so that the inadvertent return can be reached by crews on foot, or may be pulled by a bulldozer, so that contaminated soils can be vacuumed up.

7. An incident report documenting the event including pictures before and after containment/clean-up and details such as location, activity in progress, drilling fluid and pumping parameters, personnel involved, and mitigating actions to be taken shall be prepared.

4.3.2 Ocean Inadvertent Returns

While the drill head is under the ocean, workers will periodically perform visually inspections of the ocean from the shore to for possible inadvertent returns in the ocean. If detected, the following measures will be taken to allow for the drilling fluid to dissipate.

1. Direction boring and mud circulation would cease immediately as practical.
2. The bore stem will be pulled back to relieve pressure on the inadvertent return.
3. The Site Supervisor will notify the project team of the response actions to be taken and notifications to agencies will be made.
4. The Site Supervisor, drill rig operator, and project team will determine if inadvertent return is minor, easily contained, has not reached the surface, and is not threatening sensitive resources.
5. Continuous visual observation of the inadvertent release will commence.
6. Drilling activities will cease until the inadvertent release has dissipated as determined by visual inspection.
7. Drilling activities will commence no sooner than 10 minutes after the inadvertent release has dissipated and will continue for a period no longer than 10 minutes after the inadvertent release is once again observed at which point steps 1 through 5 will be implemented. This cycle will continue until the release is determined to be stopped.

4.4 Containment of Drilling Fluid Release

Immediately following the detection of the inadvertent drilling fluid release on land, containment, and clean-up operations will commence. The Contractor may use straw bales, silt fences, sandbags, and/or earth berms to prevent fluid from migrating or flowing from the immediate area of the discharge. If the volume released is too small for containment measures or, if the release occurs in an environmentally sensitive area where release of containments can cause additional damage, the receiving area will be allowed to dry naturally. If there is a threat to a sensitive resource or a threat to public safety, HDD activities will cease immediately until a plan to proceed is discussed.

Other containment measures include the following:

- Additional berms may be constructed around the release area as directed by the Site Supervisor to prevent release of materials into the adjacent water body.
- If the amount of fluid released is large enough to prevent practical collection, the affected area would be diluted with fresh water and allowed to dry. Measures would be implemented (e.g., berm, silt fence, hay bale installation) to prevent silt laden water from flowing into the water body.
- If hand tools cannot contain a small on-land release, small collection sumps may be constructed to pump the released material into the mud processing system.
- In cases of inadvertent releases to open water, it may be impractical to contain the release. Removal by vacuum truck may be attempted if deemed appropriate.

- The decision to proceed with the drilling operation would be made mutually between the Site Supervisor and the on-site Client Representatives after all practical methods to seal off the location of the discharge have been attempted.
- Underwater releases are typically allowed to dissipate since, by design, the HDD contractor would seek to avoid placing equipment within the water body. Water sampling equipment would be available for use by site inspectors to evaluate turbidity levels.

4.5 Clean-up of Releases

The clean-up will commence after the release is contained. Clean-up will include removal of all visible drilling fluid located in accessible areas. Removal methods will vary based on the volume of the release and the site-specific conditions. Removal equipment may include vacuum trucks, loader and track hoe buckets, small pumps, shovels and buckets. After removal of the released drilling fluid, all containment measures (e.g., fiber rolls, straw bale) will be removed (unless otherwise specified by the Site Supervisor) and the release area will be returned as close to the original condition as possible.

4.6 Documentation

The Site Supervisor will record the inadvertent return event in their daily log. The log would include the following:

- Details on the release event, including:
 - an estimate of the amount of drilling fluid released,
 - the location and date/time of release,
 - the size of the area impacted, and
 - the success of the clean-up action.
- Name and telephone number of person reporting.
- How the release occurred.
- The type of activity that was occurring around the area of the inadvertent return.
- Description of any sensitive areas, and their location in relation to the inadvertent return.
- Description of the methods used to clean up or secure the site.
- A listing of the current permits obtained for the project.

5. Communication with Regulatory Agencies

All employees and subcontractors will adhere to the following protocols when permitting Regulatory Agency Personnel to arrive on site. Regulatory Agency Personnel will be required to comply with appropriate safety rules. Only the Site Supervisor will coordinate communication with Regulatory Agency Personnel.

If an inadvertent return on the beach or in the ocean occurs, the Oregon Department of Environmental Quality (DEQ) Emergency Spill Response will be notified immediately:

The Oregon Emergency Response: 1-800-452-0311

In addition, the following regulatory leads will also be notified immediately:

- US Army Corps of Engineer Project Manager.
- DEQ's Section 401 Project Manager.
- Oregon Department of State Lands Removal-Fill Manager.
- Oregon Parks and Recreation Department's Ocean Shores Coordinator.



Appendix A. Example of Bentonite Powder MSDS

HALLIBURTON**MATERIAL SAFETY DATA SHEET****Product Trade Name: BORE-GEL®**

Revision Date: 20-Mar-2015

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: BORE-GEL®
 Synonyms: None
 Chemical Family: Mineral
 Application: Viscosifier

Manufacturer/Supplier: Baroid Fluid Services
 Product Service Line of Halliburton
 P.O. Box 1675
 Houston, TX 77251
 Telephone: (281) 871-4000
 Emergency Telephone: (281) 575-5000

Prepared By: Chemical Stewardship
 Telephone: 1-590-251-4335
 e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

Substances	CAS Number	PERCENT (w/w)	ACGIH TLV-TWA	OSHA PEL-TWA
Bentonite	1302-78-9	90 - 100%	TWA: 1 mg/m ³	Not applicable
Crystalline silica, quartz	14808-60-7	1 - 5%	TWA: 0.025 mg/m ³	10 mg/m ³ %SiO ₂ + 2
Crystalline silica, cristobalite	14464-46-1	0.1 - 1%	TWA: 0.025 mg/m ³	1/2 x 10 mg/m ³ %SiO ₂ + 2
Crystalline silica, tridymite	15468-32-3	0.1 - 1%	0.05 mg/m ³	1/2 x 10 mg/m ³ %SiO ₂ + 2

3. HAZARDS IDENTIFICATION

BORE-GEL®
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Hazard Overview

CAUTION! - ACUTE HEALTH HAZARD
May cause eye and respiratory irritation.

DANGER! - CHRONIC HEALTH HAZARD
Breathing crystalline silica can cause lung disease, including silicosis and lung cancer. Crystalline silica has also been associated with scleroderma and kidney disease.

This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposures below recommended exposure limits. Wear a NIOSH certified, European Standard EN 149, AS/NZS 1715, or equivalent respirator when using this product. Review the Safety Data Sheet (SDS) for this product, which has been provided to your employer.

4. FIRST AID MEASURES

Inhalation	if inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
Skin	Wash with soap and water. Get medical attention if irritation persists.
Eyes	in case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.
Ingestion	Under normal conditions, first aid procedures are not required.
Notes to Physician	Treat symptomatically.

5. FIRE FIGHTING MEASURES

Flash Point/Range (F):	Not Determined
Flash Point/Range (C):	Not Determined
Flash Point Method:	Not Determined
Autoignition Temperature (F):	Not Determined
Autoignition Temperature (C):	Not Determined
Flammability Limits in Air - Lower (%):	Not Determined
Flammability Limits in Air - Upper (%):	Not Determined
Fire Extinguishing Media	All standard firefighting media
Special Exposure Hazards	Not applicable.
Special Protective Equipment for Fire-Fighters	Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.
NFPA Ratings:	Health 0, Flammability 0, Reactivity 0
HMS Ratings:	Health 0*, Flammability 0, Physical Hazard 0, PPE: At

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures	Use appropriate protective equipment. Avoid creating and breathing dust.
Environmental Precautionary Measures	Prevent from entering sewers, waterways, or low areas.

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Procedure for Cleaning / Absorption Collect using dustless method and hold for appropriate disposal. Consider possible toxic or fire hazards associated with contaminating substances and use appropriate methods for collection, storage and disposal.

7. HANDLING AND STORAGE

Handling Precautions This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposure below recommended exposure limits. Wear a NIOSH certified, European Standard En 149, or equivalent respirator when using this product. Material is slippery when wet.

Storage Information Use good housekeeping in storage and work areas to prevent accumulation of dust. Close container when not in use. Do not reuse empty container. Product has a shelf life of 12 months.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls Use approved industrial ventilation and local exhaust as required to maintain exposures below applicable exposure limits.

Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.

Respiratory Protection Not normally needed. But if significant exposures are possible then the following respirator is recommended:
Dust/mist respirator (N95, P2/P3)

Hand Protection Normal work gloves.

Skin Protection Wear clothing appropriate for the work environment. Dusty clothing should be laundered before reuse. Use precautionary measures to avoid creating dust when removing or laundering clothing.

Eye Protection Wear safety glasses or goggles to protect against exposure.

Other Precautions None known.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Powder
Color:	Light brown or Gray
Odor:	Mild earthy
pH:	8-10
Specific Gravity @ 20 C (Water=1):	2.5
Density @ 20 C (lbs./gallon):	Not Determined
Bulk Density @ 20 C (lbs/ft3):	53 - 80
Boiling Point/Range (F):	Not Determined
Boiling Point/Range (C):	Not Determined
Freezing Point/Range (F):	Not Determined
Freezing Point/Range (C):	Not Determined
Vapor Pressure @ 20 C (mmHg):	Not Determined
Vapor Density (Air=1):	Not Determined

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Percent Volatiles:	Not Determined
Evaporation Rate (Butyl Acetate=1):	Not Determined
Solubility in Water (g/100ml):	Slightly soluble
Solubility in Solvents (g/100ml):	Not Determined
VOCs (lbs./gallon):	Not Determined
Viscosity, Dynamic @ 20 C (centipoise):	Not Determined
Viscosity, Kinematic @ 20 C (centistokes):	Not Determined
Partition Coefficient/n-Octanol/Water:	Not Determined
Molecular Weight (g/mole):	Not Determined

10. STABILITY AND REACTIVITY

Stability Data:	Stable
Hazardous Polymerization:	Will Not Occur
Conditions to Avoid	None anticipated
Incompatibility (Materials to Avoid)	Hydrofluoric acid.
Hazardous Decomposition Products	Amorphous silica may transform at elevated temperatures to tridymite (870 C) or cristobalite (1470 C)
Additional Guidelines	Not Applicable

11. TOXICOLOGICAL INFORMATION

Principle Route of Exposure Eye or skin contact, inhalation.

Symptoms related to exposure

Acute Toxicity

Inhalation

Inhaled crystalline silica in the form of quartz or cristobalite from occupational sources is carcinogenic to humans (IARC, Group 1). There is sufficient evidence in experimental animals for the carcinogenicity of tridymite (IARC, Group 2A).

Breathing silica dust may cause irritation of the nose, throat, and respiratory passages. Breathing silica dust may not cause noticeable injury or illness even though permanent lung damage may be occurring. Inhalation of dust may also have serious chronic health effects (See "Chronic Effects/Carcinogenicity" subsection below).

Eye Contact

May cause eye irritation.

Skin Contact

May cause mechanical skin irritation.

Ingestion

None known.



Chronic Effects/Carcinogenicity

Silicosis: Excessive inhalation of respirable crystalline silica dust may cause a progressive, disabling, and sometimes-fatal lung disease called silicosis. Symptoms include cough, shortness of breath, wheezing, non-specific chest illness, and reduced pulmonary function. This disease is exacerbated by smoking. Individuals with silicosis are predisposed to develop tuberculosis.

Cancer Status: The International Agency for Research on Cancer (IARC) has determined that crystalline silica inhaled in the form of quartz or cristobalite from occupational sources can cause lung cancer in humans (Group 1 - carcinogenic to humans) and has determined that there is sufficient evidence in experimental animals for the carcinogenicity of tridymite (Group 2A - possible carcinogen to humans). Refer to IARC Monograph 08, Silica, Some Silicates and Organic Fibres (June 1997) in conjunction with the use of these minerals. The National Toxicology Program classifies respirable crystalline silica as "Known to be a human carcinogen". Refer to the 9th Report on Carcinogens (2000). The American Conference of Governmental Industrial Hygienists (ACGIH) classifies crystalline silica, quartz, as a suspected human carcinogen (A2).

There is some evidence that breathing respirable crystalline silica or the disease silicosis is associated with an increased incidence of significant disease endpoints such as scleroderma (an immune system disorder manifested by scarring of the lungs, skin, and other internal organs) and kidney disease.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Bentonite	1302-78-9	> 5000 mg/kg (Rat) > 2000 mg/kg (Rat)	No data available	> 5.27 mg/L (Rat)
Crystalline silica, quartz	14808-60-7	500 mg/kg (Rat) > 15,000 mg/kg (Human)	No data available	No data available
Crystalline silica, cristobalite	14464-46-1	> 5000 mg/kg (Rat)	No data available	No data available
Crystalline silica, tridymite	15468-32-3	> 5000 mg/kg (Rat)	No data available	No data available

12. ECOLOGICAL INFORMATION

Ecotoxicological Information

Ecotoxicity Product:

Acute Fish Toxicity: TLM96: 10000 ppm (Oncorhynchus mykiss)
 Acute Crustaceans Toxicity: Not determined
 Acute Algae Toxicity: Not determined

Ecotoxicity Substance

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Bentonite	1302-78-9	EC50(72h): > 100 mg/L (freshwater algae)	TLM96 10,000 ppm (Oncorhynchus mykiss) LC50 (96h) 16,000 - 19,000 mg/L (Oncorhynchus mykiss) LC50 (24h) 2800 - 3200 mg/L (black bass, warmouth bass, blue gill and sunfish)	No information available	EC50 (96h) 81.6 mg/L (Metacarcinus magister) EC50 (96h) 24.6 mg/L (Pandalus danae) EC50 (48h) > 100 mg/L (Daphnia magna)
Crystalline silica, quartz	14808-60-7	No information available	LL0 (96h) 10,000 mg/L (Danio rerio) (similar substance)	No information available	LL50 (24h) > 10,000 mg/L (Daphnia magna) (similar substance)
Crystalline silica, cristobalite	14464-46-1	No information available	LL0 (96h) 10,000 mg/L (Danio rerio) (similar substance)	No information available	LL50 (24h) > 10,000 mg/L (Daphnia magna) (similar substance)



Crystalline silica, tridymite	15468-32-3	No information available	LL0 (96h) 10,000 mg/L (Danio rerio) (similar substance)	No information available	LL50 (24h) > 10,000 mg/L (Daphnia magna) (similar substance)
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12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
Bentonite	1302-78-9	The methods for determining biodegradability are not applicable to inorganic substances.
Crystalline silica, quartz	14808-00-7	The methods for determining biodegradability are not applicable to inorganic substances.
Crystalline silica, cristobalite	14484-46-1	The methods for determining biodegradability are not applicable to inorganic substances.
Crystalline silica, tridymite	15468-32-3	The methods for determining biodegradability are not applicable to inorganic substances.

12.3. Bioaccumulative potential

Substances	CAS Number	Log Pow
Bentonite	1302-78-9	No information available
Crystalline silica, quartz	14808-00-7	No information available
Crystalline silica, cristobalite	14484-46-1	No information available
Crystalline silica, tridymite	15468-32-3	No information available

12.4. Mobility in soil

No information available

12.5. Results of PBT and vPvB assessment

No information available.

Substances	PBT and vPvB assessment
Bentonite	No data available
Crystalline silica, quartz	Not PBT/vPvB
Crystalline silica, cristobalite	No data available
Crystalline silica, tridymite	No data available

12.6. Other adverse effects

No information available

13. DISPOSAL CONSIDERATIONS

Disposal Method	If practical, recover and reclaim, recycle, or reuse by the guidelines of an approved local reuse program. Should contaminated product become a waste, dispose of in a licensed industrial landfill according to federal, state, and local regulations.
Contaminated Packaging	Follow all applicable national or local regulations.

14. TRANSPORT INFORMATION

US DOT	
UN Number:	Not restricted
UN Proper Shipping Name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
US DOT Bulk	
DOT (Bulk)	Not applicable
Canadian TDG	

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UN Number: Not restricted
 UN Proper Shipping Name: Not restricted
 Transport Hazard Class(es): Not applicable
 Packing Group: Not applicable

IMDG/IMO

UN Number: Not restricted
 UN Proper Shipping Name: Not restricted
 Transport Hazard Class(es): Not applicable
 Packing Group: Not applicable

IATA/ICAO

UN Number: Not restricted
 UN Proper Shipping Name: Not restricted
 Transport Hazard Class(es): Not applicable
 Packing Group: Not applicable

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code: Not applicable
 Special Precautions for User: None

15. REGULATORY INFORMATION

US Regulations

US TSCA Inventory	All components listed on inventory or are exempt.
EPA SARA Title III Extremely Hazardous Substances	Not applicable
EPA SARA (311,312) Hazard Class	Acute Health Hazard Chronic Health Hazard
EPA SARA (313) Chemicals	This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372).
EPA CERCLA/Superfund Reportable Spill Quantity	Not applicable
EPA RCRA Hazardous Waste Classification	If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA.
California Proposition 65	The California Proposition 65 regulations apply to this product.
MA Right-to-Know Law	One or more components listed.
NJ Right-to-Know Law	One or more components listed.
PA Right-to-Know Law	One or more components listed.

Canadian Regulations

Canadian DSL Inventory	All components listed on inventory or are exempt.
WHMIS Hazard Class	D2A Very Toxic Materials Crystalline silica

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16. OTHER INFORMATION

The following sections have been revised since the last issue of this SDS
Not applicable

Additional information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Disclaimer Statement This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

END OF MSDS



Appendix B. Example of Biodegradable Polymer Additive MSDS (for Bore Stabilization)



HALLIBURTON**MATERIAL SAFETY DATA SHEET**Product Trade Name: **QUIK-BORE**

Revision Date: 20-Mar-2013

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: QUIK-BORE
 Synonyms: None
 Chemical Family: Mineral
 Application: Additive

Manufacturer/Supplier: Baroid Industrial Drilling Products
 Product Service Line of Halliburton
 P.O. Box 1675
 Houston, TX 77251
 Telephone: (281) 871-4613 or 1-877-379-7412
 Emergency Telephone: (281) 575-5000

Prepared By: Chemical Compliance
 Telephone: 1-580-251-4335
 e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

Substances	CAS Number	PERCENT	ACGIH TLV-TWA	OSHA PEL-TWA
Bentonite	1302-78-9	20 - 100%	Not applicable	Not applicable
Crystalline silica, onstobalite	14464-46-1	0 - 1%	0.025 mg/m ³	1/2 x 10 mg/m ³ %SiO ₂ + 2
Crystalline silica, indymite	15468-32-3	0 - 1%	0.05 mg/m ³	1/2 x 10 mg/m ³ %SiO ₂ + 2
Crystalline silica, quartz	14808-60-7	1 - 5%	0.025 mg/m ³	10 mg/m ³ %SiO ₂ + 2

More restrictive exposure limits may be enforced by some states, agencies, or other authorities.

QUIK-BORE
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3. HAZARDS IDENTIFICATION

Hazard Overview	<p>CAUTION! - ACUTE HEALTH HAZARD May cause eye and respiratory irritation</p> <p>DANGER! - CHRONIC HEALTH HAZARD Breathing crystalline silica can cause lung disease, including silicosis and lung cancer. Crystalline silica has also been associated with scleroderma and kidney disease.</p> <p>This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposures below recommended exposure limits. Wear a NIOSH certified, European Standard EN 149, or equivalent respirator when using this product. Review the Material Safety Data Sheet (MSDS) for this product, which has been provided to your employer.</p>
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4. FIRST AID MEASURES

Inhalation	If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
Skin	Wash with soap and water. Get medical attention if irritation persists.
Eyes	In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.
Ingestion	Under normal conditions, first aid procedures are not required.
Notes to Physician	Treat symptomatically.

5. FIRE FIGHTING MEASURES

Flash Point/Range (F):	Not Determined
Flash Point/Range (C):	Not Determined
Flash Point Method:	Not Determined
Autoignition Temperature (F):	Not Determined
Autoignition Temperature (C):	Not Determined
Flammability Limits in Air - Lower (%):	Not Determined
Flammability Limits in Air - Upper (%):	Not Determined
Fire Extinguishing Media	All standard firefighting media
Special Exposure Hazards	Not applicable
Special Protective Equipment for Fire-Fighters	Not applicable
NFPA Ratings:	Health 0, Flammability 0, Reactivity 0
HMIS Ratings:	Health 0*, Flammability 0, Reactivity 0

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures	Use appropriate protective equipment. Avoid creating and breathing dust.
Environmental Precautionary Measures	None known.

Procedure for Cleaning / Absorption Collect using dustless method and hold for appropriate disposal. Consider possible toxic or fire hazards associated with contaminating substances and use appropriate methods for collection, storage and disposal.

7. HANDLING AND STORAGE

Handling Precautions This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposure below recommended exposure limits. Wear a NIOSH certified, European Standard EN 149 or equivalent respirator when using this product. Material is slippery when wet.

Storage Information Use good housekeeping in storage and work areas to prevent accumulation of dust. Close container when not in use. Do not reuse empty container. Product has a shelf life of 12 months.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls Use approved industrial ventilation and local exhaust as required to maintain exposures below applicable exposure limits.

Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.

Respiratory Protection Not normally needed. But if significant exposures are possible then the following respirator is recommended:
Dust/mist respirator (N95, P2/P3)

Hand Protection Normal work gloves.

Skin Protection Wear clothing appropriate for the work environment. Dusty clothing should be laundered before reuse. Use precautionary measures to avoid creating dust when removing or laundering clothing.

Eye Protection Wear safety glasses or goggles to protect against exposure.

Other Precautions None known.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Powder
Color:	Gray
Odor:	Mild earthy
pH:	8-10
Specific Gravity @ 20 C (Water=1):	2.60
Density @ 20 C (lbs./gallon):	Not Determined
Bulk Density @ 20 C (lbs./ft ³):	50-73
Boiling Point/Range (F):	Not Determined
Boiling Point/Range (C):	Not Determined
Freezing Point/Range (F):	Not Determined
Freezing Point/Range (C):	Not Determined
Vapor Pressure @ 20 C (mmHg):	Not Determined
Vapor Density (Air=1):	Not Determined
Percent Volatiles:	Not Determined
Evaporation Rate (Butyl Acetate=1):	Not Determined
Solubility in Water (g/100ml):	Insoluble

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9. PHYSICAL AND CHEMICAL PROPERTIES

Solubility in Solvents (g/100ml):	Not Determined
VOCs (lbs./gallon):	Not Determined
Viscosity, Dynamic @ 20 C (centipoise):	Not Determined
Viscosity, Kinematic @ 20 C (centistokes):	Not Determined
Partition Coefficient/n-Octanol/Water:	Not Determined
Molecular Weight (g/mole):	Not Determined

10. STABILITY AND REACTIVITY

Stability Data:	Stable
Hazardous Polymerization:	Will Not Occur
Conditions to Avoid	None anticipated
Incompatibility (Materials to Avoid)	Hydrofluoric acid
Hazardous Decomposition Products	Amorphous silica may transform at elevated temperatures to tridymite (870 C) or cristobalite (1470 C)
Additional Guidelines	Not Applicable

11. TOXICOLOGICAL INFORMATION

Principle Route of Exposure	Eye or skin contact, inhalation
Inhalation	Inhaled crystalline silica in the form of quartz or cristobalite from occupational sources is carcinogenic to humans (IARC, Group 1). There is sufficient evidence in experimental animals for the carcinogenicity of tridymite (IARC, Group 2A). Breathing silica dust may cause irritation of the nose, throat, and respiratory passages. Breathing silica dust may not cause noticeable injury or illness even though permanent lung damage may be occurring. Inhalation of dust may also have serious chronic health effects (See "Chronic Effects/Carcinogenicity" subsection below)
Skin Contact	May cause mechanical skin irritation
Eye Contact	May cause eye irritation
Ingestion	None known
Aggravated Medical Conditions	Individuals with respiratory disease, including but not limited to asthma and bronchitis, or subject to eye irritation, should not be exposed to quartz dust.



Chronic Effects/Carcinogenicity Silicosis: Excessive inhalation of respirable crystalline silica dust may cause a progressive, disabling, and sometimes-fatal lung disease called silicosis. Symptoms include cough, shortness of breath, wheezing, non-specific chest illness, and reduced pulmonary function. This disease is exacerbated by smoking. Individuals with silicosis are predisposed to develop tuberculosis.

Cancer Status: The International Agency for Research on Cancer (IARC) has determined that crystalline silica inhaled in the form of quartz or cristobalite from occupational sources can cause lung cancer in humans (Group 1 - carcinogenic to humans) and has determined that there is sufficient evidence in experimental animals for the carcinogenicity of tridymite (Group 2A - possible carcinogen to humans). Refer to IARC Monograph 68, Silica, Some Silicates and Organic Fibres (June 1997) in conjunction with the use of these minerals. The National Toxicology Program classifies respirable crystalline silica as "Known to be a human carcinogen" Refer to the 9th Report on Carcinogens (2000). The American Conference of Governmental Industrial Hygienists (ACGIH) classifies crystalline silica, quartz, as a suspected human carcinogen (A2).

There is some evidence that breathing respirable crystalline silica or the disease silicosis is associated with an increased incidence of significant disease endpoints such as scleroderma (an immune system disorder manifested by scarring of the lungs, skin, and other internal organs) and kidney disease.

Other Information For further information consult "Adverse Effects of Crystalline Silica Exposure" published by the American Thoracic Society Medical Section of the American Lung Association, American Journal of Respiratory and Critical Care Medicine, Volume 155, pages 761-768 (1997).

Toxicity Tests

Oral Toxicity:	Not determined
Dermal Toxicity:	Not determined
Inhalation Toxicity:	Not determined
Primary Irritation Effect:	Not determined
Carcinogenicity	Refer to IARC Monograph 68, <u>Silica, Some Silicates and Organic Fibres</u> (June 1997).
Genotoxicity:	Not determined
Reproductive / Developmental Toxicity:	Not determined

12. ECOLOGICAL INFORMATION

Mobility (Water/Soil/Air)	Not determined
Persistence/Degradability	Not determined
Bio-accumulation	Not determined

Ecotoxicological Information

Acute Fish Toxicity:	TLM96: 10000 ppm (Oncorhynchus mykiss)
Acute Crustaceans Toxicity:	Not determined

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Acute Algae Toxicity:	Not determined
Chemical Fate Information	Not determined
Other Information	Not applicable

13. DISPOSAL CONSIDERATIONS

Disposal Method	Bury in a licensed landfill according to federal, state, and local regulations
Contaminated Packaging	Follow all applicable national or local regulations

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR
Not restricted

Air Transportation

ICAO/IATA
Not restricted

Sea Transportation

IMDG
Not restricted

Other Transportation Information

Labels: None

15. REGULATORY INFORMATION

US Regulations

US TSCA Inventory	All components listed on inventory or are exempt
EPA SARA Title III Extremely Hazardous Substances	Not applicable
EPA SARA (311,312) Hazard Class	Acute Health Hazard Chronic Health Hazard
EPA SARA (313) Chemicals	This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372)
EPA CERCLA/Superfund Reportable Spill Quantity	Not applicable.

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EPA RCRA Hazardous Waste Classification	If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA.
California Proposition 65	The California Proposition 65 regulations apply to this product.
MA Right-to-Know Law	One or more components listed.
NJ Right-to-Know Law	One or more components listed.
PA Right-to-Know Law	One or more components listed.
Canadian Regulations	
Canadian DSL Inventory	All components listed on inventory or are exempt.
WHMIS Hazard Class	Crystalline silica

16. OTHER INFORMATION

The following sections have been revised since the last issue of this SDS
Not applicable

Additional Information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

END OF MSDS



Appendix C. Example of Biodegradable Polymer Additive MSDS (for Fluid Circulation Loss)



HALLIBURTON**SAFETY DATA SHEET**
according to Regulation (EC) No. 453/2010**PAC™-LE**

Revision Date: 25-Oct-2012

Revision Number: 6

1. IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKINGProduct identifier
Product Name: PAC™-LERelevant identified uses of the substance or mixture and uses advised against
Recommended Use: Fluid Loss AdditiveSector of use: SU2 - Mining, (including offshore industries)
Product category: PC20 - Products such as pH-regulators, flocculants, precipitants, neutralization agents, other unspecified
Process categories: PROC4 - Use in batch and other process (synthesis) where opportunity for exposure arises
Uses Advised Against: No information available**Details of the supplier of the safety data sheet**Halliburton Manufacturing Services, Ltd.
Halliburton House, Howemoss Crescent
Kirkhill Industrial Estate
Dyce
Aberdeen, AB21 0GN
United Kingdom

Emergency Phone Number: +44 1224 795277 or +1 281 575 5000

www.halliburton.com

For further information, please contact:

E-Mail address: fdunexchem@halliburton.com

Emergency telephone number

+44 1224 795277 or +1 281 575 5000

Emergency telephone 845 - (EC)1272/2008

Europe	112
Denmark	Poison Control Hotline (DK): +45 82 12 12 12
France	ORFILA (FR): +01 45 42 59 59
Germany	Poison Center Berlin (DE): +49 030 30666 790
Italy	Poison Center, Milan (IT): +39 02 6610 1029
Netherlands	National Poisons Information Center (NL): +31 30 274 88 88 (NB: this service is only available to health professionals)
Norway	Poisons Information (NO): +47 22 591300
Poland	Poison Control and Information Centre, Warsaw (PL): +48 22 619 66 54, +48 22 619 68 97
Spain	Poison Information Service (ES): +34 91 562 04 20
United Kingdom	NHS Direct (UK): +44 0845 46 47

2. HAZARDS IDENTIFICATIONClassification of the substance or mixture
REGULATION (EC) No 1272/2008

Not classified



PACT™-LE

Revision Date: 25-Oct-2012

2. HAZARDS IDENTIFICATION

Classification according to EU Directives 67/548/EEC or 1999/45/EC
For the full text of the R-phrases mentioned in this Section, see Section 10

Classification Not Classified
Risk Phrases None

Label Elements

Not classified

Hazard Pictograms

Signal Word None

Contains

Substances CAS Number
Contains no hazardous substances Mixture

Other Hazards

Dust can form an explosive mixture in air

3. COMPOSITION/INFORMATION ON INGREDIENTS

Substances	EINECS	CAS Number	PERCENT	EEC Classification	EU - CLP Substance Classification	REACH No.
Contains no hazardous substances	Not applicable	Mixture	60 - 100%	Not applicable	Not applicable	No data available

For the full text of the R-phrases mentioned in this Section, see Section 16

4. FIRST AID MEASURES

Description of first aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
Eyes In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.
Skin Wash with soap and water. Get medical attention if irritation persists.
Ingestion Under normal conditions, first aid procedures are not required.

Most important symptoms and effects, both acute and delayed

No significant hazards expected.

Indication of any immediate medical attention and special treatment needed

Notes to Physician Treat symptomatically

5. FIREFIGHTING MEASURES

Extinguishing media

Suitable Extinguishing Media
Water fog, carbon dioxide, foam, dry chemical



PACT™-LE

Revision Date: 25-Oct-2012

5. FIREFIGHTING MEASURES

Extinguishing media which must not be used for safety reasons

None known.

Special hazards arising from the substance or mixture

Special Exposure Hazards

Organic dust in the presence of an ignition source can be explosive in high concentrations. Good housekeeping practices are required to minimize this potential.

Advice for firefighters

Special Protective Equipment for Fire-Fighters

Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

Avoid creating and breathing dust.

See Section 12 for additional information.

Environmental precautions

None known.

Methods and material for containment and cleaning up

Scoop up and remove.

Reference to other sections

See Section 12 for additional information.

7. HANDLING AND STORAGE

Precautions for Safe Handling

Avoid creating or inhaling dust. Avoid dust accumulations. Slippery when wet.

Hygiene Measures

Handle in accordance with good industrial hygiene and safety practice.

Conditions for safe storage, including any incompatibilities

Store away from oxidizers. Store in a dry location. Product has a shelf life of 36 months.

Specific End Use(s)

Exposure Scenario

No information available

Other Guidelines

No information available

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

Substances	EU	UK OEL	Netherlands	France OEL	Germany MAK/TRK
Contains no hazardous substances	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable

Substances	Italy	Poland	Hungary	Czech Republic	Denmark
Contains no hazardous substances	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable

Derived No Effect Level (DNEL)

No information available.

Predicted No Effect Concentration (PNEC)

No information available.

Exposure controls

Engineering Controls

A well ventilated area to control dust levels. Local exhaust ventilation should be used in areas without good cross ventilation.

Personal protective equipment

Respiratory Protection

Not normally needed. But if significant exposures are possible then the following respirator is recommended:
Dust/mist respirator. (N95, P2/P3)



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Hand Protection	Normal work gloves
Skin Protection	Normal work coveralls
Eye Protection	Wear safety glasses or goggles to protect against exposure.
Other Precautions	None known.
Environmental Exposure Controls	No information available

9. PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Physical State:	Solid	Color:	White to off white
Odor:	Odorless	Odor Threshold:	No information available

Property Remarks/ Method	Values
pH:	6.5-9 (1%)
Melting Point/Range	No data available
Freezing Point/Range (C):	No data available
Boiling Point/Range	No data available
Flash Point	No data available
Evaporation rate	No data available
Vapor Pressure	No data available
Vapor Density	No data available
Specific Gravity	1.5
Water Solubility	Soluble in water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

Other Information	
VOC Content (%)	No data available

10. STABILITY AND REACTIVITY

Reactivity	Not applicable
Chemical Stability	Stable
Possibility of Hazardous Reactions	Will Not Occur
Conditions to Avoid	None anticipated
Incompatible Materials	Strong oxidizers.
Hazardous Decomposition Products	Carbon monoxide and carbon dioxide.

11. TOXICOLOGICAL INFORMATION

Information on Toxicological Effects

Acute Toxicity

Inhalation	May cause mild respiratory irritation
Eye Contact	May cause mild eye irritation.
Skin Contact	May cause mild skin irritation.
Ingestion	None known

Chronic Effects/Carcinogenicity No data available to indicate product or components present at greater than 1% are chronic health hazards.



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11. TOXICOLOGICAL INFORMATION

Substances	LD50 Oral	LD50 Dermal	LC50 Inhalation
Contains no hazardous substances	No data available	No data available	No data available

12. ECOLOGICAL INFORMATION

Toxicity
Ecotoxicity Effects

Substances	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Daphnia Magna (Water Flea)
Contains no hazardous substances	No information available	No information available	No information available	No information available

Persistence and degradability
Readily biodegradable

Bioaccumulative potential
No information available

Mobility in soil
No information available

Results of PBT and vPvB assessment
No information available

Other adverse effects
Endocrine Disruptor Information
This product does not contain any known or suspected endocrine disruptors

13. DISPOSAL CONSIDERATIONS

Waste treatment methods
Disposal Method Bury in a licensed landfill according to federal, state, and local regulations.
Contaminated Packaging Follow all applicable national or local regulations.

14. TRANSPORT INFORMATION

IMDG/IMO
UN Number: Not restricted.
UN Proper Shipping Name: Not restricted
Transport Hazard Class(es): Not applicable

RID
UN Number: Not restricted.
UN Proper Shipping Name: Not restricted
Transport Hazard Class(es): Not applicable

ADR
UN Number: Not restricted.
UN Proper Shipping Name: Not restricted
Transport Hazard Class(es): Not applicable



Appendix 5

Drill Break Avoidance and Response Plan



BIFROST CABLE DRILL BREAK AVOIDANCE & RESPONSE PLAN

Prepared for
Bifrost Subsea Fiber Optic Cable Project
Winema, Oregon Operations

August 19, 2022



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1. INTRODUCTION

The construction of the Bifrost Subsea Fiber Optic Cable Project (Project) includes the installation of a steel landing pipe (LP) that will extend from on shore to a point in the ocean (**Figure 1**). This LP will be installed by use of horizontal directional drill (HDD) construction methods. Further detailed descriptions on this process and the LP are included in Ocean Shores Alteration Permit application.

While exceedingly rare, it is possible that during the HDD process, the LP can become jammed or break. This Drill Break Avoidance & Response Plan (Plan) details the measures that will be taken to try and avoid the LP becoming stuck, broken, or unrecoverable. The Plan also includes those measures that will take place to try and recover a stuck or broken pipe as well as an abandonment plan should the pipe be unrecoverable. This Plan may be revised periodically.

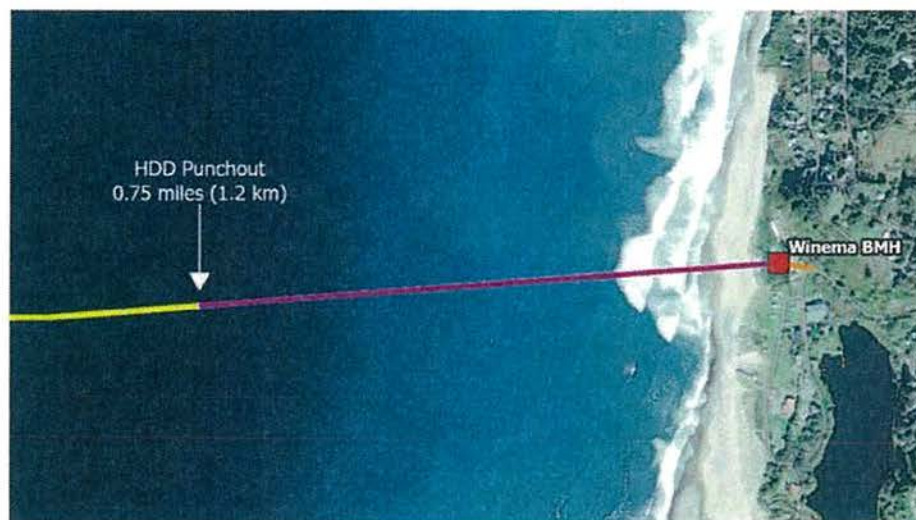


Figure 1: Bore extent from BMH to Exit Hole.

2. BASELINE CONDITIONS AND DESIGN CONSIDERATIONS

To inform the engineering design and the HDD implementation, a detailed geophysical and geotechnical investigative surveys will be conducted to identify the sub-terrain along the proposed LP alignment.

These surveys will include both marine and terrestrial surveys:

1. Marine Surveys: The marine surveys will include utilization of a seismic subbottom profiler to determine the seafloor conditions and Electronic Resistivity Tomography (ERT) to better understand the subsurface geomorphology. These data will be collected in the ocean where the vessels can operate safely.
2. Terrestrial Survey: The terrestrial geotechnical surveys will include the use of ERT, multichannel analysis of surface waves (MASW), sonar, and geophysical drill exploration. The ERT and MASW will be conducted along the proposed LP alignment. The vertical drill will be conducted near the planned entry point for the LP. The sonar will be utilized down the horizontal drilled hole.

These data will be compiled into a comprehensive geotechnical report that will provide recommendations concerning LP specifications and HDD parameters. Based on the data collected, the following specification and design parameters have been incorporated into the project design:

1. Landing Pipe Specifications:
 - a) Pipe grade: E-75 or greater.
 - b) Size: Approximately 6- to 7-inch outside diameter at the joint.
 - c) Wall size (thickness): 0.3-inch or greater.
 - d) Torsional Strength: 60,000 feet below land surface or greater (35,000 or greater at the joint).
 - e) Tensile Strength: 500,000 pounds or greater.
2. Surface Casing. Due to the changing nature of the geology confirmed via the geotechnical survey, it is expected that an additional temporary casing, called a “surface casing” will be likely be installed for the first portion of the bore. The casing will be approximately 14-inches in diameter and will be up to 500 feet in length. The purpose of the casing it so provides a stable path for the LP as it is being installed beneath the softer, looser surface materials. The casing will keep the bore hole from collapsing in the softer earth materials and will keep a clear path for the drilling mud to be returned to the bore site.

3. DRILL BREAK AVOIDANCE MEASURES

The results from the geophysical survey will be used to finalize the HDD engineering to prepare for drilling through interchanging formations of soft and hard materials expected to be encountered. The geotechnical report provides information allowing the driller to:

- Adjust penetration rates according to the identified formations.
- Slow down prior to approaching hard formations.
- Stop the drill upon encountering hard formations and if necessary, switch out tooling to drill account for the harder or softer formation.
- Adjust drilling fluid properties according to the formations.
- Determine what additional rock drill bits, mud-motor or other equipment to have on-site.
- Pre-stage drill break response materials and equipment to have on site (see Section 4).

4. DRILL BREAK RESPONSE MEASURES

This section describes the measures that will be implemented in the unlikely event that the drill string or drill head is broken “drill break” during the HDD process. A drill break can occur in conditions where the bore head becomes stuck or wedged against the down-hole formation and the efforts to free the pipe cause the bore pipe or bore head to break.

4.1 Immediate Notification

In the event of a drill break during a designated Project representative (e.g., contractor or subcontractor) will notify the individuals listed in **Table 1** by phone and/or e-mail within twenty-four (24) hours of the occurrence of the break (the “Initial Notification”).

Following the Initial Notification, the designated Project representative will submit a written report regarding the incident (the “Preliminary Report”) to the same individuals within three (3) business days following the occurrence of the break. The Preliminary Report will provide the following:

- Description of the break, including the date, time, location of drill head relative to the punch in location, and other material details regarding the break.
- Description of the suspected root cause of the break.
- Description of the immediate responsive action taken on-site.
- Description of the corrective actions taken to preclude recurrence of the break and to prevent similar occurrences involving similar components or systems.
- A copy of the Daily Progress Report from the date of the incident.
- Summary of all the third parties/agencies notified and preliminary responses from those parties.

Table 1: List of Agency Contacts

Agency	Point of Contact	Contact Information
US Army Corps of Engineers	Kinsey Friesen	Kinsey.M.Friesen@usace.army.mil Cell: 503-577-8298
Oregon Dept. of State Lands	Dario Frisone	Dario.Frisone@dsl.oregon.gov Cell: (503) 302-6094
Oregon Parks and Recreation Dept.	Kevin Herkamp	Kevin.A.Herkamp@opr.oregon.gov Cell: (971) 376-1509
Oregon Dept. of Environmental Quality	Haley Teach	Haley.teach@deq.state.or.us Cell: (503) 702-9753
Tillamook County	Sarah Absher	sabsher@co.tillamook.or.us Office: (503) 842-3408 x3317

4.2 Corrective Actions

In the event of a drill head break, the following corrective actions will be taken:

- All HDD operations will stop immediately.
- The HDD operator will recover the remaining drilling assembly attached to the HDD machine back to the drill site. The length of recovered drill pipe will be recorded.
- The drill pipe will be fitted with a tool, known as a “fishing tool” (**Figure 2**) that is designed to follow the bore hole to the down-hole break location. Fishing tools use the principle of one-way grip designed to slide over the broken drill string and latch on to the broken drill pipe.
- The HDD operator will guide the fishing tool back down the hole to the severed end of the drill pipe and attempt to attach it to the pipe.
- If the fish tool can be successfully attached to the pipe the HDD operator will attempt to recover the remainder of the drill broken drill string.
- If the broken drill string is successfully recovered, the HDD operator will determine if the existing bore hole is fully reusable, partially reusable, or not reusable.
 - Fully Reusable: This means the HDD operator will continue the HDD operation using the same bore hole in its entirety.
 - Partially Reusable: This means a portion of, or majority of, the existing bore hole can be reused but at some point, the HDD operator will divert the bore head to start cutting a new bore hole.
 - Not Reusable: This means the entire bore hole would be abandoned (See abandonment plan below) and a new bore hole will be commenced.

- If the broken drill string is not successfully recovered, the bore hole will be abandoned and a new bore hole started.
- The HDD operator will contain any released drilling mud (see Section 6).
- The HDD operator will create an incident report that documents the break and that includes photographs of the break and details regarding the break, such as location, activity in progress, drilling parameters, personnel involved and mitigating actions to be taken. This incident report will be created and provided to agencies listed in **Table 1** within 7 days of the incident.



Figure 2: Examples of Fishing Tools

5. BORE HOLE ABANDONMENT PLAN

If the bore hole must be abandoned, the bore hole will be filled with grout in accordance with local water well drilling requirements. The HDD operator will:

- Recommend the appropriate ground mixture to be used and submit it to the County for approval.
- Upon approval of the mixture, mobilize a grout pump and mixer truck to the site.
- Pump grout downhole until it is seen coming back to the surface at the bore hole entrance.
- Remove and clean up any excess grout leaving the grout line approximately 1' below natural grade.
- Fill the remaining 1-foot with topsoil.

6. DRILLING MUD RELEASE

Terrestrial Inadvertent Return

The drill operator will be equipped with a tracked hydraulic excavator, straw or hay bales, stakes to secure bails, silt fence, sandbags, shovels, pumps, and any other materials or equipment necessary to contain and clean up inadvertent releases of drilling mud caused by a drill break. Drill operator will position barriers to keep any inadvertent release on Lot 6200 from reaching to the ocean shore.

Clean-up of Releases

The drill operator will promptly remove all visible drilling mud located in accessible areas. Removal methods will vary based on the volume of the release and the site-specific conditions. Removal equipment may include vacuum trucks, loader and track hoe buckets, small pumps, shovels, and buckets. After removal of the released drilling fluid, the release area will be returned to its original condition to the greatest extent possible. If any removal equipment is to be located on the beach, the drill operator must contact Kevin Herkamp (OPRD) at (971) 376-1509 immediately for an emergency drive-on-beach permit.

7. BEACH VOID MONITORING AND RESPONSE

Upon completion of the HDD operations, the potential for the presence of beach void holes will be monitored for in the beach area west of Tax Lot 6200. Voids may be the result of sand collapsing into the space created by the removal of a 16-inch diameter guide casing that would be used during the installation of the permanent bore pipe that would house the Bifrost cable.

During high tides, seawater can saturate the sand causing the sand to flow into any spaces created during removal of the 16-inch guide casing. This saturation could lead to the collapse of the sand above the former casing location and potentially create surface voids. The geophysical survey of the beach area west of Lot 6200 conducted in May-June 2022 did not detect any voids along the proposed bore pipe route.

Monitoring and Response

Upon completion of the HDD operations (~May 2023) and prior to landing the Bifrost cable (~September 2023), the beach area adjacent Tax Lot 6200 will be visually inspected by foot for the presence of voids.

If the Project team or a member of the public reports that any voids have formed in the sand, a designated Project representative, contractor, or subcontractor will immediately secure the area with cones, signage, temporary fencing, or tape to protect the public from entering the area (“Safety Warning”). These actions will be coordinated with OPRD (Kevin Herkamp; (971) 376-1509 as listed in **Table 1**).

Upon the void discovery, the Project team will submit a written report regarding the discovery to OPRD within three (3) business days of the discovery (a “Preliminary Report”). The Preliminary Report will provide at least the following information: (i) description of observed sink hole including size, diameter, and location on the beach; (ii) immediate responsive action taken onsite; and (iii) any further corrective action to be undertaken.

After installation of the “Safety Warning” and Preliminary Report, the Project team (or its designated representative, contractor, or subcontractor) in coordination with OPRD will decide on the appropriate corrective action. The corrective action will depend on the size and nature of the observed sink hole(s).

If a void is less than three (3) feet in diameter at its widest point, the void will be filled by hand upon discovery. If a void is three (3) or more feet in diameter at its widest point, the Project team will fill in the void by hand and then follow up with additional sand compaction in the beach area west of Lot 6200.

Following completion of any corrective action, the Project team will submit a written report (“Response Report”) to OPRD within three (3) days describing the results of the corrective action and any modification to the resumed monitoring.

This plan expires seven (7) days after the landing of the Bifrost cable if no discoveries or events occur. If there are continued discoveries or events, the Project team and OPRD will coordinate on an appropriate extension of this plan.

Certificate Of Completion

Envelope Id: 2499A20488EB4267B995D5609091CEE3
Subject: Please DocuSign: Permit Application #1 - Tillamook County CUP
Source Envelope:
Document Pages: 190
Certificate Pages: 5
AutoNav: Enabled
EnvelopeId Stamping: Enabled
Time Zone: (UTC-08:00) Pacific Time (US & Canada)

Status: Completed

Envelope Originator:
Bree Urban
401 Carlson Circle
San Marcos, TX 78666
bree.urban@astound.com
IP Address: 75.172.99.186

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EXHIBIT C

Lynn Tone

From: Chris Buerger <chrisbuerger@rocketmail.com>
Sent: Thursday, November 17, 2022 10:08 AM
To: Lynn Tone
Subject: EXTERNAL: AMCD LLA/Astound/Wi-Ne-Ma Christian Camp

[**NOTICE:** This message originated outside of Tillamook County -- **DO NOT CLICK** on links or open attachments unless you are sure the content is safe.]

Dear Ms Tone

thank you for sending the notice of public hearing at the Tillamook County Planning Commission. I have one comment/request re the potential impact of the installation of the utility on WiNeMa road itself. WiNeMa road is in poor repair in the first ~150 yards leading from the 101 to the camp. There are at least a dozen 3-4 inch deep, tire sized potholes. I am concerned that the additional trucks etc required for this building effort will make the situation even worse. Will the applicant make any necessary repairs to WiNeMa road following the building process?

Thank you

Christian Buerger
Owner: Lot 6700

EXHIBIT D

SECTION 3.040: RECREATION MANAGEMENT ZONE (RM)

- (1) **PURPOSE:** The purpose of the RM zone is to designate areas for public and private parks and day-use facilities, including such areas that contain significant natural or scenic values. The RM zone is intended to accommodate the type of recreational developments that preserve an area's natural values; it is not intended for intensive recreational developments that do not retain substantial open space on the property.
- (2) **USES PERMITTED OUTRIGHT:** In the RM zone, the following uses and their accessory uses are permitted outright, subject to all applicable supplementary regulations contained in this Ordinance:
 - (a) Maintenance and operation of existing structures and facilities.
 - (b) Recreational improvements and additions necessary to serve the same numbers and densities of visitors served by the existing facilities, provided that off-site impacts are not increased. Such facilities include picnic areas, playgrounds, pavilions, maintenance buildings, tennis courts, and swimming pools.
 - (c) Single- or multiple-unit dwellings or residential quarters for caretakers and staff members necessary to serve existing facilities.
 - (d) Utility lines, excluding power transmission lines.
 - (e) Signs, subject to Section 4.020.
 - (f) Farm uses, including aquaculture, and forest uses.
 - (g) Fish and game management.
- (3) **USES PERMITTED CONDITIONALLY:** In the RM zone, the following uses and their accessory uses are permitted subject to the provisions of Article 6 and the requirements of all applicable supplementary regulations contained in this Ordinance:
 - (a) Recreation campgrounds, primitive campgrounds and group lodging facilities such as dormitories for visitors, but not including commercial motels, hotels, or group cottages.
 - (b) Meeting and recreational facilities that will increase visitor capacity or off-site impacts.
 - (c) Retail facilities, including eating establishments, that are designed primarily to serve those who visit nearby recreational developments.

- (d) Marinas or mooring areas.
 - (e) Rock quarries.
 - (f) Primary wood processing.
 - (g) Water treatment facilities and sewage treatment plants.
 - (h) Utility substations and power transmission lines.
 - (i) Towers for communications, wind energy conversion systems, or structures having similar impacts.
 - (j) Hydroelectric power generating facilities.
 - (k) Golf courses.
 - (l) A single-family residential structure on a legally created parcel that is at least 5 acres in size.
- (4) STANDARDS: Land divisions and development in the RM zone shall conform to the following standards, unless more restrictive supplemental regulations apply:
- (a) Recreational developments shall retain substantial open space on the property.
 - (b) Master plans for improvements in the RM zone may include any of the permitted or Conditional Uses listed in this zone. The Planning Department or Commission may approve such plans for a recreation area, according to the provisions of this Section, that plan for a period not to exceed ten years. Such approvals would allow all uses provided in the plan except those that require further information or review due either to lack of plan detail or the applicability of additional Ordinance criteria or standards. Any changes to the plan which would not affect visitor capacity or increase off-site impacts may be approved by the Director. All other changes or amendments shall be reviewed as required by this Section.
 - (c) The minimum lot size shall be 40 acres. The Director may approve a smaller lot size according to the provisions of Article VI, provided that forest resource values are maintained in the vicinity.



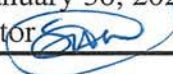
Land of Cheese, Trees and Ocean Breeze

LEGISLATIVE TEXT AMENDMENT REQUEST
#851-22-000402-PLNG: ACCESSORY DWELLING UNIT (ADU) STANDARDS

STAFF REPORT DATE: December 1, 2022

TILLAMOOK COUNTY PLANNING COMMISSION HEARING DATE: December 8, 2022

BOARD OF COMMISSIONERS HEARING DATE: January 30, 2023

PREPARED BY: Sarah Absher, CFM, Director 

I. GENERAL INFORMATION

Requested actions: Legislative text amendment request to amend Article 5: Special Use Standards and Exceptions of the Tillamook County Land Use Ordinance (TCLUO) to include Section 5.110 and the establishment of use and development standards for placement of an Accessory Dwelling Unit (ADU) on residentially zoned properties located within Tillamook County Unincorporated Communities.

Initiated By: Tillamook County Department of Community Development

II. BACKGROUND

The Tillamook County Housing Commission completed a Housing Need Analysis¹ (HNA) in December 2019. The HNA provided comprehensive review of the County’s housing shortages and forecasted housing demands for the next 20 years. Over the past twenty years, the HNA determined new housing production has not kept pace with demand, leading to a severe shortage of housing availability and affordability issues. Most new construction over the past two decades has occurred in coastal “resort” towns, and 66%-80% of the total housing stock is owned by part-time residents. Approximately one in three local workers now reside outside Tillamook County.

¹ Housing Needs Analysis for Tillamook County can be found on the Tillamook County Housing Commission page under Housing Commission History:
https://www.co.tillamook.or.us/sites/default/files/fileattachments/housing_commission/page/57834/tillamook_hna_final_report_v2.pdf

The HNA estimated an increase of 2,936 residents in the 20-year projection between the base and forecast years with significant socio-economic and demographic shifts. Accordingly, the number of housing units necessary to ensure an adequate supply is expected to increase in tandem with the variety of housing types needed to accommodate a diversity of new residents. The HNA concludes that renters—the vast majority of new residents—will demand medium- and high-density housing types.

The 2019 HNA forecasts the housing needs for Tillamook County under four scenarios and underlying assumptions to determine the additional housing units needed by 2039. Future demand for attainably priced housing will largely require the development of medium density “missing middle” housing types. The likely forecast housing mix corresponds to single-family detached homes, accessory dwelling units (ADUs), multifamily housing units including townhomes and condominiums, and manufactured housing units. With the exception of accessory dwelling units (ADUs), the aforementioned housing types are listed in several unincorporated community residential zones as uses permitted outright or conditionally.

The Department recognizes the benefits that accessory dwelling units (ADUs) provide as a housing option where such benefits consider and are balanced with other community goals. If adopted, the proposed ordinance will further the County’s efforts to meet the demands identified in the 2019 HNA.

III. APPLICABILITY & PURPOSE

The proposed Accessory Dwelling Unit (ADU) ordinance provisions apply to lots or parcels in residential zoning districts located within the Tillamook County Unincorporated Communities of Neahkahnie, Mohler, Barview/Twin Rocks/Watseco, Idaville, Oceanside, Netarts, Siskeyville, Beaver, Hebo, Cloverdale, Pacific City/Woods, and Neskowin (Exhibit A). In accordance with the Comprehensive Plan Goal 14; Urbanization Element, accessory dwelling units (ADUs) are not permitted in rural residential zones, resource zones, or any other zoning districts located outside of these unincorporated communities.

The purpose and intent of creating an ordinance for allowance of an Accessory Dwelling Unit (ADU) on residentially zoned properties located in Tillamook County unincorporated communities is to:

- (a) Ensure that accessory housing is clearly subordinate to the primary use on the property;
- (b) Accommodate unique or special housing needs and circumstances such as caretaker housing;
- (c) Increase and diversify long-term rental housing options throughout the County to meet the needs of the local workforce;
- (d) Provide for the general convenience of area property owners to accommodate family and guests with independent living quarters;
- (e) Create alternative housing opportunities that promote more efficient use of existing or planned public and private utilities, transportation facilities, public transit and other facilities;
- (f) Facilitate accessory housing where public and private utilities, transportation facilities, public transit and other facilities already exist;
- (g) Ensure that adequate sanitation facilities are available to serve the accessory housing.

A summary of the standards listed in proposed Section 5.110 are described in the following section of this report.

IV. SUMMARY OF SECTION 5.110 (ARTICLE 5 OF THE TCLUO)

TCLUO Article 5: Special Use Standards and Exceptions contains supplemental standards for permissible land uses in unincorporated Tillamook County zoning districts. The proposed standards outlined in Section 5.110 establish standards that control size, scale and compatibility of use of an Accessory Dwelling Unit

(ADU) on a lot or parcel. The proposed amendment includes a definition of Accessory Dwelling Unit (ADU) and limit density to no more than one (1) ADU allowed per lot or parcel.

General requirements and development standards for ADUs are outlined in this section, and include standards for building setbacks, off-street parking, and design standards that limit the size and appearance of an ADU ensuring the ADU remains subordinate as an accessory use to the primary dwelling.

Permitting Requirements: An approved building permit is required for structural alterations to an existing dwelling for an ADU, the conversion of space in an existing structure for an ADU and for new construction or placement of an ADU as a detached structure. Demonstration of compliance with applicable building codes must be reflected on the submitted plans and at the time of development. Trades permits for electrical, mechanical and plumbing are also required where applicable.

Letters confirming service availability from public facility service providers are required to be submitted in conjunction with the consolidated zoning/building permit application at the time of application submittal. Service provider letters from applicable water and sewer districts, the local fire department and the Oregon Water Resources Division for properties served by a well are necessary to confirm services are available for the construction or placement of an ADU on a property. Sanitation permit approvals are required for properties improved with an onsite wastewater treatment system to ensure the system is adequately sized for development of an ADU on a property.

Road approach permit approval from the Tillamook County Public Works Department or the Oregon Department of Transportation is required to confirm the existing road approach is adequate for the use of an ADU on the subject property. Documentation from the road authority must also be submitted to the Department at the time of consolidated zoning/building permit application submittal. Documentation can be a copy of an approved road approach permit or written confirmation that the existing approach is adequate to serve the primary dwelling and ADU.

Transient Lodging Prohibition: Accessory Dwelling Units (ADUs) shall not be utilized for transient lodging purposes, including use as a bed and breakfast enterprise or part of a motel/hotel accommodation. Prohibition language has been included in Section 5.110 and is also proposed to be incorporated into Tillamook County Ordinance 84, a separate County ordinance that regulates use of dwellings as short-term rentals in unincorporated Tillamook County. Properties with permitted ADUs will be flagged in the Department property database so that when future permit applications are received, or inquiries regarding a property with an ADU are received, Department staff will be able to advise property owners, sellers and future buyers of these prohibitions.

IV. ANALYSIS:

1. Statewide Planning Goal & Tillamook County Comprehensive Plan Discussion

Oregon's 19 statewide planning goals are adopted as Administrative Rule and express the state's policies on land use as well as land use related topics. Each county is required to have a comprehensive plan consistent with the statewide planning goals as well as zoning and land division ordinances for implementation of plan policies and objectives. The Tillamook County Comprehensive Plan contains 17 of the 19 Statewide Planning Goal Elements. A Goal 15 Element (Willamette Valley) and Goal 19 Element (Ocean Resources) are absent from the Tillamook County Comprehensive Plan as the goals and policies for the Willamette Valley do not apply to Tillamook County and the Ocean Resources Element was created after the adoption of the County's comprehensive plan.

The Comprehensive Plan provides the County with an important opportunity to make a detailed statement describing the needs and desires of its citizens for the future use of the County's land and water resources, and to guide future development of the County through agreed upon policy statements which give direction to County actions and programs. The policies provide a basis for coordination of the programs of other governmental entities and are also intended to assist the private sector in reaching development decisions which are beneficial to the citizens of the County generally as well as to the private property owner.

The plan must also be in conformance with the adopted statewide planning goals and policy statements are to be based upon required inventories of resource and other pertinent information and findings related to analysis of problems and opportunities existing in Tillamook County. The plan is intended to be used to guide actions for problem-solving, and state goals also require local adoption of implementation measures appropriate for dealing with the identified problems and needs.

- **Tillamook County Comprehensive Plan Goal 1 Element: The Planning Process**

Summary: Goal 1 calls for "the opportunity for citizens to be involved in all phases of the planning process." It requires each city and county to have a citizen involvement program containing six components specified in the goal. It also requires local governments to have a committee for citizen involvement (CCI) to monitor and encourage public participation in planning.

The proposed amendment is consistent with the Goal 1 element policies. Notice of public hearing was published in the Headlight Herald in accordance with the Article 10 of the TCLUO with notice provided to County designated Citizen Advisory Committees (CACs) at least 28-days prior to the first evidentiary hearing. Notice of the proposed amendment was also provided to local water, sewer and fire districts. As required, notice of public hearing and accompanying documents part of the PAPA process have been submitted to the Oregon Department of Land Conservation and Development at least 35 days prior to the first evidentiary hearing.

- **Tillamook County Comprehensive Plan Goal 2 Element: THE LAND USE PLAN**

Summary: Goal 2 outlines the basic procedures of Oregon's statewide planning program and describes the development of Tillamook County's Comprehensive Plan including justification for identifying exception areas.

The proposed amendment is consistent with the Goal 2 element and an exception is not required for the proposed amendment.

- **Tillamook County Comprehensive Plan Goal 3 Element: AGRICULTURAL LANDS**

Summary: Goal 3 defines "agricultural lands." It then requires counties to inventory such lands and to "preserve and maintain" them through farm zoning. Details on the uses allowed in farm zones are found in ORS Chapter 215 and in Oregon Administrative Rules, Chapter 660, Division 33.

- **Tillamook County Comprehensive Plan Goal 4 Element: FOREST LANDS**

Summary: This goal defines forest lands and requires counties to inventory them and adopt policies and ordinances that will "conserve forest lands for forest uses."

The proposed amendment does not apply to resource lands.

- **Tillamook County Comprehensive Plan Goal 5 Element: NATURAL RESOURCES**

Summary: The purpose of Goal 5 is to protect natural resources, and conserve scenic and historic areas and open space. Goal 5 covers more than a dozen natural and cultural resources such as

wildlife habitats and wetlands. It establishes a process for each resource to be inventoried and evaluated. If a resource or site is found to be significant, a local government has three policy choices: preserve the resource, allow proposed uses that conflict with it, or strike some sort of a balance between the resource and the uses that would conflict with it.

Findings: The proposed amendment does not reduce existing protections or resources, or natural features reflected in the policies of the Goal 5 Element.

- Tillamook County Comprehensive Plan Goal 6 Element: AIR, WATER AND LAND RESOURCES QUALITY

Summary: This goal requires local comprehensive plans and implementing measures to be consistent with state and federal regulations on matters such as groundwater pollution and noise control in Tillamook County.

Findings: The proposed amendment does not reduce existing protections or resources, or natural features contained in the policies of the Goal 6 Element.

- Tillamook County Comprehensive Plan Goal 7 Element: HAZARDS

Summary: Goal 7 deals with development in places subject to natural hazards such as floods or landslides. It requires that jurisdictions apply "appropriate safeguards" (floodplain zoning, for example) when planning for development there. In Tillamook County, the purpose of addressing hazards is not meant to restrict properties from development, but to institute policies concerning potential problems, so they can be considered before financial losses and possible injury which may be avoided by the application of the policies formulated in the Comprehensive Plan.

The proposed amendment does not reduce existing protections against hazards addressed in the Goal 7 element or waive requirements for satisfaction of standards intended to address hazards such as those contained in TCLUO Section 4.130: Development requirements for Geologic Hazard Areas, TCLUO Section 3.510: Flood Hazard Overlay (FH) Zone, TCLUO Section 3.530: Beach and Dune Overlay (BD) Zone and TCLUO Section 3.580: Tsunami Hazard Overlay (TH) Zone

- Tillamook County Comprehensive Plan Goal 8 Element: RECREATION

Summary: This goal calls for each community to evaluate its areas and facilities for recreation and develop plans to deal with the projected demand for them. It also sets forth detailed standards for expedited siting of destination resorts. In Tillamook County, the main issue surrounding recreation is that of quantity, location and orientation. This Goal element recognizes that the tourism sector of the County's economy is rapidly growing and some feel tourism places too large a burden on local public facilities and services.

Recreation opportunities are not prohibited or limited by the proposed amendment.

- Tillamook County Comprehensive Plan Goal 9 Element: POPULATION AND ECONOMY

Summary: Goal 9 calls for diversification and improvement of the economy. It asks communities to inventory commercial and industrial lands, project future needs for such lands, and plan and zone enough land to meet those needs. Projections in this Element of the Comprehensive Plan extend to year 2000. The importance of cottage industry, rural industry and light industry is recognized throughout this Element, stating that regulations be adopted to permit low-impact light manufacturing activity in suitable rural zones.

The Tillamook County Comprehensive Plan is in need of updated population projections. The

forecasted housing needs contained within the 2019 Tillamook County Housing Needs Analysis (HNA) include current population data and forecasts for housing needed for Tillamook County's workforce. Absent updated information in the Goal 9 element, updated information that supports housing needs and the need for diverse, multi-housing options can be found in the County's HNA.

The policies contained within the Goal 9 element of the Tillamook County Comprehensive Plan are directive in actions needed to be taken by Tillamook County to promote and sustain the County's economy in collaboration with special districts and others. Policies also prioritize needs of industrial and commercial lands.

Commercial and industrial zoning districts have been excluded from the list of eligible zoning districts that would allow for the placement of an ADU. Support of the proposed amendment can be considered by way of providing needed workforce housing- also needed to help sustain Tillamook County's economy. The proposed amendment is consistent with efforts to provide diverse, multiple housing options to Tillamook County's workforce.

- **Tillamook County Comprehensive Plan Goal 10 Element: HOUSING**

Summary: This goal specifies that each city must plan for and accommodate needed housing types, such as multifamily and manufactured housing. It requires each city to inventory its buildable residential lands, project future needs for such lands, and plan and zone enough buildable land to meet those needs. It also prohibits local plans from discriminating against needed housing types. This Goal element within the Tillamook County Comprehensive Plan focuses on the separation of housing needs and opportunities in both rural and urban areas. There is a strong tie to the Goal 11: Public Facilities and Goal 14: Urbanization elements of the Comprehensive Plan in this section.

Goal 10 requires planning for housing that encourages the availability of adequate numbers of housing units, and allow for flexibility of housing location, type and density. It is recognized that the intent of the statewide planning goals is to encourage the concentration of growth within the urban growth boundaries of cities, however this interpretation has resulted from the definition of "buildable lands" which has traditionally only included lands within urban growth boundaries.

The County's Goal 10 element supports a second interpretation of the applicability of the Housing Goal consistent with past LCDC decision- that it is unreasonable to conclude that, because Goal 10's building land inventory requirement applies only within urban growth boundaries, all housing needs must be satisfied within urban growth boundaries. Given the spatial distance of location of incorporated cities within Tillamook County, and the fact that there are no cities and urban growth boundaries from the City of Tillamook to the City of Lincoln City in Lincoln County, all housing needs cannot be satisfied within the urban growth boundaries of the seven incorporated cities in Tillamook County.

As a policy, Tillamook County interprets the Housing Goal (Goal 10) as applying to all areas of the County, not just to incorporated areas and their urban growth boundaries. Given the County's circumstances, this is the only reasonable non-contradictory interpretation of the goal.

The County can encourage the availability of housing to meet needs by: 1) zoning a sufficient amount of land for needed housing types, 2) encouraging cities and service districts to service a sufficient amount of land to meet housing needs, and 3) minimizing the effect of regulations on housing cost. The structure of the proposed amendment supports the third action listed by creating a process with clear and objective standards.

Staff finds the proposed amendment is supported by the goals and policies of the Goal 10 element of the Tillamook County Comprehensive Plan.

The Goal 10 Housing element references other applicable goal elements and discusses the relationships between housing and public facilities and services, urbanization and applicability of the housing goal to urban and rural areas. Goal elements 11 and 14 are further discussed below.

- **Tillamook County Comprehensive Plan Goal 11 Element: PUBLIC FACILITIES**

Summary: Goal 11 calls for efficient planning of public services such as sewers, water, law enforcement, and fire protection. The goal's central concept is that public services should be planned in accordance with a community's needs and capacities rather than be forced to respond to development as it occurs. This Element of the Comprehensive Plan outline types and levels of urban and rural facilities and services, with guidance to ensure timely, orderly and efficient arrangement of public facilities and services in Tillamook County.

Accessory Dwelling Units (ADUs) are intended to be ancillary and accessory to the primary dwelling. The development standards contained in proposed Section 5.110 establish standards that control size, scale and compatibility of use of an Accessory Dwelling Unit (ADU) on a lot or parcel. The proposed amendment includes a definition of Accessory Dwelling Unit (ADU) and limits density to no more than one (1) ADU per residentially zoned lot or parcel.

As mentioned previously in this report, ADUs would only be allowed on residentially zoned properties within unincorporated communities where public facilities and services exist. Letters from applicable public facility and service providers would be required to be submitted in conjunction with the consolidated zoning/building permit application to ensure services are available and can accommodate the proposed construction or placement of an accessory dwelling unit (ADU).

The proposed time, place and management standards ensure applicable policies contained within the Goal 11 element are not limited or compromised by the proposed amendment.

- **Tillamook County Comprehensive Plan Goal 12 Element: TRANSPORTATION**

Summary: The goal aims to provide "a safe, convenient and economic transportation system." It asks for communities to address the needs of the "transportation disadvantaged." Policies outlined in this Goal element of the Tillamook County Comprehensive Plan require the County to protect the function, operation and safety of existing and planned roadways as identified in the County's Transportation Plan, consider land use impacts on existing or planned transportation facilities in all land use decisions, plan for multi-modal networks, and coordinate transportation planning efforts with other jurisdictions to assure adequate connections to streets and transportation systems between incorporated and unincorporated areas.

Accessory Dwelling Units (ADUs) are intended to be ancillary and accessory to the primary dwelling. The development standards contained in proposed Section 5.110 establish standards that control size, scale and compatibility of use of an Accessory Dwelling Unit (ADU) on a lot or parcel. Staff finds that future needs or opportunities for transportation facilities are not limited or compromised by the proposed amendment.

- **Tillamook County Comprehensive Plan Goal 13 Element: ENERGY CONSERVATION**

Summary: Goal 13 declares that "land and uses developed on the land shall be managed and controlled so as to maximize the conservation of all forms of energy, based upon sound economic principles." Planning for energy conservation and opportunities to promote the installation of

renewable energy systems are discussed in this Goal element of the Tillamook County Comprehensive Plan.

Existing opportunities for renewable energy conservation systems and efforts to maximize conservation of existing energy facilities are not affected by the proposed amendment.

- **Tillamook County Comprehensive Plan Goal 14 Element: URBANIZATION**

Summary: This goal requires cities to estimate future growth and needs for land and then plan and zone enough land to meet those needs. It calls for each city to establish an "urban growth boundary" (UGB) to "identify and separate urbanizable land from rural land." It specifies seven factors that must be considered in drawing up a UGB. It also lists four criteria to be applied when undeveloped land within a UGB is to be converted to urban uses. This Goal element of the Tillamook County Comprehensive Plan focuses largely on development within unincorporated communities, public facility limitations to rural areas, and impacts of urban sprawl on resource lands.

Consistent with Goal 11 Comprehensive Plan policies, continued planning to ensure adequate public services such as sewer, water, law enforcement and fire protection is critical to the public health, welfare and safety of Tillamook County communities and its residents.

If adopted, ADUs would only be allowed on residentially zoned properties located in unincorporated communities where public services and facilities exist. ADUs would not be allowed on residential properties outside of residentially zoned properties within unincorporated communities (urbanizable lands).

Time, place and management regulations contained within proposed Section 5.110 are designed to avoid conflict with relevant goals and policies contained within the Goal 14 element of the Tillamook County Comprehensive Plan and ensure development does not result in urban sprawl on resource lands.

The proposed time, place and management standards ensure applicable policies contained within the Goal 14 element are not limited or compromised by the proposed amendment.

- **Tillamook County Comprehensive Plan Goal 16 Element: ESTUARINE RESOURCES**

Summary: This goal requires local governments to classify Oregon's 22 major estuaries in four categories: natural, conservation, shallow-draft development, and deep-draft development. It then describes types of land uses and activities that are permissible in those "management units." Five estuaries are inventoried and described in this element of the Tillamook County Comprehensive Plan, the Nehalem Estuary, Tillamook Estuary, Netarts Estuary, Sandlake Estuary and Nestucca Estuary.

- **Tillamook County Comprehensive Plan Goal 17 Element: COASTAL SHORELANDS**

Summary: The goal defines a planning area bounded by the ocean beaches on the west and the coast highway (State Route 101) on the east. It specifies how certain types of land and resources there are to be managed: major marshes, for example, are to be protected. Sites best suited for unique coastal land uses (port facilities, for example) are reserved for "water-dependent" or "water related" uses. Coastal Shorelands inventoried in Tillamook County as described in this element are Nehalem Estuary Shorelands, Tillamook Estuary Shorelands, Netarts Estuary Shorelands, Sandlake Estuary Shorelands, and Nestucca Estuary Shorelands.

- **Tillamook County Comprehensive Plan Goal 18 Element: BEACHES AND DUNES**

Summary: Goal 18 sets planning standards for development on various types of dunes. It prohibits

residential development on beaches and active foredunes but allows some other types of development if they meet key criteria. The goal also deals with dune grading, groundwater drawdown in dunal aquifers, and the breaching of foredunes. Several categories of dunes are described and discussed in this element of the Tillamook County Comprehensive Plan, and includes discussion about where residential, commercial and industrial uses are prohibited. Goal 18 Exception areas are also inventoried within this element which allow for residential, industrial and commercial uses in dune areas that would otherwise be prohibited.

The proposed amendment is not in conflict with the goals and policies of the coastal elements. Coastal resources areas already under policy protection will continue to remain under those protections contained within the Comprehensive Plan.

2. Tillamook County Land Use Ordinance, Article IX, Amendment Process

A. Section 9.030: Text Amendment Procedure (Amend Article 5 of the TCLUO to include Section 5.110: Accessory Dwelling Unit (ADU) Standards)

1. A COMPREHENSIVE PLAN TEXT or ORDINANCE AMENDMENT may be requested by any person, subject to the requirements of a Type IV procedure and Article 10.

If County initiated, Article 9 requires the Department to prepare an analysis of the proposed amendments addressing such issues as the intent of the applicable Comprehensive Plan policies; the intent of the provisions being amended; the effect on the land use patterns in the County; the effect on the productivity of resource lands in the County; administration and enforcement; and the benefits or costs to Departmental resources resulting from the proposed amendment.

Staff finds as follows:

- Analysis of the proposed amendment in relation to existing Comprehensive Plan policies is contained in this report.
- The proposed amendment does not impair legally designated uses permitted outright or conditionally in the established underlying residential zones. The proposed amendment is supplemental for the development of an ADU on a residential property, a residential use accessory and subordinate to the established primary use (dwelling). No effect on land use patterns is anticipated as a result.
- The proposed amendment does not have an anticipated effect on the productivity of resource lands in Tillamook County. The proposed amendment does not allow the development of an ADU on resource lands.
- The Department does not anticipate any impact on County administration or enforcement of development of an ADU on residentially zoned properties.
- A fee structure already exists for required land use, zoning and building permit application(s) which will continue to apply to development requests of properties located within unincorporated Tillamook County.
- Permitting requirements for development of an Accessory Dwelling Unit (ADU) are briefly described in this report. Permitting process will follow standard procedures and review processes currently in place to ensure compliance with applicable building, zoning and sanitation code requirements.

2. CRITERIA

- (a) If the proposal involves an amendment to the Comprehensive Plan, the amendment must be consistent with the Statewide Planning Goals and relevant Oregon Administrative Rules;*
- (b) The proposal must be consistent with the Comprehensive Plan. (The Comprehensive Plan may be amended concurrently with proposed changes in zoning);*
- (c) The Board must find the proposal to be in the public interest with regard to community conditions; the proposal either responds to changes in the community, or it corrects a mistake or inconsistency in the subject plan or ordinance; and*
- (d) The amendment must conform to Section 9.040 Transportations Planning Rule Compliance.*

Staff finds as follows:

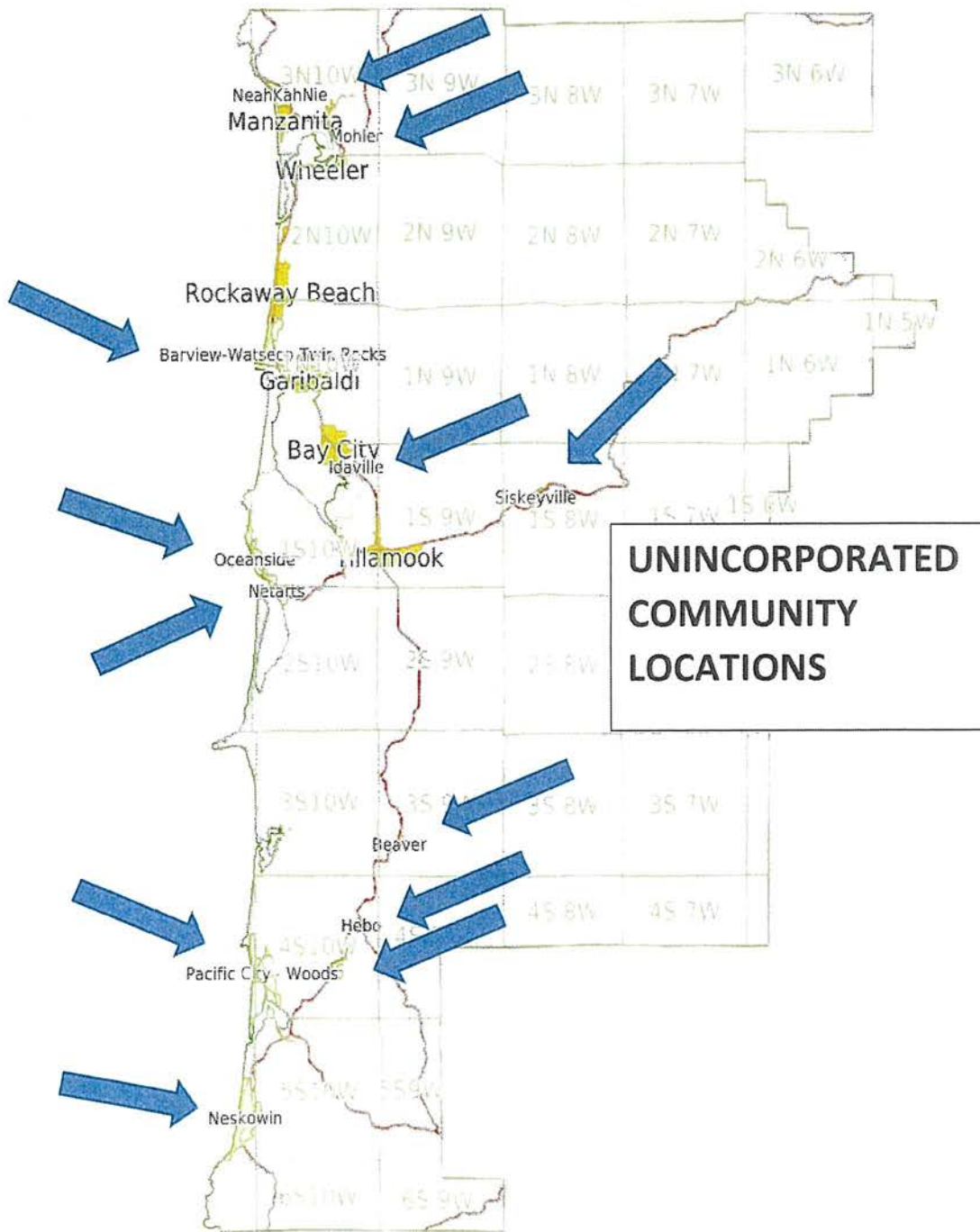
- Goals and policies reflected in the Tillamook County Comprehensive Plan are required to be consistent with the Statewide Planning Goals and relevant Oregon Administrative Rules.
- The proposed amendment does not involve an amendment to the Tillamook County Comprehensive Plan. Policies contained within the Goal 10: Housing element of the Tillamook County Comprehensive Plan support adoption of the proposed amendment.
- The proposed amendment is within the public interest regarding community conditions and known future housing needs contained within the County's Housing Needs Analysis.
- The proposed amendment is not in conflict with Section 9.040 Transportation Planning Rule Compliance, specifically this updated information will not significantly affect a transportation facility pursuant with Oregon Administrative Rule (OAR) 660-012-0060 (Transportation Planning Rule - TPR).

V. EXHIBITS:

- Exhibit A: Maps
- Exhibit B: TCLUO Section 5.110: Accessory Dwelling Unit

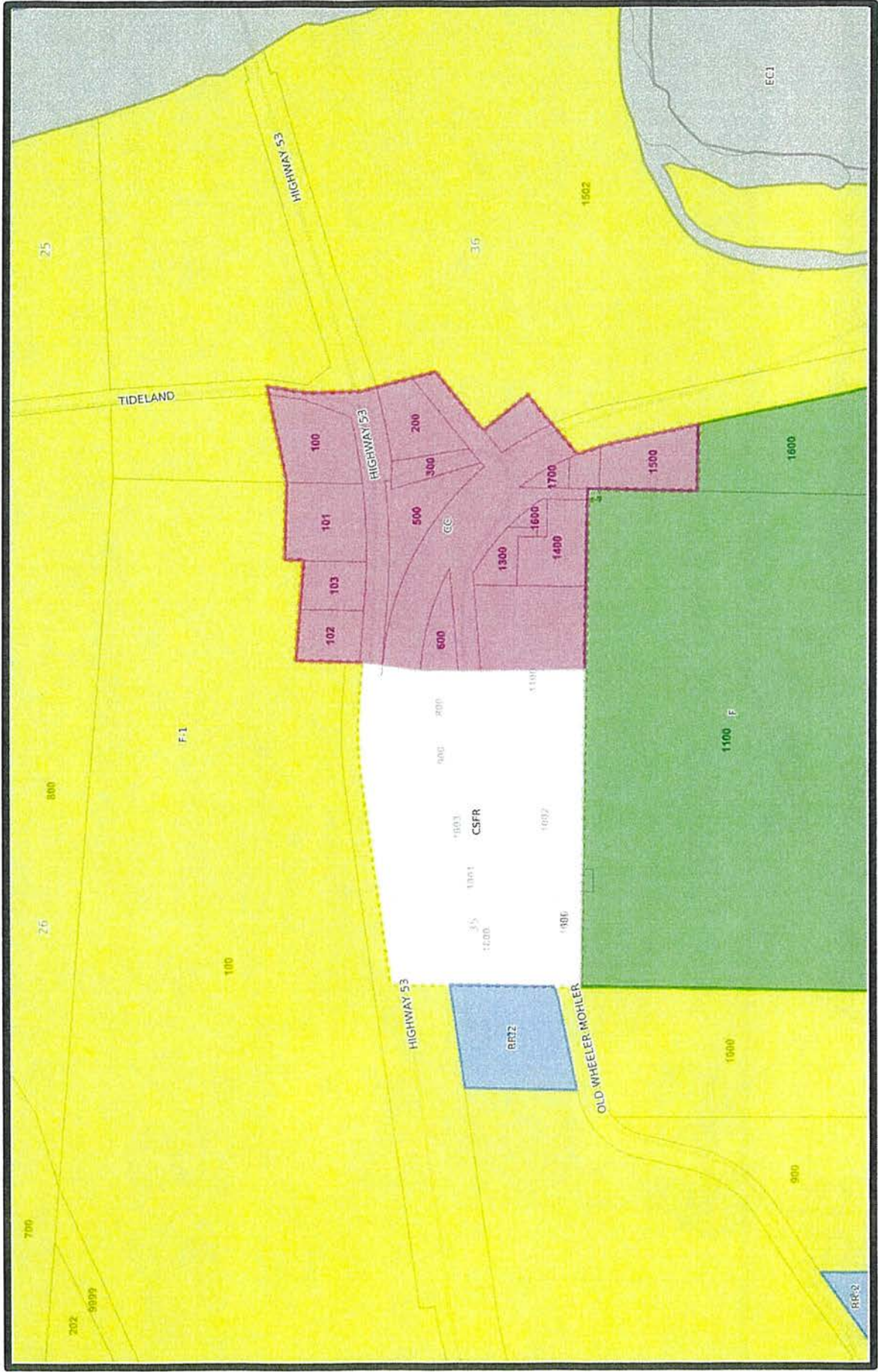
EXHIBIT A

VICINITY MAP



#851-22-000402-PLNG
TCLUO SECTION 5.110:
ACCESORY DWELLING UNIT STANDARDS

Map: MOHLER



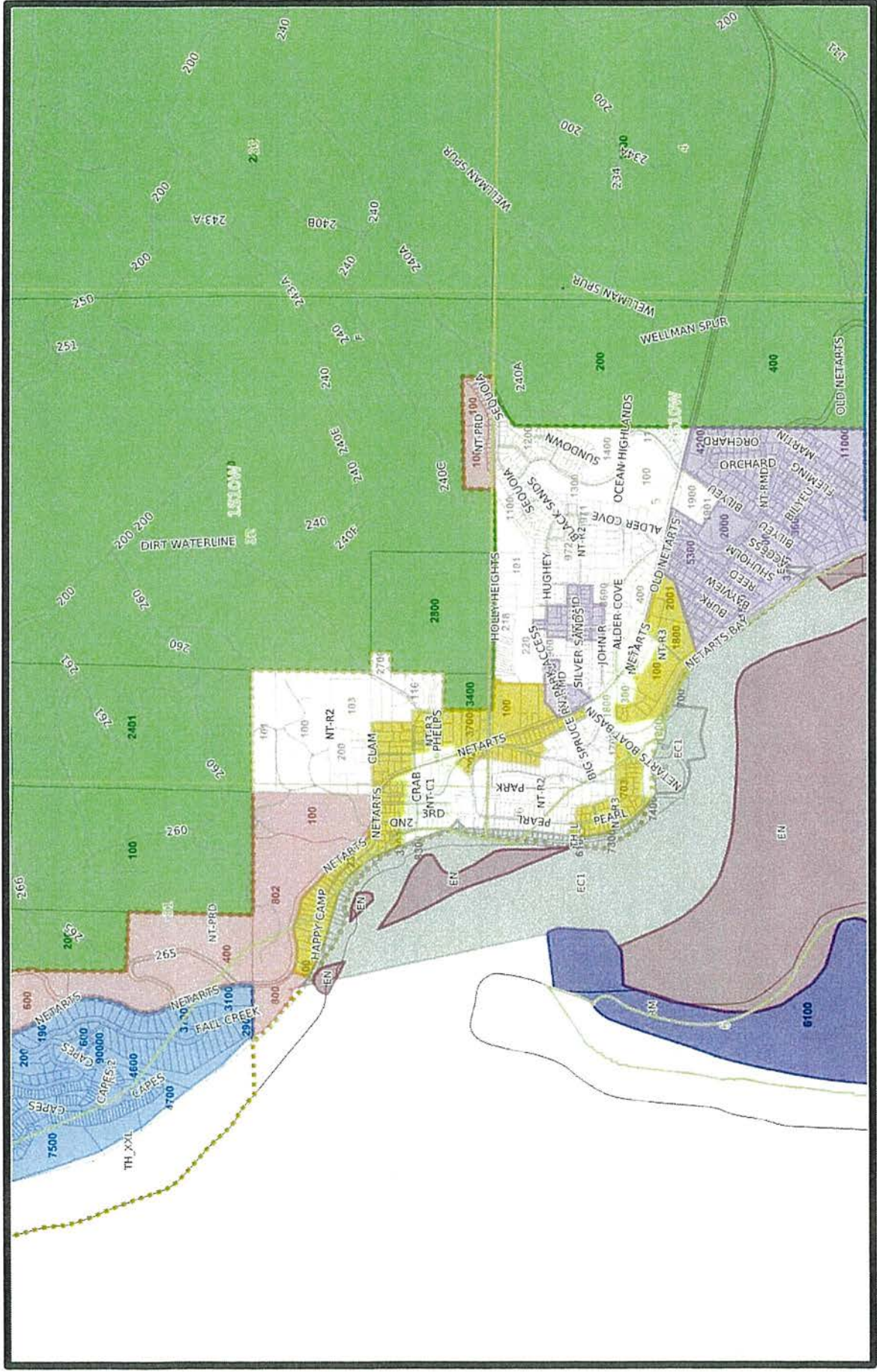
Barview / Twin Rocks /

Map: WATSECO

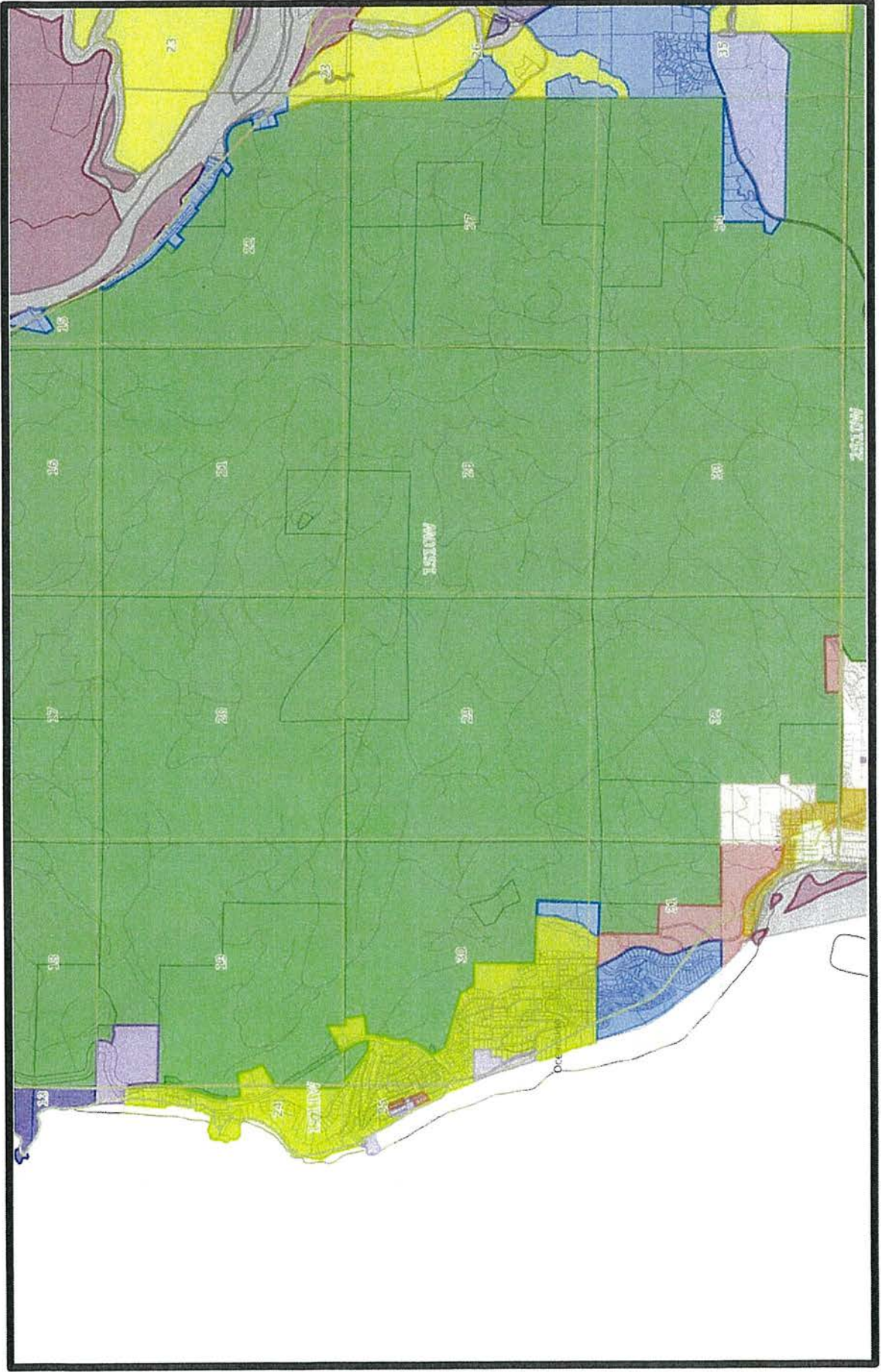
(NORTH)



Map: NETARTS



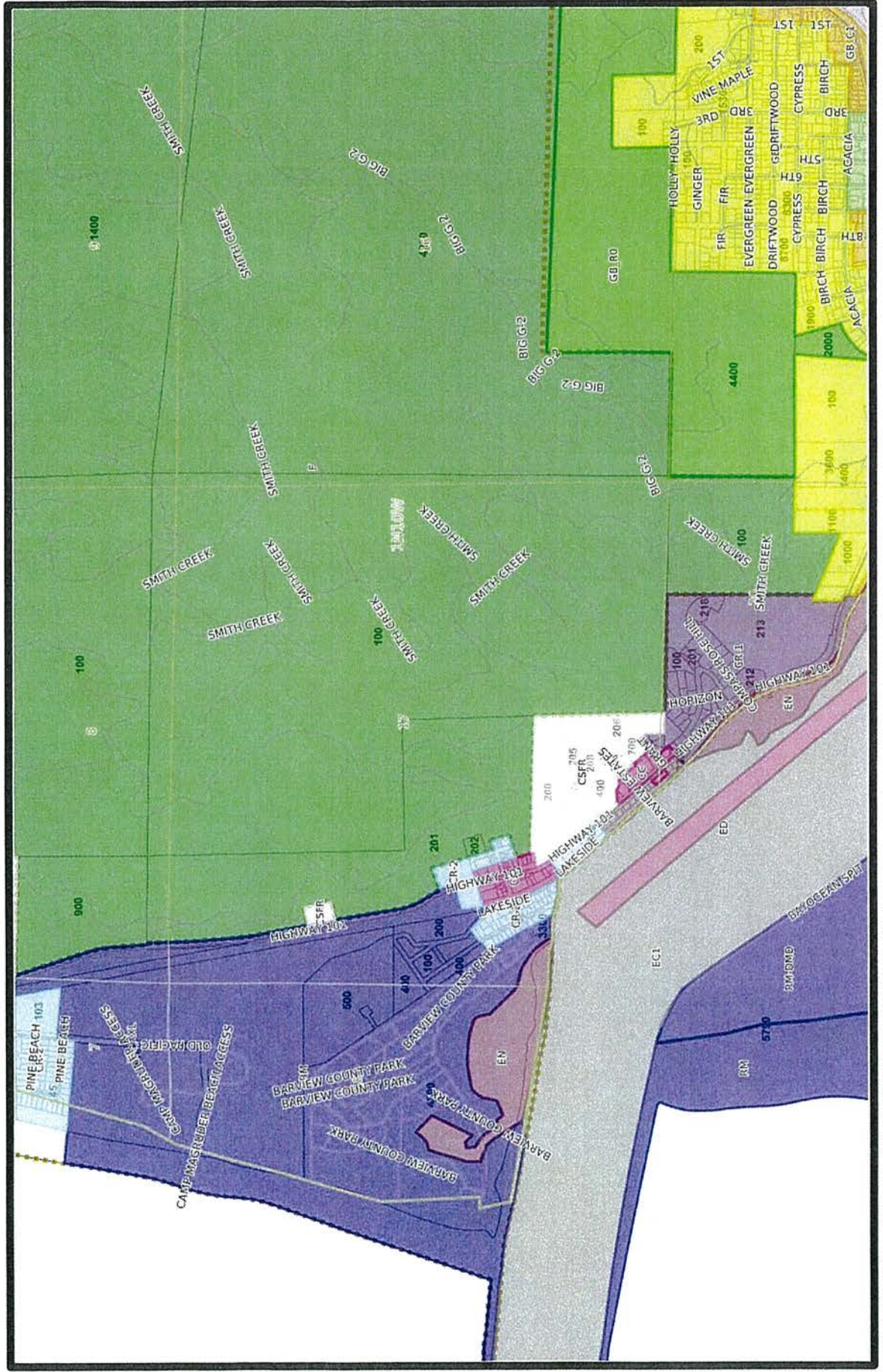
Map: OCEANSIDE



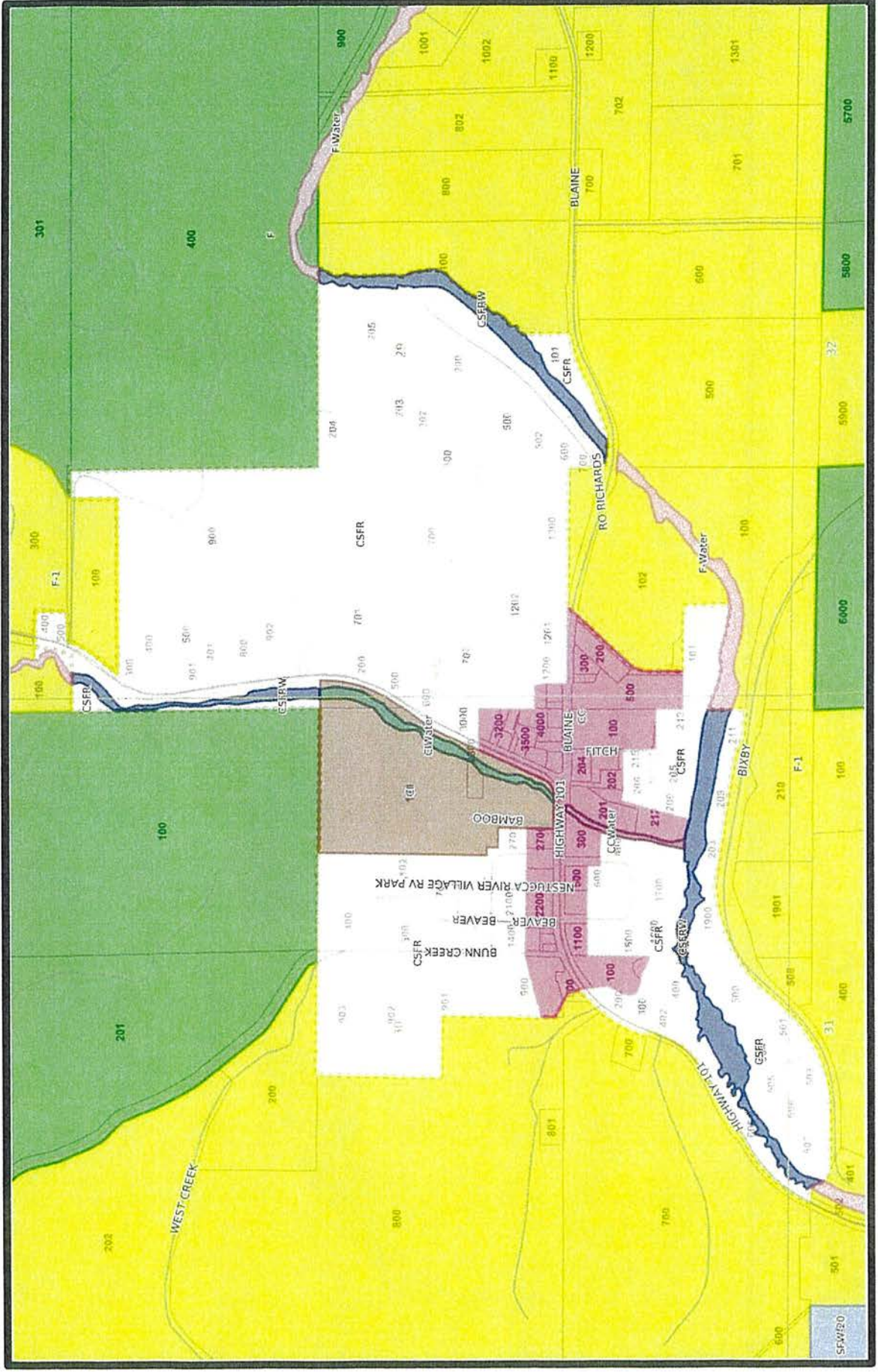
BARVIEW / TWIN ROCKS /

WATSECD

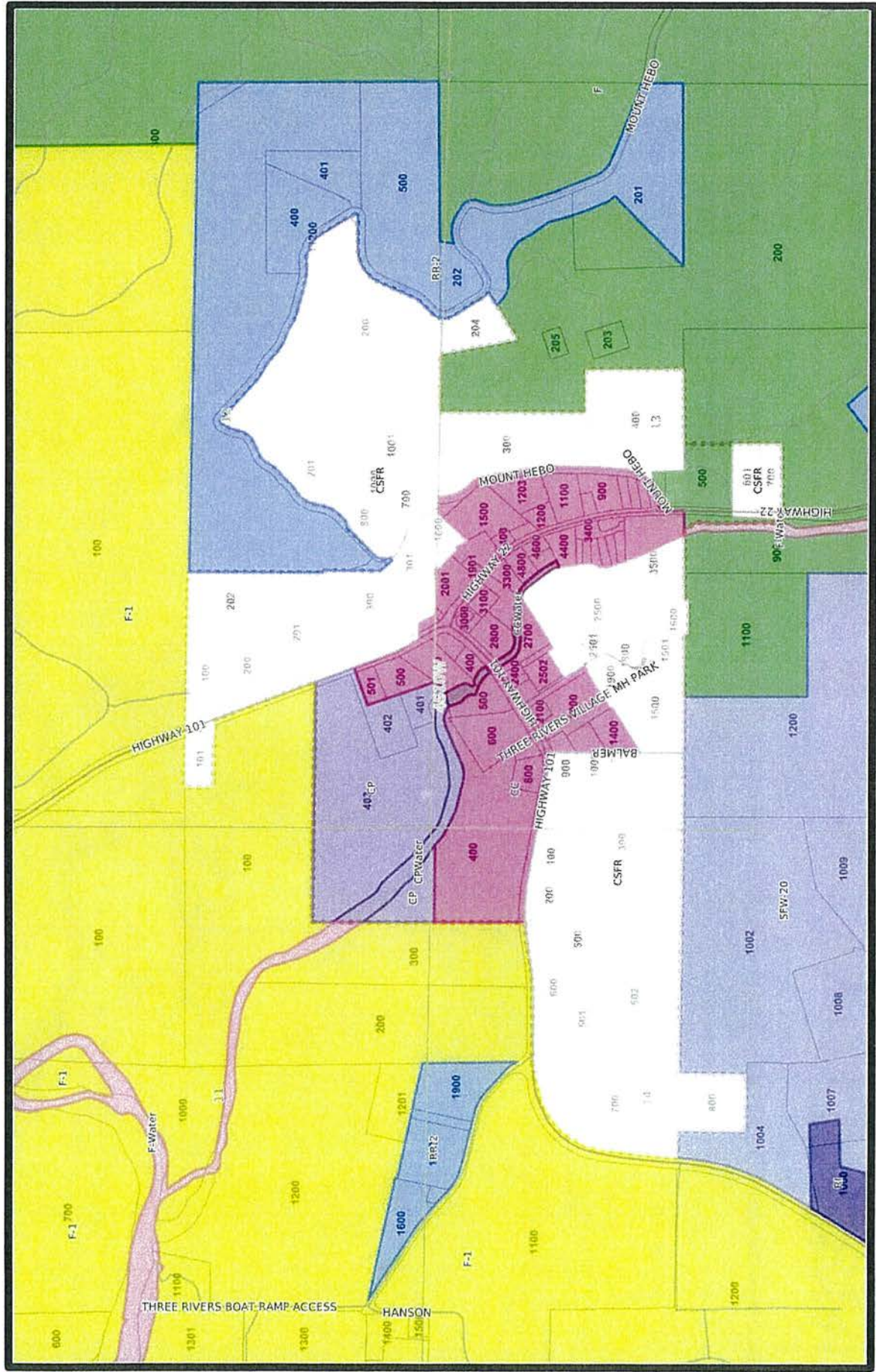
(SOUTH)



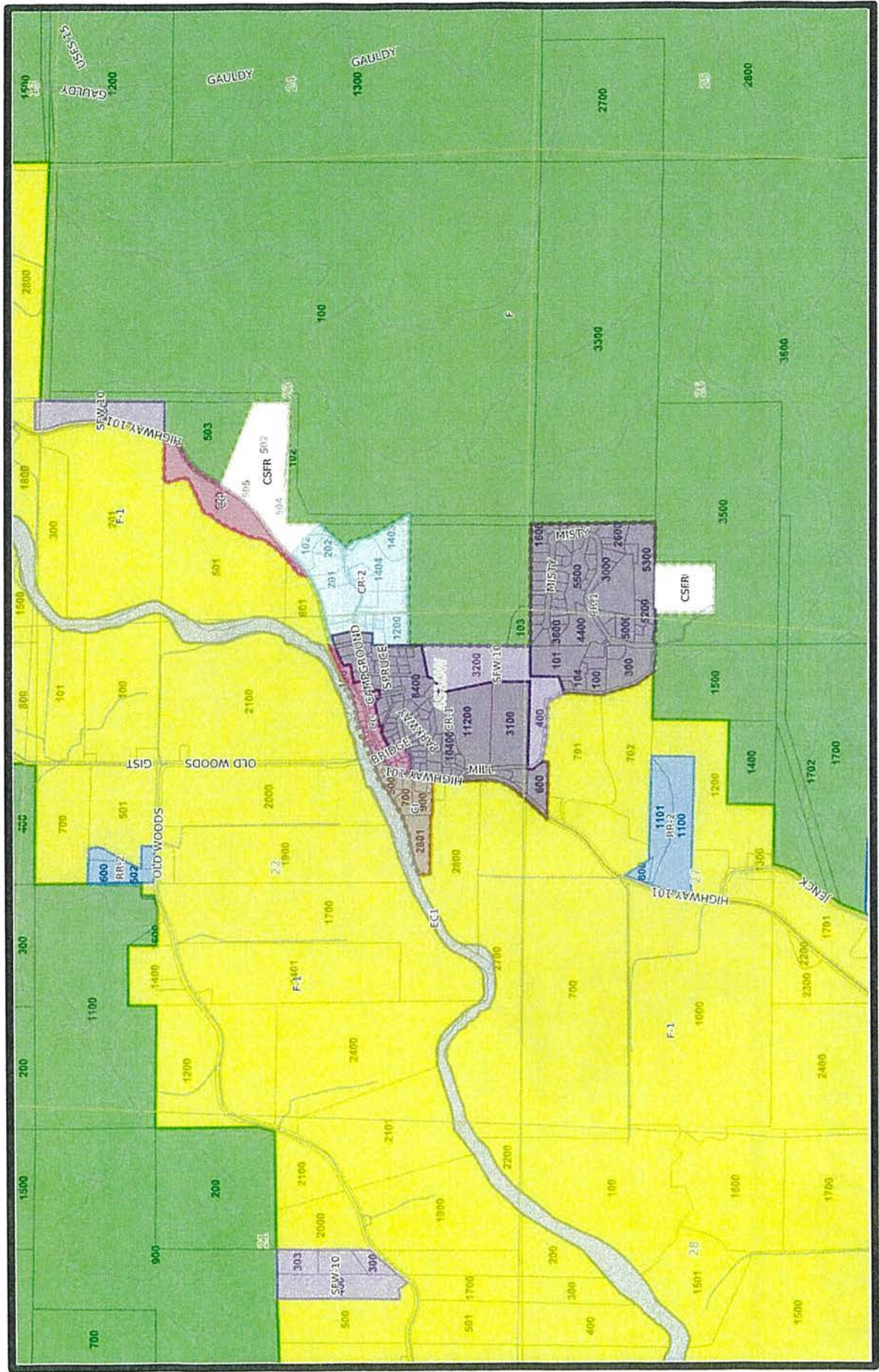
Map: BEAVER



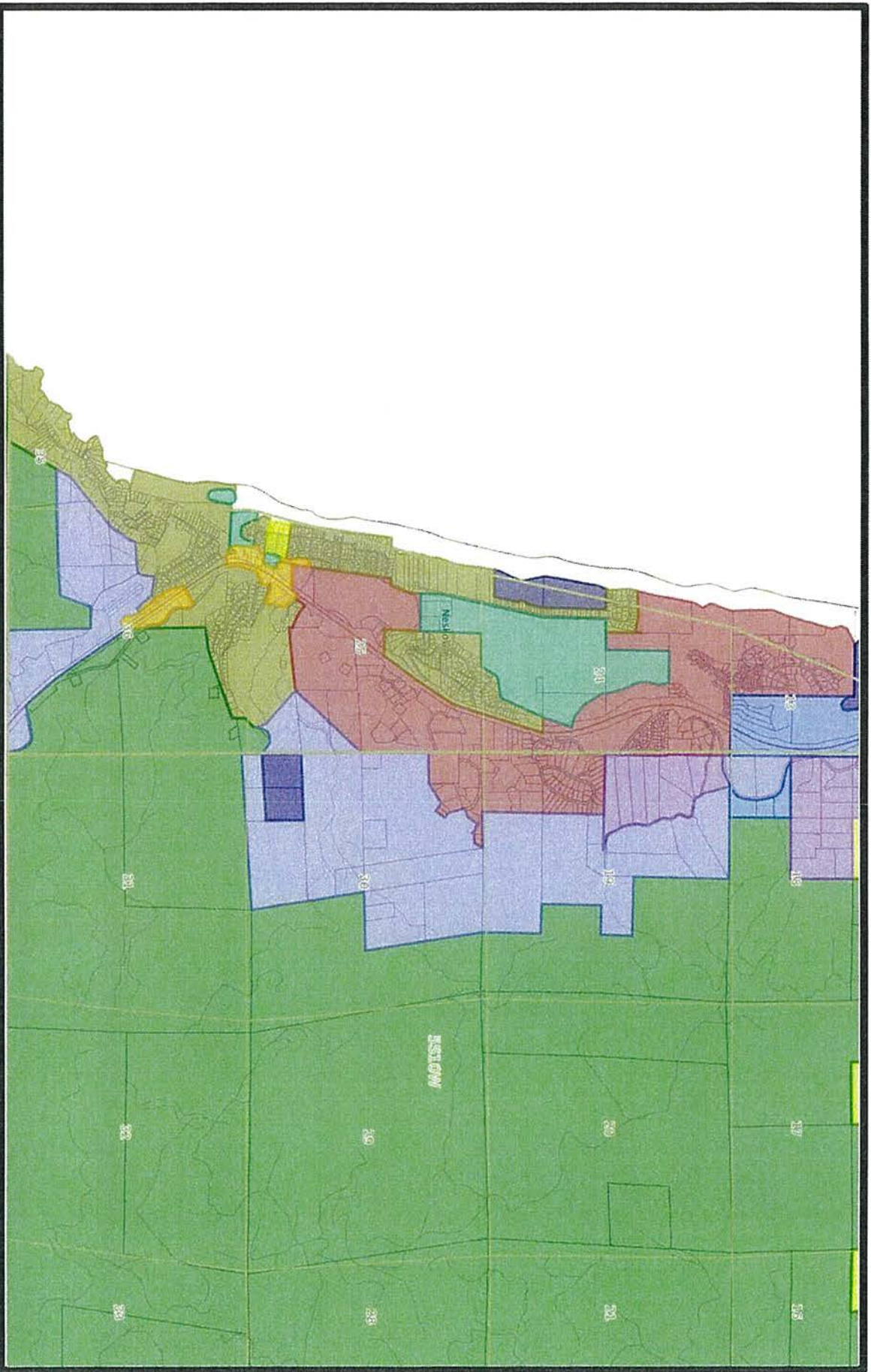
Map: Hebo



Map: Cloverdale



Map: NESKOWIN



Map: Siskeyville

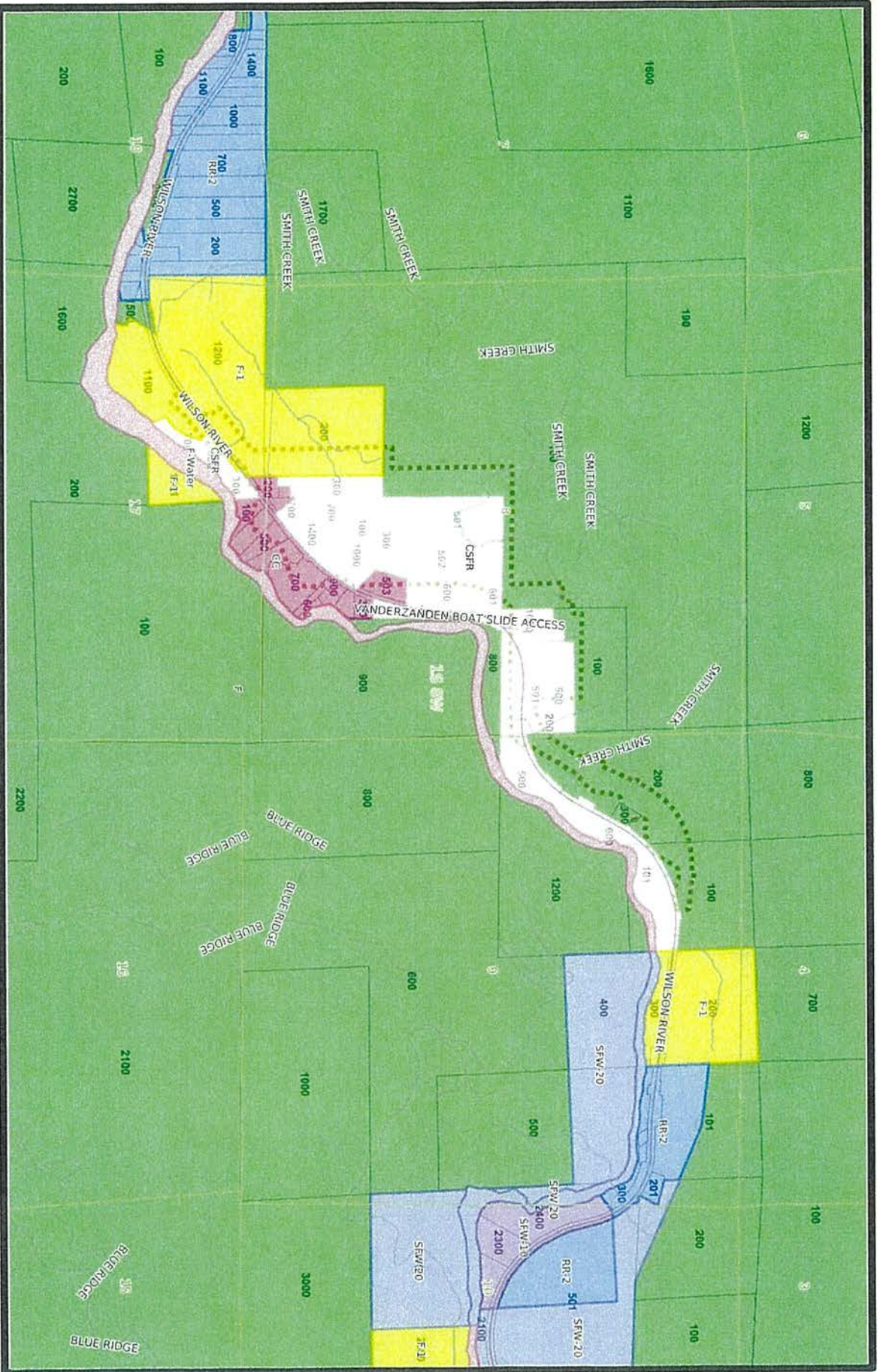


EXHIBIT B

SECTION 5.110: ACCESSORY DWELLING UNIT (ADU) STANDARDS

DEFINITION: Accessory Dwelling Unit (ADU): a subordinate dwelling unit which provides complete, independent living facilities for one or more persons including permanent provisions for living, sleeping, cooking, eating and sanitation on the same lot or parcel as the primary dwelling and which is incidental to the main use of the property. In no case shall the ADU exceed in area, extent or purpose, the primary dwelling.

An Accessory Dwelling Unit (ADU) may be either integrated into the same structure as the primary dwelling or constructed as a separate freestanding dwelling. If constructed within or as an addition to an existing or under-construction primary dwelling, the ADU shall conform to all building code requirements for fire separation between the two units. Attached or detached, an ADU shall be subordinate to the primary dwelling and shall meet the following use and development standards:

(A) *Location.* An ADU may be sited on a lawfully established lot or parcel located in unincorporated community residential zoning districts. There is no minimum land area requirement for an ADU.

(B) *Number.* Only one ADU shall be permitted per lot or parcel.

(C) *Setbacks.* For a detached ADU, the minimum rear yard setback shall be five feet; the minimum side yard setback shall be five feet and where applicable, the minimum street-side yard setback shall be ten feet. The required front yard setback of the underlying residential zone shall apply or the required front yard setback for small lots allowed under Section 4.100 and Section 4.110, where applicable. A detached ADU shall be physically separated from the primary residence by a minimum distance of six feet. A covered walkway which contains no habitable space may connect the two buildings without violation of the setback requirements.

If constructed within or as an addition to an existing or under-construction primary dwelling, the ADU shall conform to the setback requirements of the underlying zone or the required setbacks for small lots allowed under Section 4.100 and Section 4.110, where applicable.

(D) *Design.* An ADU shall be set on a permanent foundation; have any wheels, tongues, and running gear removed; and be connected to domestic sewer and water or connect to an onsite wastewater treatment system for those lots or parcels in unincorporated communities not served by sewer. A Recreational Vehicle (RV), yurt, travel trailer or other non-habitable structures not intended for residential occupancy shall not be utilized as an ADU.

(E) *Area.* The floor area of an ADU shall not exceed 75% of the living space of the primary residence or 800 square feet, whichever is less. If free-standing, the building footprint of the ADU shall also not exceed 75% of the building footprint of the primary dwelling or 800 square feet, whichever is less.

(F) *Height.* The maximum height of a freestanding ADU shall not exceed the height of the primary residence or the allowable maximum height of the underlying zone, whichever is less. An ADU built within or as an addition to the primary dwelling unit or over a detached garage shall not exceed the maximum height of the zone.

(G) *Lot Coverage.* Where applicable, maximum lot coverage requirements of the underlying zone shall not apply to the placement of an ADU. Maximum lot coverage requirements for properties developed under TCLUO Section 4.100 shall apply.

(H) *Parking.* One off-street parking space shall be maintained for the ADU. The parking space shall be a minimum of 8-feet by 20-feet in size.

(I) *Transient Lodging Prohibition.* The ADU shall not be utilized for transient lodging purposes.

(J) *Non-Conforming Structures.* Any legal nonconforming structure may be allowed to contain, or be converted to, an ADU, provided the ADU does not increase the nonconformity and meets applicable building and fire code requirements. Expansion of a Non-Conforming structure to accommodate an ADU may be allowed, subject to the provisions of Article VII: Nonconforming Uses.

EXHIBIT C

December 1, 2022

RE: SECTION 5.110: ACCESSORY DWELLING UNIT (ADU)

To Whom It May Concern:

On behalf of the Tillamook County Housing Commission and its volunteer members, we request your support for the proposed Section 5.110 ADU ordinance. This policy is one of three primary solutions we have identified to increase the number of affordable and attainable rental units to address the housing crisis in Tillamook County.

In December 2019 the Housing Commission completed a comprehensive formal Housing Needs Analysis to get the hard facts needed to look at the next 20 years of housing needs. Facts which have persisted, if not worsened, during the last three years:

- From 2014 to 2019 home prices rose by 40% but wages rose only 21%.
- Most new housing stock has been aimed at our “resort towns” where many homes are owned by part time residents.
- Vacancy rates for renters and owners plunged to near zero, pushing rents and home prices to record highs.
- One in four workers must commute over 50 miles *each way* to work.
- These severe housing affordability challenges are exacerbated by land use, environmental, and infrastructure issues as well as limited family wage jobs.

A Housing Summit held in October 2019 generated significant momentum for creating housing solutions. The Housing Commission and the Department of Community Development were joined by over 70 community stakeholders to collaborate in addressing critical housing issues.

Three proposed solutions were endorsed by the majority of Summit participants:

- Create a tax abatement program for multifamily housing.
- Establish a nightly fee from short terms rentals to provide funding to address housing issues.
- Promote the allowance of accessory dwelling units on single family home lots in unincorporated Tillamook County.

We are pleased to report the success of the first two solutions. This ADU proposal addresses the third solution to promote accessory dwelling units, in alignment with recent Oregon state senate bill SB391 which “authorizes counties to allow owner of lot or parcel within rural residential zone to construct one accessory dwelling unit on lot or parcel, subject to certain restrictions.”

Passage of this ordinance as written can help provide a near-immediate response to our current housing crisis. Where permissible, ADUs can be constructed or designated on existing properties with minimal potential barriers. Available only to long-term renters, this ordinance provides a win-win-win scenario. Homeowners gain an added source of income, employers benefit from an increased supply of workforce housing and home-seekers will have more rental options at rents they can afford. Additionally, ADUs support more efficient and flexible housing use; accommodating young people just starting out, homeowners no longer needing a large single-family home, and older adults still able to live independently, thereby freeing up stock for others in need.

Our members have reviewed the criteria and intent of this ordinance, contributing to the final proposal for your consideration. Please join us in supporting and codifying this important policy.

Respectfully Submitted,

A handwritten signature in black ink that reads "Kris Lachenmeier". The signature is written in a cursive, flowing style.

Kris Lachenmeier
Vice Chair
Tillamook County Housing Commission

Lynn Tone

From: Biff <biff@pineconedb.com>
Sent: Wednesday, November 30, 2022 4:17 PM
To: Lynn Tone
Subject: EXTERNAL: Re: Local Contractor and Resident in Support of ADUs
Attachments: nmhc_cost-of-regulations-flyer.pdf; 2022-nahb-nmhc-cost-of-regulations-report.pdf

[NOTICE: This message originated outside of Tillamook County -- **DO NOT CLICK** on links or open attachments unless you are sure the content is safe.]

Hi Lynn,

Sorry, I forgot to attach the documents to my previous email to the commissioners for the Dec. 8 public hearing about ADUs. They are attached here.

Thank You and Have a Lovely Day!

~Biff Schlicting

On Wed, Nov 30, 2022 at 3:51 PM Biff <biff@pineconedb.com> wrote:
Tillamook County Commissioners and Officials,

As a local resident, building contractor, experienced designer and builder of custom, small-footprint dwellings, remodels, conventional new construction *and* someone who is interested in solutions to affordable housing issues, I wholeheartedly encourage the sensible implementation of ADUs into the county land use ordinances. It is from my interest in creating more affordable housing that I offer the following thoughts.

Giving property owners more freedom to develop an additional dwelling on their property could very effectively, expediently and efficiently increase rentable housing stocks, thereby reducing the need for public programs that are well intentioned, but realistically and unlikely to fulfill that goal in a timely manner.

It is imperative though that there be sensible development standards regulating the addition of an ADU.

If a property owner would like to build a long-term rental unit or ADU, but when penciling it out is confronted with excessive engineering costs, building costs to comply with the engineering, hefty system development and other fees, along with inflated building material prices, *and*, all the time needed to comply with overly burdensome regulation; significantly fewer property owners would be incentivized to build an ADU. The property owners who could afford to pursue building an ADU, provided they would do so for a long-term rental and not just as a guest house, would likely end up having to charge a higher rent than what might be considered affordable so it would be worth their while.

It has been pointed out in a recent study (PDFs attached below), and I have definitely noticed it in my work as a contractor, that one of the greatest impediments to housing affordability are the costs associated with regulatory compliance. According to the research, "an average of 40.6 percent of total development costs can now be attributed to complying with regulations imposed by all levels of government."

It needs to be acknowledged that the study by the National Association of Home Builders may be somewhat biased toward improving the bottom line of larger developers, but the points made in the report I still find very valid, and fairly accurate, as I have seen it myself when producing budgets for modest home building projects. A couple of which have been canceled or delayed in large part due to the costs of compliance.

Certainly, the costs associated with reasonable county land use development programs and reasonable building development standards would still be a part of project costs, but when, as mentioned, projects aimed at affordable housing are cancelled largely because the cost of compliance is so high, it seems reasonable to consider what regulators can do to participate in helping make housing more affordable. From my perspective, this challenge will only be solved by realizing the status quo has not been working, a willingness to break with the established norms, subduing unreasonable fears and boldly trying new and creative solutions.

For me, the best path forward is (if it has not already been done), for the various commissioners and officials to take a very honest look at the real reasons it is so expensive to build a home. Then, after that assessment, coordinate with the people who build and develop housing to come up with fresh, creative ways to make it easier and more affordable for property owners to participate in being a big part of the solution. Done right, I feel that ADUs have the capacity to greatly improve Tillamook county's affordable housing options.

Thank You for taking the time to consider my perspective. Have a Great Day!

Biff Schlicting
Pinecone Design+Build LLC
Neskowin, Oregon

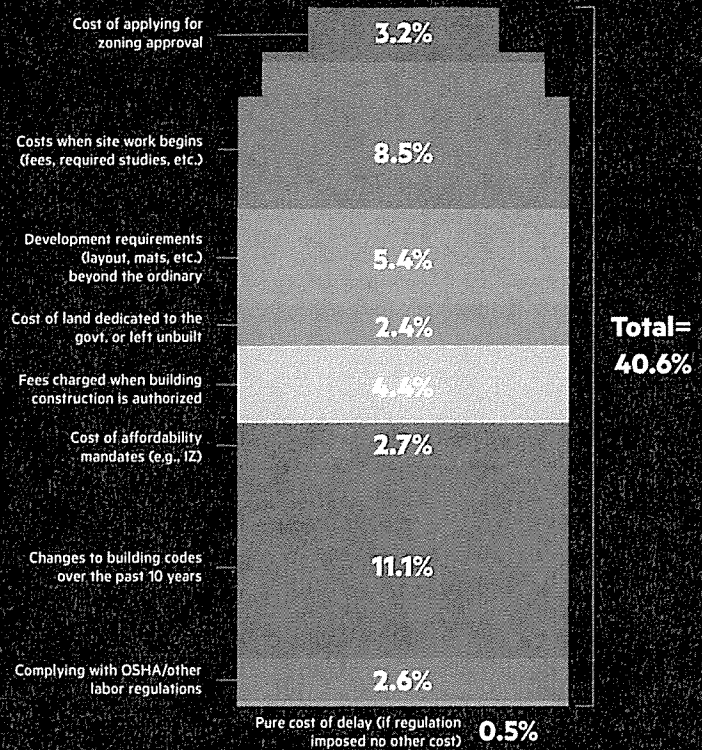
Regulations Account for 40.6% of Multifamily Development Cost, Driving Up Housing Costs and Worsening Affordability

Multifamily developers are subject to a wide range of regulations at all levels of government. While some are necessary for the health and safety of America's renters, many are not.

In addition, neighborhood opposition and affordable housing mandates can sometimes deter development altogether.

Research by the National Multifamily Housing Council (NMHC) and the National Association of Home Builders (NAHB) quantifies just how much those regulations drive up costs.

AVERAGE COST OF REGULATION AS A SHARE OF TOTAL MULTIFAMILY DEVELOPMENT COST



Note: Averages are across all multifamily properties, even those not subject to a particular type of regulation. Those are factored in as "0" when calculating.

Governments Impose Costs, But Policymakers Can Also Reduce Them Through Regulatory Reform

Examining whether some of the fees/requirements associated with these regulations are truly necessary is one way to make a dent in the affordability problem



BUILDING CODES

Changes over the past 10 years are the largest regulatory driver of development costs.

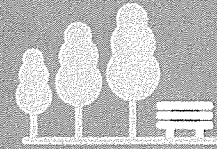
Average Cost: 11.1%



ZONING

Very little land in the U.S. is zoned for "by right" apartment development. 94% of developers reported they must dedicate resources to getting land rezoned.

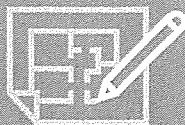
Average Cost: 3.2%



PUBLIC LAND/OPEN SPACE

Local governments often require developers to donate a portion of the land for its use or leave it unbuild.

Average Cost: 2.4%



DESIGN CHANGES

Local governments also often require developers to add certain features to their projects – such as energy-efficiency upgrades – or comply with specific design requirements.

Average Cost: 5.4%



DELAYS

Navigating the approval process, waiting for permits and inspections makes the development process take longer and time is money.

Average Cost: 0.5%



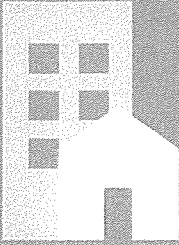
LOCAL FEES

Once developers start preparing the land for construction, local governments often impose impact fees (to be used for capital improvements, utility impact fees, specialized environmental or other impact studies).

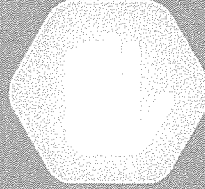
Average Cost: 8.5%

They can also charge building permit and other fees before building construction can begin. **Average Cost: 4.4%**

Community Opposition Imposes Real Costs



75% of respondents said they encountered "Not In My Backyard" (NIMBY) opposition to their proposed development.



Confronting NIMBYISM adds an average of 5.6% to the development cost and delays completion of the housing by an average 7.4 months.

"Quick-Fix" Affordability Mandates Make Housing More Expensive and Deter Development



Inclusionary Zoning. Mandates to require a certain number of apartments to have below market rents, mean higher rents for the rest. **Cost: 7.6% Rent Increase**



Rent Control and IZ deter some construction altogether.

Developers simply avoid communities with those requirements. This translates into housing not being built in many areas where it is so desperately needed.

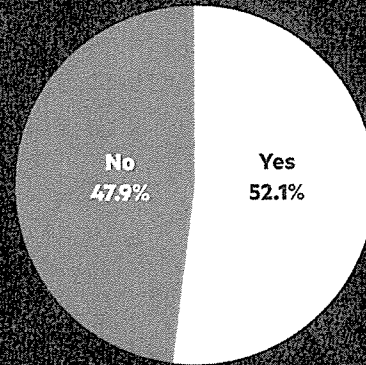


This translates into housing not being built in many areas where it is so desperately needed.

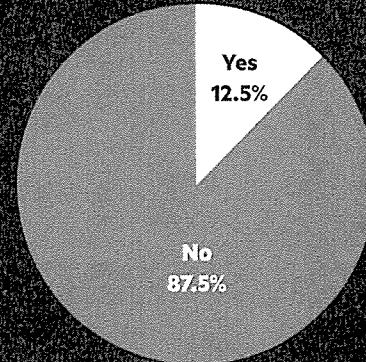
SOME MULTIFAMILY DEVELOPERS AVOID BUILDING IN JURISDICTIONS WITH THESE POLICIES

Will You Build if Affordable Housing Mandates Are Required?

Inclusionary Zoning



Rent Control



Source: NAHB and NMHC

Identifying duplicative and unnecessary regulatory costs and combatting NIMBYism are key factors as we work to address the nation's housing affordability crisis.

Learn more at www.nmhc.org/cost-of-regulations

NMHC NATIONAL MULTIFAMILY HOUSING COUNCIL

NMHC.ORG



Regulation: 40.6 Percent of the Cost of Multifamily Development

Paul Emrath, National Association of Home Builders (NAHB)

Caitlin Sugrue Walter, National Multifamily Housing Council (NMHC)

Regulation imposed by all levels of government accounts for an average of 40.6 percent of multifamily development costs, according to research by NAHB and NMHC.

Apartment development can be subject to a significant array of regulatory costs, including a broad range of fees, standards and other requirements imposed at different stages of the development and construction process. This joint research effort surveyed NAHB and NMHC members to quantify how much regulation exists and how much it is adding to the cost of developing much-needed new multifamily properties.

About NAHB

The National Association of Home Builders (NAHB) strives to protect the American Dream of housing opportunities for all, while working to achieve professional success for its members who build communities, create jobs and strengthen our economy. NAHB Multifamily provides services, benefits and opportunities to members with an interest in multifamily housing, including multifamily member meetings, newsletters, events, webinars and multifamily housing awards. It coordinates with other NAHB departments on advocacy efforts, economic studies and resources for multifamily housing. For more information, please visit NAHB Multifamily at nahb.org/nahb-community/councils/multifamily-council.

About NMHC

Based in Washington, D.C., the National Multifamily Housing Council (NMHC) is the leadership of the apartment industry. We bring together the prominent owners, managers and developers who help create thriving communities by providing apartment homes for 40 million Americans, contributing \$3.4 trillion annually to the economy. NMHC provides a forum for insight, advocacy and action that enables both members and the communities they help build to thrive. For more information, contact NMHC at 202/974-2300, e-mail the Council at info@nmhc.org, or visit NMHC's website at nmhc.org.

Introduction

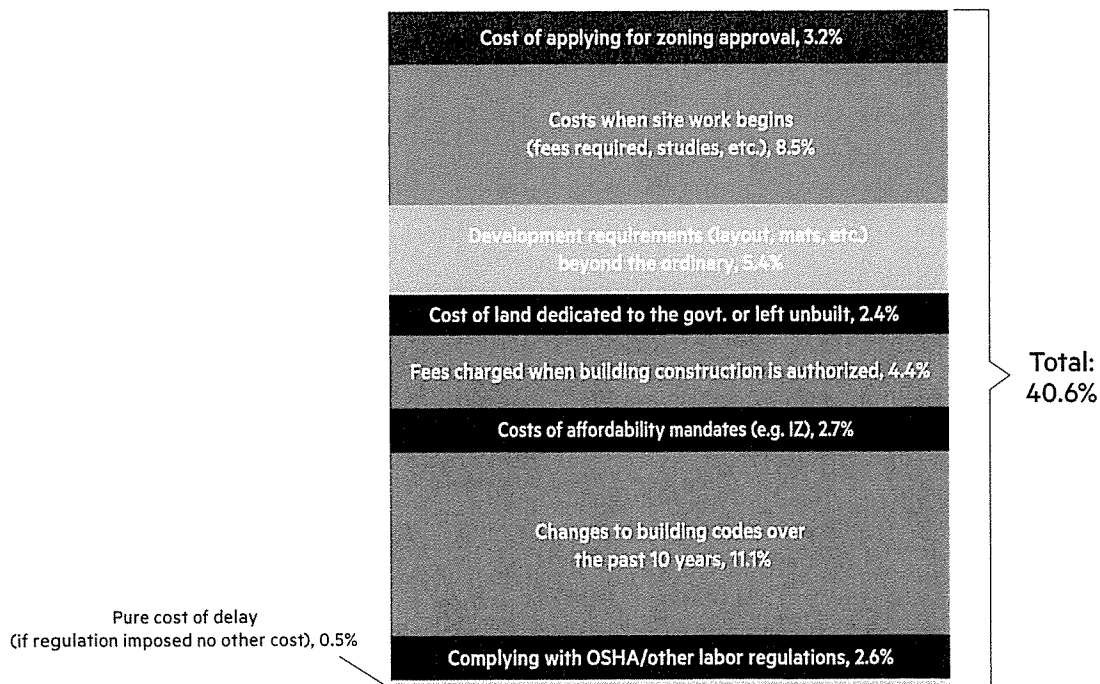
Multifamily development is subject to a variety of regulations at all levels of government. While some of these regulations are necessary to protect the health and safety of residents as well as the integrity of the building or community, it is informative to know the financial impact of each type of regulation, particularly in an era of widespread cost increases and worsening affordability problems for renters. Each added cost means the developer must increase rents for the project to remain financially feasible.

Regulations cover a wide-range of issues, and while they may be well-intentioned, the costs and burdens of any regulation must be carefully weighed against the benefits. Few would argue, for example, that basic safety standards for structures and workers are unnecessary. But, when regulation constitutes an average of 40.6 percent of a project's development costs, this raises questions about how thoroughly governments are considering the consequences of their actions. Are they aware of how much regulation currently exists? Do they realize how multiple regulations with conflicting standards can cause delays and increase costs? And do they understand the extent to which these increased costs translate into higher rents and make it difficult to build new housing that families with modest incomes can afford?

Recently, the [National Association of Home Builders \(NAHB\)](#) and the [National Multifamily Housing Council \(NMHC\)](#) undertook a joint research effort to find out how much government regulation adds to the cost of building new multifamily housing via a survey distributed to multifamily developers. (See Appendix 2).

The research finds that an average of **40.6 percent of total development costs** can now be attributed to complying with regulations imposed by all levels of government. Figure 1 shows how this percentage breaks down among the various types of regulation.

Figure 1. Average Cost of Regulation as a Percent of Total Multifamily Development Cost



Source: NAHB and NMHC

Perhaps more importantly, some of these regulatory mandates can discourage developers from building in the very marketplaces that have the greatest need for more housing. This can prove to be particularly burdensome in a world of rising costs. For example, 47.9 percent of multifamily developers said they avoid building in jurisdictions with policies such as inclusionary zoning, and a full 87.5 percent will avoid building in a jurisdiction with rent control in place.

There are also significant obstacles to development at the community level that are unrelated to governmental regulation. For instance, our research shows that “Not in My Backyard” (NIMBY) opposition to multifamily development adds an average of **5.6 percent to total development costs** and delays the delivery of new housing by an average of **7.4 months**. While most Americans agree that we need more housing and more housing affordable to middle-income households, too many change their opinion when someone proposes to put that new housing in their neighborhood. The intensity of opposition is escalated if that housing is rental housing.

About the Research

NAHB and NMHC distributed an identical survey in April 2022 to their respective memberships to access a wide range of development scales across the United States. The primary purpose was to quantify how much regulation exists for developers to contend with and how much that regulation is adding to the cost of developing new multifamily properties.

Some of these questions quantify the impact of regulations, such as inclusionary zoning and rent control, that not only may directly increase the costs of projects that are built but affect the supply and cost of housing in the community by causing some projects not to be built at all. An additional set of questions asked about the financial impact of NIMBYism, an issue that has been widely identified as one of the major cost drivers impacting affordability but where little quantifiable data currently exists.

A total of 49 usable responses were received. The responses from the survey were combined with existing public data and other survey collections to calculate the financial cost as a percent of total development cost for each regulation. A detailed description of the assumptions used in the calculations can be found in Appendix 1.

Total Cost of Regulations

Regulatory costs that exist during the multifamily development process can be divided into several categories. Table 1 shows the share of developer respondents subject to these various regulations and the average cost of each category as a percentage of the total development cost.

Table 1. Average Regulatory Costs as a Share of Total Multifamily Development

	Share With the Regulatory Cost	Regulation as a Percent of Total Development Cost	
		Average When Present*	Average Across All Properties
Cost of applying for zoning approval	93.9%	3.4%	3.2%
Costs when site work begins (fees, required studies, etc.)	98.0%	8.7%	8.5%
Dev. requirements (layout, mats, etc.) beyond the ordinary	91.8%	5.8%	5.4%
Cost of land dedicated to the government or left unbuilt	51.0%	4.7%	2.4%
Fees charged when building construction is authorized	95.9%	4.6%	4.4%
Costs of affordability mandates (e.g., inclusionary zoning)	38.8%	6.9%	2.7%
Changes to building codes over the past 10 years	100.0%	11.1%	11.1%
Complying with OSHA/other labor regulations	93.9%	2.7%	2.6%
Pure cost of delay (if regulation imposed no other cost)	95.9%	0.5%	0.5%
TOTAL COST OF REGULATION	100.0%	40.6%	40.6%

* The base is different for every percentage in this column, so the line items are not additive.

Source: NAHB and NMHC

As Table 1 indicates, the highest average regulatory cost is the result of changes to building codes over the past 10 years (11.1 percent of total development costs). The second highest are the costs imposed when site work begins (8.7 percent). The lowest average cost impact was the pure financial cost of delay, consisting of 0.5 percent when present, lower than the average cost of complying with Occupational Safety and Health Administration (OSHA) or other labor regulations (2.7 percent when present).

The first significant interaction between a multifamily developer and the government typically occurs when the developer applies for zoning approval to allow multifamily housing to be built on a particular parcel of land. Regulatory costs at this stage can vary from costs associated with fees owed to the local jurisdiction for proceeding through the approval process to market or environmental impact studies that must be commissioned from private consultants.

In some cases, a developer can acquire land that allows for multifamily structures to be built on it without requiring rezoning or a special exemption. However, this is rare, with 93.9 percent of the respondents indicating that they must dedicate resources to rezone the land to allow multifamily construction. When they exist, these costs average 3.4 percent of the total development cost.

Once site work begins, local jurisdictions often require a variety of fees or other studies. Examples of fees could include impact fees (fees charged only on a new development to be used for capital improvements) or utility impact fees. Almost all respondents (98.0 percent) reported paying some of these costs in their typical project, representing an average of 8.7 percent of total development costs when present.

Understanding Table 1

The last column of the table shows the averages across all multifamily developments in the survey, even those not subject to a particular type of regulation (i.e., the “zeroes” are averaged in). The column to the left of that shows average costs calculated **only** for those properties that **are** subject to the regulation.

Note that because each percentage in the “Average When Present” column is calculated for a different set of properties, the rows in that column do not add up to the total. The primary reason for including this column is so readers interested in the comparatively uncommon regulations—such as requiring developers to leave some of their land unbuilt and affordability mandates such as inclusionary zoning—can see how costly these regulations tend to be when they are present.

The other categories of regulation in the table are widespread (impacting over 90 percent of multifamily developers). For them, the differences between the “Average When Present” and “Average Across All Properties” columns are negligible.

Most respondents (91.8 percent) were also required by their local jurisdiction to include certain design features in their project design that go beyond what they would ordinarily include. Examples include energy-efficiency upgrades or specific design requirements for facades. When present, complying with these requirements amounted to an average of 5.8 percent of total development costs.

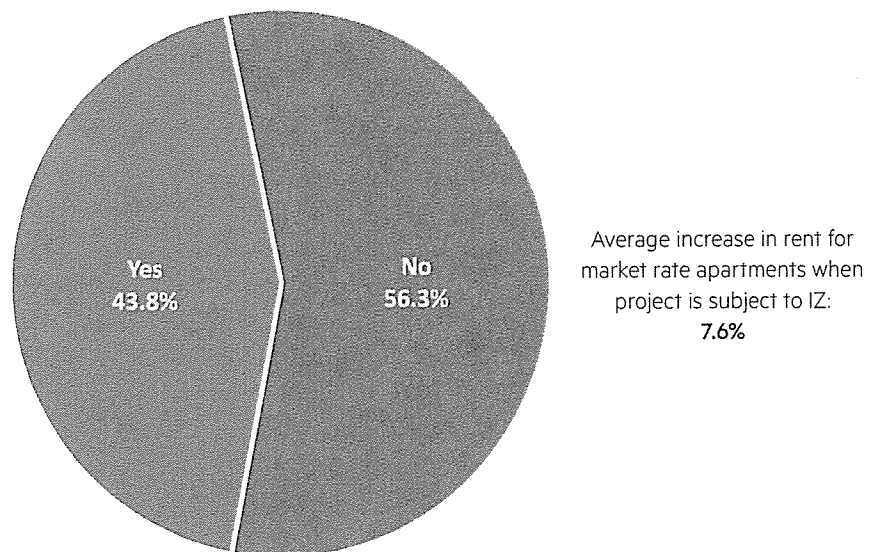
Governments can also require developers to leave a portion of the development site dedicated for government use or left unbuilt. This requirement reduces the amount of developable area, which means the revenue from that area is lost and must either be absorbed or made up for elsewhere. This requirement was present for approximately half (51.0 percent) of respondents; when present, it represented an average of 4.7 percent of total development costs.

Jurisdictions also often charge fees when site work is completed to authorize building construction. Examples of these costs include a fee when filing for a building permit or fees for additional utility hook-ups. Almost all respondents (95.9 percent) reported paying some sort of fee at this phase of development, with an average cost of 4.6 percent of total development cost when present.

Local affordability mandates are another important cost driver. These mandates are designed to increase the supply of affordable apartments. A common example is inclusionary zoning, where developers must offer a certain percentage of apartments at below-market rent levels. In many cases, a density bonus is provided to developers, which allows them to include more units in their project than ordinarily permitted by zoning to offset those lowered rents.

Unfortunately, these incentives are often inadequate and do not fully cover the lost rental revenue. In those cases, developers are forced to raise rents on the unrestricted apartments to fill the gap or to abandon the project altogether because it is no longer financially feasible.¹ These mandates were present in slightly over one-third (38.8 percent) of respondents' typical projects, and when present, they made up an average of 6.9 percent of total development costs (Figure 2). Respondents subject to inclusionary zoning report having to raise rents by an average of 7.6 percent.

**Figure 2. Is Respondent's Typical Project in a Jurisdiction with Inclusionary Zoning?
(Percent of Respondents)**



Source: NAHB and NMHC

¹ NAHB has developed an [Inclusionary Zoning Calculator Tool](#) to help developers and local jurisdictions determine if incentives are adequate to allow a project to be built.

The increase in costs to comply with changes to building codes over the past 10 years was the largest driver of development cost, amounting to 11.1 percent of total development costs.

Most jurisdictions have been adopting, revising and enforcing building codes for decades, and an entire industry has emerged supporting and encouraging changes to existing building codes. While building codes play an important role in protecting resident safety and building integrity, they have evolved well beyond their original purpose and now are also used to promote public policies like energy efficiency and sustainability.

Building code development and adoption are complex, and it is essential to consider impacts to housing affordability throughout the process. State and local jurisdictions adopt and enforce building codes, but federal policymakers are also active in the development of international model codes, and they promote the adoption of certain code editions. For example, the U.S. Department of Energy encourages states to adopt the most stringent versions of the model energy codes. Various policy groups, industry organizations and individual companies also advocate for code changes that promote specific goals. These changes do not always balance the needs of housing affordability and have the potential to drive up construction costs² without improving building safety or integrity.

Developers are also subject to complying with Occupational Safety and Health Administration (OSHA) requirements and other labor regulations throughout the development process. While measures to protect the safety and health of construction workers are essential, NAHB has argued that some OSHA policies, like applying its [beryllium standards](#) to residential construction, simply drive construction costs up without impacting health or safety.

Fully 93.9 percent of respondents said they had to comply with these regulations and that they added 2.7 percent to total development costs.

Almost all respondents (95.9 percent) also reported that complying with regulations caused some sort of delay for their typical project. We estimate that “pure” cost of delay—the financial cost that taking the time to comply with that regulation would incur—would be an average of 0.5 percent of total development costs. This may not seem like a substantial number, but in an era of rising costs and diminishing affordability, any additional cost can impact project feasibility.

Affordability Mandates and Neighborhood Opposition Can Discourage Development Altogether

Aside from increasing development costs, some regulations and restrictions can impact whether development even occurs, which is incredibly harmful given the nation’s shortage of housing.

There are many factors a developer considers when choosing a potential site for a future development; primary among them is the market demand for the proposed units. Increasingly, however, developers are also forced to consider whether their chosen jurisdiction imposes affordability mandates on new development. Two of the most popular mandates are inclusionary zoning and rent control because they are wrongly deemed to be “quick and free” fixes to housing affordability challenges.

² NAHB’s subsidiary [Home Innovation Research Labs](#) has recently produced a report showing that codes adopted in 2018 increase construction costs for standard types of multifamily buildings between \$2,500 and \$25,000.

Research has shown, however, that these quick fixes, particularly rent control, have many pitfalls. One major pitfall of both, as shown in Figure 3, is that it can deter development completely. Almost half of the respondents (47.9 percent) reported that they avoid building in jurisdictions with inclusionary zoning policies. The response was more acute for rent control—the overwhelming majority of respondents (87.5 percent) reported they avoid building in jurisdictions where rent control is present.

In fact, these mandates can impact the financial feasibility of a project, both in the short-term and long term. As a result, developers may simply choose to avoid jurisdictions with these mandates because of the difficulty in making a project pencil out.

Rent control regulations similarly differ depending on the local jurisdiction. In its basic form, rent control is a restriction on how much a property owner can raise a resident’s rent, ignoring market conditions. Some rent control laws exempt new construction from price controls, and others institute a cap on how much an owner can raise a resident’s rent, often tied to the Consumer Price Index (CPI).

Figure 3. Do Multifamily Developers Avoid Building in Jurisdictions with Certain Policies? (Percent Of Respondents)

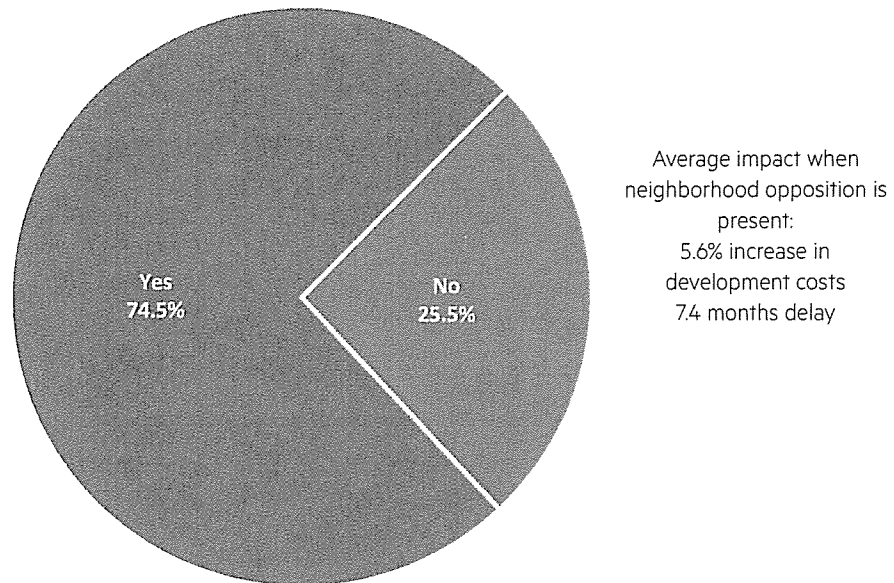


Source: NAHB and NMHC

Another major impediment to whether a project gets built can be neighborhood opposition. Opposition against multifamily development by current residents, commonly referred to as “Not in My Backyard” (NIMBY) opposition, can take many different forms. Residents may fight against rezoning attempts or may even file lawsuits to attempt to prevent development from occurring. Approximately three-quarters (74.5 percent) of respondents reported encountering neighborhood opposition to multifamily construction (Figure 4). The resources required to overcome this opposition add an average 5.6 percent increase in development costs when present. They also delay the development timeline by an

average of 7.4 months.

Figure 4. Have Developers Encountered Neighborhood Opposition To Multifamily Construction? (Percent Of Respondents)



Source: NAHB and NMHC

Conclusion

As the above discussion has demonstrated, multifamily development can be subject to many regulatory costs, including a broad range of fees, standards and other requirements imposed at different stages of the development and construction process. Because of this, it may not be surprising that regulation imposed by all levels of government accounts for 40.6 percent of multifamily development costs on average.

This research was solely restricted to the impact of regulations on total development costs. It is important to note that developers are also dealing with rapidly rising land, material, and labor costs. Combined, these costs make it virtually impossible for private sector developers to deliver housing at a price point that many working Americans can afford.

When multifamily development costs rise, it unavoidably translates to higher rents and reduced rental housing affordability. Multifamily developers cannot secure financing to build their projects unless they can demonstrate to lenders that the rents will be sufficient to cover costs and pay off the loans.

The purpose of this report is not to argue that all regulation is bad and should be eliminated, but that some of these regulations are likely duplicative as multiple levels of government impose regulations on the same project. In addition, many of these regulations do not have a relationship to resident safety or building integrity.

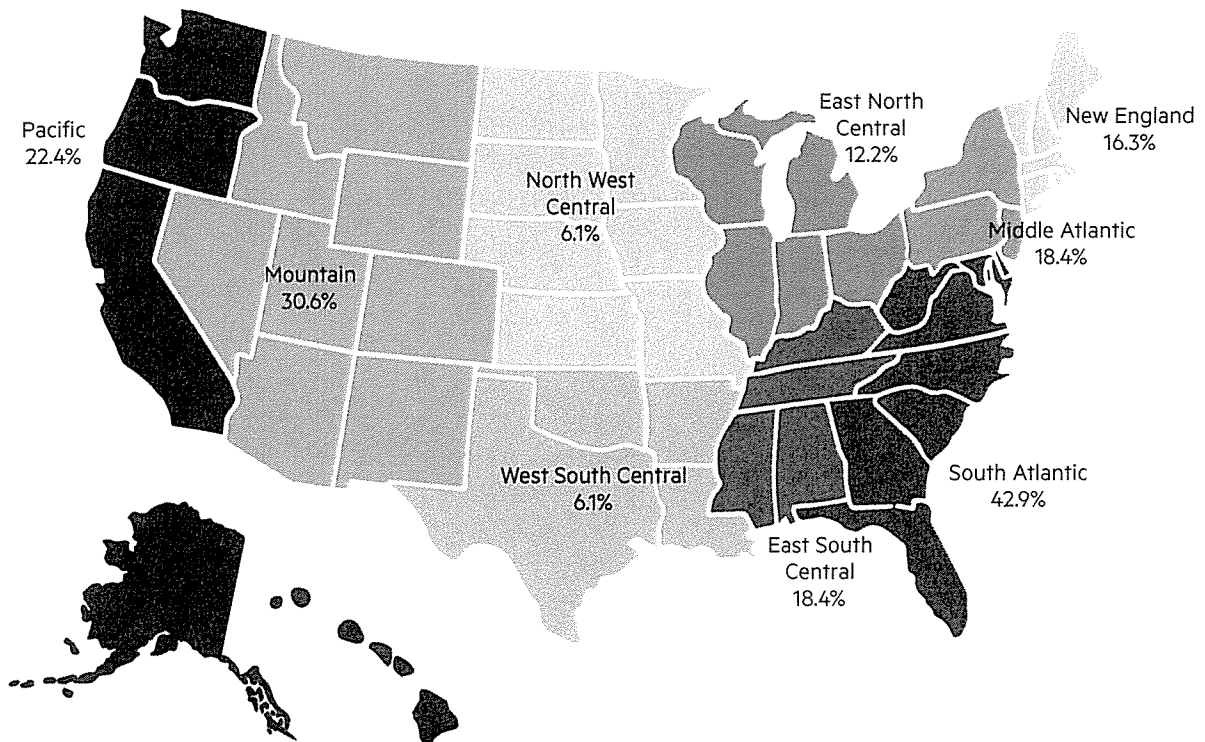
The research aims to raise awareness of how much regulation currently exists, how much it costs and to encourage governments to do a thorough job of considering the implications for housing affordability when proposing and implementing new directives. It is also to help inform local leaders that they also have the power to waive some of these duplicative costs, thus lowering the rent required for the project to remain financially feasible and improving affordability.

Respondent Profile

A total of 49 usable responses were received from multifamily developers, with a slightly higher concentration of NAHB members than NMHC members (and no duplicates). In one instance, two survey responses were accepted from one member company because the respondents represented different geographic areas.

All geographic areas in the United States were represented (see Figure 5). Respondents were able to choose more than one region of operation. The South Atlantic region (DE, DC, FL, GA, MD, NC, SC, VA, WV) had the largest representation, with 42.9 percent of respondents operating there, followed by the Mountain region (AZ, CO, ID, NM, MT, UT, NV, WY) with 30.6 percent and the Pacific region (AK, CA, HI, OR, WA) with 22.4 percent. The West North Central (IA, KS, MN, MO, NE, ND, SD) and West South Central (AR, LA, OK, TX) had the lowest representation at 6.1 percent of respondents each.

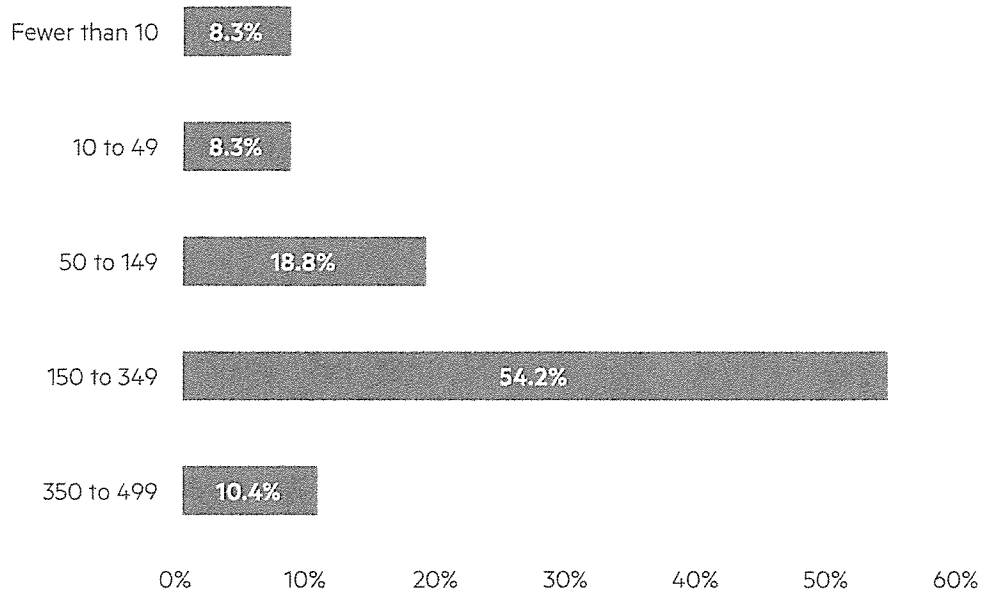
Figure 5. Share of Respondents Who Build in Each of the Nine Census Divisions



Source: NAHB and NMHC; U.S. Census Bureau

The respondents' typical project size varied widely: from fewer than 10 units to 499 (see Figure 6). The majority of respondents (54.2 percent) reported a typical project size of 150 to 349 units. Note that this is project size, not building size, meaning that each category could comprise both garden-style communities, which frequently have units spread across multiple buildings, as well as high-rise buildings, where all units are traditionally in one building.

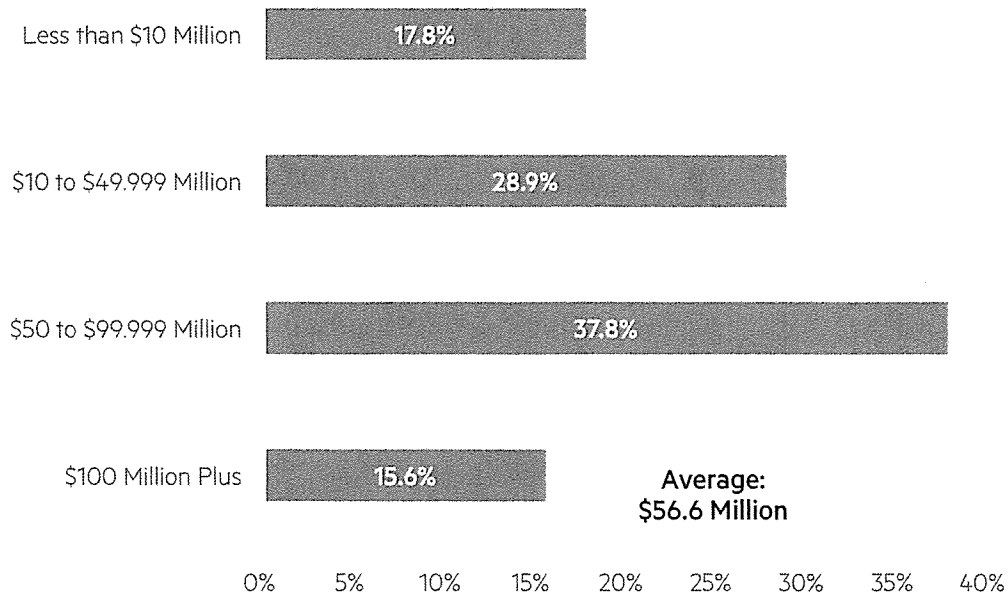
Figure 6. Number of Apartments in Respondent's Typical Project (Percent of Respondents)



Source: NAHB and NMHC

The typical total development cost varied as well but was slightly more evenly distributed (Figure 7). The average total development cost of respondents for a typical project was \$53.6 million. Barely over one-third (37.6 percent) reported a typical development cost of \$50 to \$99.99 million. Small and large projects were equally represented, with 17.8 percent of respondents reporting a cost of less than \$10 million and 15.6 percent indicating the typical project costs at least \$100 million.

Figure 7. Total Development Costs for Respondent's Typical Project (Percent of Respondents)



Source: NAHB and NMHC

Appendix 1: Assumptions Used in the Calculations

To calculate a final effect on development costs, many of the NAHB-NMHC survey responses need to be combined with additional information. Primarily these are assumptions about the terms of development and construction loans, how long construction typically takes, and how to allocate costs to different stages of the development and construction process. This appendix lists all the assumptions used in the calculations and gives the sources for each.

Loan Terms

1.1 point charged for all land acquisition, development, and construction (AD&C) loans, based on results from a Quarterly Finance Survey (QFS) that NAHB was conducting in the early to mid-2000s.

A 7.65 percent interest rate on all AD&C loans. The QFS indicates that rates are typically set one point above prime, and 6.65 percent is NAHB's estimate of the prime rate that would prevail in the long run under neutral Federal Reserve policy.

The estimates also assume that three-fourths of any category of costs are financed, based on typical AD&C loan-to-value ratios in the QFS.

Construction Lags

The source for information lags not directly collected in the NAHB-NMHC questionnaire is the [Survey of Construction](#), conducted by the Census Bureau and partially funded by the Department of Housing and Urban Development.

Preliminary estimates are taken from the published annual tables, averaged over the 2001-2016 period:

Authorization to start = 1.71 months

Start to completion = 10.87 months

If the project is 5-9 units

- Authorization to start = 1.95 months
- Start to completion = 11.64 months

If the project is 10+ units

- Authorization to start = 1.94 months
- Start to completion = 13.21 months

The NAHB-NMHC survey collected data on how much time regulation adds to the development process. To assign this to a particular phase of the development, the following assumptions are used.

The regulatory delay is split and attributed half to the lag between applying for zoning approval and the beginning of site work and half to the period after site work begins. If half of the regulatory delay exceeds the lag between applying for approval and the beginning of site work, the excess is also attributed to the period after site work begins.

It is first assumed that the resulting regulatory delay is attributable to the period between the start of site work and the start of building construction, minus three months (the assumed minimum time it would take to do site work in the absence

of regulation, based on conversations with developers). If any regulatory delay remains after being allocated to the zoning approval and site work periods, it is then attributed to the building construction period, and the start-to-completion lag is adjusted upward beyond the SOC-based average, accordingly.

The analysis assumes all loans are paid off when the buildings are completed.

Cost Breakdown

To implement the process described in the paragraph above and calculate a “pure” cost of delay (i.e., the effect regulatory delay would have even if the regulation imposed no other cost), estimates of costs incurred during different phases of the development process are needed.

The breakdown is based on the split between lot and construction costs in NAHB’s Construction Cost Surveys (averaged over surveys conducted since 2000) and the Census Bureau’s “non-construction cost factor” for raw land. The calculations also assume three-fourths of these costs are financed, based on typical AD&C loan-to-value ratios in the QFS.

Resulting assumptions:

- Only the cost of applying for zoning occurs at the very start of the development process. Financing costs associated with this are charged to the regulatory cost of the application and not counted in the pure cost of delay.
- 10.2 percent of total development represents costs financed by a land acquisition loan at the start of the site work phase.
- 10.8 percent of total development costs represent costs financed by a development loan during the site work phase, assuming draws on the loan occur on average halfway through this phase.
- 54.0 percent of total development costs represent costs incurred after building construction has started and financed with a construction loan, again assuming draws on the loan occur on average halfway through the site work phase.

Appendix 2: Survey Questionnaire

1. What regions do you build in? Please select all that apply.

- New England (CT, ME, MA, NH, RI, VT)
- Mid Atlantic (NJ, NY, PA)
- South Atlantic (DE, DC, FL, GA, MD, NC, SC, VA, WV)
- East North Central (IN, IL, MI, OH, WI)
- West North Central (IA, KS, MN, MO, NE, ND, SD)
- East South Central (AL, KY, MS, TN)
- West South Central (AR, LA, OK, TX)
- Mountain (AZ, CO, ID, NM, MT, UT, NV, WY)
- Pacific (AK, CA, HI, OR, WA)

2. How many units does your typical multifamily project have?

- 2-4 Units
- 5-9
- 10-49
- 50-149
- 150-349
- 350-499
- 500 units or more

3. What is the total dollar amount spent on development costs in your typical project?

\$_____

4. For a typical piece of land, how much does it cost to apply for zoning approval as a % of total development cost? (Include costs of fiscal or traffic impact or other studies and any review or other fees that must be paid by the time of application. Please enter "0" if application costs are Zero percent).

_____%

5. For a typical project, how many months does it take between the time you apply for zoning approval and the time you begin site work?

_____months

6. How much does it cost to comply with regulations when site work begins, as a % of total development costs? (Include costs of complying with environmental or other regulations as well as the cost of hook-up or impact or other fees.) Please enter "0" if cost of complying with these regulations is Zero percent.

_____%

7. How much do development requirements that go beyond what you would otherwise do (in terms of property layout, landscaping, materials used on building facades, etc.) add to your cost as a % of total development costs? *(Please enter "0" if the jurisdiction's requirements don't go beyond what you would normally do.)*

_____ %

8. In the typical case, what is the value of any land that must be dedicated to the local government or otherwise left unbuilt (for parks, open green space, etc.) as a % of total development cost? *(Please enter "0" if dedicating land is required infrequently.)*

_____ %

9. How many months does it take between the time you begin site work and the time you obtain authorization to begin construction of the apartment building(s)?

_____ months

10. How much extra time (in months) overall does complying with regulations add to the development process? *(Please enter "0" if regulations typically cause no delay.)*

_____ months

11. When you obtain authorization to begin construction, how much do you pay in additional fees as a % of total development costs? In many cases, this will be only a permit fee but include any additional impact or hook-up or inspection fees if they kick in at this time. *(Please enter "0" if fees paid during or after construction are Zero percent).*

_____ %

12a. In the typical case, does a jurisdiction have inclusionary zoning/affordable housing requirements that apply to your project?

- Yes
- No

12b. [If the answer to 12a is "yes"]. In the typical case, how much do these requirements (or a fee in lieu of affordable housing) cost as a % of total development cost? *(Please enter "0" if inclusionary zoning/affordable housing mandates/fees in lieu of affordable housing are encountered infrequently).*

_____ %

12c. [If the answer to 12a is "yes"]. In the typical case, how much do these additional requirements raise the rents of market-rate units?

_____ %

13. Do you typically avoid building in a jurisdiction if it has an inclusionary zoning requirement?

- Yes
- No

14. Do you typically avoid building in a jurisdiction that has rent control?

- Yes
- No

15. Over the past 10 years, how much have changes in construction codes and standards added to the cost of building a typical multifamily project as a % of total development costs? (Please enter "0" if code changes have had minimal impact on costs).

_____%

- Please select if you have not been in operation for the past 10 years

16. How much does complying with OSHA or other labor regulations cost, as a % of total development cost? (Please enter "0" if labor regulations have no impact on development costs).

_____%

17. Have you experienced added costs or delays due to neighborhood opposition to multifamily construction?

- Yes
- No

18. In the typical case, how much costs are added to a project due to neighborhood opposition to multifamily development as a % of total development costs?

_____%

19. In a typical case, how much extra time (in months) does it take to address neighborhood opposition to multifamily development?

_____months

20. Comments: