Oregon International Port of Coos Bay

Proposed Section 204(f)/408
Channel Modification Project

Sub-Appendix 5

Geotechnical Data

March 2024 Draft

EXECUTIVE SUMMARY

The Oregon International Port of Coos Bay (OIPCB or Port) seeks to modify the Coos Bay, Oregon Federal Navigation Channel (FNC); the channel modifications assessed in this evaluation are referred to as the Proposed Alteration (PA). The Port proposes navigation channel improvements to the FNC. The Proposed Alteration (PA) generally consists of widening the channel from 300 feet (ft) to 450 ft and deepening it from a depth of -47 ft to -57 ft Mean Lower Low Water (MLLW) from RM -1.0 to RM 0.0 and deepening it from a depth of -37 ft to -45 ft MLLW from RM 0.0 through approximately RM 8.2.

This Sub-Appendix 5 presents the geotechnical data collected as part of the geotechnical investigation program completed for the Coos Bay, Oregon, Section 204(f) Channel Modification Project. The geotechnical data presented in this report were collected to supplement previous geotechnical and geophysical exploration programs and further evaluate the strength and material characteristics of rock and overlying materials located within and adjacent to the proposed dredge prism.

Previous geotechnical programs consulted include United States Army Corps of Engineers (USACE) geotechnical investigations completed for Coos Bay channel-dredging projects in 1974 and 1995. David Evans and Associates, Inc. (DEA) collected geophysical survey data in 2005, multibeam bathymetric and sub-bottom profiler data in 2008, and additional geophysical survey data in 2016 and 2017. Arc Surveying & Mapping, Inc. (Arc) completed a bathymetric and electrical resistivity survey of the channel in 2023 in an effort to better characterize materials within the dredge prism. GHD utilized the subsurface conditions presented in this GDR to supplement the geophysical data and provide estimates of rock within the channel (see Sub-Appendix 2 – Geophysical Assessment and Reports).

The geotechnical investigation program was completed in three primary phases: a 2010 to 2011 phase that included 11 overwater borings, laboratory testing, and preparation of a draft geotechnical data report; a 2016 to 2017 phase that included 28 overwater borings, three upland borings, 56 jet probes, one diving exploration, and laboratory testing; and a 2023 to 2024 phase that included 15 overwater borings, laboratory testing, and preparation of this geotechnical data report, which combines the results of the 2010 to 2011, 2016 to 2017, and 2023 to 2024 geotechnical investigation phases. This GDR describes the work accomplished, provides a summary of subsurface conditions at the project site, and presents geotechnical data and information related to the investigations.

Three geologic units were encountered within the project area: sandstone and mudstone/siltstone of the Empire Formation, siltstone of the Bastendorff Formation, and sandstone of the Coaledo Formation. Based on our observations during drilling and our interpretation of available geologic information, the Empire Formation is estimated to be located within the channel between approximately RM 0.8 and RM 3.9, the Bastendorff Formation between approximately RM 3.9 and RM 5.8, and the Coaledo Formation between approximately RM 5.8 and the upstream extent of the project area at approximately RM 8.2. To date, no borings have been completed in the channel west of approximately RM 0.7. Based on our observations during drilling, the Empire Formation sandstone is typically dark gray, fresh, extremely soft to soft, and closely to widely fractured with horizontal to inclined jointing. The Empire Formation mudstone/siltstone is typically dark gray, extremely soft to very soft, with horizontal to inclined jointing. The

Bastendorff Formation siltstone is typically dark gray, fresh, extremely soft to very soft, and very closely to closely fractured with horizontal to nearly vertical jointing and inclined bedding. The Coaledo Formation sandstone is typically gray, fresh, soft to hard, and closely to widely fractured with inclined jointing. The preceding bedrock geologic formations are overlain by sediment of varying thickness within the project area.

In general, the explorations disclosed subsurface conditions similar to previous exploration programs. The 1974 USACE investigation approximated the contact between the Bastendorff and Empire formations at RM 3; however, as indicated above, the contact is estimated to be near RM 4. Additionally, the 1974 USACE investigation approximated the contact between the Bastendorff and Coaledo formations at RM 5; however, as indicated above, the contact is estimated to be near RM 6.

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ACRONYMS AND ABBREVIATIONS

ac	Acres
ARC	Arc Survey & Mapping, Inc.
AMD	Advanced Maintenance Dredging
ASTM	American Society of Testing and Materials
CSZ	Cascadia Subduction Zone
DEA	David Evans and Associates, Inc.
DMMP	Dredged Material Management Plan
EIS	Environmental Impact Statement
ft	Feet/Foot
FNC	Federal Navigation Channel
FY	Fiscal Year
GDR	Geotechnical Data Report
Global	Global Diving and Salvage, Inc.
GRI	Geotechnical Resources, Inc.
lb	Pound
JALBTCX	Joint Airborne Light Detection and Ranging Bathymetry Technical Center of Expertise
Knutson	Knutson Towboat Company
LiDAR	Light Detection and Ranging
LSB	Log Spiral Bay
MCR	Mouth of the Columbia River
mi	Miles
MLLW	Mean Lower Low Water
N	SPT Blow Counts
NOAA	National Oceanic and Atmospheric Administration
OIPCB or Port	Oregon International Port of Coos Bay
PA	Proposed Alteration
Pcf	Pounds per Cubic Foot
PPX3	Post Panamax Generation 3
Psi	Pounds Per Square Inch
RFP	Roseburg Forest Products
RM	River Mile
RQD	Rock Quality Designation
SPT	Standard Penetration Test
UCS	Unconfined Compressive Strength
WCC	West Coast Contractors

ACRONYMS AND ABBREVIATIONS

USACE	U.S. Army Corps of Engineers
WRDA	Water Resources Development Act
WRRDA	Water Resources Reform and Development Act
WSSC	Western States Soil Conservation, Inc.

1. INTRODUCTION

The Oregon International Port of Coos Bay (OIPCB or Port) is home to the second largest deep-draft coastal harbor between San Francisco and the Puget Sound, based on the tonnage of cargo transported through the Port. Access to the Port's facilities is provided by the Coos Bay Federal Navigation Channel (FNC), a federal channel that was first dredged in the early 1900s. The channel was last improved in 1998, when the channel was deepened by 2 feet (ft) from 35 ft to 37 ft. Since 1998, vessels calling at the Port have substantially increased in size.

1.1 Overview

The OIPCB proposes a Pacific Coast Intermodal Port (PCIP) project at Coos Bay, Oregon. The PCIP consists of integrated elements that would link freight arriving by container ship to the Port to Class 1 rail networks in Oregon. The in-water component of the project includes the deepening and widening of the existing FNC for deep-draft container vessels. In support of that work, the Port is conducting economic, engineering, and environmental studies preparatory to improving the Federal Navigation Project. These investigations are being conducted under the authority granted by Section 204 of the Water Resources Development Act (WRDA), 1986, as modified by Section 1014 of the Water Resources Reform and Development Act (WRRDA), 2014. This action will require approval by the U.S. Army Corps of Engineers under Section 14 of the Rivers and Harbors Appropriation Act of 1899, 33 United States Code 408, to modify the Federal Navigation Project. The Section 204/408 Report and Environmental Impact Statement (EIS) will propose modifications to the Coos Bay Navigation Channel in Coos County, Oregon, to accommodate larger deep draft vessels and provide local, state, and federal economic benefits. The USACE, Portland District, is presumed to be the lead federal agency for the EIS in cooperation with the U.S. Department of Transportation's Federal Rail Administration.

The purpose of this report is to present geotechnical data collected as part of the geotechnical investigation program completed for the Coos Bay, Oregon, Section 204(f) Channel Modification Project. The geotechnical data presented in this report were collected to supplement previous geotechnical and geophysical exploration programs and further evaluate the strength and material characteristics of rock and overlying materials located within and adjacent to the proposed dredge prism.

1.2 Study Area Description

Coos Bay is located in Coos County, Oregon, on the southern Oregon coast, about 200 miles (mi) south of the mouth of the Columbia River (MCR) and 445 mi north of San Francisco Bay. It is the navigational approach to Charleston, Empire, North Bend, Glasgow, Coos Bay, and Eastside (Figure 1-0 and Figure 1-1). The bay is formed by the junction of Isthmus Slough, Coos River, South Slough, Kentuck Slough, Haynes Slough, and Winchester Creek and is located at the foot of the Coast Range. Deep-draft navigation is limited to the lower 15 mi of the estuary.

The surface area of the Coos Bay estuary is about 12,000 acres (ac) (about 19 square mi). Tidelands, located from River Mile (RM) 0 through 15, comprise 20 percent to 30 percent of the estuary area. The inlet to the estuary, referred to as the Entrance Channel, is fully exposed to waves.

The Coos Bay estuary drains directly into the Pacific Ocean. The nearshore zone adjacent to the Entrance Channel is composed of fine- to medium-grained sediments and intermittent rock outcroppings. The coastal shelf within 8 mi of the inlet has a roughly 100:1 (Horizontal: Vertical) slope. Cape Arago, a headland that limits sediment transport and marks the southern boundary of the littoral cell, is located 2.5 mi south of the inlet.

The topography of the lower Coos River area is a combination of rugged mountain terrain, extensive sand dunes adjacent to the ocean, and relatively flat pasture land along the river. The terrain of the area is quite rugged because the mountains are relatively young, as denoted by the typical narrow, sinuous valleys and steep side slopes. Relief varies from sea level to just under 3,000 ft; however, most of the land lies between 500 ft and 1,500 ft in elevation.

Geotechnical investigations indicate the subsurface conditions in the channel typically vary from relatively clean sand to siltstone and sandstone sedimentary rock. The sedimentary rock is present near the mudline from about RM 2 to RM 6 and at Guano Rock from about RM 0.7 to RM 0.9.

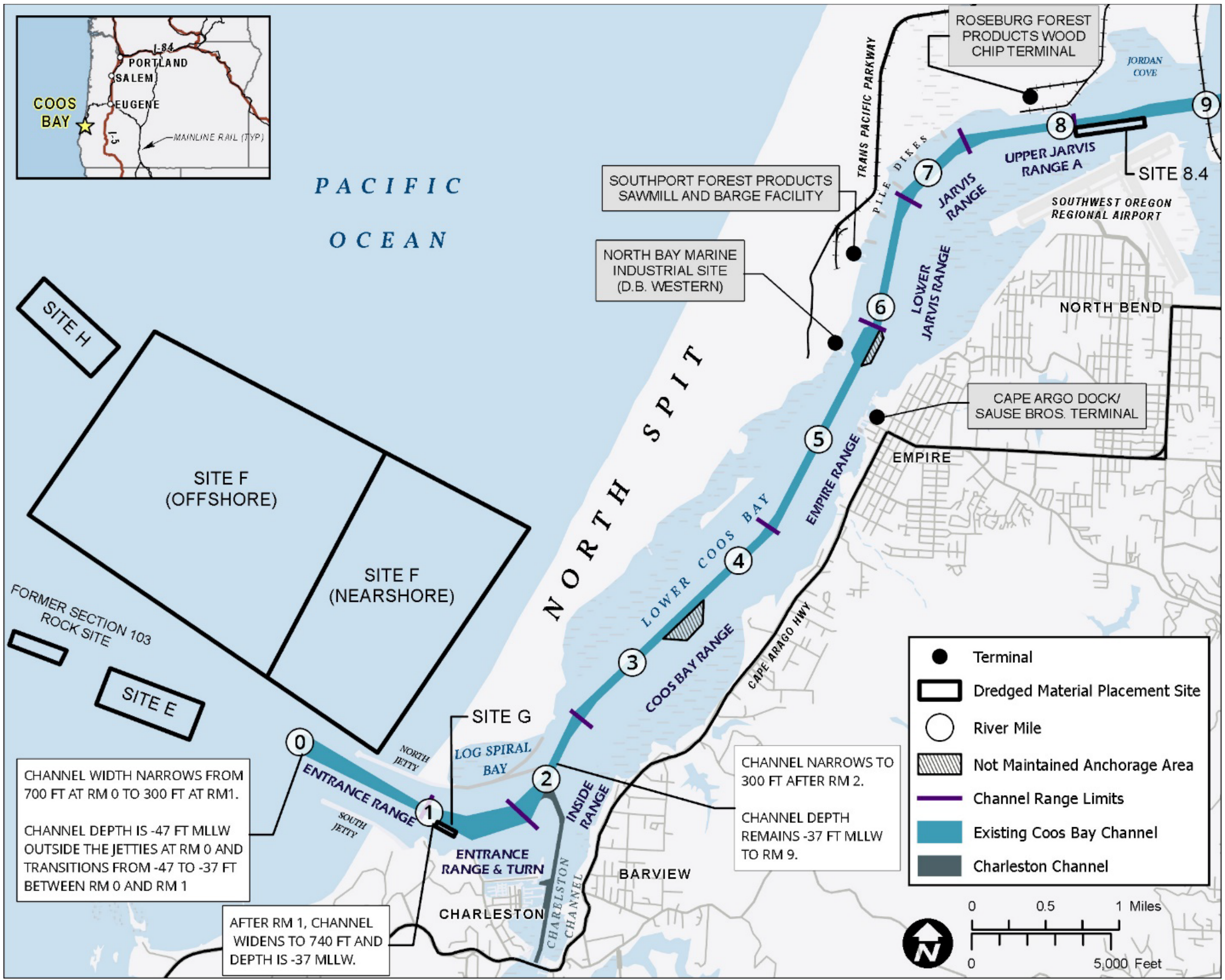


Figure 1-1
Coos Bay Project Vicinity Map, Lower Bay

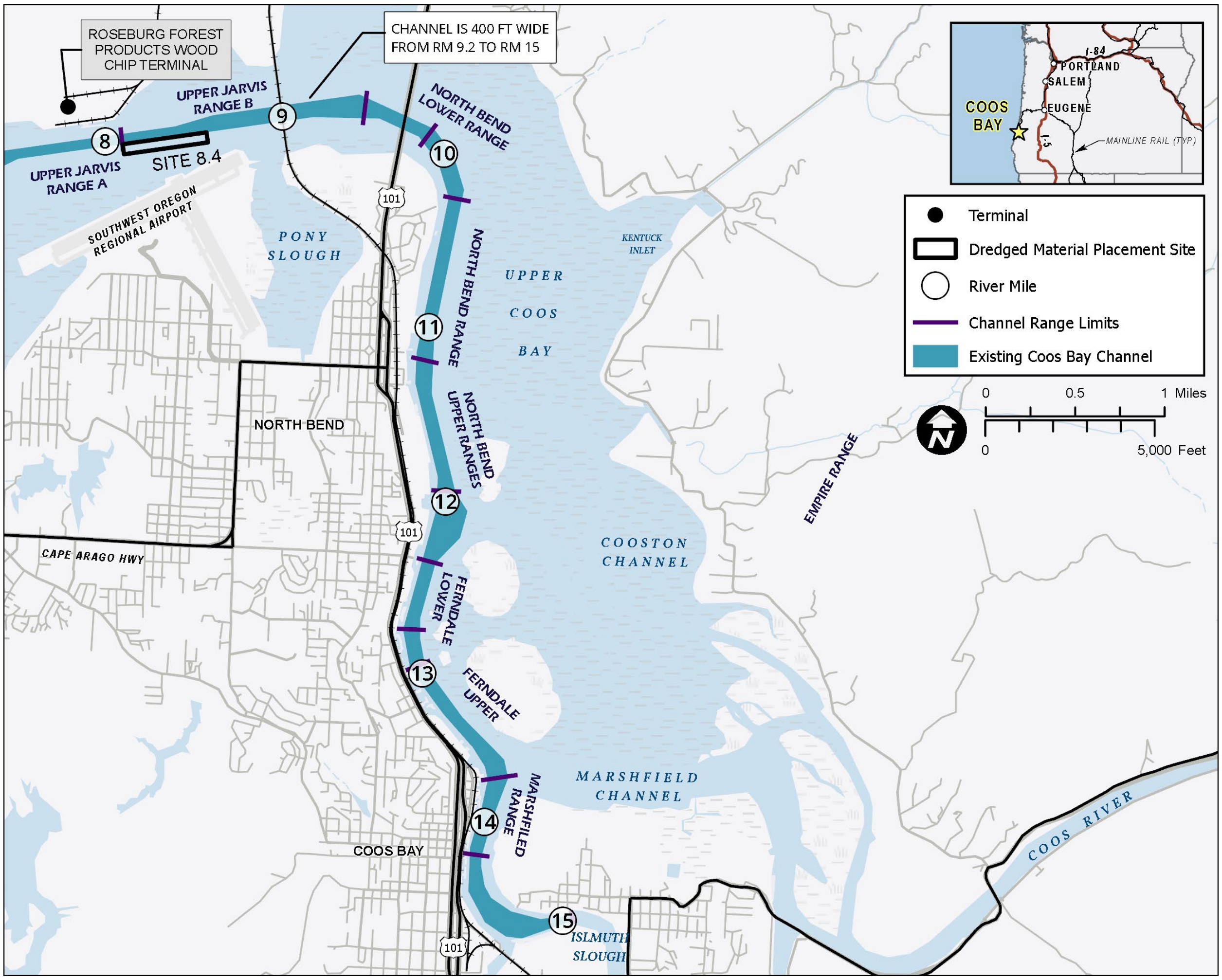


Figure 1-2
Coos Bay Project Vicinity Map, Upper Bay

1.3 Existing Navigation Channel

The Coos Bay Federal Navigation Project was first authorized by the Rivers and Harbors Appropriation Act of March 3, 1899, and has been subsequently modified in 1919, 1937, 1951, 1952, 1979, and 1998. The 1979 project represents the completion of the 1970 authorized work, which allowed the USACE to deepen and maintain the Entrance Channel at -45 ft Mean Lower Low Water (MLLW) and the inner channel to -35 ft MLLW. The most recent project modification was authorized in the fiscal year (FY) 1996 Energy and Water Development Appropriations Act, Public Law 104-46, which provided for deepening the channel by 2 ft to -47 ft MLLW from the ocean entrance to Guano Rock at RM 1, and to -37 ft MLLW from RM 1 to RM 15. Public Law 104-46 also provided for deepening the turning basin at RM 12 by 2 ft and expanding it by 100 ft, from 800 ft by 1,000 ft to 900 ft by 1,000 ft.

The U.S. Army Corps of Engineers (USACE) Federal Navigation Project consists of the following federally authorized elements:

- North Jetty (9,600 ft long) and South Jetty (3,900 ft long), located on either side of the Entrance Channel, include the two relic structures that extend from the root of the North Jetty, one of which extends into Log-Spiral Bay (LSB) and the other of which extends into the estuary.
- An Entrance Channel with an authorized depth of -47 ft MLLW, which decreases from a width of 700 ft at RM 0 to a width of 300 ft at RM 1.
- An inner channel (from RM 1 to RM 15) that has an authorized depth of -37 ft MLLW, a width of 300 ft from RM 1 to RM 9, and a width of 400 ft from RM 9 to RM 15.
- Two (2) turning basins, both of which are 1,000 ft long. The first is located at RM 12 and has a width of 900 ft. The other, located at RM 14, has a width of 730 ft. Both have a depth of -37 ft MLLW, consistent with the channel depth.
- Five (5) pile dikes between RM 6.4 and RM 7.3 in the main channel.
- Continuation of the main channel beyond RM 15 (in the Isthmus Slough) with a width of 150 ft and a depth of -22 ft MLLW.
- A 150-ft-wide Charleston Access Channel that has a depth that varies from –17 ft to -14 ft MLLW.
- A breakwater and bulkhead at Charleston.
- The Charleston Small Boat Basin (10 ft deep) was constructed by USACE in 1956 and maintained by the OIPCB.
- Advanced maintenance dredging (AMD) of the channel extends offshore to RM -0.55, where the width of maintenance is 1,060 ft. Authorized AMD is 5 ft of depth in the Entrance Channel (RM 0.55 to RM 1) and 1 ft of depth upstream of RM 1.

The USACE maintains the above elements to provide navigational access to Coos Bay. USACE maintenance of the main navigation channel and jetty features provides ongoing deep-draft navigation access to Coos Bay.

1.4 Description of Proposed Action

To accommodate larger deep draft vessels and provide local, state, and federal economic benefits, the Port proposes navigation channel improvements to the Coos Bay Navigation Channel. These proposed channel improvements are hereinafter referred to as the 2023 Proposed Alteration (2023 PA), and they are summarized as follows:

- *Coos Bay Inside Range*: the channel from RM 1.3 to RM 2.8 on the red side of the channel was widened. The range heading of the Coos Bay Inside Range was changed by 1° from 28.0° - 208.0° to 27.0° - 207.0°.

- *Bend Widener at RM 4.0*: a bend widener was included in the 2023 PA to add an additional 50 ft on the green side in the turn from Coos Bay Range to Empire Range.

- *Post Panamax Generation 3 (PPX3) Containership Turning Basin at RM 5.0*: a larger turning basin at the container facility is needed to accommodate the PPX3 containership. Based on the vessel's dimensions, the proposed turning basin is 2,000 feet long (parallel to the channel) and 1,600 feet wide. The turning basin's design bottom elevation is -45 ft MLLW, the same as the 2023 PA channel.

- *Capesize Turning Basin at RM 8.0*: a Capesize turning basin was added at RM 8.0 to replace the turning basin that was removed at RM 7.5. Operationally, this turning basin will be used by inbound empty vessels. Therefore, the turning basin's design bottom elevation is -37 ft MLLW. The deeper navigation channel (450-ft wide at -45 ft MLLW) continues through the length of the turning basin.

The above improvements are shown in Table 1-1 and Table 1-2; no dredging is proposed beyond the boundaries in these tables. The project vicinity is represented graphically in Figure 1-2. In this figure, the channel is labeled by RM. Figure 1-2 also shows the location of the adjacent federal infrastructure: the two jetties that run parallel to the channel from RM 0 to RM 1 and the pile dikes located along the north bank of the channel from RM 6.4 to RM 7.5.

Table 1-1
Channel Footprint for Existing Authorized Project and 2023 PA

Range(s) and RM	Existing Conditions	2023 PA
	Offshore Extent	
Offshore Limit including Advanced Maintenance Dredging	RM -0.55[1]	RM -1
Offshore Limit of Navigation Channel	RM 0[1]	RM -0.9
	Channel Width (ft)	
Offshore Inlet Offshore Limit of Navigation Channel to RM 0.3	700 narrowing to 550	1,280 narrowing to 600
Entrance Range RM 0.3 to 1.0	550 narrowing to 300	600
Entrance Range RM 1.0 to 2.0 and Turn	Varies up to 740	Varies up to 1,140
Inside Range RM 2.0 to 2.5	300	500
Coos Bay Range RM 2.5 to 4.3	300	450
Empire Range RM 4.3 to 5.9	300	450
Post Panamax Generation 3 Turning Basin RM 4.7 to 5.6	None	2,000 x 1,600

Range(s) and RM	Existing Conditions	2023 PA
Lower Jarvis Range RM 5.9 to 6.8	300	450
Jarvis Turn RM 6.8 to 7.3	400	500
Upper Jarvis Range RM 7.3 to 8.2	300	450
Capesize Turning Basin RM 7.6 to 8.0	None	2,000 × 1,100

Notes:

1. The authorized FNC starts at RM 0. However, advanced maintenance dredging (AMD) occurs further offshore, typically from the channel entrance to RM -0.55. The channel width at RM -0.55 is approximately 960 ft.
2.

Table 1-2
Channel Depth for Existing Authorized Project and 2023 PA

	Navigation Bottom Elevation (ft, MLLW)		Advance Maintenance Dredging[1] (ft)	
Range(s) and RM	**Existing Conditions**	**2023 PA**	**Existing Conditions**	**2023 PA**
Offshore Inlet Offshore Limit of Navigation Channel to RM 0.3	-47	-57	5	6
Entrance Range RM 0.3 to 1.0	-47 decreasing to -37[2]	-57 decreasing to -45[3]	Varies 5 to 1[4]	Varies 1 or 6[5]
Entrance Range and Turn RM 1.0 to 2.0	-37	-45	1	1
Inside Range RM 2.0 to 2.5	-37	-45	1	1

Coos Bay Range RM 2.5 to 4.3	-37	-45	1	1
Empire Range RM 4.3 to 5.9	-37	-45	1	1
Post Panamax Generation 3 Turning Basin RM 4.7 to 5.6	None	-45	None	1
Lower Jarvis Range RM 5.9 to 6.8	-37	-45	1	1
Jarvis Turn RM 6.8 to 7.3	-37	-45	1	1
Upper Jarvis Range RM 7.3 to 8.2	-37	-45	1	1
Capesize Turning Basin RM 7.6 to 8.0	None[6]	-37[6]	None	1

Notes:

1. Capital dredging consists of the navigation depth plus AMD plus a rock buffer plus a portion of overdepth.
2. For the existing channel, the navigation depth decreases from a depth of -47 ft to -37 ft MLLW between RM 0.4 and RM 0.7. The channel is dredged farther offshore to allow for AMD.
3. For the 2023 PA, the navigation depth decreases by 12 ft between RM 0.3 (depth of -57 ft MLLW) and RM 1.0 (depth of -45 ft MLLW).
4. AMD of 5 ft starts at the offshore daylight line, approximately RM -0.6, and continues to RM 0.7.
5. AMD of 6 ft starts at the offshore daylight line. The AMD will be 1 ft in areas near Guano Rock (RM 0.7 to RM 1).
6. Under the Existing Conditions, there is no formal turning basin; vessels that visit RFP turn in existing deeper water at this location. Under the 2023 PA, incoming vessels will enter the channel and turn under ballast load, so it is not necessary to dredge beyond -37 ft MLLW.

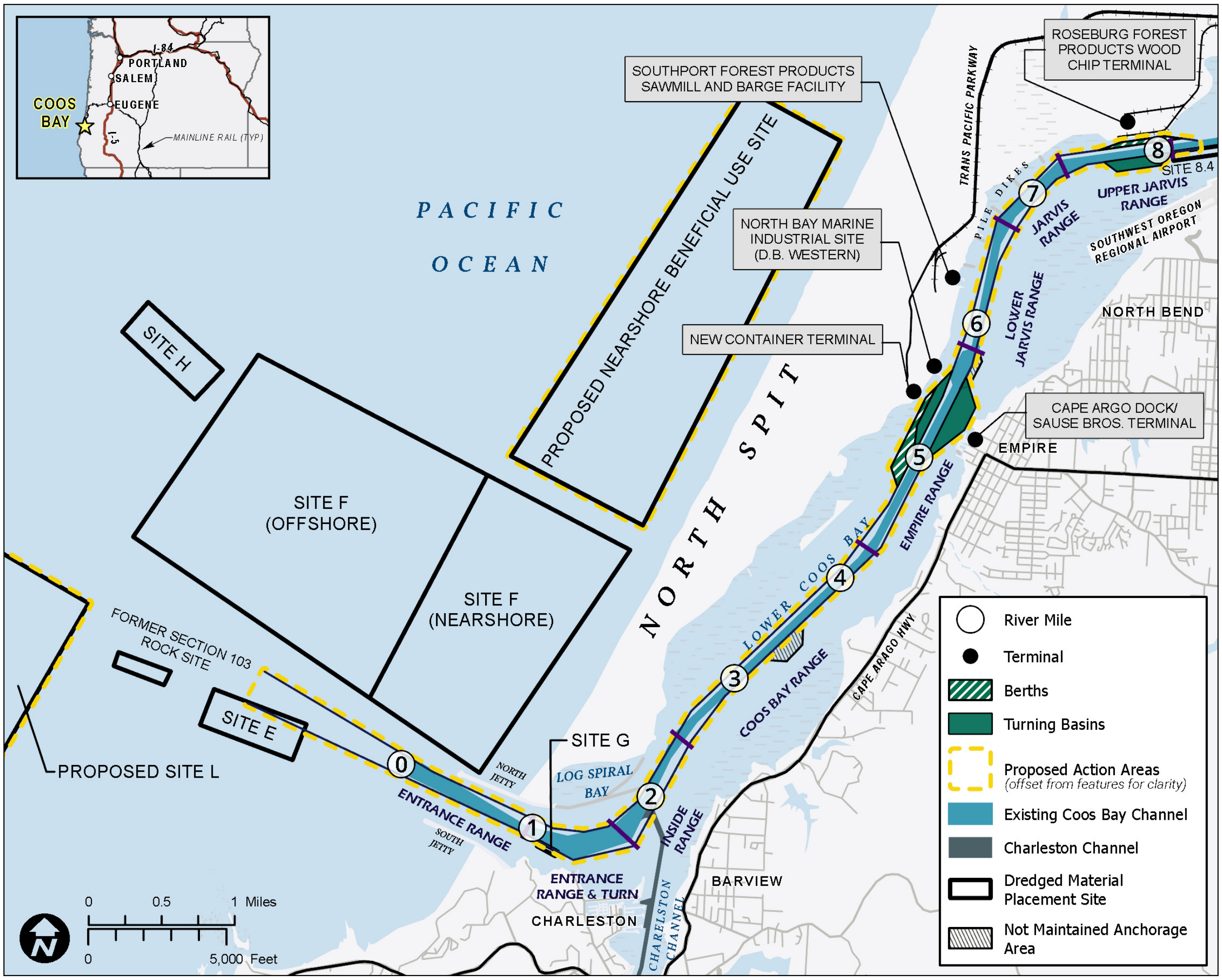


Figure 1-3
Summary of the 2023 Proposed Alteration

1.5 Previous Studies

The geotechnical investigation program to date has been completed in the following three primary phases: a 2010 to 2011 phase of work that included 11 overwater borings, laboratory testing, and preparation of a draft geotechnical data report; a 2016 to 2017 phase of work that included 28 overwater borings, three upland borings, 56 jet probes, one diving exploration, and laboratory testing; and a 2023 to 2024 phase of work that included 15 overwater borings, laboratory testing, and preparation of this geotechnical data report (GDR), which combines the results of the 2010 to 2011, 2016 to 2017, and 2023 to 2024 geotechnical investigation phases. This GDR describes the work accomplished, provides a summary of subsurface conditions at the project site, and presents geotechnical data and information related to the investigations. The general project area and locations of the overwater borings, upland borings, jet probes, and diving exploration are presented in the Exploration Site Plans, Figures 2-0 through 2-6. The Exploration Site Plans are based on Sub-

Appendix 8 – Drawings. Detailed discussions of the field exploration and laboratory testing programs for the project are provided in Appendices A and B, respectively.

David Evans and Associates, Inc., (DEA) collected geophysical survey data in 2005, multibeam bathymetric and sub-bottom profiler data in 2008, and additional geophysical survey data in 2016 and 2017. Arc Surveying & Mapping, Inc. (Arc) completed a bathymetric and electrical resistivity survey of the channel in 2023. GHD utilized the subsurface conditions presented in this GDR to supplement the geophysical data and provide estimates of rock within the channel (see Sub-Appendix 2 – Geophysical Assessment and Reports). The USACE completed the following geotechnical investigations within Coos Bay for previous dredging projects:

- USACE – Portland District, 1974; Coos Bay and Harbor, Oregon, Geologic Investigations.
- USACE – Portland District, 1995; Coos Bay, Oregon; Lower Coos River, Oregon; Coos Bay Channel Deepening, 1994 Subsurface Explorations.

The geotechnical information from the USACE efforts is included in Appendices C and D. A comparison of the subsurface conditions encountered during the 1974 and 1995 USACE investigations and the Port's investigations is provided in Section 4 of this report. The available geophysical information is summarized in Sub-Appendix 2 – Geophysical Assessment and Reports, which describes the sources of information utilized to develop an estimated rock-surface model. This available information includes geophysical surveys, subsurface explorations completed by the USACE Portland District to support its previous dredging efforts, and subsurface explorations completed as part of this GDR.

1.6 Report Organization

This report is organized into the following sections:

Section 1 – Introduction: Background information on the Project.

Section 2 – Site Description: Description of the bathymetry, regional geologic and seismic settings, and the local geological setting and conditions.

Section 3 – Subsurface Conditions: Description of work completed and the soil and rock conditions encountered as part of the geotechnical investigation program.

Section 4 – Discussion: Description of the various considerations related to the results of the geotechnical investigation program as compared to previous studies completed by the USACE.

Section 5 – Limitations: Information to help readers manage risks with respect to use of this report.

Section 6 – References: Identification of the references used in the geotechnical investigation program.

Appendix A – OIPCB Field Explorations: Presentation of a detailed description of the subsurface explorations completed as part of the geotechnical investigation program, borings logs, and rock-core photographs.

Appendix B – Laboratory Testing: Presentation of a detailed description of the geotechnical laboratory testing completed as part of the geotechnical investigation program and the results of the laboratory testing.

Appendix C – USACE 1974 Field Explorations: Presentation of the boring logs and rock-core photographs completed as part of the USACE 1974 field explorations.

Appendix D – USACE 1994 Field Explorations and Laboratory Testing: Presentation of the boring logs, rock-core photographs, and laboratory testing completed as part of the USACE 1994 field explorations.

Appendix E – Kenneth L. Finger, Ph.D., Consulting, Paleontologist, Micropaleontological Examination: Presentation of the report used to identify the various geologic formations encountered as part of the geotechnical investigation program.

2. SITE DESCRIPTION

2.1 Bathymetry

The bathymetry shown on the Exploration Site Plans (Figures 2-0 through 2-6) is based on the information provided in Sub-Appendix 8 – Drawings.

2.2 Regional Geologic Setting

The project area is located within a portion of the Coos Bay region that features lowland areas generally underlain by Quaternary unconsolidated sediments and upland areas of Paleogene and Neogene sedimentary rock. Geologic mapping in the area shows stable (vegetated) and unstable sand dunes (Beaulieu and Hughes, 1976), underlain by sedimentary rock. Recent dating of dune sand in the Florence and Coos dune sheets indicates the dunes in the immediate proximity of the project area were deposited during the late-Holocene epoch; however, late-Pleistocene dune deposits are exposed within the project area as well (Peterson et al., 2005). Based on geologic mapping within the project area, the dune sands are assumed to be underlain by Paleogene and Neogene sedimentary rock (Madin et al., 1995; Beaulieu and Hughes, 1975).

Non-marine and marine sedimentary rocks exposed in the upland parts of the Coos Bay area were deposited during periods of sea-level change (regressions and transgressions) in the Coos Basin starting in the Eocene epoch. Convergent tectonism uplifted these sedimentary rocks, forming the Coast Range, and caused the initial faulting and folding now observed in the area. Within the southern portion of the project area, the dominant structural feature is the South Slough syncline, which extends from the mouth of Coos Bay southward to the mouth of Winchester Creek. Locally, the area has been folded into a series of primarily north-northeast-trending anticlines and synclines. Faults are generally either north-south-trending reverse faults or west-northwest and east-northeast thrust or oblique strike-slip faults. The regional geologic setting is illustrated in Figure 3-0.

2.3 Local Geologic Conditions

Based on review of published literature and maps and the results of subsurface explorations performed during the 2010 through 2024 explorations, the Port identified the following bedrock geologic units (from youngest to oldest) within the project area that may be relevant to the construction of the project:

- Eocene-aged Coaledo Formation,
- Eocene-aged Bastendorff Formation, and
- Miocene-aged Empire Formation.

The approximate limits of these formations, whether encountered at the mudline or where estimated underlying sediment is within the PA channel, are shown on the Exploration Site Plans (Figures 2-0 through 2-6).

Diller (1899) named the Coaledo Formation for a series of predominantly non-marine, coal-bearing, late-Eocene strata exposed a few miles south of Coos Bay. Turner (1938) proposed a division of the Coaledo into lower and upper sandstone members, separated by a middle unit of marine mudstone. The overlying Bastendorff Formation consists of thinly laminated, dark-brown siltstones and mudstones that weather a light brown. As shown on Figure 4-0, the Bastendorff Formation is unconformable with the Miocene Empire Formation, which consists of a basal conglomerate and sandstones (Addicott, 1983; Beaulieu and Hughes, 1975). The lower fossiliferous portion of the Empire Formation has been described informally as the *Miocene Beds* (Moore, 1963; Oles et al., 1980). The local geologic conditions are illustrated in Figure 5-0.

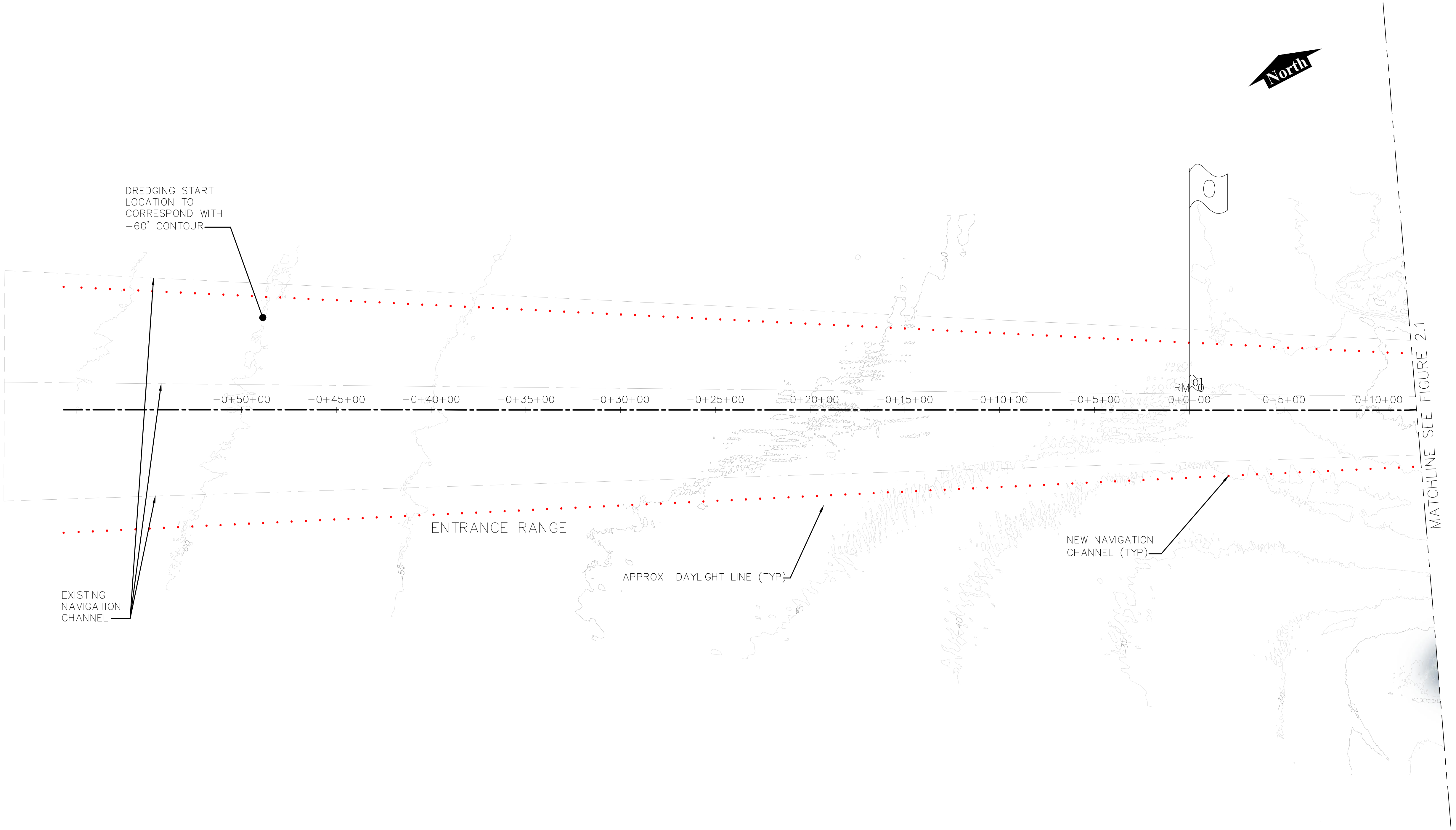
Selected core samples were submitted to Kenneth L. Finger, Ph.D., Consulting Paleontologist, for age dating. The purpose of the micropaleontology examination was to inspect selected rock-core samples from the borings for micropaleontological evidence that differentiates the Empire, Bastendorff, and Coaledo formations. The analyses provided identification of fossils typical for the various geologic formations to confirm and/or refine the boundaries between geologic formations based on the age of the geologic units. The results of the micropaleontology examination indicate the presence of deep-water fauna typical of the Bastendorff Formation in borings B-21 and B-23 and shallow-marine fauna typical of the Empire Formation in boring B-30. The micropaleontology examination is provided as Appendix E.

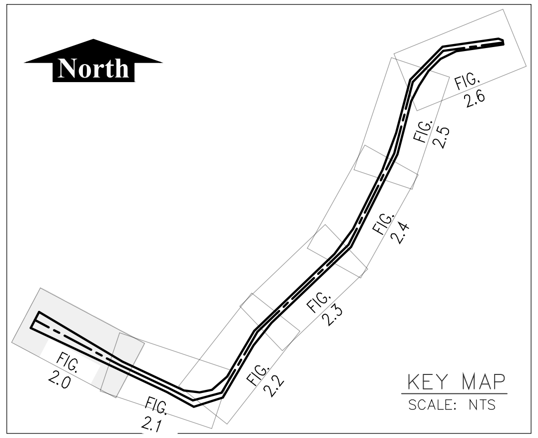
Section 3 of this report provides a summary of geologic conditions within the project area. Additional geologic discussion will be completed as part of the Environmental Impact Statement (EIS) phase of the project.

2.4 Regional Tectonic and Seismic Setting

The project area is located along the eastern edge of the Cascadia Subduction Zone (CSZ), the active convergent-plate boundary between the subducting Explorer, Juan de Fuca, and Gorda plates, and the overriding North American Plate. The convergence of these plates dominates the regional tectonics and results in megathrust earthquakes, which are interplate earthquakes that occur when a tectonic plate subducts beneath another plate at a shallow dip. Offshore, subduction causes a deformation zone along the western edge of the accretionary wedge complex, strike-slip faulting in the North American Plate, and a zone of folding extending from the coast westward. Onshore, the major tectonic elements associated with the subduction zone include a deformed forearc basin (the Coast Range and Willamette Valley), a volcanic arc complex (the Cascade Range), and a backarc. The regional tectonic and seismic setting is illustrated in Figure 6-0.

On a more local scale, the project area lies at the junction of the accretionary wedge complex and the forearc basin. Local bedrock structure within the project area has been the subject of ongoing study to evaluate seismogenic sources and paleoseismicity associated with the subduction zone. Local structures reflect east-west compressional deformation resulting from ongoing oblique subduction on the CSZ that has occurred since the late-middle Miocene epoch (Wells and Peck, 1961) and include the megathrust itself, north-south-trending folds, north-south-trending reverse and thrust faults, and west-northwest-trending oblique strike-slip faults (Black and Madin, 1995; Goldfinger et al., 1992). Within the PA channel, the compression deformation manifests in the South Slough Syncline. Geologic maps for the project area indicate that bedding surfaces dip toward the east-northeast down stream of approximately RM 2 and toward the west-northwest upstream of RM 2 as a result of the South Slough Syncline (Madin et al., 1995).





NOTES:

1. ELEVATIONS SHOWN BASED ON MLLW VERTICAL DATUM.
2. CONTOUR INTERVAL 5 FEET.
3. AERIAL IMAGE: USDA NAIP, 2016.
4. THE LOCATIONS OF ALL FEATURES SHOWN ARE APPROXIMATE.
5. THIS DRAWING IS FOR INFORMATION PURPOSES. IT IS INTENDED TO ASSIST IN SHOWING FEATURES DISCUSSED IN AN ATTACHED DOCUMENT. GRI CANNOT GUARANTEE THE ACCURACY AND CONTENT OF ELECTRONIC FILES. THE MASTER FILE IS STORED BY GRI AND WILL SERVE AS THE OFFICIAL RECORD OF THIS COMMUNICATION.

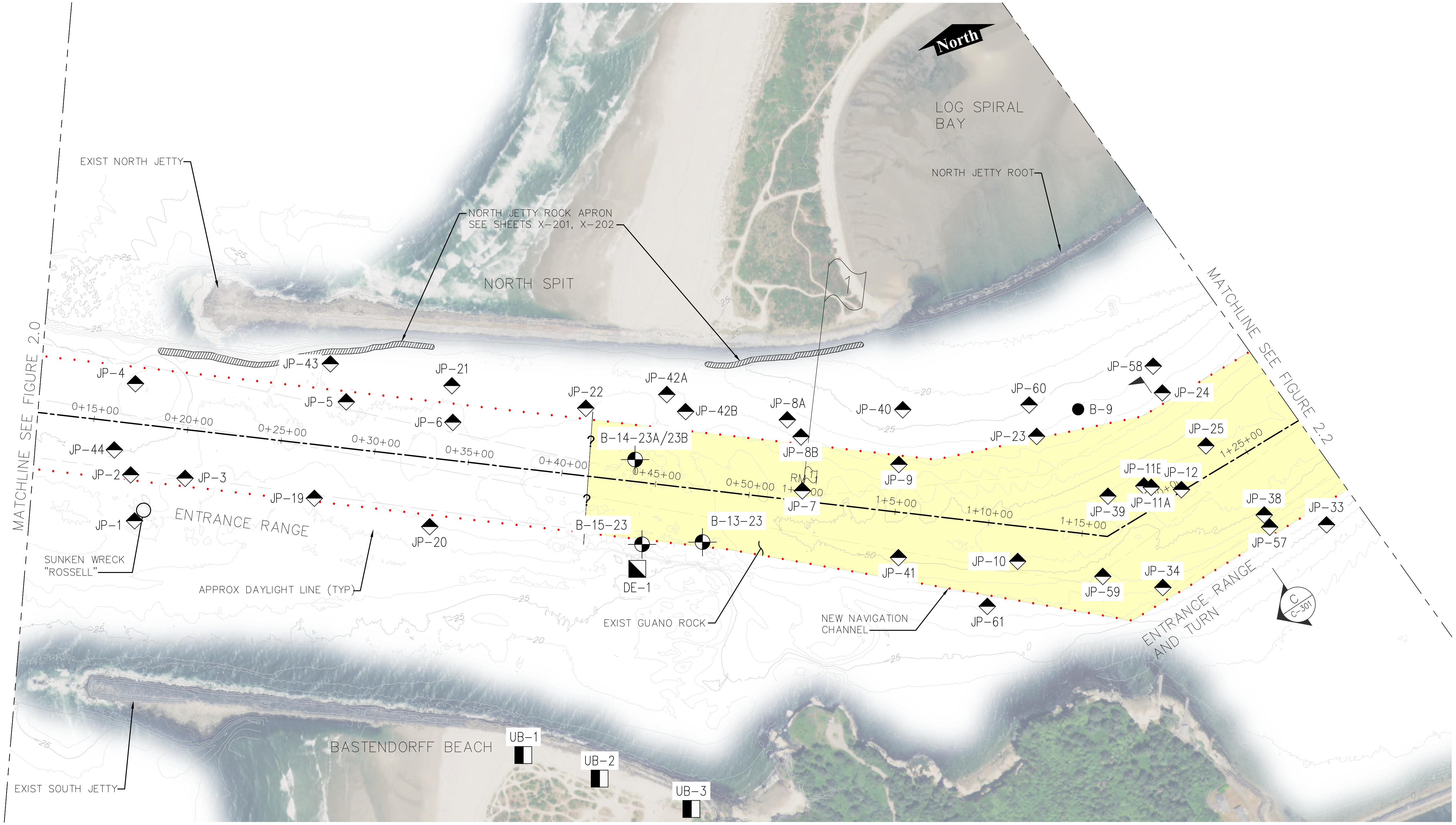
LEGEND

EXISTING RIVER MILE MARKER
EXISTING BATHYMETRY MAJOR CONTOURS
EXISTING BATHYMETRY MINOR CONTOURS
EXISTING NAVIGATION CHANNEL
EXISTING CHANNEL CENTERLINE
— — NEW CHANNEL CENTERLINE
· · · · NEW NAVIGATION CHANNEL

SITE PLAN AND COMPILED BATHYMETRY FROM MOFFATT & NICHOL

0 600 1,200 FT

Figure 2-0: Exploration Site Plan



NOTES:

1. ELEVATIONS SHOWN BASED ON MLLW VERTICAL DATUM.
2. CONTOUR INTERVAL 5 FEET.
3. AERIAL IMAGE: USDA NAIP, 2016.
4. THE LOCATIONS OF ALL FEATURES SHOWN ARE APPROXIMATE.
5. THIS DRAWING IS FOR INFORMATION PURPOSES. IT IS INTENDED TO ASSIST IN SHOWING FEATURES DISCUSSED IN AN ATTACHED DOCUMENT. GRI CANNOT GUARANTEE THE ACCURACY AND CONTENT OF ELECTRONIC FILES. THE MASTER FILE IS STORED BY GRI AND WILL SERVE AS THE OFFICIAL RECORD OF THIS COMMUNICATION.

BEDROCK GEOLOGIC FORMATION LEGEND

🟨 EMPIRE FORMATION (SANDSTONE)

NOTE: BEDROCK IS OVERLAIN BY SEDIMENT WITH VARYING THICKNESS

EXPLORATION LEGEND

⊕ BORING COMPLETED BY GRI (2023)
◪ GRI (2018) IN-WATER EXPLORATION
◆ GRI (2017) JET PROBE EXPLORATION
◧ GRI (2016) UPLAND BORING EXPLORATION
● GRI (2010) BORING EXPLORATION
⬒ CORPS (1974) EXPLORATION

LEGEND

0 EXISTING RIVER MILE MARKER
EXISTING BATHYMETRY MAJOR CONTOURS
EXISTING BATHYMETRY MINOR CONTOURS
EXISTING NAVIGATION CHANNEL
EXISTING CHANNEL CENTERLINE
NEW CHANNEL CENTERLINE
NEW NAVIGATION CHANNEL

SITE PLAN AND COMPILED BATHYMETRY FROM MOFFATT & NICHOL

0 600 1,200 FT

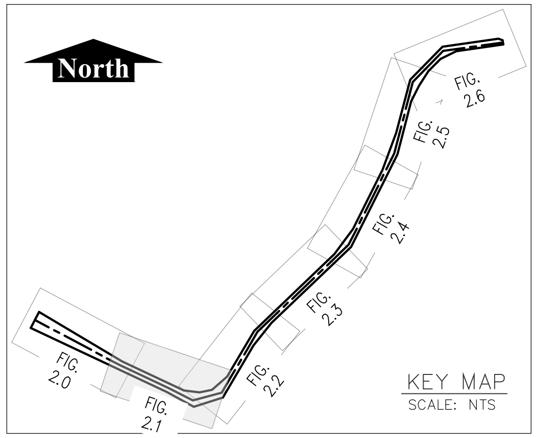
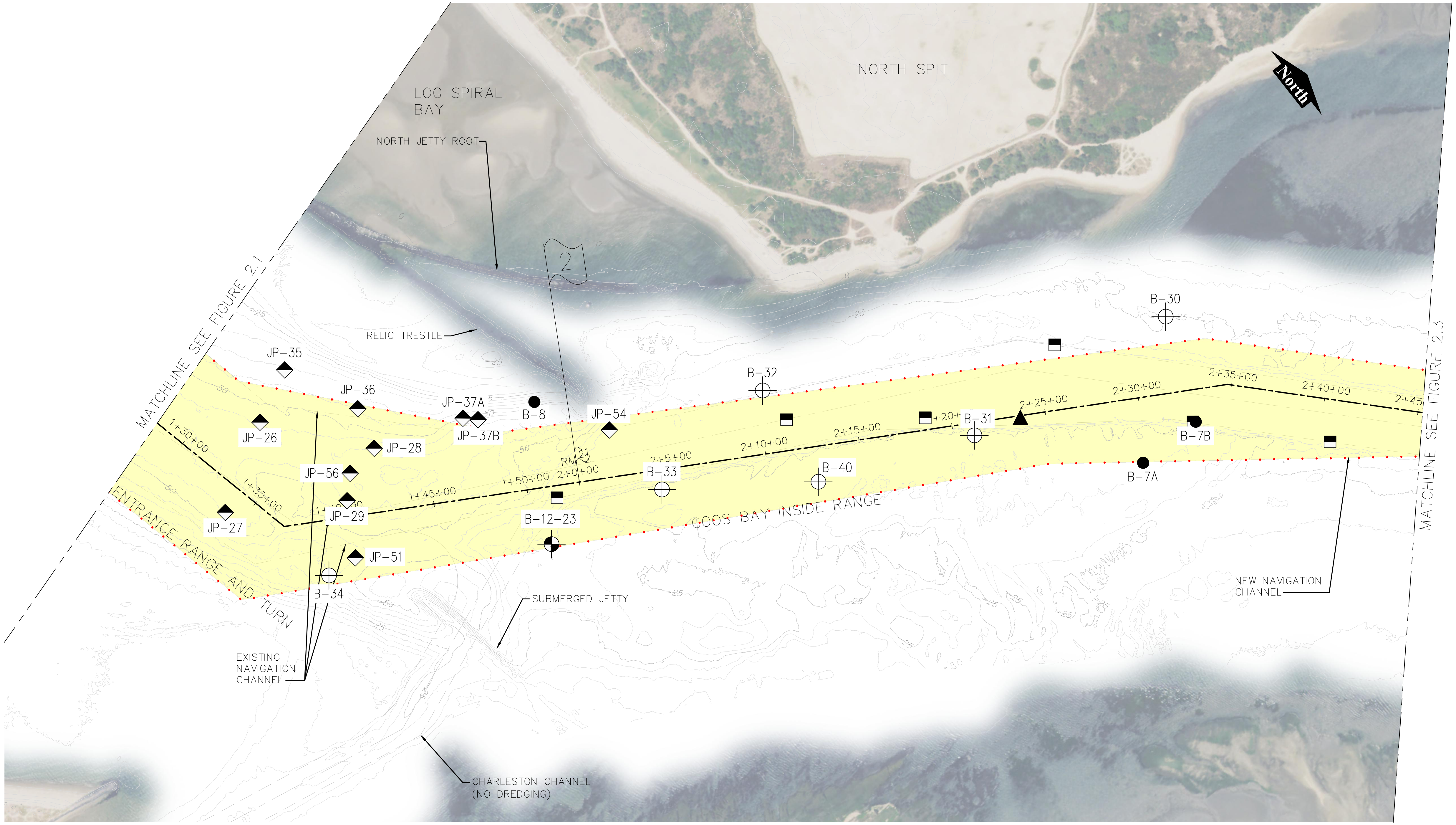


Figure 2-1: Exploration Site Plan



NOTES:

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2. CONTOUR INTERVAL 5 FEET.
3. AERIAL IMAGE: USDA NAIP, 2016.
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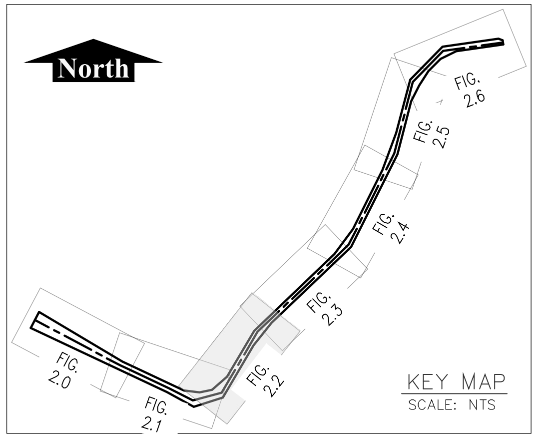
BEDROCK GEOLOGIC FORMATION LEGEND

🟨 EMPIRE FORMATION (SANDSTONE)

NOTE: BEDROCK IS OVERLAIN BY SEDIMENT WITH VARYING THICKNESS



EXPLORATION LEGEND

⊕ BORING COMPLETED BY GRI (2023)
◆ GRI (2017) JET PROBE EXPLORATION
⌖ GRI (2016) BORING EXPLORATION
● GRI (2010) BORING EXPLORATION
▲ CORPS (1994) EXPLORATION
⬒ CORPS (1974) EXPLORATION

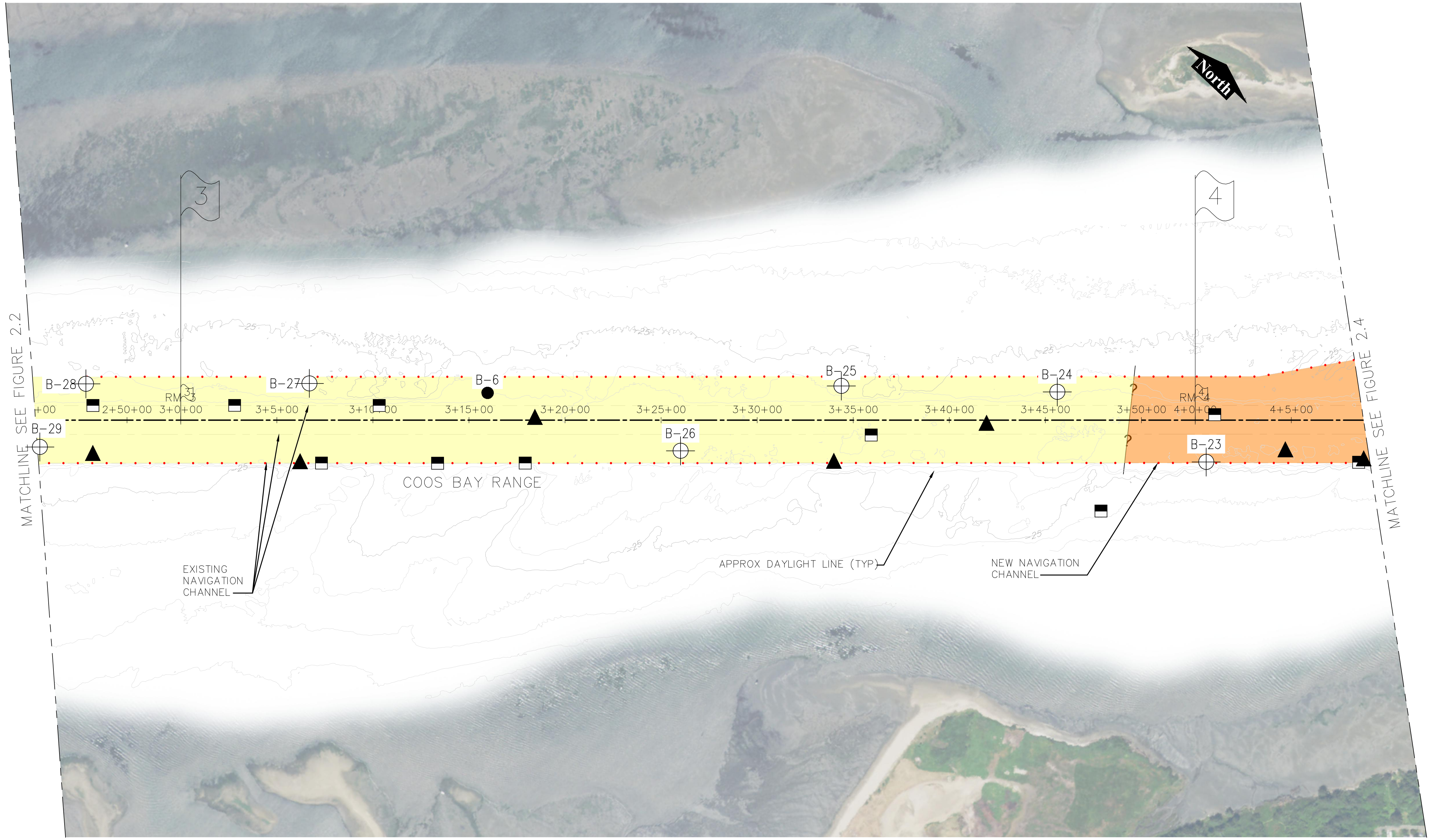
LEGEND

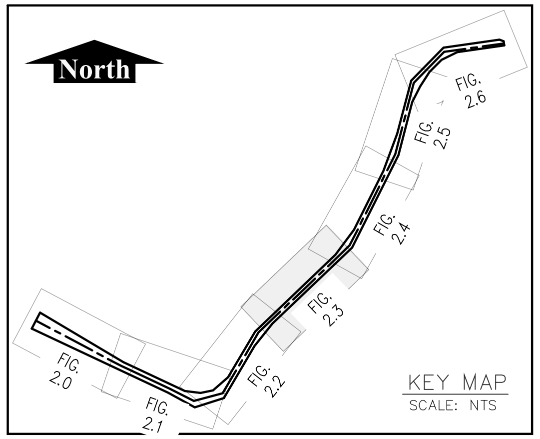
0 EXISTING RIVER MILE MARKER
EXISTING BATHYMETRY MAJOR CONTOURS
EXISTING BATHYMETRY MINOR CONTOURS
EXISTING NAVIGATION CHANNEL
EXISTING CHANNEL CENTERLINE
— — — NEW CHANNEL CENTERLINE
· · · · NEW NAVIGATION CHANNEL

SITE PLAN AND COMPILED BATHYMETRY FROM MOFFATT & NICHOL

0 600 1,200 FT

Figure 2-2: Exploration Site Plan





NOTES:

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2. CONTOUR INTERVAL 5 FEET.
3. AERIAL IMAGE: USDA NAIP, 2016.
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BEDROCK GEOLOGIC FORMATION LEGEND

🟨 EMPIRE FORMATION (SANDSTONE)

🟧 BASTENDORFF FORMATION (SILTSTONE)

NOTE: BEDROCK IS OVERLAIN BY SEDIMENT WITH VARYING THICKNESS

EXPLORATION LEGEND

⌖ GRI (2016) BORING EXPLORATION

● GRI (2010) BORING EXPLORATION

▲ CORPS (1994) EXPLORATION

⬒ CORPS (1974) EXPLORATION

LEGEND

⚐ EXISTING RIVER MILE MARKER

— EXISTING BATHYMETRY MAJOR CONTOURS

— EXISTING BATHYMETRY MINOR CONTOURS

- - - EXISTING NAVIGATION CHANNEL

— - — EXISTING CHANNEL CENTERLINE

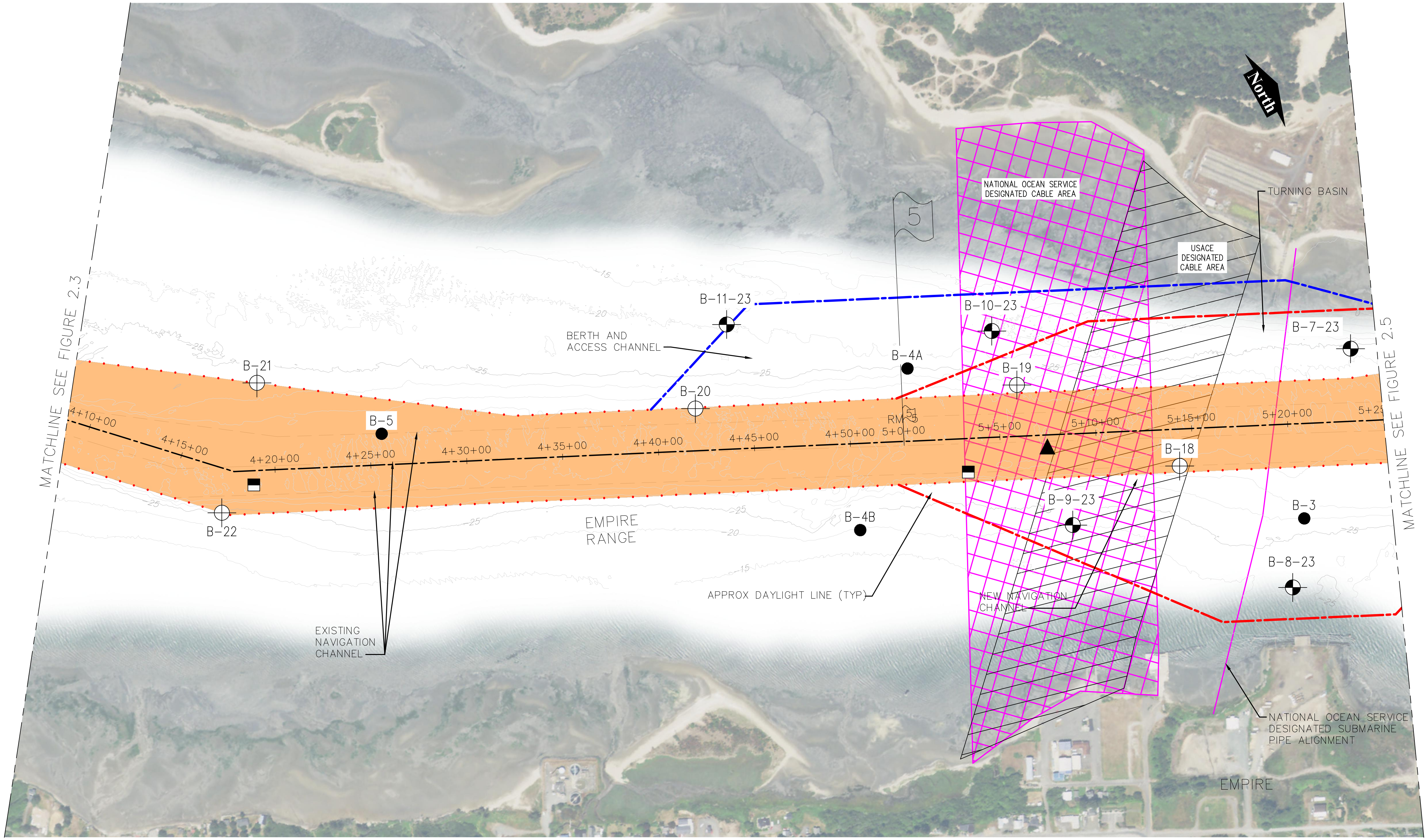
— — — NEW CHANNEL CENTERLINE

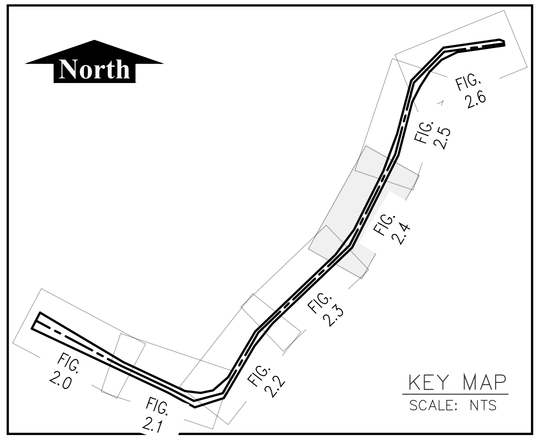
· · · · · NEW NAVIGATION CHANNEL

SITE PLAN AND COMPILED BATHYMETRY FROM
MOFFATT & NICHOL

0 600 1,200 FT

Figure 2-3: Exploration Site Plan





NOTES:

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2. CONTOUR INTERVAL 5 FEET.
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BEDROCK GEOLOGIC FORMATION LEGEND

🟧 BASTENDORFF FORMATION (SILTSTONE)

NOTE: BEDROCK IS OVERLAIN BY SEDIMENT WITH VARYING THICKNESS

EXPLORATION LEGEND

⊕ BORING COMPLETED BY GRI (2023)

⊕ GRI (2016) BORING EXPLORATION

● GRI (2010) BORING EXPLORATION

▲ CORPS (1994) EXPLORATION

▬ CORPS (1974) EXPLORATION

LEGEND

0 EXISTING RIVER MILE MARKER

EXISTING BATHYMETRY MAJOR CONTOURS

EXISTING BATHYMETRY MINOR CONTOURS

EXISTING NAVIGATION CHANNEL

EXISTING CHANNEL CENTERLINE

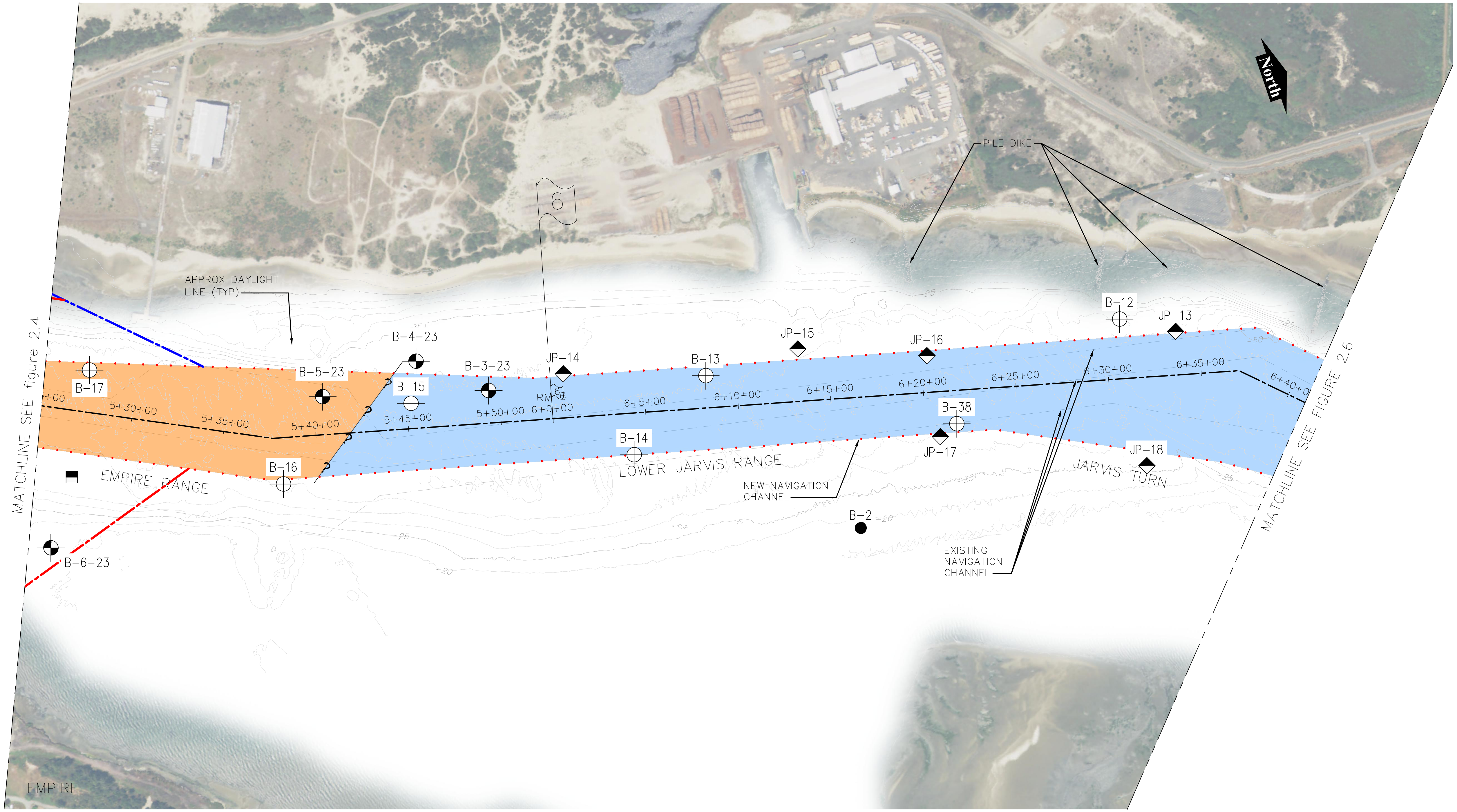
NEW CHANNEL CENTERLINE

NEW NAVIGATION CHANNEL

SITE PLAN AND COMPILED BATHYMETRY FROM MOFFATT & NICHOL

0 600 1,200 FT

Figure 2-4: Exploration Site Plan



NOTES:

1. ELEVATIONS SHOWN BASED ON MLLW VERTICAL DATUM.
2. CONTOUR INTERVAL 5 FEET.
3. AERIAL IMAGE: USDA NAIP, 2016.
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BEDROCK GEOLOGIC FORMATION LEGEND

🟧 BASTENDORFF FORMATION (SILTSTONE)

🟦 COALEDO FORMATION (SANDSTONE)

NOTE: BEDROCK IS OVERLAIN BY SEDIMENT WITH VARYING THICKNESS

EXPLORATION LEGEND

⊕ BORING COMPLETED BY GRI (2023)
◆ GRI (2017) JET PROBE EXPLORATION
⊕ GRI (2016) BORING EXPLORATION
● GRI (2010) BORING EXPLORATION
▬ CORPS (1974) EXPLORATION

LEGEND

EXISTING RIVER MILE MARKER
EXISTING BATHYMETRY MAJOR CONTOURS
EXISTING BATHYMETRY MINOR CONTOURS
EXISTING NAVIGATION CHANNEL
EXISTING CHANNEL CENTERLINE
NEW CHANNEL CENTERLINE
NEW NAVIGATION CHANNEL

SITE PLAN AND COMPILED BATHYMETRY FROM MOFFATT & NICHOL

0 600 1,200 FT

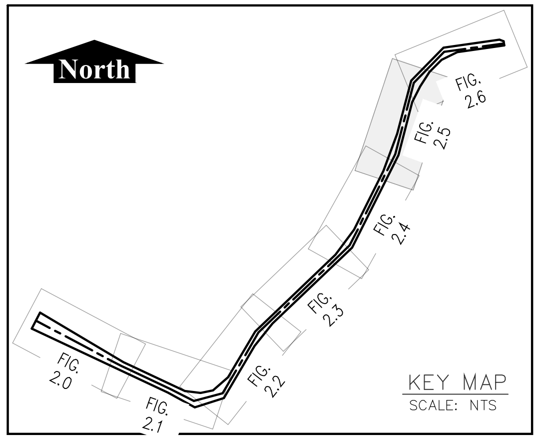
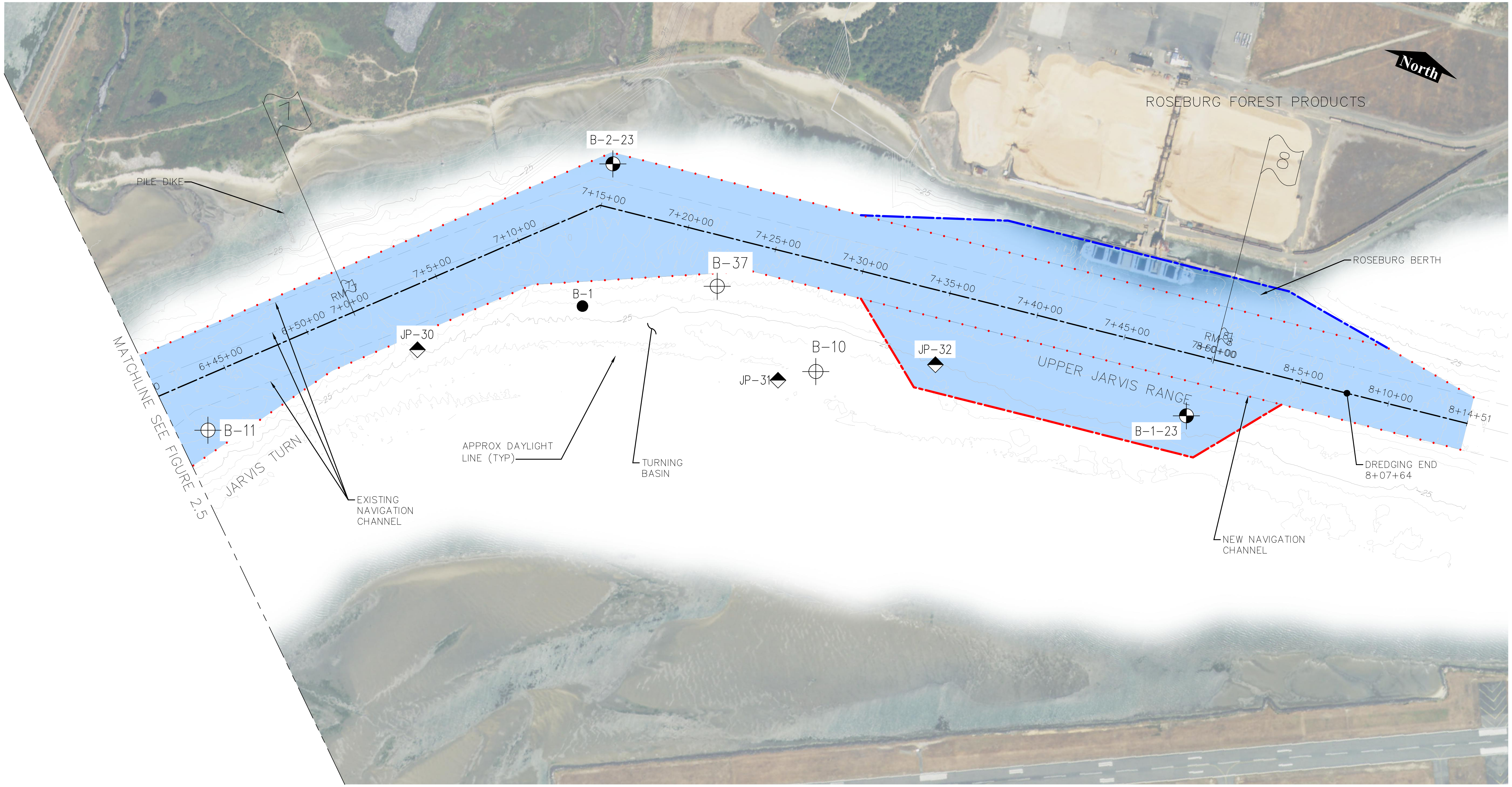


Figure 2-5: Exploration Site Plan



NOTES:

1. ELEVATIONS SHOWN BASED ON MLLW VERTICAL DATUM.
2. CONTOUR INTERVAL 5 FEET.
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BEDROCK GEOLOGIC FORMATION LEGEND

🟦 COALEDO FORMATION (SANDSTONE)

NOTE: BEDROCK IS OVERLAIN BY SEDIMENT WITH VARYING THICKNESS

EXPLORATION LEGEND

⊕ BORING COMPLETED BY GRI (2023)

◆ GRI (2017) JET PROBE EXPLORATION

⊕ GRI (2016) BORING EXPLORATION

● GRI (2010) BORING EXPLORATION

LEGEND

EXISTING RIVER MILE MARKER

EXISTING BATHYMETRY MAJOR CONTOURS

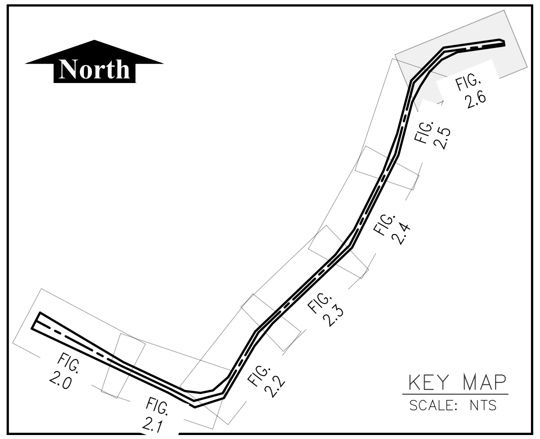
EXISTING BATHYMETRY MINOR CONTOURS

EXISTING NAVIGATION CHANNEL

EXISTING CHANNEL CENTERLINE

NEW CHANNEL CENTERLINE

NEW NAVIGATION CHANNEL



SITE PLAN AND COMPILED BATHYMETRY FROM MOFFATT & NICHOL

Figure 2-6: Exploration Site Plan

3. SUBSURFACE CONDITIONS

3.1 General

The subsurface exploration programs for this project were completed during six separate mobilizations. The first mobilization occurred between September 8 and 17, 2010. Subsequent mobilizations were completed as funding for the project was available and the project design advanced. The second and third mobilizations occurred between July 14 and August 12, 2016, and between October 31 and November 3, 2016, respectively. The purpose of the second and third mobilizations was to complete additional overwater borings to further supplement previous geotechnical and geophysical exploration programs and further evaluate the strength and material characteristics of rock and overlying materials located within the proposed dredge prism. The fourth mobilization occurred between March 22 and April 21, 2017. The purpose of the fourth mobilization was to complete jet-probe explorations to further supplement geophysical and subsurface explorations and further support further development of the sediment and rock surfaces within the channel. The fifth mobilization occurred between October 25 and 27, 2017. The primary purpose of the fifth mobilization was to help evaluate the strength and material characteristics of the rock at Guano Rock. The sixth mobilization occurred between October 2nd and November 7th, 2023. The primary purpose of the sixth mobilization was to help evaluate the strength and material characteristics of rock at Guano Rock as well as materials further upriver in the proposed turning basin near Empire and other areas.

Subsurface materials and conditions within the project area were investigated with overwater, upland, and diving explorations. The overwater subsurface explorations included 54 overwater borings and 56 jet probes. The overwater borings were designated B-1 through B-3, B-4A, B-4B, B-5, B-6, B-7A, B-7B, B-8 through B-34, B-37, B-38, and B-40; the 2023 overwater explorations were designated B-1-23 through B-15-23. It should be noted that B-15-23 was labeled as B-16-23 in the field; however, B-16-23 was re-labeled to B-15-23 and noted in this report accordingly. Borings B-35, B-36, and B-39 could not be completed using a floating barge due to the amount of ocean swell at these locations. The jet probes were designated JP-1 through JP-44, JP-51, JP-54, and JP-56 through JP-61. Jet probes JP-45 through JP-50, JP- 52 and JP-53, JP-55, and JP-62 were considered “Secondary Importance/Backup” or “Supplemental As Needed” by the PDT and not completed. The upland subsurface explorations included three borings designated UB-1 through UB-3. The diving exploration was designated DE-1. Borings B-1-23 through B-15-23 were completed from a hydraulic jack-up barge, which allowed for the successful completion of explorations at Guano Rock in strong ocean swell conditions. The approximate locations of the overwater, upland, and diving explorations are shown on the Exploration Site Plans, Figures 2-0 to 2-6. A summary of boring location, mudline elevation, elevation where rock was first encountered, and bottom-of-boring elevation for each overwater boring is provided in Table 3-1 below. As shown in Table 3-1, the bottom elevation of the borings was developed to coincide with an elevation of at least 5 ft below the planned Maximum Allowable Overdepth. The methodology for estimating mudline, rock, and bottom-of-boring elevation is provided in Section A-1.1.1 of Appendix A. A summary of boring location, ground-surface elevation, elevation where rock was first encountered, and the bottom-of-boring elevation for the upland borings is provided in Table 3-2. Logs of the borings are provided in Appendix A. A summary of jet-probe location and elevation of refusal for each jet probe, if applicable, is provided in Table 3-3 below. A methodology for estimating rock elevation for the jet probes is provided in Section A-1.3 of Appendix A. A summary of the exploration location, mudline elevation, elevation where rock was first encountered, and bottom-of-exploration elevation for the diving exploration is provided in Table 3-4 below. A log of the diving exploration is provided in Appendix A.

Table 3-1
Overwater Boring Locations and Elevations

Boring	Latitude	Longitude	Approximate Station	Approximate River Mile	Mudline Elevation (ft, MLLW)	Top of Rock Elevation (ft, MLLW)	Bottom of Boring Elevation (ft, MLLW)
B-1	43.420611	-124.267889	7+12+00	7.23	-30.0	N/A	-61.5
B-2	43.409833	-124.275194	6+15+00	6.28	-18.5	N/A	-60.5
B-3	43.397028	-124.281139	5+20+00	5.38	-29.0	N/A	-61.5
B-4A	43.392917	-124.28725	5+00+00	5.00	-29.5	-45.5	-53.5
B-4B	43.391278	-124.284833	4+50+00	4.95	-20.5	-20.5	-59.5
B-5	43.385778	-124.290722	4+25+00	4.47	-39.5	-39.5	-61.0
B-6	43.373083	-124.305972	3+15+50	3.29	-34.5	-34.5	-62.0
B-7A	43.364417	-124.314139	2+29+00	2.55	-21.0	-21.0	-36.0
B-7B	43.365389	-124.314194	2+31+50	2.60	-37.0	-37.0	-61.0
B-8	43.357722	-124.322194	1+50+00	1.95	-44.0	-58.5	-64.0

Table 3-1
Overwater Boring Locations and Elevations

Boring	Latitude	Longitude	Approximate Station	Approximate River Mile	Mudline Elevation (ft, MLLW)	Top of Rock Elevation (ft, MLLW)	Bottom of Boring Elevation (ft, MLLW)
B-9	43.354111	-124.330417	1+12+50	1.24	-28.0	N/A	-34.5
B-10	43.42128	-124.26263	7+29+00	7.55	-19.0	N/A	-53.0
B-11	43.4165	-124.27392	6+42+00	6.80	-38.0	N/A	-54.5
B-12	43.41436	-124.27782	6+30+50	6.58	-38.0	N/A	-54.5
B-13	43.40825	-124.27903	6+08+00	6.15	-34.5	N/A	-56.0
B-14	43.40691	-124.27789	6+03+00	6.06	-38.5	N/A	-55.0
B-15	43.40395	-124.28014	5+44+50	5.84	-33.0	-34.0	-56.5
B-16	43.40181	-124.27928	5+38+00	5.72	-41.0	-43.0	-57.0
B-17	43.39952	-124.28258	5+27+00	5.51	-38.5	-48.5	-52.5
B-18	43.39577	-124.28315	5+13+50	5.26	-37.0	-41.0	-52.0
B-19	43.39421	-124.286	5+05+50	5.10	-34.0	-47.0	-55.5
B-20	43.38995	-124.28841	4+41+00	4.78	-40.0	-49.0	-55.5

Table 3-1
Overwater Boring Locations and Elevations

Boring	Latitude	Longitude	Approximate Station	Approximate River Mile	Mudline Elevation (ft, MLLW)	Top of Rock Elevation (ft, MLLW)	Bottom of Boring Elevation (ft, MLLW)
B-21	43.38451	-124.29271	4+18+50	4.35	-29.5	-33.0	-52.5
B-22	43.38323	-124.29074	4+17+00	4.32	-24.0	-31.0	-55.0
B-23	43.37981	-124.29526	4+00+00	4.00	-39.5	-43.0	-52.5
B-24	43.37897	-124.29827	3+45+00	3.85	-28.5	-32.0	-54.5
B-25	43.37680	-124.30128	3+34+00	3.64	-32.0	-34.0	-52.0
B-26	43.3745	-124.30254	3+25+50	3.48	-39.0	-41.0	-54.0
B-27	43.37134	-124.30852	3+06+00	3.11	-26.5	-30.0	-53.5
B-28	43.36903	-124.31154	2+47+50	2.90	-32.5	-36.0	-53.5
B-29	43.36793	-124.31127	2+46+00	2.87	-38.0	-39.0	-53.0
B-30	43.36592	-124.31625	2+31+50	2.60	-26.0	-35.0	-56.5
B-31	43.36265	-124.31654	2+20+00	2.38	-23.5	-26.0	-52.5
B-32	43.36052	-124.31973	2+09+50	2.18	-33.0	-34.0	-53.0

Table 3-1
Overwater Boring Locations and Elevations

Boring	Latitude	Longitude	Approximate Station	Approximate River Mile	Mudline Elevation (ft, MLLW)	Top of Rock Elevation (ft, MLLW)	Bottom of Boring Elevation (ft, MLLW)
B-33	43.35849	-124.31929	2+03+00	2.06	-21.5	-22.5	-52.5
B-34	43.35382	-124.32176	1+38+50	1.73	-40.5	N/A	-57.0
B-35	--	--	NOT COMPLETED[2]				
B-36	--	--	NOT COMPLETED[2]				
B-37	43.42183	-124.26525	7+22+50	7.43	-36.5	N/A	-53.0
B-38	43.41162	-124.27669	6+21+00	6.40	-38.0	N/A	-54.5
B-39	--	--	NOT COMPLETED[2]				
B-40	43.36041	-124.31760	2+11+50	2.22	-22.0	-23.0	-52.0
B-1-23	43.422949	-124.255400	7+49+50	7.93	-29.5	N/A	-66.0
B-2-23	43.422744	-124.268509	7+14+50	7.27	-30.5	N/A	-62.0
B-3-23	43.405104	-124.279921	5+48+70	5.92	-32.0	N/A	-63.5
B-4-23	43.404186	-124.280900	5+45+00	5.85	-29.0	-48.0	-62.3

Table 3-1
Overwater Boring Locations and Elevations

Boring	Latitude	Longitude	Approximate Station	Approximate River Mile	Mudline Elevation (ft, MLLW)	Top of Rock Elevation (ft, MLLW)	Bottom of Boring Elevation (ft, MLLW)
B-5-23	43.402718	-124.280715	5+39+65	5.75	-36.0	-47.0	-64.5
B-6-23	43.398245	-124.279268	5+26+00	5.49	-18.5	-25.5	-60.0
B-7-23	43.398739	-124.283695	5+22+90	5.43	-29.5	N/A	-71.0
B-8-23	43.396442	-124.280009	5+19+20	5.36	-23.0	-27.5	-64.5
B-9-23	43.394023	-124.283004	5+07+80	5.15	-20.0	-24.5	-61.5
B-10-23	43.394250	-124.287132	5+04+40	5.08	-20.5	-45.0	-62.0
B-11-23	43.390870	-124.289567	4+43+0	4.81	-20.0	-44.0	-61.5
B-12-23	43.356701	-124.319644	1+50+50	1.96	-34.0	N/A	-67.5
B-13-23	43.353704	-124.338351	0+47+60	0.90	-41.5	-41.5	-66.8
B-14-23A /	43.355129	-124.339197	0+43+80	0.83	-41.5	-41.5	-53.8 / -62.3

Table 3-1
Overwater Boring Locations and Elevations

Boring	Latitude	Longitude	Approximate Station	Approximate River Mile	Mudline Elevation (ft, MLLW)	Top of Rock Elevation (ft, MLLW)	Bottom of Boring Elevation (ft, MLLW)
B-14-23B							
B-15-23[3]	43.353916	-124.339520	0+44+60	0.84	-42.5	-42.5	-64.5

Notes:

1. *All elevations are estimates.*
2. *Several attempts were made to drill borings B-35, B-36, and B-39 during the 2016 drilling effort. However, these borings could not be completed due to ocean-swell conditions and excessive barge movement.*
3. *B-15-23 was labeled as B-16-23 in the field and in core box photos.*

Table 3-2
Upland Boring Locations and Elevations

Boring	Latitude	Longitude	Approximate Station	Approximate River Mile	Ground Surface Elevation (ft, MLLW)	Top of Rock Elevation (ft, MLLW)	Bottom of Boring Elevation (ft, MLLW)
UB-1	43.351482	-124.342956	0+40+00	0.76	13.8	-30.7	-65.2
UB-2	43.350847	-124.341620	0+44+50	0.84	14.6	-23.9	-60.4
UB-3	43.350055	-124.340027	0+50+00	0.95	16.9	-7.2	-53.2

Notes:

1. *All elevations are estimates.*

Table 3-3
Overwater Jet Probe Locations and Elevations

Exploration	Latitude	Longitude	Approxi-mate Station	Approximate River Mile	Jet Probe Penetration Elevation (ft, MLLW)	Top of Rock (Refusal) Elevation (ft, MLLW)
JP-1	43.356312	-124.349140	0+18+00	0.34	-84.2	-84.2
JP-2	43.356971	-124.348963	0+17+50	0.33	-78.9	-78.9
JP-3	43.356706	-124.347938	0+20+00	0.38	-71.1	-71.1
JP-4	43.358230	-124.348373	0+16+50	0.31	-79.9	-79.9
JP-5	43.357134	-124.344426	0+28+00	0.53	-77.9	-77.9
JP-6	43.356422	-124.342492	0+34+00	0.64	-88	N/A
JP-7	43.354069	-124.336156	1+00+00	1.00	-85.3	-85.3
JP-8a[3]	43.355124	-124.336057	0+51+00	0.97	-60.1	-60.1
JP-8b[3]	43.354830	-124.335887	0+51+50	0.98	-63.4	-63.4
JP-9	43.354053	-124.334160	1+05+00	1.09	-74.7	-74.7
JP-10	43.352222	-124.332408	1+12+00	1.23	-83.1	-83.1
JP-11a	43.352727	-124.329440	1+20+50	1.39	-73.6	-73.6
JP-11b	43.352775	-124.329574	1+20+00	1.38	-67.6	-67.6
JP-12	43.352573	-124.328873	1+21+50	1.41	-67.6	-67.6

Table 3-3
Overwater Jet Probe Locations and Elevations

Exploration	Latitude	Longitude	Approximate Station	Approximate River Mile	Jet Probe Penetration Elevation (ft, MLLW)	Top of Rock (Refusal) Elevation (ft, MLLW)
JP-13	43.415107	-124.277269	6+33+00	6.63	-90.1	N/A
JP-14	43.406235	-124.279866	6+00+00	6.00	-88.9	N/A
JP-15	43.409668	-124.279038	6+13+00	6.25	-90.3	N/A
JP-16	43.411476	-124.278186	6+19+00	6.36	-89.9	N/A
JP-17	43.411335	-124.276531	6+20+00	6.38	-88.4	-88.4
JP-18	43.414152	-124.274810	6+31+00	6.59	-85.7	-85.7
JP-19	43.355912	-124.345565	0+27+50	0.52	-69.3	-69.3
JP-20	43.355053	-124.343505	0+33+00	0.63	-53.3	-53.3
JP-21	43.356939	-124.342310	0+34+00	0.64	-88.5	N/A
JP-22	43.356090	-124.339862	0+41+00	0.78	-88.5	N/A
JP-23	43.353897	-124.331361	1+12+00	1.23	-61.5	-61.5
JP-24	43.354004	-124.328710	1+24+00	1.45	-80.1	-80.1
JP-25	43.353089	-124.328164	1+23+50	1.45	-64.7	-64.7
JP-26	43.354300	-124.325048	1+32+50	1.62	-87.5	-87.5

Table 3-3
Overwater Jet Probe Locations and Elevations

Exploration	Latitude	Longitude	Approxi-mate Station	Approximate River Mile	Jet Probe Penetration Elevation (ft, MLLW)	Top of Rock (Refusal) Elevation (ft, MLLW)
JP-27	43.353126	-124.323988	1+33+00	1.63	-77.8	-77.8
JP-28	43.355432	-124.323301	1+42+00	1.80	-87.8	-87.8
JP-29	43.354667	-124.322763	1+40+00	1.76	-87.8	-87.8
JP-30	43.418953	-124.270642	7+02+00	7.04	-79.3	-79.3
JP-31	43.420834	-124.263524	7+24+00	7.45	-70.3	-70.3
JP-32	43.422054	-124.260668	7+34+50	7.65	-85.5	-85.5
JP-33	43.351501	-124.326280	1+26+00	1.49	-64.5	-64.5
JP-34	43.351277	-124.329766	1+18+00	1.34	-55.4	-55.4
JP-35	43.355036	-124.325610	1+32+00	1.61	-81.8	N/A
JP-36	43.355572	-124.324134	1+41+00	1.78	-82.3	N/A
JP-37a	43.356738	-124.322758	1+46+00	1.87	-67.3	-67.3
JP-37b	43.356904	-124.322561	1+47+50	1.90	-67.6	-67.6
JP-38	43.351888	-124.327422	1+24+00	1.45	-67.3	-67.3
JP-39	43.352775	-124.330320	1+18+00	1.34	-85.7	N/A

Table 3-3
Overwater Jet Probe Locations and Elevations

Exploration	Latitude	Longitude	Approxi-mate Station	Approximate River Mile	Jet Probe Penetration Elevation (ft, MLLW)	Top of Rock (Refusal) Elevation (ft, MLLW)
JP-40	43.354804	-124.333786	1+05+00	1.09	-45.4	-45.4
JP-41	43.352750	-124.334677	1+05+50	1.10	-86.1	N/A
JP-42a	43.355958	-124.338232	0+45+00	0.85	-87.5	N/A
JP-42b	43.355645	-124.337964	0+46+00	0.87	-87.5	N/A
JP-43	43.357730	-124.344524	0+27+50	0.52	-88	N/A
JP-44	43.357386	-124.349140	0+16+50	0.31	-78.3	-78.3
JP-51	43.354281	-124.321742	1+40+00	1.76	-84.3	-84.3
JP-54	43.358372	-124.320869	2+01+00	2.02	-40.2	N/A
JP-56	43.354936	-124.323175	1+40+50	1.77	-84.6	N/A
JP-57	43.351695	-124.327384	1+24+00	1.45	-65.7	-65.7
JP-58	43.354415	-124.328740	1+24+00	1.45	-62.2	-62.2
JP-59	43.351672	-124.330856	1+16+00	1.30	-66.1	-66.1
JP-60	43.354367	-124.331334	1+11+50	1.22	-53.2	-53.2
JP-61	43.351713	-124.333238	1+11+00	1.21	-63.3	-63.3

Notes:

1. *All elevations are estimates.*
2. *Jet probes JP-45 through JP-50, JP- 52 and JP-53, JP-55, and JP-62 were considered “Secondary Importance/Backup” or “Supplemental As Needed” by the PDT and not completed.*
3. *Jet-probe refusal provides an approximation of top-of-rock elevation. Jet-probe explorations do not allow for descriptive or engineering characteristics of sediment or rock encountered in the explorations.*
4. *JP-8b, JP-11b, JP-37b, and JP-42b represent additional attempts at the planned locations.*
5. *Several attempts were made to complete JP-8a and JP-8b. However, these jet probes could not be completed due to ocean-swell conditions and excessive barge movement.*
6. *Jet probes were generally completed in less than 5 minutes.*

Table 3-4
Diving Exploration Location and Elevation

Exploration	Latitude	Longitude	Approximate Station	Approximate River Mile	Mudline Elevation (ft, MLLW)	Top of Rock Elevation (ft, MLLW)	Bottom of Exploration Elevation (ft, MLLW)
DE-1	43.353633	-124.339752	0+45+00	0.85	-22	-22	-23.5

Notes:

1. *All elevations are estimates.*

3.2 Soil and Rock

The following overwater subsurface explorations encountered sediment to the maximum depth of the explorations:

- Borings B-1 through B-3, B-9 through B-14, B-34, B-37, B-38, B-1-23 through B-3-23, B-7-23, and B-12-23.
- Jet probes JP-6, JP-13 through JP-16, JP-21 and JP-22, JP-35 and JP-36, JP-39, JP-41 through JP-43, JP-54, and JP-56.

The following overwater subsurface explorations encountered bedrock overlain by sediments of varying thickness:

- Borings B-4A, B-8, B-15 through B-33, B-40, B-4-23 through B-6-23, and B-8-23 through B-11-23.
- Jet probes JP-1 through JP-5, JP-7 through JP-12, JP-17 through JP-20, JP-23 through JP-34, JP-37 through JP-38, JP-40, JP-44, JP-51, and JP-57 through JP-61.

Overwater borings B-4B, B-5, B-6, B-7A, B-7B, and B-13-23 through B-15-23 encountered bedrock at the mudline. Diving exploration DE-1 also encountered bedrock at the mudline.

All three of the upland subsurface explorations encountered bedrock overlain by sediments of varying thickness.

In general, the overwater subsurface explorations indicate the presence of sediment deposits throughout the project area, with bedrock exposed at a shallow depth or at the mudline between about RM 2 and RM 6. Guano Rock is also located within the PA channel footprint, between approximately RM 0.7 and RM 0.9. The explorations completed at Guano Rock indicate bedrock is present at the mudline. The available information indicates the thickest sediment deposits exist in the channel between approximately RM 0.3 to RM 2 and RM 6 to RM 8. RM 0.3 is the approximate downstream extent of the subsurface explorations. As indicated in Section 1.0, GHD prepared an updated estimated rock-surface model for the project based on historical information, geophysical surveys, and the geotechnical subsurface explorations included as part of this GDR (see Sub-Appendix 2 – Geophysical Assessment and Reports).

The 1974 USACE investigation encountered sandstone within the PA channel between approximately RM 0.8 and RM 0.9. The sandstone was encountered at the mudline or at shallow depths within the USACE borings and described as unweathered, gray, fine to medium grained, and soft to moderately hard, although the investigation did not include rock-strength testing. The 2023 overwater borings completed at Guano Rock (B-13-23 through B-15-23) encountered bedrock at the mudline. The bedrock encountered in these borings consisted predominantly of sandstone; however, mudstone/siltstone was also encountered at shallower depths in boring B-13-23. The sandstone encountered is fresh, gray, fine-grained, very closely to moderately closely jointed, and contains shell fragments and worm castings. Rock strength testing indicates the sandstone is extremely soft to soft. The mudstone/siltstone encountered is fresh, dark gray, close to moderately closely jointed, and contains shell fragments. Rock strength testing indicates the mudstone/siltstone is extremely soft to soft.

For the purpose of discussion, the materials disclosed by the borings have been grouped into five major units based on their physical characteristics and engineering properties:

SAND

SILT

CLAY (Decomposed Bastendorff Formation)

SANDSTONE and MUDSTONE (Empire Formation)

MUDSTONE/SILTSTONE (Bastendorff Formation)

SANDSTONE (Coaledo Formation)

Laboratory testing completed on samples of each unit is provided in Appendix B. A summary of relevant engineering properties is provided below, on the boring logs, on Figures 1A through 58A, and in the Laboratory Summary, Table 1B.

SAND. Sand was encountered at the mudline in borings B-1 through B-4A, B-8 through B-34, B-38, B-40, and B-1-23 through B-12-23. Sand was encountered beneath the surficial silt in boring B-37. The total range in elevations in which sand was encountered in the overwater borings was from about -18.5 ft, the mudline elevation in boring B-6-23, to -67.5 ft, the maximum depth explored in boring B-12-23. Sand was encountered at the ground surface in upland borings UB-1 through UB-3 and extends to elevations ranging from about -7.1 ft to -30.7 ft. The sand is typically brown to gray and fine- to medium-grained and contains varying amounts of silt. In general, the sand encountered contains relatively low percentages of fine-grained material; however, zones of silty sand were encountered at depth in borings B-3-23 and B-7-23. Shell fragments and organics are present in the sand. A thin layer of sand was encountered beneath the surface of the mudstone/siltstone between about elevation -50 ft and -51 ft in boring B-11-23. Wood chips and debris were observed in the sand in boring B-3 at elevation -40.5 ft, boring B-1-23 at elevation -44.5 ft, boring B-2-23 at elevation -50.5 ft, boring B-6-23 at about elevation -23.5 ft, boring B-7-23 at about elevation -60 ft, and boring B-12-23 at about elevation -46 ft. Thin layers of peat (less than 1 in.) were observed in the sand between elevations -24 ft and -39 ft in boring B-10 and at about elevation -45 ft in boring B-1-23. The relative density of the sand ranges from very loose to very dense based on Standard Penetration Test (SPT) N-values ranging from 1 blow/ft to more than 50 blows for 6 in. or less of sampler penetration, defined as refusal. The relative density of the sand typically increases with depth. The natural moisture content of the sand ranges from about 13 to 50%.

SILT. Silt was encountered at the mudline in boring B-37 and beneath the sand in borings B-2 and B-3. The silt extends to elevations varying from about -41 ft to at least -61.5 ft, the maximum depth explored in boring B-3. The silt is typically gray to brown and contains varying amounts of clay and sand. The silt in boring B-3 contains abundant wood debris, including an 18-in.-thick solid piece of wood at elevation -49.0 ft. The relative consistency of the silt ranges from soft to very stiff based on SPT N-values ranging from 3 blows/ft to 30 blows/ft; however, the presence of wood in the silt in boring B-3 likely resulted in the higher blow count. Based on additional and more recent explorations in the area, the silt noted in boring B-3 is likely residual Bastendorff Formation. The natural moisture content of the silt ranges from about 43% to 71%. Moisture contents above about 50% are typically associated with relatively high clay content (some clay to clayey) and/or the presence of organics. Atterberg limits testing of a representative sample of silt from boring B-2 indicates the soil has a liquid limit of 93% and a plasticity index of 40%. With the exception of relatively thin interbedded layers within the larger sand unit and residual Bastendorff Formation described above, silt was not encountered in any of the upland borings or the overwater borings completed in 2023.

CLAY (Decomposed Bastendorff Formation). Clay was encountered beneath the sand in boring B-7-23. The clay extends from about elevation -65.5 ft to at least about elevation -71 ft, the maximum depth explored in boring B-7-23. The clay is typically dark brown, contains trace amounts of silt and fine- to medium-grained sand, and scattered organics. The relative consistency of the clay is very stiff to hard based on SPT N-values ranging from 18 blows/ft to 51 blows/ft. The natural moisture content of the clay was about 60%. Atterberg limits testing of a representative sample indicates the clay is of high plasticity with a liquid limit of about 76% and a plasticity index of about 45%.

SANDSTONE AND MUDSTONE (Empire Formation). Sandstone of the Empire Formation was encountered below the sand in borings B-8, B-24 through B-33, B-40, and UB-1 through UB-3, below mudstone in boring B-13-23, and at the mudline in borings B-6, B-7A, B-7B, B-14-23, and B-15-23. Diving exploration DE-1 also encountered sandstone of the Empire Formation at the mudline. The sandstone is typically gray to dark gray, fresh, extremely soft to soft, and very close to widely fractured with horizontal to inclined jointing. Sandstone was the predominant Empire Formation unit we encountered and appears to be massive based on our observations during drilling. Mudstone of the Empire Formation was also encountered at the mudline in boring B-13-23 near Guano Rock. The mudstone is typically dark gray, fresh, extremely soft to soft, blocky, and close to moderately closely fractured. Numerous samples of the Empire Formation contain marine shell fossils. The unconfined compressive strength and dry unit weight of the Empire Formation samples generally range from 23 to 1,816 pounds per square inch (psi) and 90 to 127 pounds per cubic foot (pcf), respectively. One sample obtained at an elevation of approximately -35 ft in upland boring UB-1 has a significantly higher unconfined compressive strength and dry unit weight of 6,673 psi and 132 pcf, respectively. Core recovery and RDQ ranged from 0% to 100%.

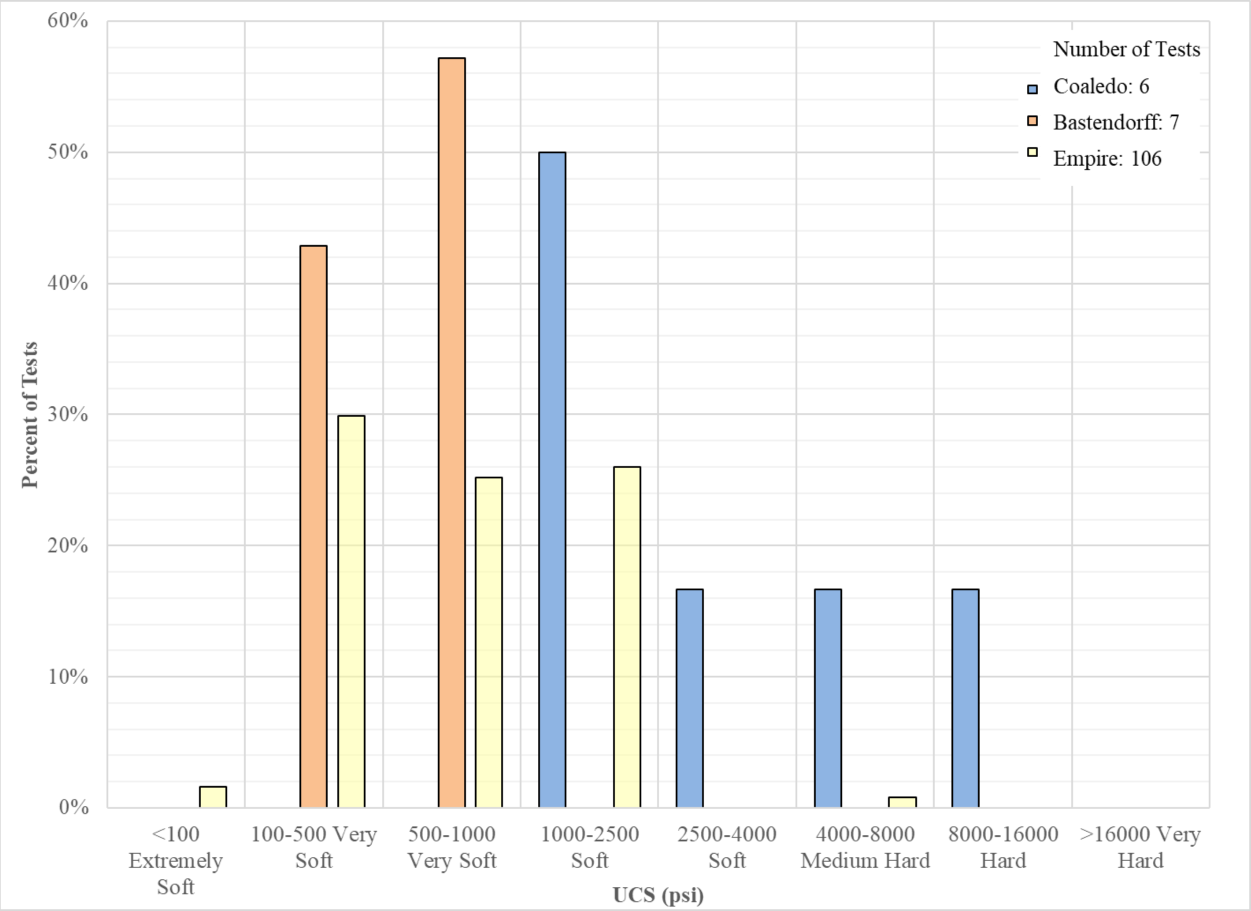
MUDSTONE/SILTSTONE (Bastendorff Formation). Mudstone/siltstone of the Bastendorff Formation was encountered below the sand in borings B-4A, B-16 through B-23, B-5-23, B-6-23, B-8-23 through B-11-23, and at the mudline in borings B-4B and B-5. The mudstone/siltstone is typically dark gray, fresh, extremely soft to very soft, and very closely to moderately closely fractured with horizontal to nearly vertical jointing and inclined bedding. The Bastendorff Formation occurs as siltstone and sandstone in an interbedded structure in boring B-5. Several samples of the Bastendorff Formation contain marine shell fossils. The unconfined compressive strength and dry unit weight of the Bastendorff Formation samples range from 180 psi to 912 psi and 94 pcf to 117 pcf, respectively. Core recovery ranged from 10% to 100%, and RQD ranged from 0% to 100%.

It should be noted that the Bastendorff Formation is described as Siltstone for the borings completed prior to 2023 and as Siltstone/Mudstone in the borings completed in 2023, where additional laboratory testing indicated the range of materials present. Additional discussion related to the use of these terms is provided in Section 4.0, Discussion.

SANDSTONE (Coaledo Formation). Sandstone of the Coaledo Formation was encountered below the sand in borings B-15 and B-4-23. Sandstone encountered at B-4-23 was embedded in the mudstone/siltstone. It should be noted that boring B-4-23 was completed near the estimated contact between the Bastendorff and Coaledo Formations at about RM 5.85. The sandstone encountered in boring B-4-23 appeared to be soft to medium hard, which is generally consistent with that observed in nearby boring B-15. The sandstone is typically gray, fresh, soft to hard, and closely to widely fractured with inclined jointing. Several samples of the Coaledo Formation contain marine shell fossils. The unconfined compressive strength and dry unit weight of the Coaledo Formation samples range from 1,150 psi to 11,361 psi and 124 pcf to 149 pcf, respectively. Core recovery was 100%, and Rock Quality Designation (RQD) ranged from 95% to 100%.

Charts 3-1 and 3-2 present a summary of Unconfined Compressive Strength (UCS) and RQD for the various rock formations encountered by our subsurface explorations. As shown on Chart 3-1, the Very Soft and Soft rock hardness categories were subdivided to better display the distribution of rock hardness within each rock formation. It should be noted that the UCS test can only be completed on rock cores of sufficient length and competency. Consequently, the extremely soft rock encountered by our subsurface explorations in the Empire and Bastendorff formations is not generally represented in Chart 3-1. The RQD values presented in Chart 3-2 encompass all rock coring completed for the project.

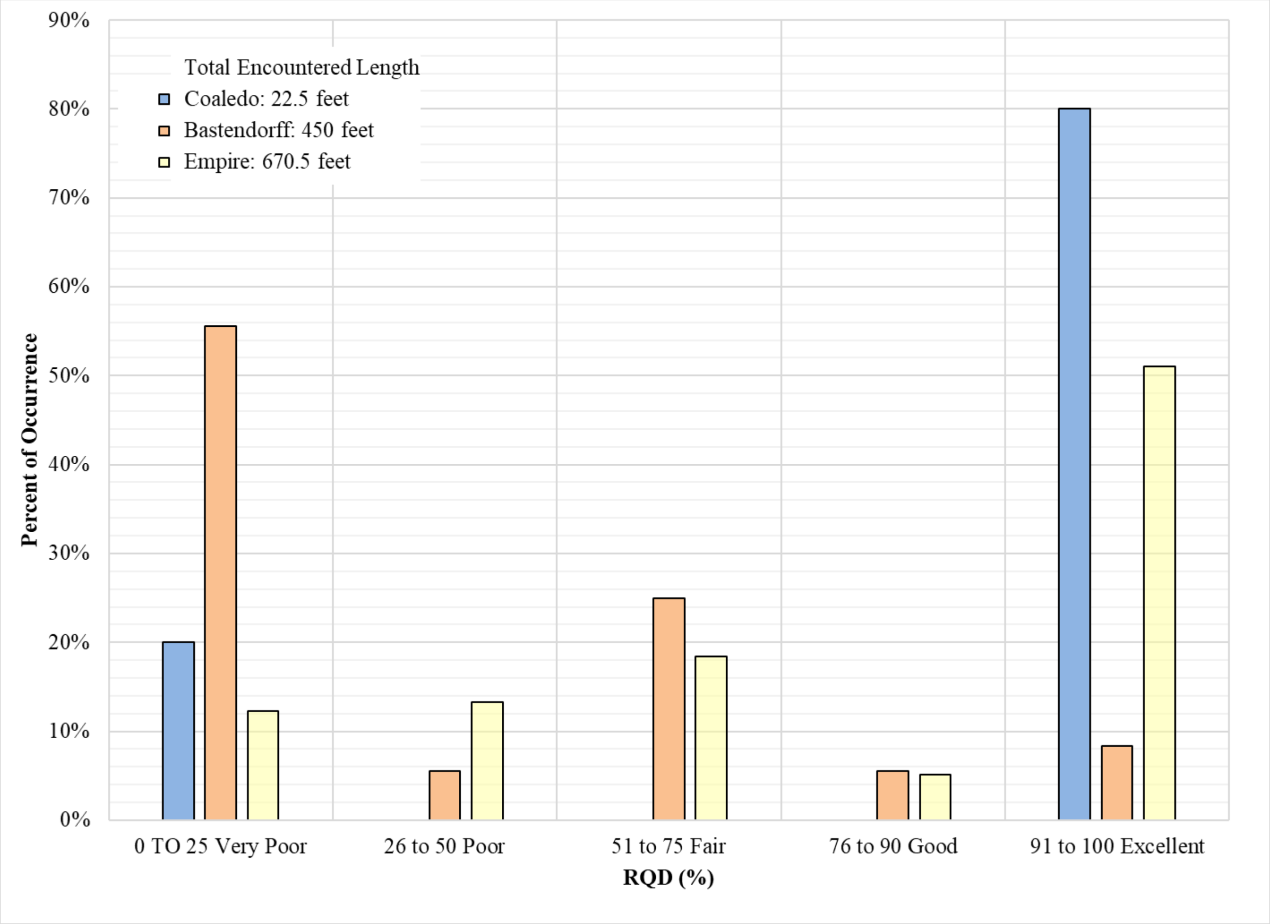
Chart 3-1
Histogram of UCS Values for Coaledo Sandstone, Bastendorff Siltstone, and Empire Sandstone Formations



Notes:

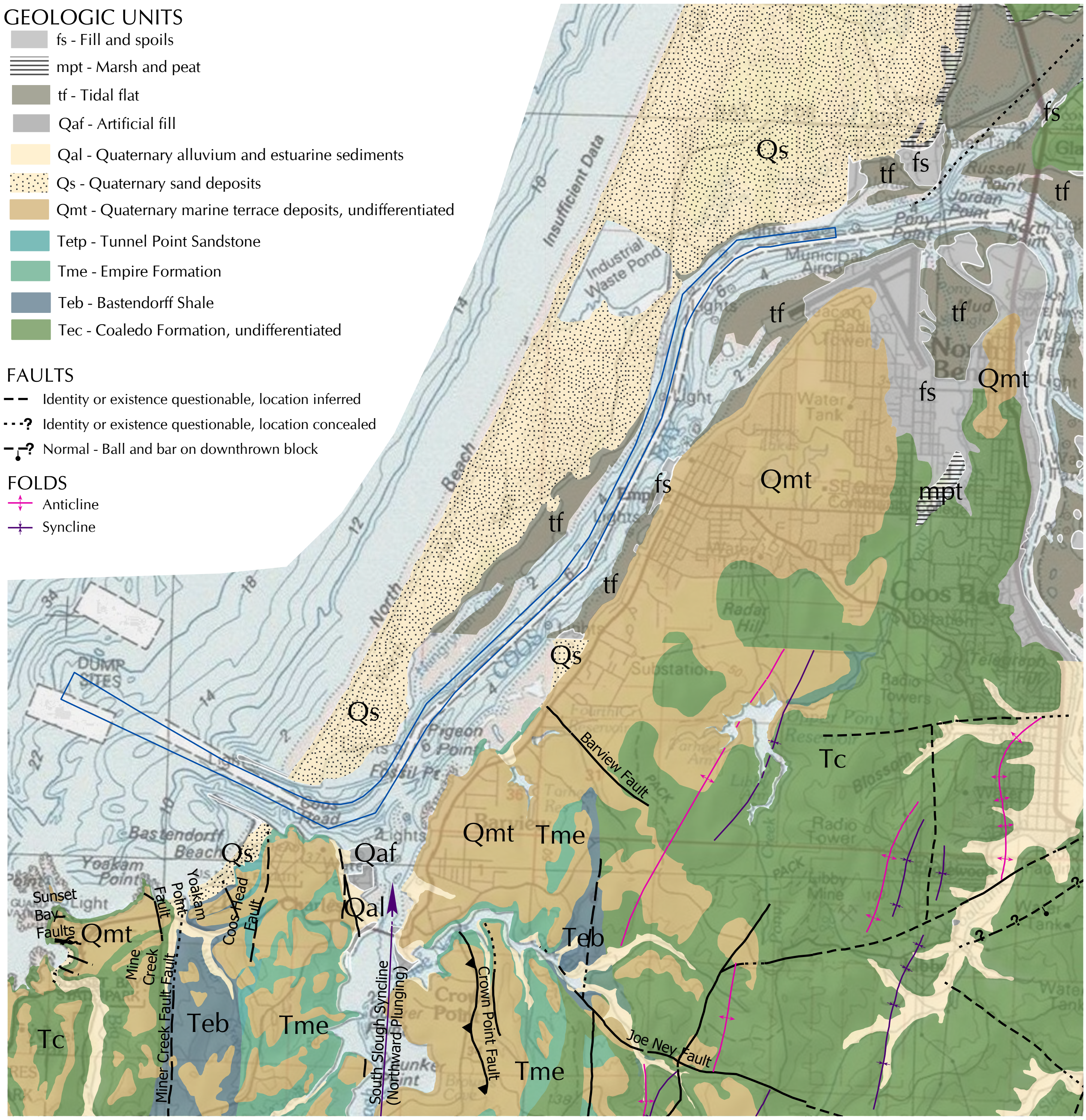
1. *The UCS test can only be completed on rock core of sufficient length and competency.*

Chart 3-2
Histogram of RQD Values for Coaledo Sandstone, Bastendorff Siltstone, and Empire Sandstone Formations



Notes:

1. *The percentage of occurrence is relative to the length of rock core drilled for each formation represented in Chart 3-2, not to the total length of rock core drilled during the subsurface exploration programs.*



Modified from Oregon Geologic Database Compilation OGDC Version 6

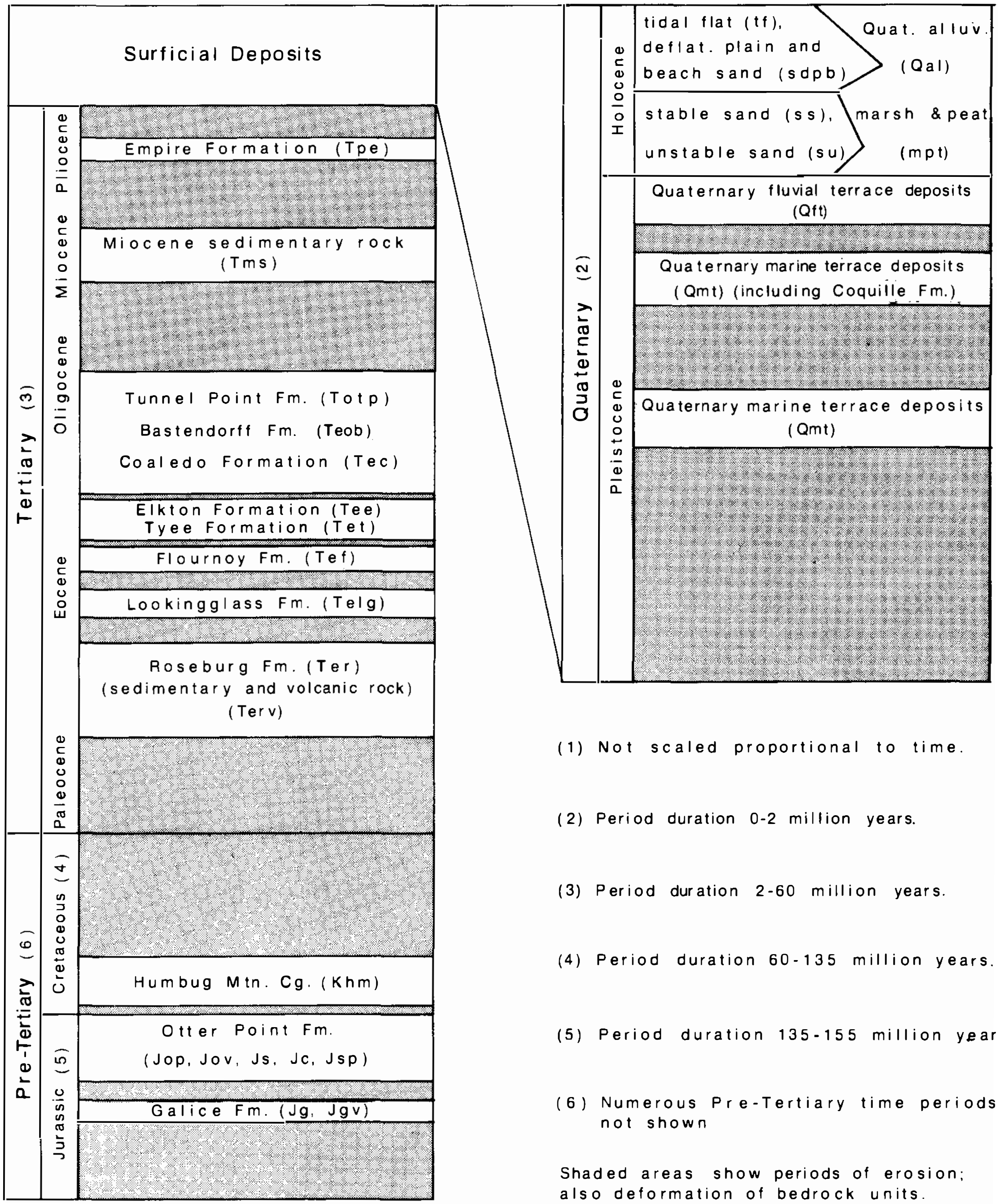
APPROXIMATE EXTENT OF PROPOSED ALTERATION (PA)

North

0 6,000 12,000 FT

1. THE LOCATIONS OF ALL FEATURES SHOWN ARE APPROXIMATE.
2. THIS DRAWING IS FOR INFORMATION PURPOSES. IT IS INTENDED TO ASSIST IN SHOWING FEATURES DISCUSSED IN AN ATTACHED DOCUMENT. GRI CANNOT GUARANTEE THE ACCURACY AND CONTENT OF ELECTRONIC FILES. THE MASTER FILE IS STORED BY GRI AND WILL SERVE AS THE OFFICIAL RECORD OF THIS COMMUNICATION.

Figure 3-0: Regional Geologic Map



(1) Not scaled proportional to time.

(2) Period duration 0-2 million years.

(3) Period duration 2-60 million years.

(4) Period duration 60-135 million years.

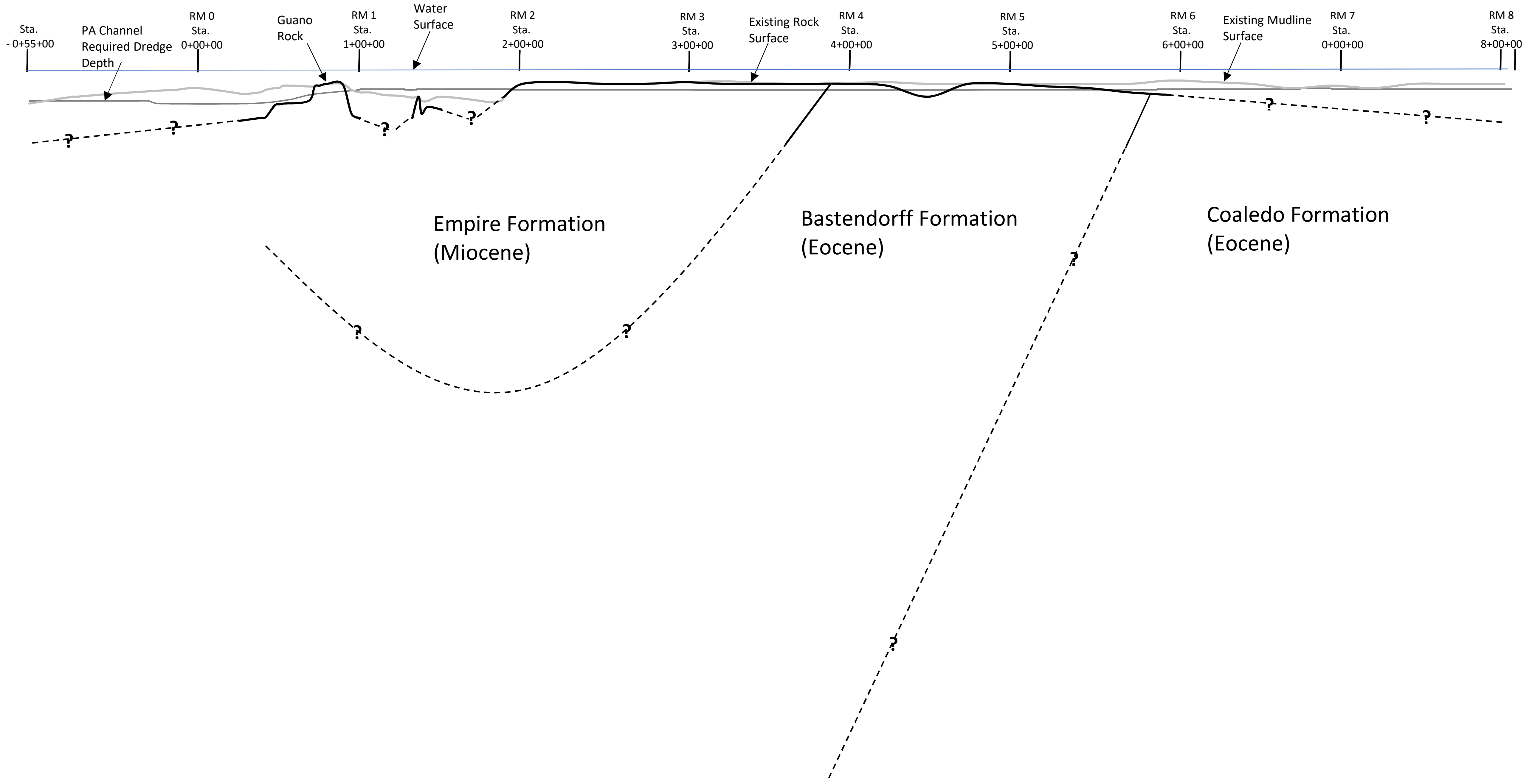
(5) Period duration 135-155 million years.

(6) Numerous Pre-Tertiary time periods not shown

Shaded areas show periods of erosion; also deformation of bedrock units.

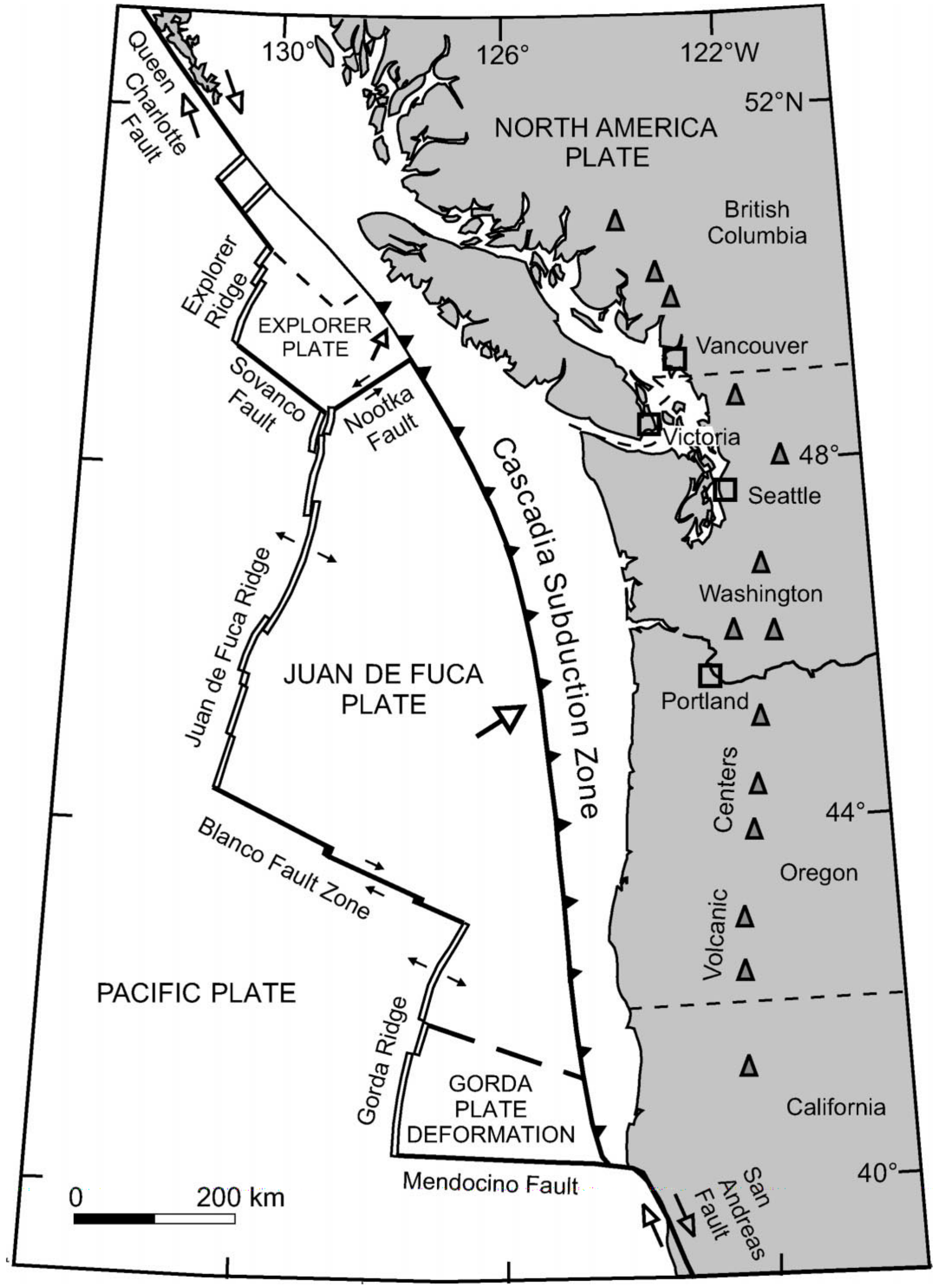
TAKEN FROM: BEAULIEU AND HUGHES, 1975

Figure 4-0: Stratigraphic Column Of Geologic Units



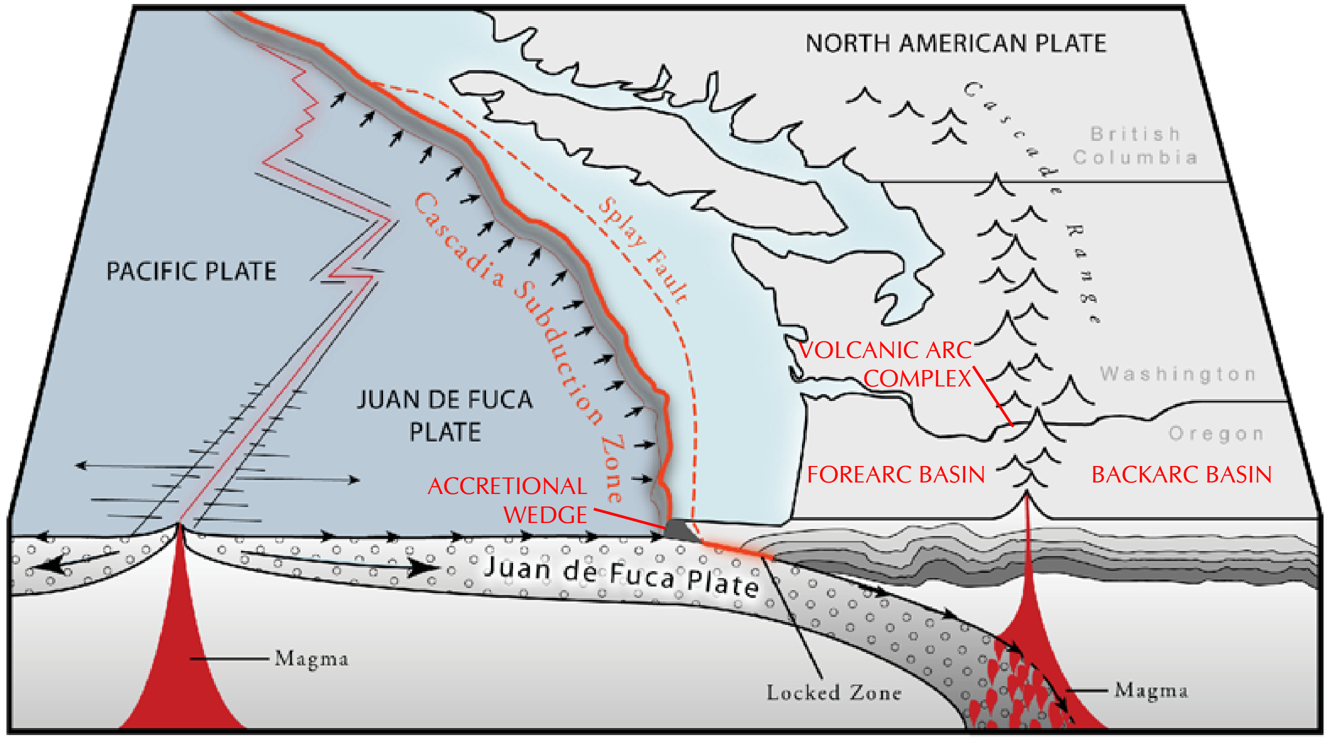
NOTES
1. NOT TO SCALE.
2. THIS FIGURE IS FOR ILLUSTRATIVE PURPOSES ONLY. THE LOCATIONS OF ALL FEATURES SHOWN ARE APPROXIMATE.
3. THIS DRAWING IS FOR INFORMATION PURPOSES. IT IS INTENDED TO ASSIST IN SHOWING FEATURES DISCUSSED IN AN ATTACHED DOCUMENT. GRI CANNOT GUARANTEE THE ACCURACY AND CONTENT OF ELECTRONIC FILES. THE MASTER FILE IS STORED BY GRI AND WILL SERVE AS THE OFFICIAL RECORD OF THIS COMMUNICATION.

Figure 5-0: Schematic Geologic Cross Section, PA Channel Centerline



A) TECTONIC MAP OF PACIFIC NORTHWEST, SHOWING ORIENTATION AND EXTENT OF CASCADIA SUBDUCTION ZONE (MODIFIED FROM WANG, K., AND OTHERS, 1994)

Cascadia Subduction Zone Setting



MODIFIED FROM
CASCADIA SUBDUCTION ZONE SETTING, TSUNAMI INUNDATION MAPS, OREGON DEPARTMENT OF GEOLOGY AND MINERAL INDUSTRY, 2013

Figure 6-0: Tectonic Setting Summary

4. DISCUSSION

In general, the recent explorations disclosed subsurface conditions similar to previous exploration programs. Exceptions were encountered in upland boring UB-1 and previous overwater boring B-15, where substantially harder rock was encountered. The harder material encountered in UB-1 is likely associated with a lens (< 1 ft thick) of strongly cemented material. The harder material in B-15 is associated with the Coaledo Formation and was coarser grained and more strongly cemented at the location of the boring compared to the adjacent geologic formation. Relatively hard sandstone was also encountered at depth in boring B-4-23, which was also completed in Coaledo Formation near B-15.

Previous investigations completed by the USACE in 1974 and 1994 described fine-grained rock of the Bastendorff Formation as either claystone, claystone/mudstone, or claystone/siltstone; however, the Port described the same fine-grained rock as siltstone. The Port is using the term siltstone to describe the fine-grained sedimentary rocks within the project area; however, the reader should be aware that variability, as well as fine-grained sedimentary rocks with clay-sized to coarse-grained, sand-size particles, will be encountered. Specifically, the majority of the explorations used the term siltstone to describe claystone, mudstone, and siltstone. However, for the 2023 to 2024 exploration program, where substantial additional explorations and laboratory testing were completed in the Bastendorff Formation, the Mudstone/Siltstone designation was used.

The 1974 USACE investigation approximated the contact between the Bastendorff and Empire formations at RM 3; however, based on our observations during drilling and our interpretation of available geologic information, the contact is estimated to be near RM 4. Additionally, the 1974 USACE investigation approximated the contact between the Bastendorff and Coaledo formations at RM 5; however, based on our observations during drilling and interpretation of available geologic information, the contact is estimated to be near RM 6. Wood debris was also encountered in borings B-3, B-6-23, and B-7-23 in the Bastendorff Formation.

5. LIMITATIONS

This data report has been prepared by GRI to assist the OIPCB in the design and evaluation of this project. The scope is limited to the specific project location described herein. The findings submitted in this report are based on the data obtained from the subsurface explorations made at the locations indicated on the Exploration Site Plans and other sources of information discussed in this report. In the performance of subsurface investigations, specific information is obtained at specific locations at specific times. However, it is acknowledged that variations in soil and rock conditions may exist between subsurface exploration locations. This report does not reflect any variations that may occur between these subsurface explorations.

6. REFERENCES

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APPENDIX A: OIPCB Field Explorations

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A-1.0 FIELD EXPLORATIONS

The subsurface exploration programs for this project were completed during six separate mobilizations. The first mobilization occurred between September 8 and 17, 2010. Subsequent mobilizations were completed as funding for the project was available and the project design advanced. The second and third mobilizations occurred between July 14 and August 12, 2016, and between October 31 and November 3, 2016, respectively. The purpose of the second and third mobilizations was to complete additional overwater borings to further supplement previous geotechnical and geophysical exploration programs and further evaluate the strength and material characteristics of rock and overlying materials located within the proposed dredge prism. The fourth mobilization occurred between March 22 and April 21, 2017. The purpose of the fourth mobilization was to complete jet-probe explorations to further supplement geophysical and subsurface explorations and further support further development of the sediment and rock surface within the channel. The fifth mobilization occurred between October 25 and 27, 2017. The primary purpose of the fifth mobilization was to help evaluate the strength and material characteristics of rock at Guano Rock. The sixth mobilization occurred between October 2nd and November 7th 2023. The primary purpose of the sixth mobilization was to help evaluate the strength and material characteristics of rock at Guano Rock as well as materials further upriver in the proposed turning basin near Empire and other areas.

Subsurface materials and conditions within the project area were investigated with overwater, upland, and diving explorations. The overwater subsurface explorations included 54 overwater borings and 56 jet probes. The overwater borings were designated as B-1 through B-3, B-4A, B-4B, B-5, B-6, B-7A, B-7B, B-8 through B-34, B-37, B-38, and B-40. Borings B-35, B-36, and B-39 could not be completed due to the amount of ocean swell at these locations. The 2023 overwater explorations, completed using a hydraulic jack-up barge, are designated B-1-23 through B-15-23. The jet probes were designated as JP-1 through JP-44, JP-51, JP-54, and JP-56 through JP-61. Jet probes JP-45 through JP-50, JP-52, JP-53, JP-55, and JP-62 were considered “Secondary Importance/Backup” or “Supplemental As Needed” by the PDT and were not completed. The upland subsurface explorations included three borings designated as UB-1 through UB-3. The diving exploration was designated as DE-1.

A-1.1 Overwater Borings

The overwater borings were observed and documented by a member of GRI’s geotechnical engineering staff, who maintained a detailed log of the materials encountered during the course of the work.

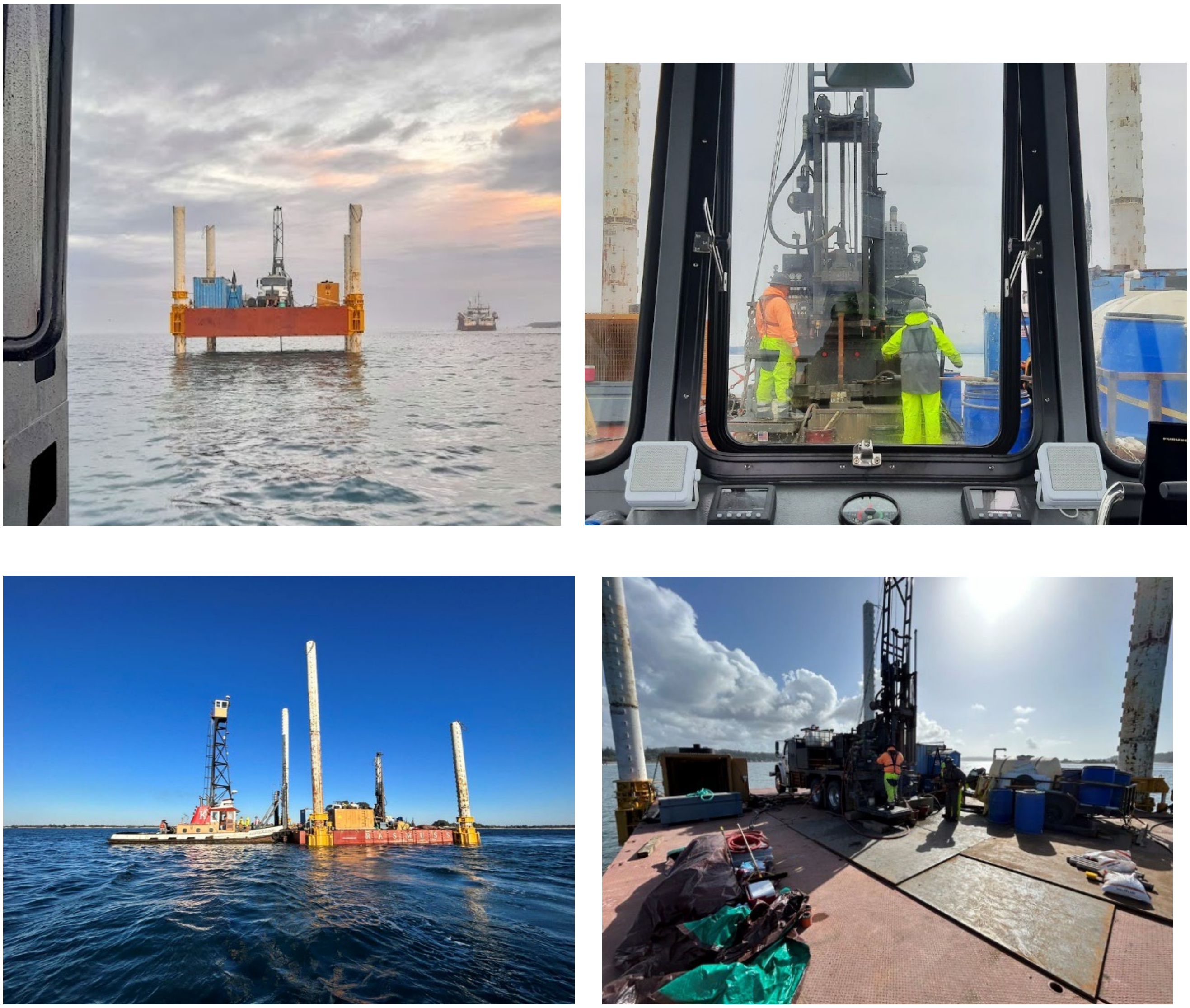
Hardcore Drilling of Dundee, Oregon, completed the overwater borings during the 2010 and 2016 drilling operations using a truck-mounted CME 55 or CME 75 drill rig. The borings were advanced to depths of 6.5 ft to 42 ft below the existing mudline using mud-rotary or HQ rock-coring techniques. The depths of the borings were developed to coincide with an elevation of approximately 5 ft below the Maximum Allowable Overdepth. The spud barge and tugboat were provided and operated by Knutson Towboat of Coos Bay, Oregon. The barges for the two separate mobilizations measured between approximately 103 ft and 112 ft long and were 39 ft wide, 6 ft to 9 ft deep, and equipped with three 20-in.-diameter, steel pipe-pile spuds about 60 ft long. The pipe-pile spuds were mounted in three corners of the barge to stabilize the barge in the desired locations during drilling. Drilling was completed off the back of the barge, with the operators working from a platform with a safety-rail system. Photographs taken during the 2010 and 2016 drilling operations are provided below. A Trimble handheld GPS unit, physical soundings, and bathymetric maps were used to locate the proposed boring locations.

Western States Soil Conservation, Inc. (WSSC) of Hubbard, Oregon, completed the 2023 overwater borings using a truck-mounted CME 75 drill rig. The borings were advanced to depths ranging from about 21 ft to 42 ft below mudline using mud-rotary or HQ rock-coring techniques. The depths of the borings were developed to target an elevation of at least 5 ft below the Maximum Allowable Overdepth. The hydraulic jack-up spud barge and tugboat were provided and operated by West Coast Contractors (WCC) of Coos Bay, Oregon.

The Flexifloat S-40 raft barge used for the 2023 mobilization measured approximately 60 ft long by 40 ft wide and was equipped with four jack leg spuds with total length between about 84 ft and 89 ft. The jack leg spuds were maneuvered up or down using hydraulic actuators located at each corner of the barge. The spuds were able to moved up and in approximately 2-foot increments in order to maintain stability of the platform. The use of a jack-up barge allowed drilling operations to take place near the mouth of the channel, where difficult weather, tide, and swell conditions are common. This allowed for the collection of samples at Guano Rock, where previous attempts using a floating barge had failed. Drilling from the jack-up barge was completed through a moon pool, or open hole, through the Flexifloat barge. Photographs taken during the 2023 drilling operations are provided below. A Trimble handheld GPS unit, physical soundings, and bathymetric maps were used to locate the proposed boring locations in 2023.

2010 Drilling Operations

2016 Drilling Operations



2023 Drilling Operations

When drilling in sand and silt using mud-rotary techniques, disturbed samples were obtained from the borings at 2.5- to 5-ft intervals of depth using a standard split-spoon sampler. At the time of sampling, the Standard Penetration Test (SPT) was conducted. This test consists of driving a standard split-spoon sampler into the soil a distance of 18 in. using a 140-pound (lb) hammer dropped from a height of 30 in. The number of blows required to drive the sampler the last 12 in. is known as the standard penetration resistance, or SPT N-value. SPT N-values provide a measure of the relative density of granular soils, such as sand, and the relative consistency, or stiffness, of cohesive soils, such as silt. The soil samples obtained in the split-spoon sampler were classified in the field, and selected portions were saved in airtight jars and bags for further examination and physical testing in GRI’s laboratory.

When drilling in sandstone and mudstone/siltstone bedrock using HQ coring techniques, core samples were classified and photographed in the field prior to being sealed in core boxes and returned to GRI's laboratories. Further rock testing was completed at external laboratories. For rock sampled during the 2010 and 2015 drilling operations, rock samples were sent to Cooper Testing Labs in McMinnville, Oregon. For the 2023 drilling operations, core samples were sent to Intertek PSI Portland Lab in Portland, Oregon, and GeoTesting Express, LLC lab in Acton, Massachusetts.

Logs of the overwater borings are provided on Figures 1A through 39A and 43A through 58A. Each log provides a description of the various materials encountered in the boring and notes the depths at which the materials and/or characteristics of the materials change. To the right of the descriptive summary, the numbers and types of samples taken during the drilling operation are indicated. Farther to the right, SPT N-values, fractures per ft, sample recovery, and rock quality designation (RQD) are shown graphically, along with pertinent laboratory testing results. The terms used to describe the materials encountered in the borings are defined in Tables 1A and 2A.

Core-sample photographs are provided after the boring logs.

A-1.1.1 Comments on Mudline and Rock Elevations

The mudline elevations reported herein for the geotechnical borings should be considered approximate and were developed using the following methodology:

1. Tidal-water level elevations were taken from the National Oceanic and Atmospheric Administration (NOAA) Tide Prediction tables for the nearest Coos Bay tidal station (e.g., Charleston, Sitka Dock, Empire).
2. The tidal-water level elevations were corrected for time of day and distance of the drilling operations from the tidal station.
3. A GRI field representative took several depth soundings from the barge deck to mudline at the location of the drilling equipment.
4. The distance from the barge deck to the water was subtracted from the depth taken in Step 3. This final depth was the depth from water level to mudline.
5. The depth noted in Step 4 was subtracted from the elevation noted in Step 1, which resulted in the approximate mudline elevation for the borings.
6. Observed and predicted tidal-water elevation data are provided by NOAA for the Charleston tidal station. Where applicable, the elevation noted in Step 2 was corrected for differences between observed and predicted tidal-water elevations.

The vertical uncertainty of elevations associated with the preceding procedure is estimated to be approximately +/- 1 ft.

David Evans and Associates, Inc., (DEA) completed more-detailed GPS surveying for the jet-probe explorations, discussed separately (see Sub-Appendix 2 – Geophysical Assessment and Reports).

A-1.1.2 Comments on Drilling Conditions

In some cases, the boreholes were not advanced to the desired depths due to tidal conditions or excessive barge movement. For example, during the 2010 exploration program, boring B-7A could not be drilled to the desired depth/elevation due to large ocean swells and excessive barge movement. The barge was then moved, and boring B-7B was drilled to complete the exploration to the target drilling elevation. Several attempts were made to drill boring B-9, but severe ocean swells prevented the driller from advancing below elevation -34.5 ft. Three potential borings (B-35, B-36, and B-39) were attempted during the 2016 drilling effort but not completed due to ocean swells and excessive barge movement. Conversations with Knutson Towboat indicate the conditions during the period these borings were attempted were very favorable. After the 2016 drilling efforts, GRI provided scoping documents for a jack-up barge, subfloor drill, or other exploration techniques to increase the likelihood of completing borings near the mouth of the channel. During the 2023 drilling efforts, a total of three explorations were able to be completed successfully from a jack-up barge near the entrance of the bay at Guano Rock. It should be noted that ideal swell conditions were still necessary to complete the explorations at Guano Rock with the jack-up barge configuration utilized. The duration to complete explorations is also impacted by the ability to set and pull drill casing, which is typically not possible except in slack tide conditions due to strong currents in the bay.

A-1.2 Upland Borings

The upland borings were observed and documented by a member of GRI's geotechnical engineering staff, who maintained a detailed log of the materials encountered during the course of the work.

Hardcore Drilling of Dundee, Oregon, completed the upland borings using a track-mounted CME 55 drill rig. The borings were advanced to depths of 70 ft to 79 ft below the existing ground surface using mud-rotary or HQ rock-coring techniques. The depths of the borings were developed to coincide with an elevation of approximately 5 ft below the Maximum Allowable Overdepth presented in the Moffatt & Nichol 30% design submittal. Photographs taken during the 2016 drilling operations are provided below. A Garmin handheld GPS unit was used to locate the proposed boring locations.

2016 Drilling Operations

When drilling in sand and silt using mud-rotary techniques, disturbed samples were obtained from the borings at 2.5- to 5-ft intervals of depth using a standard split-spoon sampler. At the time of sampling, the SPT was conducted as previously described in Section A-1.1 of this appendix. The soil samples obtained in the split-spoon sampler were classified in the field, and representative portions were saved in airtight jars for further examination and physical testing in GRI's laboratory.

When drilling in sandstone bedrock using HQ coring techniques, core samples were classified and photographed in the field prior to being sealed in core boxes and returned to either GRI's Beaverton, Oregon, laboratory or Cooper Testing Labs' McMinnville, Oregon, laboratory for further examination and physical testing.

Logs of the upland borings are provided on Figures 40A through 42A. Each log provides a description of the various materials encountered in the boring and notes the depths at which the materials and/or characteristics of the materials change. To the right of the descriptive summary, the numbers and types of samples taken during the drilling operation are indicated. Farther to the right, SPT N-values, fractures per foot, sample recovery, and RQD are shown graphically, along with pertinent laboratory testing results. The terms used to describe the materials encountered in the borings are defined in Tables 1A and 2A.

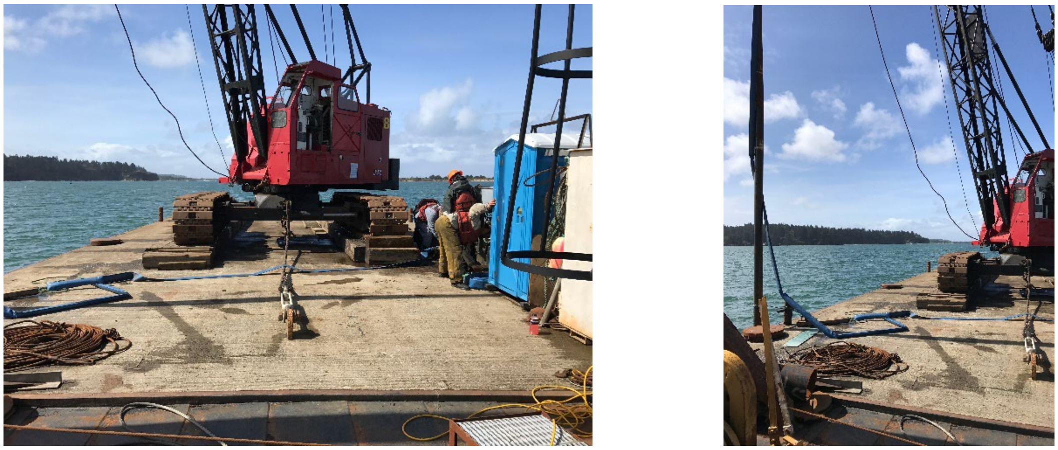
The elevation of the ground surface at the location of each boring was approximated using elevation data from the 2010-2011 U. S. Army Corps of Engineers (USACE) Joint Airborne Light Detection and Ranging (LiDAR) Bathymetry Technical Center of Expertise (JALBTCX) for the vicinity of the upland borings.

Core-sample photographs are provided after the boring logs.

A-1.3 Jet Probes

The jet-probe explorations were surveyed by a marine surveyor from DEA and observed and documented by a member of GRI's geotechnical engineering staff. Data collected as part of the jet-probe explorations are included in Table 3-3.

The jet-probe process used a stream of pressurized water directed downward through a steel pipe to allow the steel pipe probe to sink into the alluvial sediment to the top of rock, where it was present. The jet-probe equipment was suspended from a barge-mounted crane. The barge, tugboat, crane, and jet probe were provided and operated by Knutson Towboat Company (Knutson) of Coos Bay, Oregon. The barge measured approximately 108 ft long and 32 ft wide. The tugboat measured approximately 54 ft long and 22 ft wide. The 90-ft-long, 6-in.-diameter jet probe was moved and operated with a 30-ton crane with a 100-ft-long boom. The weight of the jet probe was approximately 1,800 lbs empty. At locations between about River Mile (RM) 0 and RM 2, the barge generally utilized the tug to maintain position of the barge at the jet-probe locations. Upstream of about RM 2, the barge generally utilized spuds to maintain position of the barge at the jet-probe locations. Photographs taken during the 2017 jet-probe operations are provided below.



2017 Jet Probe Operations

The following is a general description of the sequence of work to complete the jet probes:

1. DEA personnel were responsible for helping Knutson navigate to the proposed jet-probe locations for surveying the final location of the jet probes and surveying the elevations of jet-probe refusal or elevation of full penetration without reaching refusal. DEA fixed a GPS antenna to the top of crane boom to measure the horizontal location of the jet probes. The elevations of the jet probes were measured through a combination of instrumentation and utilizing markers every 1 ft along the shaft of the jet probe. Additional instrumentation and monitoring equipment were located throughout the barge and tugboat to further aid DEA's navigation and survey work.
2. Once the jet-probe apparatus was positioned at the desired location, the probe was slowly lowered by the crane to the top of the water and then at a constant rate to the mudline. The mudline was estimated by a slower rate of penetration of the jet probe into the mudline than through the water column. The probe was then raised several feet above the mudline to ensure the nozzle was not blocked, and the water pump was switched on. The water pressure varied between about 75 psi and 100 psi to penetrate the sediment.
3. The probe was lowered by the crane until refusal was obtained. Upon reaching refusal, the jet-probe apparatus was raised and lowered 1 ft to 2 ft several times, and further penetration was attempted. If further penetration was not observed, the final depth was recorded. Following refusal, the jet-probe apparatus was raised about 1 ft and the water pressure was increased to full-pump capacity to confirm refusal.

A-1.4 Diving Exploration

The diving exploration was observed and documented by a member of GRI's geotechnical engineering staff, who maintained a detailed log of the materials encountered during the course of the work.

Global Diving and Salvage, Inc., (Global) of Seattle, Washington, completed the diving exploration with a hydraulically driven, diver-operated chisel. All work was conducted from an approximately 76-ft-long chartered research vessel operated by Miss Linda Boat Charters of Coos Bay, Oregon. The vessel maintained position through an anchor spread. It should be noted that the diving exploration was planned to be completed using rock-coring techniques with a hydraulically driven, diver-operated core drill to a maximum depth of approximately 9 ft below mudline elevation. However, limited slack-tide window durations, highly variable water-current direction and associated excessive movement of the vessel, and difficulty setting rock anchors for the core-drill base plate did not allow for completion of the exploration as planned.

The exploration was advanced to a depth of approximately 1.5 ft below the existing mudline. GPS equipment on the Miss Linda Boat Charters vessel was used to locate the proposed exploration location. When excavating the diving exploration, grab samples were obtained at continuous intervals to the total depth explored. The samples were classified in the field before being placed in a container and returned to GRI's Beaverton, Oregon, laboratory for further examination and physical testing.

2017 Diving Exploration Operations

A log of the diving exploration is provided on Figure 59A. The log provides a description of the various materials encountered in the exploration and notes the depths at which the materials and/or characteristics of the materials change. To the right of the descriptive summary, the numbers and types of samples taken during the drilling operation are indicated. The terms used to describe the materials encountered in the borings are defined in Table 2A.

Table 1A
Guidelines for Classification of Soils
Description of Relative Density for Granular Soil[3]

Relative Density	Standard Penetration Resistance (N-values) blows per ft
Very Loose	0 – 4
Loose	4 – 10
Medium Dense	10 – 30
Dense	30 – 50
Very Dense	over 50

Description of Consistency for Fine-Grained (Cohesive) Soil

Consistency	Standard Penetration Resistance (N-values) blows per ft	Torvane or Undrained Shear Strength, tsf
Very Soft	0 – 2	less than 0.125
Soft	2 – 4	0.125 – 0.25

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[3] *Oregon Department of Transportation (ODOT) – Highway Division, 1987, Soil and Rock Classification Manual. Accessed: ftp://ftp.odot.state.or.us/techserv/Geo-Environmental/Geotech/Manuals/Soil_Rock_Classification_Manual.pdf*

Description of Consistency for Fine-Grained (Cohesive) Soil

Consistency	Standard Penetration Resistance (N-values) blows per ft	Torvane or Undrained Shear Strength, tsf
Medium Stiff	4 – 8	0.25 – 0.50
Stiff	8 – 15	0.50 – 1.0
Very Stiff	15 – 30	1.0 – 2.0
Hard	over 30	over 2.0

Sandy silt materials which exhibit general properties of granular soils are given relative density description.

Grain-Size Classification	Modifier for Subclassification	
Boulders		Percentage of Other Material In Total Sample
12 – 36 in.	Adjective	
Cobbles		
3 – 12 in.	clean	0 – 2
	trace	2 – 10
Gravel	some	10 – 30
1/4 – 3/4 in. (fine)	sandy, silty,	
3/4 – 3 in. (coarse)	clayey, etc.	30 – 50
Sand		
No. 200 – No. 40 sieve (fine)		
No. 40 – No. 10 sieve (medium)		
No. 10 – No. 4 sieve (coarse)		
Silt/Clay – pass No. 200 sieve		

Table 2A
Guidelines for Classification of Rock[4]

Relative Rock Weathering Scale

Term	Field Identification
Fresh	Crystals are bright. Discontinuities may show some minor surface staining. No discoloration in rock fabric.
Slightly Weathered	Rock mass is generally fresh. Discontinuities are stained and may contain clay. Some discoloration in rock fabric. Decomposition extends up to 1 inch into rock.
Moderately Weathered	Rock mass is decomposed 50% or less. Significant portions of rock show discoloration and weathering effects. Crystals are dull and show visible chemical alteration. Discontinuities are stained and may contain secondary mineral deposits.
Predominantly Decomposed	Rock mass is more than 50% decomposed. Rock can be excavated with geologist's pick. All discontinuities exhibit secondary mineralization. Complete discoloration of rock fabric. Surface of core is friable and usually pitted due to washing out of highly altered minerals by drilling water.
Decomposed	Rock mass is completely decomposed. Original rock "fabric" may be evident. May be reduced to soil with hand pressure.

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[4] *Oregon Department of Transportation (ODOT) – Highway Division, 1987, Soil and Rock Classification Manual. Accessed: ftp://ftp.odot.state.or.us/techserv/Geo-Environmental/Geotech/Manuals/Soil_Rock_Classification_Manual.pdf*

Relative Rock Hardness Scale

Term	Hardness Designation	Field Identification	Approximate Unconfined Compressive Strength
Extremely Soft	R0	Can be indented with difficulty by thumbnail. May be moldable or friable with finger pressure.	< 100 psi
Very Soft	R1	Crumbles under firm blows with point of a geology pick. Can be peeled by a pocket knife and scratched with fingernail.	100 – 1,000 psi
Soft	R2	Can be peeled by a pocket knife with difficulty. Cannot be scratched with fingernail. Shallow indentation made by firm blow of geology pick.	1,000 – 4,000 psi
Medium Hard	R3	Can be scratched by knife or pick. Specimen can be fractured with a single firm blow of hammer/geology pick.	4,000 – 8,000 psi
Hard	R4	Can be scratched with knife or pick only with difficulty. Several hard hammer blows required to fracture specimen.	8,000 – 16,000 psi
Very Hard	R5	Cannot be scratched by knife or sharp pick. Specimen requires many blows of hammer to fracture or chip. Hammer rebounds after impact.	> 16,000 psi

RQD and Rock Quality

Relation of RQD and Rock Quality

RQD (Rock Quality Designation), %	Description of Rock Quality
0 – 25	Very Poor
26 – 50	Poor
51 – 75	Fair
76 – 90	Good
91 – 100	Excellent

Terminology for Planar Surface

Bedding	Joints and Fractures	Spacing
Laminated	Very Close	< 2 in.
Thin	Close	2 in. – 12 in.
Medium	Moderately Close	12 in. – 36 in.
Thick	Wide	36 in. – 10 ft
Massive	Very Wide	> 10 ft

BORING AND TEST PIT LOG LEGEND

SOIL SYMBOLS

Symbol	Typical Description
⁙	LANDSCAPE MATERIALS
▩	FILL
○	GRAVEL; clean to some silt, clay, and sand
○	Sandy GRAVEL; clean to some silt and clay
○	Silty GRAVEL; up to some clay and sand
○	Clayey GRAVEL; up to some silt and sand
⁙	SAND; clean to some silt, clay, and gravel
⁙	Gravelly SAND; clean to some silt and clay
⁙	Silty SAND; up to some clay and gravel
⁙	Clayey SAND; up to some silt and gravel
▥	SILT; up to some clay, sand, and gravel
▥	Gravelly SILT; up to some clay and sand
▥	Sandy SILT; up to some clay and gravel
▥	Clayey SILT; up to some sand and gravel
▨	CLAY; up to some silt, sand, and gravel
▨	Gravelly CLAY; up to some silt and sand
▨	Sandy CLAY; up to some silt and gravel
▨	Silty CLAY; up to some sand and gravel
≋	PEAT

BEDROCK SYMBOLS

Symbol	Typical Description
+++ +++ +++	BASALT
▤	MUDSTONE
▤	SILTSTONE
▤	SANDSTONE

SURFACE MATERIAL SYMBOLS

Symbol	Typical Description
■	Asphalt concrete PAVEMENT
■	Portland cement concrete PAVEMENT
○	Crushed rock BASE COURSE

SAMPLER SYMBOLS

Symbol	Sampler Description
Ⅰ	2.0-in. O.D. split-spoon sampler and Standard Penetration Test with recovery (ASTM D1586)
▮	Shelby tube sampler with recovery (ASTM D1587)
▮	3.0-in. O.D. split-spoon sampler with recovery (ASTM D3550)
⊠	Grab Sample
▯	Rock core sample interval
▮	Sonic core sample interval
▮	Geoprobe sample interval

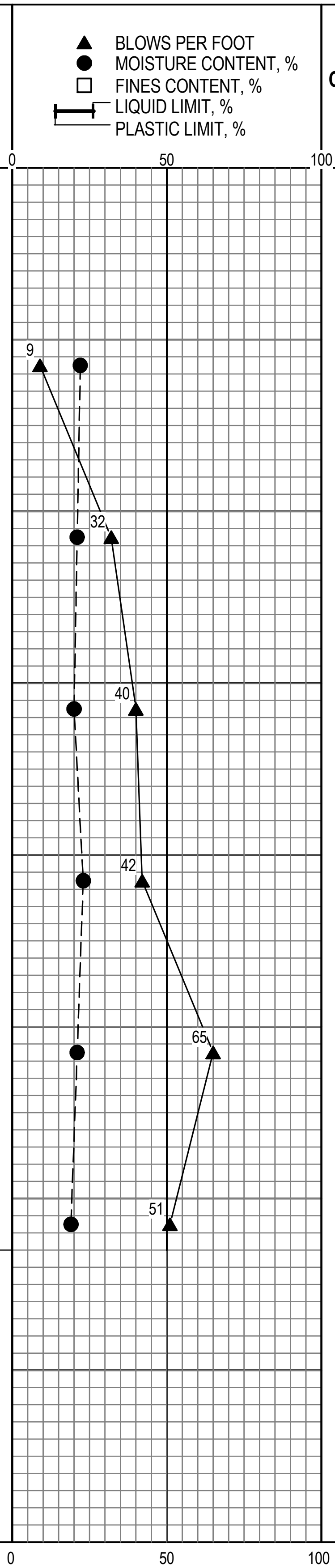
INSTALLATION SYMBOLS

Symbol	Symbol Description
▥	Flush-mount monument set in concrete
▥	Concrete, well casing shown where applicable
▨	Bentonite seal, well casing shown where applicable
⁙	Filter pack, machine-slotted well casing shown where applicable
▥	Grout, vibrating-wire transducer cable shown where applicable
P	Vibrating-wire pressure transducer
│	1-in.-diameter solid PVC
┆	1-in.-diameter hand-slotted PVC
║	Grout, inclinometer casing shown where applicable

FIELD MEASUREMENTS

Symbol	Typical Description
▽	Groundwater level during drilling and date measured
▼	Groundwater level after drilling and date measured
▨	Rock core recovery (%)
▨	Rock quality designation (RQD, %)

DEPTH, FT	GRAPHIC LOG	CLASSIFICATION OF MATERIAL Surface Elevation: -30.0 ft [±] (MLLW)	ELEVATION, FT / DEPTH, FT	UCS, PSI	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT	FRACTURES/FT	COMMENTS AND ADDITIONAL TESTS
		SAND, trace silt, gray, loose, fine to medium grained, contains scattered organics and shell fragments							
5					S-1	I	3 4 5		
10		---brown to gray, medium dense to dense, shell fragments and organics absent below 10 ft			S-2	I	10 16 16		
15		---dense below 15 ft			S-3	I	11 18 22		
20					S-4	I	14 24 18		
25		---very dense below 25 ft			S-5	I	19 30 35		
30					S-6	I	12 21 30		
		(9/14/2010)	-61.5 31.5						
35									
40									



▨ CORE RECOVERY, %
▨ ROCK QUALITY DESIGNATION (RQD), %

Logged By: J. Gordon **Drilled by:** Hard Core Drilling, Inc.
Date Started: 9/14/10 **Coordinates:** 43.42055556° N 124.26777778° W (WGS 84)
Drilling Method: Mud Rotary
Equipment: CME 55 Truck-Mounted Drill Rig
Hole Diameter: 5 in.
Note: See Legend for Explanation of Symbols
Hammer Type: Auto Hammer
Weight: 140 lb
Drop: 30 in.
Energy Ratio: Not Available

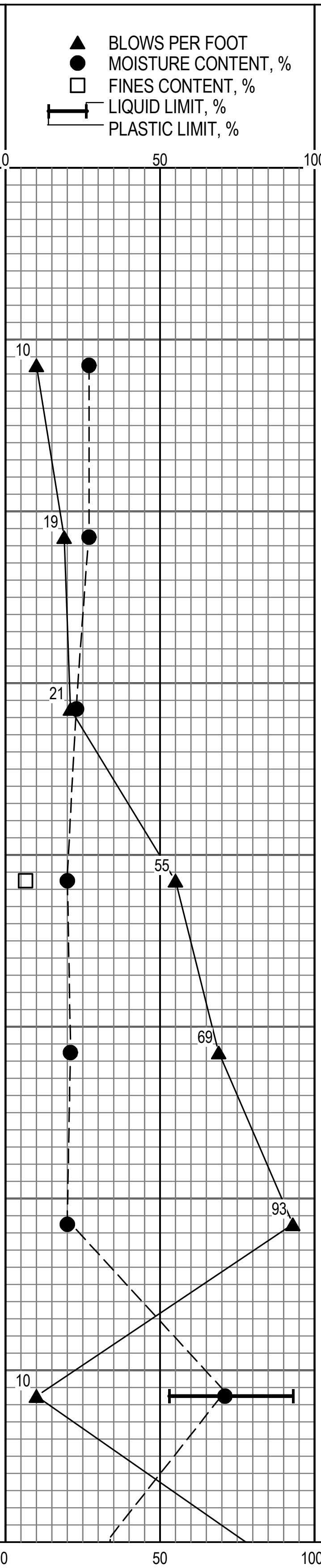
GRI

BORING B-1

2020 JOB NO. 5128 FIG. 1A

Surface Elevation: -18.5 ft [±] (MLLW)

DEPTH, FT	CLASSIFICATION OF MATERIAL	ELEVATION, FT / DEPTH, FT	UCS, PSI	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT	FRACTURES/FT	COMMENTS AND ADDITIONAL TESTS
	SAND, trace silt, brown to gray, loose to medium dense, fine to medium grained, scattered organics							
5				S-1	I	4 5 5		
10	---medium dense below 10 ft			S-2	I	6 9 10		
15				S-3	I	6 9 12		
20	---some silt, very dense below 20 ft			S-4	I	17 26 29		
25				S-5	I	19 32 37		
30				S-6	I	27 45 48		
	Clayey SILT, trace fine-grained sand, gray, stiff	-53.0 34.5						
35				S-7	I	3 5 5		
40								



▨ CORE RECOVERY, %

▨ ROCK QUALITY DESIGNATION (RQD), %

(CONTINUED NEXT PAGE)

Logged By: J. Gordon

Drilled by: Hard Core Drilling, Inc.

Date Started: 9/15/10

Coordinates: 43.40972222° N 124.27527778° W (WGS 84)

Drilling Method: Mud Rotary

Equipment: CME 55 Truck-Mounted Drill Rig

Hole Diameter: 5 in.

Note: See Legend for Explanation of Symbols

Hammer Type: Auto Hammer

Weight: 140 lb

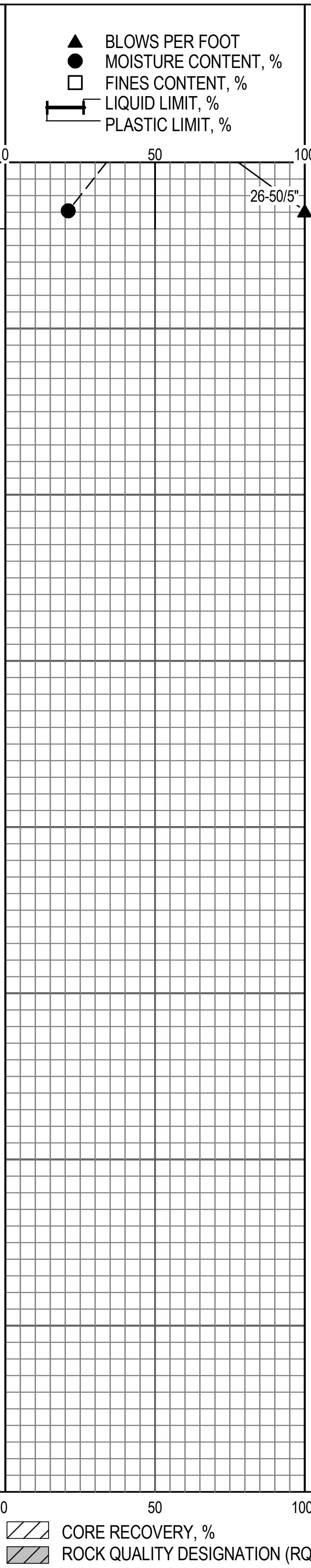
Drop: 30 in.

Energy Ratio: Not Available

GRI

BORING B-2

DEPTH, FT	GRAPHIC LOG	CLASSIFICATION OF MATERIAL **Surface Elevation:** -18.5 ft [±] (MLLW)	ELEVATION, FT / DEPTH, FT	UCS, PSI	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT	FRACTURES/FT	COMMENTS AND ADDITIONAL TESTS
		Clayey SILT, trace fine-grained sand, gray, stiff	-59.5 41.0						
		SAND, trace silt, gray, very dense, fine to medium grained	-60.5 42.0		S-8	I	26 50/5"		
		(9/15/2010)							
45									
50									
55									
60									
65									
70									
75									
80									



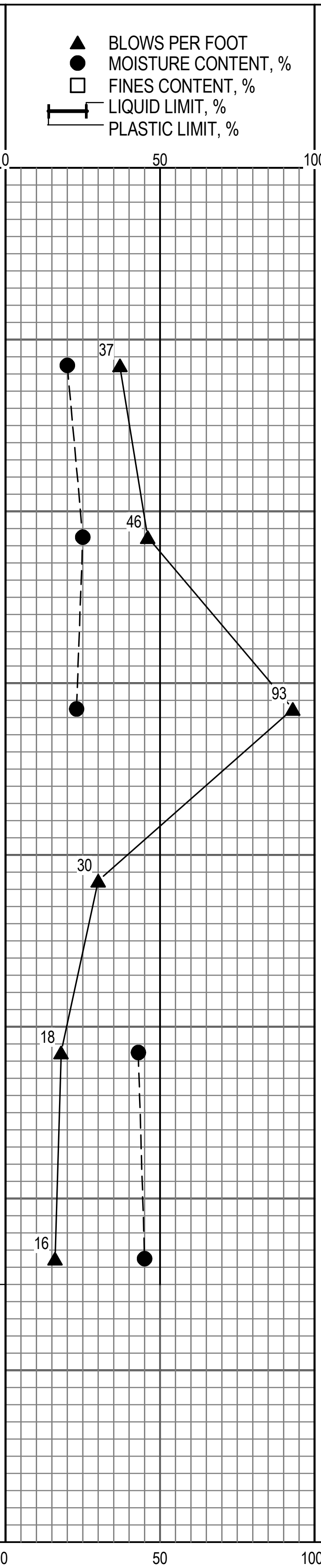
GRI ROCK BORING LOG (LAT/LONG) GRI DATA TEMPLATE.GDT 4/1/20

GRI

BORING B-2

Surface Elevation: -29.0 ft [±] (MLLW)

DEPTH, FT	GRAPHIC LOG	CLASSIFICATION OF MATERIAL	ELEVATION, FT / DEPTH, FT	UCS, PSI	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT	FRACTURES/FT	COMMENTS AND ADDITIONAL TESTS
		SAND, trace silt, gray, dense, fine to medium grained, contains shell fragments							
5					S-1		8 16 21		
10		---2-in.-thick seam of gray, clayey silt at 10 ft			S-2		12 20 26		
		---wood chips at 11.5 ft							
15		---very dense at 15 ft			S-3		30 44 49		
		SILT, some clay and fine-grained sand, gray to brown, very stiff, contains wood debris	-47.5 18.5						
20		---18-in.-thick piece of wood at 20 ft; wood debris between 21.5 and 22.5 ft			S-4		17 16 14		
25					S-5		4 8 10		
		---6-in.-thick layer of wood debris at 28.5 ft							
30		---6-in.-thick layer of wood debris at 32 ft			S-6		5 7 9		
		(9/16/2010)	-61.5 32.5						
35									
40									



▨ CORE RECOVERY, %

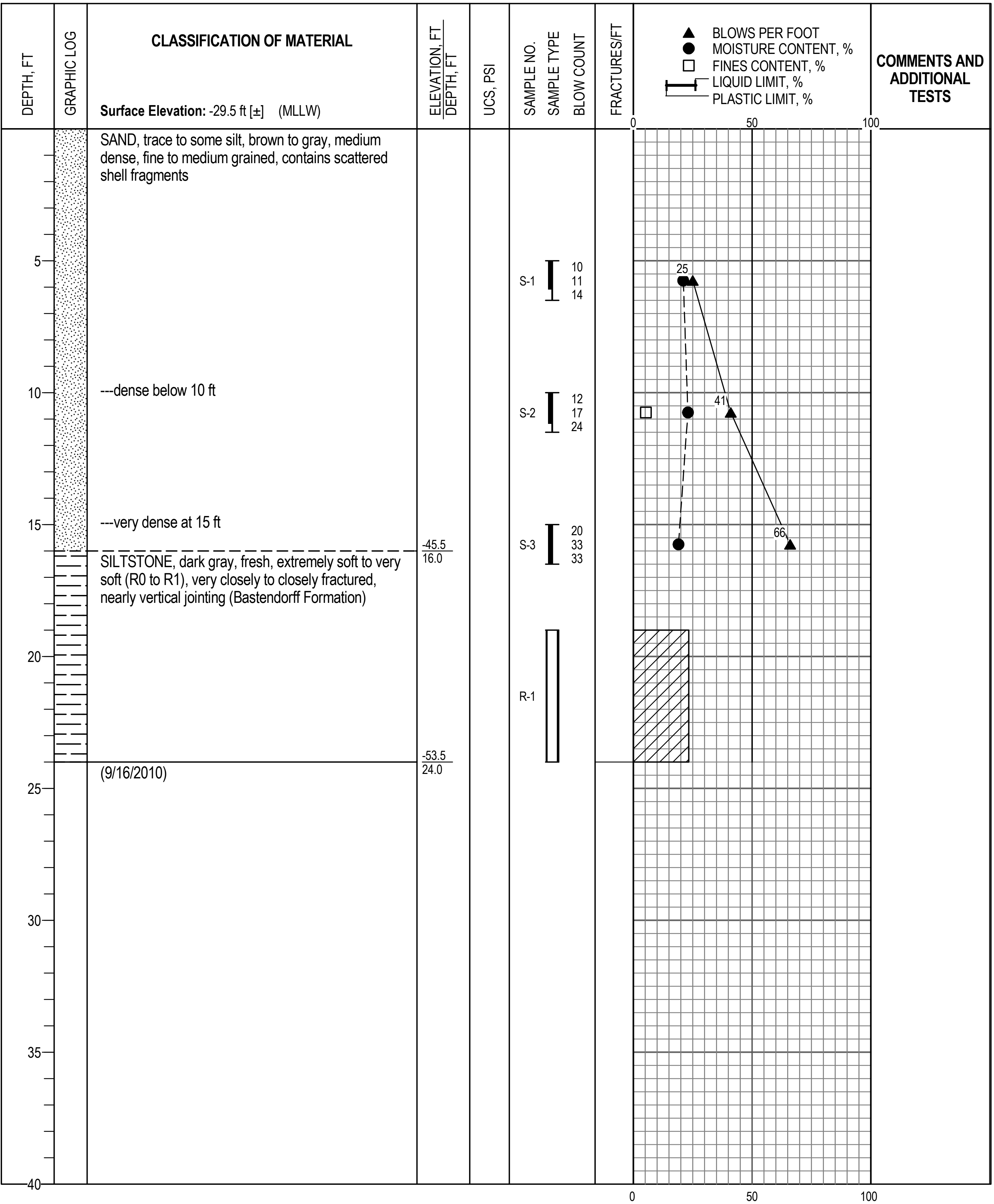
▨ ROCK QUALITY DESIGNATION (RQD), %

Logged By: J. Gordon	**Drilled by:** Hard Core Drilling, Inc.
Date Started: 9/16/10	**Coordinates:** 43.39694444° N 124.28111111° W (WGS 84)
Drilling Method: Mud Rotary **Equipment:** CME 55 Truck-Mounted Drill Rig **Hole Diameter:** 5 in.	**Hammer Type:** Auto Hammer **Weight:** 140 lb **Drop:** 30 in. **Energy Ratio:** Not Available
Note: See Legend for Explanation of Symbols	

GRI

BORING B-3

2020 JOB NO. 5128 FIG. 3A



CLASSIFICATION OF MATERIAL

Surface Elevation: -29.5 ft [±] (MLLW)

DEPTH, FT	CLASSIFICATION OF MATERIAL	ELEVATION, FT / DEPTH, FT	SAMPLE NO.	BLOW COUNT	BLOWS PER FOOT
0	SAND, trace to some silt, brown to gray, medium dense, fine to medium grained, contains scattered shell fragments				
5			S-1	10 11 14	25
10	---dense below 10 ft		S-2	12 17 24	41
15	---very dense at 15 ft		S-3	20 33 33	66
16	SILTSTONE, dark gray, fresh, extremely soft to very soft (R0 to R1), very closely to closely fractured, nearly vertical jointing (Bastendorff Formation)	-45.5 16.0			
19			R-1		
24	(9/16/2010)	-53.5 24.0			

▨ CORE RECOVERY, %

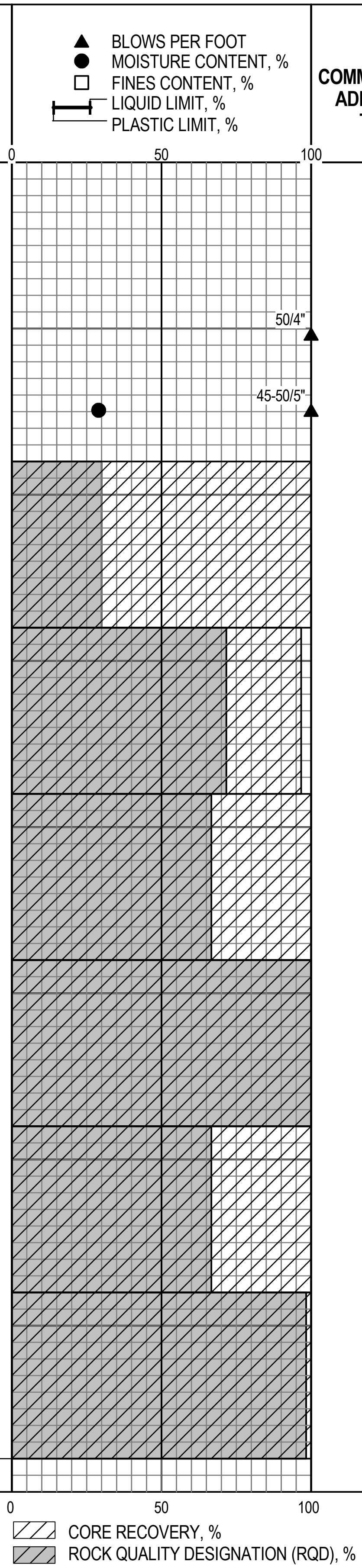
▨ ROCK QUALITY DESIGNATION (RQD), %

Logged By: J. Gordon	**Drilled by:** Hard Core Drilling, Inc.
Date Started: 9/16/10	**Coordinates:** 43.39277778° N 124.28722222° W (WGS 84)
Drilling Method: Mud Rotary **Equipment:** CME 55 Truck-Mounted Drill Rig **Hole Diameter:** 5 in.	**Hammer Type:** Auto Hammer **Weight:** 140 lb **Drop:** 30 in. **Energy Ratio:** Not Available
Note: See Legend for Explanation of Symbols	

GRI

BORING B-4A

DEPTH, FT	CLASSIFICATION OF MATERIAL Surface Elevation: -20.5 ft [±] (MLLW)	ELEVATION, FT / DEPTH, FT	UCS, PSI	SAMPLE NO.	BLOW COUNT	FRACTURES/FT	COMMENTS AND ADDITIONAL TESTS
0	SILTSTONE, dark gray, fresh, extremely soft to very soft (R0 to R1), closely to moderately closely fractured, inclined to near vertical jointing, contains shells and gravel-sized ripups (Bastendorff Formation)						
5				S-1	50/4"		
				S-2	45 50/5"		
10				R-1			
15			715	R-2			
	---extremely soft (R0), clayey between 18 and 18.5 ft						
20				R-3			
25			401	R-4			
	---calcite cemented at 29.5 ft						
30				R-5			
35			287	R-6			
	(9/17/2010)	-59.5 39.0					
40							



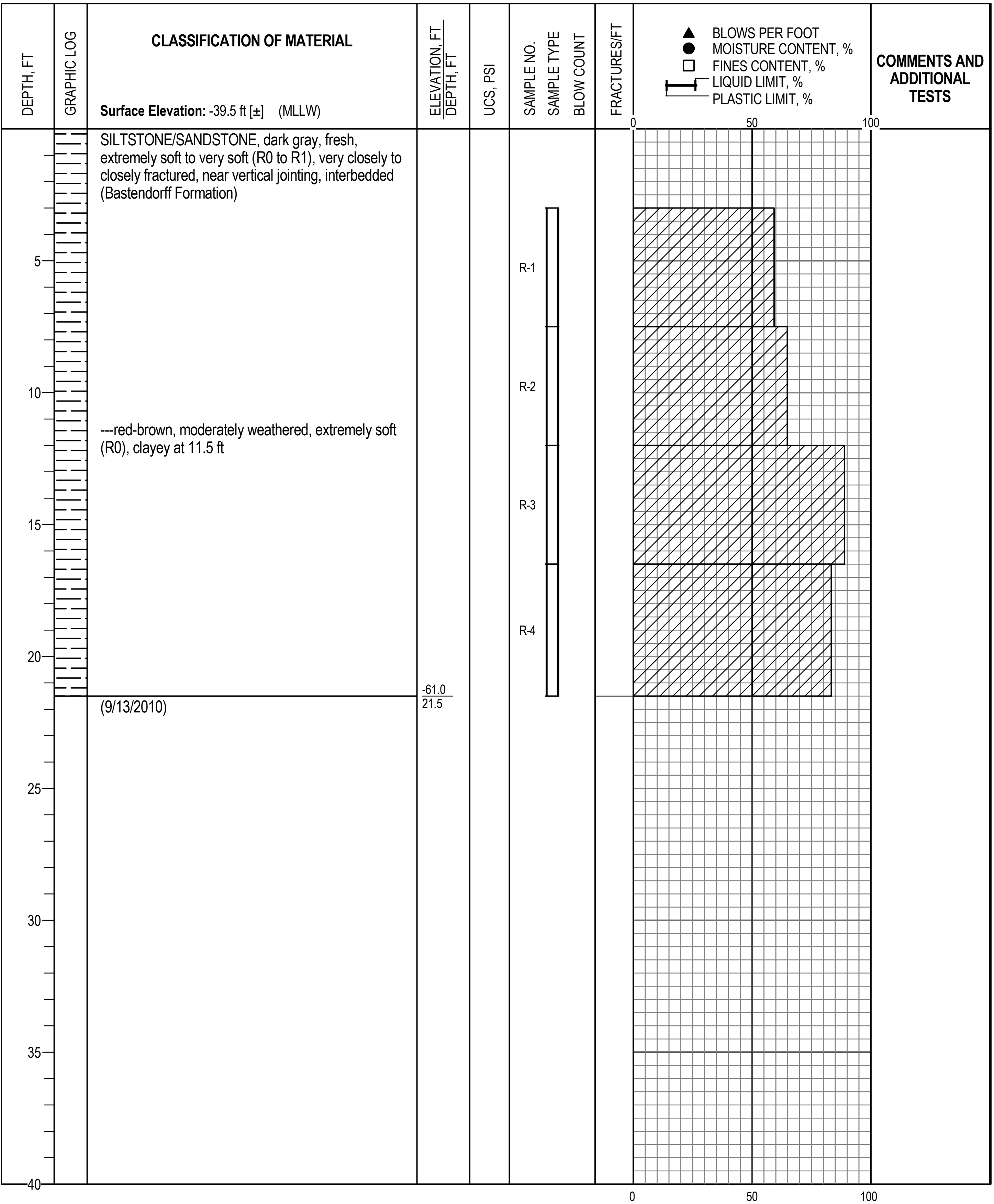
GRI ROCK BORING LOG (LAT/LONG) GRI DATA TEMPLATE.GDT 4/1/20

Logged By: J. Gordon
Drilled by: Hard Core Drilling, Inc.
Date Started: 9/17/10
Coordinates: 43.39138889° N 124.28472222° W (WGS 84)
Drilling Method: Mud Rotary
Equipment: CME 55 Truck-Mounted Drill Rig
Hole Diameter: 5 in.
Note: See Legend for Explanation of Symbols
Hammer Type: Auto Hammer
Weight: 140 lb
Drop: 30 in.
Energy Ratio: Not Available

GRI

BORING B-4B

2020 JOB NO. 5128 FIG. 5A



Surface Elevation: -39.5 ft [±] (MLLW)

SILTSTONE/SANDSTONE, dark gray, fresh, extremely soft to very soft (R0 to R1), very closely to closely fractured, near vertical jointing, interbedded (Bastendorff Formation)

---red-brown, moderately weathered, extremely soft (R0), clayey at 11.5 ft

(9/13/2010)

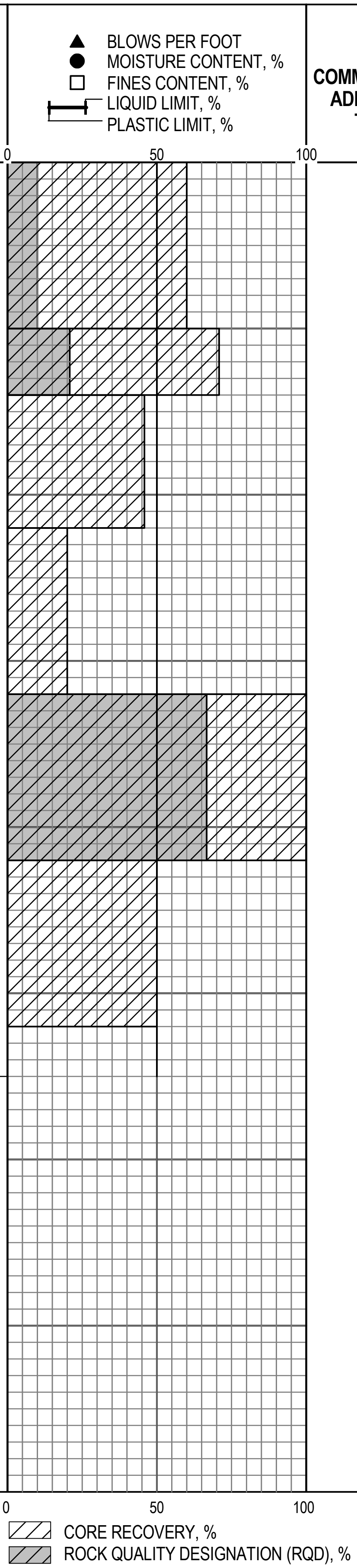
▨ CORE RECOVERY, %
▨ ROCK QUALITY DESIGNATION (RQD), %

Logged By: J. Gordon **Drilled by:** Hard Core Drilling, Inc.
Date Started: 9/13/10 **Coordinates:** 43.38583333° N 124.29083333° W (WGS 84)
Drilling Method: Mud Rotary
Equipment: CME 55 Truck-Mounted Drill Rig
Hole Diameter: 5 in.
Note: See Legend for Explanation of Symbols
Hammer Type: Auto Hammer
Weight: 140 lb
Drop: 30 in.
Energy Ratio: Not Available

BORING B-5

2020 JOB NO. 5128 FIG. 6A

DEPTH, FT	GRAPHIC LOG	CLASSIFICATION OF MATERIAL **Surface Elevation:** -34.5 ft [±] (MLLW)	ELEVATION, FT / DEPTH, FT	UCS, PSI	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT	FRACTURES/FT	COMMENTS AND ADDITIONAL TESTS
5 10 15 20 25		SANDSTONE, dark gray, fine grained, fresh, very soft to soft (R1 to R2), very closely to closely fractured, nearly horizontal jointing, massive (Empire Formation)			R-1 R-2 R-3 R-4 R-5 R-6 R-7				
30 35 40		(9/8/2010)	-62.0 27.5						



Logged By: J. Gordon | **Drilled by:** Hard Core Drilling, Inc.
Date Started: 9/8/10 | **Coordinates:** 43.37305556° N 124.30611111° W (WGS 84)

Drilling Method: Mud Rotary
Equipment: CME 55 Truck-Mounted Drill Rig
Hole Diameter: 5 in.
Note: See Legend for Explanation of Symbols

Hammer Type: Auto Hammer
Weight: 140 lb
Drop: 30 in.
Energy Ratio: Not Available

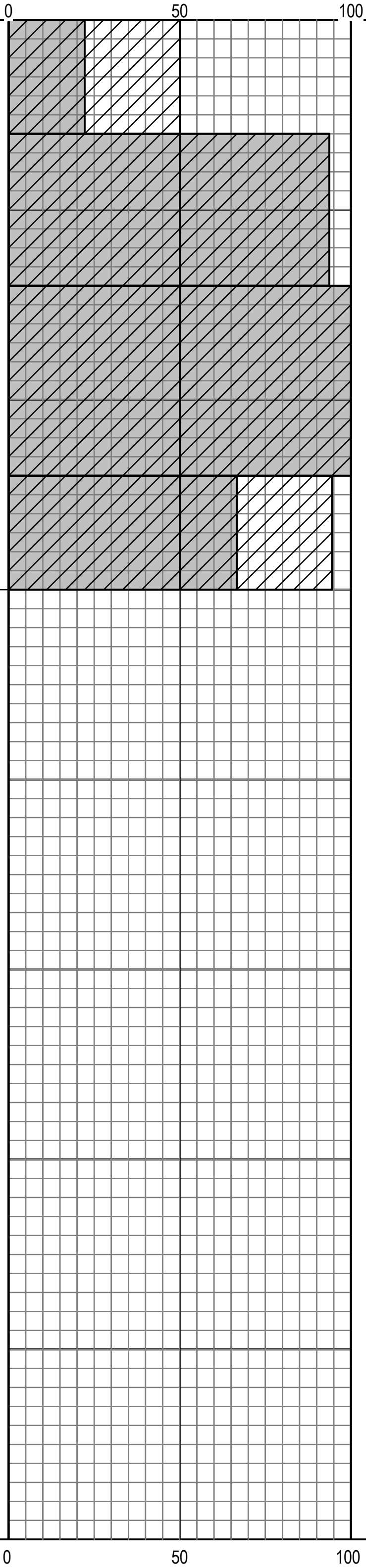
BORING B-6

Surface Elevation: -21.0 ft [±] (MLLW)

DEPTH, FT	CLASSIFICATION OF MATERIAL	ELEVATION, FT / DEPTH, FT	UCS, PSI	SAMPLE NO.
0	SANDSTONE, dark gray, fine grained, fresh, very soft (R1), closely to moderately closely fractured, horizontal to inclined jointing, contains shells, massive (Empire Formation)			R-1
			633	R-2
			655	R-3
	---calcite cemented between 11 and 12 ft; soft (R2) below 11 ft			
	---calcite cemented between 13 and 13.5 ft		1193	R-4
15	(9/9/2010)	-36.0 15.0		

SAMPLE TYPE | BLOW COUNT | FRACTURES/FT | COMMENTS AND ADDITIONAL TESTS

▲ BLOWS PER FOOT
● MOISTURE CONTENT, %
☐ FINES CONTENT, %
LIQUID LIMIT, %
PLASTIC LIMIT, %



▨ CORE RECOVERY, %
▨ ROCK QUALITY DESIGNATION (RQD), %

GRI ROCK BORING LOG (LAT/LONG) GRI DATA TEMPLATE.GDT 4/1/20

Logged By: J. Gordon	**Drilled by:** Hard Core Drilling, Inc.
Date Started: 9/9/10	**Coordinates:** 43.36444444° N 124.31416667° W (WGS 84)
Drilling Method: Mud Rotary **Equipment:** CME 55 Truck-Mounted Drill Rig **Hole Diameter:** 5 in.	**Hammer Type:** Auto Hammer **Weight:** 140 lb **Drop:** 30 in. **Energy Ratio:** Not Available
Note: See Legend for Explanation of Symbols	

GRI

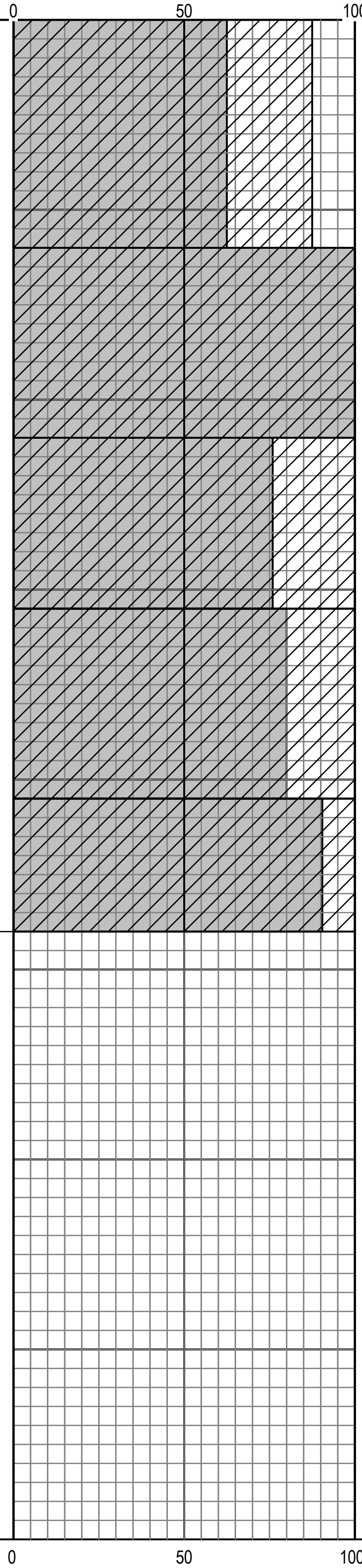
BORING B-7A

2020 JOB NO. 5128 FIG. 8A

Surface Elevation: -37.0 ft [±] (MLLW)

DEPTH, FT	CLASSIFICATION OF MATERIAL	ELEVATION, FT / DEPTH, FT	UCS, PSI	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT	FRACTURES/FT	COMMENTS AND ADDITIONAL TESTS
	SANDSTONE, dark gray, fine grained, fresh, soft (R2), closely to moderately closely fractured, horizontal to inclined jointing, contains shells and woody debris, massive (Empire Formation)			R-1				
5			1668	R-2				
10	---very soft (R1) below 11 ft			R-3				
15			784	R-4				
20			708	R-5				
	(9/10/2010)	-61.0 24.0						
25								
30								
35								
40								

▲ BLOWS PER FOOT
● MOISTURE CONTENT, %
☐ FINES CONTENT, %
LIQUID LIMIT, %
PLASTIC LIMIT, %



▨ CORE RECOVERY, %
▨ ROCK QUALITY DESIGNATION (RQD), %

Logged By: J. Gordon **Drilled by:** Hard Core Drilling, Inc.
Date Started: 9/10/10 **Coordinates:** 43.36527778° N 124.31416667° W (WGS 84)
Drilling Method: Mud Rotary
Equipment: CME 55 Truck-Mounted Drill Rig
Hole Diameter: 5 in.
Note: See Legend for Explanation of Symbols
Hammer Type: Auto Hammer
Weight: 140 lb
Drop: 30 in.
Energy Ratio: Not Available

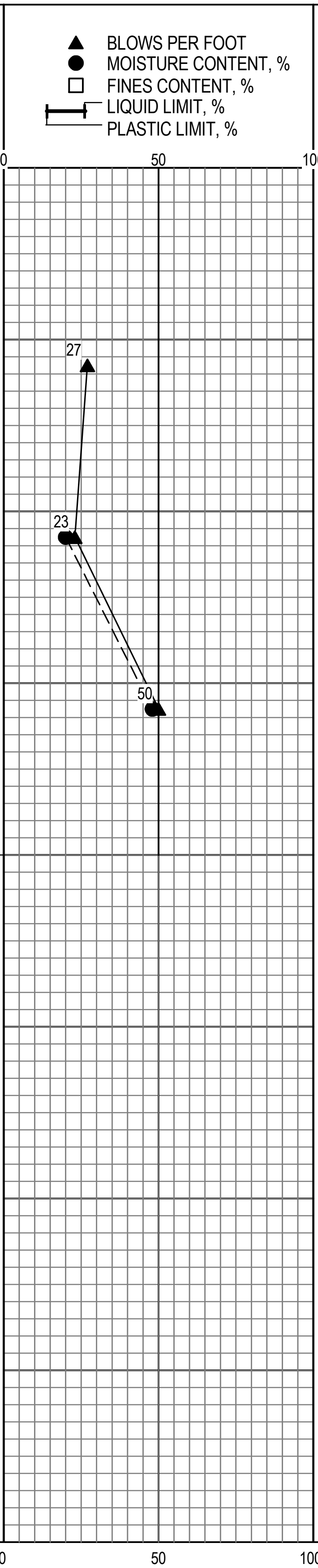
GRI

BORING B-7B

2020 JOB NO. 5128 FIG. 9A

Surface Elevation: -44.0 ft [±] (MLLW)

DEPTH, FT	CLASSIFICATION OF MATERIAL	ELEVATION, FT DEPTH, FT	UCS, PSI	SAMPLE NO.	BLOW COUNT	FRACTURES/FT	COMMENTS AND ADDITIONAL TESTS
	SAND, trace silt, brown to gray, medium dense, fine to medium grained						
5				S-1	4 7 20		
10				S-2	8 10 13		
15	SANDSTONE, dark gray, fine grained, fresh, extremely soft to soft (R0 to R2) (Empire Formation)	-58.5 14.5		S-3	9 19 31		
20	(9/14/2010)	-64.0 20.0					
25							
30							
35							
40							



▨ CORE RECOVERY, %
▨ ROCK QUALITY DESIGNATION (RQD), %

GRI ROCK BORING LOG (LAT/LONG) GRI DATA TEMPLATE.GDT 4/1/20

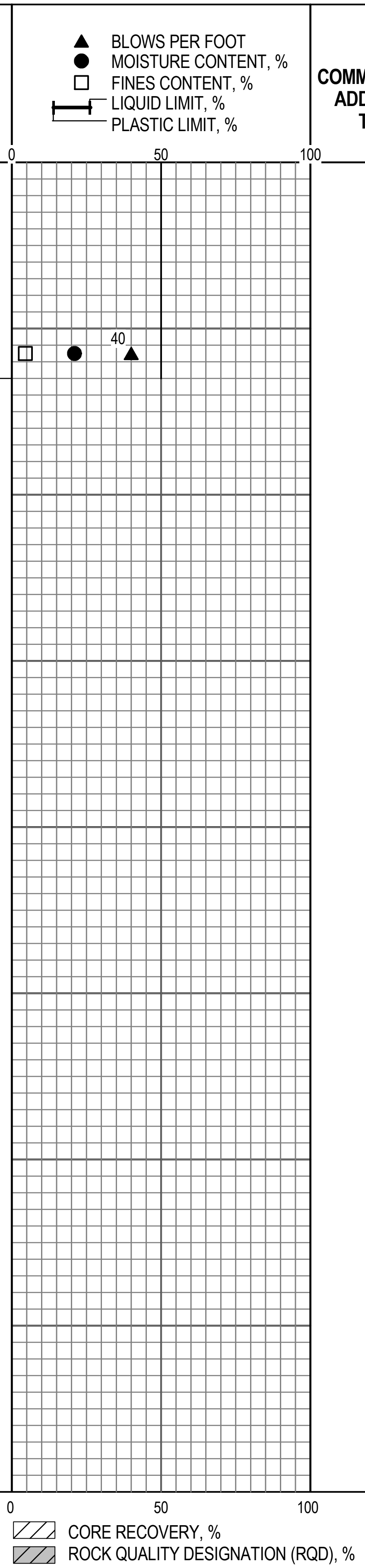
Logged By: J. Gordon **Drilled by:** Hard Core Drilling, Inc.
Date Started: 9/14/10 **Coordinates:** 43.35777778° N 124.32222222° W (WGS 84)
Drilling Method: Mud Rotary
Equipment: CME 55 Truck-Mounted Drill Rig
Hole Diameter: 5 in.
Note: See Legend for Explanation of Symbols
Hammer Type: Auto Hammer
Weight: 140 lb
Drop: 30 in.
Energy Ratio: Not Available

GRI

BORING B-8

2020 JOB NO. 5128 FIG. 10A

DEPTH, FT	GRAPHIC LOG	CLASSIFICATION OF MATERIAL Surface Elevation: -28.0 ft [±] (MLLW)	ELEVATION, FT DEPTH, FT	UCS, PSI	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT	FRACTURES/FT	COMMENTS AND ADDITIONAL TESTS
0	▨	SAND, trace silt, brown, dense, fine to medium grained							
5	▨				S-1	I	14 19 21		
			-34.5 6.5						
		(9/15/2010)							
10									
15									
20									
25									
30									
35									
40									



GRI ROCK BORING LOG (LAT/LONG) GRI DATA TEMPLATE.GDT 4/1/20

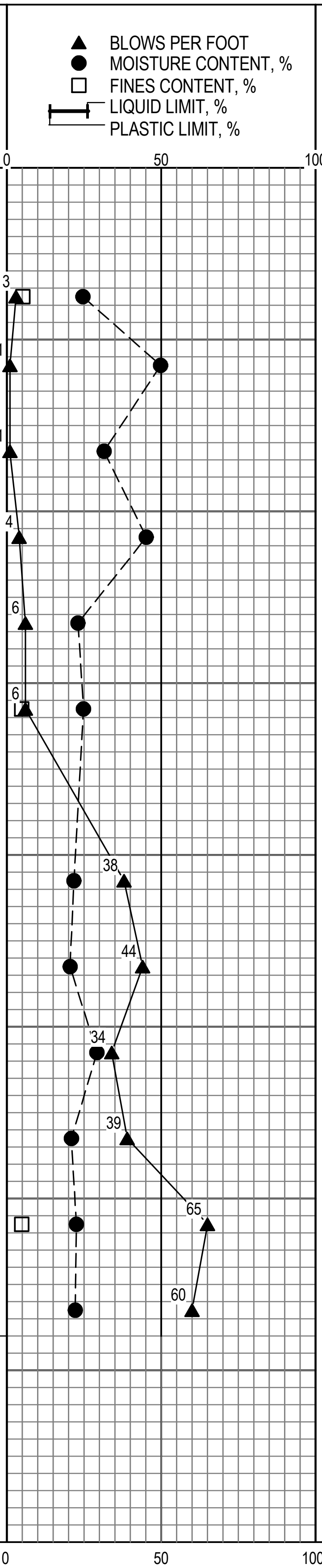
Logged By: J. Gordon
Drilled by: Hard Core Drilling, Inc.
Date Started: 9/15/10
Coordinates: 43.35416667° N 124.33055556° W (WGS 84)
Drilling Method: Mud Rotary
Equipment: CME 55 Truck-Mounted Drill Rig
Hole Diameter: 5 in.
Note: See Legend for Explanation of Symbols
Hammer Type: Auto Hammer
Weight: 140 lb
Drop: 30 in.
Energy Ratio: Not Available

GRI

BORING B-9

2020 JOB NO. 5128 FIG. 11A

DEPTH, FT	GRAPHIC LOG	CLASSIFICATION OF MATERIAL Surface Elevation: -19.0 ft [±] (MLLW)	ELEVATION, FT / DEPTH, FT	UCS, PSI	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT	FRACTURES/FT	COMMENTS AND ADDITIONAL TESTS
		SAND, trace to some silt, dark gray, very loose, fine to medium grained, contains shell fragments							Casing embedded to 3 ft below mudline
					S-1		2 1 2		
5		---dark gray to black, contains thin (<1 in.) layers of peat, organic odor below 5 ft			S-2		1 0 1		
					S-3		0 1 0		
10		---very loose to loose, contains wood fragments below 10 ft			S-4		0 1 3		
		---loose below 12.5 ft			S-5		1 3 3		
15					S-6		3 3 3		
20		---gray, dense, peat absent below 20 ft			S-7		13 19 19		
					S-8		15 19 25		
25		---contains zones of silt and organics below 25 ft			S-9		9 13 21		
		---silt absent, contains woody organics below 27.5 ft			S-10		11 19 20		
30		---very dense, organics absent below 30 ft			S-11		11 23 42		
					S-12		14 27 33		
		(8/9/2016)	-53.0 34.0						
35									
40									



▨ CORE RECOVERY, %
▨ ROCK QUALITY DESIGNATION (RQD), %

GRI ROCK BORING LOG (LAT/LONG) GRI DATA TEMPLATE.GDT 4/1/20

Logged By: S. Reddy	**Drilled by:** Hard Core Drilling, Inc.
Date Started: 8/9/16	**Coordinates:** 43.42128° N 124.26263° W (WGS84)
Drilling Method: Mud Rotary **Equipment:** CME 75 HT Truck-Mounted Drill Rig **Hole Diameter:** 5 in.	**Hammer Type:** Auto Hammer **Weight:** 140 lb **Drop:** 30 in. **Energy Ratio:** 85%
Note: See Legend for Explanation of Symbols	

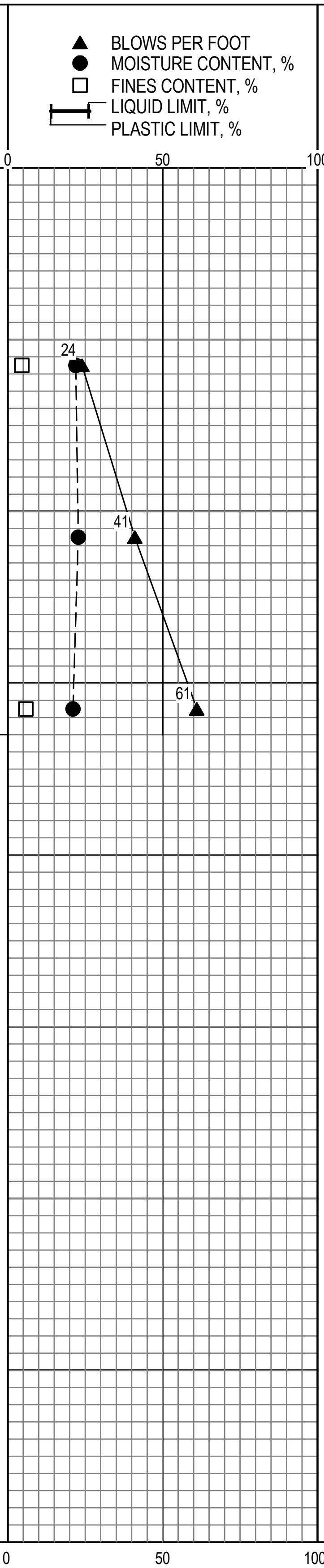
GRI

BORING B-10

2020 JOB NO. 5128 FIG. 12A

Surface Elevation: -38.0 ft [±] (MLLW)

DEPTH, FT	GRAPHIC LOG	CLASSIFICATION OF MATERIAL	ELEVATION, FT / DEPTH, FT	UCS, PSI	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT	FRACTURES/FT	COMMENTS AND ADDITIONAL TESTS
		SAND, trace silt, gray, medium dense, fine to medium grained							Casing embedded to 3.5 ft below mudline
5					S-1		8 10 14		
10		---dense below 10 ft			S-2		11 18 23		
15		---trace to some silt, very dense below 15 ft			S-3		18 27 34		
		(7/25/2016)	-54.5 16.5						
20									
25									
30									
35									
40									



▨ CORE RECOVERY, %

▨ ROCK QUALITY DESIGNATION (RQD), %

Logged By: S. Reddy	**Drilled by:** Hard Core Drilling, Inc.
Date Started: 7/25/16	**Coordinates:** 43.4165° N 124.27392° W (WGS84)
Drilling Method: Mud Rotary **Equipment:** CME 75 HT Truck-Mounted Drill Rig **Hole Diameter:** 5 in.	**Hammer Type:** Auto Hammer **Weight:** 140 lb **Drop:** 30 in. **Energy Ratio:** 85%
Note: See Legend for Explanation of Symbols	

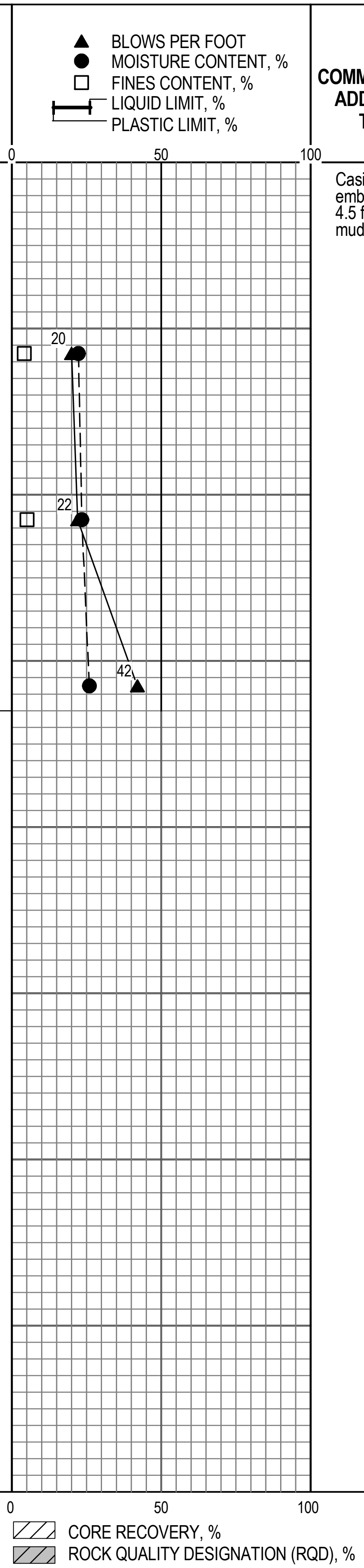
GRI

BORING B-11

2020 JOB NO. 5128 FIG. 13A

Surface Elevation: -38.0 ft [±] (MLLW)

DEPTH, FT	GRAPHIC LOG	CLASSIFICATION OF MATERIAL	ELEVATION, FT / DEPTH, FT	UCS, PSI	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT	FRACTURES/FT	COMMENTS AND ADDITIONAL TESTS
		SAND, trace silt, gray, medium dense, fine to medium grained, contains shell fragments							Casing embedded to 4.5 ft below mudline
5					S-1		4 8 12		
10		---trace to some silt, shell fragments absent below 10 ft			S-2		7 9 13		
15		---dense below 15 ft			S-3		14 19 23		
		(7/28/2016)	-54.5 16.5						
20									
25									
30									
35									
40									

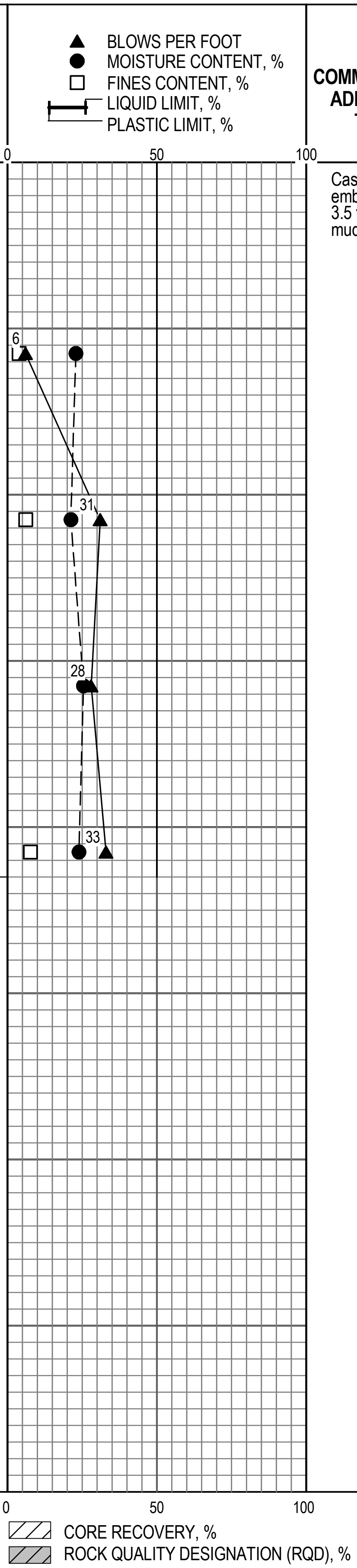


Logged By: S. Reddy	**Drilled by:** Hard Core Drilling, Inc.
Date Started: 7/28/16	**Coordinates:** 43.41436° N 124.27782° W (WGS84)
Drilling Method: Mud Rotary **Equipment:** CME 75 HT Truck-Mounted Drill Rig **Hole Diameter:** 5 in.	**Hammer Type:** Auto Hammer **Weight:** 140 lb **Drop:** 30 in. **Energy Ratio:** 85%
Note: See Legend for Explanation of Symbols	

GRI

BORING B-12

DEPTH, FT	GRAPHIC LOG	CLASSIFICATION OF MATERIAL **Surface Elevation:** -34.5 ft [±] (MLLW)	ELEVATION, FT / DEPTH, FT	UCS, PSI	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT	FRACTURES/FT	COMMENTS AND ADDITIONAL TESTS
		SAND, trace to some silt, gray, medium dense, fine to medium grained, contains shell fragments							Casing embedded to 3.5 ft below mudline
5					S-1	I	4 6 0		
10		---dense, shell fragments absent below 10 ft			S-2	I	9 13 18		
15					S-3	I	8 12 16		
20					S-4	I	9 14 19		
		(7/28/2016)	-56.0 21.5						
25									
30									
35									
40									



Logged By: S. Reddy **Drilled by:** Hard Core Drilling, Inc.
Date Started: 7/28/16 **Coordinates:** 43.40825° N 124.27903° W (WGS84)
Drilling Method: Mud Rotary
Equipment: CME 75 HT Truck-Mounted Drill Rig
Hole Diameter: 5 in.
Note: See Legend for Explanation of Symbols
Hammer Type: Auto Hammer
Weight: 140 lb
Drop: 30 in.
Energy Ratio: 85%

GRI

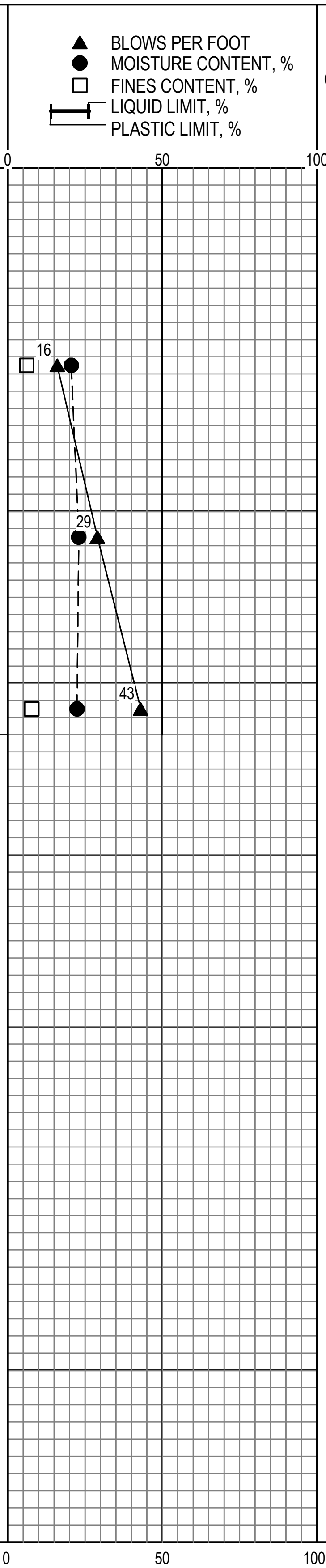
BORING B-13

2020 JOB NO. 5128 FIG. 15A

GRI ROCK BORING LOG (LAT/LONG) GRI DATA TEMPLATE.GDT 4/1/20

Surface Elevation: -38.5 ft [±] (MLLW)

DEPTH, FT	GRAPHIC LOG	CLASSIFICATION OF MATERIAL	ELEVATION, FT / DEPTH, FT	UCS, PSI	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT	FRACTURES/FT	COMMENTS AND ADDITIONAL TESTS
		SAND, trace to some silt, gray, medium dense, fine to medium grained, contains shell fragments							Casing embedded to 5 ft below mudline
5					S-1		4 6 10		
10					S-2		9 13 16		
15		---dense below 15 ft			S-3		17 19 24		
		(7/29/2016)	-55.0 16.5						
20									
25									
30									
35									
40									



▨ CORE RECOVERY, %
▨ ROCK QUALITY DESIGNATION (RQD), %

Logged By: S. Reddy	**Drilled by:** Hard Core Drilling, Inc.
Date Started: 7/29/16	**Coordinates:** 43.40691° N 124.27789° W (WGS84)
Drilling Method: Mud Rotary **Equipment:** CME 75 HT Truck-Mounted Drill Rig **Hole Diameter:** 5 in.	**Hammer Type:** Auto Hammer **Weight:** 140 lb **Drop:** 30 in. **Energy Ratio:** 85%
Note: See Legend for Explanation of Symbols	

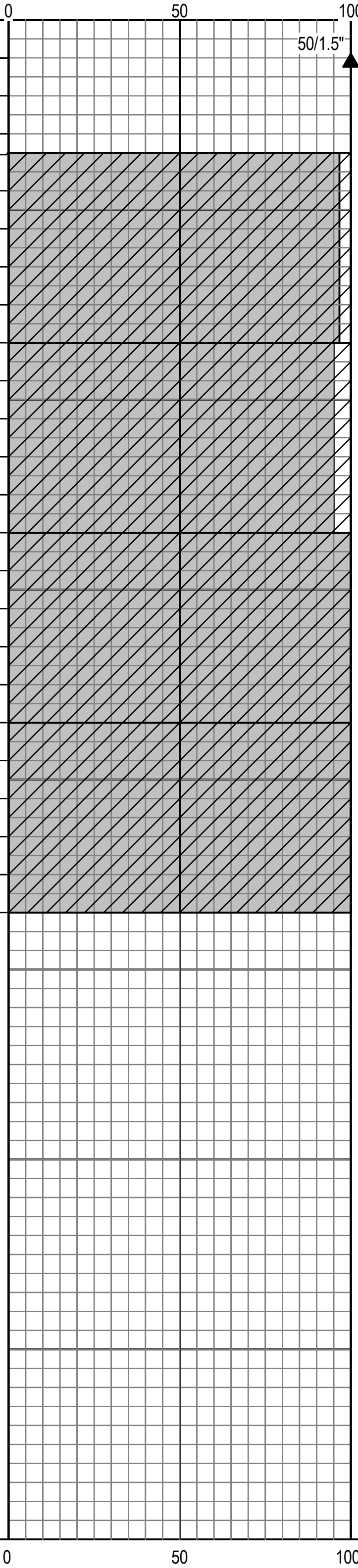
GRI

BORING B-14

2020 JOB NO. 5128 FIG. 16A

DEPTH, FT	GRAPHIC LOG	CLASSIFICATION OF MATERIAL	ELEVATION, FT / DEPTH, FT	UCS, PSI	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT	FRACTURES/FT	COMMENTS AND ADDITIONAL TESTS
		Surface Elevation: -33.0 ft [±] (MLLW)							
		SAND, trace silt, dark gray, medium dense to dense, fine to medium grained	-34.0 1.0		S-1		50/1.5"		Casing embedded to 1 ft below mudline
		SANDSTONE, gray, fine to medium grained, fresh, hard (R4), closely fractured, inclined jointing, open to healed calcite in joints and bedding (Coaledo Formation) ---contains shells from 3.5 to 8.5 ft		11361	R-1			N/A 1 0	
5		---soft (R2) below 5 ft		2554	R-2			0 1 1 2 1	
10		---widely fractured below 10 ft		1461	R-3			1 0 0 0 0	
15				1335	R-4			0 0 0 0 0	
		---medium hard (R3) below 18.5 ft		4226					
20					R-5			0 0 0	
		---soft (R2) below 22 ft		1150				2 1	
		(7/14/2016)	-56.5 23.5						
25									
30									
35									
40									

▲ BLOWS PER FOOT
● MOISTURE CONTENT, %
☐ FINES CONTENT, %
LIQUID LIMIT, %
PLASTIC LIMIT, %



▨ CORE RECOVERY, %
▨ ROCK QUALITY DESIGNATION (RQD), %

Logged By: S. Reddy	**Drilled by:** Hard Core Drilling, Inc.
Date Started: 7/14/16	**Coordinates:** 43.40395° N 124.28014° W (WGS84)
Drilling Method: Mud Rotary/HQ-3 Wireline Core **Equipment:** CME 75 HT Truck-Mounted Drill Rig **Hole Diameter:** 4 in.	**Hammer Type:** Auto Hammer **Weight:** 140 lb **Drop:** 30 in. **Energy Ratio:** 85%
Note: See Legend for Explanation of Symbols	

GRI

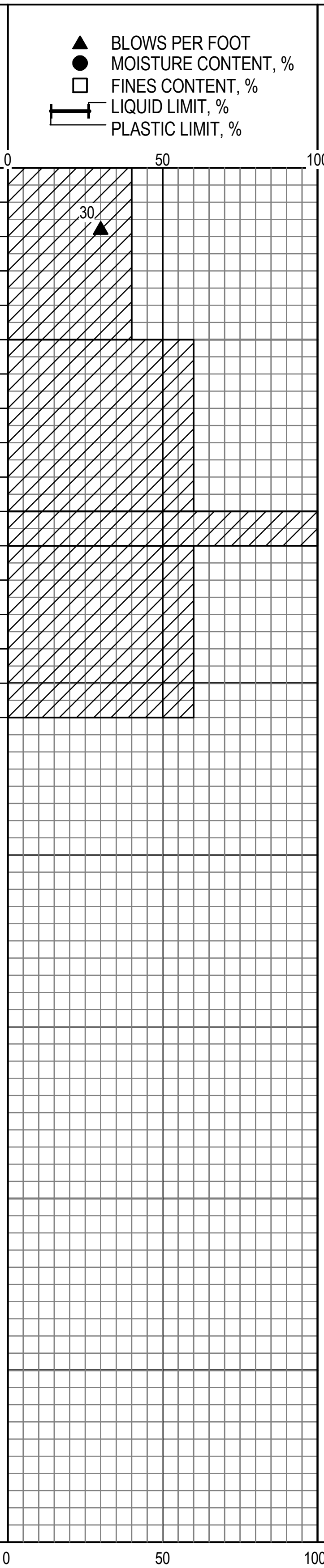
BORING B-15

2020 JOB NO. 5128 FIG. 17A

Surface Elevation: -41.0 ft [±] (MLLW)

DEPTH, FT	CLASSIFICATION OF MATERIAL	ELEVATION, FT / DEPTH, FT	UCS, PSI	SAMPLE NO.	BLOW COUNT	COMMENTS AND ADDITIONAL TESTS
0	SAND, trace silt, dark gray, medium dense to dense, fine to medium grained, contains shell fragments					Casing embedded to 2 ft below mudline
2	SILTSTONE, dark gray, fresh, extremely soft (R0), very closely fractured, inclined jointing and bedding, contains clay alteration, slickensides (Bastendorff Formation) ---light gray, medium hard (R3), contains altered shell fragments between 4.5 and 5.0 ft	-43.0 2.0		S-1 R-1	8 9 21	
5						
7.5				R-2		
10	---very soft (R1), contains less clay alteration below 11 ft			R-3		
13	---extremely soft (R0), contains clay alteration below 13 ft			R-4		
15	---light gray below 15 ft					
16	(7/18/2016)	-57.0 16.0				
20						
25						
30						
35						
40						

DEPTH, FT	FRACTURES/FT
0–1	N/A
1–2	N/A
2–3	N/A
3–4	>10
4–5	>10
5–6	>10
6–7	>10
7–8	>10
8–9	N/A
9–10	N/A
10–11	>10
11–12	>10
12–13	>10
13–14	>10
14–15	N/A
15–16	N/A



▨ CORE RECOVERY, %

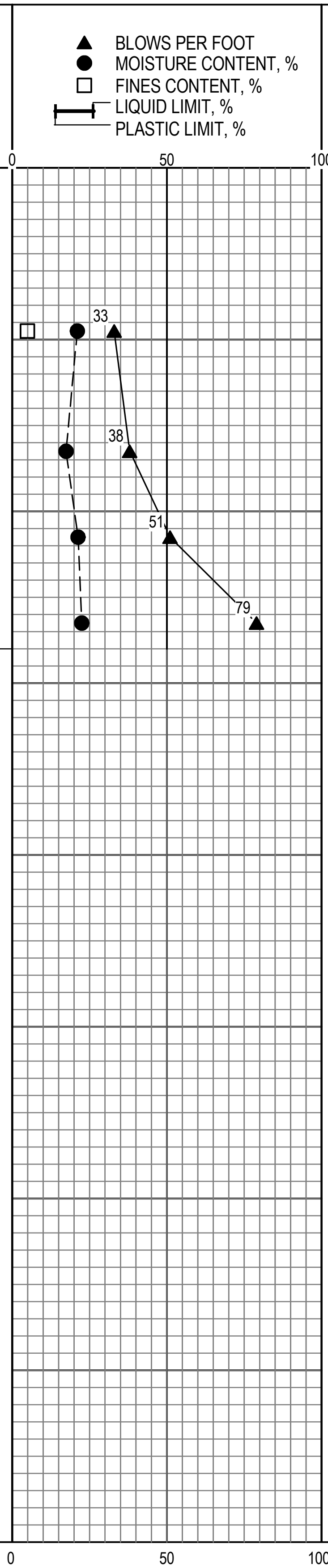
▨ ROCK QUALITY DESIGNATION (RQD), %

Logged By: S. Reddy	**Drilled by:** Hard Core Drilling, Inc.
Date Started: 7/18/16	**Coordinates:** 43.40181° N 124.27928° W (WGS84)
Drilling Method: Mud Rotary/HQ-3 Wireline Core **Equipment:** CME 75 HT Truck-Mounted Drill Rig **Hole Diameter:** 4 in.	**Hammer Type:** Auto Hammer **Weight:** 140 lb **Drop:** 30 in. **Energy Ratio:** 85%
Note: See Legend for Explanation of Symbols	

GRI

BORING B-16

DEPTH, FT	GRAPHIC LOG	CLASSIFICATION OF MATERIAL Surface Elevation: -38.5 ft [±] (MLLW)	ELEVATION, FT / DEPTH, FT	UCS, PSI	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT	FRACTURES/FT	COMMENTS AND ADDITIONAL TESTS
		SAND, trace silt, gray, dense, fine to medium grained, contains shell fragments							Casing embedded to 4 ft below mudline
5					S-1		7 14 19		
		---contains gravel-sized, moderately weathered, very soft (R1) siltstone fragments below 7.5 ft			S-2		11 15 23		
10		SILTSTONE, fresh, dark gray, extremely soft to very soft (R0 to R1) (Bastendorff Formation)	-48.5 10.0		S-3		18 24 27		
					S-4		19 32 47		
15		(8/8/2016)	-52.5 14.0						
20									
25									
30									
35									
40									



▨ CORE RECOVERY, %
▨ ROCK QUALITY DESIGNATION (RQD), %

Logged By: S. Reddy	**Drilled by:** Hard Core Drilling, Inc.
Date Started: 8/8/16	**Coordinates:** 43.39952° N 124.28258° W (WGS84)
Drilling Method: Mud Rotary **Equipment:** CME 75 HT Truck-Mounted Drill Rig **Hole Diameter:** 5 in.	**Hammer Type:** Auto Hammer **Weight:** 140 lb **Drop:** 30 in. **Energy Ratio:** 85%
Note: See Legend for Explanation of Symbols	

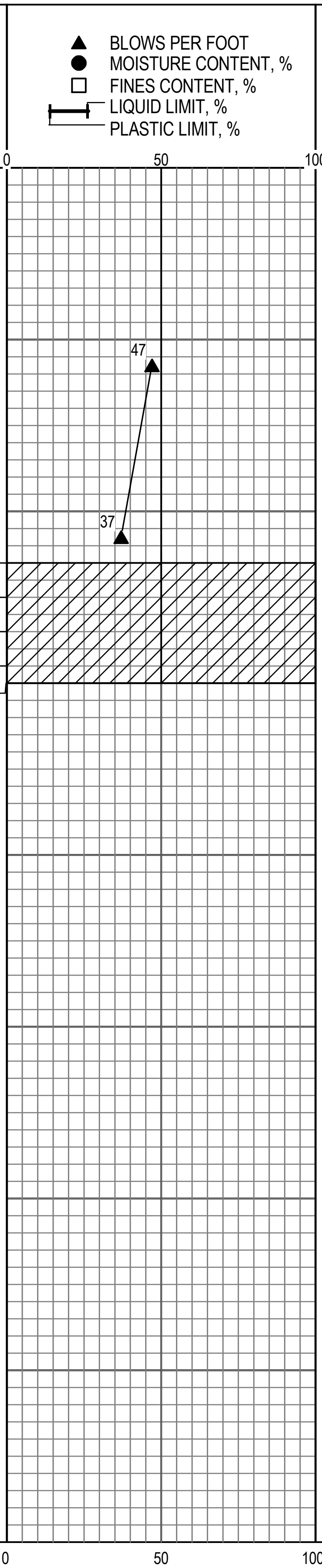
GRI

BORING B-17

2020 JOB NO. 5128 FIG. 19A

Surface Elevation: -37.0 ft [±] (MLLW)

DEPTH, FT	GRAPHIC LOG	CLASSIFICATION OF MATERIAL	ELEVATION, FT DEPTH, FT	UCS, PSI	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT	FRACTURES/FT	COMMENTS AND ADDITIONAL TESTS
		SAND, trace silt, dark gray, medium dense to dense, fine to medium grained, contains shell fragments							Casing embedded to 4 ft below mudline
5		SILTSTONE, dark gray, fresh, extremely soft (R0), very closely fractured, inclined jointing and bedding, contains clay alteration, slickensides (Bastendorff Formation)	-41.0 4.0		S-1		13 19 28		
10					S-2		14 19 18		
		---very soft (R1), contains less clay alteration between 12 and 12.5 ft			R-1			>10 >10	
		---very soft (R1), contains less clay alteration between 14 and 15 ft						>10	
15		(7/19/2016)	-52.0 15.0					>10	
20									
25									
30									
35									
40									



▨ CORE RECOVERY, %
▨ ROCK QUALITY DESIGNATION (RQD), %

Logged By: S. Reddy **Drilled by:** Hard Core Drilling, Inc.
Date Started: 7/19/16 **Coordinates:** 43.39577° N 124.28315° W (WGS84)
Drilling Method: Mud Rotary/HQ-3 Wireline Core
Equipment: CME 75 HT Truck-Mounted Drill Rig
Hole Diameter: 4 in.
Note: See Legend for Explanation of Symbols
Hammer Type: Auto Hammer
Weight: 140 lb
Drop: 30 in.
Energy Ratio: 85%

GRI

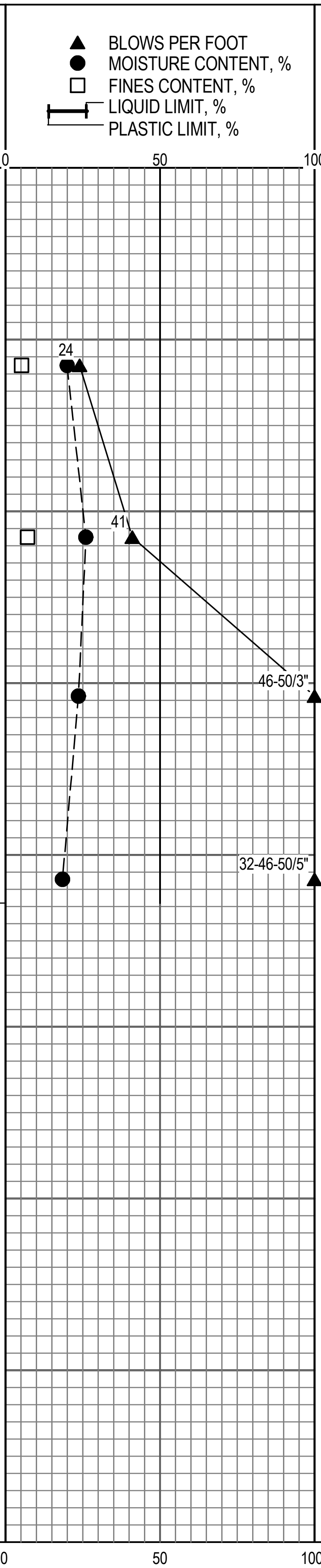
BORING B-18

2020 JOB NO. 5128 FIG. 20A

Surface Elevation: -34.0 ft [±] (MLLW)

CLASSIFICATION OF MATERIAL	ELEVATION, FT / DEPTH, FT	SAMPLE NO.	BLOW COUNT	COMMENTS AND ADDITIONAL TESTS
SAND, trace to some silt, gray, medium dense, fine to medium grained, contains gravel-sized shell fragments				Casing embedded to 3.5 ft below mudline
		S-1	7 12 12	
---dense below 10 ft		S-2	11 17 24	
SILTSTONE, fresh, dark gray, extremely soft to very soft (R0 to R1) (Bastendorff Formation)	-47.0 13.0			
		S-3	46 50/3"	
		S-4	32 46 50/5"	
(7/26/2016)	-55.4 21.4			

DEPTH, FT: 5, 10, 15, 20, 25, 30, 35, 40



▨ CORE RECOVERY, %

▨ ROCK QUALITY DESIGNATION (RQD), %

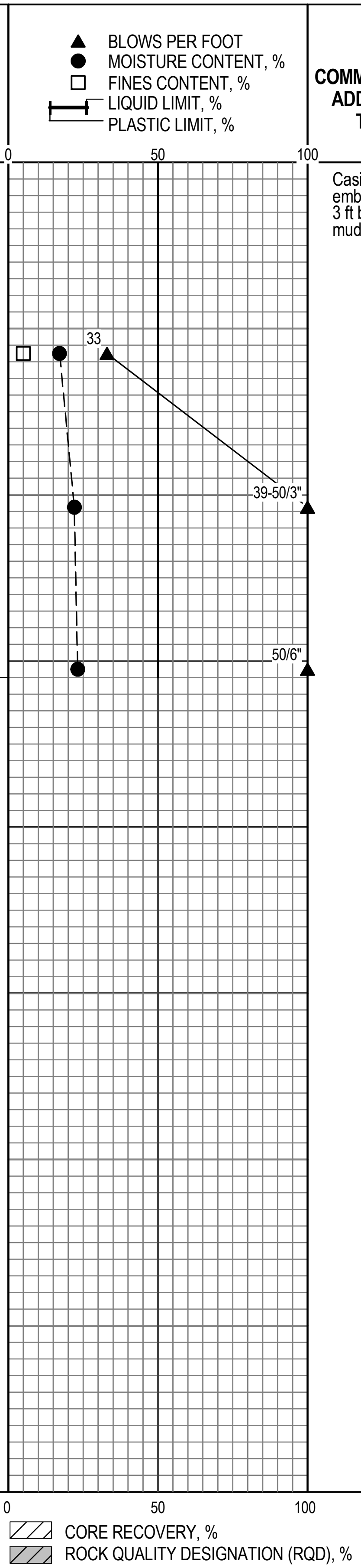
Logged By: S. Reddy	**Drilled by:** Hard Core Drilling, Inc.
Date Started: 7/26/16	**Coordinates:** 43.39421° N 124.286° W (WGS84)
Drilling Method: Mud Rotary **Equipment:** CME 75 HT Truck-Mounted Drill Rig **Hole Diameter:** 5 in.	**Hammer Type:** Auto Hammer **Weight:** 140 lb **Drop:** 30 in. **Energy Ratio:** 85%
Note: See Legend for Explanation of Symbols	

BORING B-19

GRI

2020 JOB NO. 5128 FIG. 21A

DEPTH, FT	GRAPHIC LOG	CLASSIFICATION OF MATERIAL Surface Elevation: -40.0 ft [±] (MLLW)	ELEVATION, FT / DEPTH, FT	UCS, PSI	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT	FRACTURES/FT	COMMENTS AND ADDITIONAL TESTS
0		SAND, trace to some silt, gray, dense, fine to medium grained, contains shell fragments							Casing embedded to 3 ft below mudline
5					S-1	I	8 12 21		
		SILTSTONE, fresh, dark gray, extremely soft to very soft (R0 to R1) (Bastendorff Formation)	-49.0 9.0						
10					S-2	I	39 50/3"		
15					S-3	I	50/6"		
		(7/26/2016)	-55.5 15.5						
20									
25									
30									
35									
40									



GRI ROCK BORING LOG (LAT/LONG) GRI DATA TEMPLATE.GDT 4/1/20

Logged By: S. Reddy **Drilled by:** Hard Core Drilling, Inc.
Date Started: 7/26/16 **Coordinates:** 43.38995° N 124.28841° W (WGS84)
Drilling Method: Mud Rotary
Equipment: CME 75 HT Truck-Mounted Drill Rig
Hole Diameter: 5 in.
Note: See Legend for Explanation of Symbols
Hammer Type: Auto Hammer
Weight: 140 lb
Drop: 30 in.
Energy Ratio: 85%

GRI

BORING B-20

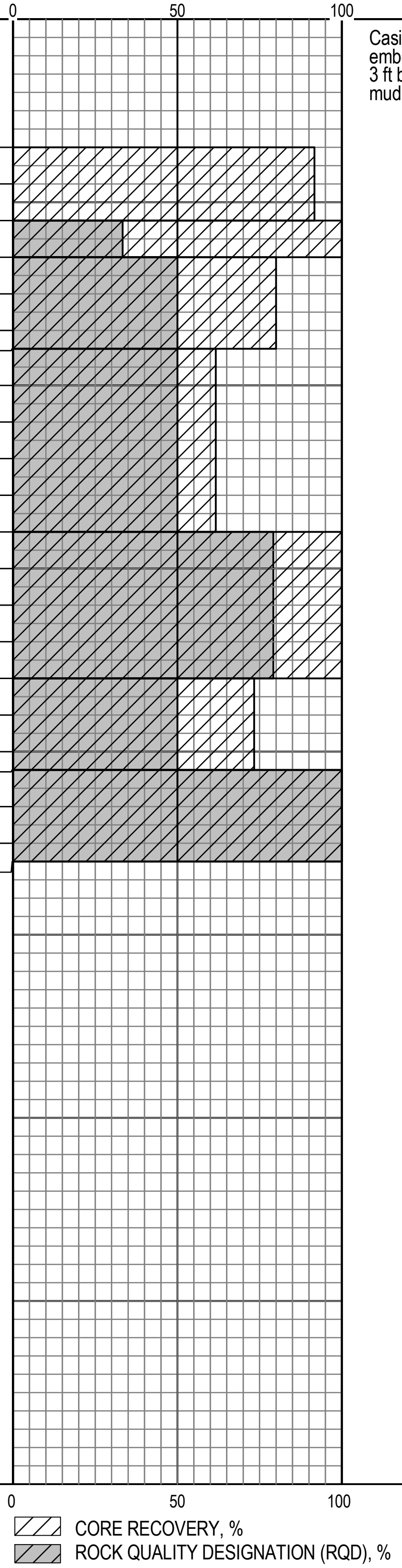
2020 JOB NO. 5128 FIG. 22A

Surface Elevation: -29.5 ft [±] (MLLW)

DEPTH, FT	GRAPHIC LOG	CLASSIFICATION OF MATERIAL	ELEVATION, FT / DEPTH, FT	UCS, PSI	COMMENTS AND ADDITIONAL TESTS
		SAND, trace silt, dark gray, medium dense to dense, fine to medium grained, contains shell fragments			Casing embedded to 3 ft below mudline
		SILTSTONE, dark gray, fresh, very soft (R1), very closely to closely fractured, inclined to nearly vertical jointing and bedding (Bastendorff Formation)	-33.0 3.5		
		---light gray, soft (R2) between 18 and 18.5 ft			
		---very soft (R1) moderately closely fractured below 20.5 ft		180	
		(7/15/2016)	-52.5 23.0		

SAMPLE NO.	FRACTURES/FT
R-1	>10 N/A
R-2	4
R-3	5 3 N/A
R-4	>10 8 2 N/A N/A
R-5	3 3 1 1
R-6	>10 N/A N/A
R-7	0 0 0

- ▲ BLOWS PER FOOT
- ● MOISTURE CONTENT, %
- ☐ FINES CONTENT, %
- LIQUID LIMIT, %
- PLASTIC LIMIT, %



GRI ROCK BORING LOG (LAT/LONG) GRI DATA TEMPLATE.GDT 4/1/20

Logged By: S. Reddy	**Drilled by:** Hard Core Drilling, Inc.
Date Started: 7/15/16	**Coordinates:** 43.38451° N 124.29271° W (WGS84)
Drilling Method: HQ-3 Wireline Core **Equipment:** CME 75 HT Truck-Mounted Drill Rig **Hole Diameter:** 4 in.	**Hammer Type:** Auto Hammer **Weight:** 140 lb **Drop:** 30 in. **Energy Ratio:** 85%
Note: See Legend for Explanation of Symbols	

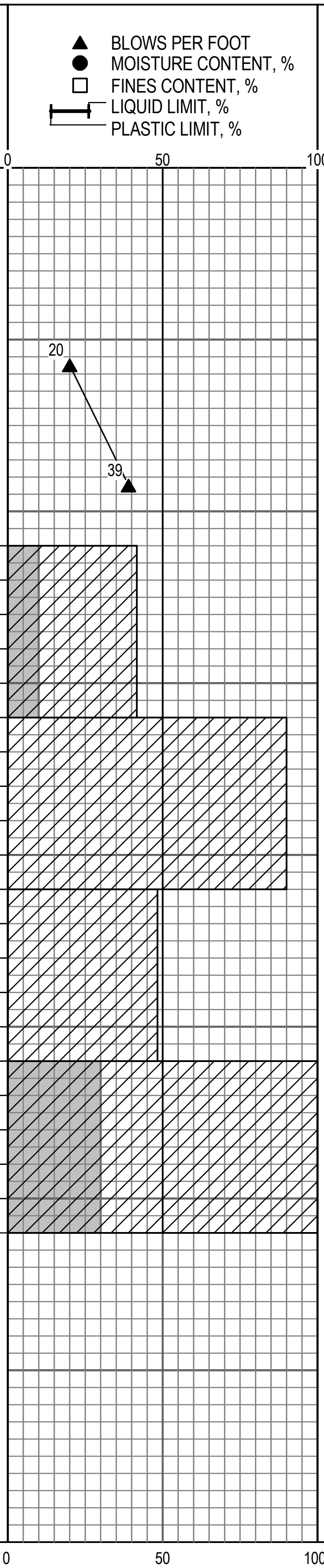
GRI

BORING B-21

2020 JOB NO. 5128 FIG. 23A

Surface Elevation: -24.0 ft [±]   (MLLW)

DEPTH, FT	CLASSIFICATION OF MATERIAL	ELEVATION, FT / DEPTH, FT	UCS, PSI	SAMPLE NO.	BLOW COUNT	FRACTURES/FT	COMMENTS AND ADDITIONAL TESTS
	SAND, trace silt, gray, medium dense, fine to medium grained, contains shell and gravel-sized, moderately weathered, very soft (R1) siltstone fragments						Casing embedded to 7 ft below mudline
5				S-1	6 7 13		
	SILTSTONE, dark gray, fresh, extremely soft (R0), very closely fractured, inclined jointing and bedding (Bastendorff Formation)	-31.0 7.0					
				S-2	8 16 23		
10							
	---very soft (R1) below 11 ft			R-1		>10 >10 N/A N/A N/A	
15							
				R-2		>10 >10 >10 >10 N/A	
	---extremely soft (R0), contains clay alteration between 19 and 20.5 ft						
20							
	---extremely soft (R0), contains clay alteration between 22 and 23.5 ft			R-3		>10 >10 >10 N/A N/A	
25							
	---closely fractured below 26 ft			R-4		7 6 3 6 >10	
30							
	(7/21/2016)	-55.0 31.0					
35							
40							



▨ CORE RECOVERY, %

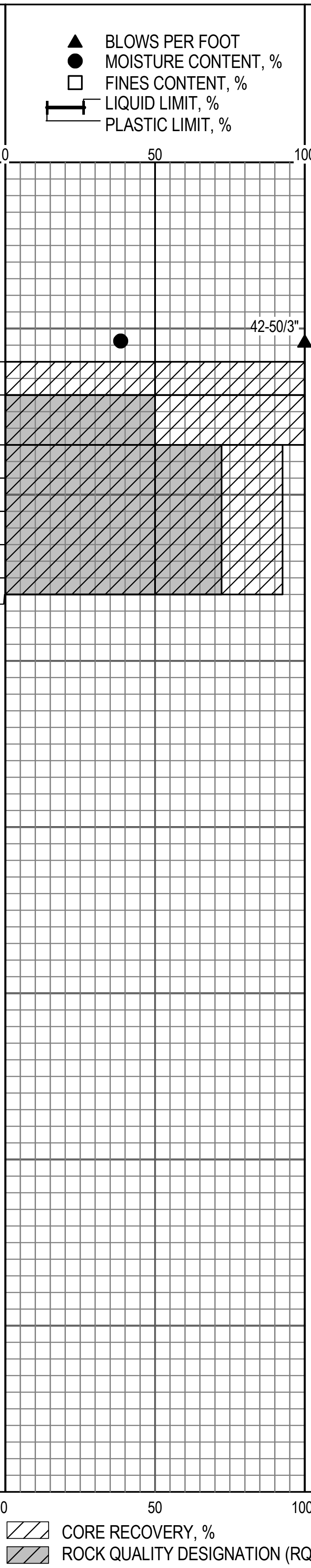
▨ ROCK QUALITY DESIGNATION (RQD), %

Logged By: S. Reddy	**Drilled by:** Hard Core Drilling, Inc.
Date Started: 7/21/16	**Coordinates:** 43.38323° N 124.29074° W (WGS84)
Drilling Method: Mud Rotary/HQ-3 Wireline Core **Equipment:** CME 75 HT Truck-Mounted Drill Rig **Hole Diameter:** 4 in.	**Hammer Type:** Auto Hammer **Weight:** 140 lb **Drop:** 30 in. **Energy Ratio:** 85%
Note: See Legend for Explanation of Symbols	

GRI

BORING B-22

DEPTH, FT	GRAPHIC LOG	CLASSIFICATION OF MATERIAL **Surface Elevation:** -39.5 ft [±] (MLLW)	ELEVATION, FT DEPTH, FT	UCS, PSI	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT	FRACTURES/FT	COMMENTS AND ADDITIONAL TESTS
		SAND, trace silt, dark gray, medium dense to dense, fine to medium grained, contains shell fragments							Casing embedded to 2.5 ft below mudline
		SILTSTONE, fresh, dark gray, very soft (R1), very closely to closely fractured, inclined bedding planes, contains shells (Bastendorff Formation)	-43.0 3.5						
5					S-1		42 50/3"		
					R-1			>10	
					R-2			5	
		---closely to moderately closely fractured below 8.5 ft		897				3	
10				608				0	
					R-3			8	
				912				0	
								N/A	
		(7/27/2016)	-52.5 13.0						
15									
20									
25									
30									
35									
40									



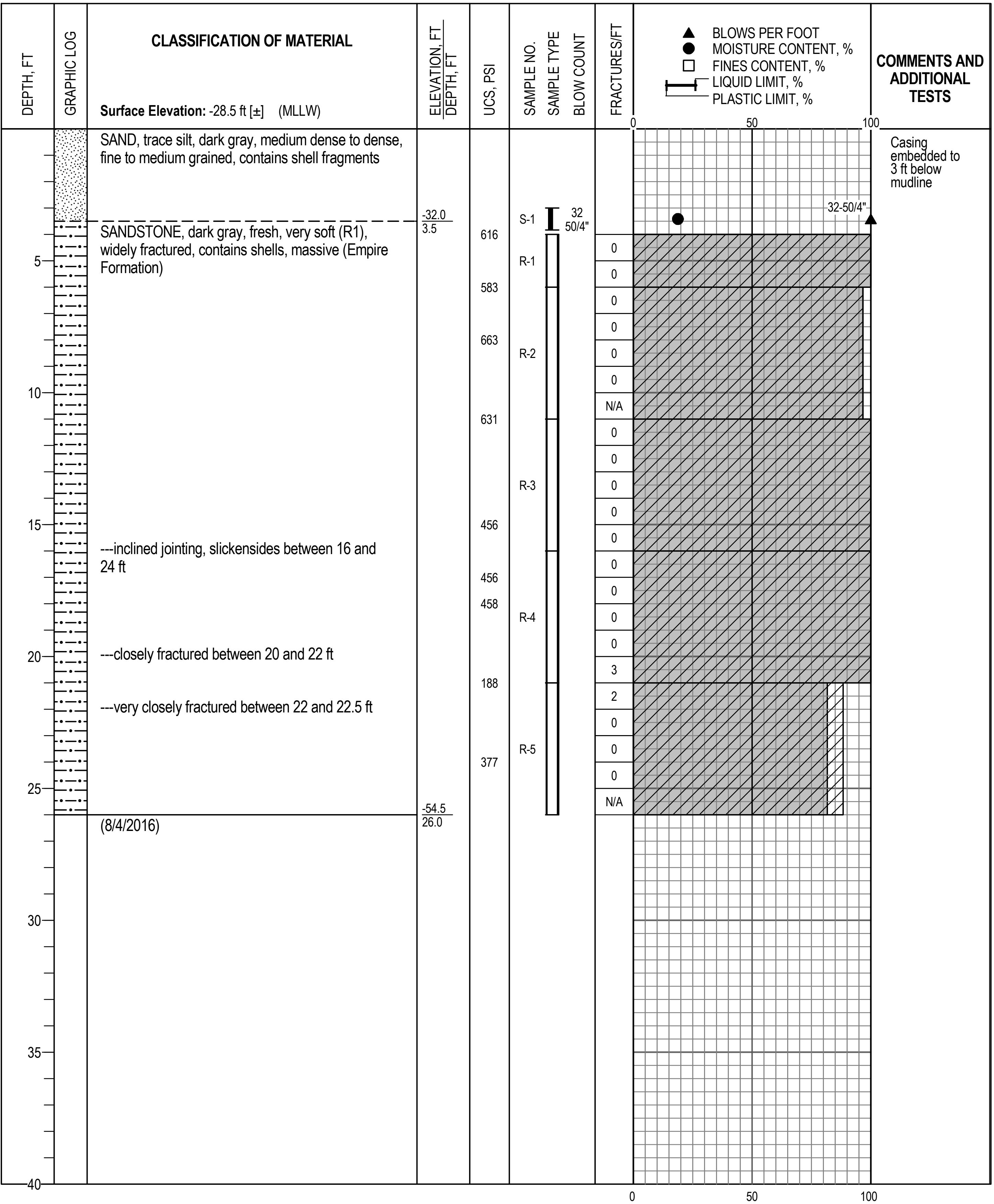
Logged By: S. Reddy **Drilled by:** Hard Core Drilling, Inc.
Date Started: 7/27/16 **Coordinates:** 43.37981° N 124.29526° W (WGS84)
Drilling Method: Mud Rotary / Hollow-Stem Auger
Equipment: CME 75 HT Truck-Mounted Drill Rig
Hole Diameter: 4 in.
Note: See Legend for Explanation of Symbols

Hammer Type: Auto Hammer
Weight: 140 lb
Drop: 30 in.
Energy Ratio: 85%

GRI

BORING B-23

2020 JOB NO. 5128 FIG. 25A



Surface Elevation: -28.5 ft [±] (MLLW)

SAND, trace silt, dark gray, medium dense to dense, fine to medium grained, contains shell fragments

SANDSTONE, dark gray, fresh, very soft (R1), widely fractured, contains shells, massive (Empire Formation)

---inclined jointing, slickensides between 16 and 24 ft

---closely fractured between 20 and 22 ft

---very closely fractured between 22 and 22.5 ft

(8/4/2016)

Casing embedded to 3 ft below mudline

▨ CORE RECOVERY, %

▨ ROCK QUALITY DESIGNATION (RQD), %

GRI ROCK BORING LOG (LAT/LONG) GRI DATA TEMPLATE.GDT 4/1/20

Logged By: S. Reddy	**Drilled by:** Hard Core Drilling, Inc.
Date Started: 8/4/16	**Coordinates:** 43.37897° N 124.29827° W (WGS84)
Drilling Method: Mud Rotary/HQ-3 Wireline Core **Equipment:** CME 75 HT Truck-Mounted Drill Rig **Hole Diameter:** 4 in.	**Hammer Type:** Auto Hammer **Weight:** 140 lb **Drop:** 30 in. **Energy Ratio:** 85%
Note: See Legend for Explanation of Symbols	

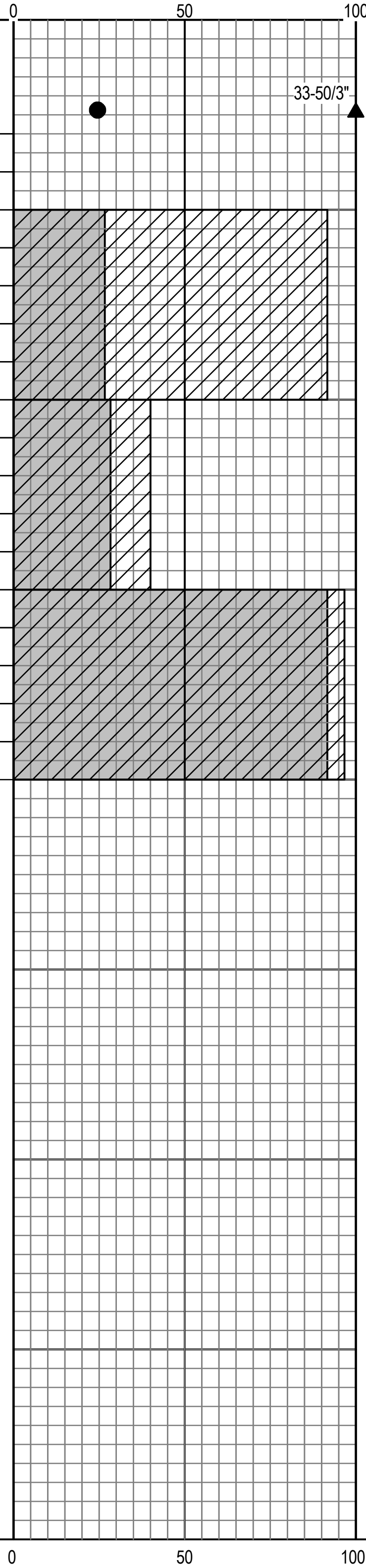
GRI

BORING B-24

2020 JOB NO. 5128 FIG. 26A

DEPTH, FT	GRAPHIC LOG	CLASSIFICATION OF MATERIAL Surface Elevation: -32.0 ft [±] (MLLW)	ELEVATION, FT / DEPTH, FT	UCS, PSI	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT	FRACTURES/FT	COMMENTS AND ADDITIONAL TESTS
		SAND, trace silt, gray, medium dense, fine to medium grained, contains shell and gravel-sized, moderately weathered, very soft (R1) siltstone fragments							Casing embedded to 1.5 ft below mudline
			-34.0 2.0		S-1	I	33 50/3"		
		SANDSTONE, dark gray, fine grained, fresh, very soft (R1), closely fractured, inclined jointing, massive (Empire Formation)			R-1			N/A	
								N/A	
5								5	
				160				0	
					R-2			2	
		---extremely soft (R0), very closely fractured between 8 and 9 ft						3	
								N/A	
10		---widely fractured below 10 ft		199				0	
								0	
					R-3			N/A	
								N/A	
								N/A	
15				209				0	
								0	
				277	R-4			0	
								1	
								N/A	
20		(8/10/2016)	-52.0 20.0						
25									
30									
35									
40									

▲ BLOWS PER FOOT
● MOISTURE CONTENT, %
□ FINES CONTENT, %
LIQUID LIMIT, %
PLASTIC LIMIT, %



▨ CORE RECOVERY, %
▨ ROCK QUALITY DESIGNATION (RQD), %

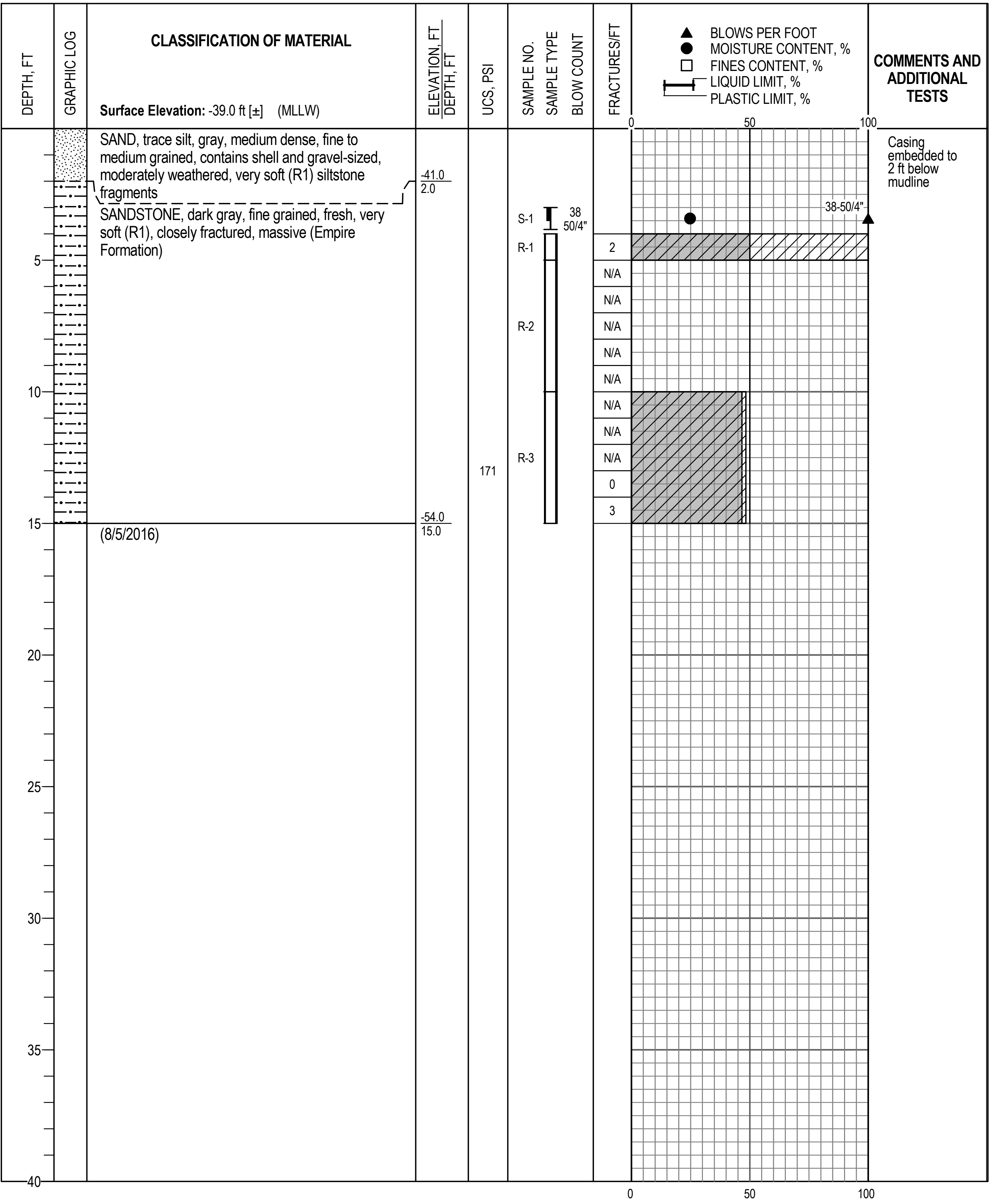
GRI ROCK BORING LOG (LAT/LONG) GRI DATA TEMPLATE.GDT 4/1/20

Logged By: K. Wolfe **Drilled by:** Hard Core Drilling, Inc.
Date Started: 8/10/16 **Coordinates:** 43.3768° N 124.30128° W (WGS84)
Drilling Method: Mud Rotary/HQ-3 Wireline Core
Equipment: CME 75 HT Truck-Mounted Drill Rig
Hole Diameter: 4 in.
Note: See Legend for Explanation of Symbols
Hammer Type: Auto Hammer
Weight: 140 lb
Drop: 30 in.
Energy Ratio: 85%

GRI

BORING B-25

2020 JOB NO. 5128 FIG. 27A



CLASSIFICATION OF MATERIAL

Surface Elevation: -39.0 ft [±] (MLLW)

DEPTH, FT	CLASSIFICATION OF MATERIAL	ELEVATION, FT / DEPTH, FT	UCS, PSI	SAMPLE NO.	BLOW COUNT	FRACTURES/FT	COMMENTS AND ADDITIONAL TESTS
0–2	SAND, trace silt, gray, medium dense, fine to medium grained, contains shell and gravel-sized, moderately weathered, very soft (R1) siltstone fragments	-41.0 2.0					Casing embedded to 2 ft below mudline
2–15	SANDSTONE, dark gray, fine grained, fresh, very soft (R1), closely fractured, massive (Empire Formation)			S-1	38 50/4"		
				R-1		2	
						N/A	
				R-2		N/A	
						N/A	
						N/A	
						N/A	
						N/A	
				R-3		N/A	
			171			N/A	
						0	
						3	
15	(8/5/2016)	-54.0 15.0					

▨ CORE RECOVERY, %
▨ ROCK QUALITY DESIGNATION (RQD), %

Logged By: S. Reddy	**Drilled by:** Hard Core Drilling, Inc.
Date Started: 8/5/16	**Coordinates:** 43.3745° N 124.30254° W (WGS84)
Drilling Method: Mud Rotary/HQ-3 Wireline Core **Equipment:** CME 75 HT Truck-Mounted Drill Rig **Hole Diameter:** 4 in.	**Hammer Type:** Auto Hammer **Weight:** 140 lb **Drop:** 30 in. **Energy Ratio:** 85%
Note: See Legend for Explanation of Symbols	

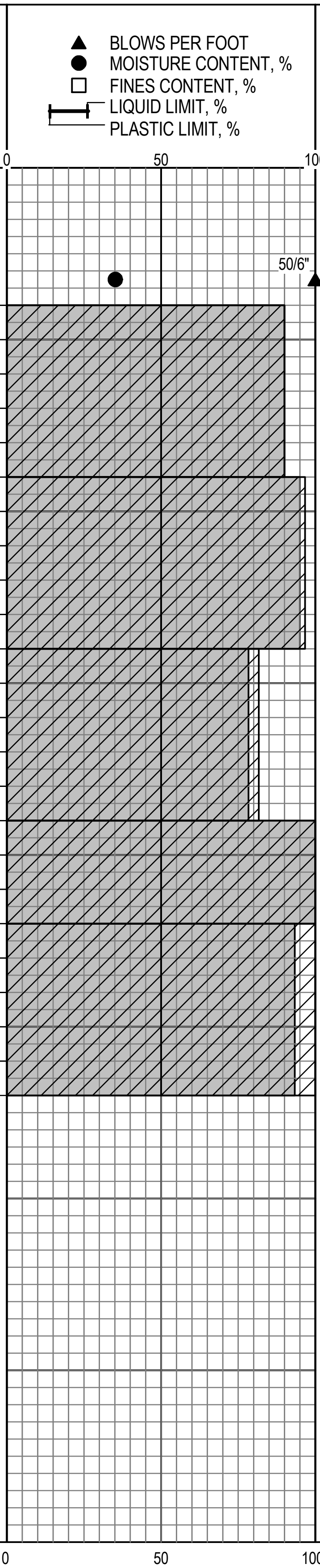
GRI

BORING B-26

2020 JOB NO. 5128 FIG. 28A

GRI ROCK BORING LOG (LAT/LONG) GRI DATA TEMPLATE.GDT 4/1/20

DEPTH, FT	GRAPHIC LOG	CLASSIFICATION OF MATERIAL Surface Elevation: -26.5 ft [±] (MLLW)	ELEVATION, FT DEPTH, FT	UCS, PSI	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT	FRACTURES/FT	COMMENTS AND ADDITIONAL TESTS
		SAND, trace silt, gray, very dense, fine grained							Casing embedded to 2.5 ft below mudline
			-30.0 3.5		S-1	I	50/6"		
		SANDSTONE, gray, fine grained, fresh, soft (R2), widely fractured, horizontal to vertical jointing, massive (Empire Formation)		1746				0	
5								0	
					R-1			0	
				1662				0	
								N/A	
								2	
10								0	
				1211	R-2			0	
				1692				0	
								N/A	
		---very closely fractured, contains shells between 14 and 14.5 ft						2	
15								0	
				1695	R-3			0	
								0	
								N/A	
				1655				0	
20					R-4			0	
				1816				0	
		---very closely fractured between 22 and 22.5 ft						2	
				1711				0	
					R-5			0	
25				1555				0	
								0	
		(8/3/2016)	-53.5 27.0						
30									
35									
40									



▨ CORE RECOVERY, %
▨ ROCK QUALITY DESIGNATION (RQD), %

GRI ROCK BORING LOG (LAT/LONG) GRI DATA TEMPLATE.GDT 4/1/20

Logged By: S. Reddy
Drilled by: Hard Core Drilling, Inc.
Date Started: 8/3/16
Coordinates: 43.37134° N 124.30852° W (WGS84)
Drilling Method: Mud Rotary/HQ-3 Wireline Core
Equipment: CME 75 HT Truck-Mounted Drill Rig
Hole Diameter: 4 in.
Hammer Type: Auto Hammer
Weight: 140 lb
Drop: 30 in.
Energy Ratio: 85%
Note: See Legend for Explanation of Symbols

GRI

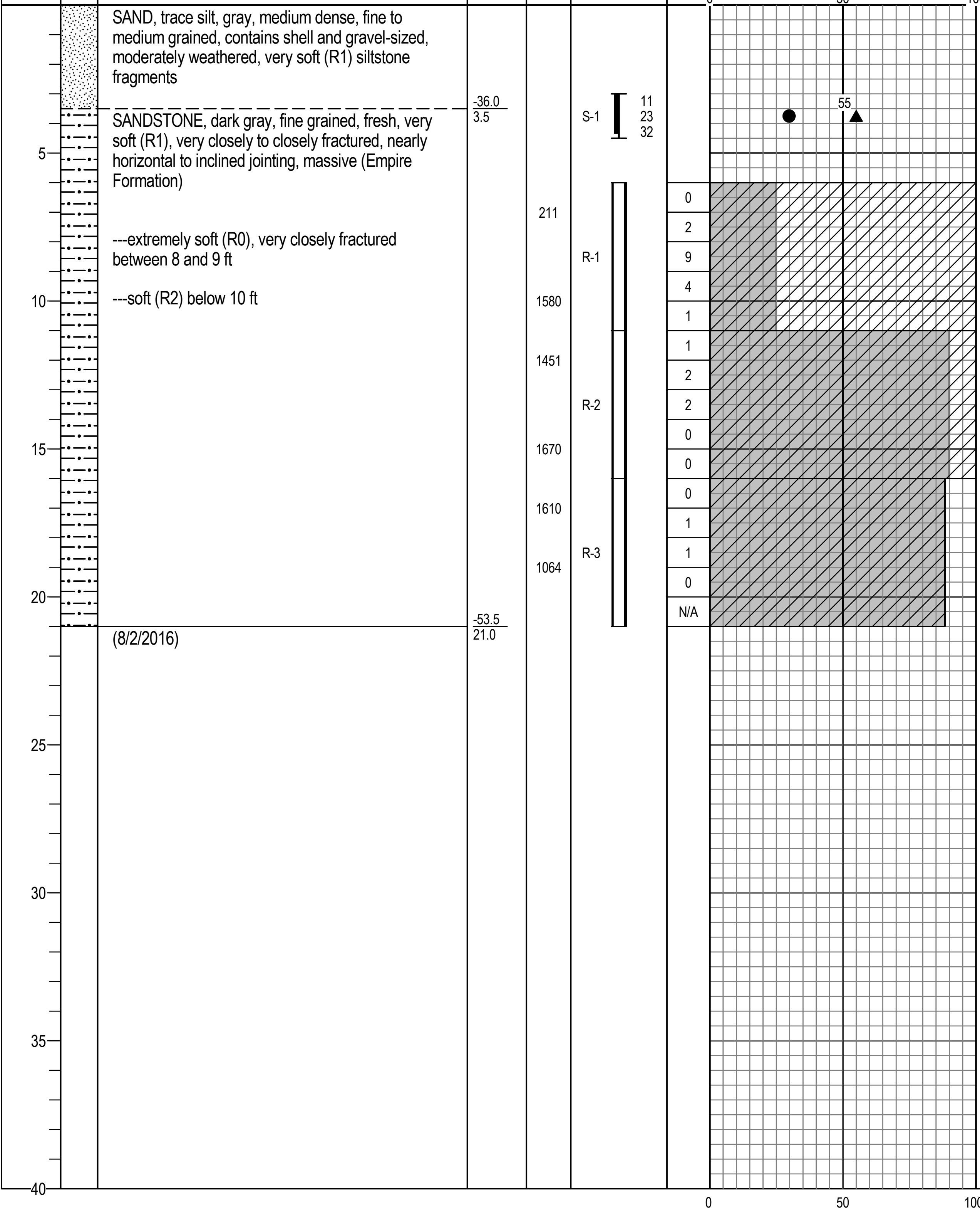
BORING B-27

2020 JOB NO. 5128 FIG. 29A

CLASSIFICATION OF MATERIAL

Surface Elevation: -32.5 ft [±] (MLLW)

DEPTH, FT	CLASSIFICATION OF MATERIAL	ELEVATION, FT / DEPTH, FT	UCS, PSI	SAMPLE NO.	BLOW COUNT	FRACTURES/FT	COMMENTS AND ADDITIONAL TESTS
0–3.5	SAND, trace silt, gray, medium dense, fine to medium grained, contains shell and gravel-sized, moderately weathered, very soft (R1) siltstone fragments						Casing embedded to 3 ft below mudline
3.5	SANDSTONE, dark gray, fine grained, fresh, very soft (R1), very closely to closely fractured, nearly horizontal to inclined jointing, massive (Empire Formation)	-36.0 3.5		S-1	11 23 32		
6–7			211	R-1		0	
7–8	---extremely soft (R0), very closely fractured between 8 and 9 ft					2	
8–9						9	
9–10						4	
10–11	---soft (R2) below 10 ft		1580			1	
11–12				R-2		1	
12–13			1451			2	
13–14						2	
14–15						0	
15–16			1670			0	
16–17				R-3		0	
17–18			1610			1	
18–19						1	
19–20			1064			0	
20–21						N/A	
21.0	(8/2/2016)	-53.5 21.0					



▲ BLOWS PER FOOT
● MOISTURE CONTENT, %
☐ FINES CONTENT, %
LIQUID LIMIT, %
PLASTIC LIMIT, %

▨ CORE RECOVERY, %
▨ ROCK QUALITY DESIGNATION (RQD), %

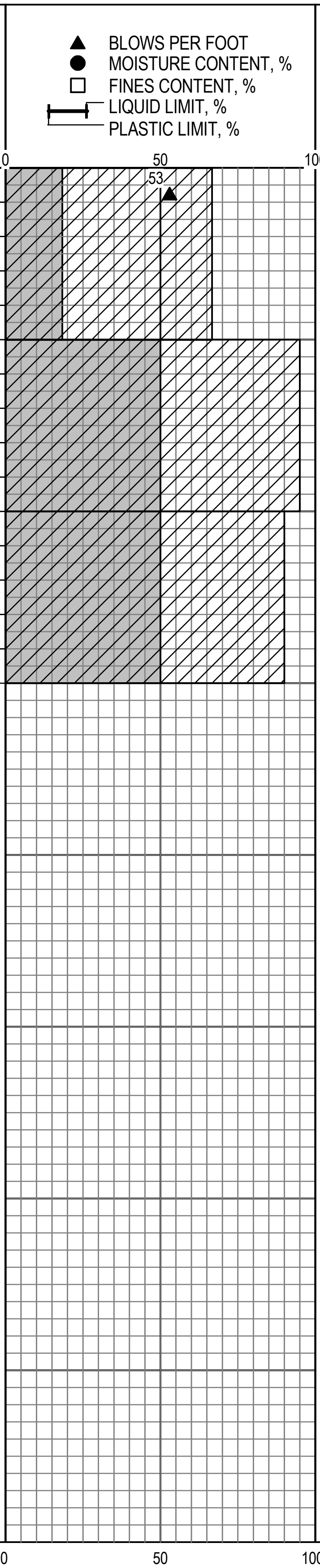
Logged By: S. Reddy
Drilled by: Hard Core Drilling, Inc.
Date Started: 8/2/16
Coordinates: 43.36903° N 124.31154° W (WGS84)
Drilling Method: Mud Rotary/HQ-3 Wireline Core
Equipment: CME 75 HT Truck-Mounted Drill Rig
Hole Diameter: 4 in.
Hammer Type: Auto Hammer
Weight: 140 lb
Drop: 30 in.
Energy Ratio: 85%
Note: See Legend for Explanation of Symbols

GRI

BORING B-28

2020 JOB NO. 5128 FIG. 30A

DEPTH, FT	GRAPHIC LOG	CLASSIFICATION OF MATERIAL **Surface Elevation:** -38.0 ft [±] (MLLW)	ELEVATION, FT DEPTH, FT	UCS, PSI	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT	FRACTURES/FT	COMMENTS AND ADDITIONAL TESTS
0		SAND, trace silt, gray, medium dense, fine to medium grained, contains shell and gravel-sized, moderately weathered, very soft (R1) siltstone fragments			S-1		14 19 34	N/A	Casing embedded to 1 ft below mudline
1		SANDSTONE, dark gray, fine grained, fresh, soft (R2), very closely to closely fractured, horizontal to inclined jointing, massive (Empire Formation)	-39.0 1.0					>10	
2					R-1			5	
3								3	
4								N/A	
5								2	
6								3	
7		---contains shells below 7.5 ft			R-2			2	
8								1	
9								N/A	
10								6	
11								1	
12				1512	R-3			4	
13								1	
14								N/A	
15		(7/20/2016)	-53.0 15.0						
20									
25									
30									
35									
40									



▨ CORE RECOVERY, %
▨ ROCK QUALITY DESIGNATION (RQD), %

GRI ROCK BORING LOG (LAT/LONG) GRI DATA TEMPLATE.GDT 4/1/20

Logged By: S. Reddy
Drilled by: Hard Core Drilling, Inc.
Date Started: 7/20/16
Coordinates: 43.36793° N 124.31127° W (WGS84)
Drilling Method: Mud Rotary/HQ-3 Wireline Core
Equipment: CME 75 HT Truck-Mounted Drill Rig
Hole Diameter: 4 in.
Note: See Legend for Explanation of Symbols
Hammer Type: Auto Hammer
Weight: 140 lb
Drop: 30 in.
Energy Ratio: 85%

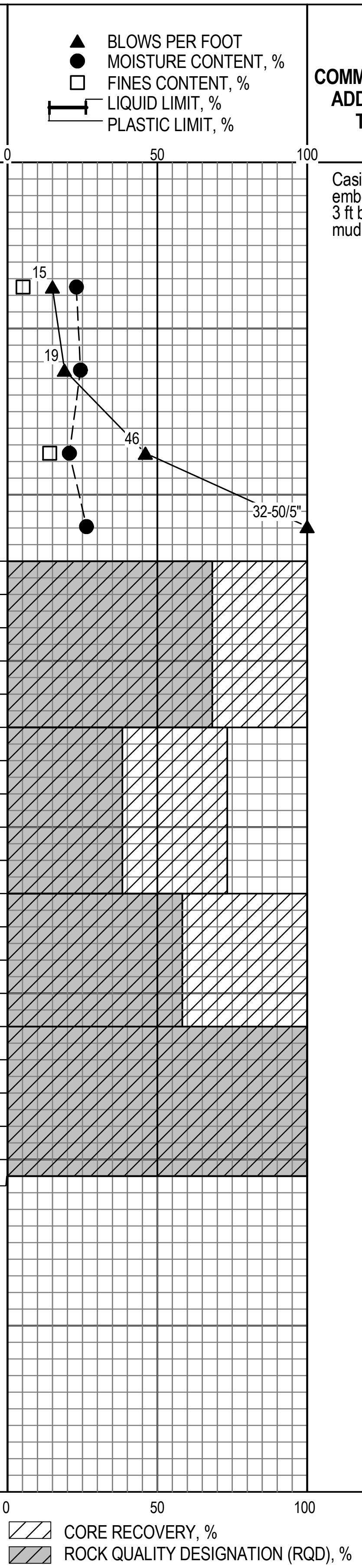
GRI

BORING B-29

2020 JOB NO. 5128 FIG. 31A

Surface Elevation: -26.0 ft [±] (MLLW)

DEPTH, FT	CLASSIFICATION OF MATERIAL	ELEVATION, FT / DEPTH, FT	UCS, PSI	SAMPLE NO.	BLOW COUNT	FRACTURES/FT	COMMENTS AND ADDITIONAL TESTS
0	SAND, trace to some silt, gray, medium dense, fine to medium grained, contains shell fragments						Casing embedded to 3 ft below mudline
4				S-1	4 6 9		
6				S-2	7 8 11		
8	---some silt to silty, dense below 8 ft						
9	SANDSTONE, dark gray, fine grained, fresh, very soft (R1), moderately closely fractured, horizontal to vertical jointing, contains shells, massive (Empire Formation)	-35.0 9.0		S-3	9 14 32		
11				S-4	32 50/5"		
12			542	R-1		0	
13	---extremely soft (R0), very closely fractured between 13 and 14 ft					4	
14	---soft (R2) below 14.5 ft		1095			0	
15						0	
16	---extremely soft (R0), very closely fractured between 16 and 17 ft					>10	
17				R-2		0	
18	---very soft (R1) below 18 ft		555			3	
19						1	
20						N/A	
21						N/A	
22			365	R-3		0	
23						1	
24						1	
25			531			0	
26	---widely fractured below 26 ft			R-4		0	
27						0	
28			386			0	
29	---fine to medium grained below 29.5 ft					0	
30			339			0	
30.5	(8/11/2016)	-56.5 30.5					



Logged By: K. Wolfe **Drilled by:** Hard Core Drilling, Inc.

Date Started: 8/11/16 **Coordinates:** 43.36592° N 124.31625° W (WGS84)

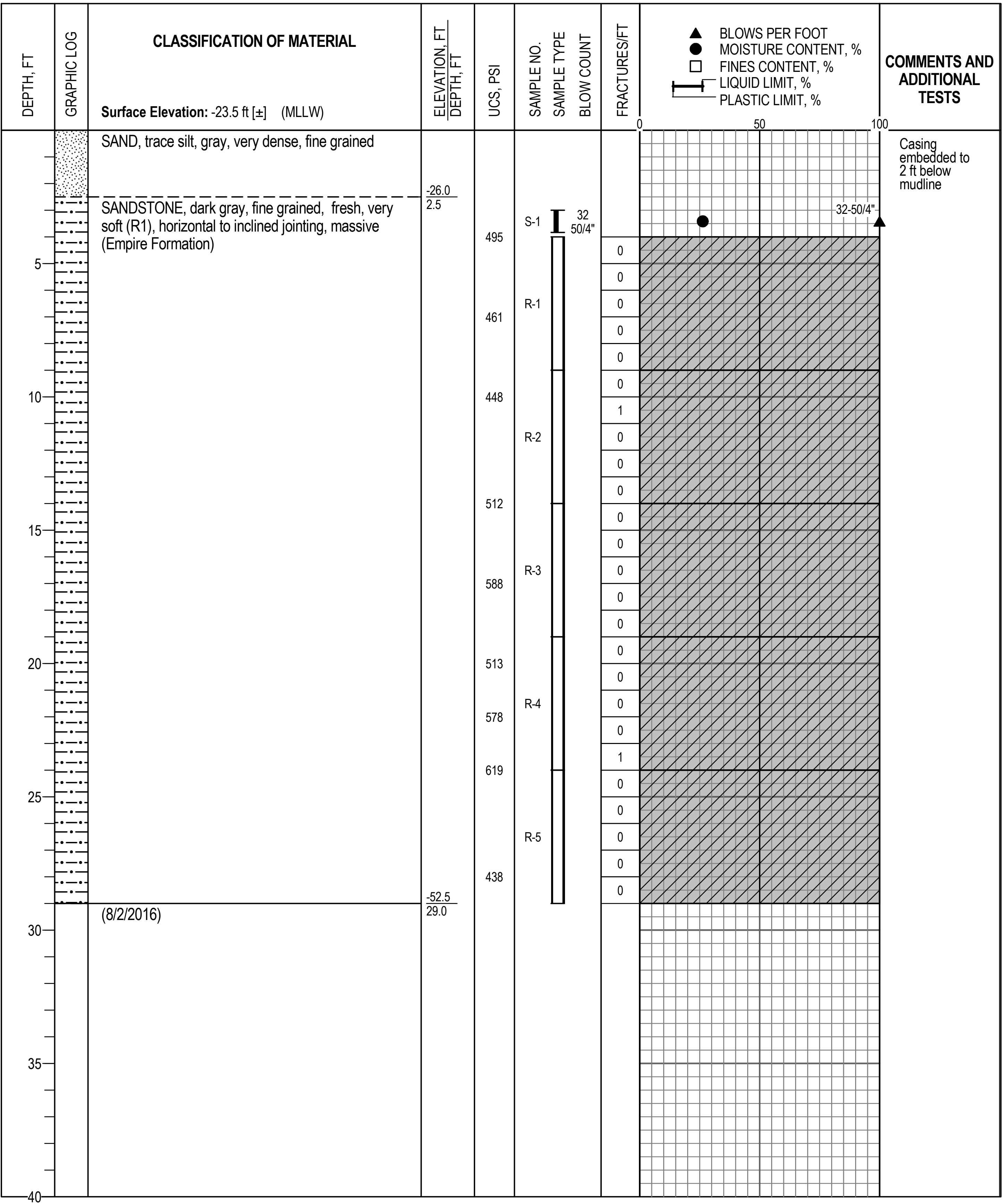
Drilling Method: Mud Rotary/HQ-3 Wireline Core
Equipment: CME 75 HT Truck-Mounted Drill Rig
Hole Diameter: 4 in.

Hammer Type: Auto Hammer
Weight: 140 lb
Drop: 30 in.
Energy Ratio: 85%

Note: See Legend for Explanation of Symbols

GRI

BORING B-30



CLASSIFICATION OF MATERIAL

Surface Elevation: -23.5 ft [±] (MLLW)

COMMENTS AND ADDITIONAL TESTS

SAND, trace silt, gray, very dense, fine grained

-26.0
2.5

SANDSTONE, dark gray, fine grained, fresh, very soft (R1), horizontal to inclined jointing, massive (Empire Formation)

-52.5
29.0

(8/2/2016)

Casing embedded to 2 ft below mudline

SAMPLE NO.	BLOW COUNT
S-1	32 50/4"
R-1	
R-2	
R-3	
R-4	
R-5	

UCS, PSI
495
461
448
512
588
513
578
619
438

FRACTURES/FT
0
0
0
0
0
0
1
0
0
0
0
0
0
0
0
0
0
0
0
0
1
0
0
0
0

0 50 100

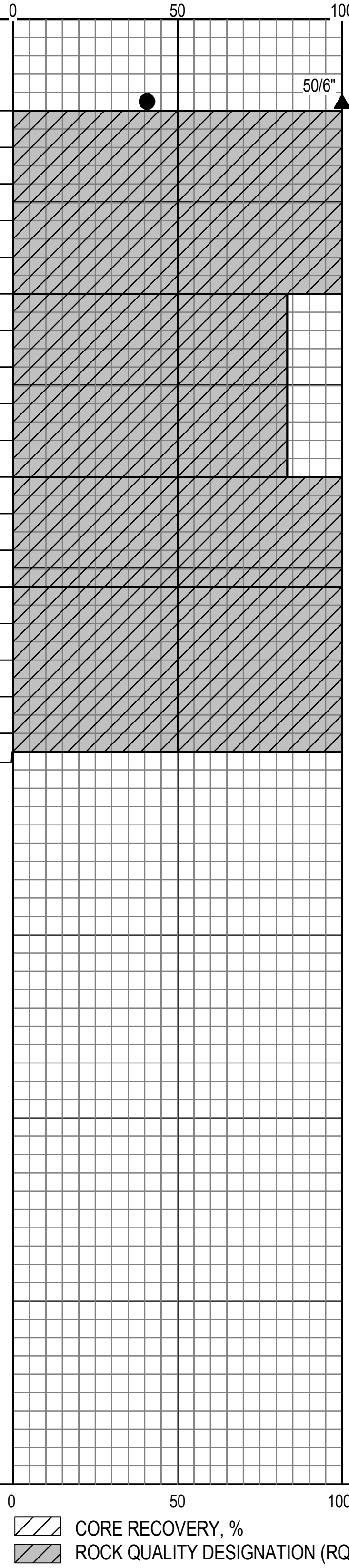
▨ CORE RECOVERY, %
▨ ROCK QUALITY DESIGNATION (RQD), %

Logged By: S. Reddy **Drilled by:** Hard Core Drilling, Inc.
Date Started: 8/2/16 **Coordinates:** 43.36265° N 124.31654° W (WGS84)
Drilling Method: Mud Rotary/HQ-3 Wireline Core
Equipment: CME 75 HT Truck-Mounted Drill Rig
Hole Diameter: 4 in.
Hammer Type: Auto Hammer
Weight: 140 lb
Drop: 30 in.
Energy Ratio: 85%
Note: See Legend for Explanation of Symbols

GRI

BORING B-31

DEPTH, FT	GRAPHIC LOG	CLASSIFICATION OF MATERIAL Surface Elevation: -33.0 ft [±] (MLLW)	ELEVATION, FT DEPTH, FT	UCS, PSI	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT	FRACTURES/FT	▲ BLOWS PER FOOT ● MOISTURE CONTENT, % ☐ FINES CONTENT, % LIQUID LIMIT, % PLASTIC LIMIT, %	COMMENTS AND ADDITIONAL TESTS
		SAND, trace silt, gray, very dense, fine grained	-34.0 1.0		S-1		50/6"			Casing embedded to 1.5 ft below mudline
		SANDSTONE, dark gray, fine grained, fresh, soft (R2), very widely fractured, nearly horizontal to inclined jointing, massive (Empire Formation)	-53.0 20.0	1424 1711 1418 1319 1544 1769 1296	R-1 R-2 R-3 R-4			0 0 0 0 0 0 0 0 0 N/A 0 0 0 0 0 0 0 0		
		(8/11/2016)								



DEPTH, FT: 5, 10, 15, 20, 25, 30, 35, 40

GRI ROCK BORING LOG (LAT/LONG) GRI DATA TEMPLATE.GDT 4/1/20

Logged By: K. Wolfe
Drilled by: Hard Core Drilling, Inc.
Date Started: 8/11/16
Coordinates: 43.36052° N 124.31973° W (WGS84)
Drilling Method: Mud Rotary/HQ-3 Wireline Core
Equipment: CME 75 HT Truck-Mounted Drill Rig
Hole Diameter: 4 in.
Note: See Legend for Explanation of Symbols
Hammer Type: Auto Hammer
Weight: 140 lb
Drop: 30 in.
Energy Ratio: 85%

GRI

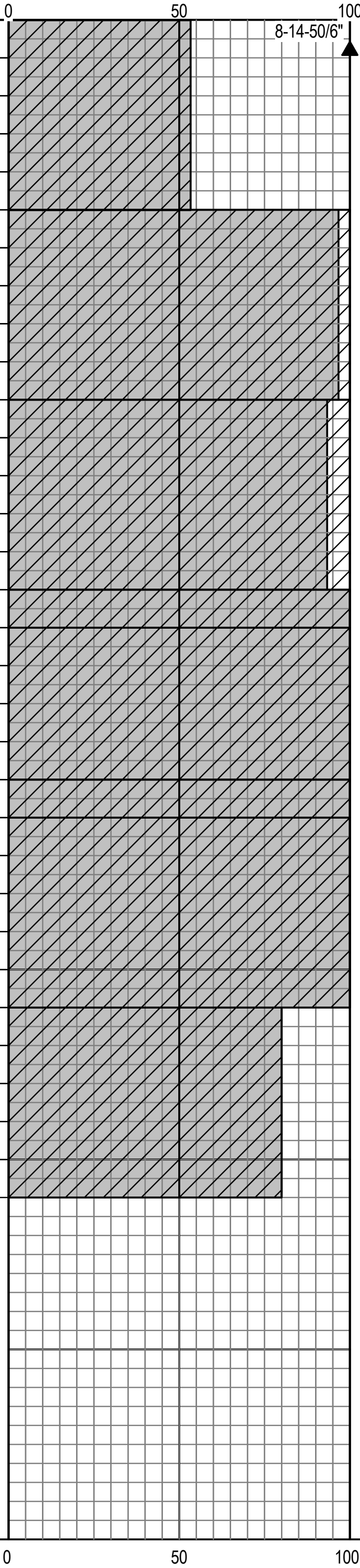
BORING B-32

2020 JOB NO. 5128 FIG. 34A

Surface Elevation: -21.5 ft [±] (MLLW)

▲ BLOWS PER FOOT
● MOISTURE CONTENT, %
☐ FINES CONTENT, %
LIQUID LIMIT, %
PLASTIC LIMIT, %

DEPTH, FT	CLASSIFICATION OF MATERIAL	ELEVATION, FT / DEPTH, FT	UCS, PSI	SAMPLE NO.	BLOW COUNT	FRACTURES/FT	COMMENTS AND ADDITIONAL TESTS
	SAND, trace silt, brown, very dense, fine to medium grained, contains shell fragments	-22.5 1.0		S-1	8 14 50/6"	N/A	Casing embedded to 1 ft below mudline
	SANDSTONE, dark gray, fine grained, fresh, soft (R2), widely fractured, horizontal to inclined jointing, massive (Empire Formation)					N/A	
			1681	R-1		1	
						0	
						0	
5						0	
			1729			0	
				R-2		0	
						0	
			1723			0	
10						1	
						0	
				R-3		0	
						0	
						0	
15				R-4		0	
			1576			0	
						1	
				R-5		0	
						0	
20				R-6		0	
			1239			0	
						0	
				R-7		0	
						0	
25						0	
			1495			0	
						0	
				R-8		0	
						0	
30						N/A	
	(7/22/2016)	-52.5 31.0					
35							
40							



▨ CORE RECOVERY, %
▨ ROCK QUALITY DESIGNATION (RQD), %

GRI ROCK BORING LOG (LAT/LONG) GRI DATA TEMPLATE.GDT 4/1/20

Logged By: S. Reddy
Drilled by: Hard Core Drilling, Inc.
Date Started: 7/22/16
Coordinates: 43.35849° N 124.31929° W (WGS84)
Drilling Method: Mud Rotary/HQ-3 Wireline Core
Equipment: CME 75 HT Truck-Mounted Drill Rig
Hole Diameter: 4 in.
Note: See Legend for Explanation of Symbols
Hammer Type: Auto Hammer
Weight: 140 lb
Drop: 30 in.
Energy Ratio: 85%

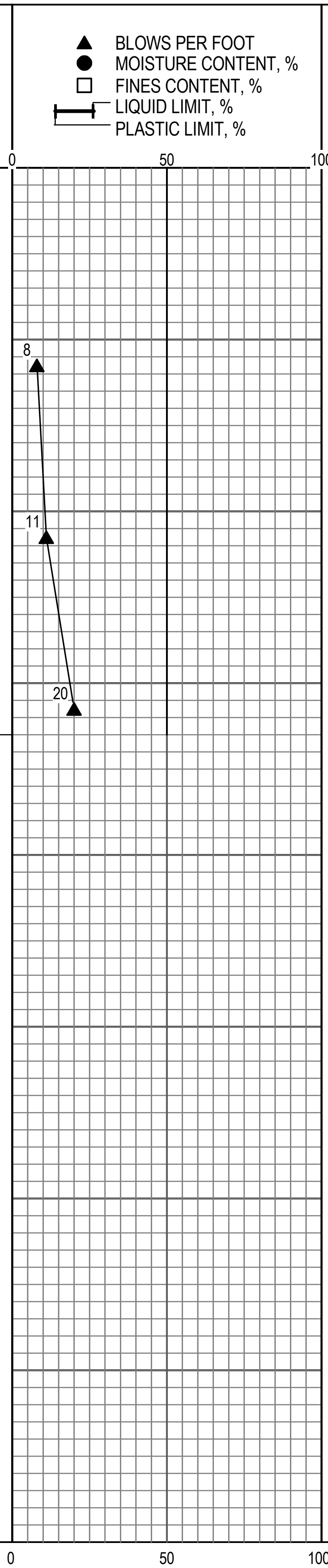
GRI

BORING B-33

2020 JOB NO. 5128 FIG. 35A

Surface Elevation: -40.5 ft [±] (MLLW)

DEPTH, FT	GRAPHIC LOG	CLASSIFICATION OF MATERIAL	ELEVATION, FT / DEPTH, FT	UCS, PSI	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT	FRACTURES/FT	COMMENTS AND ADDITIONAL TESTS
0		SAND, trace silt, gray, loose, fine to medium grained, contains shell fragments							Casing embedded to 3.5 ft below mudline
5					S-1		3 3 5		
10		---medium dense below 10 ft			S-2		4 5 6		
15					S-3		5 10 10		
16.5		(7/20/2016)	-57.0 16.5						
20									
25									
30									
35									
40									



▨ CORE RECOVERY, %
▨ ROCK QUALITY DESIGNATION (RQD), %

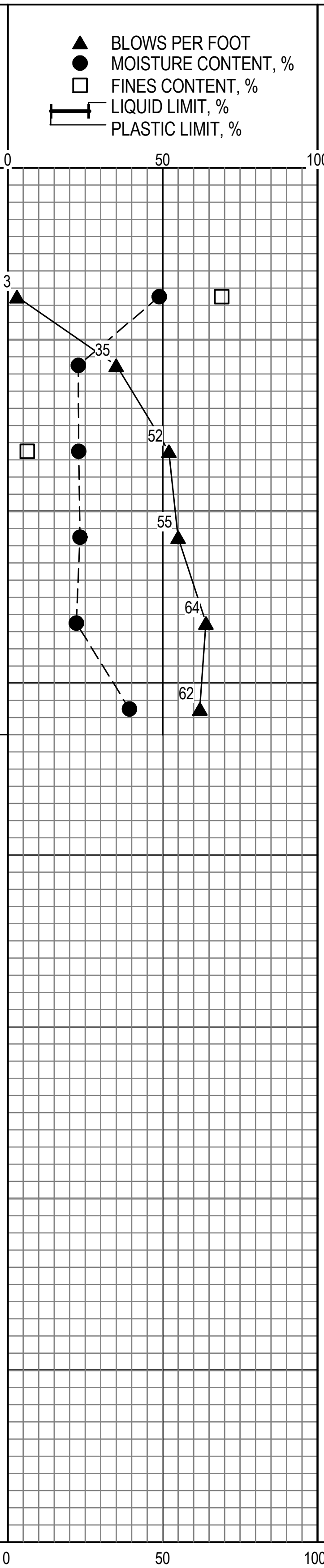
Logged By: S. Reddy	**Drilled by:** Hard Core Drilling, Inc.
Date Started: 7/20/16	**Coordinates:** 43.35382° N 124.32176° W (WGS84)
Drilling Method: Mud Rotary/HQ-3 Wireline Core **Equipment:** CME 75 HT Truck-Mounted Drill Rig **Hole Diameter:** 4 in.	**Hammer Type:** Auto Hammer **Weight:** 140 lb **Drop:** 30 in. **Energy Ratio:** 85%
Note: See Legend for Explanation of Symbols	

GRI

BORING B-34

Surface Elevation: -36.5 ft [±] (MLLW)

DEPTH, FT	CLASSIFICATION OF MATERIAL	ELEVATION, FT DEPTH, FT	UCS, PSI	SAMPLE NO.	BLOW COUNT	FRACTURES/FT	COMMENTS AND ADDITIONAL TESTS
	SILT, gray, soft, very thin interbedded layers of fine- to medium-grained sand						Casing embedded to 3 ft below mudline
				S-1	0 0 3		
5	SAND, trace to some silt, dark gray, dense, fine to medium grained	-41.0 4.5					
				S-2	5 15 20		
	---very dense below 7.5 ft						
				S-3	15 23 29		
10				S-4	16 22 33		
				S-5	20 30 34		
15				S-6	23 28 34		
	(8/9/2016)	-53.0 16.5					
20							
25							
30							
35							
40							



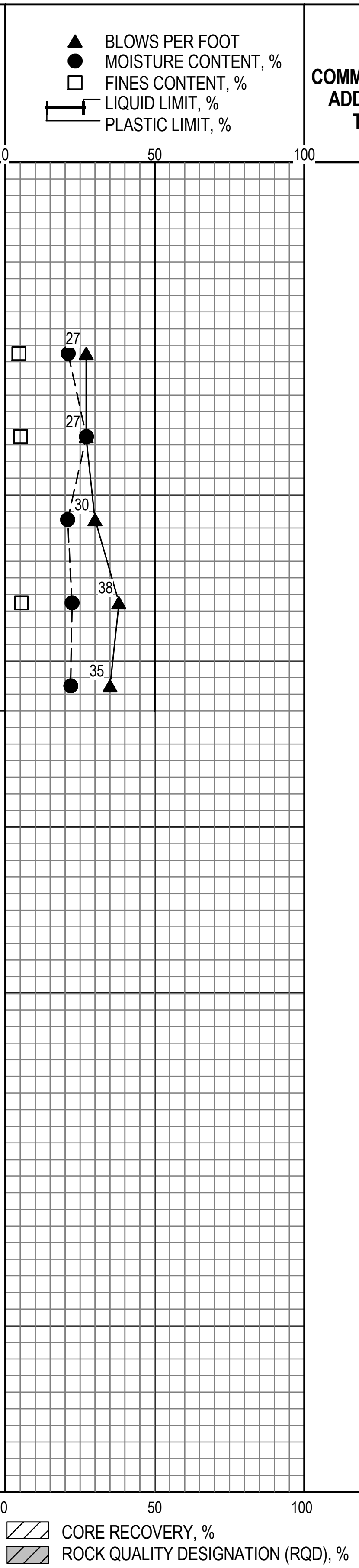
▨ CORE RECOVERY, %
▨ ROCK QUALITY DESIGNATION (RQD), %

Logged By: S. Reddy	**Drilled by:** Hard Core Drilling, Inc.
Date Started: 8/9/16	**Coordinates:** 43.42183° N 124.26525° W (WGS84)
Drilling Method: Mud Rotary **Equipment:** CME 75 HT Truck-Mounted Drill Rig **Hole Diameter:** 5 in.	**Hammer Type:** Auto Hammer **Weight:** 140 lb **Drop:** 30 in. **Energy Ratio:** 85%
Note: See Legend for Explanation of Symbols	

GRI

BORING B-37

DEPTH, FT	GRAPHIC LOG	CLASSIFICATION OF MATERIAL **Surface Elevation:** -38.0 ft [±] (MLLW)	ELEVATION, FT DEPTH, FT	UCS, PSI	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT	FRACTURES/FT	COMMENTS AND ADDITIONAL TESTS
		SAND, trace to some silt, gray, medium dense, fine to medium grained, contains shell fragments							
5					S-1		8 12 15		
		---shell fragments absent below 7.5 ft			S-2		12 14 13		
10		---medium dense to dense below 10 ft			S-3		11 13 17		
		---dense below 12.5 ft			S-4		14 18 20		
15					S-5		13 15 20		
		(8/4/2016)	-54.5 16.5						
20									
25									
30									
35									
40									



GRI ROCK BORING LOG (LAT/LONG) GRI DATA TEMPLATE.GDT 4/1/20

Logged By: S. Reddy
Drilled by: Hard Core Drilling, Inc.
Date Started: 8/4/16
Coordinates: 43.41162° N 124.27669° W (WGS84)
Drilling Method: Mud Rotary
Equipment: CME 75 HT Truck-Mounted Drill Rig
Hole Diameter: 5 in.
Note: See Legend for Explanation of Symbols
Hammer Type: Auto Hammer
Weight: 140 lb
Drop: 30 in.
Energy Ratio: 85%

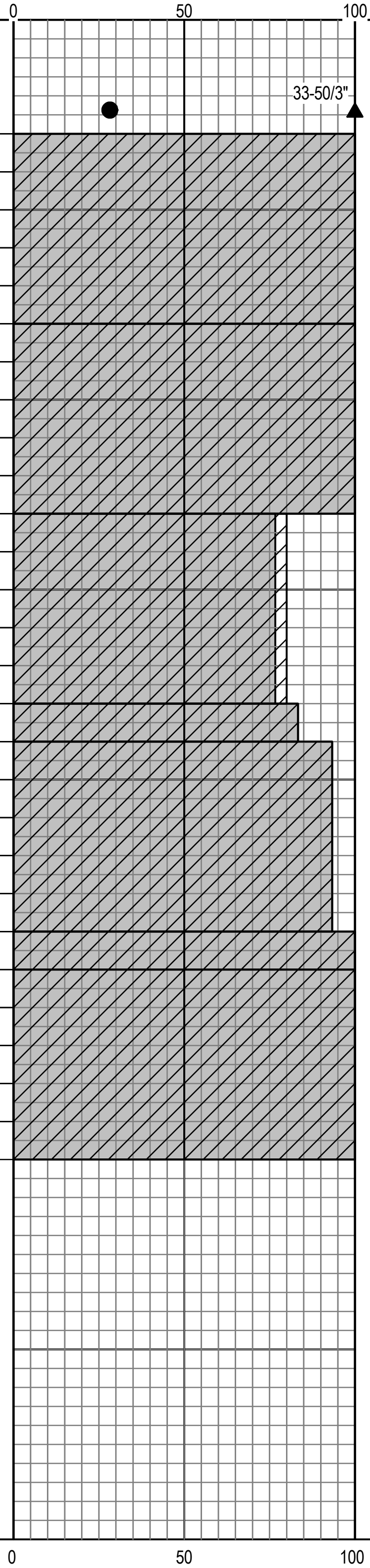
GRI

BORING B-38

2020 JOB NO. 5128 FIG. 38A

DEPTH, FT	GRAPHIC LOG	CLASSIFICATION OF MATERIAL Surface Elevation: -22.0 ft [±] (MLLW)	ELEVATION, FT DEPTH, FT	UCS, PSI	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT	FRACTURES/FT	COMMENTS AND ADDITIONAL TESTS
		SAND, trace silt, dark gray, very dense, fine grained	-23.0 1.0						Casing embedded to 1 ft below mudline
		SANDSTONE, dark gray, fine grained, fresh, very soft (R1), widely fractured, nearly horizontal to inclined jointing, massive (Empire Formation)			S-1	I	33 50/3"		
				335	R-1			0 0 0 0 1	
5				428					
		---very widely fractured below 8 ft			R-2			0 0 0 0 0	
10				389 372					
				346	R-3			0 0 2 0 N/A	
15									
					R-4			N/A	
20				258 327	R-5			0 0 0 0 N/A	
					R-6			0	
25				397 465	R-7			0 0 0 0 0 0	
30		(8/12/2016)	-52.0 30.0						
35									
40									

▲ BLOWS PER FOOT
● MOISTURE CONTENT, %
□ FINES CONTENT, %
LIQUID LIMIT, %
PLASTIC LIMIT, %



▨ CORE RECOVERY, %
▨ ROCK QUALITY DESIGNATION (RQD), %

Logged By: K. Wolfe
Drilled by: Hard Core Drilling, Inc.
Date Started: 8/12/16
Coordinates: 43.36041° N 124.3176° W (WGS84)
Drilling Method: Mud Rotary/HQ-3 Wireline Core
Equipment: CME 75 HT Truck-Mounted Drill Rig
Hole Diameter: 4 in.
Note: See Legend for Explanation of Symbols
Hammer Type: Auto Hammer
Weight: 140 lb
Drop: 30 in.
Energy Ratio: 85%

GRI

BORING B-40

2020 JOB NO. 5128 FIG. 39A

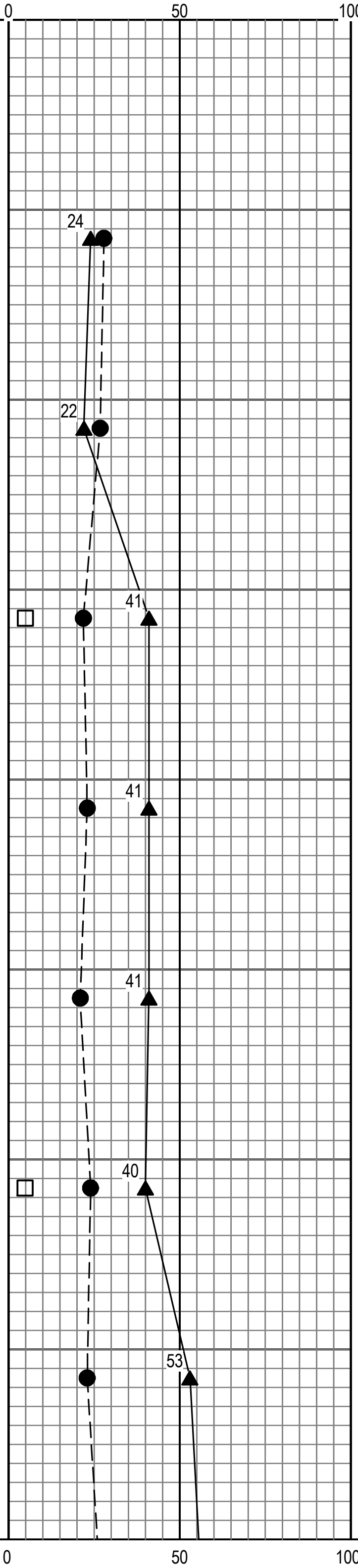
GRI ROCK BORING LOG (LAT/LONG) GRI DATA TEMPLATE.GDT 4/1/20

CLASSIFICATION OF MATERIAL

Surface Elevation: 13.8 ft [±] (MLLW)

DEPTH, FT	GRAPHIC LOG	CLASSIFICATION OF MATERIAL	ELEVATION, FT DEPTH, FT	UCS, PSI	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT	FRACTURES/FT	COMMENTS AND ADDITIONAL TESTS
0		SAND, trace silt, brown, medium dense, fine to medium grained							
5					S-1	I	8 11 13		
10					S-2	I	9 11 11		
15		---dense below 15 ft			S-3	I	14 17 24		
20					S-4	I	12 22 19		
25					S-5	I	14 18 23		
30					S-6	I	15 20 20		
35		---gray, very dense, shell fragments below 35 ft			S-7	I	15 23 30		
40									

▲ BLOWS PER FOOT
● MOISTURE CONTENT, %
☐ FINES CONTENT, %
LIQUID LIMIT, %
PLASTIC LIMIT, %



▨ CORE RECOVERY, %
▨ ROCK QUALITY DESIGNATION (RQD), %

(CONTINUED NEXT PAGE)

Logged By: S. Reddy	**Drilled by:** Hard Core Drilling, Inc.
Date Started: 11/1/16	**Coordinates:** 43.351482° N 124.342956° W (WGS84)
Drilling Method: Mud Rotary/HQ-3 Wireline Core **Equipment:** CME 850 Track-Mounted Drill Rig **Hole Diameter:** 5 in.	**Hammer Type:** Auto Hammer **Weight:** 140 lb **Drop:** 30 in. **Energy Ratio:** 91%
Note: See Legend for Explanation of Symbols	

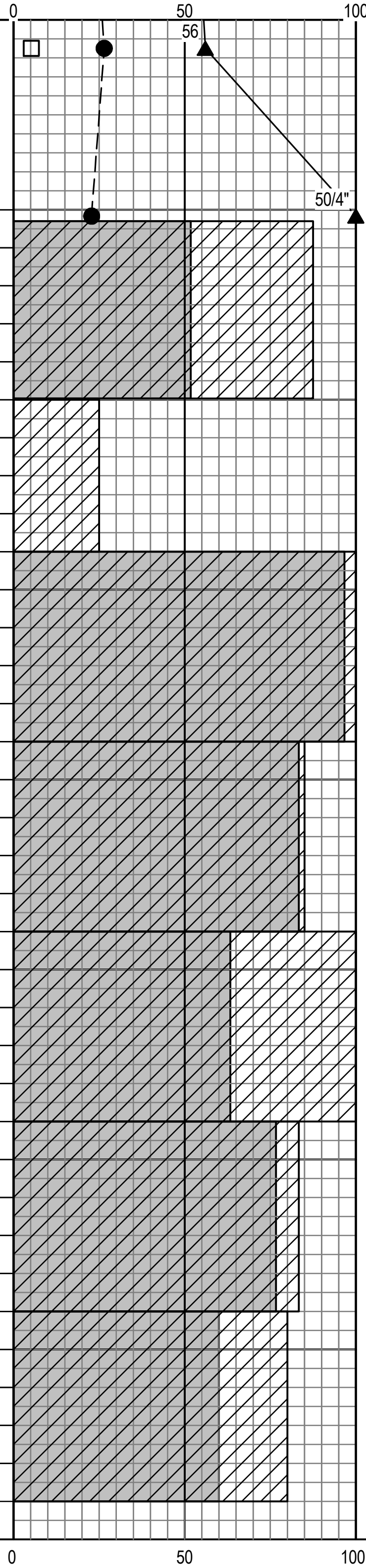
GRI

BORING UB-1

Surface Elevation: 13.8 ft [±] (MLLW)

DEPTH, FT	CLASSIFICATION OF MATERIAL	ELEVATION, FT / DEPTH, FT	UCS, PSI	SAMPLE NO.	BLOW COUNT	FRACTURES/FT	COMMENTS AND ADDITIONAL TESTS
	SAND, trace silt, gray, very dense, fine grained, contains shell fragments			S-8	20 26 30		
45	SANDSTONE, dark gray, fine grained, fresh, extremely soft (R0), closely fractured, horizontal to inclined jointing, contains shells, massive (Empire Formation)	-30.7 44.5		S-9	50/4"		
	---light gray, medium hard (R3) between 49 and 49.5 ft		6673	R-1		N/A 1 2 3 4	
50	---very closely fractured between 50 and 51 ft --very soft (R1), below 54 ft			R-2		>10 N/A N/A N/A	
55				R-3		1 2 1 2 0	
60			730	R-4		2 0 0 1 N/A	
65	---very closely fractured, horizontal to nearly vertical jointing between 65 and 67 ft ---moderately closely fractured below 67 ft		784	R-5		1 5 >10 1 0	
70			663	R-6		0 0 0 1 N/A	
75			619	R-7		0 0 0 2 N/A	
80	(11/2/2016)	-65.2 79.0					

▲ BLOWS PER FOOT
● MOISTURE CONTENT, %
☐ FINES CONTENT, %
LIQUID LIMIT, %
PLASTIC LIMIT, %



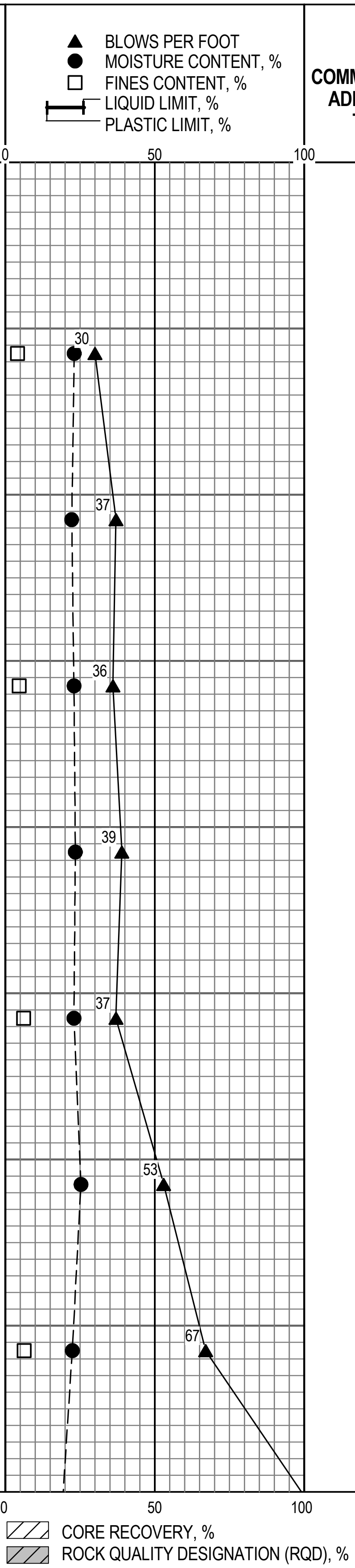
▨ CORE RECOVERY, %
▨ ROCK QUALITY DESIGNATION (RQD), %

GRI

BORING UB-1

Surface Elevation: 14.6 ft [±] (MLLW)

DEPTH, FT	GRAPHIC LOG	CLASSIFICATION OF MATERIAL	ELEVATION, FT / DEPTH, FT	UCS, PSI	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT	FRACTURES/FT	COMMENTS AND ADDITIONAL TESTS
		SAND, trace to some silt, brown, medium dense to dense, fine to medium grained							
5					S-1	I	8 12 18		
10		---dense below 10 ft			S-2	I	16 18 19		
15					S-3	I	11 15 21		
20		---gray, shell fragments below 20 ft			S-4	I	8 19 20		
25					S-5	I	11 14 23		
30		---very dense below 30 ft			S-6	I	20 27 26		
35					S-7	I	20 30 37		
		SANDSTONE (see following page for full description)	-23.9 38.5						
40									



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Logged By: S. Reddy	**Drilled by:** Hard Core Drilling, Inc.
Date Started: 10/31/16	**Coordinates:** 43.350847° N 124.34162° W (WGS84)

Drilling Method: Mud Rotary/HQ-3 Wireline Core
Equipment: CME 850 Track-Mounted Drill Rig
Hole Diameter: 5 in.
Note: See Legend for Explanation of Symbols

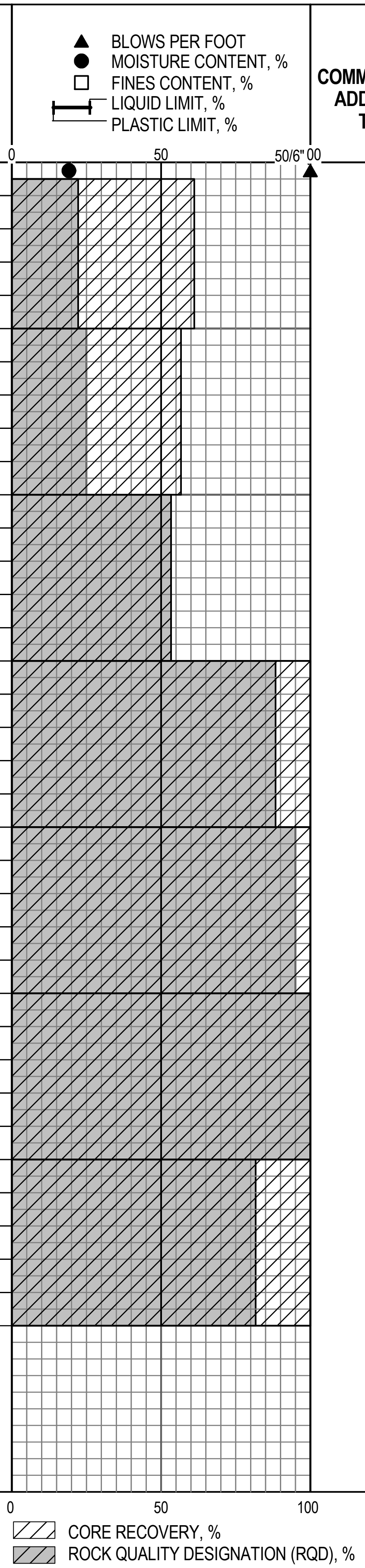
Hammer Type: Auto Hammer
Weight: 140 lb
Drop: 30 in.
Energy Ratio: 91%

GRI

BORING UB-2

Surface Elevation: 14.6 ft [±] (MLLW)

DEPTH, FT	GRAPHIC LOG	CLASSIFICATION OF MATERIAL	ELEVATION, FT / DEPTH, FT	UCS, PSI	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT	FRACTURES/FT	COMMENTS AND ADDITIONAL TESTS
		SANDSTONE, dark gray, fine grained, fresh, very soft (R1), closely fractured, horizontal to inclined jointing, contains shells, massive (Empire Formation)			S-8		50/6"		
								N/A	
					R-1			N/A	
								2	
								3	
45								3	
				355				5	
					R-2			N/A	
								N/A	
								N/A	
50				312				0	
								0	
					R-3			N/A	
								N/A	
								N/A	
55		---closely to moderately closely fractured below 55 ft						1	
				449				2	
					R-4			0	
								0	
								1	
60								4	
								1	
					R-5			1	
				124				0	
								1	
65				466				0	
								0	
					R-6			1	
								0	
								0	
70		---very closely fractured between 70 to 70.5 ft						>10	
				632				0	
					R-7			0	
								0	
		---very closely fractured between 74.5 and 75 ft	-60.4 75.0					>10	
75		(11/1/2016)							
80									



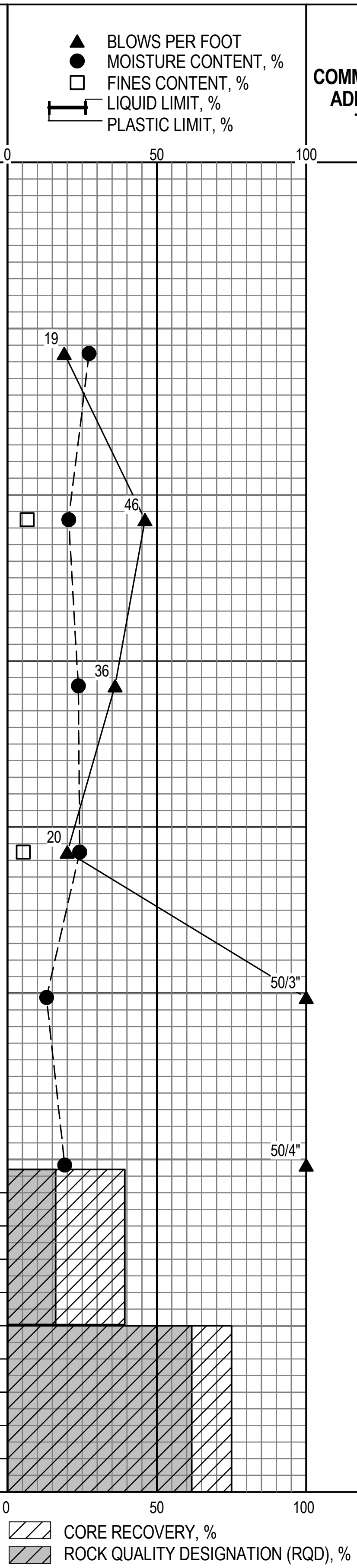
GRI ROCK BORING LOG (LAT/LONG) GRI DATA TEMPLATE.GDT 4/1/20

GRI

BORING UB-2

Surface Elevation: 16.9 ft [±] (MLLW)

DEPTH, FT	GRAPHIC LOG	CLASSIFICATION OF MATERIAL	ELEVATION, FT / DEPTH, FT	UCS, PSI	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT	FRACTURES/FT	COMMENTS AND ADDITIONAL TESTS
0		SAND, some silt to silty, dark brown to black, medium dense, fine to medium grained, contains roots and wood debris							
5		---trace to some silt, gray, roots and wood debris absent below 6 ft			S-1		7 8 11		
10		---brown, dense below 10 ft			S-2		12 18 28		
15					S-3		14 15 21		
20		---gray, medium dense below 20 ft			S-4		9 8 12		
24		SANDSTONE, gray to dark gray, fine to medium grained, fresh, very soft (R1), closely fractured, nearly horizontal to inclined jointing, contains shells, massive (Empire Formation)	-7.1 24.0						
25					S-5		50/3"		
30					S-6		50/4"		
31								N/A	
32								N/A	
33					R-1			N/A	
34								4	
35				312				0	
36								5	
37					R-2			3	
38								N/A	
39								N/A	
40									



(CONTINUED NEXT PAGE)

Logged By: S. Reddy	**Drilled by:** Hard Core Drilling, Inc.
Date Started: 11/3/16	**Coordinates:** 43.350055° N 124.340027° W (WGS84)
Drilling Method: Mud Rotary/HQ-3 Wireline Core **Equipment:** CME 850 Track-Mounted Drill Rig **Hole Diameter:** 5 in.	**Hammer Type:** Auto Hammer **Weight:** 140 lb **Drop:** 30 in. **Energy Ratio:** 91%
Note: See Legend for Explanation of Symbols	

GRI

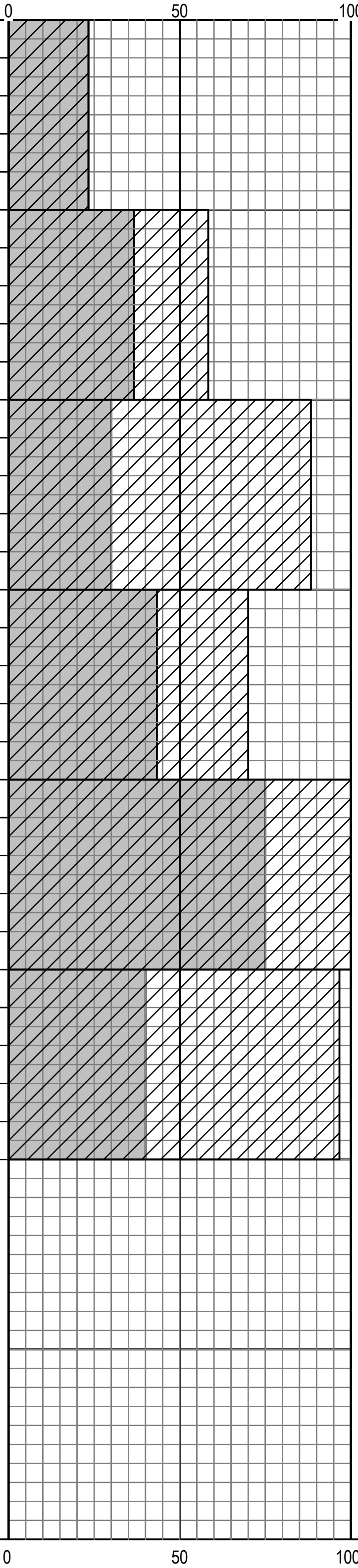
BORING UB-3

BORING UB-3

Surface Elevation: 16.9 ft [±] (MLLW)

DEPTH, FT	CLASSIFICATION OF MATERIAL	ELEVATION, FT / DEPTH, FT	UCS, PSI	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT	FRACTURES/FT	COMMENTS AND ADDITIONAL TESTS
	SANDSTONE, gray to dark gray, fine to medium grained, fresh, very soft (R1), closely fractured, nearly horizontal to inclined jointing, contains shells, massive (Empire Formation)		246				1	
							N/A	
				R-3			N/A	
							N/A	
							N/A	
45	---fine grained, extremely soft (R0) below 46 ft						2	
							1	
				R-4			N/A	
							N/A	
							N/A	
50	---very soft (R1), very closely fractured, nearly horizontal jointing below 50 ft						3	
							7	
				R-5			4	
							2	
							N/A	
55	---closely to moderately closely fractured below 55 ft		326				1	
							4	
				R-6			1	
							N/A	
							N/A	
60							3	
	---extremely soft (R0), closely fractured, nearly horizontal to vertical jointing, contains shells below 62 ft		91				5	
				R-7			3	
							0	
							0	
65							2	
			23				0	
				R-8			3	
							4	
							N/A	
70	(11/3/2016)	-53.1 70.0						
75								
80								

▲ BLOWS PER FOOT
● MOISTURE CONTENT, %
☐ FINES CONTENT, %
LIQUID LIMIT, %
PLASTIC LIMIT, %



▨ CORE RECOVERY, %
▨ ROCK QUALITY DESIGNATION (RQD), %

GRI ROCK BORING LOG (LAT/LONG) GRI DATA TEMPLATE.GDT 4/1/20

GRI

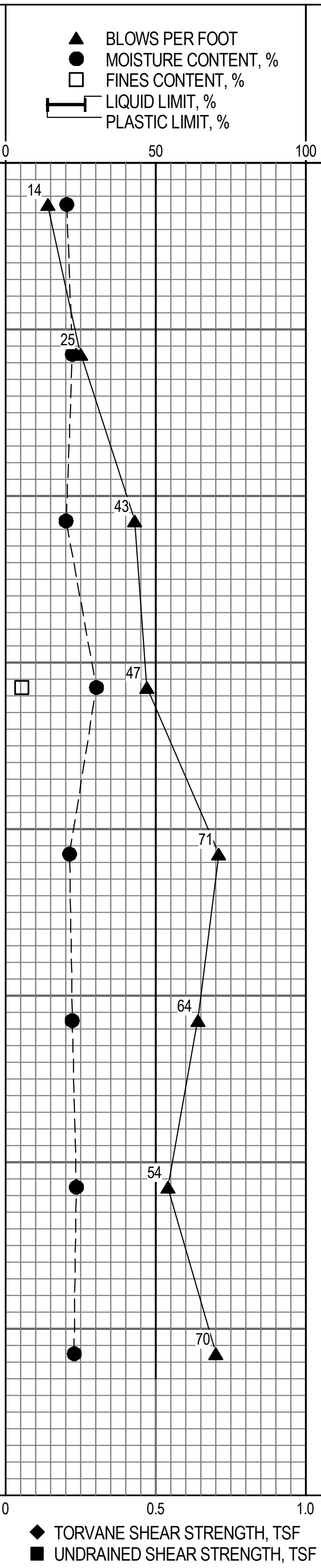
2020 JOB NO. 5128 FIG. 42A

DEPTH, FT | GRAPHIC LOG | **CLASSIFICATION OF MATERIAL** | ELEVATION, FT / DEPTH, FT | INSTALLATION | SAMPLE NO. | SAMPLE TYPE | BLOW COUNT | **COMMENTS AND ADDITIONAL TESTS**

Surface Elevation: -29.5 ft [±] (MLLW)

DEPTH, FT	CLASSIFICATION OF MATERIAL	ELEVATION, FT / DEPTH, FT
0	SAND, gray, medium dense, fine- to medium-grained, contains scattered shell fragments	
5	---light gray below 5 feet	
10	---dense below 10 feet	
15	---contains wood debris and scattered organics below 15 feet ---0.25 inch thick black silt layer at 15.5 feet	
20	---trace silt, very dense below 20 feet	
30	---shells fragments absent below 30 feet	
36.5	(11/1/2023)	-66.0 36.5
40		

SAMPLE NO.	BLOW COUNT
S-1	5 8 6
S-2	7 11 14
S-3	12 19 24
S-4	7 15 32
S-5	18 31 40
S-6	22 29 35
S-7	19 24 30
S-8	20 34 36



COMMENTS AND ADDITIONAL TESTS

Boring advanced from jack up barge platform through 5-inch diameter casing embedded below mudline. All depths are below mudline

Driller indicated 5 inch casing sunk into mudline about 6 inches

Casing embedded to 5 feet after sampling S-1

Casing driven to 10 feet with auto hammer after sampling S-2

GRI BORING LOG (LAT/LONG) GRI DATA TEMPLATE.GDT 3/21/24

Logged By: M. Preciado | **Drilled by:** Western States Soil Conservation, Inc.

Date Started: 11/1/23 | **Coordinates:** 43.422949° N 124.2554° W (WGS84)

Drilling Method: Mud Rotary
Equipment: CME 75 Truck-Mounted Drill Rig
Hole Diameter: 5 in.

Hammer Type: Auto Hammer
Weight: 140 lb
Drop: 30 in.
Energy Ratio: 0.8

Note: See Legend for Explanation of Symbols

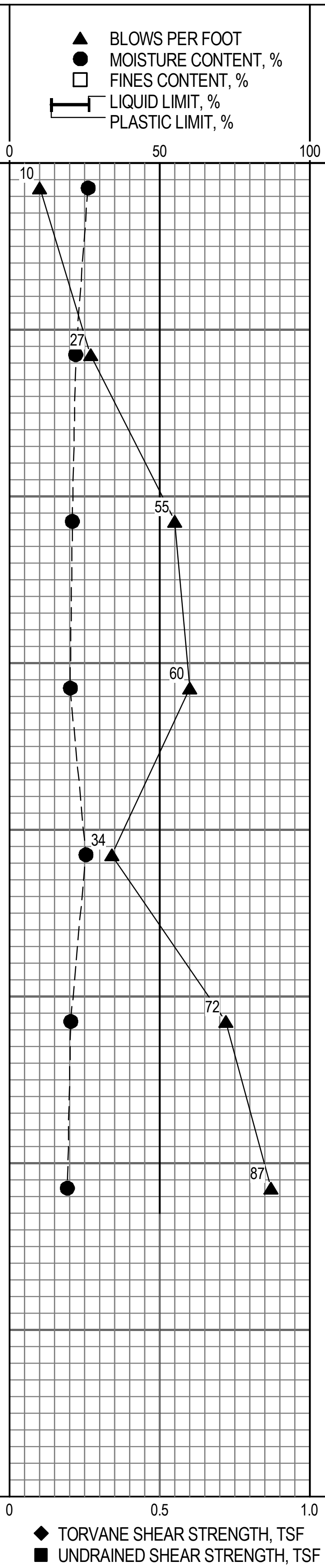
GRI

BORING B-1-23

2023 JOB NO. 5128 FIG. 43A

Surface Elevation: -30.5 ft [±] (MLLW)

DEPTH, FT	CLASSIFICATION OF MATERIAL	ELEVATION, FT / DEPTH, FT	INSTALLATION	SAMPLE NO.	BLOW COUNT	COMMENTS AND ADDITIONAL TESTS
0	SAND, loose to medium dense, black mottled dark gray, fine-grained, contains organic odor			S-0	3 4 6	Boring advanced from jack up barge platform through 5-inch diameter casing embedded below mudline. All depths are below mudline Driller indicated about 1.5 feet of casing sunk into mudline. SPT blowcounts at mudline are of disturbed material Casing embedded to 5 feet before sampling S-1
5	---gray, medium dense, contains scattered shell fragments, organic odor absent below 5 feet			S-1	10 13 14	
10	---very dense, contains organics below 10 feet			S-2	14 23 32	
15	---organics absent below 15 feet			S-3	17 28 32	
20	---dense, contains organics and wood debris below 20 feet			S-4	16 16 18	
25	---organics absent below 25 feet			S-5	21 32 40	
30				S-6	23 38 49	
31.5	(11/2/2023)	-62.0 31.5				
35						
40						

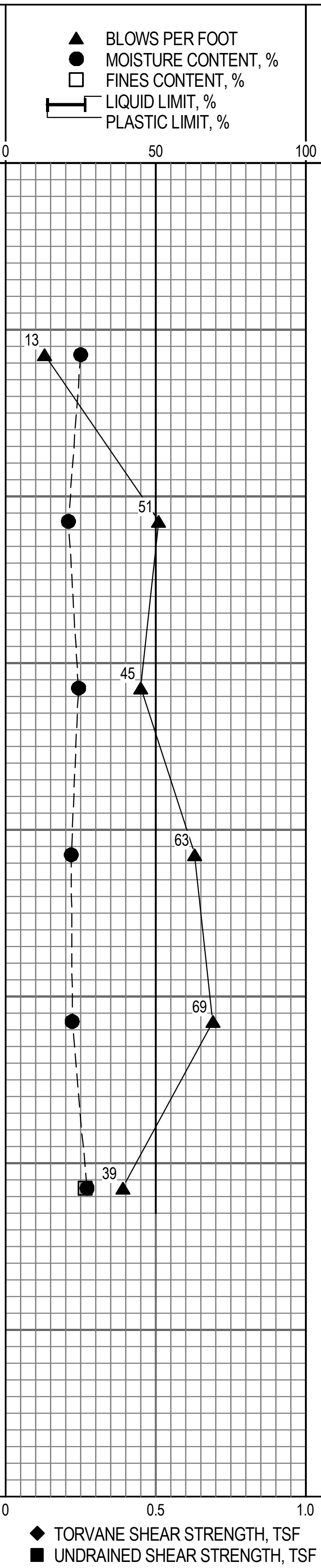


Logged By: M. Preciado	**Drilled by:** Western States Soil Conservation, Inc.
Date Started: 11/2/23	**Coordinates:** 43.422744° N 124.268509° W (WGS84)
Drilling Method: Mud Rotary **Equipment:** CME 75 Truck-Mounted Drill Rig **Hole Diameter:** 5 in.	**Hammer Type:** Auto Hammer **Weight:** 140 lb **Drop:** 30 in. **Energy Ratio:** 0.8
Note: See Legend for Explanation of Symbols	

GRI

BORING B-2-23

DEPTH, FT	GRAPHIC LOG	CLASSIFICATION OF MATERIAL Surface Elevation: -32.0 ft [±] (MLLW)	ELEVATION, FT DEPTH, FT	INSTALLATION	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT	COMMENTS AND ADDITIONAL TESTS
		SAND, gray, medium dense, fine-grained						Boring advanced from jack up barge platform through 5-inch diameter casing embedded below mudline. All depths are below mudline
5					S-1		5 5 8	Driller indicated mudline material was very soft. Casing embedded 5 feet before sampling S-1
10		---very dense below 10 feet			S-2		20 25 26	10 feet of casing embedded after sampling S-2
15		---dense below 15 feet			S-3		15 20 25	
20		---very dense, contains scattered shell fragments below 20 feet			S-4		23 31 32	
25					S-5		25 33 36	
30		Silty SAND, gray, dense, fine-grained, contains scattered shell fragments	-62.0 30.0		S-6		28 22 17	
		(10/16/2023)	-63.5 31.5					
35								
40								



GRI BORING LOG (LAT/LONG) GRI DATA TEMPLATE.GDT 3/21/24

Logged By: M. Preciado	**Drilled by:** Western States Soil Conservation, Inc.
Date Started: 10/16/23	**Coordinates:** 43.405104° N 124.279921° W (WGS84)
Drilling Method: Mud Rotary **Equipment:** CME 75 Truck-Mounted Drill Rig **Hole Diameter:** 5 in.	**Hammer Type:** Auto Hammer **Weight:** 140 lb **Drop:** 30 in. **Energy Ratio:** 0.8
Note: See Legend for Explanation of Symbols	

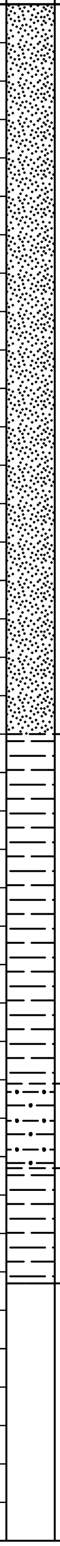
GRI

BORING B-3-23

2023 JOB NO. 5128 FIG. 45A

DEPTH, FT | GRAPHIC LOG | **CLASSIFICATION OF MATERIAL** | ELEVATION, FT / DEPTH, FT | INSTALLATION | SAMPLE NO. | SAMPLE TYPE | BLOW COUNT | **COMMENTS AND ADDITIONAL TESTS**

Surface Elevation: -29.0 ft [±] (MLLW)



SAND, trace silt, gray, medium dense, fine-to medium-grained

---some silt, dense below 8 feet

---very dense, contains scattered shell fragments

-48.0 / 19.0

MUDSTONE/SILTSTONE, gray, fresh, extremely soft to very soft (R0-R1), very close to closely jointed at 0° to 90°, joints are open to healed and predominantly contain white calcite cementation (Coaledo Formation)

-57.1 / 28.1

---interbedded SANDSTONE, light gray to dark gray, fine-grained, fresh, soft to medium hard (R2-R3), closely fractured, open to calcite healed joints at 30° to 70°, inclined bedding at 30° (Coaledo Formation)

-59.3 / 30.3

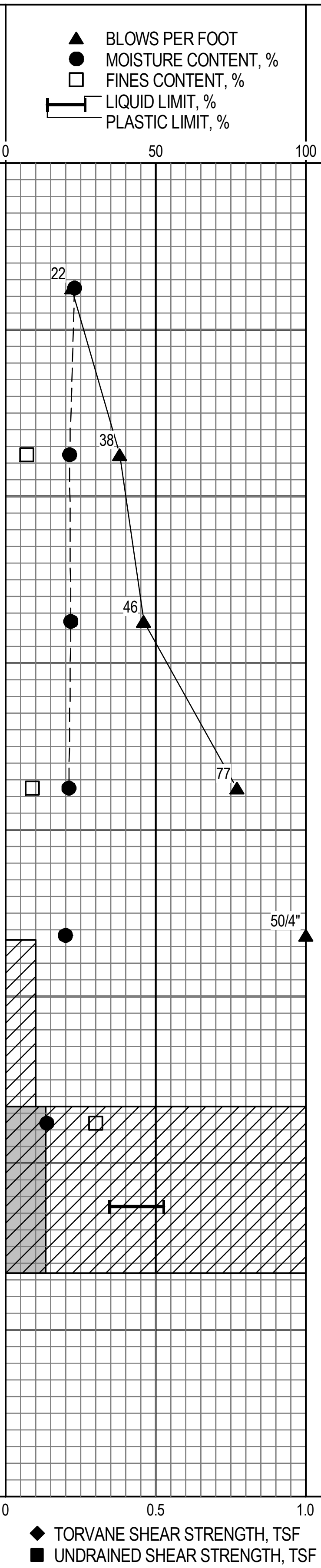
---contains irregular slickensides at 29.3 feet, inclined at 60°

-62.3 / 33.3

---sandstone interbedding absent below 30.3 feet, blocky texture

MUDSTONE/SILTSTONE, gray, fresh, extremely soft to very soft (R0-R1), very close to closely jointed at 0° to 90°, joints are open to healed and contain white calcite cementation (Coaledo Formation)
---calcite cementation absent below 31.6 feet
---dark brown below 31.6 feet, contains irregular slickensides at 32 feet, inclined at 20°

Sample No.	Blow Count
S-1	7 11 11
S-2	15 18 20
S-3	17 22 24
S-4A S-4	17 31 46
S-5	50/4"
R-1	
R-2	



Boring advanced from jack up barge platform through 5-inch diameter casing embedded below mudline. All depths are below mudline

Driller indicated mudline material was very soft, casing sunk and embedded 3 feet before sampling S-1

8 feet of casing embedded, last 5 feet driven with auto hammer

Hole collapsed, sands caved in. R-1 core lost from 23.3 to 27.8 feet

(CONTINUED NEXT PAGE)

GRI BORING LOG (LAT/LONG) GRI DATA TEMPLATE.GDT 3/21/24

Logged By: M. Preciado
Drilled by: Western States Soil Conservation, Inc.
Date Started: 10/13/23
Coordinates: 43.404186° N 124.2809° W (WGS84)
Drilling Method: Mud Rotary
Equipment: CME 75 Truck-Mounted Drill Rig
Hole Diameter: 5 in.
Hammer Type: Auto Hammer
Weight: 140 lb
Drop: 30 in.
Energy Ratio: 0.8
Note: See Legend for Explanation of Symbols

GRI BORING B-4-23

2023 JOB NO. 5128 FIG. 46A

DEPTH, FT	GRAPHIC LOG	**CLASSIFICATION OF MATERIAL** **Surface Elevation:** -29.0 ft [±] (MLLW) (10/13/2023)	ELEVATION, FT / DEPTH, FT	INSTALLATION	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT	▲ BLOWS PER FOOT ● MOISTURE CONTENT, % ☐ FINES CONTENT, % ├─┤ LIQUID LIMIT, % / PLASTIC LIMIT, % 0 50 100	**COMMENTS AND ADDITIONAL TESTS**
45									
50									
55									
60									
65									
70									
75									
80								0 0.5 1.0	

◆ TORVANE SHEAR STRENGTH, TSF

■ UNDRAINED SHEAR STRENGTH, TSF

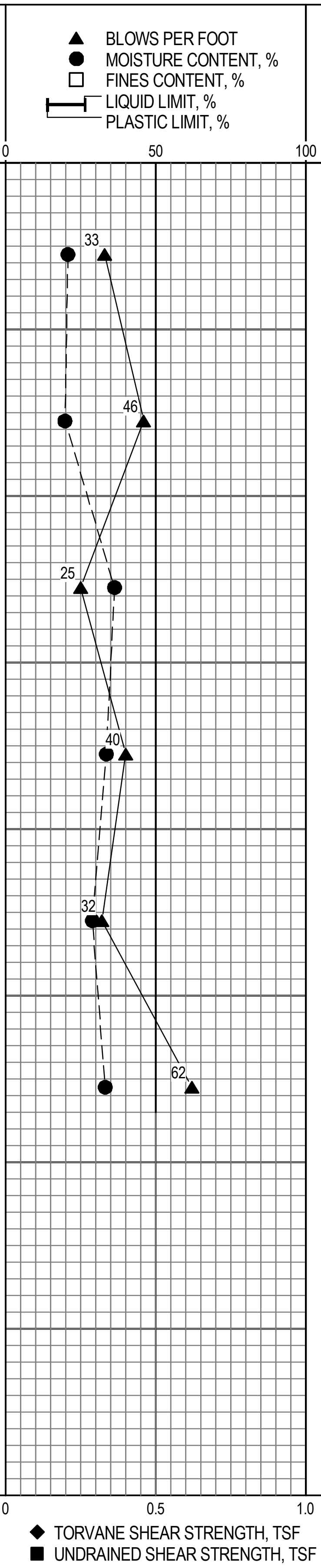
GRI

BORING B-4-23

Surface Elevation: -36.0 ft [±] (MLLW)

DEPTH, FT	CLASSIFICATION OF MATERIAL	ELEVATION, FT / DEPTH, FT
	SAND, gray, dense, fine- to medium-grained, contains scattered shell fragments	
5		
10		
	MUDSTONE/SILTSTONE, dark gray, fresh, extremely soft to soft (R0-R1), fine-grained sand in silt matrix, blocky, contains scattered shell fragments (Bastendorff Formation)	-47.0 / 11.0
15		
20		
25		
	(10/12/2023)	-64.5 / 28.5
30		
35		
40		

INSTALLATION	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT
	S-1	I	12 15 18
	S-2	I	15 23 23
	S-3	I	9 11 14
	S-4	I	11 14 26
	S-5	I	12 18 14
	S-6	I	23 27 35



COMMENTS AND ADDITIONAL TESTS

Boring advanced from jack up barge platform through 5-inch diameter casing embedded below mudline. All depths are below mudline

Driller indicated mudline material was very soft, casing sunk and embedded 2 feet before sampling S-1

Casing embedded to 6 feet below mudline

GRI BORING LOG (LAT/LONG) GRI DATA TEMPLATE.GDT 3/21/24

Logged By: M. Preciado
Drilled by: Western States Soil Conservation, Inc.
Date Started: 10/12/23
Coordinates: 43.402718° N 124.280715° W (WGS84)
Drilling Method: Mud Rotary
Equipment: CME 75 Truck-Mounted Drill Rig
Hole Diameter: 5 in.
Hammer Type: Auto Hammer
Weight: 140 lb
Drop: 30 in.
Energy Ratio: 0.8
Note: See Legend for Explanation of Symbols

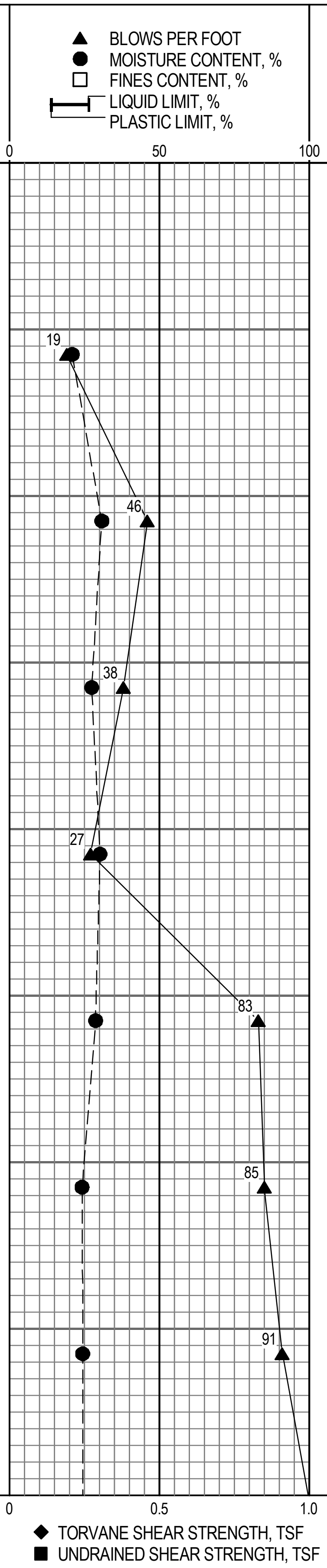
GRI BORING B-5-23

2023 JOB NO. 5128 FIG. 47A

Surface Elevation: -18.5 ft [±] (MLLW)

DEPTH, FT	CLASSIFICATION OF MATERIAL	ELEVATION, FT / DEPTH, FT	INSTALLATION	SAMPLE NO.	BLOW COUNT
	SAND, gray, medium dense, fine- to coarse-grained, contains scattered shell fragments				
5				S-1	5 8 11
	MUDSTONE/SILTSTONE, gray, fresh, extremely soft to very soft (R0-R1), contains scattered shell fragments (Bastendorff Formation)	-25.5 7.0			
10				S-2	18 22 24
15	---shells absent below 15 feet			S-3	15 20 18
20	---dark gray, contains gravel sized pieces, blocky below 20 feet			S-4	9 13 14
25				S-5	25 38 45
30				S-6	31 38 47
35				S-7	27 41 50
40					

(CONTINUED NEXT PAGE)



COMMENTS AND ADDITIONAL TESTS

Boring advanced from jack up barge platform through 5-inch diameter casing embedded below mudline. All depths are below mudline

Driller indicated mudline material was very soft, casing sunk 3 feet. Drilled to 5 feet before sampling S-1

Scattered shell fragments and wood debris observed in drilling spoils from 5 to 10 feet

Driller indicater harder material below 7 feet

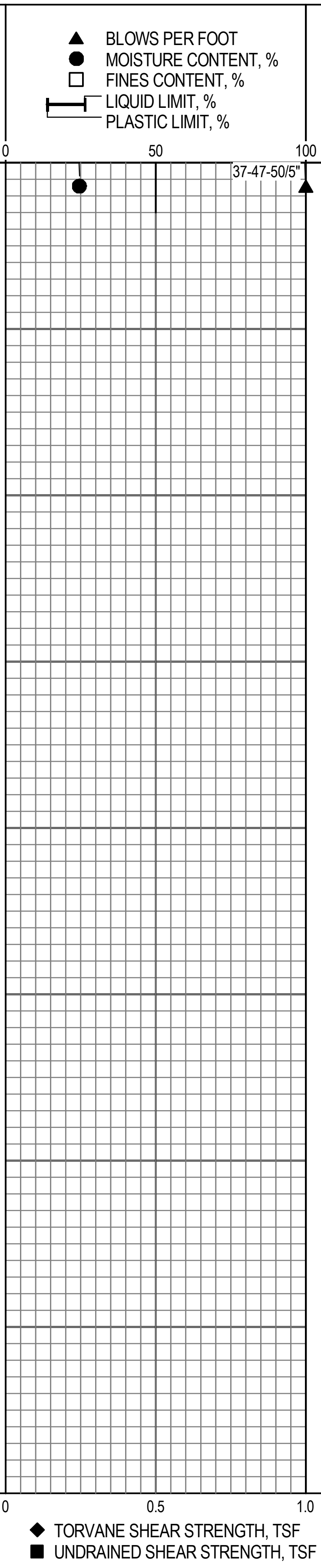
Collaring observed below 10 feet

Logged By: M. Preciado **Drilled by:** Western States Soil Conservation, Inc.
Date Started: 10/16/23 **Coordinates:** 43.398245° N 124.279268° W (WGS84)
Drilling Method: Mud Rotary
Equipment: CME 75 Truck-Mounted Drill Rig
Hole Diameter: 5 in.
Note: See Legend for Explanation of Symbols
Hammer Type: Auto Hammer
Weight: 140 lb
Drop: 30 in.
Energy Ratio: 0.8

GRI

BORING B-6-23

DEPTH, FT	GRAPHIC LOG	CLASSIFICATION OF MATERIAL **Surface Elevation:** -18.5 ft [±] (MLLW)	ELEVATION, FT / DEPTH, FT	INSTALLATION	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT	COMMENTS AND ADDITIONAL TESTS
		MUDSTONE/SILTSTONE, gray, fresh, extremely soft to very soft (R0-R1), blocky, contains scattered shell fragments (Bastendorff Formation) (10/17/2023)	-60.0 41.5		S-8		37 47 50/5"	
45								
50								
55								
60								
65								
70								
75								
80								



GRI BORING LOG (LAT/LONG) GRI DATA TEMPLATE.GDT 3/21/24

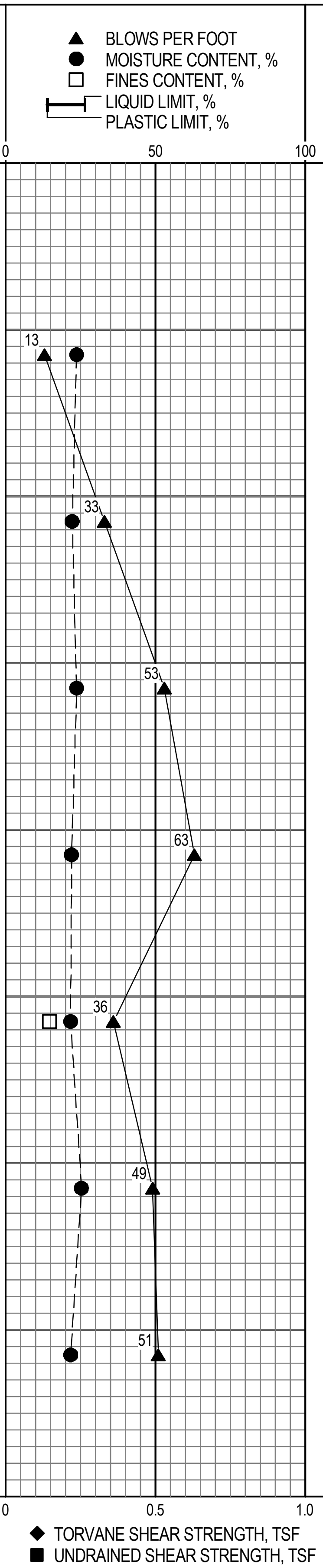
GRI BORING B-6-23

2023 JOB NO. 5128 FIG. 48A

CLASSIFICATION OF MATERIAL

Surface Elevation: -29.5 ft [±] (MLLW)

DEPTH, FT	CLASSIFICATION OF MATERIAL	ELEVATION, FT / DEPTH, FT	INSTALLATION	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT	COMMENTS AND ADDITIONAL TESTS
	SAND, gray, medium dense, fine-grained, contains scattered shell fragments						Boring advanced from jack up barge platform through 5-inch diameter casing embedded below mudline. All depths are below mudline
5				S-1	I	6 6 7	Driller indicated mudline material was very soft, casing sunk 3 feet. Drilled to 5 feet before sampling S-1
10	---dense below 10 feet			S-2	I	13 13 20	
15	---very dense below 15 feet			S-3	I	15 23 30	Casing embedded 10 feet after sampling S-3
20	---fine- to medium-grained below 20 feet, scattered shell fragments absent Silty SAND, trace rounded gravel, gray, dense, fine- to coarse-grained, contains scattered shell fragments	-49.5 20.0		S-4	I	22 30 33	
25				S-5	I	15 18 18	Casing sunk as approaching 25 feet, casing embedded to 22 feet below mudline after sampling S-5
30	---scattered shell fragments absent, 1 inch thick wood chunk at 30.3 feet			S-6	I	19 20 29	
35				S-7A S-7B	I	24 30 21	
	CLAY, trace silt, trace fine- to medium-grained sand, dark brown, very stiff to hard (Decomposed Bastendorff Formation)	-65.5 36.0					
40							



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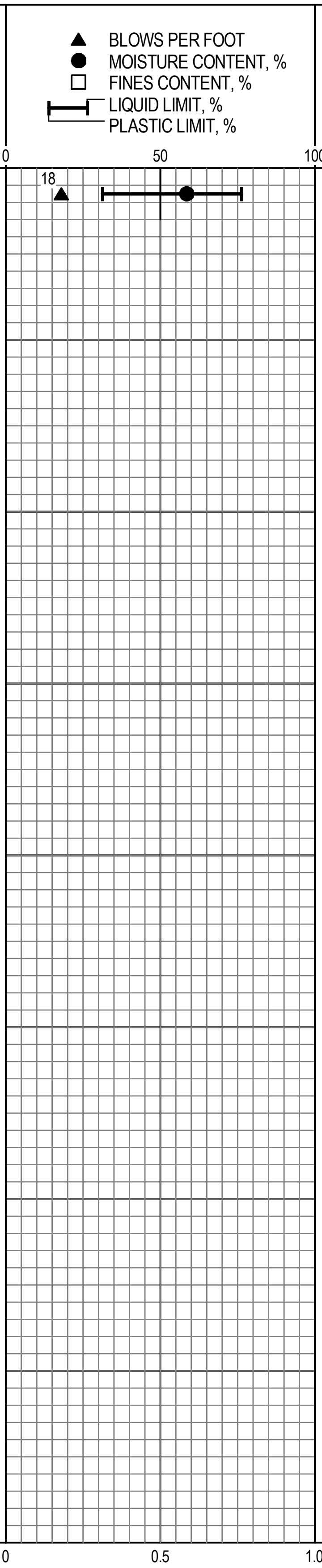
Logged By: M. Preciado	**Drilled by:** Western States Soil Conservation, Inc.
Date Started: 10/23/23	**Coordinates:** 43.398739° N 124.283695° W (WGS84)
Drilling Method: Mud Rotary **Equipment:** CME 75 Truck-Mounted Drill Rig **Hole Diameter:** 5 in.	**Hammer Type:** Auto Hammer **Weight:** 140 lb **Drop:** 30 in. **Energy Ratio:** 0.8
Note: See Legend for Explanation of Symbols	

GRI **BORING B-7-23**

2023 JOB NO. 5128 FIG. 49A

DEPTH, FT	GRAPHIC LOG	CLASSIFICATION OF MATERIAL **Surface Elevation:** -29.5 ft [±] (MLLW)	ELEVATION, FT / DEPTH, FT	INSTALLATION	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT	COMMENTS AND ADDITIONAL TESTS
	▨	CLAY, trace silt, trace fine- to medium-grained sand, dark brown, very stiff to hard, contains scattered organics (Decomposed Bastendorff Formation)	-71.0 41.5		S-8	▮	5 7 11	
		(10/24/2023)						
45								
50								
55								
60								
65								
70								
75								
80								



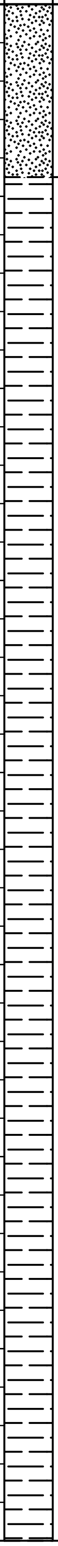
◆ TORVANE SHEAR STRENGTH, TSF
■ UNDRAINED SHEAR STRENGTH, TSF

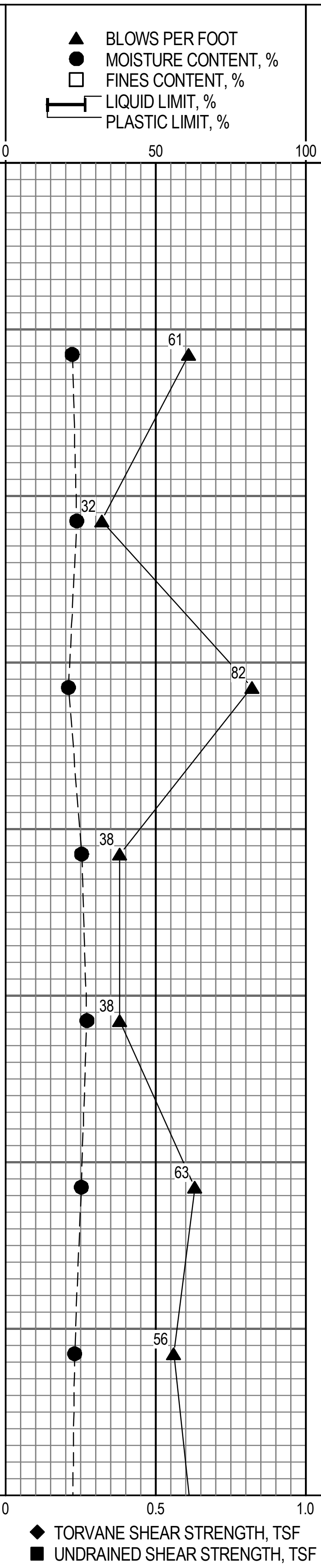
GRI BORING LOG (LAT/LONG) GRI DATA TEMPLATE.GDT 3/21/24

GRI BORING B-7-23

2023 JOB NO. 5128 FIG. 49A

DEPTH, FT	GRAPHIC LOG	CLASSIFICATION OF MATERIAL Surface Elevation: -23.0 ft [±] (MLLW)	ELEVATION, FT DEPTH, FT	INSTALLATION	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT
		SAND					
		MUDSTONE/SILTSTONE, dark gray, fresh, extremely soft to very soft (R0-R1), blocky, contains scattered shell fragments (Bastendorff Formation)	-27.5 4.5				
5					S-1	I	20 26 35
10					S-2	I	12 16 16
15					S-3	I	23 37 45
20		---gray, very soft to soft (R1-R2) at 20 feet			S-4	I	8 14 24
25					S-5	I	8 14 24
30					S-6	I	19 26 37
35					S-7	I	18 26 30
40							





COMMENTS AND ADDITIONAL TESTS

Boring advanced from jack up barge platform through 5-inch diameter casing embedded below mudline. All depths are below mudline

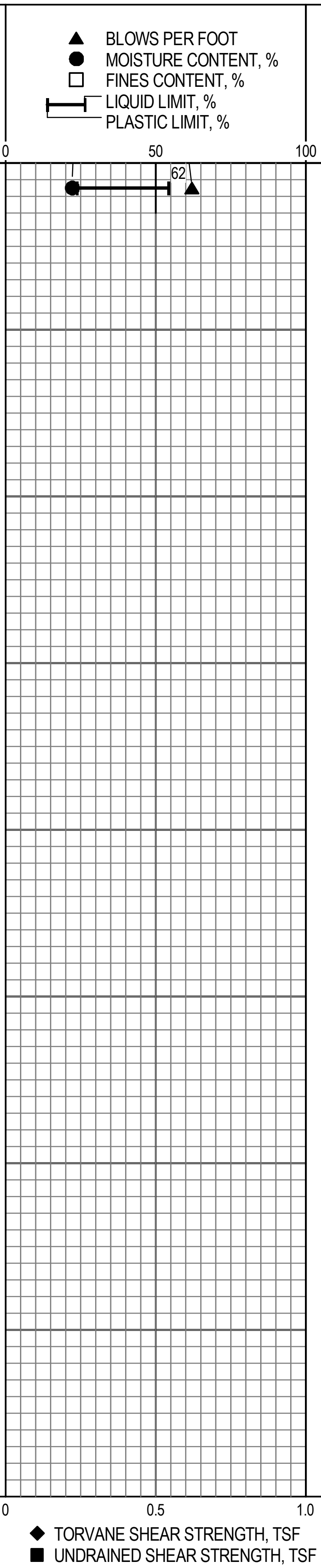
Driller indicated soft material at the surface, casing embedded 4.5 feet. From 4.5 feet to 5 feet, casing was driven with auto hammer

(CONTINUED NEXT PAGE)

Logged By: M. Preciado
Drilled by: Western States Soil Conservation, Inc.
Date Started: 10/25/23
Coordinates: 43.396442° N 124.280009° W (WGS84)
Drilling Method: Mud Rotary
Equipment: CME 75 Truck-Mounted Drill Rig
Hole Diameter: 5 in.
Note: See Legend for Explanation of Symbols
Hammer Type: Auto Hammer
Weight: 140 lb
Drop: 30 in.
Energy Ratio: 0.8

GRI BORING B-8-23

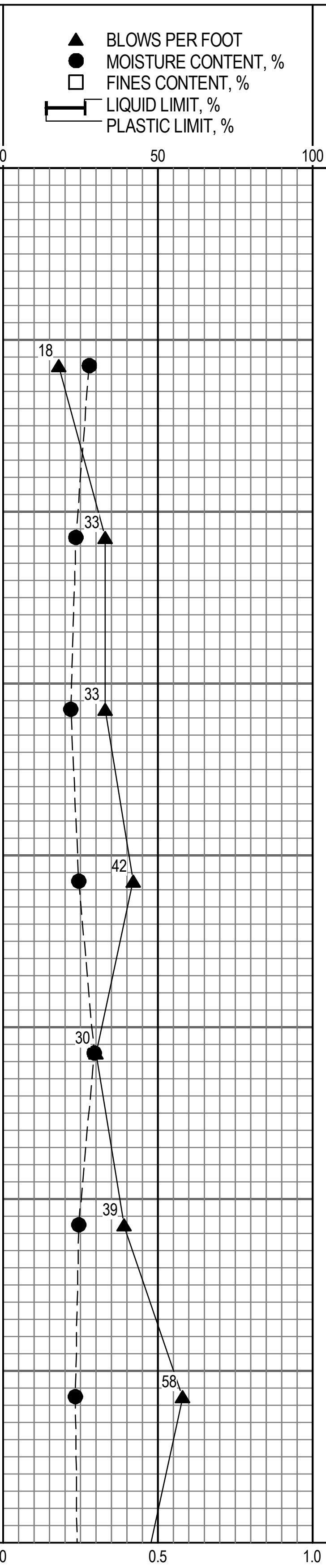
DEPTH, FT	GRAPHIC LOG	CLASSIFICATION OF MATERIAL	ELEVATION, FT / DEPTH, FT	INSTALLATION	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT	COMMENTS AND ADDITIONAL TESTS
		Surface Elevation: -23.0 ft [±] (MLLW)						
		MUDSTONE/SILTSTONE, dark gray, fresh, extremely soft to very soft (R0-R1), blocky, contains scattered shell fragments (Bastendorff Formation) (10/26/2023)	-64.5 41.5		S-8		19 25 37	
45								
50								
55								
60								
65								
70								
75								
80								



GRI BORING B-8-23

2023 JOB NO. 5128 FIG. 50A

DEPTH, FT	CLASSIFICATION OF MATERIAL **Surface Elevation:** -20.0 ft [±] (MLLW)	ELEVATION, FT / DEPTH, FT	INSTALLATION	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT	COMMENTS AND ADDITIONAL TESTS
0	SAND, gray, fine- to coarse-grained, contains scattered shell fragments						Boring advanced from jack up barge platform through 5-inch diameter casing embedded below mudline. All depths are below mudline Driller indicated casing sunk about 4.5 feet, casing was driven with auto hammer to 5 feet before sampling S-1
4.5	MUDSTONE/SILTSTONE, gray, fresh, extremely soft to very soft (R0-R1), contains scattered shell fragments (Bastendorff Formation)	-24.5 4.5		S-1	I	6 7 11	Gray sand, fine- to coarse-grained slough encountered in S-1
10	---gray mottled dark brown, blocky below 10 feet			S-2	I	12 15 18	
15				S-3	I	11 15 18	
20	---mottled light brown, laminated, samples tested positive for HCl reaction below 20 feet			S-4	I	17 20 22	Casing embedded 7 feet before sampling S-4
25				S-5	I	12 15 15	
30	---gray mottled light brown and orange, bedding at 60°			S-6	I	18 20 19	
35	---bedding irregular/ not apparent below 35 feet			S-7	I	19 26 32	



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Logged By: M. Preciado	**Drilled by:** Western States Soil Conservation, Inc.
Date Started: 10/21/23	**Coordinates:** 43.394023° N 124.283004° W (WGS84)
Drilling Method: Mud Rotary **Equipment:** CME 75 Truck-Mounted Drill Rig **Hole Diameter:** 5 in.	**Hammer Type:** Auto Hammer **Weight:** 140 lb **Drop:** 30 in. **Energy Ratio:** 0.8
Note: See Legend for Explanation of Symbols	

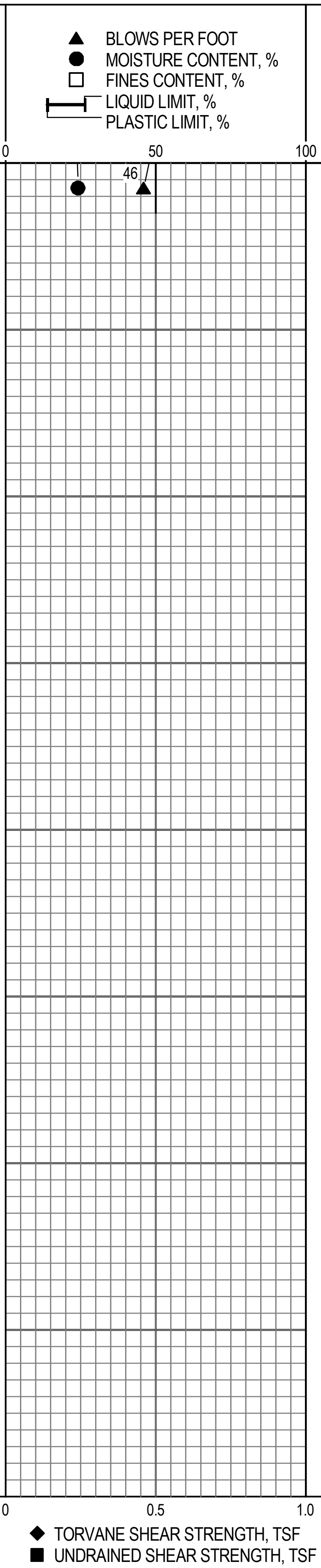
GRI

BORING B-9-23

2023 JOB NO. 5128 FIG. 51A

GRI BORING LOG (LAT/LONG) GRI DATA TEMPLATE.GDT 3/21/24

DEPTH, FT	GRAPHIC LOG	CLASSIFICATION OF MATERIAL **Surface Elevation:** -20.0 ft [±] (MLLW)	ELEVATION, FT / DEPTH, FT	INSTALLATION	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT		COMMENTS AND ADDITIONAL TESTS
		MUDSTONE/SILTSTONE, gray, fresh, extremely soft to very soft (R0-R1), contains scattered shell fragments, blocky below 40 feet (Bastendorff Formation) (10/21/2023)	-61.5 41.5		S-8		18 21 25		
45									
50									
55									
60									
65									
70									
75									
80									

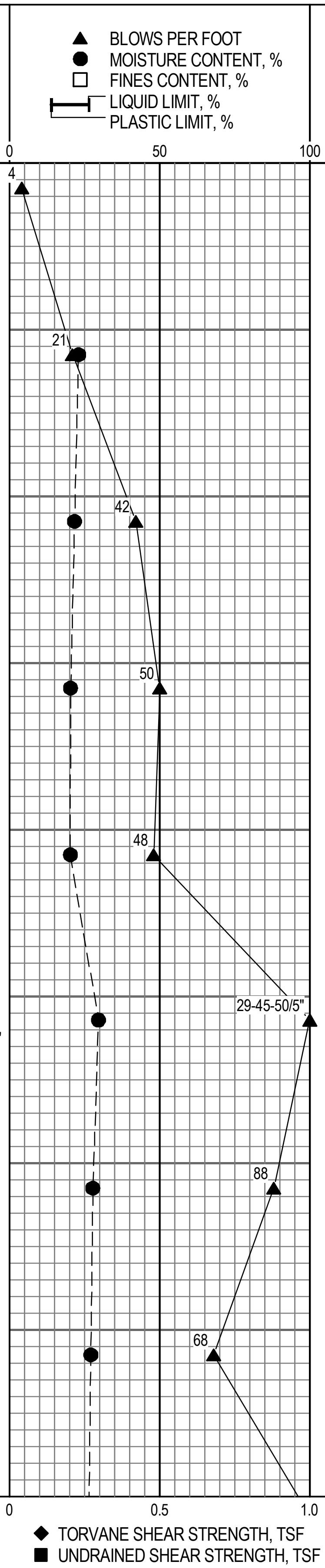


GRI **BORING B-9-23**

BORING B-10-23

Surface Elevation: -20.5 ft [±] (MLLW)

DEPTH, FT	CLASSIFICATION OF MATERIAL	ELEVATION, FT / DEPTH, FT	SAMPLE NO.	BLOW COUNT	COMMENTS AND ADDITIONAL TESTS
0	SAND, gray, medium dense, fine-grained		S-1	5 2 2	Boring advanced from jack up barge platform through 5-inch diameter casing embedded below mudline. All depths are below mudline Casing advanced to mudline elevation before sampling S-1 at 0 feet, no sample was able to be recovered at the mudline
5			S-2	6 9 12	
10	---dense, contains scattered shell fragments below 10 feet		S-3	12 23 19	
15	---dense to very dense below 15 feet		S-4	19 23 27	
20	---fine- to medium-grained below 20 feet		S-5	17 21 27	
25	MUDSTONE/SILTSTONE, gray, fresh, extremely soft to very soft (R0-R1), laminated, contains scattered shell fragments (Bastendorff Formation)	-45.0 24.5	S-6	29 45 50/5"	Driller indicated harder drilling below 24.5 feet Collaring observed below 25 feet
30	---blocky below 30 feet		S-7	31 39 49	
35			S-8	30 32 36	
40					



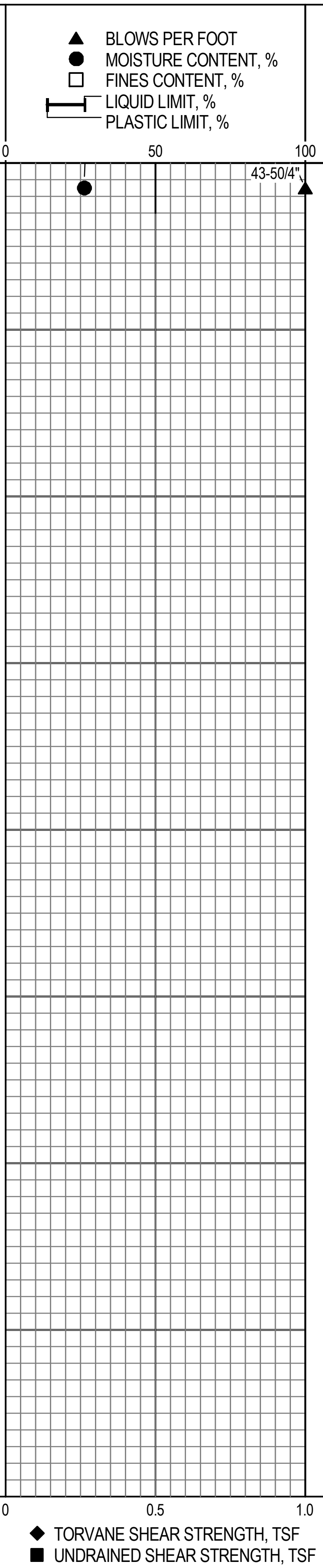
(CONTINUED NEXT PAGE)

Logged By: M. Preciado
Drilled by: Western States Soil Conservation, Inc.
Date Started: 10/10/23
Coordinates: 43.39425° N 124.287132° W (WGS84)
Drilling Method: Mud Rotary
Equipment: CME 75 Truck-Mounted Drill Rig
Hole Diameter: 5 in.
Hammer Type: Auto Hammer
Weight: 140 lb
Drop: 30 in.
Energy Ratio: 0.8
Note: See Legend for Explanation of Symbols

GRI

2023 JOB NO. 5128 FIG. 52A

DEPTH, FT	GRAPHIC LOG	CLASSIFICATION OF MATERIAL Surface Elevation: -20.5 ft [±] (MLLW)	ELEVATION, FT / DEPTH, FT	INSTALLATION	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT	COMMENTS AND ADDITIONAL TESTS
		MUDSTONE/SILTSTONE, gray, fresh, extremely soft to very soft (R0-R1), laminated, contains scattered shell fragments (Bastendorff Formation)	-62.0 41.5		S-9		43 50/4"	
		(10/11/2023)						
45								
50								
55								
60								
65								
70								
75								
80								



GRI BORING LOG (LAT/LONG) GRI DATA TEMPLATE.GDT 3/21/24

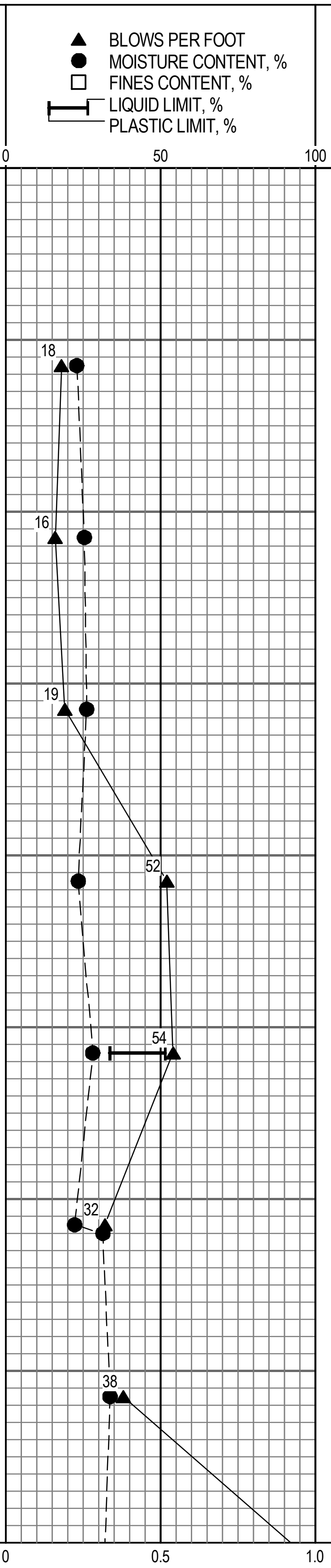
GRI BORING B-10-23

2023 JOB NO. 5128 FIG. 52A

CLASSIFICATION OF MATERIAL

Surface Elevation: -20.0 ft [±] (MLLW)

DEPTH, FT	GRAPHIC LOG	CLASSIFICATION OF MATERIAL	ELEVATION, FT / DEPTH, FT	INSTALLATION	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT	COMMENTS AND ADDITIONAL TESTS
		SAND, trace silt, gray, medium dense, fine-grained						Boring advanced from jack up barge platform through 5-inch diameter casing embedded below mudline. All depths are below mudline Unable to sample at mudline, 5 inch casing got stuck to SPT sampler Casing embedded 5 feet before sampling S-1
5					S-1		9 10 8	
10					S-2		8 8 8	
15					S-3		9 9 10	
20					S-4		20 23 29	Driller indicated harder drilling below 24 feet
		MUDSTONE/SILTSTONE, gray to light gray, very soft to soft (R1 to R2), laminated bedding inclined at 60°, contains fine-grained sand, shell fragments absent (Bastendorff Formation)	-44.0 24.0					Collaring observed below 24 feet, spoils contain shell fragments
25					S-5		19 25 29	Driller indicated softer drilling in-and-out from 25 feet to 30 feet, sand observed in spoils
30		SAND, gray, medium dense to dense, fine-to coarse-grained, contains scattered organics	-50.0 30.0		S-6A S-6B		16 15 17	
		MUDSTONE/SILTSTONE, light to dark gray, extremely soft to soft (R0 to R2), contains irregular laminations (Bastendorff Formation)	-51.0 31.0					
35		---blocky at 35 feet			S-7		13 18 20	
40								



◆ TORVANE SHEAR STRENGTH, TSF

■ UNDRAINED SHEAR STRENGTH, TSF

(CONTINUED NEXT PAGE)

Logged By: M. Preciado | **Drilled by:** Western States Soil Conservation, Inc.

Date Started: 10/9/23 | **Coordinates:** 43.39087° N 124.289567° W (WGS84)

Drilling Method: Mud Rotary
Equipment: CME 75 Truck-Mounted Drill Rig
Hole Diameter: 5 in.

Hammer Type: Auto Hammer
Weight: 140 lb
Drop: 30 in.
Energy Ratio: 0.8

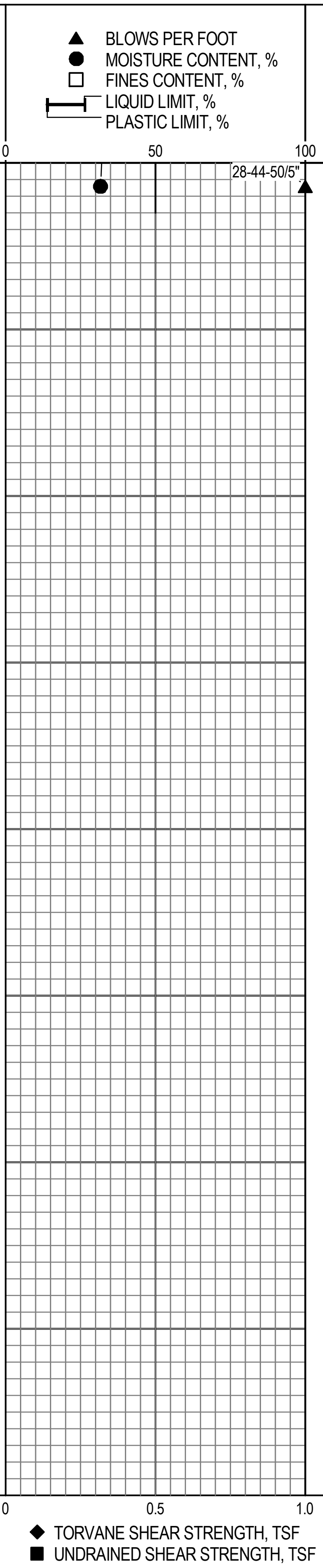
Note: See Legend for Explanation of Symbols

GRI

BORING B-11-23

Surface Elevation: -20.0 ft [±] (MLLW)

DEPTH, FT	GRAPHIC LOG	CLASSIFICATION OF MATERIAL	ELEVATION, FT / DEPTH, FT	INSTALLATION	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT	COMMENTS AND ADDITIONAL TESTS
		MUDSTONE/SILTSTONE, light to dark gray, extremely soft to soft (R0 to R2) (Bastendorff Formation) (10/9/2023)	-61.5 41.5		S-8		28 44 50/5"	
45								
50								
55								
60								
65								
70								
75								
80								

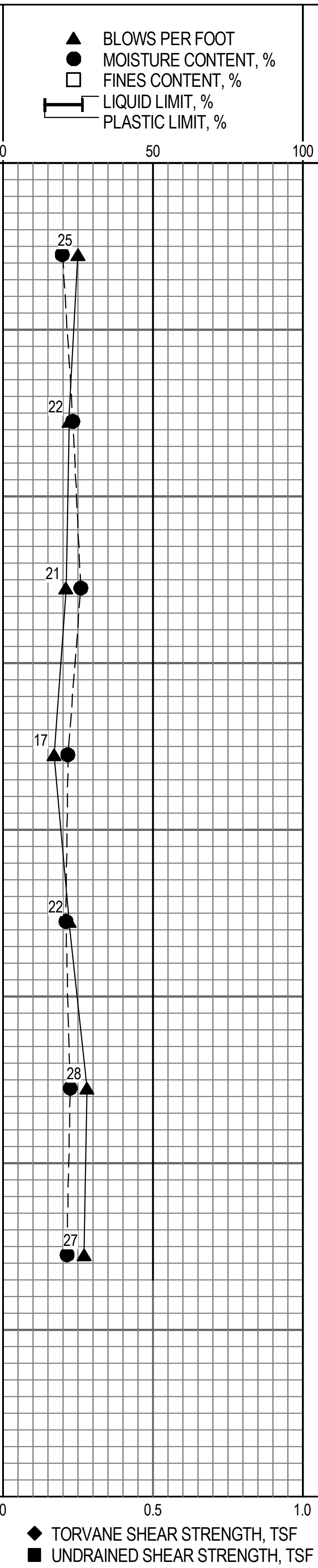


GRI **BORING B-11-23**

2023 JOB NO. 5128 FIG. 53A

Surface Elevation: -34.0 ft [±] (MLLW)

DEPTH, FT	GRAPHIC LOG	CLASSIFICATION OF MATERIAL	ELEVATION, FT / DEPTH, FT	INSTALLATION	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT	COMMENTS AND ADDITIONAL TESTS
		SAND, gray, medium dense, fine- to medium-grained, contains shell fragments						Boring advanced from jack up barge platform through 5-inch diameter casing embedded below mudline. All depths are below mudline
					S-1		11 13 12	
5								Driller indicated mudline material was very soft, casing sunk and embedded 2 feet before sampling S-1
					S-2		8 10 12	Casing embedded 7 feet after sampling S-1, auto hammer used to embed casing.
10								
					S-3		6 10 11	Casing embedded 12 feet after sampling S-3 at 12 feet
15								Wood debris observed in spoils from 12 to 17 feet
					S-4		5 8 9	
20								
					S-5		7 10 12	
25								
		---shells absent below 27 feet			S-6		10 13 15	
30								
					S-7		8 12 15	
		(10/27/2023)	-67.5 33.5					
35								
40								



Logged By: M. Preciado	**Drilled by:** Western States Soil Conservation, Inc.
Date Started: 10/27/23	**Coordinates:** 43.356701° N 124.319644° W (WGS84)
Drilling Method: Mud Rotary **Equipment:** CME 75 Truck-Mounted Drill Rig **Hole Diameter:** 5 in.	**Hammer Type:** Auto Hammer **Weight:** 140 lb **Drop:** 30 in. **Energy Ratio:** 0.8
Note: See Legend for Explanation of Symbols	

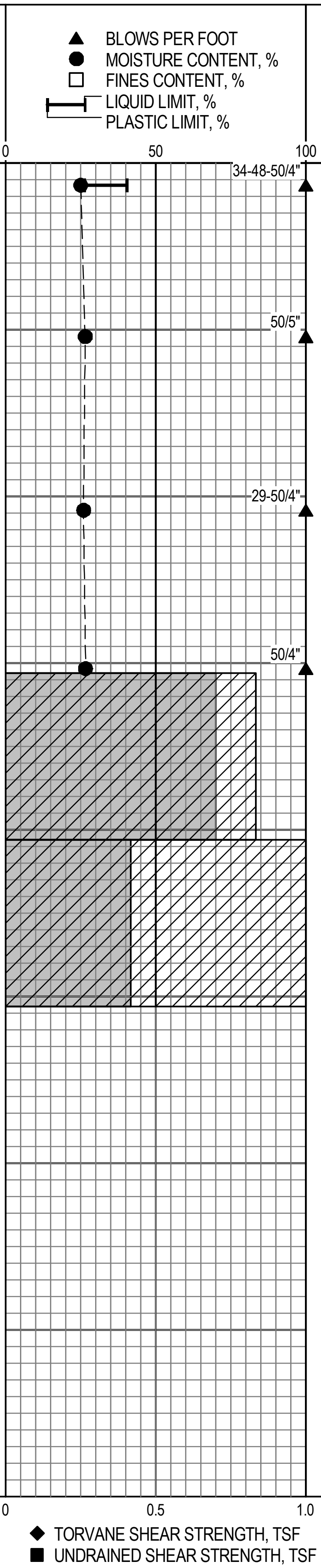
GRI

BORING B-12-23

CLASSIFICATION OF MATERIAL

Surface Elevation: -41.5 ft [±] (MLLW)

DEPTH, FT	CLASSIFICATION OF MATERIAL	ELEVATION, FT / DEPTH, FT	SAMPLE NO.	BLOW COUNT
0	MUDSTONE/SILTSTONE, dark gray, fresh, extremely soft to very soft (R0-R1), blocky, contains scattered shell fragments (Empire Formation)		S-1	34 48 50/4"
5	---shell fragments encountered below 5 feet		S-2	50/5"
10			S-3	29 50/4"
15	---close to moderately closely jointed from 0° to 45°, joints open below 15.3 feet		S-4	50/4"
			R-1	
20	SANDSTONE, gray, fresh, very soft to soft (R1 to R2), closely jointed from 0° to 30°, fine-grained (Empire Formation) ---light brown, 4 inch section below 22.3 feet	-61.8 20.3	R-2	
25	(10/28/2023)	-66.8 25.3		
30				
35				
40				



COMMENTS AND ADDITIONAL TESTS

Boring advanced from jack up barge platform through 5-inch diameter casing embedded below mudline. All depths are below mudline

Casing advanced to mudline elevation before sampling S-1 at surface

Casing embedded 5 feet after sampling S-1, casing was driven with auto hammer

Casing embedded 12 feet before sampling S-4, casing driven with auto hammer

UCS = 511 psi at 15.3 feet

Core loss from 15.9 feet to 16.7 feet

UCS = 504 psi at 17 feet

UCS = 371 psi at 17.9 feet

UCS = 472 psi at 18.5 feet

UCS = 481 psi at 19 feet

UCS = 1072 psi at 20.3 feet

UCS = 761 psi at 21.6 feet

UCS = 636 psi at 22.9 feet

GRI BORING LOG (LAT/LONG) GRI DATA TEMPLATE.GDT 3/21/24

Logged By: M. Preciado | **Drilled by:** Western States Soil Conservation, Inc.

Date Started: 10/28/23 | **Coordinates:** 43.353704° N 124.338351° W (WGS84)

Drilling Method: Mud Rotary
Equipment: CME 75 Truck-Mounted Drill Rig
Hole Diameter: 5 in.

Hammer Type: Auto Hammer
Weight: 140 lb
Drop: 30 in.
Energy Ratio: 0.8

Note: See Legend for Explanation of Symbols

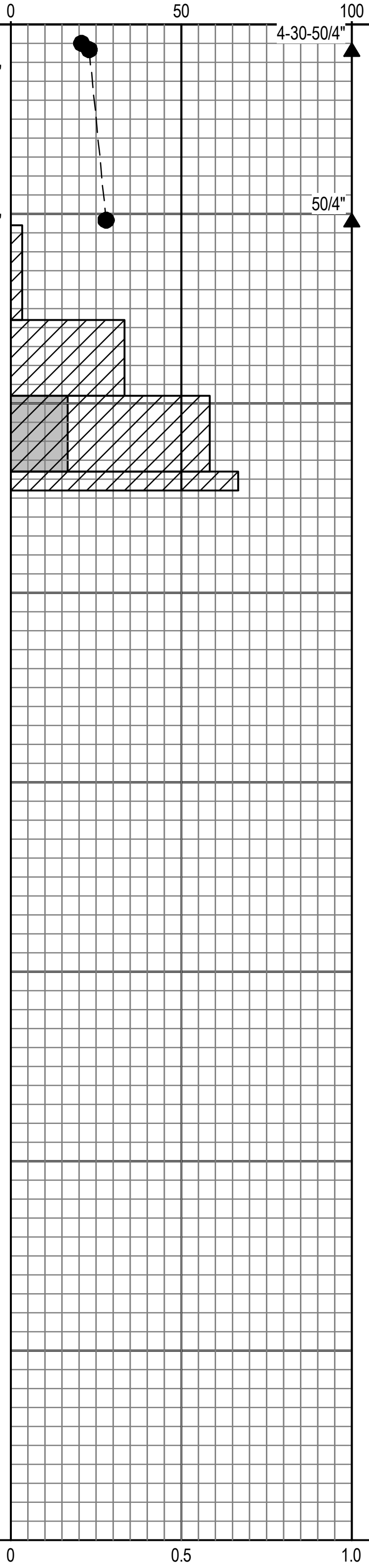
GRI

BORING B-13-23

2023 JOB NO. 5128 FIG. 55A

DEPTH, FT	GRAPHIC LOG	CLASSIFICATION OF MATERIAL Surface Elevation: -41.5 ft [±] (MLLW)	ELEVATION, FT / DEPTH, FT	INSTALLATION	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT	COMMENTS AND ADDITIONAL TESTS
0		SANDSTONE, gray, fresh, extremely soft to soft (R0 to R1), fine-grained, very closely jointed, contains shells and shell fragments (Empire Formation)			S-1B S-1A		4 30 50/4"	Boring advanced from jack up barge platform through 5-inch diameter casing embedded below mudline. All depths are below mudline
5		---jointed from 0° to 30° below 5.3 feet			S-2		50/4"	Casing advanced to mudline elevation before sampling S-1 at the surface
					R-1			Core loss from 5.5 feet to 7.8 feet, possible washout
		---worm castings present below 8.6 feet			R-2			Core loss from 8.5 feet to 9.8 feet, possible washout
10		---jointed at 0° and 45° below 10.3 feet			R-3			Core loss from 10.9 feet to 11.8 feet, possible washout
			-53.8 12.3		R-4			Core loss from 12 feet to 12.3 feet, possible washout Casing embedded 10 feet before end of day, casing broke at mudline. B-14-23-A was re-drilled as B-14-23-B the next day
		(10/30/2023)						
15								
20								
25								
30								
35								
40								

▲ BLOWS PER FOOT
● MOISTURE CONTENT, %
☐ FINES CONTENT, %
LIQUID LIMIT, %
PLASTIC LIMIT, %



◆ TORVANE SHEAR STRENGTH, TSF
■ UNDRAINED SHEAR STRENGTH, TSF

Logged By: M. Preciado	**Drilled by:** Western States Soil Conservation, Inc.
Date Started: 10/30/23	**Coordinates:** 43.355129° N 124.339197° W (WGS84)
Drilling Method: Mud Rotary **Equipment:** CME 75 Truck-Mounted Drill Rig **Hole Diameter:** 5 in.	**Hammer Type:** Auto Hammer **Weight:** 140 lb **Drop:** 30 in. **Energy Ratio:** 80%
Note: See Legend for Explanation of Symbols	

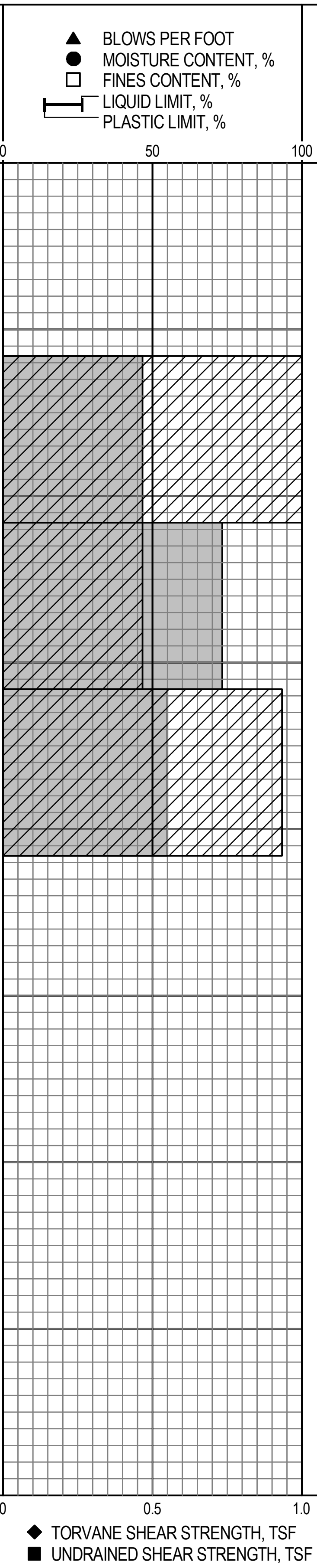
GRI

BORING B-14-23A

2023 JOB NO. 5128 FIG. 56A

Surface Elevation: -41.5 ft [±] (MLLW)

DEPTH, FT	CLASSIFICATION OF MATERIAL	ELEVATION, FT DEPTH, FT	SAMPLE NO.	COMMENTS AND ADDITIONAL TESTS
	SANDSTONE, gray, fresh, extremely soft to very soft (R0-R1), fine-grained (Empire Formation) (See Drilling Notes)			Boring advanced from jack up barge platform through 5-inch diameter casing embedded below mudline. All depths are below mudline 10 foot long section of 5 inch casing broke on the previous day causing HQ casing to shift from the original hole
5	---close to moderately closely jointed from 0° to 30°, contains shell fragments and worm castings below 5.8 feet		R-5	Hole was re-cored starting at 5.8 feet. Soil and rock classifications for B-14-23-B above 5.8 feet are based on drilling information from previous day UCS = 753 psi at 8.6 feet UCS = 983 psi at 12.1 feet UCS = 794 psi at 13.6 feet
10	---joints from 0° to 60° below 10.8 feet		R-6	
15	---joints from 0° to 90° below 15.8 feet		R-7	
20	(10/31/2023)	-62.3 20.8		10 foot long section of 5 inch casing that broke previous day was unable to be retrieved
25				
30				
35				
40				



◆ TORVANE SHEAR STRENGTH, TSF
■ UNDRAINED SHEAR STRENGTH, TSF

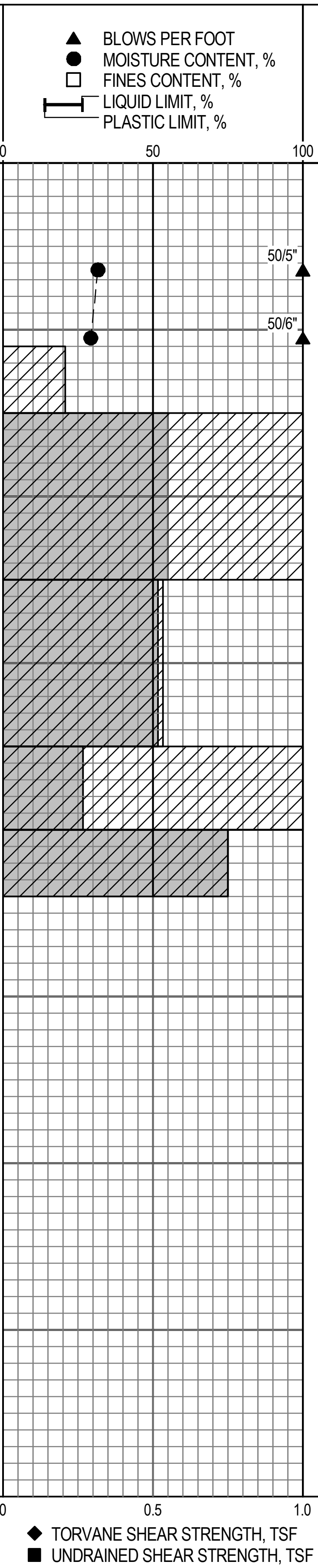
Logged By: M. Preciado	**Drilled by:** Western States Soil Conservation, Inc.
Date Started: 10/31/23	**Coordinates:** 43.355129° N 124.339197° W (WGS84)
Drilling Method: Mud Rotary **Equipment:** CME 75 Truck-Mounted Drill Rig **Hole Diameter:** 5 in.	**Hammer Type:** Auto Hammer **Weight:** 140 lb **Drop:** 30 in. **Energy Ratio:** 0.8
Note: See Legend for Explanation of Symbols	

GRI

BORING B-14-23B

2023 JOB NO. 5128 FIG. 57A

DEPTH, FT	GRAPHIC LOG	CLASSIFICATION OF MATERIAL **Surface Elevation:** -42.5 ft [±] (MLLW)	ELEVATION, FT DEPTH, FT	INSTALLATION	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT
		SANDSTONE, gray, fresh, extremely soft to soft (R0-R2), fine-grained, closely jointed, contains shell fragments and worm castings (Empire Formation)			S-1	I	18
					S-2	I	50/5"
5		---calcite veins below 5 feet ---very close to moderately closely jointed at 0° to 80°, joints are typically open			S-3	I	50/6"
					R-1		
		---laminated, friable zone from 7.9 feet to 8.4 feet					
10					R-2		
		---joints at 0° below 12 feet					
15					R-3		
		---joints at 0°, 30°, and 90° below 17.5 feet					
					R-4		
20							
					R-5		
		(10/22/2023)	-64.5 22.0				
25							
30							
35							
40							



COMMENTS AND ADDITIONAL TESTS

Boring advanced from jack up barge platform through 5-inch diameter casing embedded below mudline. All depths are below mudline

Driller indicated soft material at mudline. Casing advancer used to 1.5 feet

Driller noted heaving sands when sampling S-1. Casing stuck to SPT, S-1 only driven 6 inches. Blowcounts for S-1 not recorded
UCS = 797 psi at 7.8 feet
Core loss from 5.5 to 7.3 feet- possible washout
Core loss from 12.5 to 14.8 feet- possible washout, sample slipped out during retrieval. Part of the sample recovered in the next run
UCS=1054psi at 13.1 ft
UCS = 908 psi at 14.5 feet

UCS = 992 psi at 18 feet
UCS = 735 psi at 18.6 feet

GRI BORING LOG (LAT/LONG) GRI DATA TEMPLATE.GDT 3/21/24

Logged By: M. Preciado	**Drilled by:** Western States Soil Conservation, Inc.
Date Started: 10/21/23	**Coordinates:** 43.353916° N 124.33952° W (WGS84)
Drilling Method: Mud Rotary **Equipment:** CME 75 Truck-Mounted Drill Rig **Hole Diameter:** 5 in.	**Hammer Type:** Auto Hammer **Weight:** 140 lb **Drop:** 30 in. **Energy Ratio:** 0.8
Note: See Legend for Explanation of Symbols	

GRI

BORING B-15-23

2023 JOB NO. 5128 FIG. 58A

DEPTH, FT	GRAPHIC LOG	CLASSIFICATION OF MATERIAL **Surface Elevation:** -22.0 ft [±] (MLLW)	ELEVATION, FT DEPTH, FT	SAMPLE NO.	SAMPLE TYPE	● MOISTURE CONTENT, % ☐ FINES CONTENT, % ├─┤ LIQUID LIMIT, % PLASTIC LIMIT, % 0 50 100	COMMENTS AND ADDITIONAL TESTS
		SANDSTONE, dark gray, fresh, soft (R2), sand is fine grained, contains shells and numerous voids left by burrowing animals (Empire Formation)	-23.5 1.5	S-1 S-2 S-3 S-4 S-5 S-6 S-7 S-8 S-9 S-10	☒ ☒ ☒ ☒ ☒ ☒ ☒ ☒ ☒ ☒		
		(10/27/2017) Excavation performed underwater by diver Sample depths are approximate					
5							

0 0.5 1.0

◆ TORVANE SHEAR STRENGTH, TSF

Logged By: S. Reddy **Excavated by:** Global Diving & Salvage **Equipment:** Hydraulic Chisel

Date Started: 10/27/17 **Coordinates:** 43.353633° N 124.339752° W (WGS84) **Note:** See Legend for Explanation of Symbols

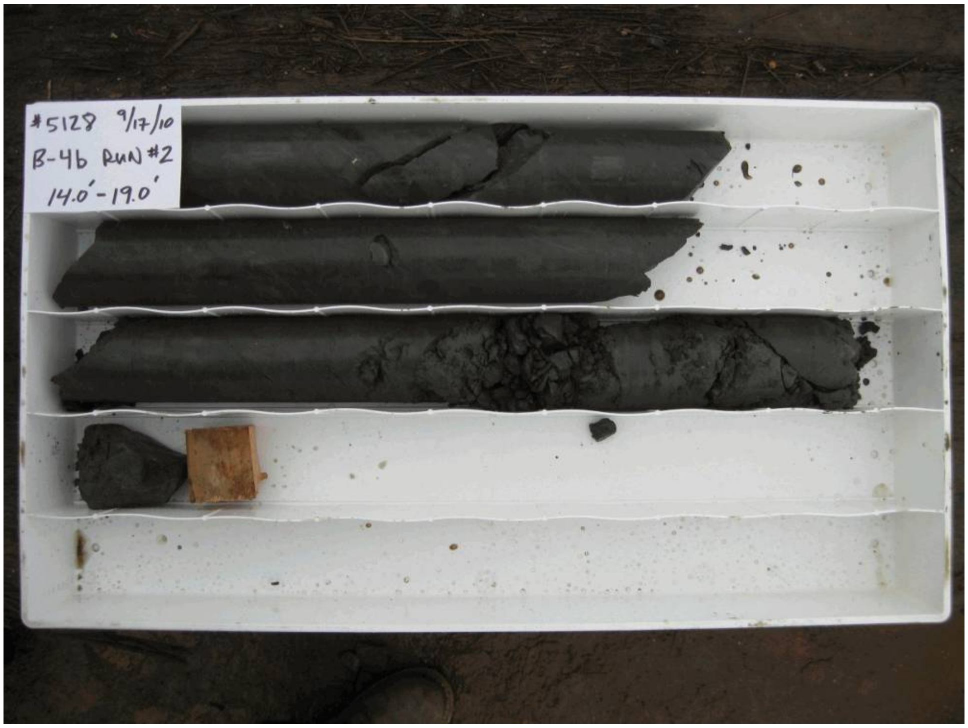
GRI

TEST PIT DE-1

Rock Core Photographs From 2010

Boring 4a, Run 1, 19 - 24 ft depth

Boring 4b, Run 1, 9 – 14 ft depth



Boring 4b, Run 2, 14 - 19 ft depth

Boring 4b, Run 3 to Run 4, 19 – 29 ft depth

Boring 4b, Run 5, 29 - 34 ft depth

Boring 4b, Run 6, 34 – 39 ft depth

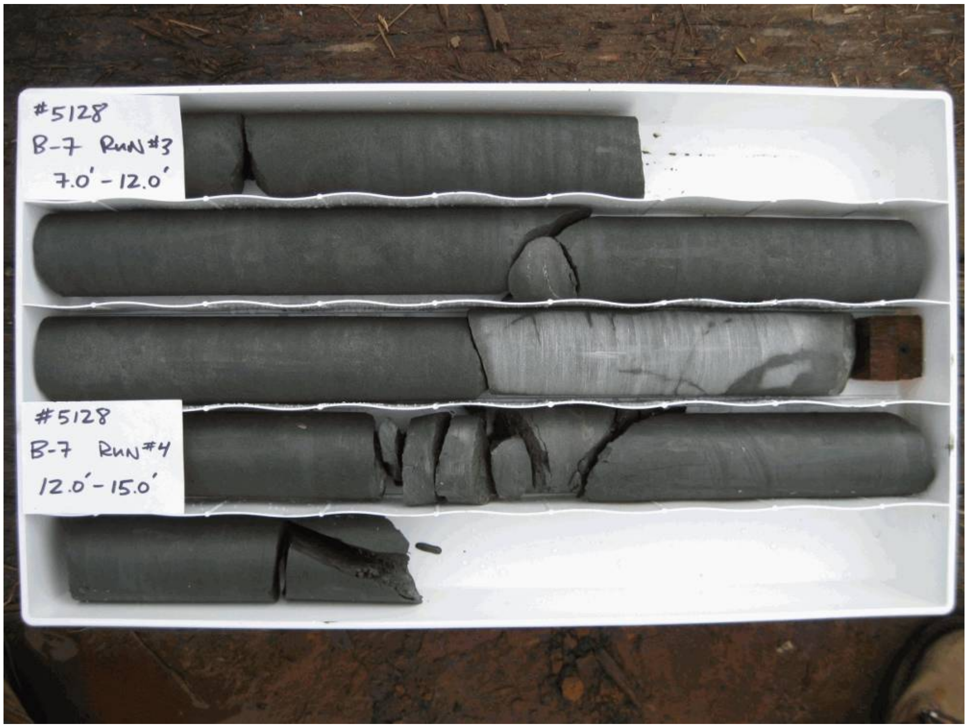
Boring 5, Run 1 to Run 3, 7.5 – 16.5 ft depth

Boring 5, Run 4, 16.5 – 21.5 ft depth

Boring 6, Run 1 to Run 4, 0 - 16 ft depth

Boring 6, Run 5 to Run 6, 16 – 26 ft depth

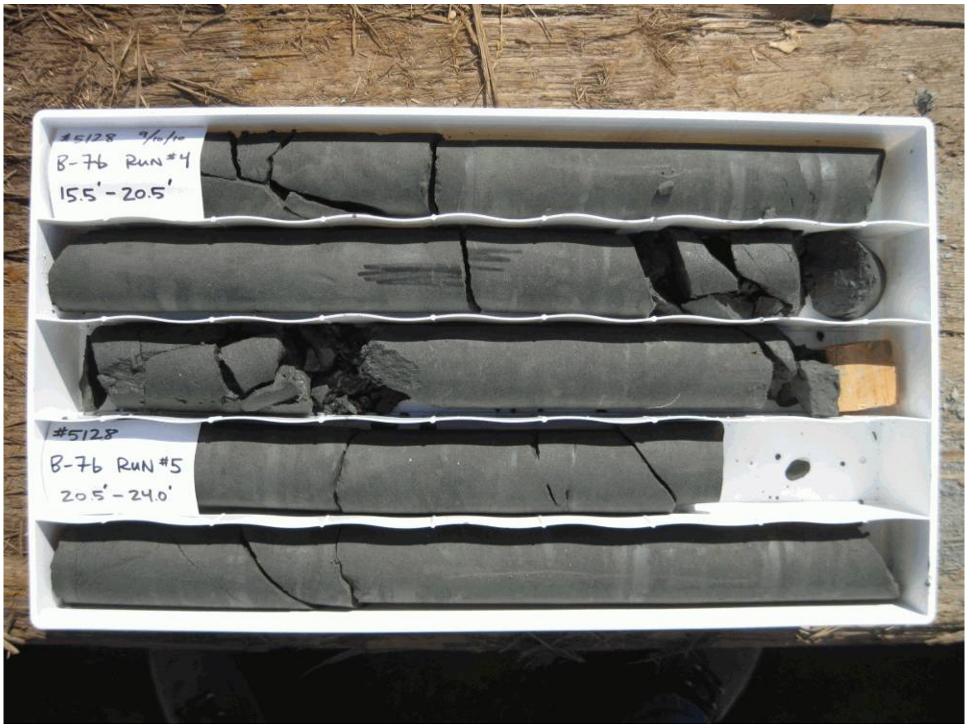
Boring 7, Run 1 to Run 2, 0 - 7 ft depth



Boring 7, Run 3 to Run 4, 7 – 15 ft depth

Boring 7b, Run 1 to Run 2, 1 - 11 ft depth

Boring 7b, Run 3, 11 – 15.5 ft depth



Boring 7b, Run 4 to Run 5, 15.5 - 24 ft depth

Rock Core Photographs From 2016

Boring 15, Run 1 to Run 2, 0 - 8.5 ft depth

Boring 15, Run 3, 8.5 - 13.5 ft depth

Boring 15, Run 4, 13.5 - 18.5 ft depth

Boring 15, Run 5, 18.5 - 23.5 ft depth

Boring 16, Run 1 to Run 4, 0 - 16 ft depth

Boring 18, Run 1, 11.5 - 15 ft depth

Boring 21, Run 1 to Run 4, 3.5 - 14 ft depth

Boring 21, Run 5 to Run 7, 14 - 23 ft depth

Boring 22, Run 1 to Run 3, 11 - 26 ft depth

Boring 22, Run 4, 26 - 31 ft depth

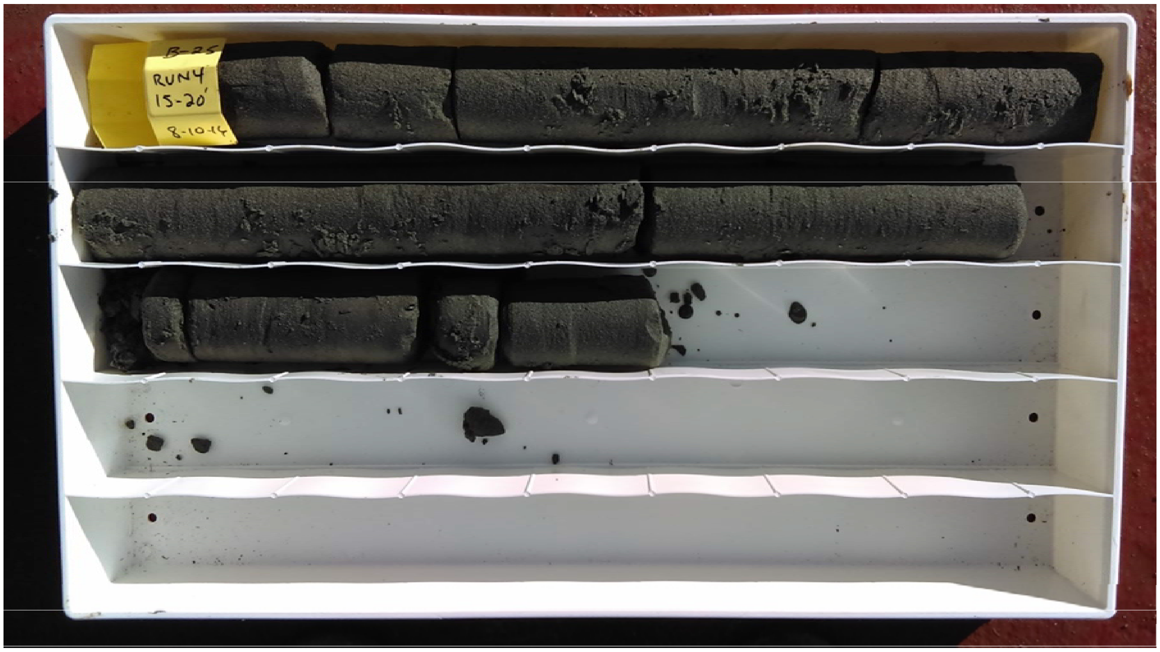
Boring 23, Run 1 to Run 3, 6 - 13 ft depth

Boring 24, Run 1 to Run 2, 4 - 11 ft depth

Boring 24, Run 3 to Run 4, 11 - 21 ft depth

Boring 24, Run 5, 21 - 26 ft depth

Boring 25, Run 2 to Run 3, 5 - 15 ft depth



Boring 25, Run 4, 15 - 20 ft depth

Note: No recovery in boring B-25, Run 1, 3-5 ft depth

Boring 26, Run 1 and Run 3, 4 - 15 ft depth

Boring 27, Run 1 to Run 2, 4 - 14 ft depth

Note: No recovery in boring B-26, Run 2, 5-10 ft depth

Boring 27, Run 3 to Run 4, 14 - 22 ft depth

Boring 27, Run 5, 22 - 27 ft depth

Boring 28, Run 1, 6 - 11 ft depth

Boring 28, Run 2 to Run 3, 11 - 21 ft depth

Boring 29, Run 1 to Run 2, 0 - 10 ft depth

Boring 29, Run 3, 10 - 15 ft depth

Boring 30, Run 1 to Run 2, 12 - 22 ft depth

Boring 30, Run 3 to Run 4, 22 - 30.5 ft depth

Boring 31, Run 1 to Run 2, 4 - 14 ft depth

Boring 31, Run 3 to Run 4, 14 - 24 ft depth

Boring 31, Run 5, 24 - 29 ft depth

Boring 32, Run 1 to Run 2, 2.5 – 12.5 ft depth

Boring 32, Run 3 to Run 4, 12.5 - 20 ft depth

Boring 33, Run 1 to Run 3, 0 - 15 ft depth

Boring 33, Run 4 to Run 5, 15 - 20 ft depth

Boring 33, Run 6, 20 - 21 ft depth

Note: The bottom 3 ft of rock core from Run 4 should be labeled as Run 5. The bottom 4 ft of rock core from Run 6 should be labeled as Run 7.

Boring 33, Run 7 to Run 8, 21 - 31 ft depth

Boring 40, Run 1 to Run 2, 3 - 13 ft depth

Boring 40, Run 3 to Run 5, 13 - 24 ft depth

Boring 40, Run 6 to Run 7, 24 - 30 ft depth

Boring UB-1, Run 1 to Run 3, 45.3 - 59 ft depth

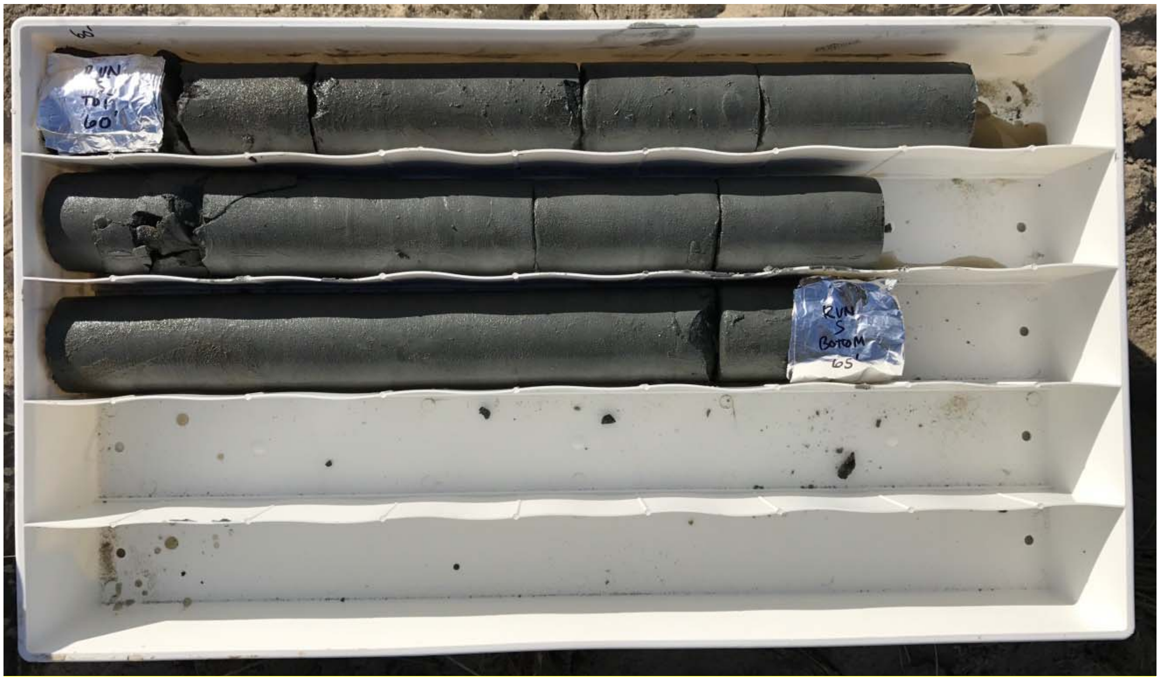
Boring UB-1, Run 4 to Run 5, 59 - 69 ft depth

Boring UB-1, Run 6, 69 - 74 ft depth (Run 7 not photographed during field work)

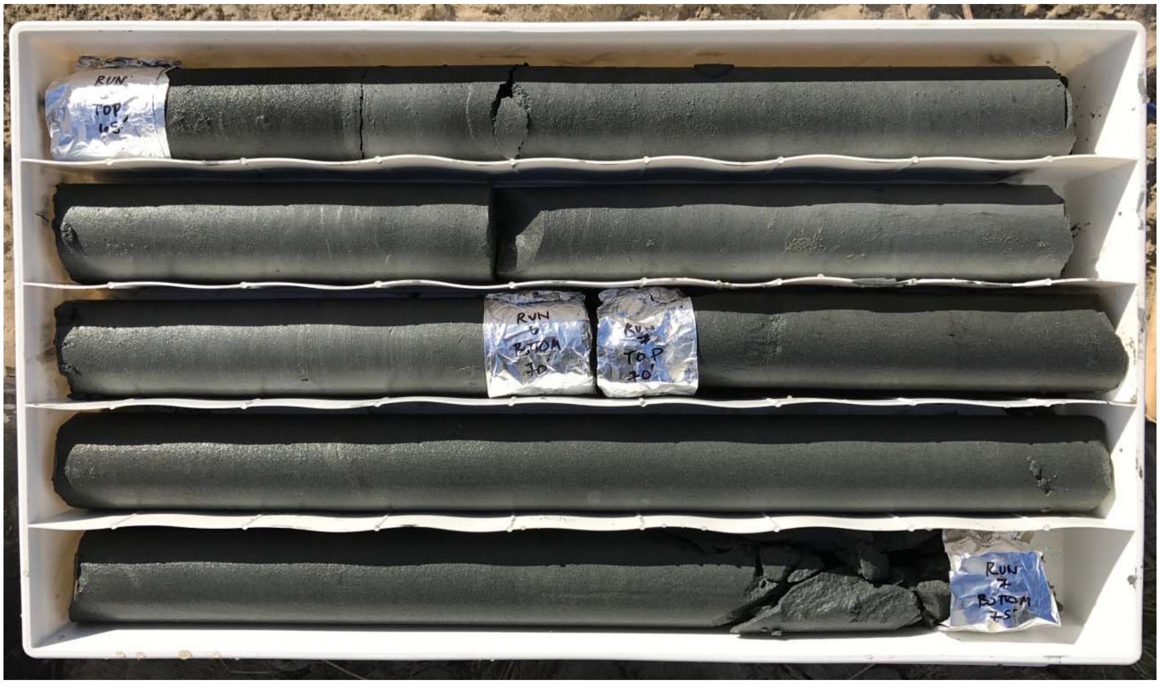
Boring UB-1, Run 6 to Run 7, 69 - 79 ft depth (photo taken in lab 1/10/2017)

Boring UB-2, Run 1 to Run 3, 40.5 - 55 ft depth

Boring UB-2, Run 4, 55 - 60 ft depth



Boring UB-2, Run 5, 60 - 65 ft depth



Boring UB-2, Run 6 to Run 7, 65 - 75 ft depth

Boring UB-3, Run 1 to Run 4, 30.3 - 50 ft depth

Boring UB-3, Run 5 to Run 6, 50 - 60 ft depth

Boring UB-3, Run 7 to Run 8, 60 - 70 ft depth

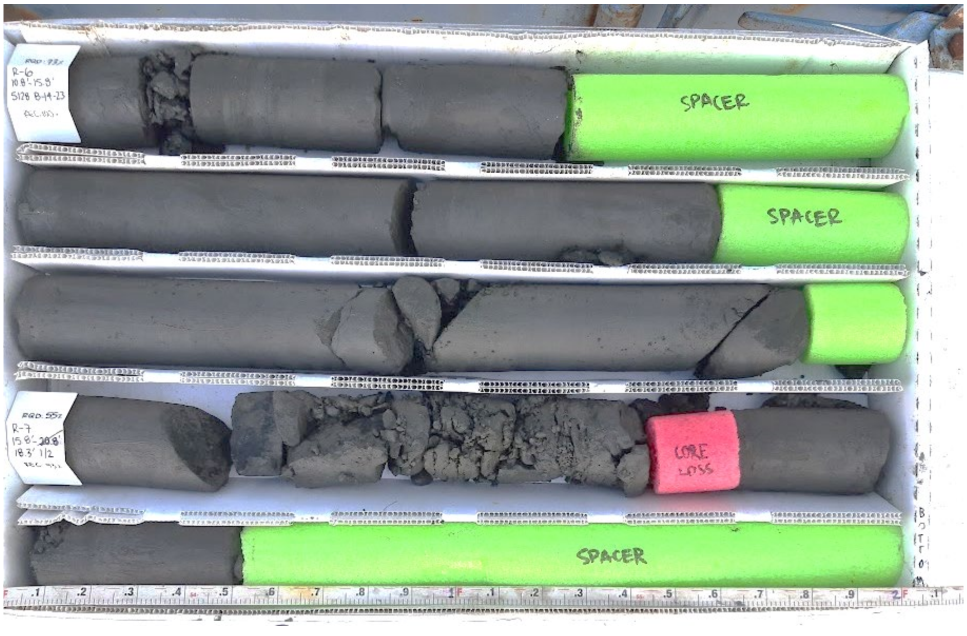
Rock Core Photographs From 2023

Boring B-4-23, Run 1 to Run 2, 23.3 – 33.3 ft depth

Boring B-13-23, Run 1 to Run 2, 15.3 – 25.3 ft depth

Boring B-14-23, Run 1 to Run 5, 5.3 – 10.8 ft depth

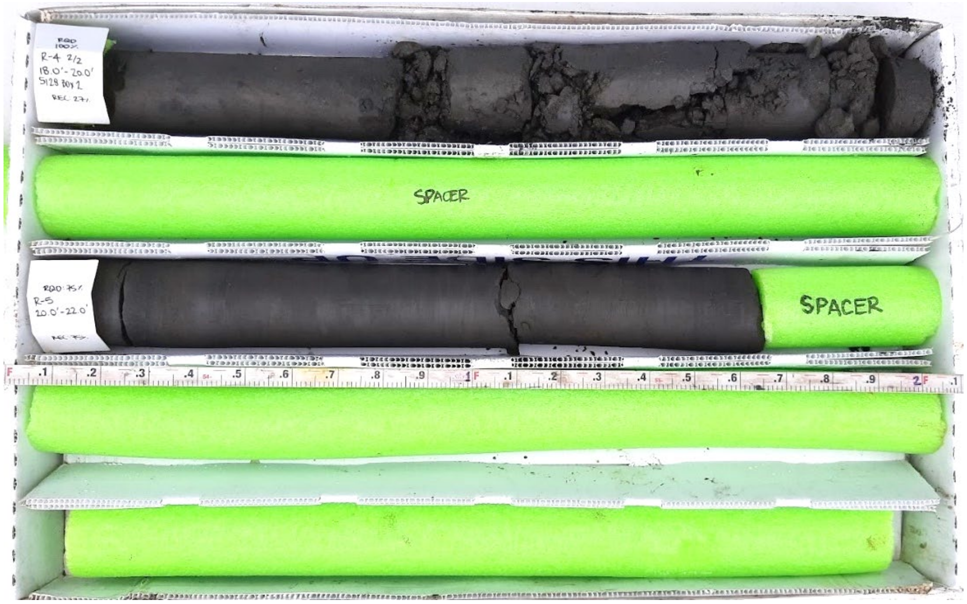
**Boring B-14-23 was re-drilled as B-14-23-B due to broken casing*



Boring B-14-23, Run 6 to Run 7, 10.8 – 18.3 ft depth

Boring B-14-23, Run 7, 18.3 - 20.8 ft depth

Boring B-15-23, Run 1 to Run 4, 5.5 - 18.0 ft depth



Boring B-15-23*, Run 4 to Run 5, 18.0 - 22.0 ft depth

**Boring B-15-23 was logged in the field as B-16-23*

APPENDIX B: Laboratory Testing

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B-1.0 LABORATORY TESTING

B-1.1 GENERAL

The soil samples obtained from the borings were examined in GRI's laboratory, where the physical characteristics of the samples were noted and the field classifications modified where appropriate. At the time of classification, the natural moisture content of the soil samples was determined. Additional testing included washed-sieve analyses (gradation) and Atterberg limits. The rock-core samples were examined at either the GRI or Cooper Testing Labs laboratories located in Beaverton and McMinnville, Oregon, respectively. Physical characteristics of the rock-core samples were noted, and the field classification was modified where appropriate. Rock-core testing included unconfined compressive strength, point load strength index, splitting tensile strength, slake durability, and Cerchar abrasion index. Rock testing was completed by ACS Testing, Inc., in Tigard, Oregon, during the 2010 laboratory testing program and Cooper Testing Labs in Palo Alto, California, during the 2016 laboratory testing program. For the 2023 drilling operations, core samples were sent to Intertek PSI Portland Lab in Portland, Oregon, and GeoTesting Express, LLC lab in Acton, Massachusetts. A summary of laboratory testing completed by GRI during the 2010, 2016, and 2023 laboratory testing programs is provided in Table 1B. The following sections describe the testing program in more detail.

B-1.2 SOIL TESTING

B-1.2.1 Natural Moisture Content

The natural moisture content of soil samples was determined to be in conformance with ASTM International (ASTM) D2216. The test results are shown on the boring logs, Figures 1A through 58A.

B-1.2.2 Atterberg Limits

Atterberg-limit determinations were performed on samples of soil and residual rock obtained from borings B-2, B-4-23, B-7-23, B-8-23, B-11-23, and B-13-23. The test was performed in substantial conformance with ASTM D4318. The test data are used for soil-classification purposes and as an indicator of the engineering properties of the fine-grained soils encountered in some of the explorations. The results of the Atterberg-limits determinations are shown on Figures 1B and 2B and summarized in Table 1B.

B-1.2.3 Grain Size Distribution

A total of 26 grain-size distribution tests were performed in substantial conformance with ASTM C117/C136 to evaluate the gradation characteristics of representative sand samples obtained from the borings. The test results are summarized graphically on Figures 3B through 14B and summarized in Table 1B.

B-1.3 ROCK CORE TESTING

B-1.3.1 General

Rock-strength tests were typically completed on the core samples with better recovery and strengths. The recovered lengths of some of the softer rock cores were not sufficient for testing.

B-1.3.2 Unconfined Compressive Strength

The unconfined compressive strength of representative rock-core samples obtained from the borings was determined in conformance with ASTM D7012D. At the time of testing, the dry unit weight of the core samples was also determined. The results of the unconfined compressive strength testing are shown on Pages 15B through 117B, Figures 118B through 133B, and summarized in Table 1B.

B-1.3.3 Point Load Strength Index

The point load strength index testing of representative rock-core samples obtained from the borings and diving exploration was performed in conformance with ASTM D5731. The results of the point load strength index testing are shown on Pages 134B through 234B, and Figures 235B through 238B and summarized in Table 1B.

B-1.3.4 Splitting Tensile Strength

The splitting tensile strength of representative rock-core samples obtained from the borings was determined in conformance with ASTM D3967. The results of the splitting tensile strength testing are shown on Pages 239B through 274B, and Figure 275B, and summarized in Table 1B.

B-1.3.5 Slake Durability

The slake durability of representative rock-core samples obtained from the borings was determined in conformance with ASTM D4644-87. The results of the slake durability testing are shown on Pages 276B through 281B and summarized in Table 1B.

B-1.3.6 Cerchar Abrasion Index

The Cerchar abrasion index of representative rock-core samples obtained from the borings was determined in conformance with ASTM D7625-10. The results of the Cerchar abrasion index testing are shown on Figures 282B through 291B and summarized in Table 1B.

Table 1B: Summary of Laboratory Results

Page 1 of 4

						Soil Testing					Rock Testing					
						Grain Size Distribution			Atterberg Limits							
Boring	Sample	Depth or Depth below mudline (feet)	Elevation (feet, MLLW)	Soil/Rock Type	Geologic Formation	Fines (%)	Sand (%)	Gravel (%)	Plasticity Index	Liquid Limit	Dry Unit Weight (pcf)	Unconfined Compressive Strength (psi)	Average Point Load Strength Index (psi)	Splitting Tensile Strength (psi)	Slake Durability (Second Cycle) (%)	Cerchar Abrasion Index
B-2	S-4	20.0	-38.5	SAND	N/A	6.4	93.6	0.0								
B-2	S-7	35.0	-53.5	SILT	N/A				40	93						
B-4A	S-2	10.0	-39.5	SAND	N/A	5.3	94.7	0.0								
B-4B	R-2	16.5	-37.0	SILTSTONE	BASTENDORFF						117	715				
B-4B	R-2	26.5	-47.0	SILTSTONE	BASTENDORFF						115	401				
B-4B	R-6	37.0	-57.5	SILTSTONE	BASTENDORFF						115	287			0.2	
B-7A	R-2	4.0	-25.0	SANDSTONE	EMPIRE						111	633				
B-7A	R-3	7.5	-28.5	SANDSTONE	EMPIRE						110	665				
B-7A	R-4	12.5	-33.5	SANDSTONE	EMPIRE						109	1193				
B-7B	R-2	7.5	-44.5	SANDSTONE	EMPIRE						103	1668			89.9	
B-7B	R-3	15.0	-52.0	SANDSTONE	EMPIRE						106	784				
B-7B	R-5	23.0	-60.0	SANDSTONE	EMPIRE						111	708			14.5	
B-9	S-1	5.0	-33.0	SAND	N/A	4.5	95.5	0.0								
B-10	S-1	3.0	-22.0	SAND	N/A	5.2	93.8	1.0								
B-10	S-6	15.0	-34.0	SAND	N/A	4.8	95.2	0.0								
B-10	S-11	30.0	-49.0	SAND	N/A	4.8	95.2	0.0								
B-11	S-1	5.0	-43.0	SAND	N/A	4.5	95.5	0.0								
B-11	S-3	15.0	-53.0	SAND	N/A	5.8	94.2	0.0								
B-12	S-1	5.0	-43.0	SAND	N/A	4.2	90.5	5.4								
B-12	S-2	10.0	-48.0	SAND	N/A	5.1	94.9	0.0								
B-13	S-1	5.0	-39.5	SAND	N/A	3.9	95.6	0.4								
B-13	S-2	10.0	-44.5	SAND	N/A	6.1	93.9	0.0								
B-13	S-4	20.0	-54.5	SAND	N/A	7.7	92.3	0.0								
B-14	S-1	5.0	-43.5	SAND	N/A	6.1	93.9	0.1								
B-14	S-3	15.0	-53.5	SAND	N/A	7.8	92.2	0.0								
B-15	R-1	2.0	-35.0	SANDSTONE	COALEDO						149	11361	688			
B-15	R-2	5.5	-38.5	SANDSTONE	COALEDO						127	2554	98	81		2.3
B-15	R-3	9.5	-42.5	SANDSTONE	COALEDO						131	1461	54		60.3	
B-15	R-4	15.5	-48.5	SANDSTONE	COALEDO						124	1335	67	92	18.9	
B-15	R-5	18.5	-51.5	SANDSTONE	COALEDO						144	4226	51			
B-15	R-5	22.5	-55.5	SANDSTONE	COALEDO						126	1150	264	65		
B-17	S-1	4.0	-42.5	SAND	N/A	4.9	92.6	2.5								
B-19	S-1	5.0	-39.0	SAND	N/A	5.2	75.3	19.5								
B-19	S-2	10.0	-44.0	SAND	N/A	7.1	88.3	4.6								
B-20	S-1	5.0	-45.0	SAND	N/A	5.0	89.4	5.6								
B-21	R-3	6.5	-36.5	SILTSTONE	BASTENDORFF								34		0.1	
B-21	R-5	16.0	-46.0	SILTSTONE	BASTENDORFF								5			
B-21	R-7	20.5	-50.5	SILTSTONE	BASTENDORFF						94	180		29	6.3	
B-22	R-2	16.0	-40.0	SILTSTONE	BASTENDORFF										0.6	
B-23	R-1	6.0	-45.5	SILTSTONE	BASTENDORFF								7			
B-23	R-2	7.0	-46.5	SILTSTONE	BASTENDORFF								41			

Table 1B: Summary of Laboratory Results

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						Soil Testing					Rock Testing					
						Grain Size Distribution			Atterberg Limits							
Boring	Sample	Depth or Depth below mudline (feet)	Elevation (feet, MLLW)	Soil/Rock Type	Geologic Formation	Fines (%)	Sand (%)	Gravel (%)	Plasticity Index	Liquid Limit	Dry Unit Weight (pcf)	Unconfined Compressive Strength (psi)	Average Point Load Strength Index (psi)	Splitting Tensile Strength (psi)	Slake Durability (Second Cycle) (%)	Cerchar Abrasion Index
B-23	R-3	8.5	-48.0	SILTSTONE	BASTENDORFF						99	897			46.2	
B-23	R-3	9.5	-49.0	SILTSTONE	BASTENDORFF						98	608		55		
B-23	R-3	11.5	-51.0	SILTSTONE	BASTENDORFF						98	912				0.1
B-24	R-1	4.0	-32.5	SANDSTONE	EMPIRE						118	616	15	38		
B-24	R-2	6.0	-34.5	SANDSTONE	EMPIRE						119	583	16			
B-24	R-2	8.0	-36.5	SANDSTONE	EMPIRE						120	663	27		0.0	
B-24	R-3	11.0	-39.5	SANDSTONE	EMPIRE						119	631	21			0.2
B-24	R-3	15.0	-43.5	SANDSTONE	EMPIRE						121	456	21			
B-24	R-4	17.0	-45.5	SANDSTONE	EMPIRE						124	456				
B-24	R-4	18.0	-46.5	SANDSTONE	EMPIRE						124	458	20	32		
B-24	R-5	21.0	-49.5	SANDSTONE	EMPIRE						126	188				
B-24	R-5	24.0	-52.5	SANDSTONE	EMPIRE						120	377	12	12	0.0	
B-25	R-2	5.0	-37.0	SANDSTONE	EMPIRE								10			
B-25	R-2	6.0	-38.0	SANDSTONE	EMPIRE						109	160	13			
B-25	R-2	8.0	-40.0	SANDSTONE	EMPIRE								8	22		
B-25	R-3	10.0	-42.0	SANDSTONE	EMPIRE						104	199	8		0.6	
B-25	R-4	15.0	-47.0	SANDSTONE	EMPIRE						110	209	10			
B-25	R-4	17.0	-49.0	SANDSTONE	EMPIRE						107	277	7	14		
B-26	R-1	4.0	-43.0	SANDSTONE	EMPIRE								9		0.1	
B-26	R-3	13.0	-52.0	SANDSTONE	EMPIRE						107	171	7	13		
B-27	R-1	4.0	-30.5	SANDSTONE	EMPIRE						95	1746	73	119		
B-27	R-1	7.0	-33.5	SANDSTONE	EMPIRE						96	1662	81		93.0	
B-27	R-2	11.0	-37.5	SANDSTONE	EMPIRE						96	1211	74			
B-27	R-2	12.0	-38.5	SANDSTONE	EMPIRE						99	1692	66			
B-27	R-3	16.0	-42.5	SANDSTONE	EMPIRE						94	1695	80			0.4
B-27	R-4	19.0	-45.5	SANDSTONE	EMPIRE						91	1655	73			
B-27	R-4	21.0	-47.5	SANDSTONE	EMPIRE						97	1816	66	101	94.3	
B-27	R-5	23.0	-49.5	SANDSTONE	EMPIRE						94	1711	73			
B-27	R-5	25.0	-51.5	SANDSTONE	EMPIRE						98	1555	75			
B-28	R-1	7.0	-39.5	SANDSTONE	EMPIRE						101	211				
B-28	R-1	10.0	-42.5	SANDSTONE	EMPIRE						100	1580	68	119		
B-28	R-2	12.0	-44.5	SANDSTONE	EMPIRE						96	1451	75	117	89.9	
B-28	R-2	15.0	-47.5	SANDSTONE	EMPIRE						98	1670	70			0.3
B-28	R-3	17.0	-49.5	SANDSTONE	EMPIRE						98	1610	70			
B-28	R-3	19.0	-51.5	SANDSTONE	EMPIRE						98	1064	71	146		
B-29	R-1	2.0	-40.0	SANDSTONE	EMPIRE								50	99		
B-29	R-2	5.0	-43.0	SANDSTONE	EMPIRE										89.5	
B-29	R-2	8.0	-46.0	SANDSTONE	EMPIRE								54			
B-29	R-3	12.0	-50.0	SANDSTONE	EMPIRE						99	1512	55	91	90.6	0.4
B-30	S-1	3.0	-29.0	SAND	N/A	5.2	93.4	1.4								
B-30	S-3	8.0	-34.0	SAND	N/A	14.1	83.4	2.5								

Table 1B: Summary of Laboratory Results

Page 3 of 4

						Soil Testing					Rock Testing					
						Grain Size Distribution			Atterberg Limits							
Boring	**Sample**	**Depth or Depth below mudline (feet)**	**Elevation (feet, MLLW)**	**Soil/Rock Type**	**Geologic Formation**	**Fines (%)**	**Sand (%)**	**Gravel (%)**	**Plasticity Index**	**Liquid Limit**	**Dry Unit Weight (pcf)**	**Unconfined Compressive Strength (psi)**	**Average Point Load Strength Index (psi)**	**Splitting Tensile Strength (psi)**	**Slake Durability (Second Cycle) (%)**	**Cerchar Abrasion Index**
B-30	R-1	12.0	-38.0	SANDSTONE	EMPIRE						110	542	44			
B-30	R-1	14.0	-40.0	SANDSTONE	EMPIRE						127	1095	35	25		
B-30	R-1	14.5	-40.5	SANDSTONE	EMPIRE										83.9	
B-30	R-2	18.0	-44.0	SANDSTONE	EMPIRE						112	555				
B-30	R-3	22.0	-48.0	SANDSTONE	EMPIRE						111	365	28	32		
B-30	R-3	25.0	-51.0	SANDSTONE	EMPIRE						114	531	33		0.1	
B-30	R-4	28.0	-54.0	SANDSTONE	EMPIRE						113	386	28			
B-30	R-4	30.0	-56.0	SANDSTONE	EMPIRE						113	339	17			
B-31	R-1	4.0	-27.5	SANDSTONE	EMPIRE						111	495	27		0.0	
B-31	R-1	7.0	-30.5	SANDSTONE	EMPIRE						110	461	28			
B-31	R-2	10.0	-33.5	SANDSTONE	EMPIRE						109	448	25	50		
B-31	R-3	14.0	-37.5	SANDSTONE	EMPIRE						112	512	39			0.4
B-31	R-3	17.0	-40.5	SANDSTONE	EMPIRE						111	588	31			
B-31	R-4	20.0	-43.5	SANDSTONE	EMPIRE						114	513	31	72		
B-31	R-4	22.0	-45.5	SANDSTONE	EMPIRE						111	578	42			
B-31	R-5	24.0	-47.5	SANDSTONE	EMPIRE						109	619	27	36		
B-31	R-5	28.0	-51.5	SANDSTONE	EMPIRE						109	438	20			
B-32	R-1	2.5	-35.5	SANDSTONE	EMPIRE						102	1424	57	151	85.0	
B-32	R-1	6.5	-39.5	SANDSTONE	EMPIRE						96	1711	62			
B-32	R-2	8.5	-41.5	SANDSTONE	EMPIRE						101	1418	59			0.3
B-32	R-2	10.5	-43.5	SANDSTONE	EMPIRE						102	1319	61			
B-32	R-3	12.5	-45.5	SANDSTONE	EMPIRE						99	1544	57	100		
B-32	R-4	16.5	-49.5	SANDSTONE	EMPIRE						94	1769	73	138		
B-32	R-4	19.5	-52.5	SANDSTONE	EMPIRE						101	1296	44			
B-33	R-1	2.0	-23.5	SANDSTONE	EMPIRE							1681	73	186	95.6	0.3
B-33	R-2	6.0	-27.5	SANDSTONE	EMPIRE						98	1729	80			
B-33	R-2	9.0	-30.5	SANDSTONE	EMPIRE						92	1723	66			
B-33	R-3	13.0	-34.5	SANDSTONE	EMPIRE								13			
B-33	R-5	16.0	-37.5	SANDSTONE	EMPIRE						90	1576	56			
B-33	R-6	20.0	-41.5	SANDSTONE	EMPIRE								57			
B-33	R-7	21.0	-42.5	SANDSTONE	EMPIRE						103	1239	55	105	71.3	
B-33	R-8	26.0	-47.5	SANDSTONE	EMPIRE						96	1495	62			
B-37	S-1	3.0	-39.5	SILT	N/A	69.1	30.9	0.0								
B-37	S-3	7.5	-44.0	SAND	N/A	6.3	93.7	0.0								
B-38	S-1	5.0	-43.0	SAND	N/A	4.6	95.2	0.2								
B-38	S-2	7.5	-45.5	SAND	N/A	5.1	94.9	0.0								
B-38	S-4	12.5	-50.5	SAND	N/A	5.3	94.7	0.0								
B-40	R-1	3.0	-25.0	SANDSTONE	EMPIRE						111	335	21			
B-40	R-1	6.0	-28.0	SANDSTONE	EMPIRE						111	428	27	30	0.0	
B-40	R-2	10.0	-32.0	SANDSTONE	EMPIRE						112	389				
B-40	R-2	11.0	-33.0	SANDSTONE	EMPIRE						112	372	23			0.4

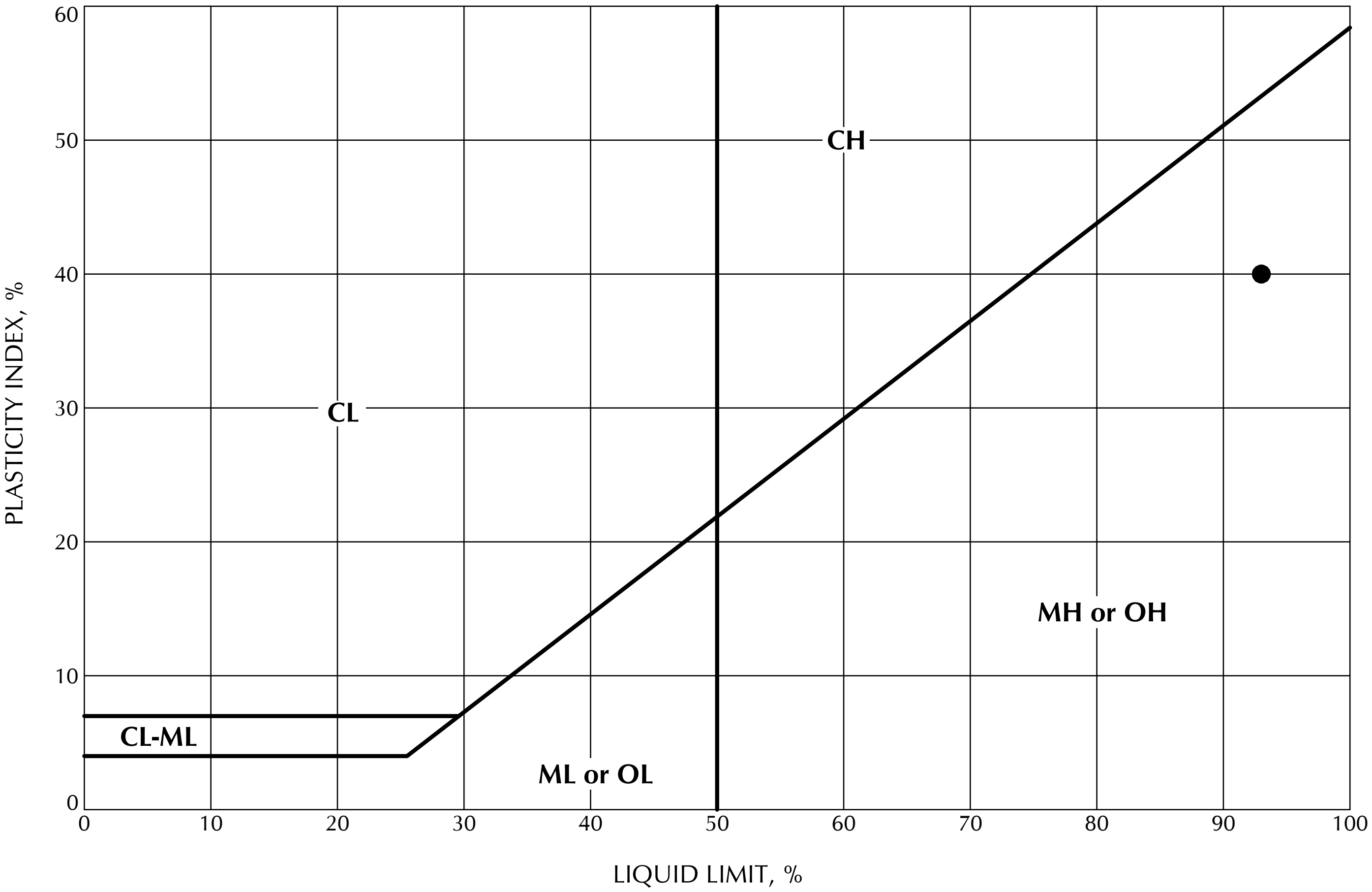
Table 1B: Summary of Laboratory Results

Page 4 of 4

						Soil Testing					Rock Testing					
						Grain Size Distribution			Atterberg Limits							
Boring	Sample	Depth or Depth below mudline (feet)	Elevation (feet, MLLW)	Soil/Rock Type	Geologic Formation	Fines (%)	Sand (%)	Gravel (%)	Plasticity Index	Liquid Limit	Dry Unit Weight (pcf)	Unconfined Compressive Strength (psi)	Average Point Load Strength Index (psi)	Splitting Tensile Strength (psi)	Slake Durability (Second Cycle) (%)	Cerchar Abrasion Index
B-40	R-3	16.0	-38.0	SANDSTONE	EMPIRE						111	346	25	29		
B-40	R-5	21.0	-43.0	SANDSTONE	EMPIRE						109	258	21			
B-40	R-5	23.0	-45.0	SANDSTONE	EMPIRE						108	327	27			
B-40	R-7	26.0	-48.0	SANDSTONE	EMPIRE						110	397	21	28	0.0	
B-40	R-7	28.0	-50.0	SANDSTONE	EMPIRE						111	465	24			
UB-1	S-3	7.5	-29.5	SAND	N/A	4.9	95.1	0.0								
UB-1	S-6	30.0	-52.0	SAND	N/A	4.8	95.2	0.0								
UB-1	S-8	40.0	-62.0	SAND	N/A	5.2	94.8	0.0								
UB-1	R-1	46	-32.2	SANDSTONE	EMPIRE								16		0.1	
UB-1	R-1	48	-34.2	SANDSTONE	EMPIRE								11			
UB-1	R-1	48.5	-34.7	SANDSTONE	EMPIRE						132	6673				
UB-1	R-3	57	-43.2	SANDSTONE	EMPIRE								22			
UB-1	R-4	60	-46.2	SANDSTONE	EMPIRE						116	730	28			0.4
UB-1	R-5	67	-53.2	SANDSTONE	EMPIRE						116	784	36	34		
UB-1	R-6	71	-57.2	SANDSTONE	EMPIRE						116	663	40	50		
UB-1	R-7	77	-63.2	SANDSTONE	EMPIRE						116	619	23			
UB-2	S-1	5	8.8	SAND	N/A	4.1	95.5	0.4								
UB-2	S-3	15	-1.2	SAND	N/A	4.6	95.4	0.0								
UB-2	S-5	25	-11.2	SAND	N/A	6.1	93.9	0.0								
UB-2	S-7	35	-21.2	SAND	N/A	6.3	93.7	0.0								
UB-2	R-2	46	-31.4	SANDSTONE	EMPIRE						115	355	15			
UB-2	R-3	50	-35.4	SANDSTONE	EMPIRE						117	312	14	27	8.6	
UB-2	R-4	56	-41.4	SANDSTONE	EMPIRE						115	449	8			
UB-2	R-5	63	-48.4	SANDSTONE	EMPIRE						115	124	9	9		
UB-2	R-6	65	-50.4	SANDSTONE	EMPIRE						117	466	24			
UB-2	R-7	72	-57.4	SANDSTONE	EMPIRE						123	632	31		42.3	0.4
UB-3	S-2	10	4.6	SAND	N/A	6.6	93.4	0.0								
UB-3	S-4	20	-5.4	SAND	N/A	5.2	94.8	0.0								
UB-3	R-1	30.3	-13.4	SANDSTONE	EMPIRE								11			0.4
UB-3	R-2	35	-18.1	SANDSTONE	EMPIRE								12	15	0.0	
UB-3	R-2	35.5	-18.6	SANDSTONE	EMPIRE						111	312				
UB-3	R-3	40	-23.1	SANDSTONE	EMPIRE						111	246	12			
UB-3	R-3	51	-34.1	SANDSTONE	EMPIRE								13			
UB-3	R-6	55	-38.1	SANDSTONE	EMPIRE						118	326	16			
UB-3	R-7	62	-45.1	SANDSTONE	EMPIRE						112	91	21			
UB-3	R-8	66	-49.1	SANDSTONE	EMPIRE						111	23	12			

GROUP SYMBOL	UNIFIED SOIL CLASSIFICATION FINE-GRAINED SOIL GROUPS
OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
ML	INORGANIC CLAYEY SILTS TO VERY FINE SANDS OF SLIGHT PLASTICITY
CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY

GROUP SYMBOL	UNIFIED SOIL CLASSIFICATION FINE-GRAINED SOIL GROUPS
OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
MH	INORGANIC SILTS AND CLAYEY SILT
CH	INORGANIC CLAYS OF HIGH PLASTICITY



	Location	Sample	Depth, ft	Classification	LL	PL	PI	MC, %
●	B-2	S-7	35.0	Clayey SILT, trace fine-grained sand, gray	93	53	40	71

ATTERBERG-PLASTICITY 1 PER PAGE GRI DATA TEMPLATE.GDT 4/1/20

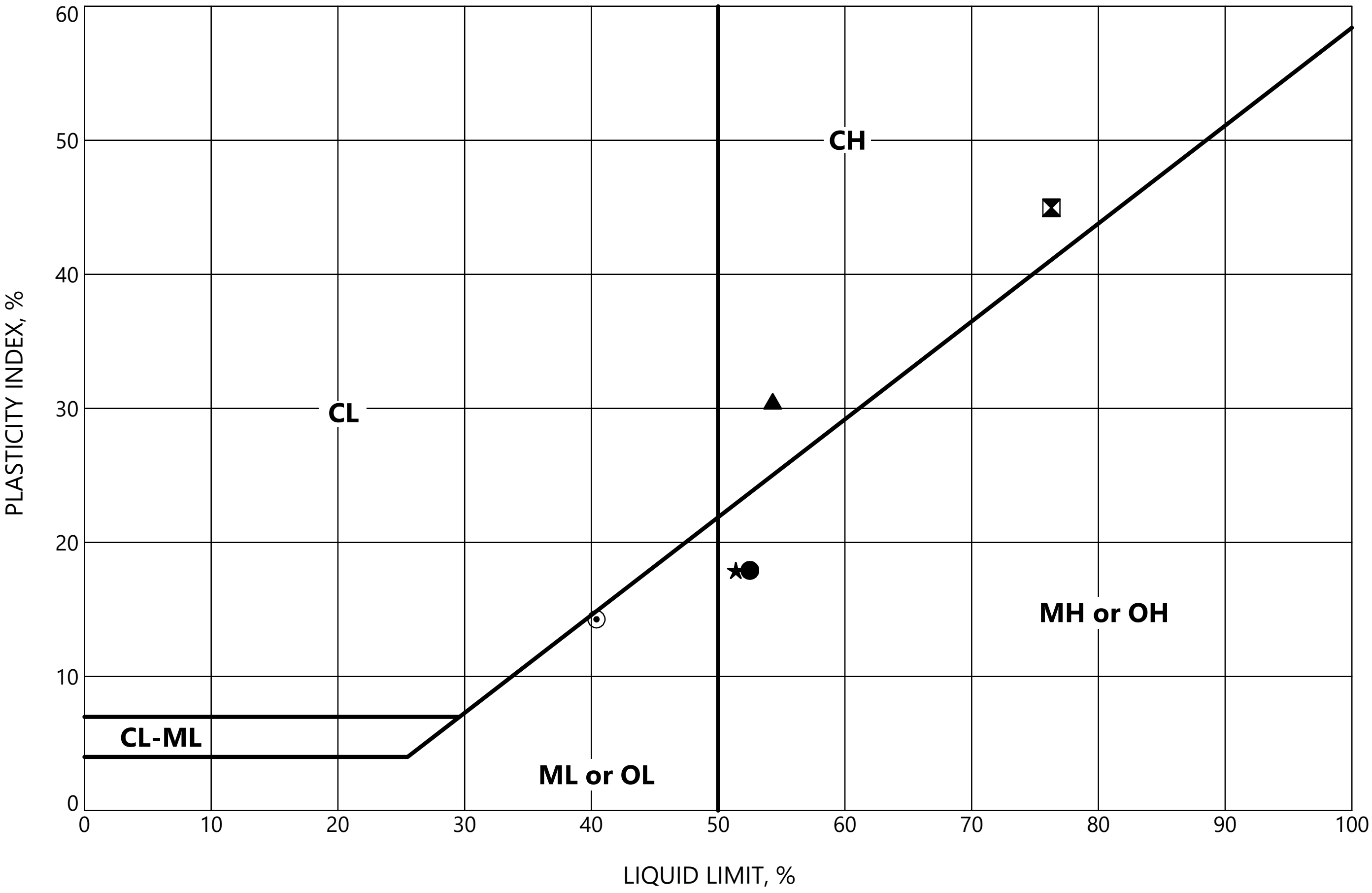
GRI

PLASTICITY CHART

2020 JOB NO. 5128 FIG. 1B

GROUP SYMBOL	UNIFIED SOIL CLASSIFICATION FINE-GRAINED SOIL GROUPS
OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
ML	INORGANIC CLAYEY SILTS TO VERY FINE SANDS OF SLIGHT PLASTICITY
CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY

GROUP SYMBOL	UNIFIED SOIL CLASSIFICATION FINE-GRAINED SOIL GROUPS
OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
MH	INORGANIC SILTS AND CLAYEY SILT
CH	INORGANIC CLAYS OF HIGH PLASTICITY



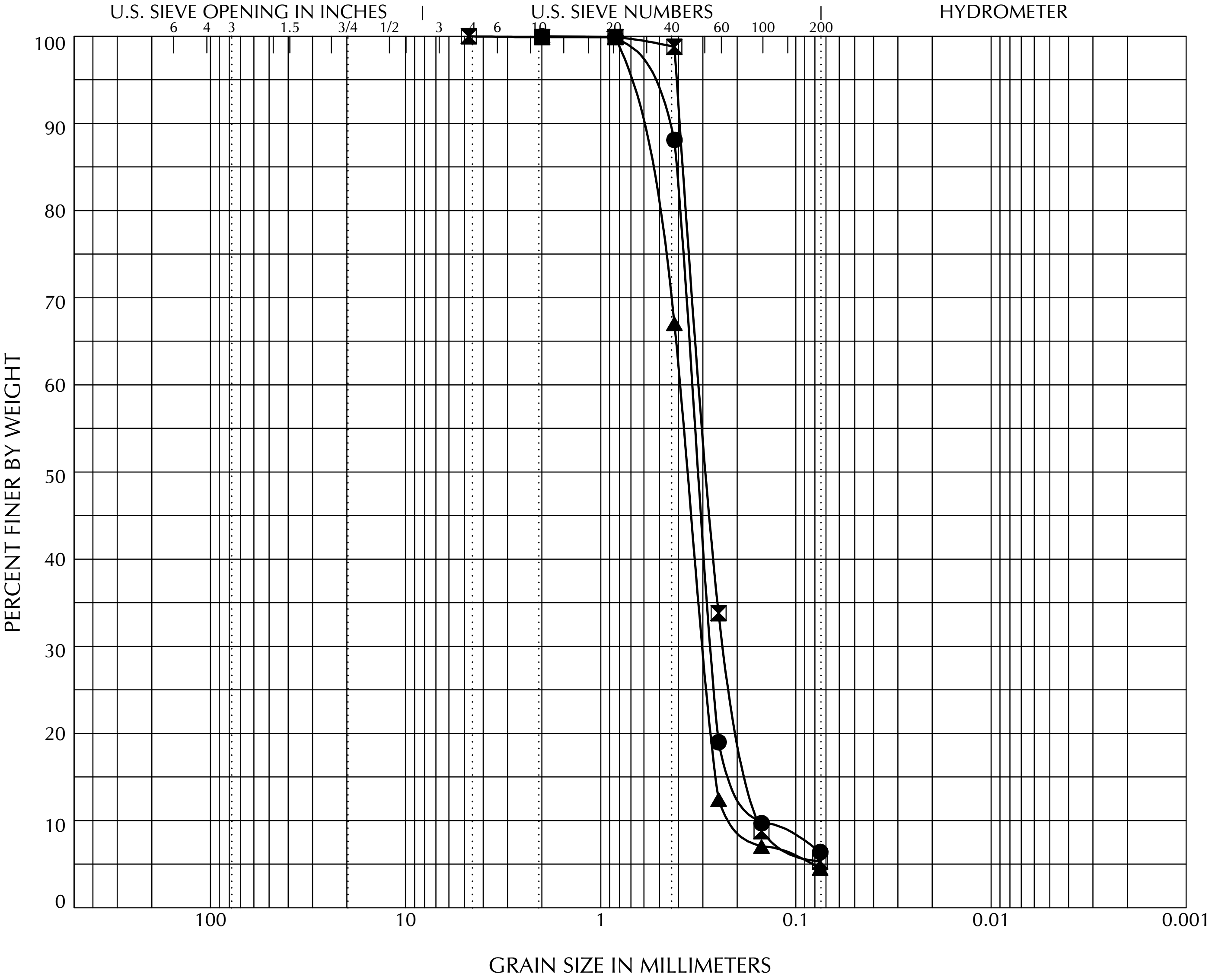
	Location	Sample	Depth, ft	Classification	LL	PL	PI	MC, %
●	B-4-23	R-2	31.3	MUDSTONE/SILTSTONE, gray, fresh, extremely soft to very soft (R0-R1)	53	35	17	
⧗	B-7-23	S-8	40.0	CLAY, trace silt, trace fine- to medium-grained sand, dark brown	76	31	45	59
▲	B-8-23	S-8	40.0	MUDSTONE/SILTSTONE, dark gray, fresh, extremely soft to very soft (R0-R1)	54	24	30	22
★	B-11-23	S-5	25.0	MUDSTONE/SILTSTONE, gray to light gray, very soft to soft (R1 to R2)	51	33	18	28
⊙	B-13-23	S-1	0.0	MUDSTONE/SILTSTONE, dark gray, fresh, extremely soft to very soft (R0-R1)	40	26	14	25

GRI

PLASTICITY CHART

2024 JOB NO. 5128 FIG. 2B

ATTERBERG-PLASTICITY 5 PER PAGE GRI DATA TEMPLATE.GDT 1/30/24



COBBLES	GRAVEL		SAND			SILT OR CLAY
	Coarse	Fine	Coarse	Medium	Fine	

	Location	Sample	Depth, ft	Classification	Gravel, %	Sand, %	Fines, %
●	B-2	S-4	20.0	SAND, some silt, brown to gray, fine to medium grained, contains scattered organics	0.0	93.6	6.4
⧗	B-4A	S-2	10.0	SAND, trace to some silt, brown to gray, fine grained, contains scattered shell fragments	0.0	94.7	5.3
▲	B-9	S-1	5.0	SAND, trace silt, brown, fine to medium grained	0.0	95.5	4.5

GRAIN SIZE GRI-THREE PER PAGE GRI DATA TEMPLATE.GDT 4/1/20

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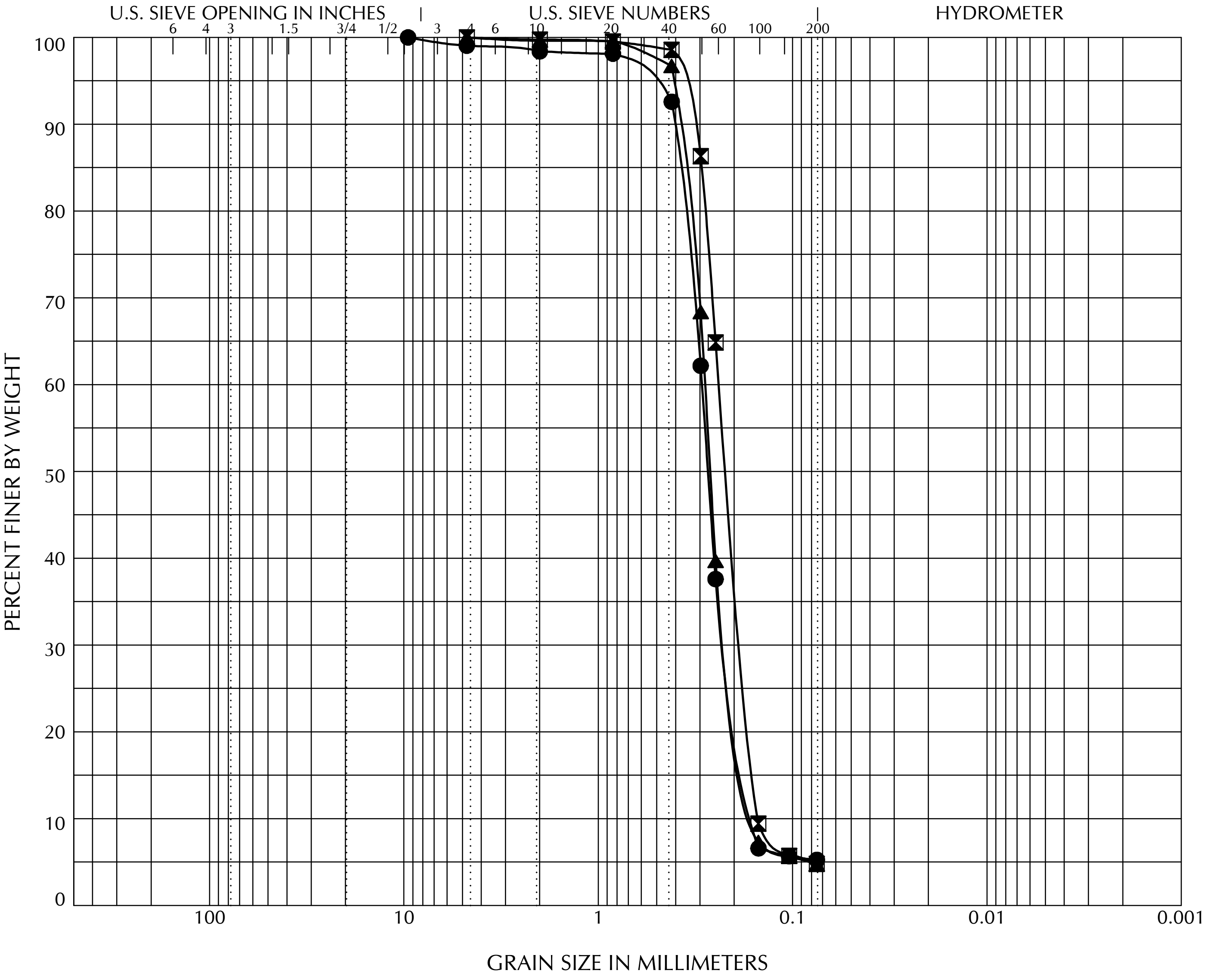
GRAIN SIZE DISTRIBUTION

2020 JOB NO. 5128 FIG. 3B



COBBLES	GRAVEL		SAND			SILT OR CLAY
	Coarse	Fine	Coarse	Medium	Fine	

	Location	Sample	Depth, ft	Classification	Gravel, %	Sand, %	Fines, %
●	B-10	S-1	3.0	SAND, trace to some silt, dark gray, fine to medium grained, contains shell fragments	1.0	93.8	5.2
⧗	B-10	S-6	15.0	SAND, trace silt, dark gray, fine grained, contains shell fragments	0.0	95.2	4.8
▲	B-10	S-11	30.0	SAND, trace silt, dark gray, fine grained, contains shell fragments	0.0	95.2	4.8

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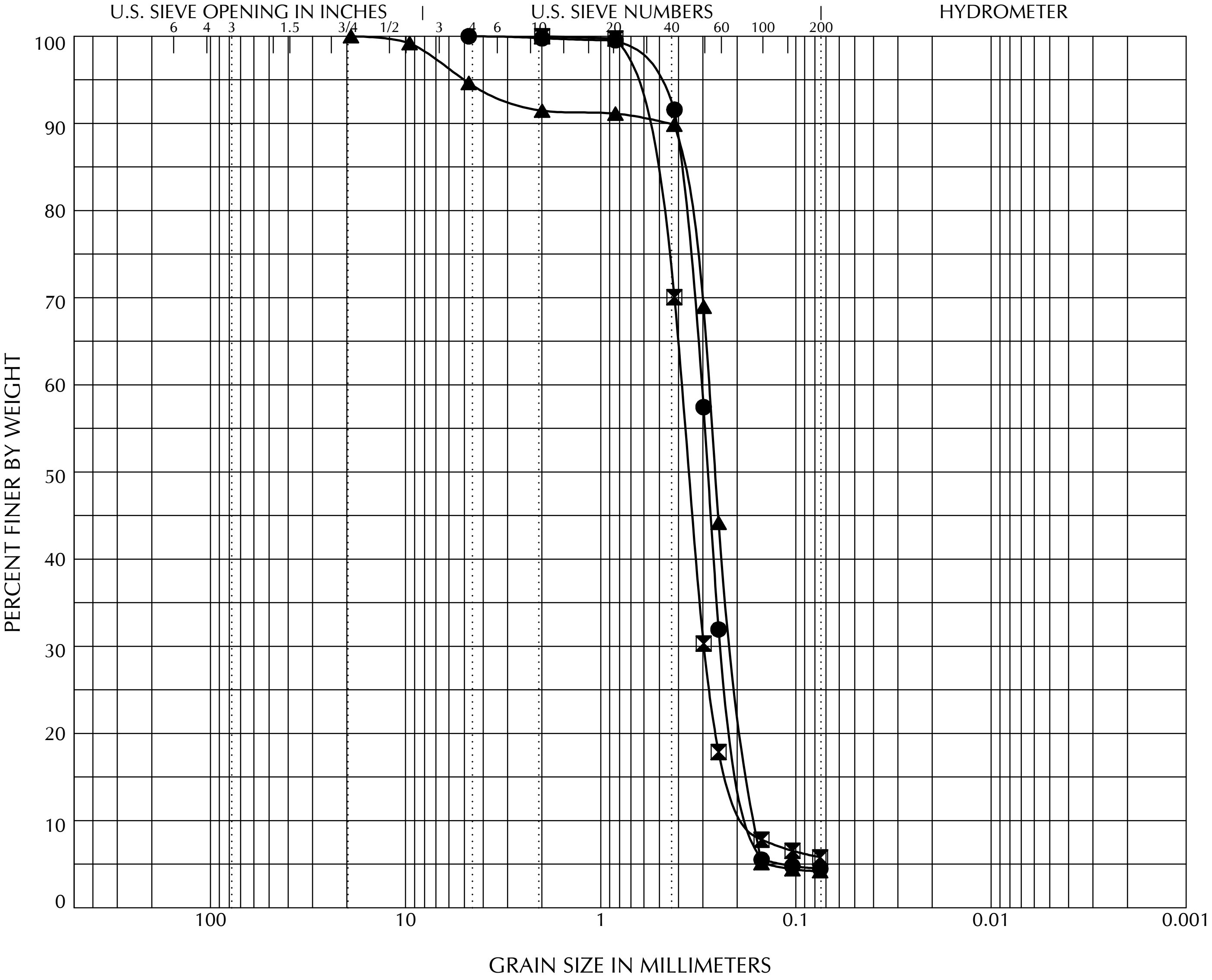
GRAIN SIZE DISTRIBUTION

2020 JOB NO. 5128 FIG. 4B

GRAIN SIZE GRI-THREE PER PAGE GRI DATA TEMPLATE.GDT 4/1/20



COBBLES	GRAVEL		SAND			SILT OR CLAY
	Coarse	Fine	Coarse	Medium	Fine	

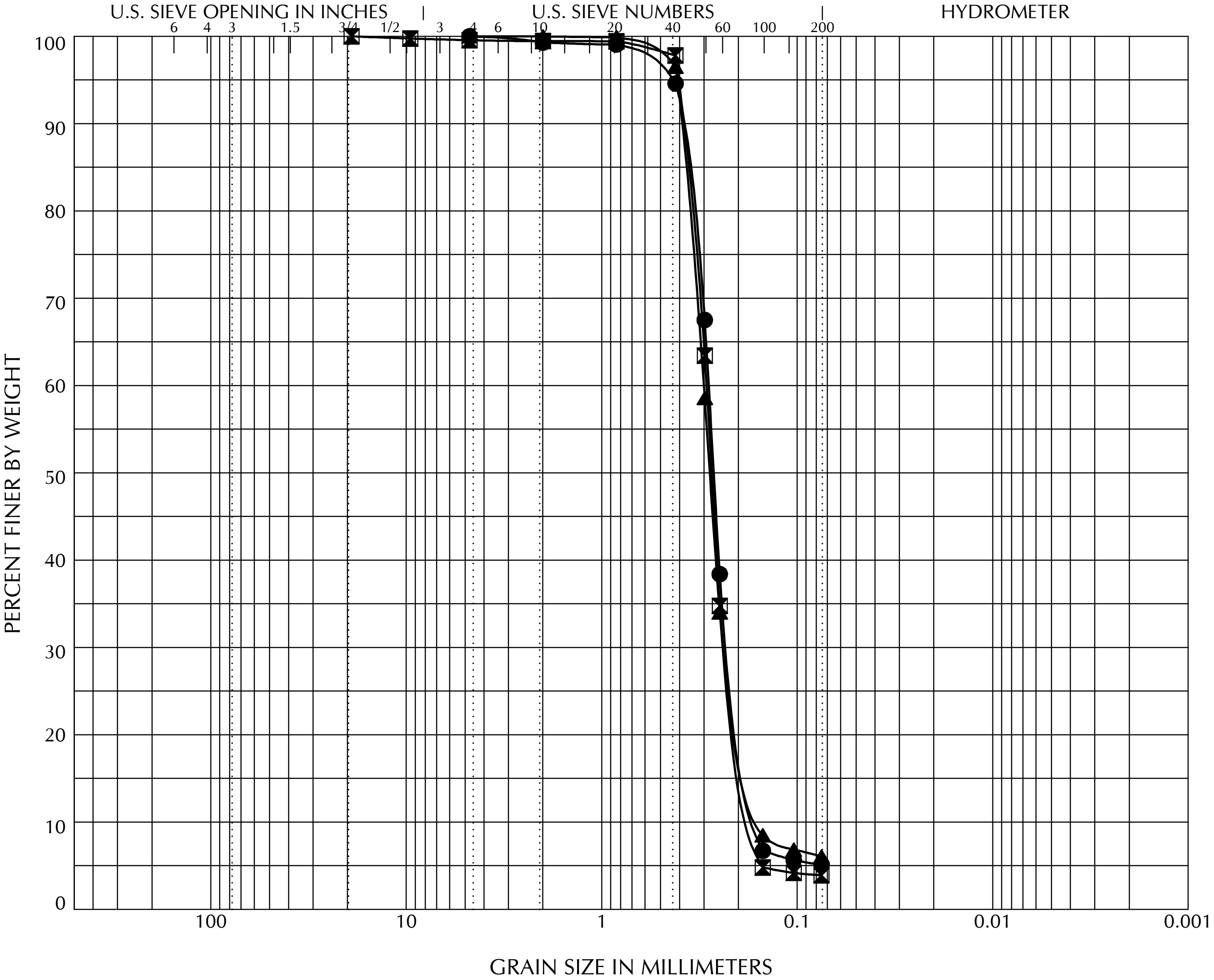
	Location	Sample	Depth, ft	Classification	Gravel, %	Sand, %	Fines, %
●	B-11	S-1	5.0	SAND, trace silt, gray, fine to medium grained	0.0	95.5	4.5
⧗	B-11	S-3	15.0	SAND, trace to some silt, gray, fine to medium grained	0.0	94.2	5.8
▲	B-12	S-1	5.0	SAND, trace silt and gravel-sized shell fragments, gray, fine grained	5.4	90.5	4.2

GRI

GRAIN SIZE DISTRIBUTION

2020 JOB NO. 5128 FIG. 5B

GRAIN SIZE GRI-THREE PER PAGE GRI DATA TEMPLATE.GDT 4/1/20



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<tr><td>Coarse</td><td>Fine</td><td>Coarse</td><td>Medium</td><td>Fine</td></tr>
</table>

	Location	Sample	Depth, ft	Classification	Gravel, %	Sand, %	Fines, %
●	B-12	S-2	10.0	SAND, trace to some silt, gray, fine to medium grained	0.0	94.9	5.1
⧗	B-13	S-1	5.0	SAND, trace silt, gray, fine grained, contains shell fragments	0.4	95.6	3.9
▲	B-13	S-2	10.0	SAND, some silt, gray, fine grained	0.0	93.9	6.1

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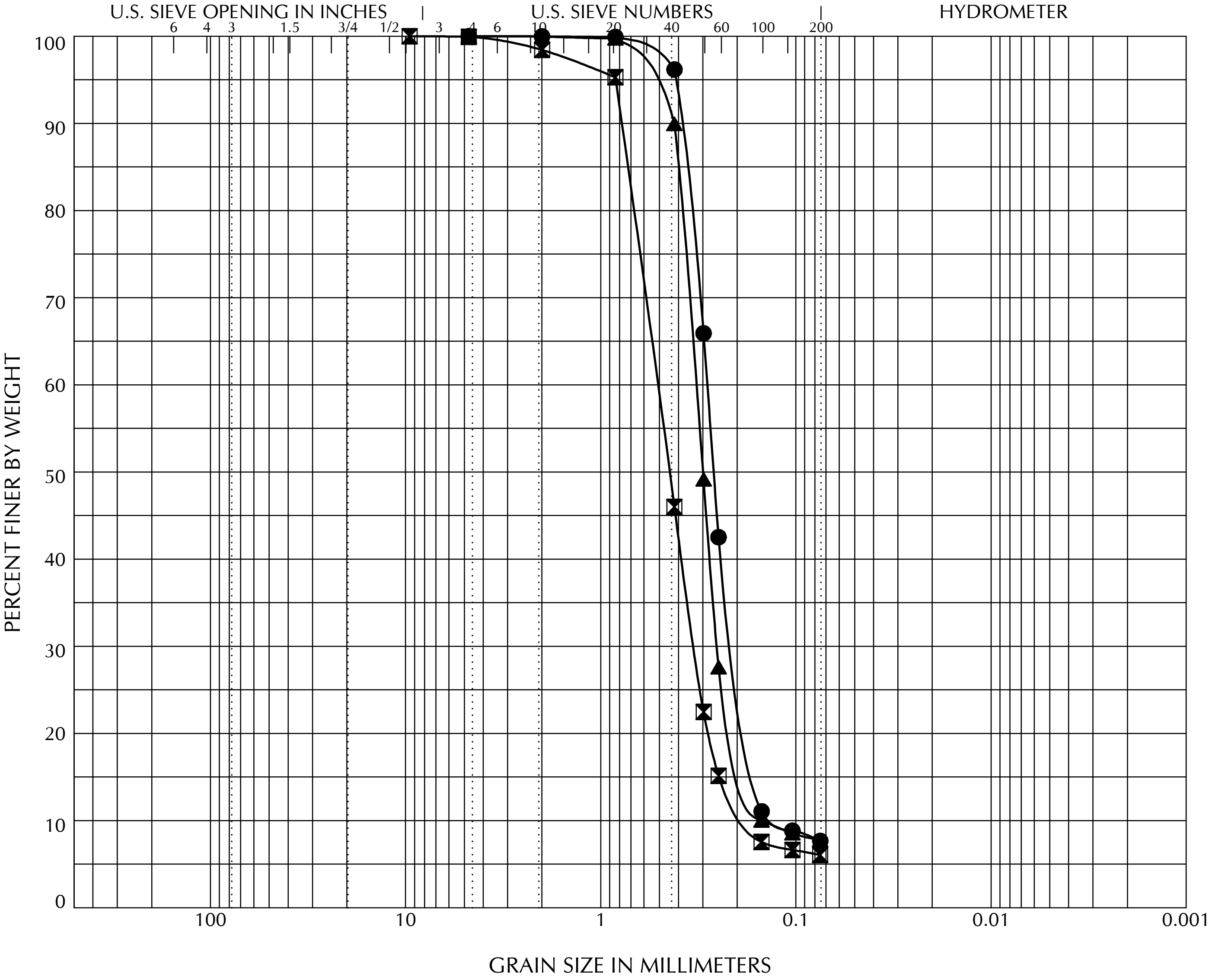
GRAIN SIZE DISTRIBUTION

2020 JOB NO. 5128 FIG. 6B



COBBLES	GRAVEL		SAND			SILT OR CLAY
	Coarse	Fine	Coarse	Medium	Fine	

	Location	Sample	Depth, ft	Classification	Gravel, %	Sand, %	Fines, %
●	B-13	S-4	20.0	SAND, some silt, gray, fine grained	0.0	92.3	7.7
☒	B-14	S-1	5.0	SAND, some silt, gray, fine to medium grained, contains shell fragments	0.1	93.9	6.1
▲	B-14	S-3	15.0	SAND, some silt, gray, fine to medium grained, contains shell fragments	0.0	92.2	7.8

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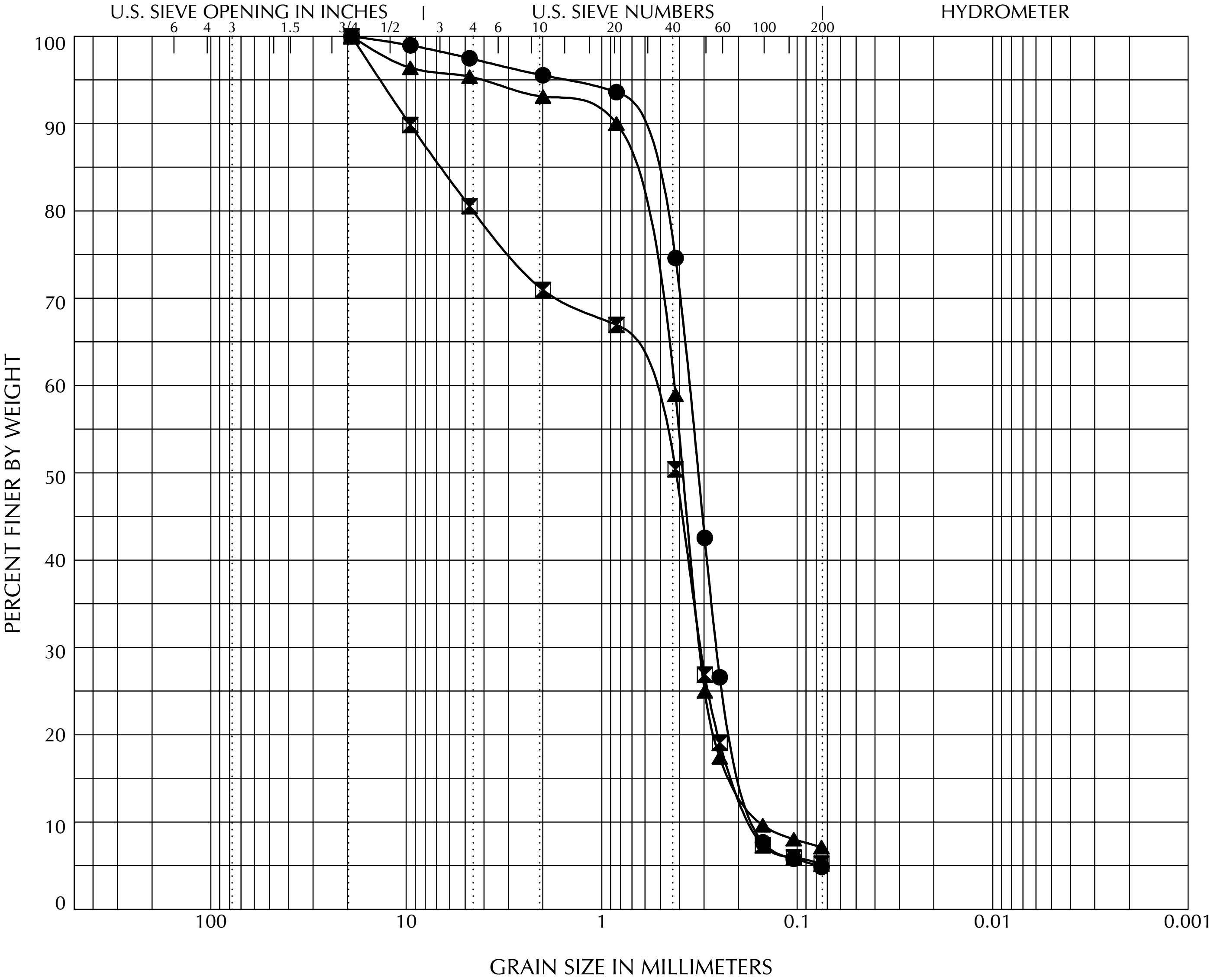
GRAIN SIZE DISTRIBUTION

2020 JOB NO. 5128 FIG. 7B

GRAIN SIZE GRI-THREE PER PAGE GRI DATA TEMPLATE.GDT 4/1/20



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<tr><td>Coarse</td><td>Fine</td><td>Coarse</td><td>Medium</td><td>Fine</td></tr>
</table>

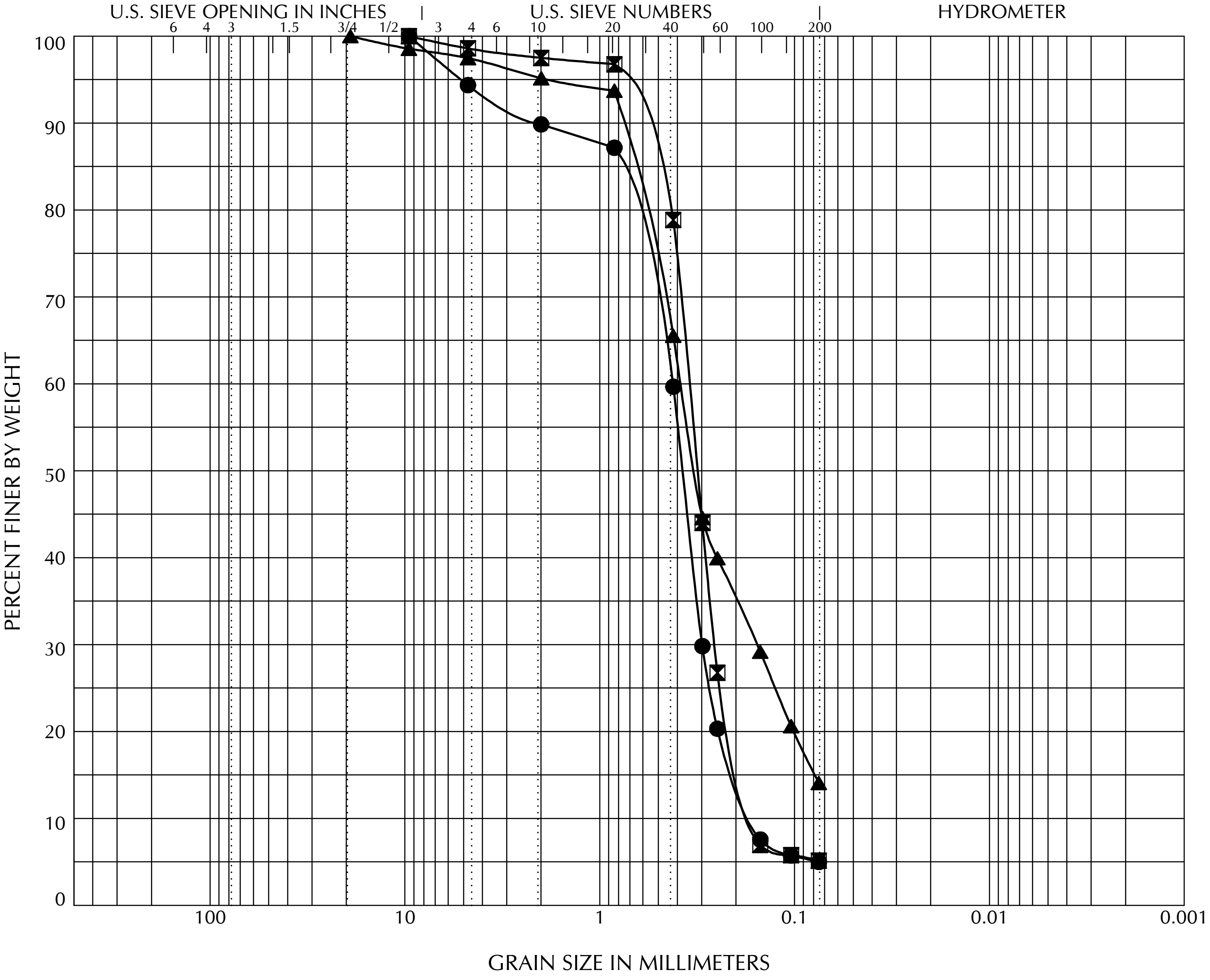
	Location	Sample	Depth, ft	Classification	Gravel, %	Sand, %	Fines, %
●	B-17	S-1	4.0	SAND, trace silt, gray, fine to medium grained, contains gravel-sized shell fragments	2.5	92.6	4.9
⧗	B-19	S-1	5.0	SAND, some gravel-sized shell fragments, trace to some silt, gray, fine to medium grained	19.5	75.3	5.2
▲	B-19	S-2	10.0	SAND, some silt, gray, fine to medium grained, contains gravel-sized shell fragments	4.6	88.3	7.1

GRAIN SIZE GRI-THREE PER PAGE GRI DATA TEMPLATE.GDT 4/1/20

GRI

GRAIN SIZE DISTRIBUTION

2020 JOB NO. 5128 FIG. 8B



COBBLES	GRAVEL		SAND			SILT OR CLAY
	Coarse	Fine	Coarse	Medium	Fine	

	Location	Sample	Depth, ft	Classification	Gravel, %	Sand, %	Fines, %
●	B-20	S-1	5.0	SAND, trace to some silt, gray, fine to medium grained, contains shell fragments	5.6	89.4	5.0
☒	B-30	S-1	3.0	SAND, trace to some silt, gray, fine grained, contains shell fragments	1.4	93.4	5.2
▲	B-30	S-3	8.0	Silty SAND, gray, fine to medium grained, contains shell fragments	2.5	83.4	14.1

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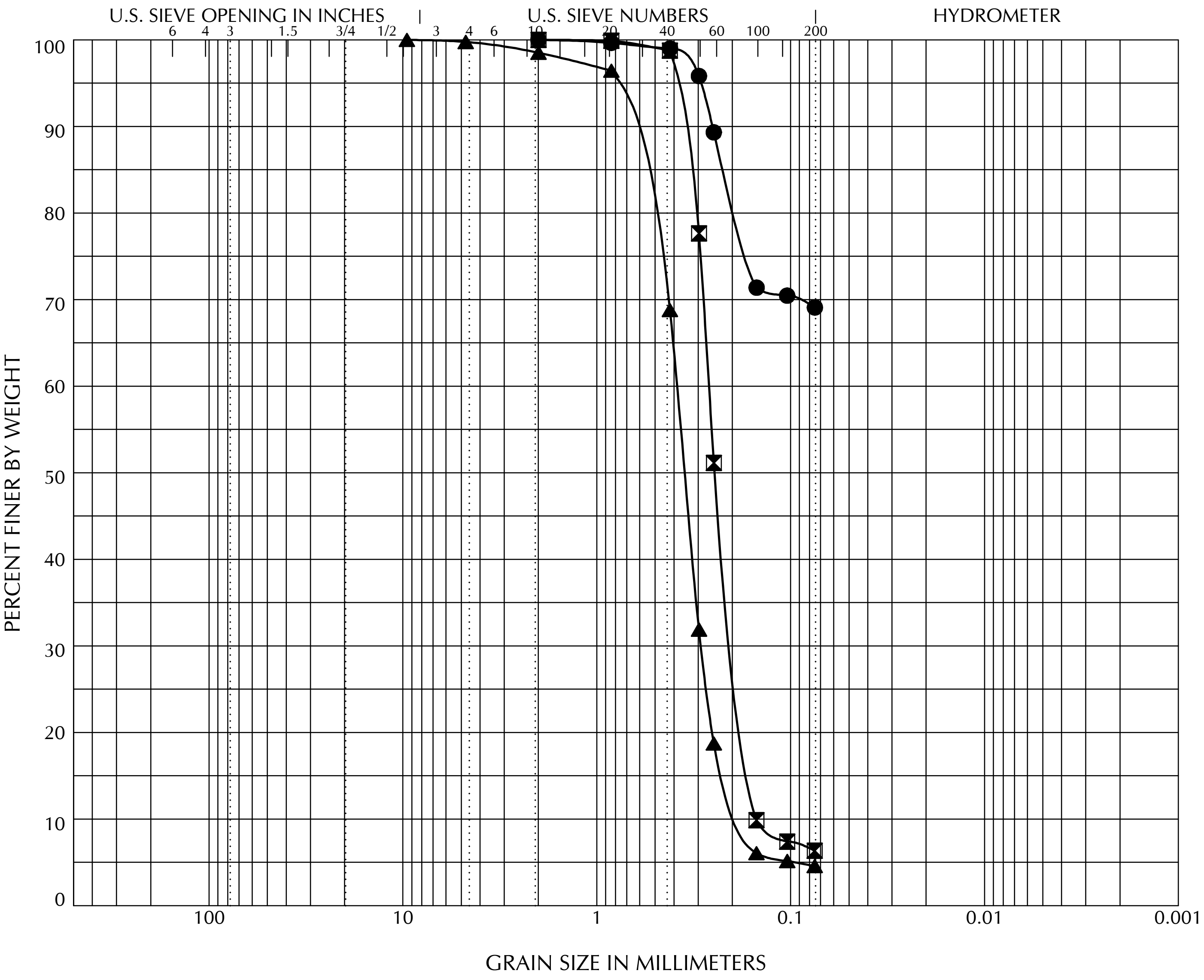
GRAIN SIZE DISTRIBUTION

2020 JOB NO. 5128 FIG. 9B

GRAIN SIZE GRI-THREE PER PAGE GRI DATA TEMPLATE.GDT 4/1/20



COBBLES	GRAVEL		SAND			SILT OR CLAY
	Coarse	Fine	Coarse	Medium	Fine	

	Location	Sample	Depth, ft	Classification	Gravel, %	Sand, %	Fines, %
●	B-37	S-1	3.0	Sandy SILT, gray, fine-grained sand	0.0	30.9	69.1
⧗	B-37	S-3	7.5	SAND, some silt, dark gray, fine grained	0.0	93.7	6.3
▲	B-38	S-1	5.0	SAND, trace silt, gray, fine to medium grained, contains shell fragments	0.2	95.2	4.6

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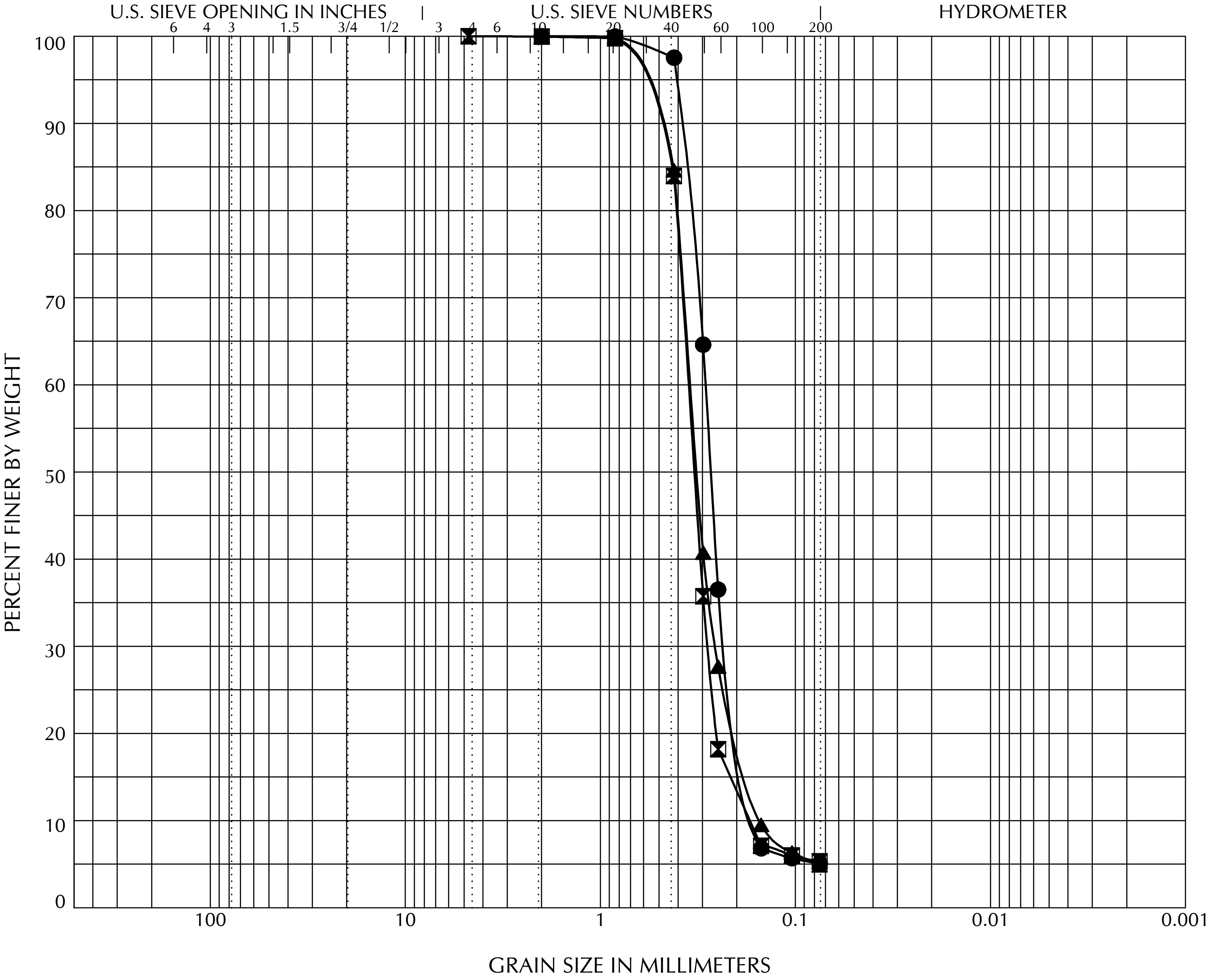
GRAIN SIZE DISTRIBUTION

2020 JOB NO. 5128 FIG. 10B

GRAIN SIZE GRI-THREE PER PAGE GRI DATA TEMPLATE.GDT 4/1/20



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<tr><td>Coarse</td><td>Fine</td><td>Coarse</td><td>Medium</td><td>Fine</td></tr>
</table>

	Location	Sample	Depth, ft	Classification	Gravel, %	Sand, %	Fines, %
●	B-38	S-2	7.5	SAND, trace to some silt, gray, fine grained	0.0	94.9	5.1
⧗	B-38	S-4	12.5	SAND, trace to some silt, gray, fine to medium grained	0.0	94.7	5.3
▲	UB-1	S-3	15.0	SAND, trace silt, brown, fine to medium grained	0.0	95.1	4.9

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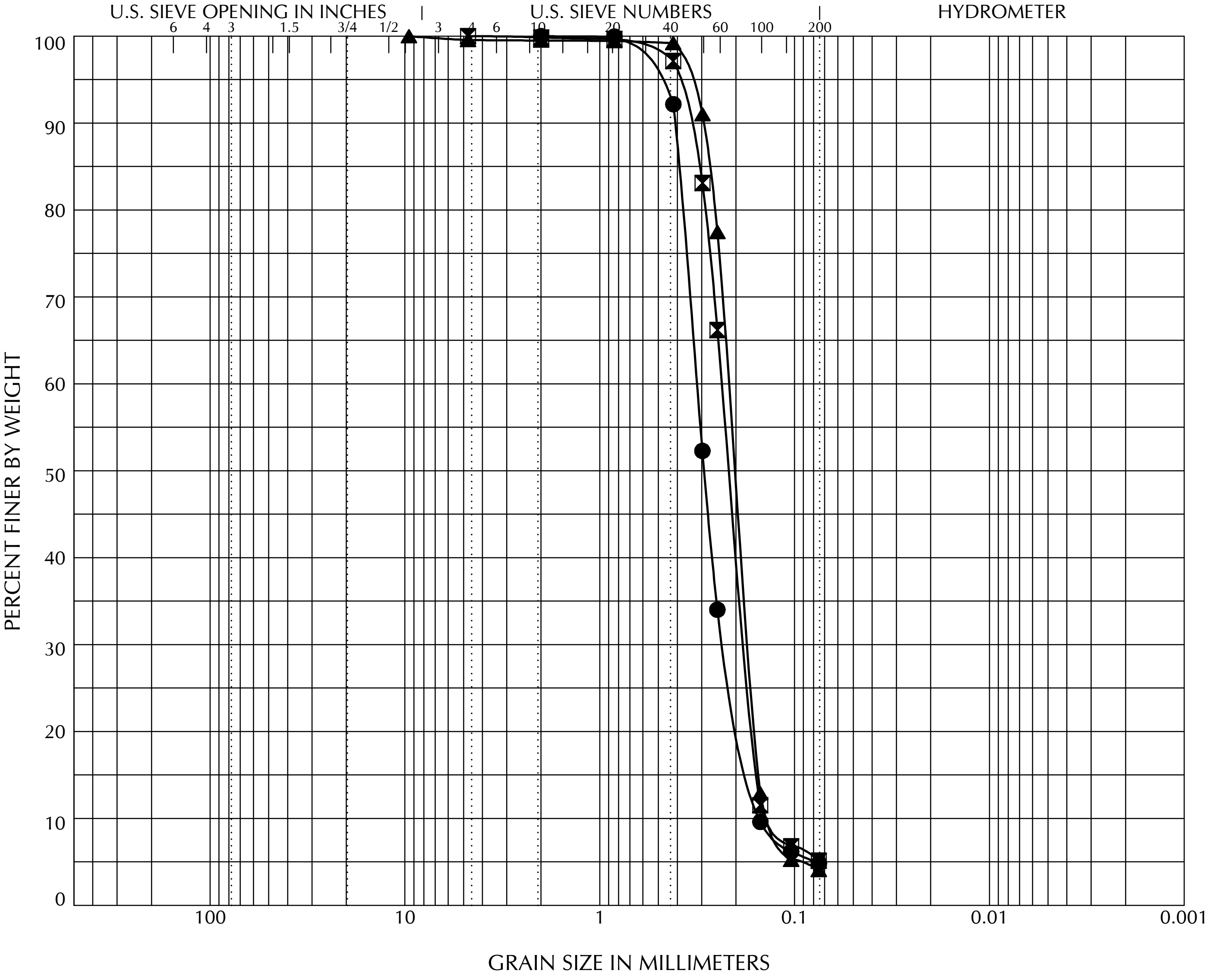
GRAIN SIZE DISTRIBUTION

2020 JOB NO. 5128 FIG. 11B

GRAIN SIZE GRI-THREE PER PAGE GRI DATA TEMPLATE.GDT 4/1/20



COBBLES	GRAVEL		SAND			SILT OR CLAY
	Coarse	Fine	Coarse	Medium	Fine	

	Location	Sample	Depth, ft	Classification	Gravel, %	Sand, %	Fines, %
●	UB-1	S-6	30.0	SAND, trace silt, brown, fine to medium grained	0.0	95.2	4.8
⧗	UB-1	S-8	40.0	SAND, trace silt, gray, fine grained, contains shell fragments	0.0	94.8	5.2
▲	UB-2	S-1	5.0	SAND, trace silt, brown, fine grained	0.4	95.5	4.1

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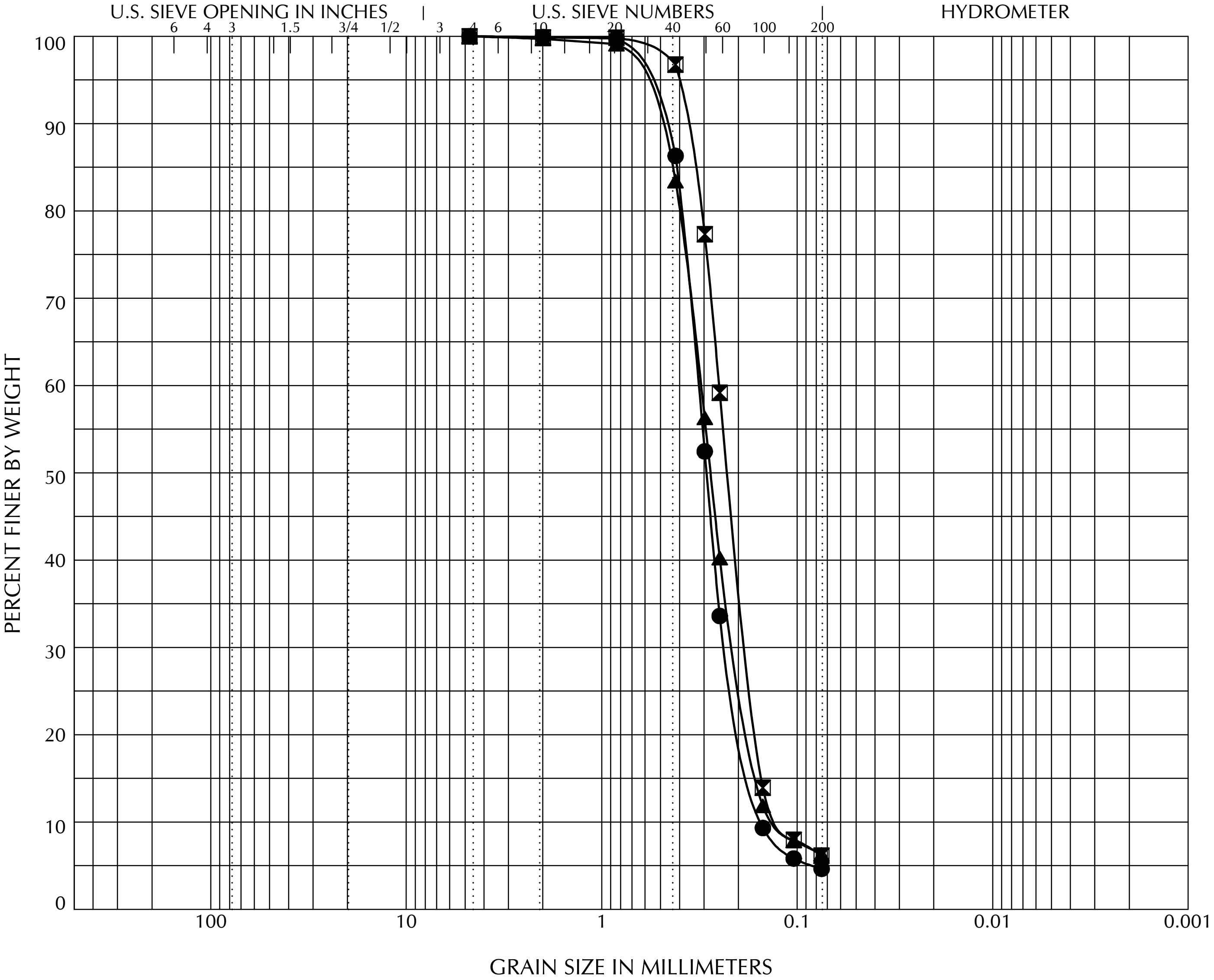
GRAIN SIZE DISTRIBUTION

2020 JOB NO. 5128 FIG. 12B

GRAIN SIZE GRI-THREE PER PAGE GRI DATA TEMPLATE.GDT 4/1/20



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<tr><td>Coarse</td><td>Fine</td><td>Coarse</td><td>Medium</td><td>Fine</td></tr>
</table>

	Location	Sample	Depth, ft	Classification	Gravel, %	Sand, %	Fines, %
●	UB-2	S-3	15.0	SAND, trace silt, brown, fine to medium grained	0.0	95.4	4.6
⧗	UB-2	S-5	25.0	SAND, some silt, gray, fine grained, contains shell fragments	0.0	93.9	6.1
▲	UB-2	S-7	35.0	SAND, some silt, gray, fine to medium grained, contains shell fragments	0.0	93.7	6.3

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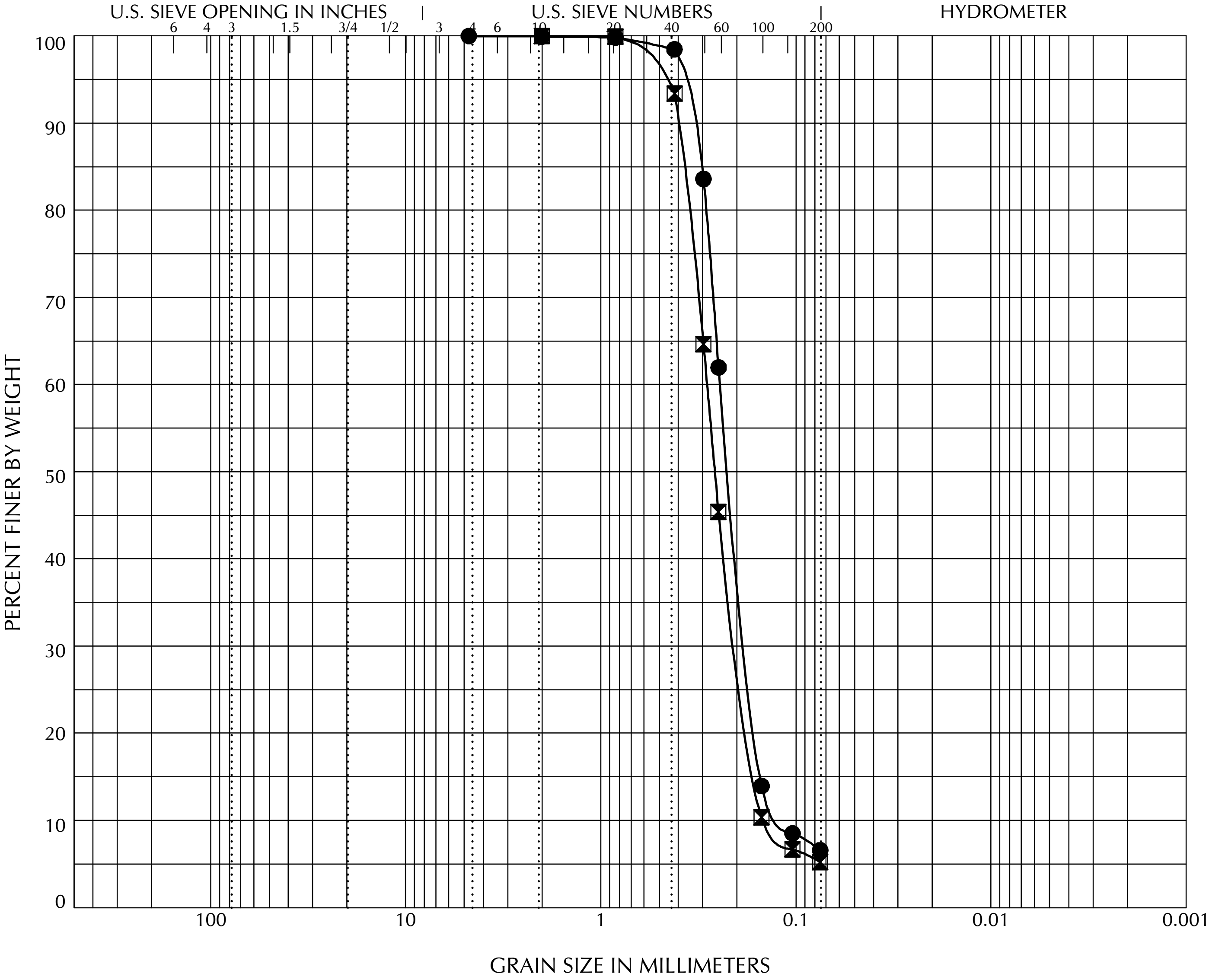
GRAIN SIZE DISTRIBUTION

2020 JOB NO. 5128 FIG. 13B

GRAIN SIZE GRI-THREE PER PAGE GRI DATA TEMPLATE.GDT 4/1/20



COBBLES	GRAVEL		SAND			SILT OR CLAY
	Coarse	Fine	Coarse	Medium	Fine	

	Location	Sample	Depth, ft	Classification	Gravel, %	Sand, %	Fines, %
●	UB-3	S-2	10.0	SAND, some silt, brown, fine grained	0.0	93.4	6.6
⧗	UB-3	S-4	20.0	SAND, trace to some silt, gray, fine to medium grained	0.0	94.8	5.2

GRAIN SIZE GRI-TWO PER PAGE GRI DATA TEMPLATE.GDT 6/11/18

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GRAIN SIZE DISTRIBUTION

2019 JOB NO. 5128 FIG. 14B

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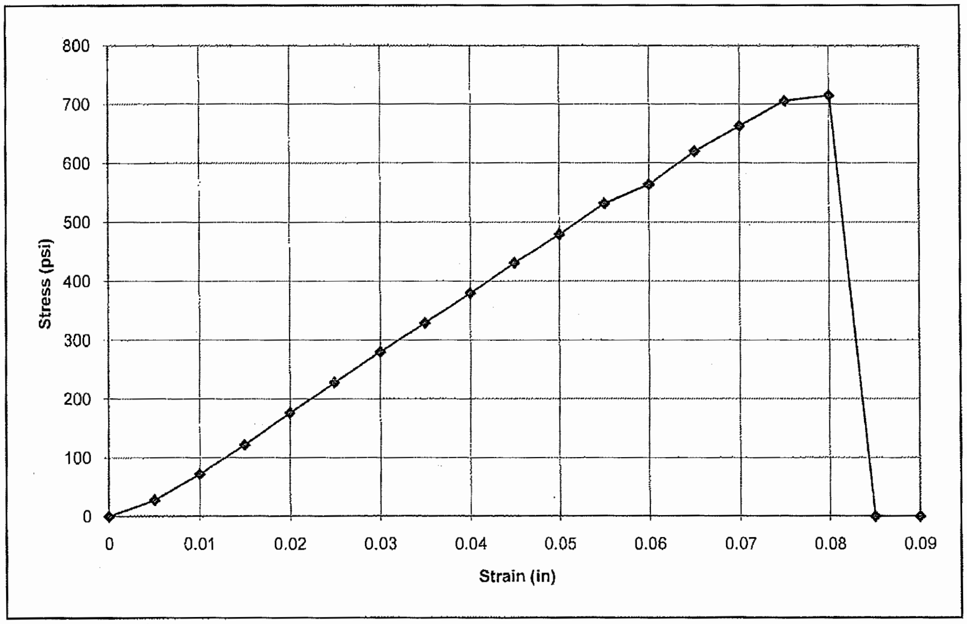
GRI Geotechnical & Environmental Consulting
9725 SW Beaverton Hillsdale Hwy
Beaverton OR 97005

PROJECT:	Coos Bay Channel Modifications	**JOB NO:**	10-2830
LOCATION:	Site	**WORK ORDER NO:**	5128
MATERIAL:	Rock Core	**LAB NO:**	5310-3
SAMPLE SOURCE:	Run 2 @ 16.0 TO 17.0	**DATE SAMPLED:**	
SAMPLE PREP:	B-4b		

UNCONFINED COMPRESSION STRENGTH OF Rock Cores
APPLICABLE PORTIONS OF (ASTM D7012)

DIAMETER:	2.38 in	MAXIMUM STRESS:	715 psi
HEIGHT:	5.81 in	AT STRAIN:	1.38%
STRAIN RATE:	.006 inches/min.		
DRY DENSITY:	116.8 lb/cu.ft		
MOISTURE:	16.7%		



Note:

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GRI Geotechnical & Environmental Consulting
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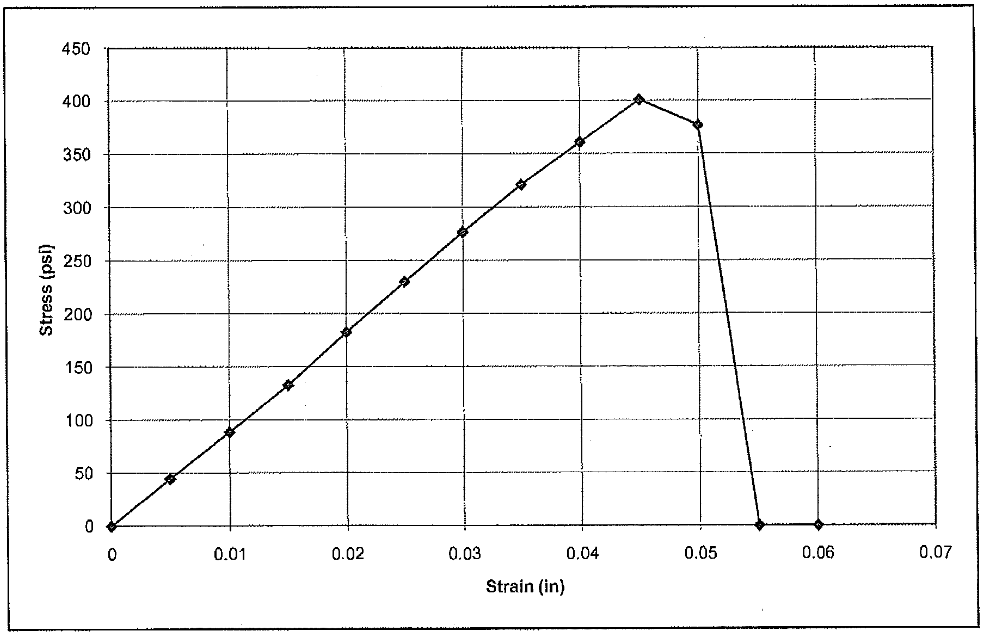
Beaverton OR 97005

PROJECT:	Coos Bay Channel Modifications	**JOB NO:**	10-2830
LOCATION:	Site	**WORK ORDER NO:**	5128
MATERIAL:	Rock Core	**LAB NO:**	5310-7
SAMPLE SOURCE:	Run 4 @ 26.0 to 27.0	**DATE SAMPLED:**	
SAMPLE PREP:	B-4b		

UNCONFINED COMPRESSION STRENGTH OF Rock Cores
APPLICABLE PORTIONS OF (ASTM D7012)

DIAMETER:	2.39 in	MAXIMUM STRESS:	401 psi
HEIGHT:	5.88 in	AT STRAIN:	0.77%
STRAIN RATE:	.006 inches/min.		
DRY DENSITY:	114.9 lb/cu.ft		
MOISTURE:	17.0%		



Note:

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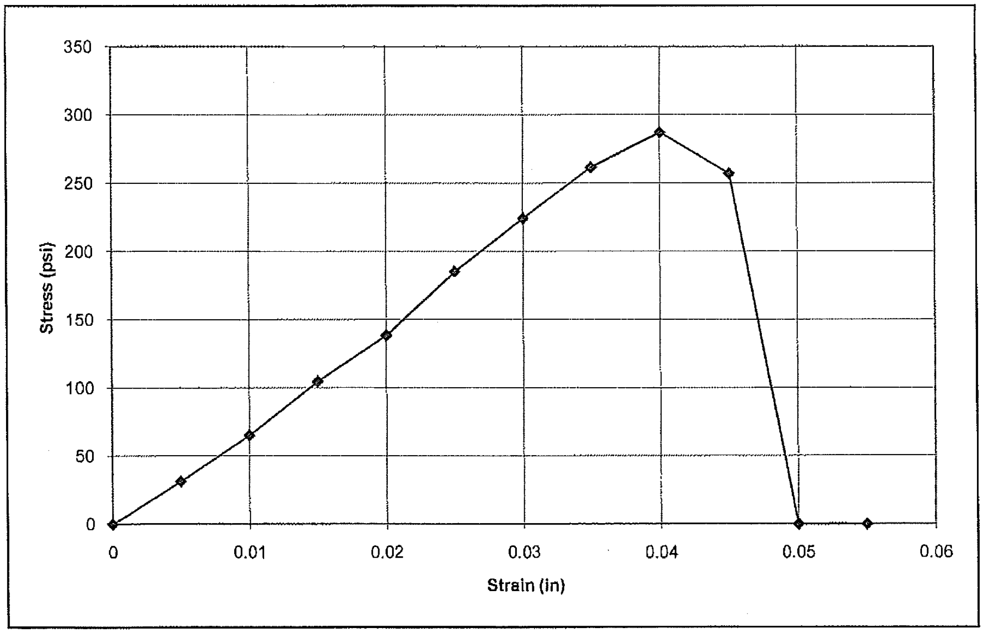
GRI Geotechnical & Environmental Consulting
9725 SW Beaverton Hillsdale Hwy
Beaverton OR 97005

PROJECT:	Coos Bay Channel Modifications	**JOB NO:**	10-2830
LOCATION:	Site	**WORK ORDER NO:**	5128
MATERIAL:	Rock Core	**LAB NO:**	5310-9
SAMPLE SOURCE:	Run 6 @ 36.5 to 37.5	**DATE SAMPLED:**	
SAMPLE PREP:	B-46		

UNCONFINED COMPRESSION STRENGTH OF Rock Cores
APPLICABLE PORTIONS OF (ASTM D7012)

DIAMETER:	2.38 in	MAXIMUM STRESS:	287 psi
HEIGHT:	5.69 in	AT STRAIN:	0.70%
STRAIN RATE:	.006 inches/min.		
DRY DENSITY:	115.2 lb/cu.ft		
MOISTURE:	17.3%		



Note:

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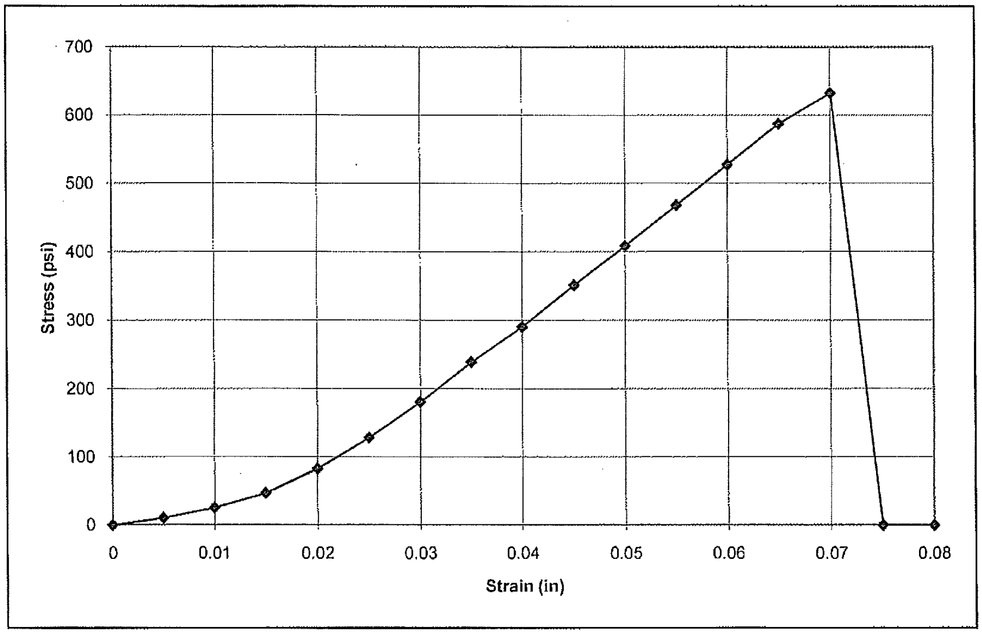
GRI Geotechnical & Environmental Consulting
9725 SW Beaverton Hillsdale Hwy
Beaverton OR 97005

PROJECT:	Coos Bay Channel Modifications	JOB NO:	10-2830
LOCATION:	Site	WORK ORDER NO:	5128
MATERIAL:	Rock Core	LAB NO:	5310-1
SAMPLE SOURCE:	B-7a ~~Run 9~~ @ 3'-10" to 4'-8"	DATE SAMPLED:	
SAMPLE PREP:	RUN 2		

UNCONFINED COMPRESSION STRENGTH OF Rock Cores
APPLICABLE PORTIONS OF (ASTM D7012)

DIAMETER:	2.38 in	MAXIMUM STRESS:	633 psi
HEIGHT:	5.82 in	AT STRAIN:	1.20%
STRAIN RATE:	.006 inches/min.		
DRY DENSITY:	111.2 lb/cu.ft		
MOISTURE:	18.5%		



Note:

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DOUG ESQUIVEL, VP OPERATIONS

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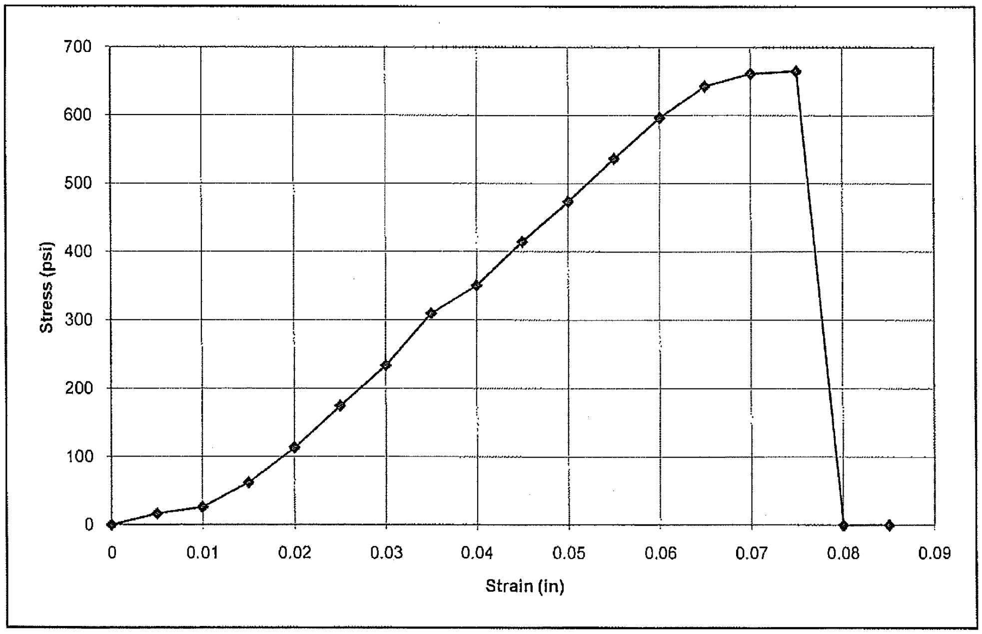
7409 SW Tech Center Dr Ste 145
Tigard, OR 97223
PH: 503-443-3799 F: 503-620-2748

GRI Geotechnical & Environmental Consulting
9725 SW Beaverton Hillsdale Hwy
Beaverton OR 97005

PROJECT:	Coos Bay Channel Modifications	**JOB NO:**	10-2830
LOCATION:	Site	**WORK ORDER NO:**	5128
MATERIAL:	Rock Core	**LAB NO:**	5310-4
SAMPLE SOURCE:	Run 3 @ 7.0 TO 8.0	**DATE SAMPLED:**	
SAMPLE PREP:	B-7a		

UNCONFINED COMPRESSION STRENGTH OF Rock Cores
APPLICABLE PORTIONS OF (ASTM D7012)

DIAMETER:	2.38 in	MAXIMUM STRESS:	665 psi
HEIGHT:	5.81 in	AT STRAIN:	1.29%
STRAIN RATE:	.006 inches/min.		
DRY DENSITY:	110.3 lb/cu.ft		
MOISTURE:	18.6%		



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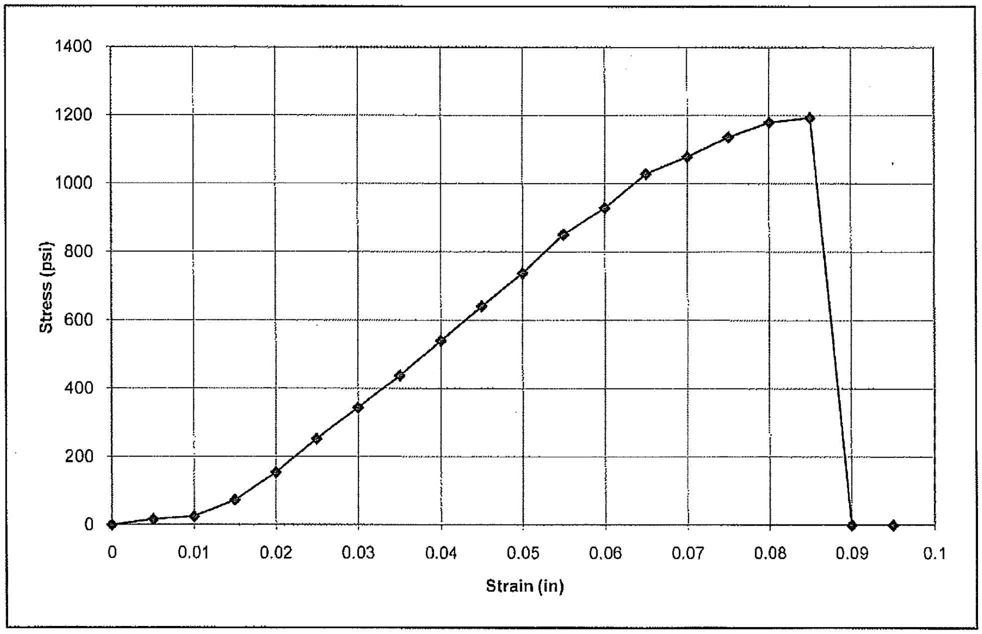
Beaverton OR 97005

PROJECT:	Coos Bay Channel Modifications	**JOB NO:**	10-2830
LOCATION:	Site	**WORK ORDER NO:**	5128
MATERIAL:	Rock Core	**LAB NO:**	5310-6
SAMPLE SOURCE:	Run 4 @ 12'-12'10"	**DATE SAMPLED:**	
SAMPLE PREP:	B-7a		

UNCONFINED COMPRESSION STRENGTH OF Rock Cores
APPLICABLE PORTIONS OF (ASTM D7012)

DIAMETER:	2.36 in	MAXIMUM STRESS:	1,193 psi
HEIGHT:	5.78 in	AT STRAIN:	1.47%
STRAIN RATE:	.006 inches/min.		
DRY DENSITY:	108.8 lb/cu.ft		
MOISTURE:	18.8%		



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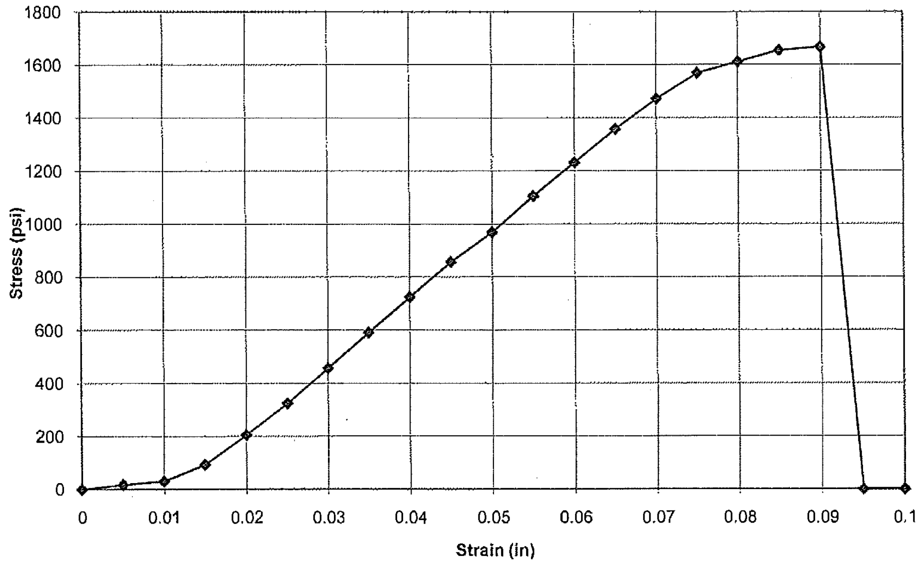
GRI Geotechnical & Environmental Consulting
9725 SW Beaverton Hillsdale Hwy
Beaverton OR 97005

PROJECT: Coos Bay Channel Modifications
LOCATION: Site
MATERIAL: Rock Core
SAMPLE SOURCE: Run 2 @ 7.0 TO 8.0
SAMPLE PREP: B-7b

JOB NO: 10-2830
WORK ORDER NO: 5128
LAB NO: 5310-2
DATE SAMPLED:

UNCONFINED COMPRESSION STRENGTH OF Rock Cores
APPLICABLE PORTIONS OF (ASTM D7012)

DIAMETER:	2.38 in	MAXIMUM STRESS:	1,668 psi
HEIGHT:	5.83 in	AT STRAIN:	1.54%
STRAIN RATE:	.006 inches/min.		
DRY DENSITY:	102.7 lb/cu.ft		
MOISTURE:	23.7%		



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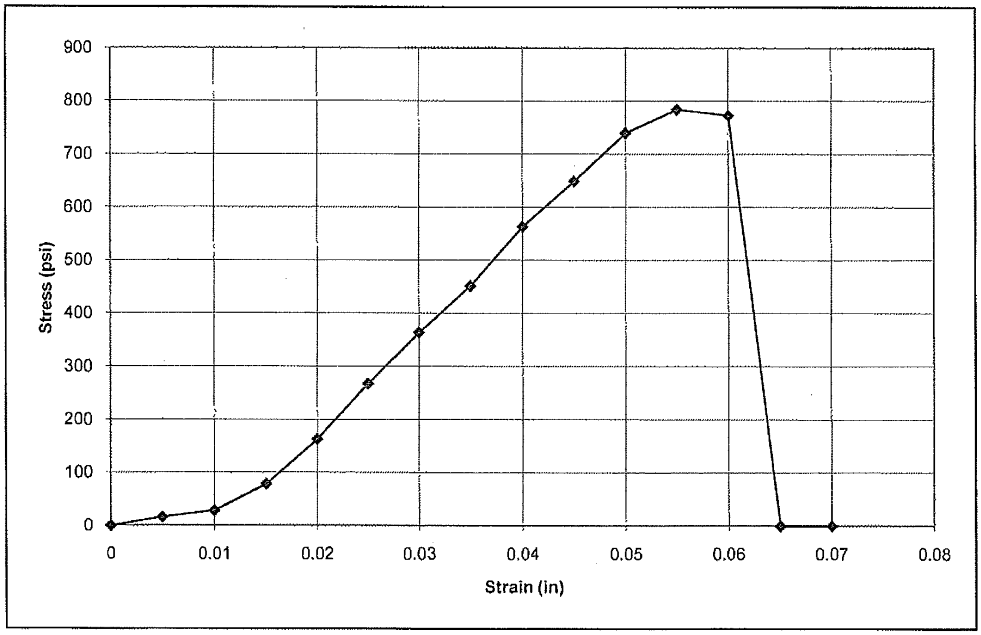
Beaverton OR 97005

PROJECT:	Coos Bay Channel Modifications	**JOB NO:**	10-2830
LOCATION:	Site	**WORK ORDER NO:**	5128
MATERIAL:	Rock Core	**LAB NO:**	5310-5
SAMPLE SOURCE:	Run 3 @ 14.5 TO 15.5	**DATE SAMPLED:**	
SAMPLE PREP:	B-7b		

UNCONFINED COMPRESSION STRENGTH OF Rock Cores
APPLICABLE PORTIONS OF (ASTM D7012)

DIAMETER:	2.38 in	MAXIMUM STRESS:	784 psi
HEIGHT:	5.51 in	AT STRAIN:	1.00%
STRAIN RATE:	.006 inches/min.		
DRY DENSITY:	106.0 lb/cu.ft		
MOISTURE:	21.9%		



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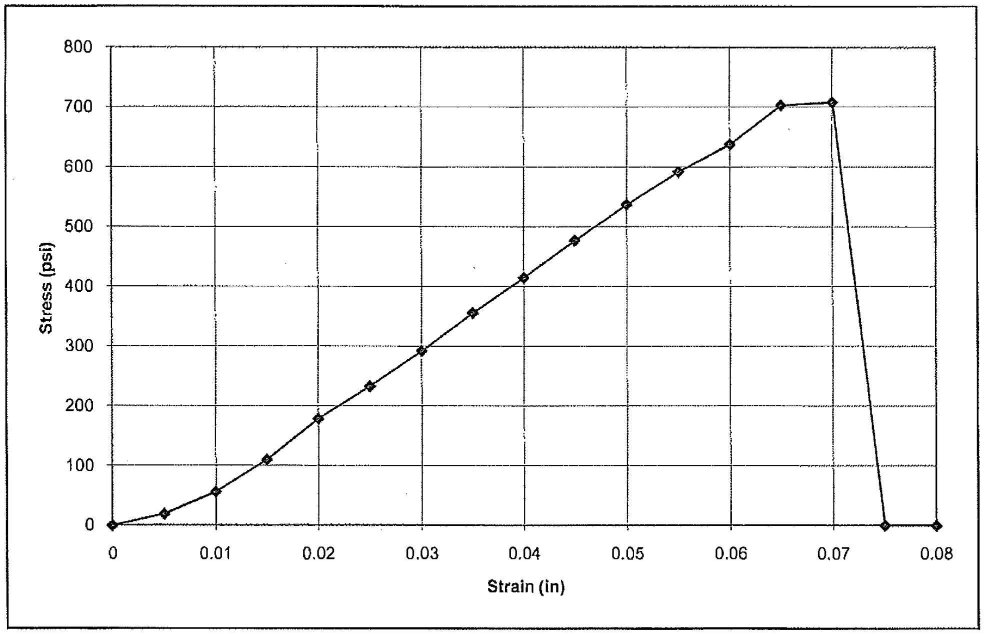
Beaverton OR 97005

PROJECT:	Coos Bay Channel Modifications	**JOB NO:**	10-2830
LOCATION:	Site	**WORK ORDER NO:**	5128
MATERIAL:	Rock Core	**LAB NO:**	5310-8
SAMPLE SOURCE:	Run 5 @ 22.5 to 23.5	**DATE SAMPLED:**	
SAMPLE PREP:	B-7b		

UNCONFINED COMPRESSION STRENGTH OF Rock Cores
APPLICABLE PORTIONS OF (ASTM D7012)

DIAMETER:	2.38 in	MAXIMUM STRESS:	708 psi
HEIGHT:	5.63 in	AT STRAIN:	1.24%
STRAIN RATE:	.006 inches/min.		
DRY DENSITY:	111.2 lb/cu.ft		
MOISTURE:	19.0%		



Note:

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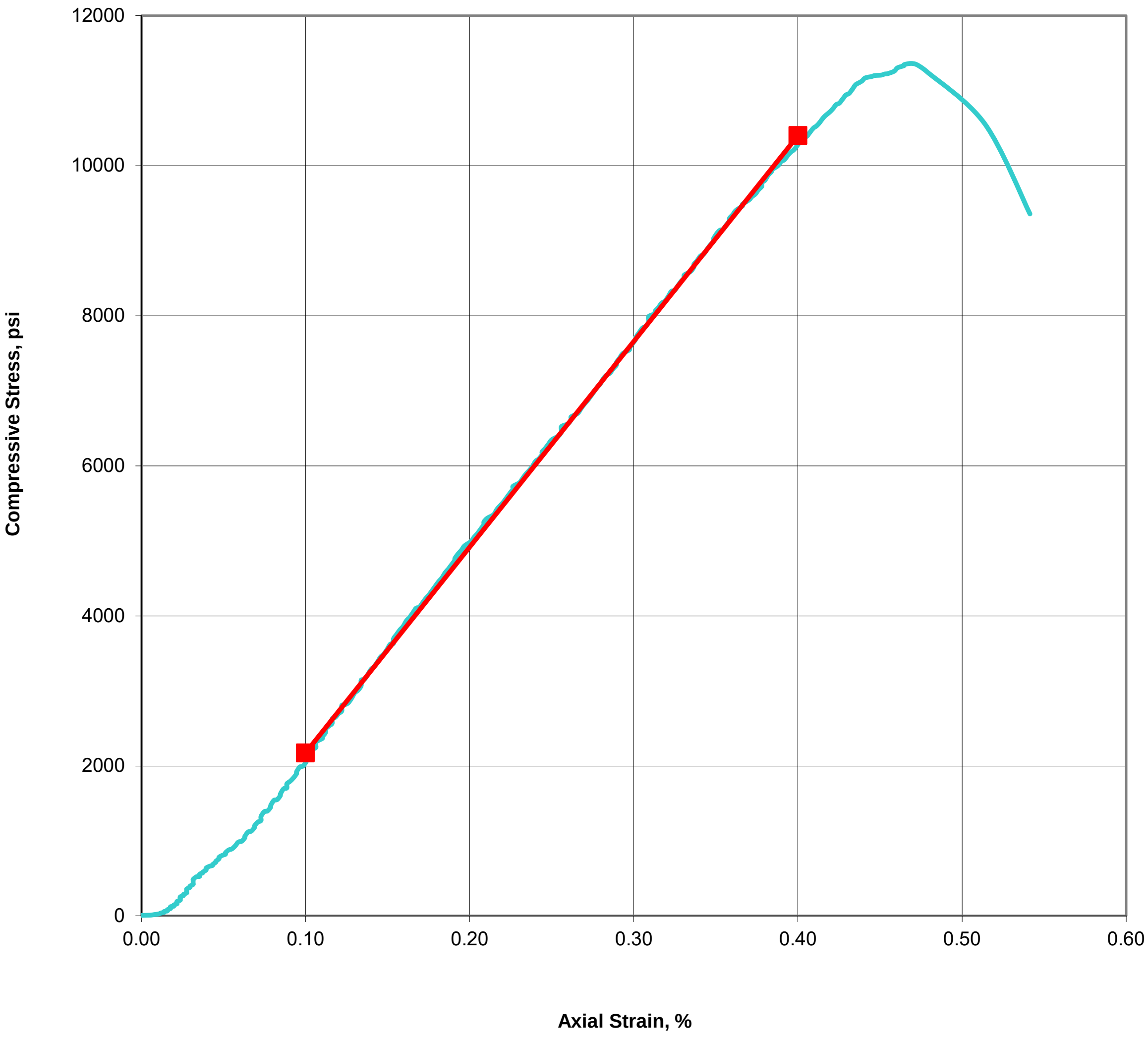
Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D7012D)

CTL Job No.: 823-008A1
Boring: B-15
Date: 9/14/2016
Client: GRI
Sample: R-1
By: PJ
Project Name: Port of Coos Bay Channel Modification Project
Depth,ft.: 2
Checked: DC
Project No.: 5128
Visual Description: Gray Rock
Moisture Condition at Test: Sample was washed and in a moist state.
Test Temperature, (^{o}C): Ambient
Remarks:

Sample Height, in.	5.08
Sample Diameter, in.	2.40
Height / Diameter	2.1
Sample Area, in^2	4.53
Wet Density, pcf	158.1
Dry Density, pcf	149.4
Moisture Content, %	5.8
Strain Rate, % / min	0.25

Unconfined Compressive Strength (psi)	**11361**
Young's Modulus (E) (psi)	**2,741,700**



Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D7012D)

CTL Job No.:	823-008A2	Boring:	B-15	Date:	9/14/2016
Client:	GRI	Sample:	R-2	By:	PJ
Project Name:	Port of Coos Bay Channel Modification Project	Depth,ft.:	5.5	Checked:	DC
Project No.:	5128				

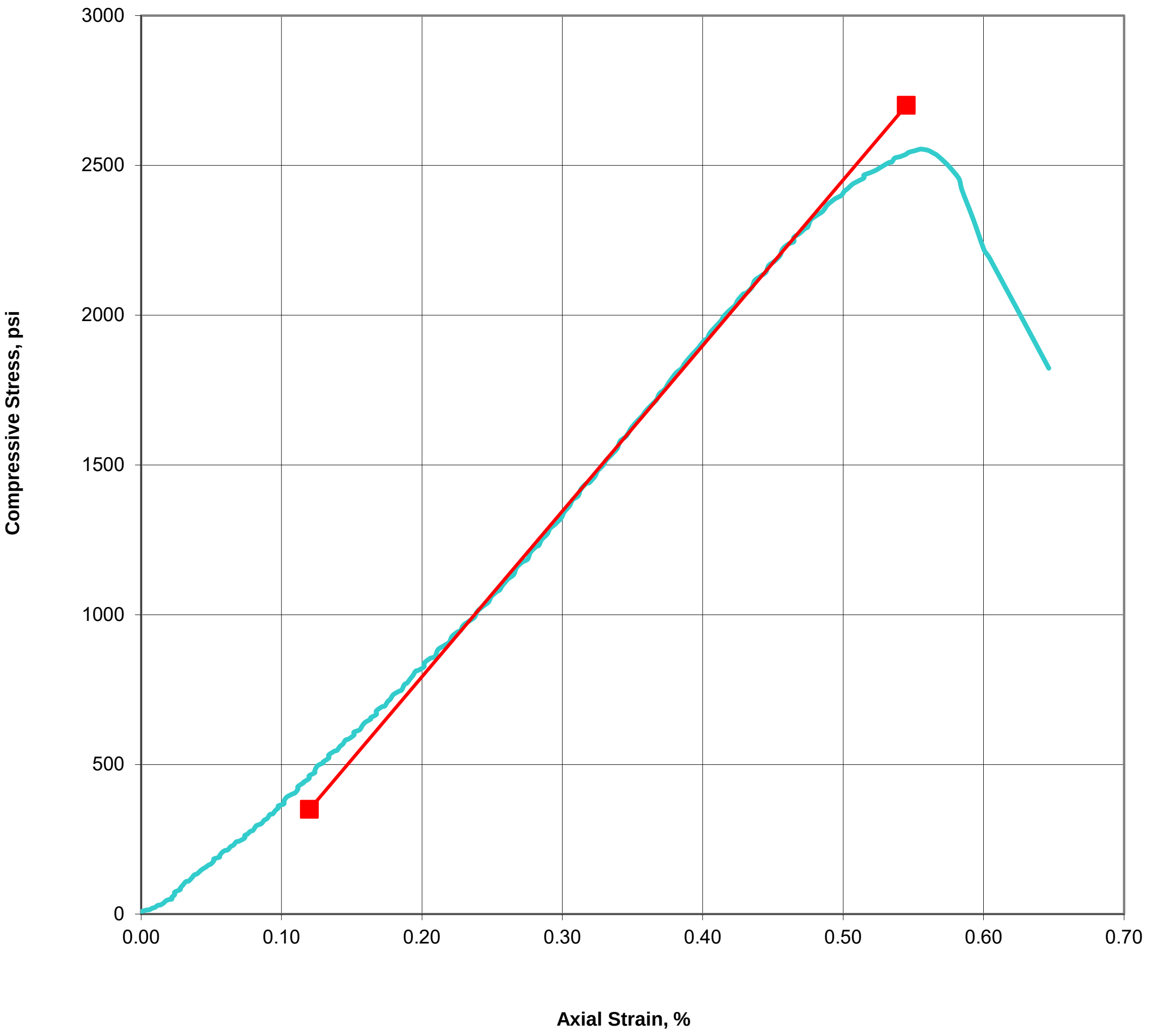
Visual Description: Gray Rock

Moisture Condition at Test: Sample was washed and in a moist state.

Test Temperature, (°C): Ambient

Remarks:

Sample Height, in.	5.01	**Unconfined Compressive Strength (psi)**	**2554**
Sample Diameter, in.	2.36		
Height / Diameter	2.1		
Sample Area, in^2	4.36		
Wet Density, pcf	143.7	**Young's Modulus (E) (psi)**	**552,900**
Dry Density, pcf	126.6		
Moisture Content, %	13.5		
Strain Rate, % / min	0.25		



Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D7012D)

CTL Job No.:	823-008A3	Boring:	B-15	Date:	9/14/2016
Client:	GRI	Sample:	R-3	By:	PJ
Project Name:	Port of Coos Bay Channel Modification Project	Depth,ft.:	9.5	Checked:	DC
Project No.:	5128				

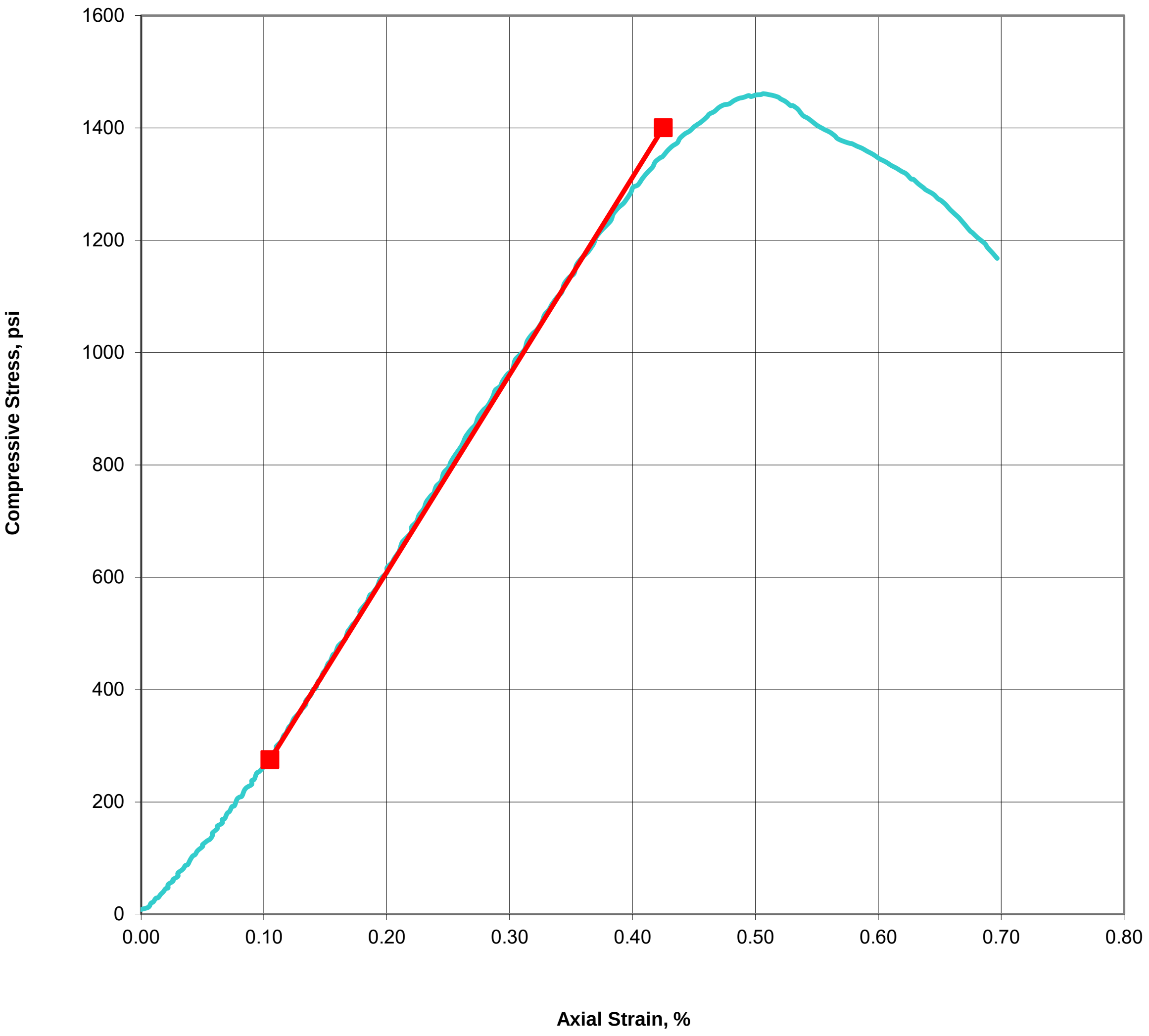
Visual Description: Gray Rock

Moisture Condition at Test: Sample was washed and in a moist state.

Test Temperature, (^{o}C): Ambient

Remarks:

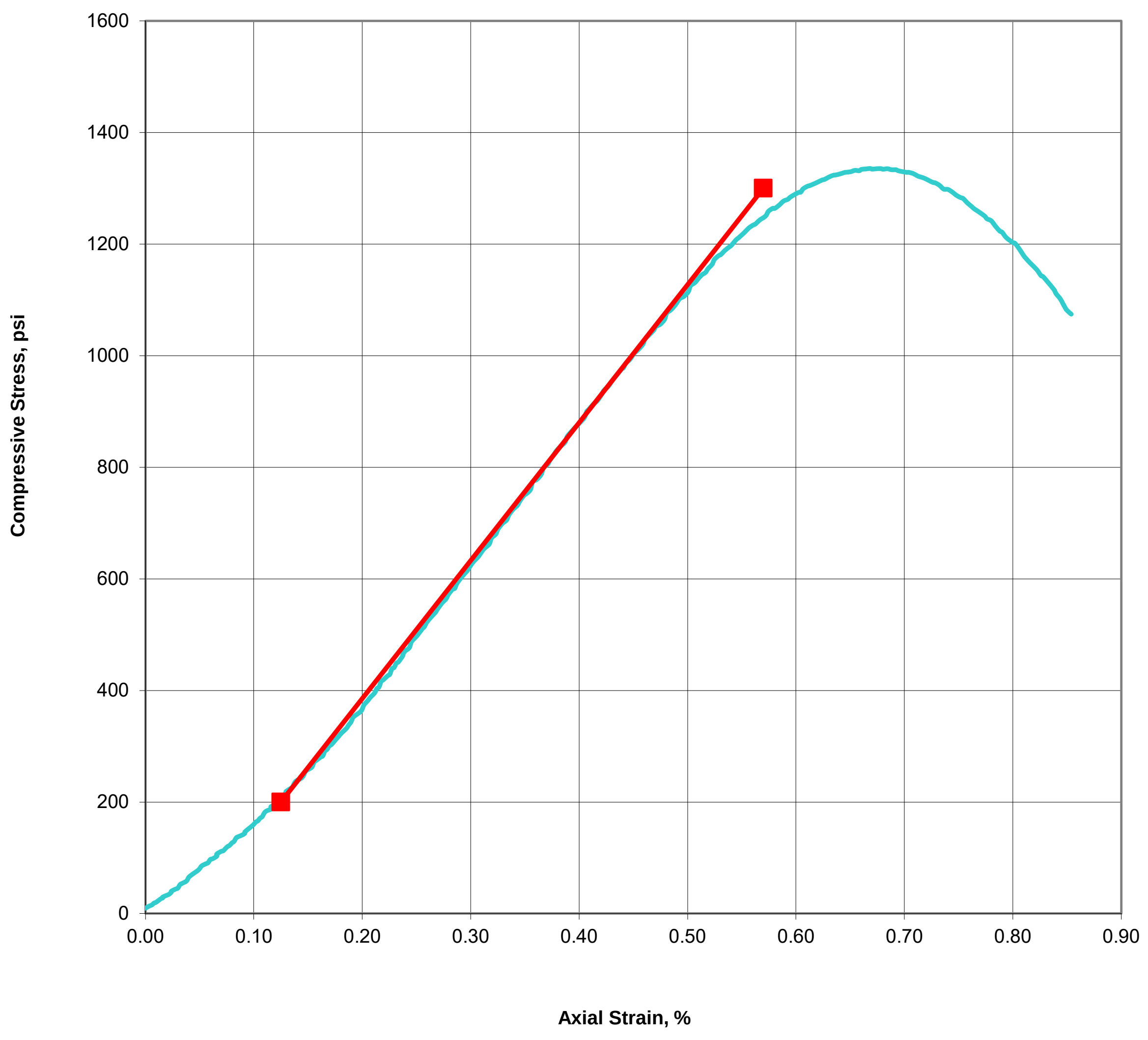
Sample Height, in.	4.99	**Unconfined Compressive Strength (psi)**	**1461**
Sample Diameter, in.	2.39		
Height / Diameter	2.1		
Sample Area, in^{2}	4.49		
Wet Density, pcf	141.9	**Young's Modulus (E) (psi)**	**351,600**
Dry Density, pcf	131.2		
Moisture Content, %	8.1		
Strain Rate, % / min	0.25		



Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D7012D)

CTL Job No.: 823-008A4
Boring: B-15
Date: 9/14/2016
Client: GRI
Sample: R-4
By: PJ
Project Name: Port of Coos Bay Channel Modification Project
Depth,ft.: 15.5
Checked: DC
Project No.: 5128
Visual Description: Gray Rock
Moisture Condition at Test Sample was washed and in a moist state.
Test Temperature, (^{o}C) Ambient
Remarks:

Sample Height, in.	5.01	**Unconfined Compressive Strength (psi)**	**1335**
Sample Diameter, in.	2.38		
Height / Diameter	2.1		
Sample Area, in^2	4.45		
Wet Density, pcf	139.2	**Young's Modulus (E) (psi)**	**247,200**
Dry Density, pcf	124.1		
Moisture Content, %	12.1		
Strain Rate, % / min	0.25		



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Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D7012D)

CTL Job No.:	823-008A5	Boring:	B-15	Date:	9/14/2016
Client:	GRI	Sample:	R-5	By:	PJ
Project Name:	Port of Coos Bay Channel Modification Project	Depth,ft.:	18.5	Checked:	DC
Project No.:	5128				

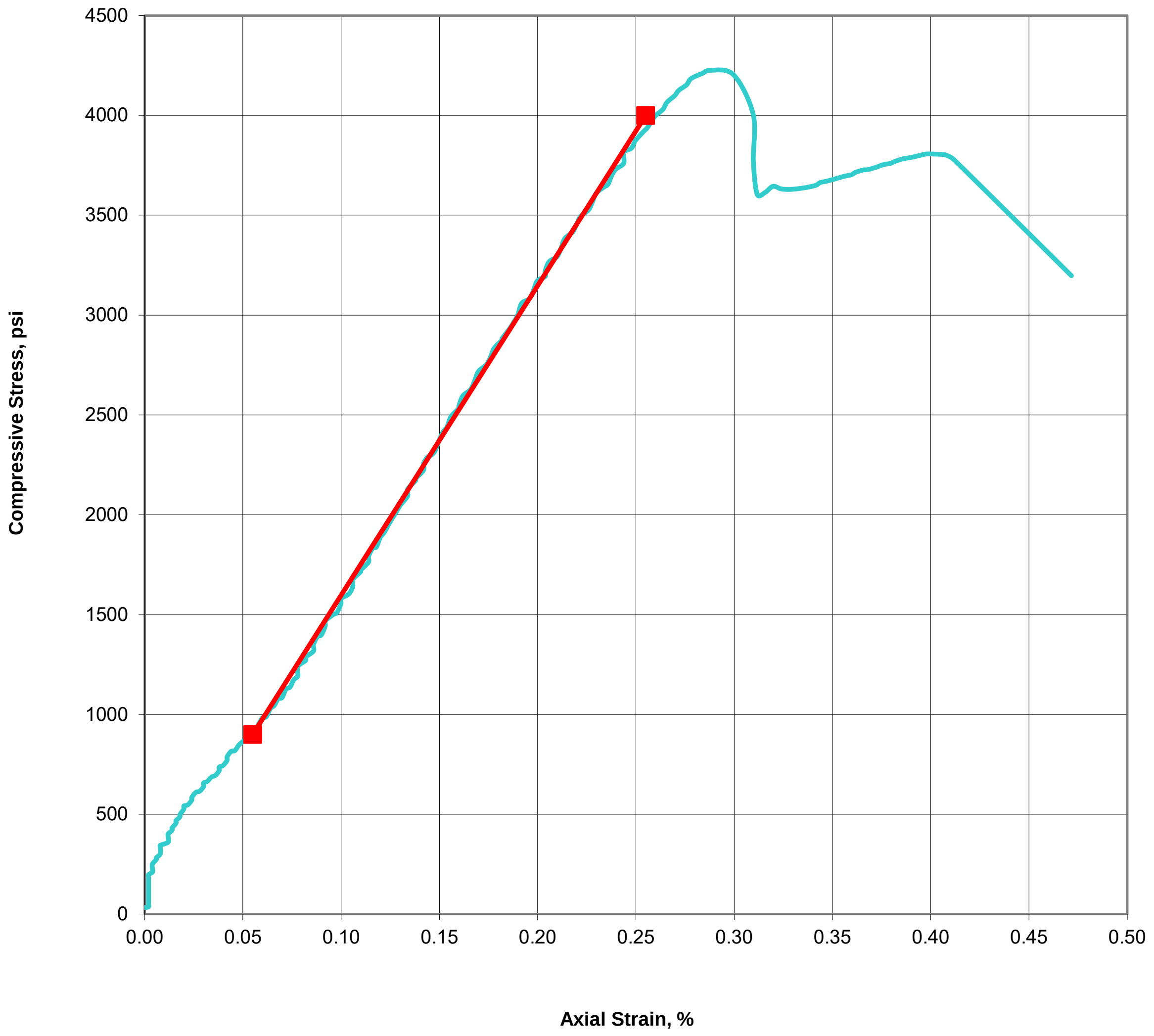
Visual Description: Gray Rock

Moisture Condition at Test: Sample was washed and in a moist state.

Test Temperature, (°C): Ambient

Remarks:

Sample Height, in.	5.00	**Unconfined Compressive Strength (psi)**	**4226**
Sample Diameter, in.	2.40		
Height / Diameter	2.1		
Sample Area, in^2	4.51		
Wet Density, pcf	155.1	**Young's Modulus (E) (psi)**	**1,550,000**
Dry Density, pcf	143.6		
Moisture Content, %	8.0		
Strain Rate, % / min	0.25		



Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D7012D)

CTL Job No.:	823-008A6	Boring:	B-15	Date:	9/14/2016
Client:	GRI	Sample:	R-5	By:	PJ
Project Name:	Port of Coos Bay Channel Modification Project	Depth,ft.:	22.5	Checked:	DC
Project No.:	5128				

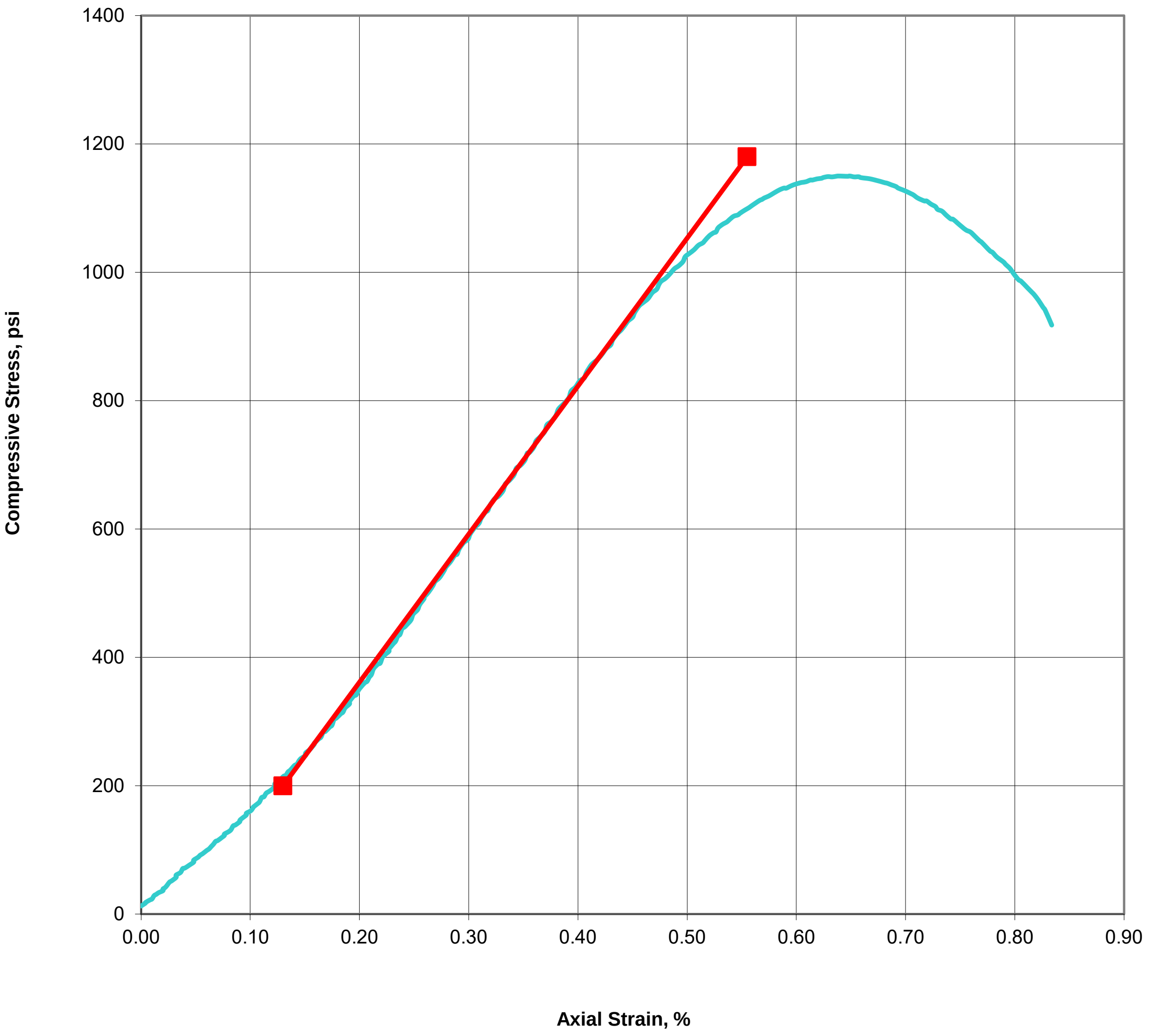
Visual Description: Dark Gray Rock

Moisture Condition at Test Sample was washed and in a moist state.

Test Temperature, (^{o}C) Ambient

Remarks:

Sample Height, in.	4.98	**Unconfined Compressive Strength (psi)**	**1150**
Sample Diameter, in.	2.39		
Height / Diameter	2.1		
Sample Area, in^2	4.48		
Wet Density, pcf	139.1	**Young's Modulus (E) (psi)**	**230,600**
Dry Density, pcf	126.1		
Moisture Content, %	10.3		
Strain Rate, % / min	0.25		



Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D7012D)

CTL Job No.:	823-008B4	Boring:	B-21	Date:	9/14/2016
Client:	GRI	Sample:	R-7	By:	PJ
Project Name:	Port of Coos Bay Channel Modification Project	Depth,ft.:	20.5	Checked:	DC
Project No.:	5128				

Visual Description: Very Dark Brown Rock

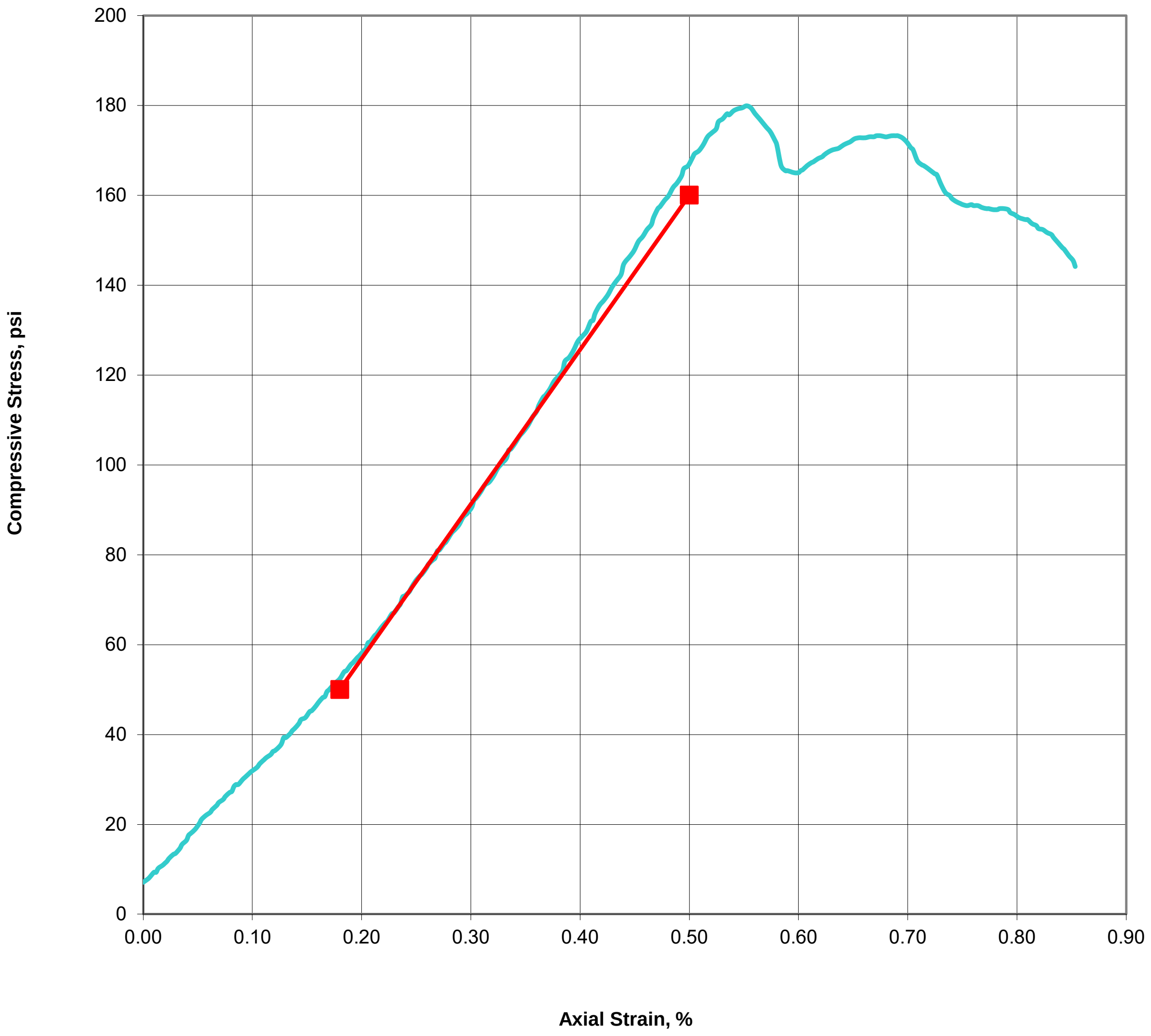
Moisture Condition at Test: Sample was washed and in a moist state.

Test Temperature, (^{o}C): Ambient

Remarks: Prior to testing, one corner of the sample was partially fractured.

Sample Height, in.	5.05
Sample Diameter, in.	2.39
Height / Diameter	2.1
Sample Area, in^2	4.50
Wet Density, pcf	119.8
Dry Density, pcf	93.7
Moisture Content, %	27.9
Strain Rate, % / min	0.25

Unconfined Compressive Strength (psi)	**180**
Young's Modulus (E) (psi)	**34,400**



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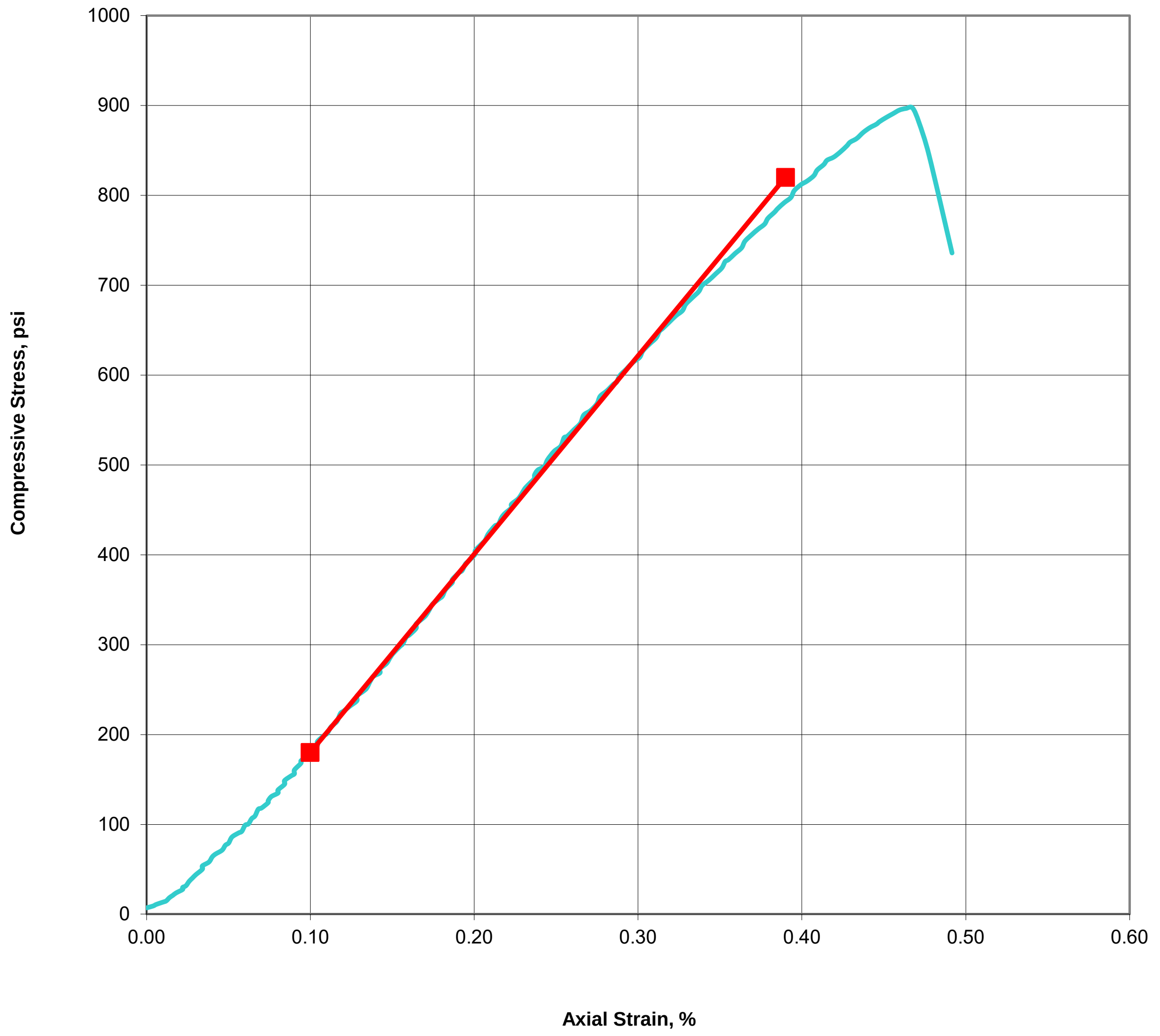
Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D7012D)

CTL Job No.: 823-008D1
Boring: B-23
Date: 9/14/2016
Client: GRI
Sample: R-3
By: PJ
Project Name: Port of Coos Bay Channel Modification Project
Depth,ft.: 8.5
Checked: DC
Project No.: 5128
Visual Description: Very Dark Brown Rock
Moisture Condition at Test Sample was washed and in a moist state.
Test Temperature, (^{o}C) Ambient
Remarks:

Sample Height, in.	4.98
Sample Diameter, in.	2.36
Height / Diameter	2.1
Sample Area, in^2	4.39
Wet Density, pcf	121.9
Dry Density, pcf	98.5
Moisture Content, %	23.8
Strain Rate, % / min	0.25

Unconfined Compressive Strength (psi)	**897**
Young's Modulus (E) (psi)	**220,700**



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Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D7012D)

CTL Job No.:	823-008D2	Boring:	B-23	Date:	9/14/2016
Client:	GRI	Sample:	R-3	By:	PJ
Project Name:	Port of Coos Bay Channel Modification Project	Depth,ft.:	9.5	Checked:	DC
Project No.:	5128				

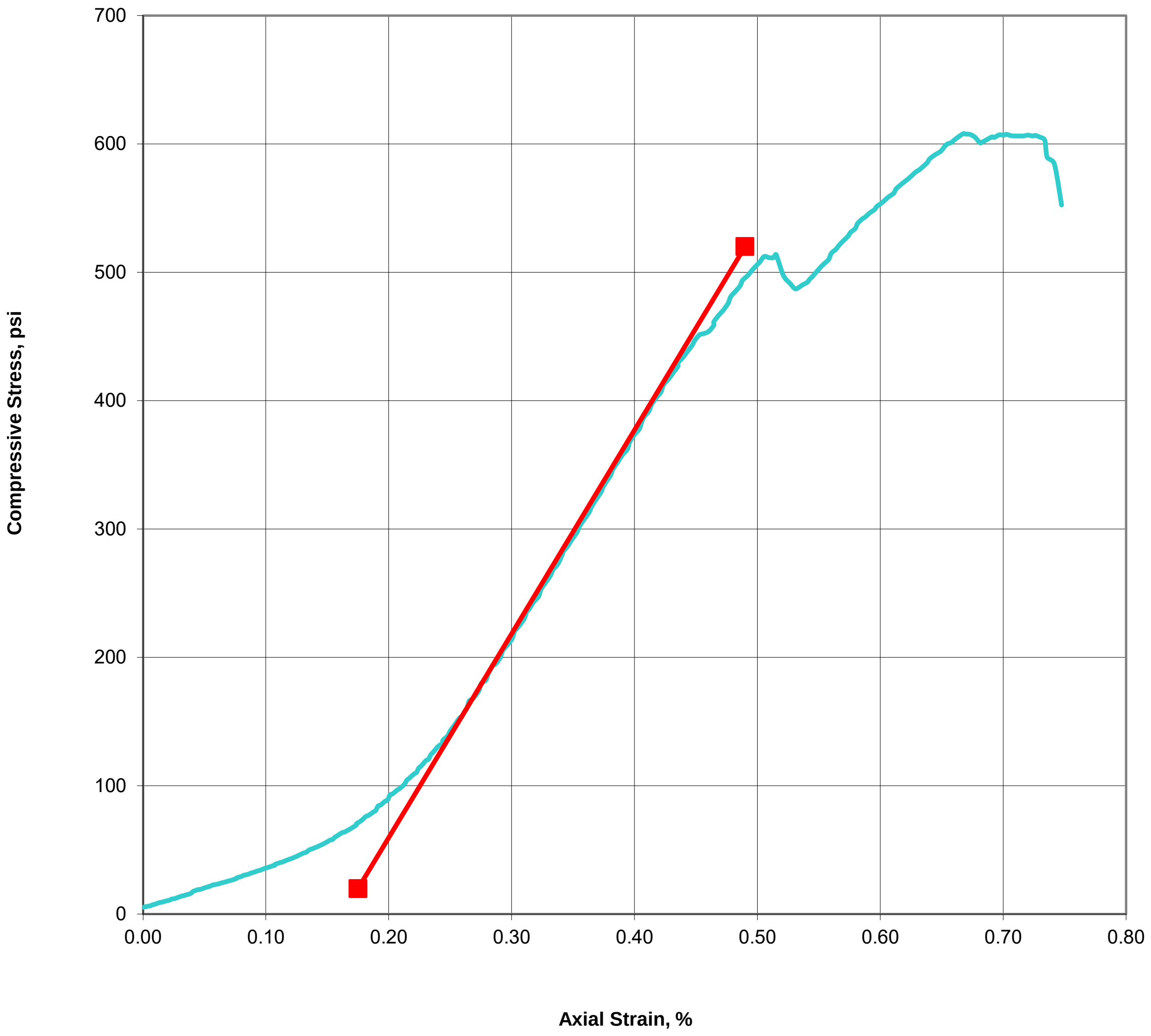
Visual Description: Very Dark Brown Rock

Moisture Condition at Test: Sample was washed and in a moist state.

Test Temperature, (^oC): Ambient

Remarks:

Sample Height, in.	5.12	**Unconfined Compressive Strength (psi)**	**608**
Sample Diameter, in.	2.39		
Height / Diameter	2.1		
Sample Area, in^2	4.49		
Wet Density, pcf	123.1	**Young's Modulus (E) (psi)**	**158,700**
Dry Density, pcf	98.2		
Moisture Content, %	25.4		
Strain Rate, % / min	0.25		



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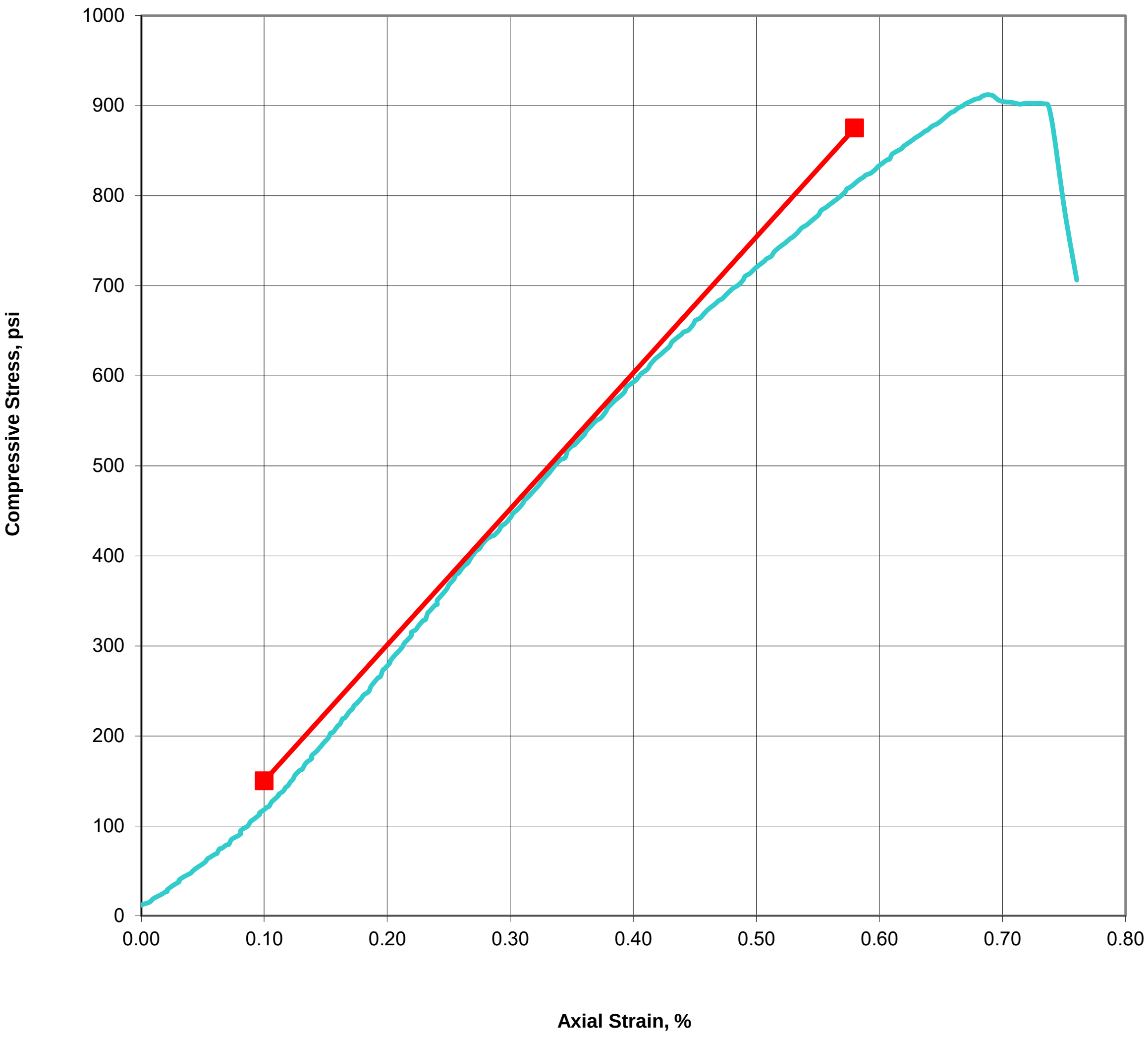
Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D7012D)

CTL Job No.: 823-008D3
Boring: B-23
Date: 9/14/2016
Client: GRI
Sample: R-3
By: PJ
Project Name: Port of Coos Bay Channel Modification Project
Depth,ft.: 11.5
Checked: DC
Project No.: 5128
Visual Description: Very Dark Brown Rock
Moisture Condition at Test Sample was washed and in a moist state.
Test Temperature, (°C) Ambient
Remarks: The surface of the sample developed fine fractures prior to testing. These fractures appear to be the result of the sample drying slightly during handling and preparation.

Sample Height, in.	5.19
Sample Diameter, in.	2.39
Height / Diameter	2.2
Sample Area, in^2	4.48
Wet Density, pcf	123.9
Dry Density, pcf	97.7
Moisture Content, %	26.8
Strain Rate, % / min	0.25

Unconfined Compressive Strength (psi)	**912**
Young's Modulus (E) (psi)	**151,000**



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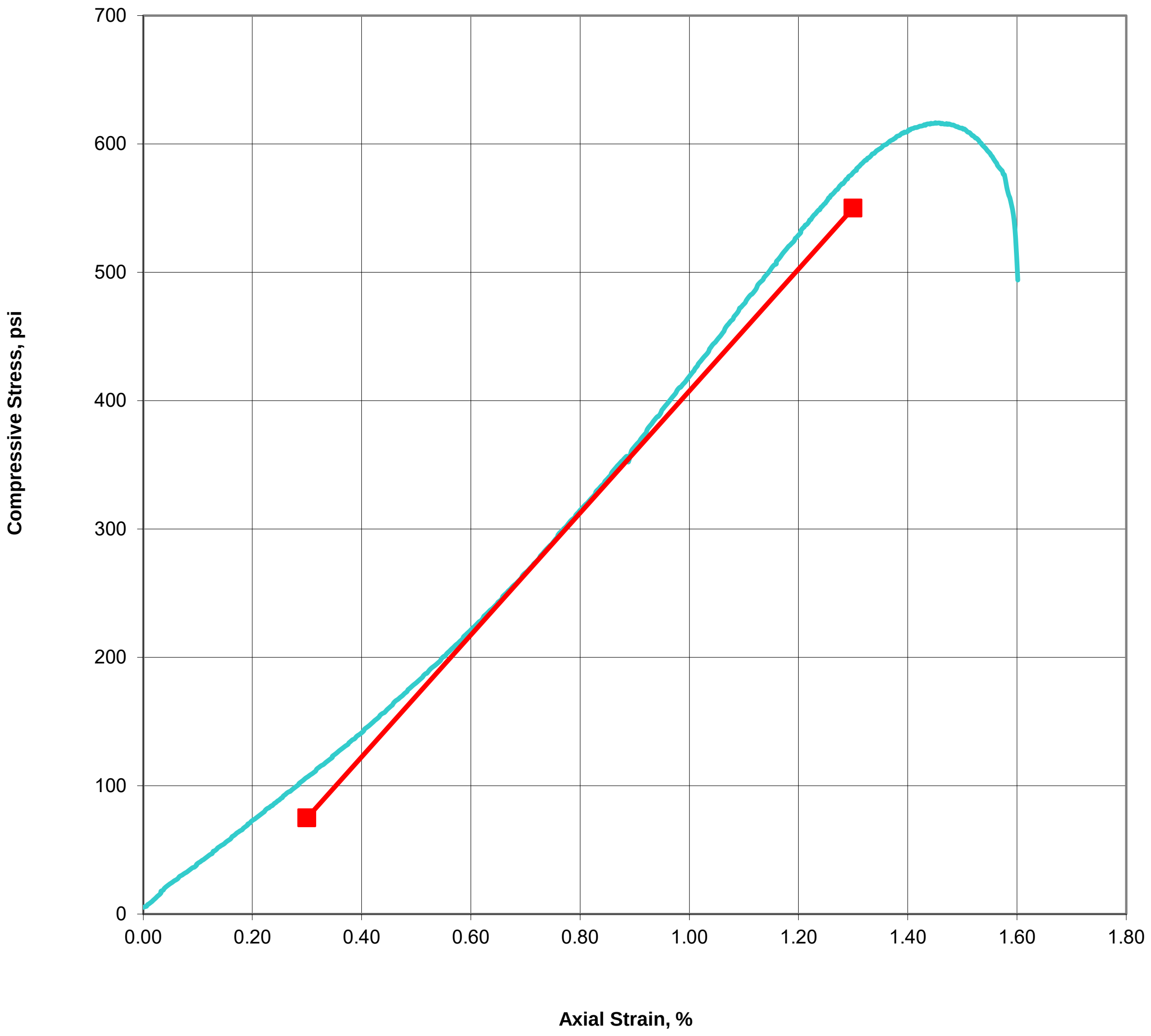
Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D7012D)

CTL Job No.:	823-008E1	Boring:	B-24	Date:	9/14/2016
Client:	GRI	Sample:	R-1	By:	PJ
Project Name:	Port of Coos Bay Channel Modification Project	Depth,ft.:	4	Checked:	DC
Project No.:	5128				

Visual Description: Very Dark Bluish Gray Rock
Moisture Condition at Test: Sample was washed and in a moist state.
Test Temperature, (°C): Ambient
Remarks:

Sample Height, in.	4.91	**Unconfined Compressive Strength (psi)**	**616**
Sample Diameter, in.	2.40		
Height / Diameter	2.0		
Sample Area, in^2	4.53		
Wet Density, pcf	137.0	**Young's Modulus (E) (psi)**	**47,500**
Dry Density, pcf	118.0		
Moisture Content, %	16.1		
Strain Rate, % / min	0.25		



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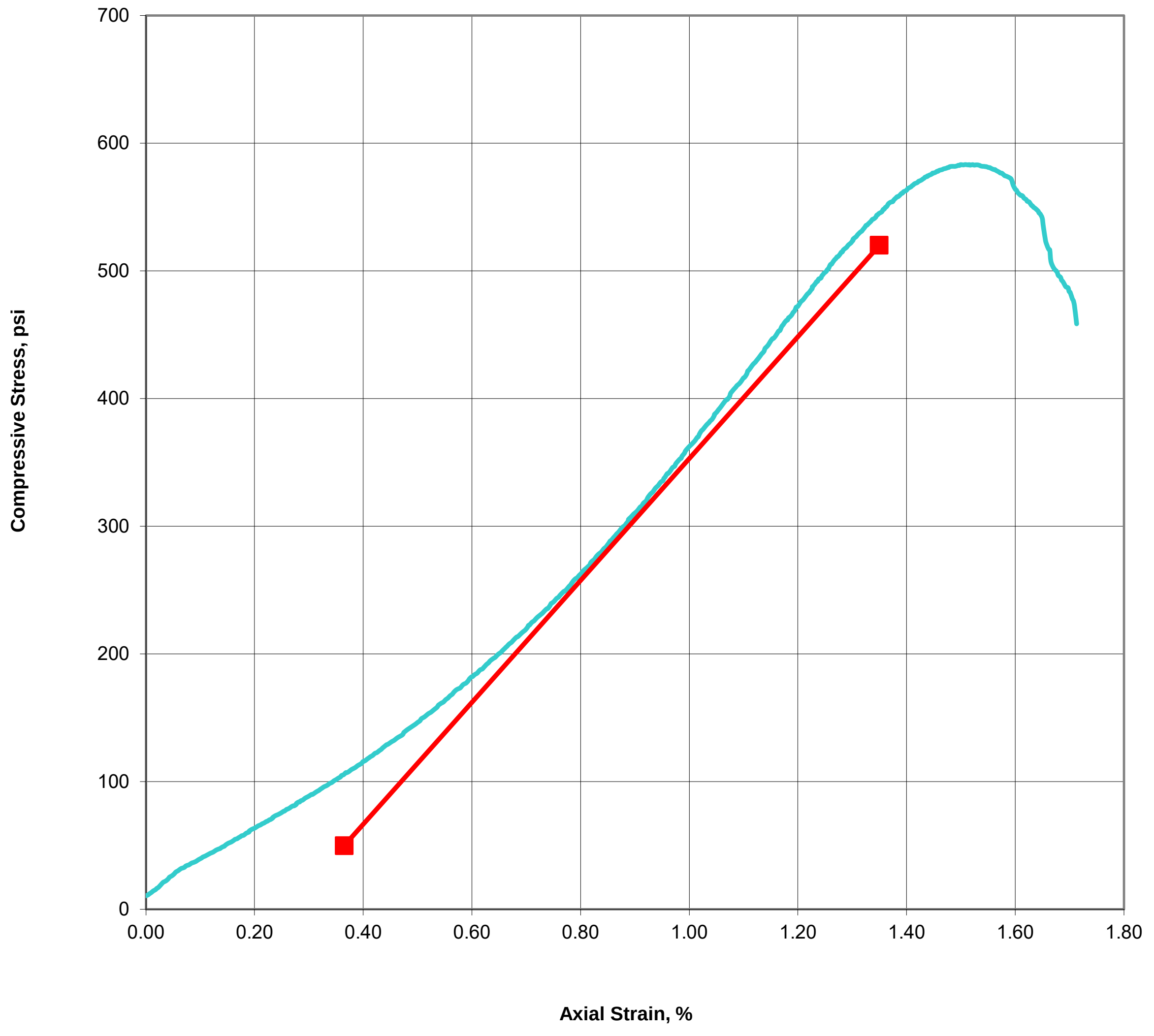
Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D7012D)

CTL Job No.: 823-008E2
Boring: B-24
Date: 9/14/2016
Client: GRI
Sample: R-2
By: PJ
Project Name: Port of Coos Bay Channel Modification Project
Depth,ft.: 6
Checked: DC
Project No.: 5128
Visual Description: Very Dark Bluish Gray Rock
Moisture Condition at Test Sample was washed and in a moist state.
Test Temperature, (^{o}C) Ambient
Remarks:

Sample Height, in.	5.06
Sample Diameter, in.	2.36
Height / Diameter	2.1
Sample Area, in^2	4.39
Wet Density, pcf	137.6
Dry Density, pcf	118.6
Moisture Content, %	16.1
Strain Rate, % / min	0.25

Unconfined Compressive Strength (psi)	**583**
Young's Modulus (E) (psi)	**47,700**



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Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D7012D)

CTL Job No.:	823-008E3	Boring:	B-24	Date:	9/14/2016
Client:	GRI	Sample:	R-2	By:	PJ
Project Name:	Port of Coos Bay Channel Modification Project	Depth,ft.:	8	Checked:	DC
Project No.:	5128				

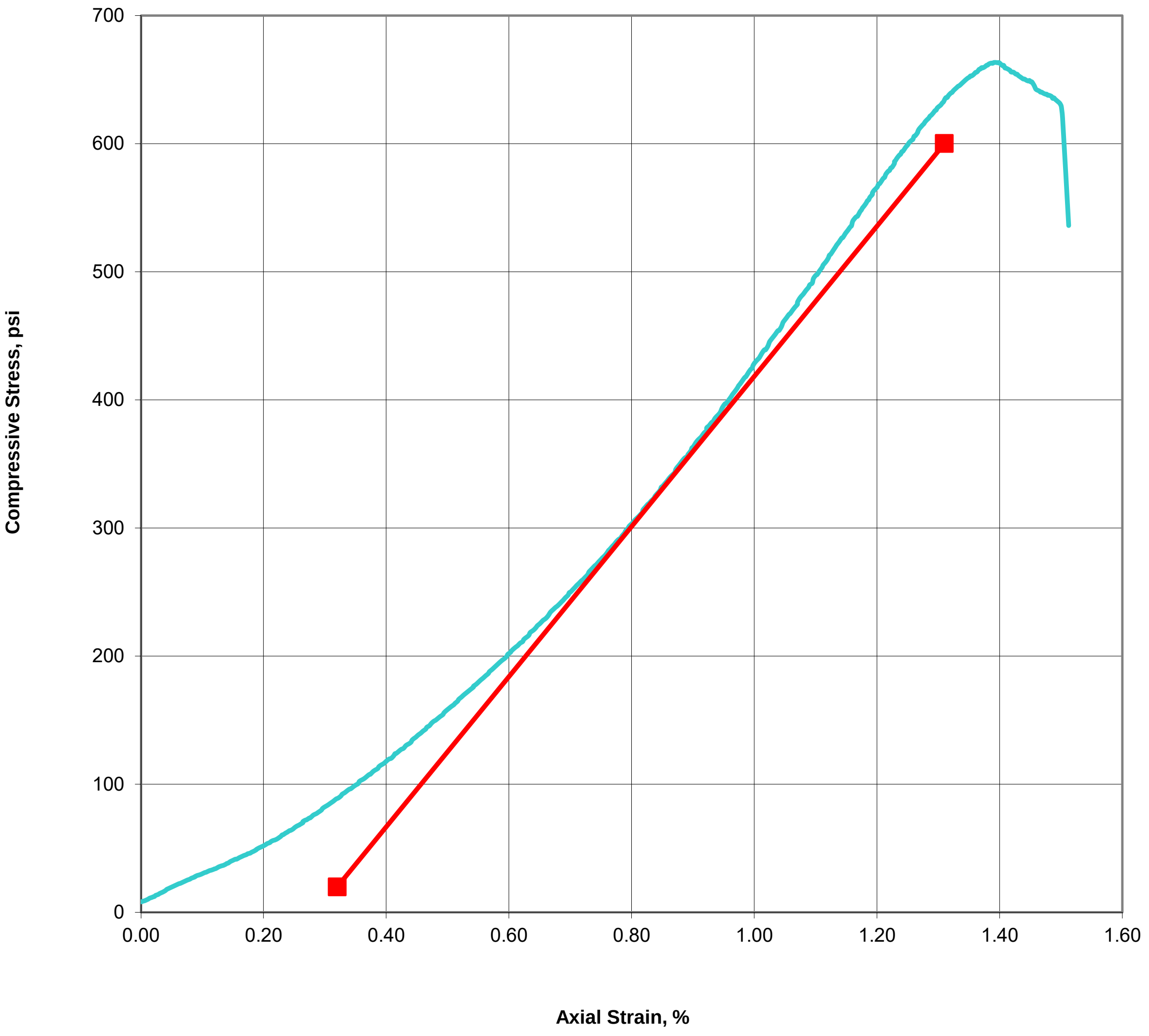
Visual Description: Very Dark Bluish Gray Rock

Moisture Condition at Test: Sample was washed and in a moist state.

Test Temperature, (^{o}C): Ambient

Remarks:

Sample Height, in.	5.00	**Unconfined Compressive Strength (psi)**	**663**
Sample Diameter, in.	2.39		
Height / Diameter	2.1		
Sample Area, in^2	4.50		
Wet Density, pcf	138.2	**Young's Modulus (E) (psi)**	**58,600**
Dry Density, pcf	119.8		
Moisture Content, %	15.3		
Strain Rate, % / min	0.25		



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Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D7012D)

CTL Job No.:	823-008E4	Boring:	B-24	Date:	9/14/2016
Client:	GRI	Sample:	R-3	By:	PJ
Project Name:	Port of Coos Bay Channel Modification Project	Depth,ft.:	11	Checked:	DC
Project No.:	5128				

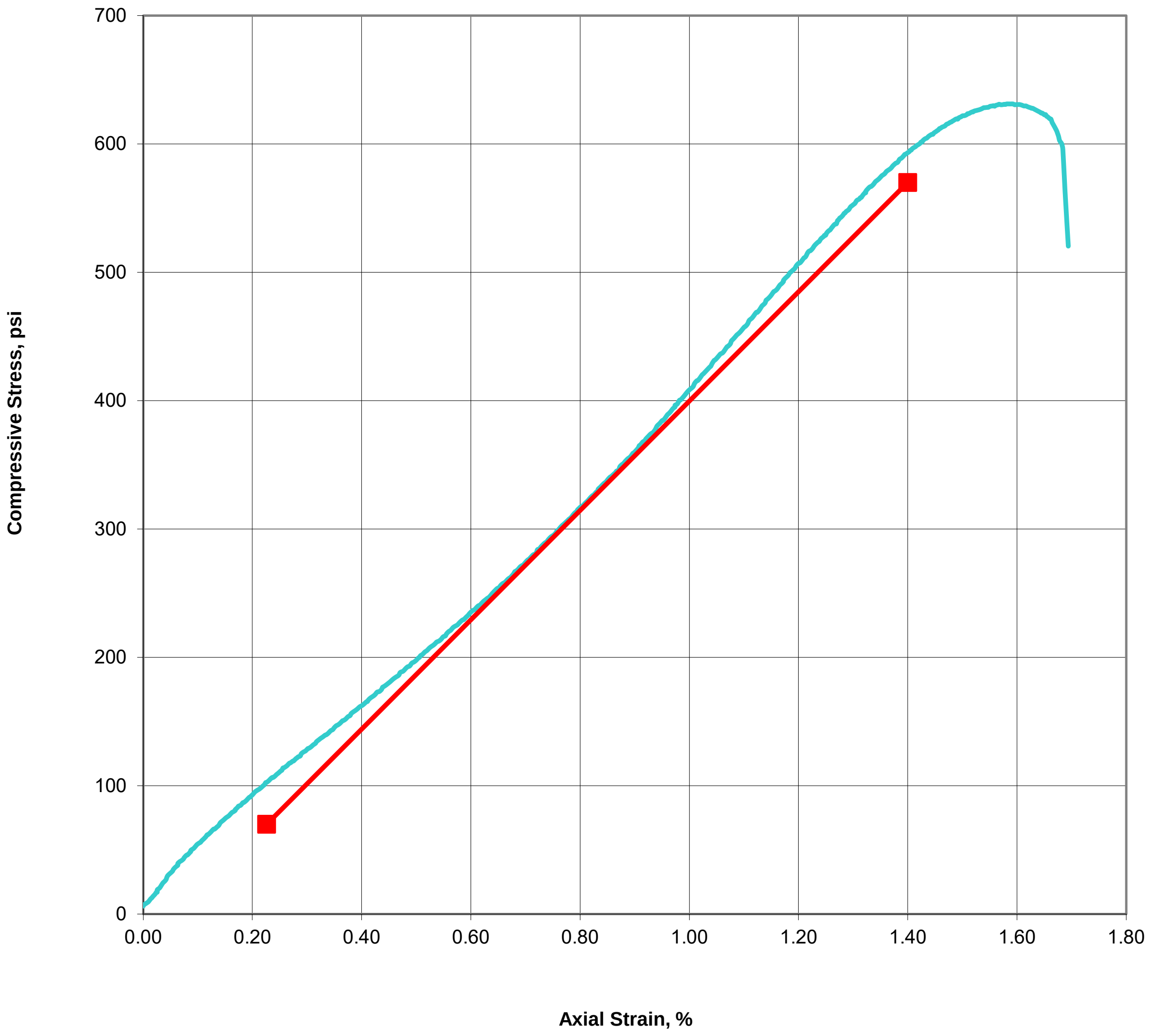
Visual Description: Very Dark Bluish Gray Rock

Moisture Condition at Test Sample was washed and in a moist state.

Test Temperature, (^oC) Ambient

Remarks:

Sample Height, in.	5.04	**Unconfined Compressive Strength (psi)**	**631**
Sample Diameter, in.	2.39		
Height / Diameter	2.1		
Sample Area, in^2	4.48		
Wet Density, pcf	136.9	**Young's Modulus (E) (psi)**	**42,600**
Dry Density, pcf	119.1		
Moisture Content, %	15.0		
Strain Rate, % / min	0.25		

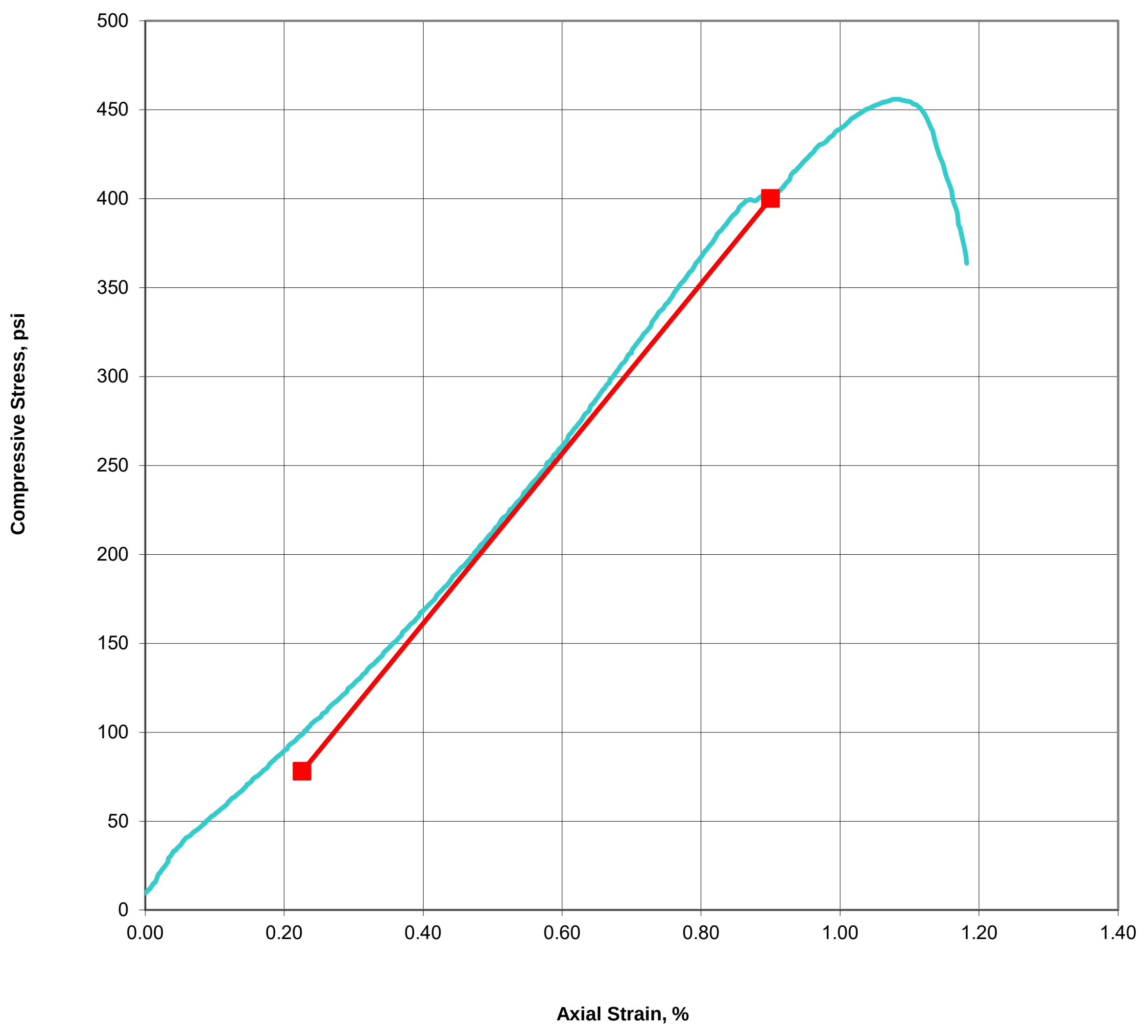


Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D7012D)

CTL Job No.: 823-008E5 Boring: B-24 Date: 9/14/2016
Client: GRI Sample: R-3 By: PJ
Project Name: Port of Coos Bay Channel Modification Project Depth,ft.: 15 Checked: DC
Project No.: 5128
Visual Description: Very Dark Bluish Gray Rock
Moisture Condition at Test: Sample was washed and in a moist state.
Test Temperature, (^{o}C): Ambient
Remarks:

Sample Height, in.	5.10
Sample Diameter, in.	2.39
Height / Diameter	2.1
Sample Area, in^2	4.49
Wet Density, pcf	138.9
Dry Density, pcf	121.4
Moisture Content, %	14.4
Strain Rate, % / min	0.25

Unconfined Compressive Strength (psi)	**456**
Young's Modulus (E) (psi)	**47,800**



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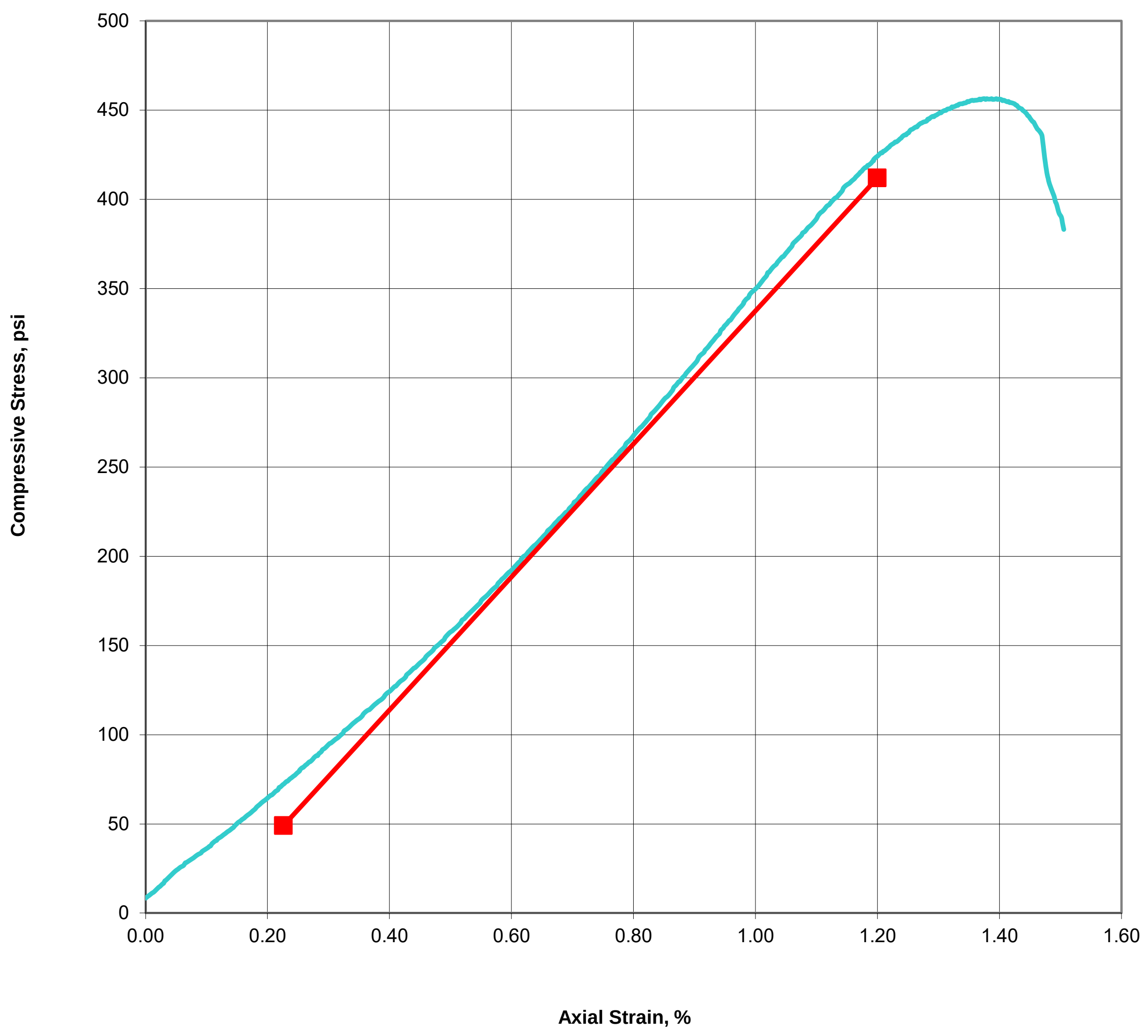
Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D7012D)

CTL Job No.: 823-008E6
Boring: B-24
Date: 9/14/2016
Client: GRI
Sample: R-4
By: PJ
Project Name: Port of Coos Bay Channel Modification Project
Depth,ft.: 17
Checked: DC
Project No.: 5128
Visual Description: Very Dark Bluish Gray Rock
Moisture Condition at Test Sample was washed and in a moist state.
Test Temperature, (°C) Ambient
Remarks:

Sample Height, in.	5.07
Sample Diameter, in.	2.41
Height / Diameter	2.1
Sample Area, in^2	4.54
Wet Density, pcf	140.5
Dry Density, pcf	123.9
Moisture Content, %	13.4
Strain Rate, % / min	0.25

Unconfined Compressive Strength (psi)	**456**
Young's Modulus (E) (psi)	**37,300**



COOPER TESTING LABORATORY

Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D7012D)

CTL Job No.:	823-008E7	Boring:	B-24	Date:	9/14/2016
Client:	GRI	Sample:	R-4	By:	PJ
Project Name:	Port of Coos Bay Channel Modification Project	Depth,ft.:	18.25	Checked:	DC
Project No.:	5128				

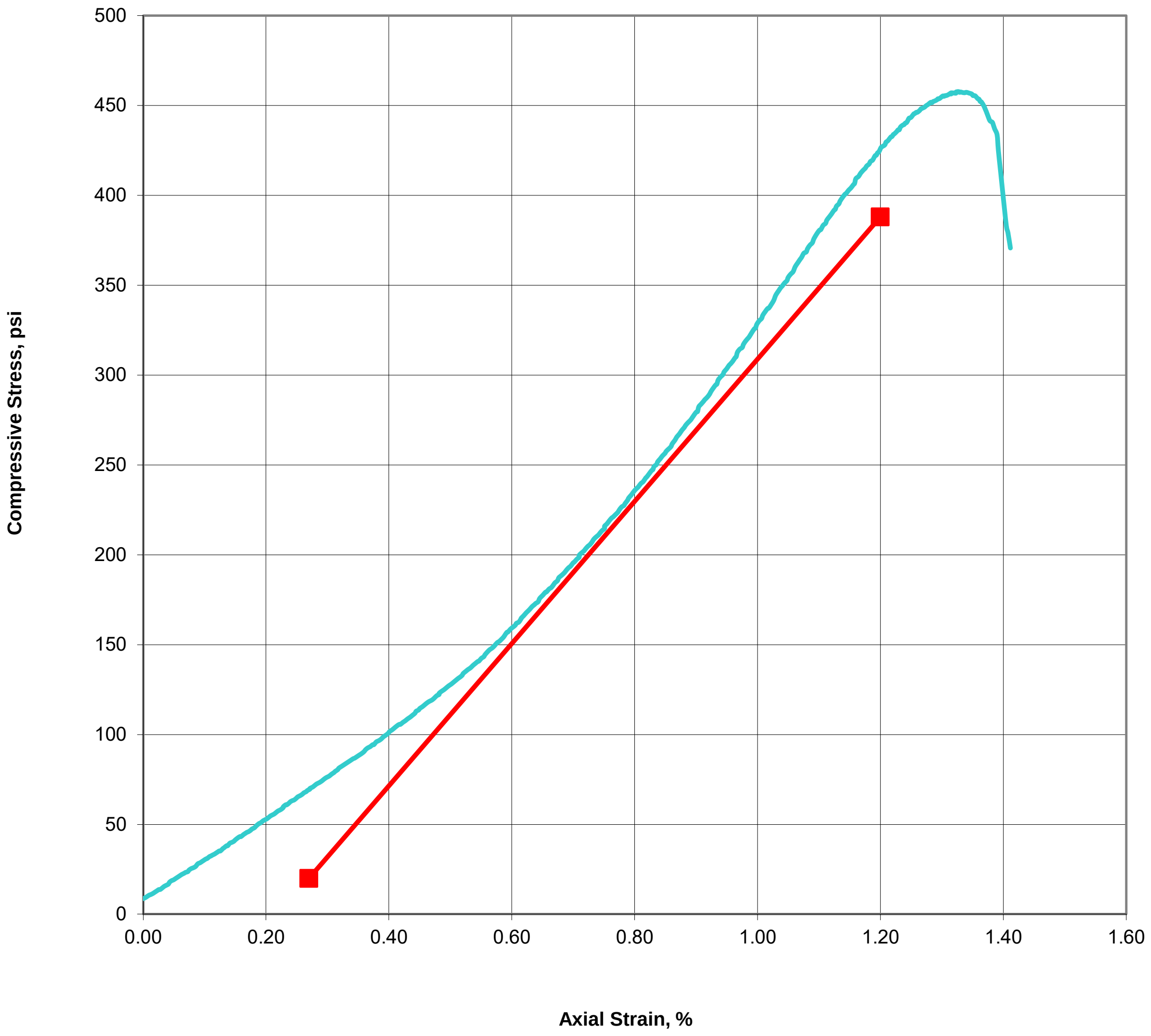
Visual Description: Very Dark Bluish Gray Rock

Moisture Condition at Test: Sample was washed and in a moist state.

Test Temperature, (^oC): Ambient

Remarks: The sample had a small void on one side.

Sample Height, in.	5.09	**Unconfined Compressive Strength (psi)**	**458**
Sample Diameter, in.	2.40		
Height / Diameter	2.1		
Sample Area, in^2	4.52		
Wet Density, pcf	140.1	**Young's Modulus (E) (psi)**	**39,600**
Dry Density, pcf	124.1		
Moisture Content, %	12.9		
Strain Rate, % / min	0.25		



COOPER TESTING LABORATORY

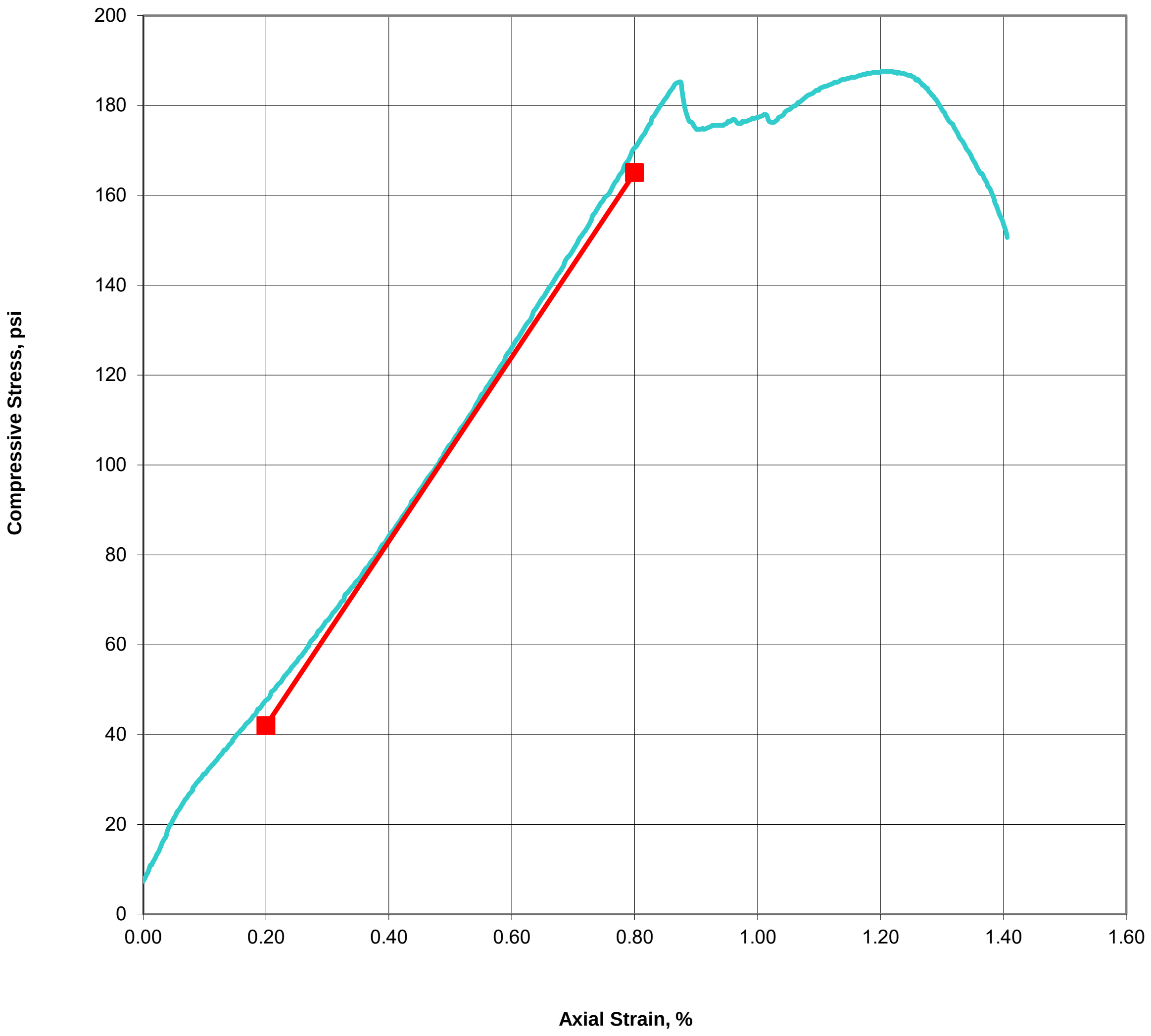
Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D7012D)

CTL Job No.: 823-008E8
Boring: B-24
Date: 9/14/2016
Client: GRI
Sample: R-5
By: PJ
Project Name: Port of Coos Bay Channel Modification Project
Depth,ft.: 21.75
Checked: DC
Project No.: 5128

Visual Description: Very Dark Bluish Gray Rock
Moisture Condition at Test Sample was washed and in a moist state.
Test Temperature, (^oC) Ambient
Remarks:

Sample Height, in.	5.08
Sample Diameter, in.	2.39
Height / Diameter	2.1
Sample Area, in^2	4.49
Wet Density, pcf	139.3
Dry Density, pcf	126.4
Moisture Content, %	10.2
Strain Rate, % / min	0.25

Unconfined Compressive Strength (psi)	**188**
Young's Modulus (E) (psi)	**20,500**



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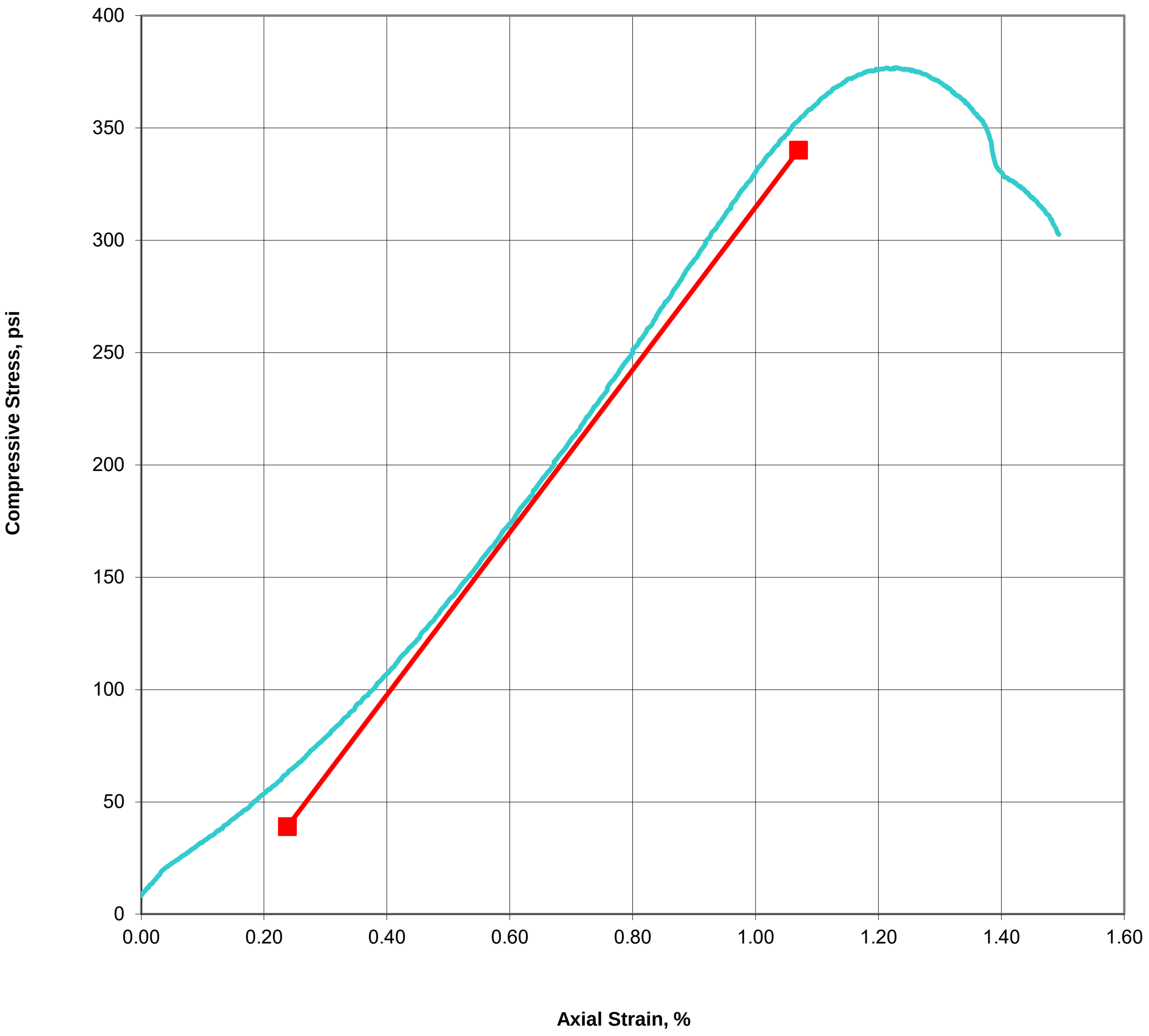
Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D7012D)

CTL Job No.: 823-008E9 Boring: B-24 Date: 9/14/2016
Client: GRI Sample: R-5 By: PJ
Project Name: Port of Coos Bay Channel Modification Project Depth,ft.: 24 Checked: DC
Project No.: 5128
Visual Description: Very Dark Bluish Gray Rock
Moisture Condition at Test Sample was washed and in a moist state.
Test Temperature, (^{o}C) Ambient
Remarks: .

Sample Height, in.	5.07	**Unconfined Compressive Strength (psi)**	**377**
Sample Diameter, in.	2.39		
Height / Diameter	2.1		
Sample Area, in^2	4.47		
Wet Density, pcf	137.6	**Young's Modulus (E) (psi)**	**36,200**
Dry Density, pcf	119.6		
Moisture Content, %	15.1		
Strain Rate, % / min	0.25		



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Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D7012D)

CTL Job No.:	823-008F1	Boring:	B-25	Date:	9/15/2016
Client:	GRI	Sample:	R-2	By:	PJ
Project Name:	Port of Coos Bay Channel Modification Project	Depth,ft.:	6.25	Checked:	DC
Project No.:	5128				

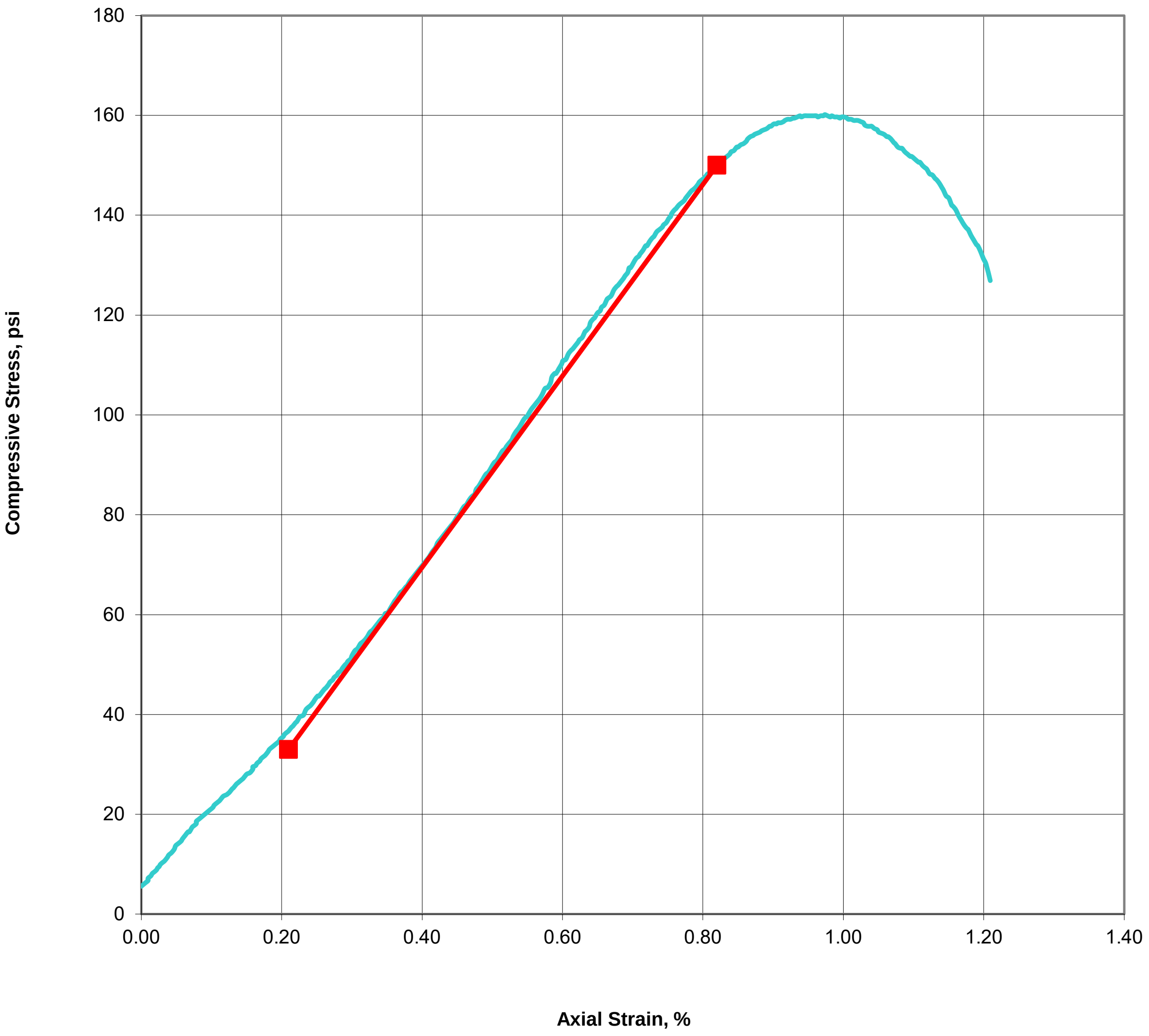
Visual Description: Very Dark Bluish Gray Rock

Moisture Condition at Test: Sample was washed and in a moist state.

Test Temperature, (°C): Ambient

Remarks:

Sample Height, in.	5.09	**Unconfined Compressive Strength (psi)**	**160**
Sample Diameter, in.	2.34		
Height / Diameter	2.2		
Sample Area, in^2	4.30		
Wet Density, pcf	129.5	**Young's Modulus (E) (psi)**	**19,200**
Dry Density, pcf	109.4		
Moisture Content, %	18.4		
Strain Rate, % / min	0.25		



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Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D7012D)

CTL Job No.:	823-008F2	Boring:	B-25	Date:	9/15/2016
Client:	GRI	Sample:	R-3	By:	PJ
Project Name:	Port of Coos Bay Channel Modification Project	Depth,ft.:	10.5	Checked:	DC
Project No.:	5128				

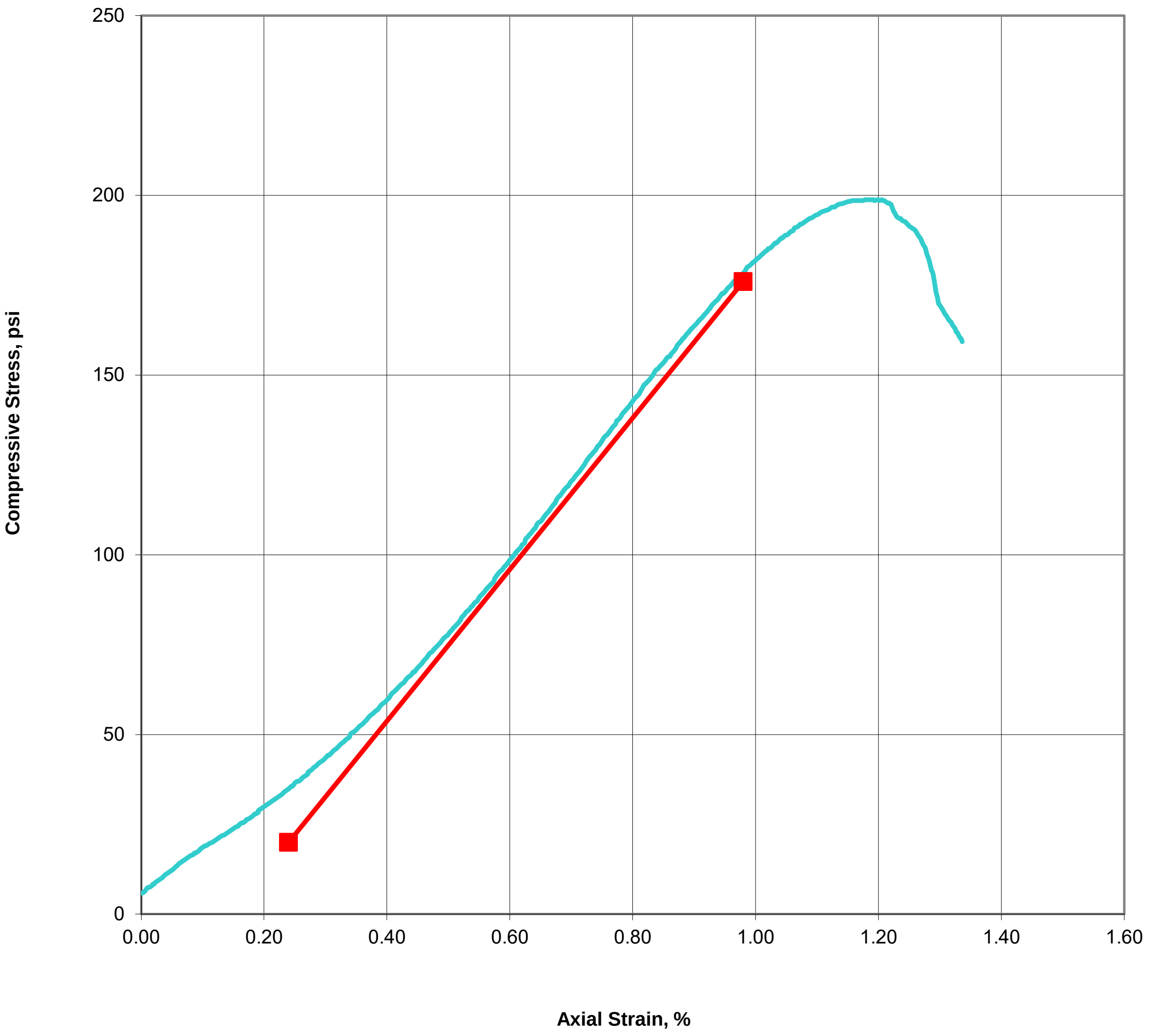
Visual Description: Very Dark Bluish Gray Rock

Moisture Condition at Test: Sample was washed and in a moist state.

Test Temperature, (^{o}C): Ambient

Remarks:

Sample Height, in.	5.19	**Unconfined Compressive Strength (psi)**	**199**
Sample Diameter, in.	2.37		
Height / Diameter	2.2		
Sample Area, in^{2}	4.41		
Wet Density, pcf	123.8	**Young's Modulus (E) (psi)**	**21,100**
Dry Density, pcf	103.8		
Moisture Content, %	19.2		
Strain Rate, % / min	0.25		



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Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D7012D)

CTL Job No.:	823-008F3	Boring:	B-25	Date:	9/15/2016
Client:	GRI	Sample:	R-4	By:	PJ
Project Name:	Port of Coos Bay Channel Modification Project	Depth,ft.:	15.5	Checked:	DC
Project No.:	5128				

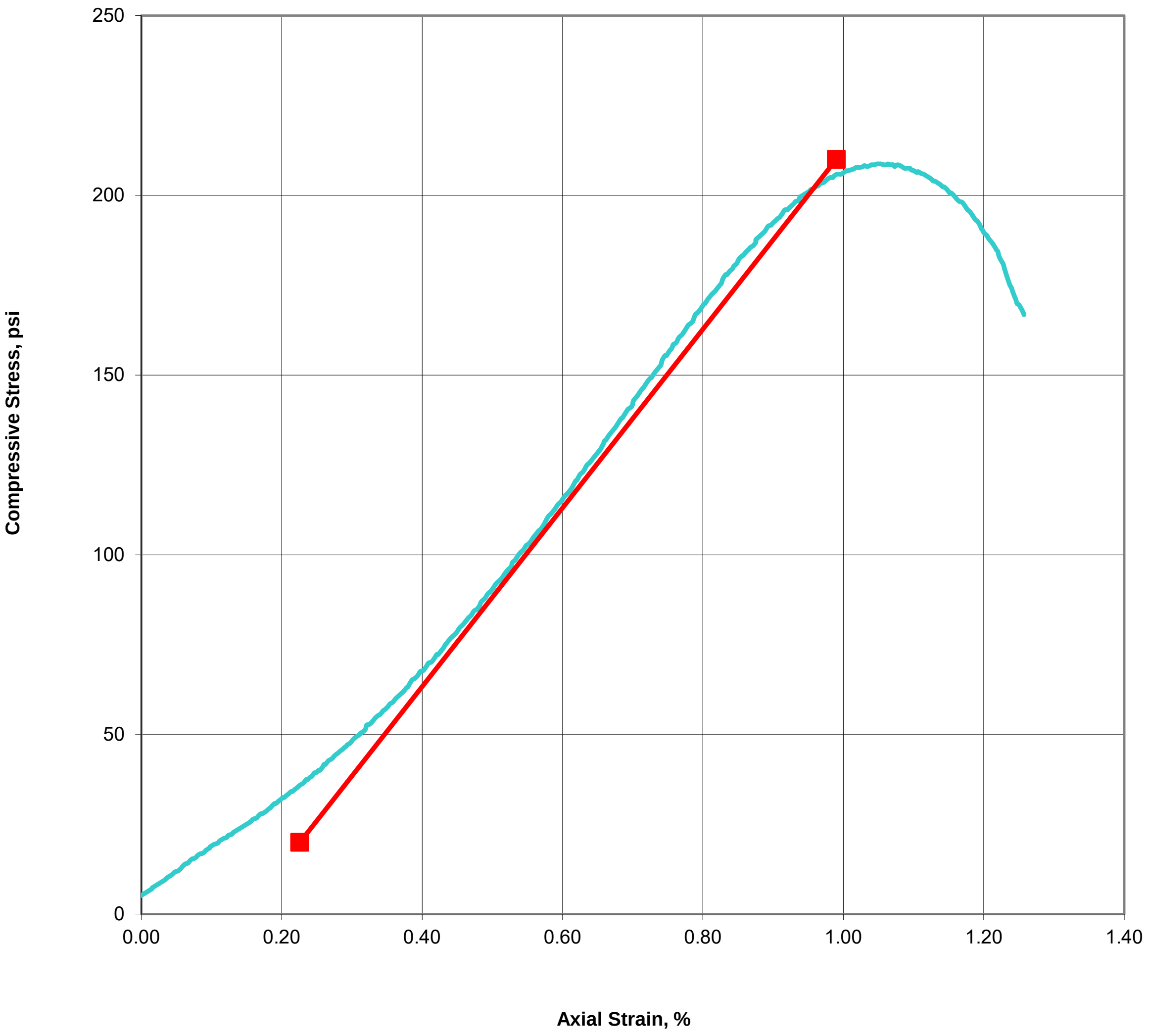
Visual Description: Very Dark Bluish Gray Rock

Moisture Condition at Test: Sample was washed and in a moist state.

Test Temperature, (^{o}C): Ambient

Remarks:

Sample Height, in.	5.11	**Unconfined Compressive Strength (psi)**	**209**
Sample Diameter, in.	2.32		
Height / Diameter	2.2		
Sample Area, in^2	4.22		
Wet Density, pcf	130.9	**Young's Modulus (E) (psi)**	**24,900**
Dry Density, pcf	109.8		
Moisture Content, %	19.2		
Strain Rate, % / min	0.25		



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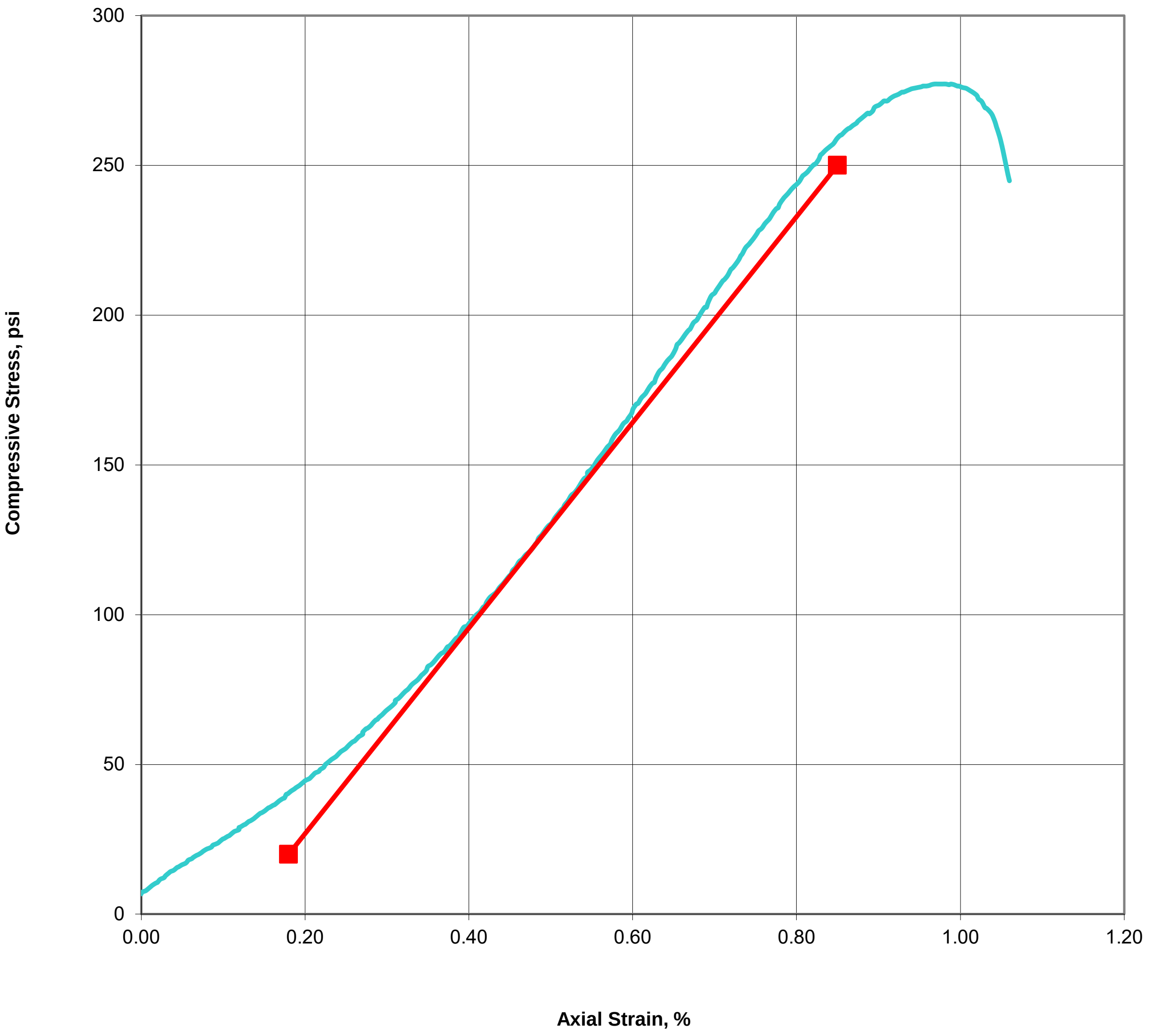
Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D7012D)

CTL Job No.: 823-008F4
Boring: B-25
Date: 9/15/2016
Client: GRI
Sample: R-4
By: PJ
Project Name: Port of Coos Bay Channel Modification Project
Depth,ft.: 17
Checked: DC
Project No.: 5128
Visual Description: Very Dark Bluish Gray Rock
Moisture Condition at Test Sample was washed and in a moist state.
Test Temperature, (°C) Ambient
Remarks:

Sample Height, in.	5.03	**Unconfined Compressive Strength (psi)**	**277**
Sample Diameter, in.	2.37		
Height / Diameter	2.1		
Sample Area, in^2	4.43		
Wet Density, pcf	128.2	**Young's Modulus (E) (psi)**	**34,300**
Dry Density, pcf	107.4		
Moisture Content, %	19.4		
Strain Rate, % / min	0.25		



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Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D7012D)

CTL Job No.: 823-008G2 Boring: B-26 Date: 9/15/2016

Client: GRI Sample: R-3 By: PJ

Project Name: Port of Coos Bay Channel Modification Project Depth,ft.: 13 Checked: DC

Project No.: 5128

Visual Description: Very Dark Bluish Gray Rock

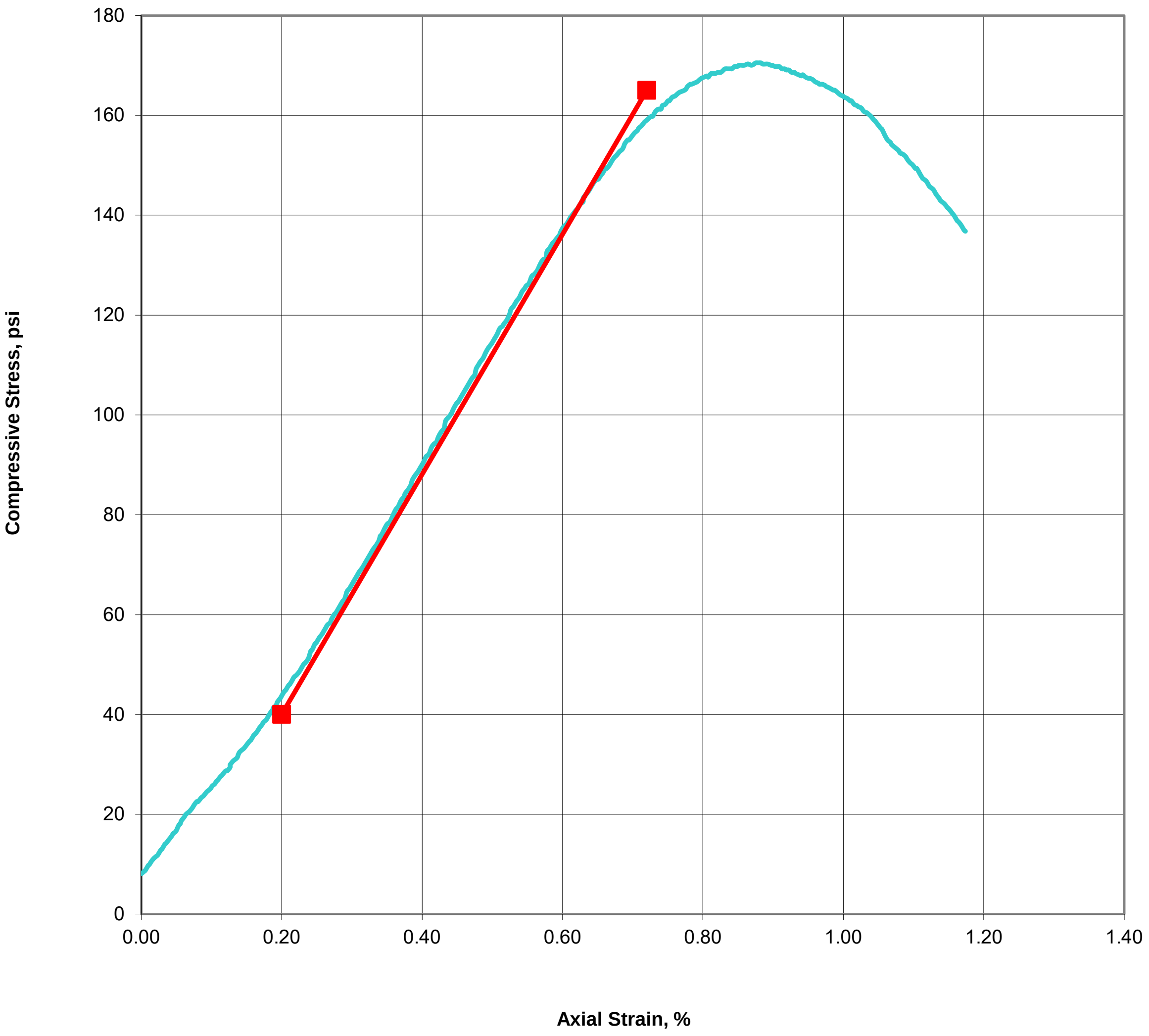
Moisture Condition at Test Sample was washed and in a moist state.

Test Temperature, (°C) Ambient

Remarks:

Sample Height, in.	5.05
Sample Diameter, in.	2.32
Height / Diameter	2.2
Sample Area, in^2	4.21
Wet Density, pcf	128.8
Dry Density, pcf	106.6
Moisture Content, %	20.9
Strain Rate, % / min	0.25

Unconfined Compressive Strength (psi)	**171**
Young's Modulus (E) (psi)	**24,000**



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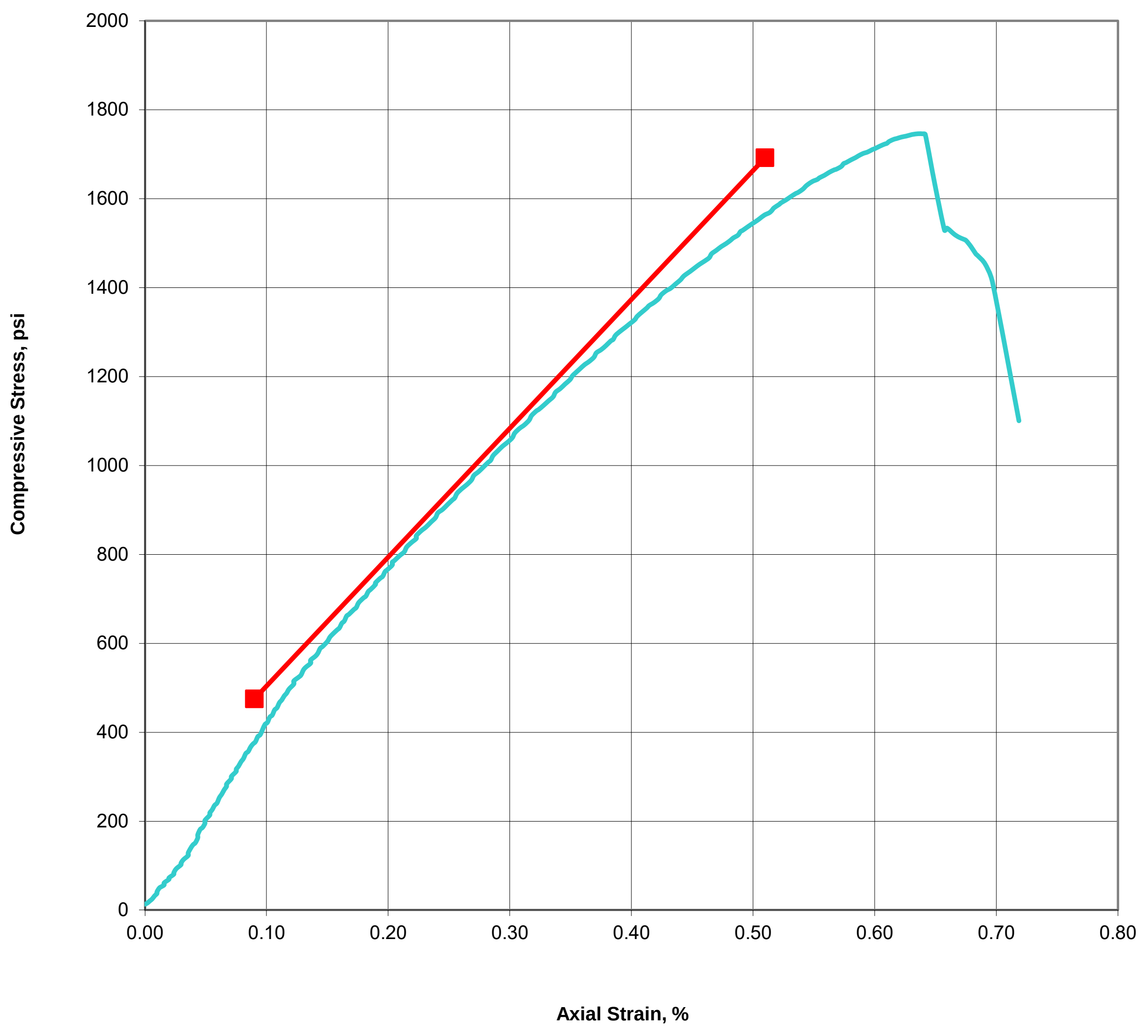
Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D7012D)

CTL Job No.: 823-008H1
Boring: B-27
Date: 9/15/2016
Client: GRI
Sample: R-1
By: PJ
Project Name: Port of Coos Bay Channel Modification Project
Depth,ft.: 4
Checked: DC
Project No.: 5128
Visual Description: Very Dark Bluish Gray Rock
Moisture Condition at Test Sample was washed and in a moist state.
Test Temperature, (^oC) Ambient
Remarks:

Sample Height, in.	5.07
Sample Diameter, in.	2.39
Height / Diameter	2.1
Sample Area, in^2	4.48
Wet Density, pcf	121.6
Dry Density, pcf	94.7
Moisture Content, %	28.4
Strain Rate, % / min	0.25

Unconfined Compressive Strength (psi)	**1746**
Young's Modulus (E) (psi)	**289,800**



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Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D7012D)

CTL Job No.:	823-008H2	Boring:	B-27	Date:	9/15/2016
Client:	GRI	Sample:	R-1	By:	PJ
Project Name:	Port of Coos Bay Channel Modification Project	Depth,ft.:	7	Checked:	DC
Project No.:	5128				

Visual Description: Very Dark Bluish Gray Rock

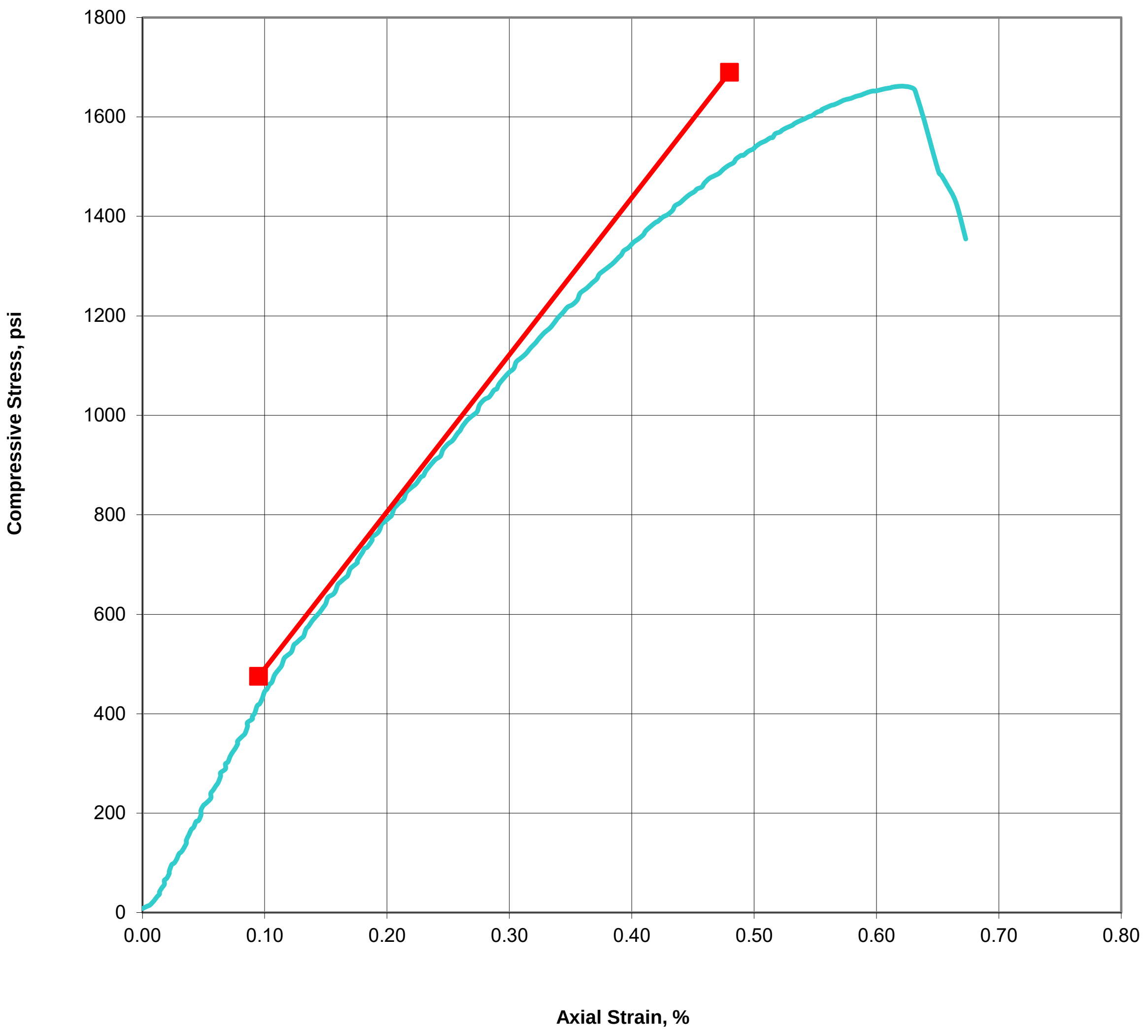
Moisture Condition at Test Sample was washed and in a moist state.

Test Temperature, (^{o}C) Ambient

Remarks:

Sample Height, in.	5.01
Sample Diameter, in.	2.40
Height / Diameter	2.1
Sample Area, in^2	4.51
Wet Density, pcf	122.6
Dry Density, pcf	95.9
Moisture Content, %	27.9
Strain Rate, % / min	0.25

Unconfined Compressive Strength (psi)	**1662**
Young's Modulus (E) (psi)	**315,600**



Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D7012D)

CTL Job No.:	823-008H3	Boring:	B-27	Date:	9/15/2016
Client:	GRI	Sample:	R-2	By:	PJ
Project Name:	Port of Coos Bay Channel Modification Project	Depth,ft.:	11	Checked:	DC
Project No.:	5128				

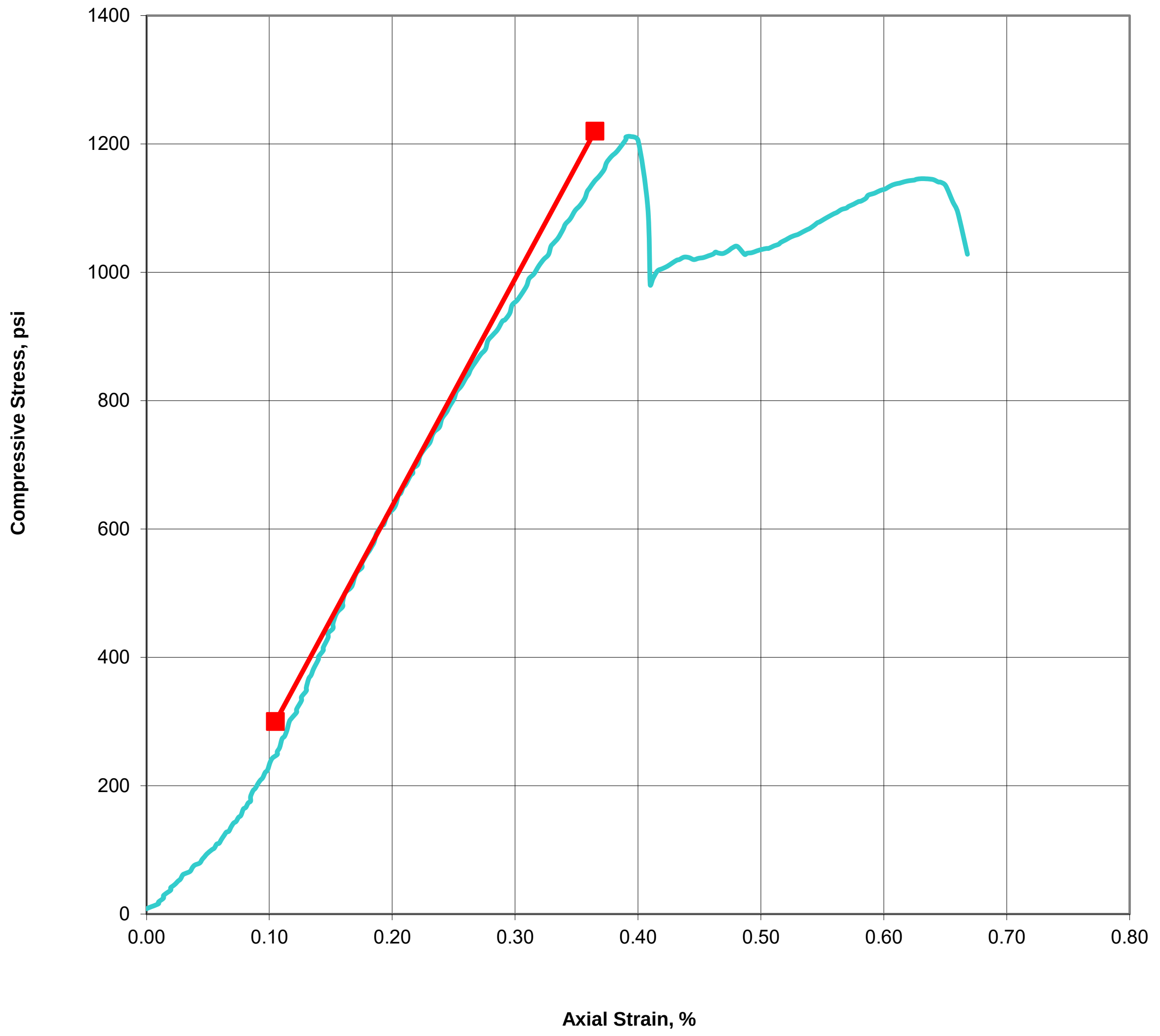
Visual Description: Very Dark Bluish Gray Rock

Moisture Condition at Test Sample was washed and in a moist state.

Test Temperature, (°C) Ambient

Remarks:

Sample Height, in.	5.07	**Unconfined Compressive Strength (psi)**	**1211**
Sample Diameter, in.	2.38		
Height / Diameter	2.1		
Sample Area, in^2	4.45		
Wet Density, pcf	124.0	**Young's Modulus (E) (psi)**	**353,800**
Dry Density, pcf	95.8		
Moisture Content, %	29.5		
Strain Rate, % / min	0.25		



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Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D7012D)

CTL Job No.:	823-008H4	Boring:	B-27	Date:	9/15/2016
Client:	GRI	Sample:	R-2	By:	PJ
Project Name:	Port of Coos Bay Channel Modification Project	Depth,ft.:	12.25	Checked:	DC
Project No.:	5128				

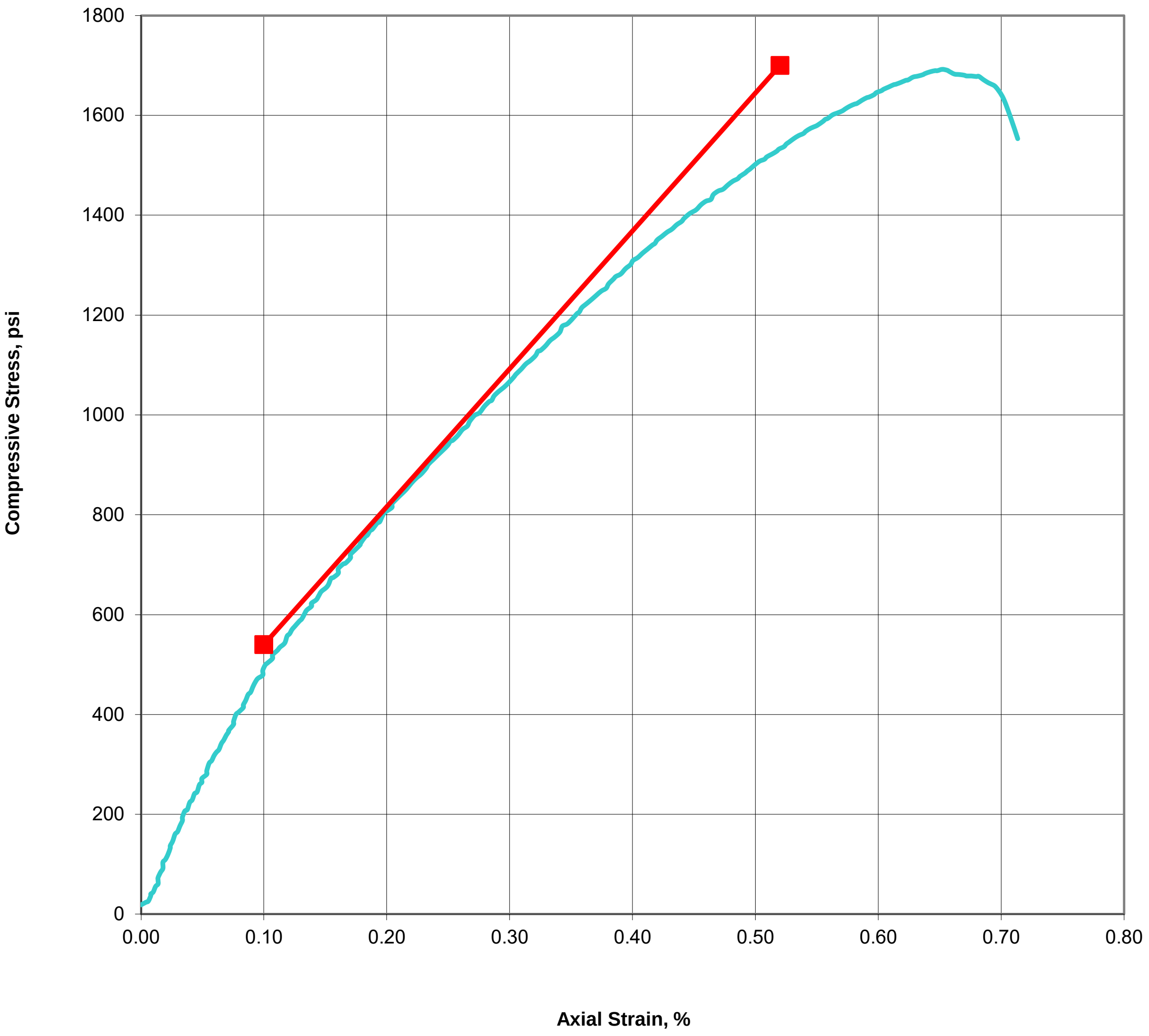
Visual Description: Very Dark Bluish Gray Rock

Moisture Condition at Test Sample was washed and in a moist state.

Test Temperature, (°C) Ambient

Remarks:

Sample Height, in.	5.05	**Unconfined Compressive Strength (psi)**	**1692**
Sample Diameter, in.	2.38		
Height / Diameter	2.1		
Sample Area, in^2	4.44		
Wet Density, pcf	124.7	**Young's Modulus (E) (psi)**	**276,200**
Dry Density, pcf	98.5		
Moisture Content, %	26.6		
Strain Rate, % / min	0.25		



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Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D7012D)

CTL Job No.:	823-008H5	Boring:	B-27	Date:	9/15/2016
Client:	GRI	Sample:	R-3	By:	PJ
Project Name:	Port of Coos Bay Channel Modification Project	Depth,ft.:	16	Checked:	DC
Project No.:	5128				

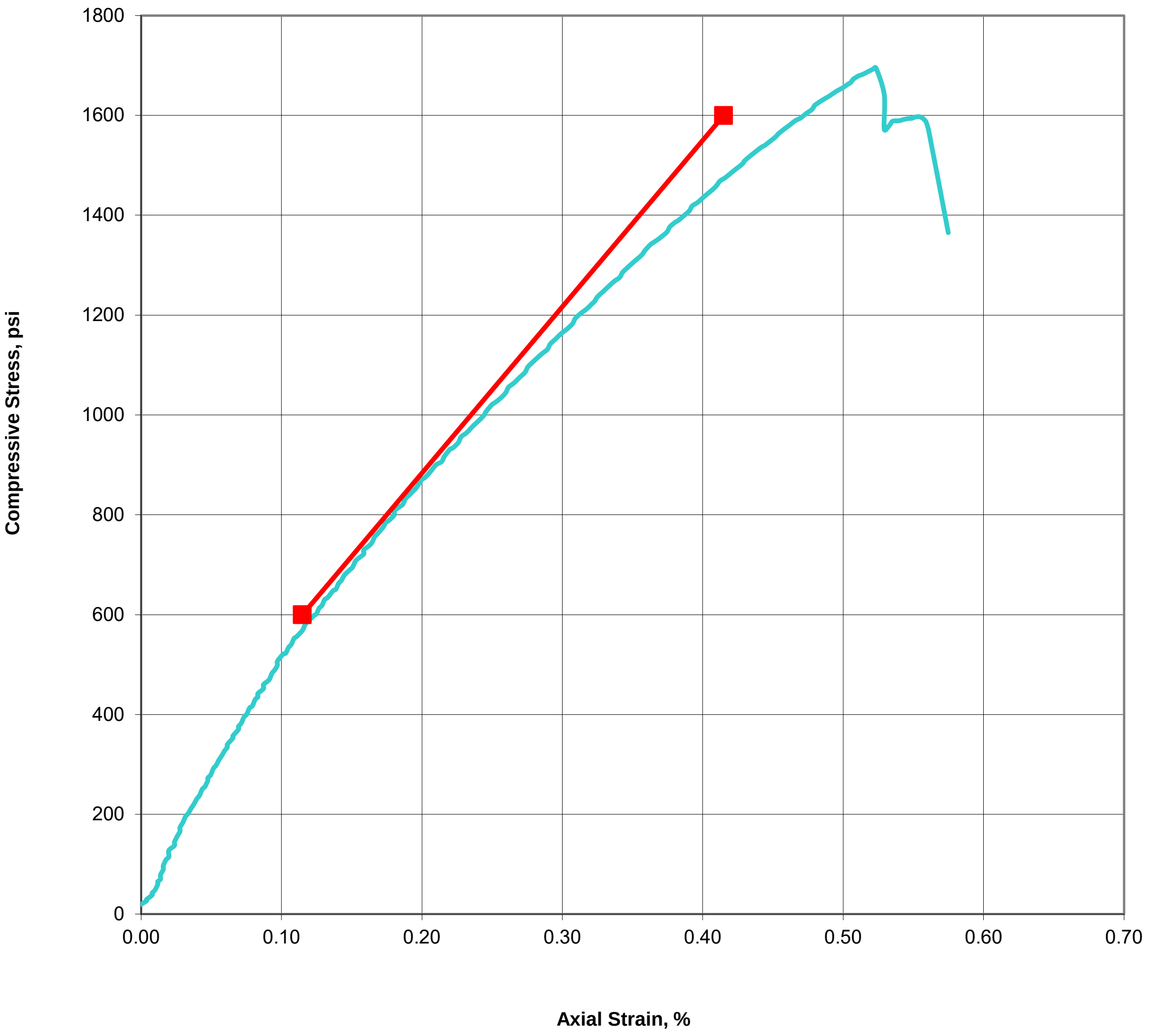
Visual Description: Very Dark Bluish Gray Rock

Moisture Condition at Test: Sample was washed and in a moist state.

Test Temperature, (^{o}C): Ambient

Remarks:

Sample Height, in.	5.05	**Unconfined Compressive Strength (psi)**	**1695**
Sample Diameter, in.	2.36		
Height / Diameter	2.1		
Sample Area, in^2	4.37		
Wet Density, pcf	120.1	**Young's Modulus (E) (psi)**	**333,300**
Dry Density, pcf	94.1		
Moisture Content, %	27.6		
Strain Rate, % / min	0.25		



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Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D7012D)

CTL Job No.:	823-008H6	Boring:	B-27	Date:	9/15/2016
Client:	GRI	Sample:	R-4	By:	PJ
Project Name:	Port of Coos Bay Channel Modification Project	Depth,ft.:	19	Checked:	DC
Project No.:	5128				

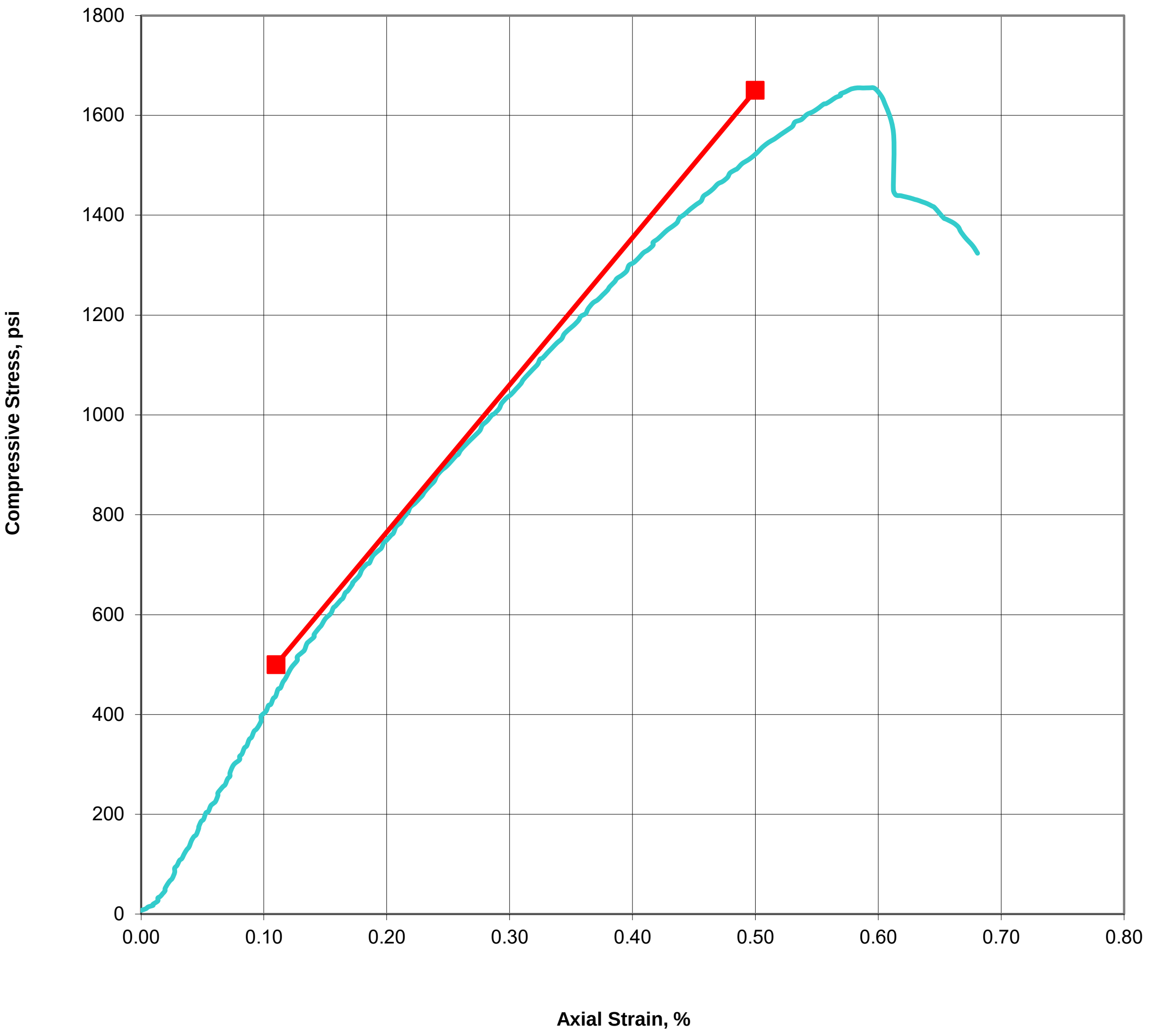
Visual Description: Very Dark Bluish Gray Rock

Moisture Condition at Test Sample was washed and in a moist state.

Test Temperature, (°C) Ambient

Remarks:

Sample Height, in.	5.11	**Unconfined Compressive Strength (psi)**	**1655**
Sample Diameter, in.	2.34		
Height / Diameter	2.2		
Sample Area, in^2	4.30		
Wet Density, pcf	118.7	**Young's Modulus (E) (psi)**	**294,900**
Dry Density, pcf	91.0		
Moisture Content, %	30.5		
Strain Rate, % / min	0.25		



Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D7012D)

CTL Job No.:	823-008H7	Boring:	B-27	Date:	9/22/2016
Client:	GRI	Sample:	R-4	By:	PJ
Project Name:	Port of Coos Bay Channel Modification Project	Depth,ft.:	21	Checked:	DC
Project No.:	5128				

Visual Description: Very Dark Bluish Gray Rock

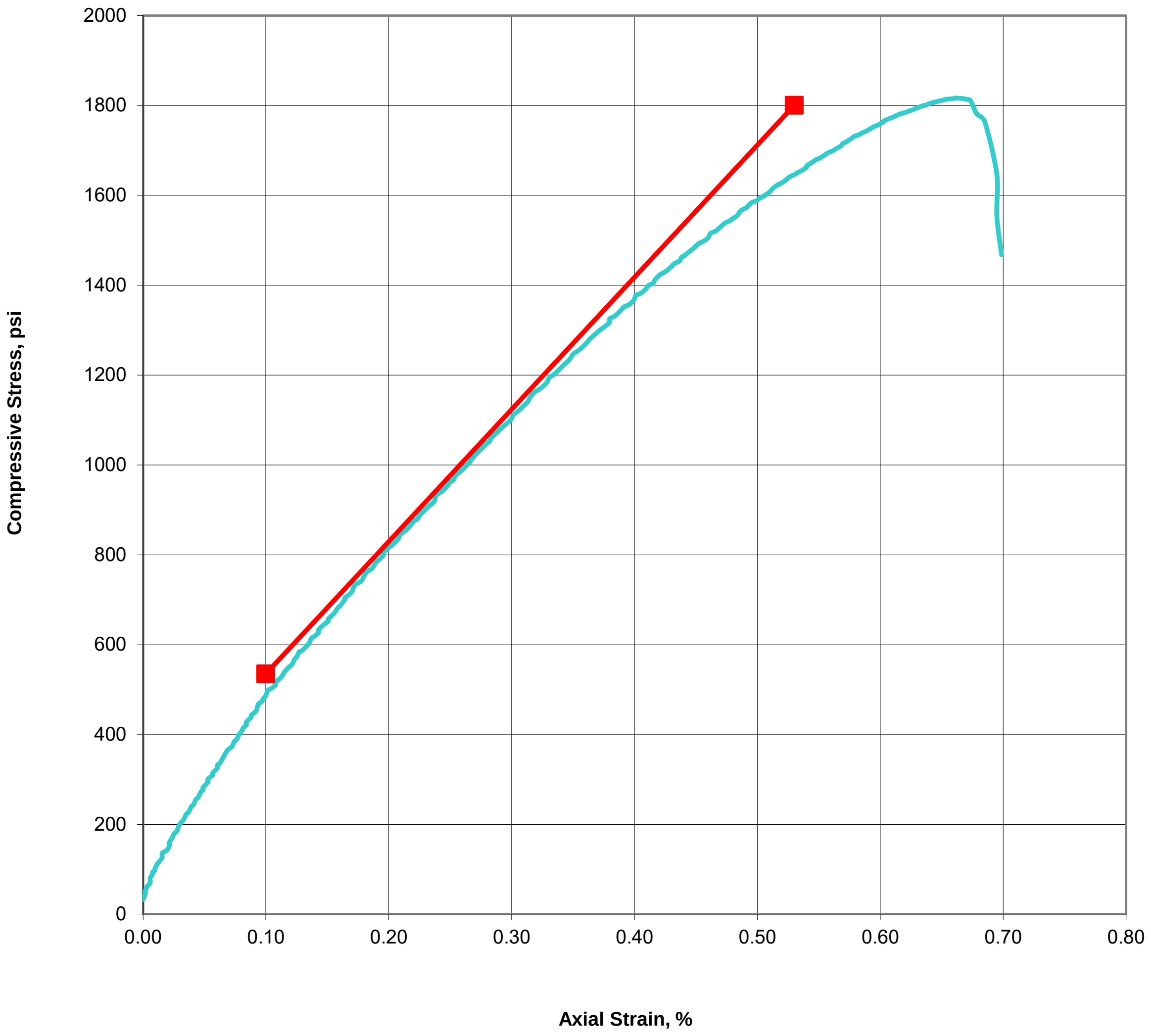
Moisture Condition at Test Sample was washed and in a moist state.

Test Temperature, (°C) Ambient

Remarks:

Sample Height, in.	5.11
Sample Diameter, in.	2.40
Height / Diameter	2.1
Sample Area, in^2	4.52
Wet Density, pcf	120.5
Dry Density, pcf	96.9
Moisture Content, %	24.4
Strain Rate, % / min	0.25

Unconfined Compressive Strength (psi)	**1816**
Young's Modulus (E) (psi)	**294,200**

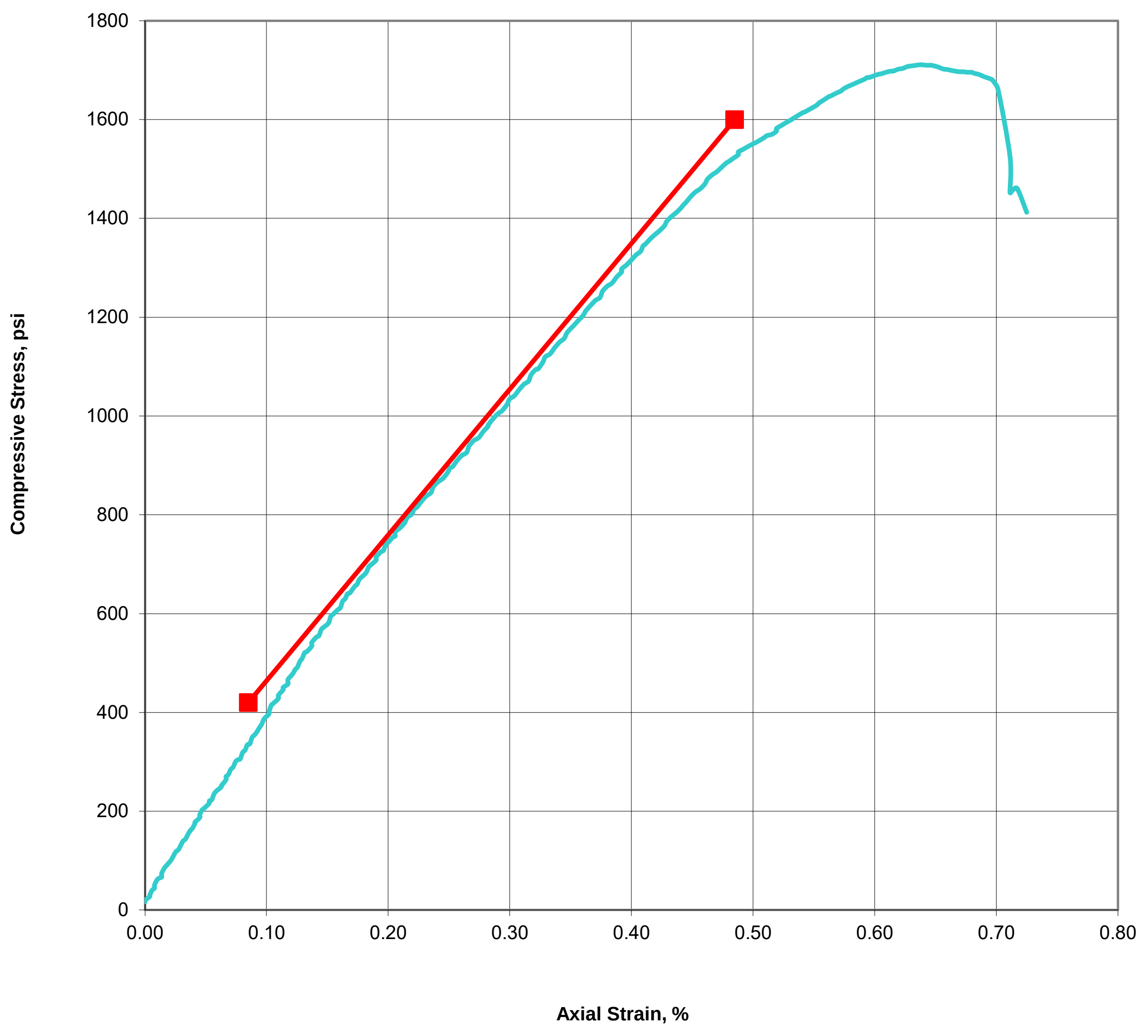


Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D7012D)

CTL Job No.: 823-008H8
Boring: B-27
Date: 9/22/2016
Client: GRI
Sample: R-5
By: PJ
Project Name: Port of Coos Bay Channel Modification Project
Depth,ft.: 23
Checked: DC
Project No.: 5128
Visual Description: Very Dark Bluish Gray Rock
Moisture Condition at Test Sample was washed and in a moist state.
Test Temperature, (^{o}C) Ambient
Remarks:

Sample Height, in.	5.10
Sample Diameter, in.	2.38
Height / Diameter	2.1
Sample Area, in^2	4.46
Wet Density, pcf	122.3
Dry Density, pcf	94.2
Moisture Content, %	29.9
Strain Rate, % / min	0.25

Unconfined Compressive Strength (psi)	**1711**
Young's Modulus (E) (psi)	**295,000**



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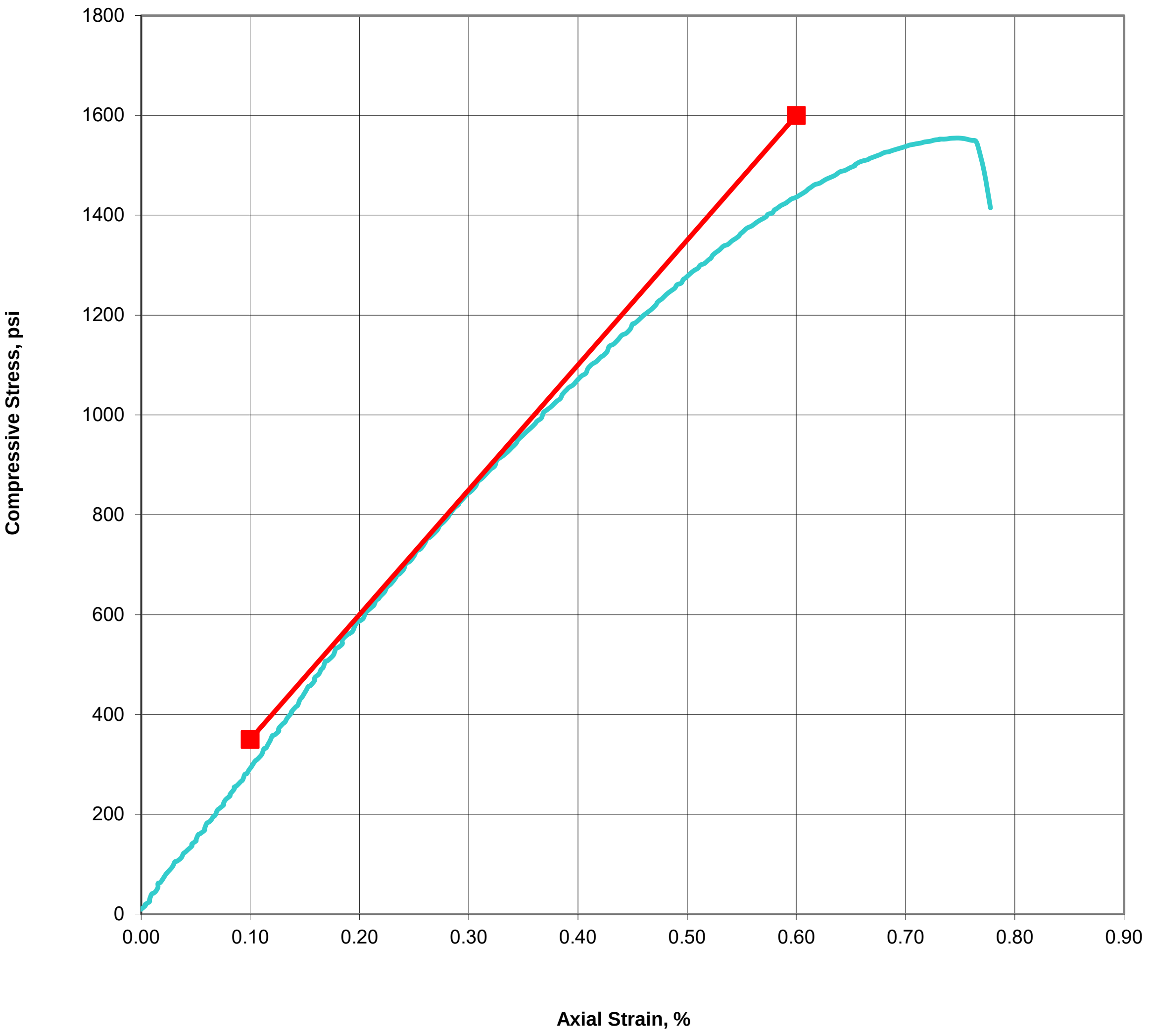
Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D7012D)

CTL Job No.: 823-008H9
Boring: B-27
Date: 9/22/2016
Client: GRI
Sample: R-5
By: PJ
Project Name: Port of Coos Bay Channel Modification Project
Depth,ft.: 25
Checked: DC
Project No.: 5128
Visual Description: Very Dark Bluish Gray Rock
Moisture Condition at Test: Sample was washed and in a moist state.
Test Temperature, (^{o}C): Ambient
Remarks:

Sample Height, in.	5.16	**Unconfined Compressive Strength (psi)**	**1555**
Sample Diameter, in.	2.37		
Height / Diameter	2.2		
Sample Area, in^2	4.40		
Wet Density, pcf	124.4	**Young's Modulus (E) (psi)**	**250,000**
Dry Density, pcf	97.5		
Moisture Content, %	27.6		
Strain Rate, % / min	0.25		



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Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D7012D)

CTL Job No.:	823-008I1	Boring:	B-28	Date:	9/22/2016
Client:	GRI	Sample:	R-1	By:	PJ
Project Name:	Port of Coos Bay Channel Modification Project	Depth,ft.:	7.5	Checked:	DC
Project No.:	5128				

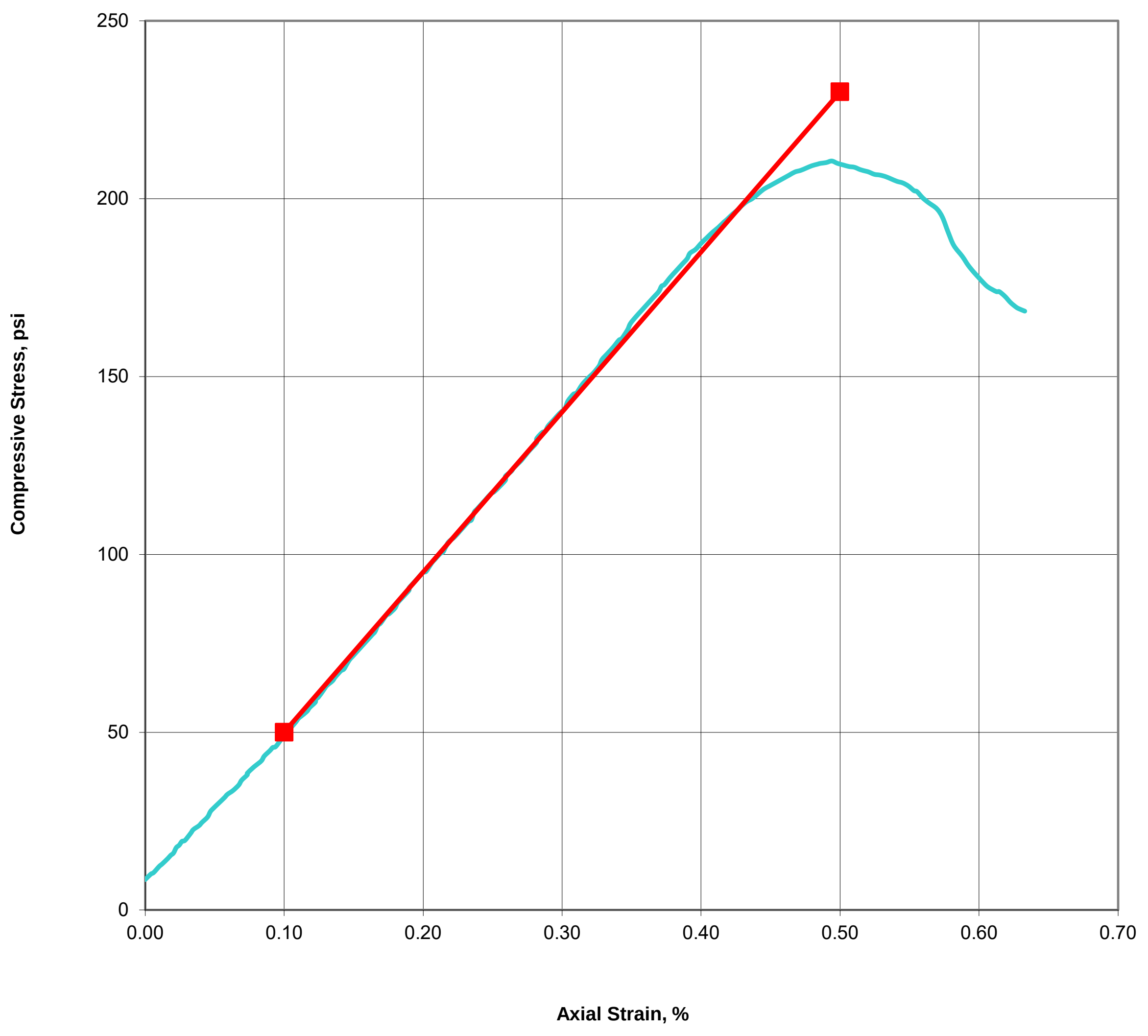
Visual Description: Very Dark Bluish Gray Rock

Moisture Condition at Test: Sample was washed and in a moist state.

Test Temperature, (^{o}C): Ambient

Remarks:

Sample Height, in.	4.90	**Unconfined Compressive Strength (psi)**	**211**
Sample Diameter, in.	2.41		
Height / Diameter	2.0		
Sample Area, in^2	4.55		
Wet Density, pcf	124.8	**Young's Modulus (E) (psi)**	**45,000**
Dry Density, pcf	100.7		
Moisture Content, %	23.9		
Strain Rate, % / min	0.25		



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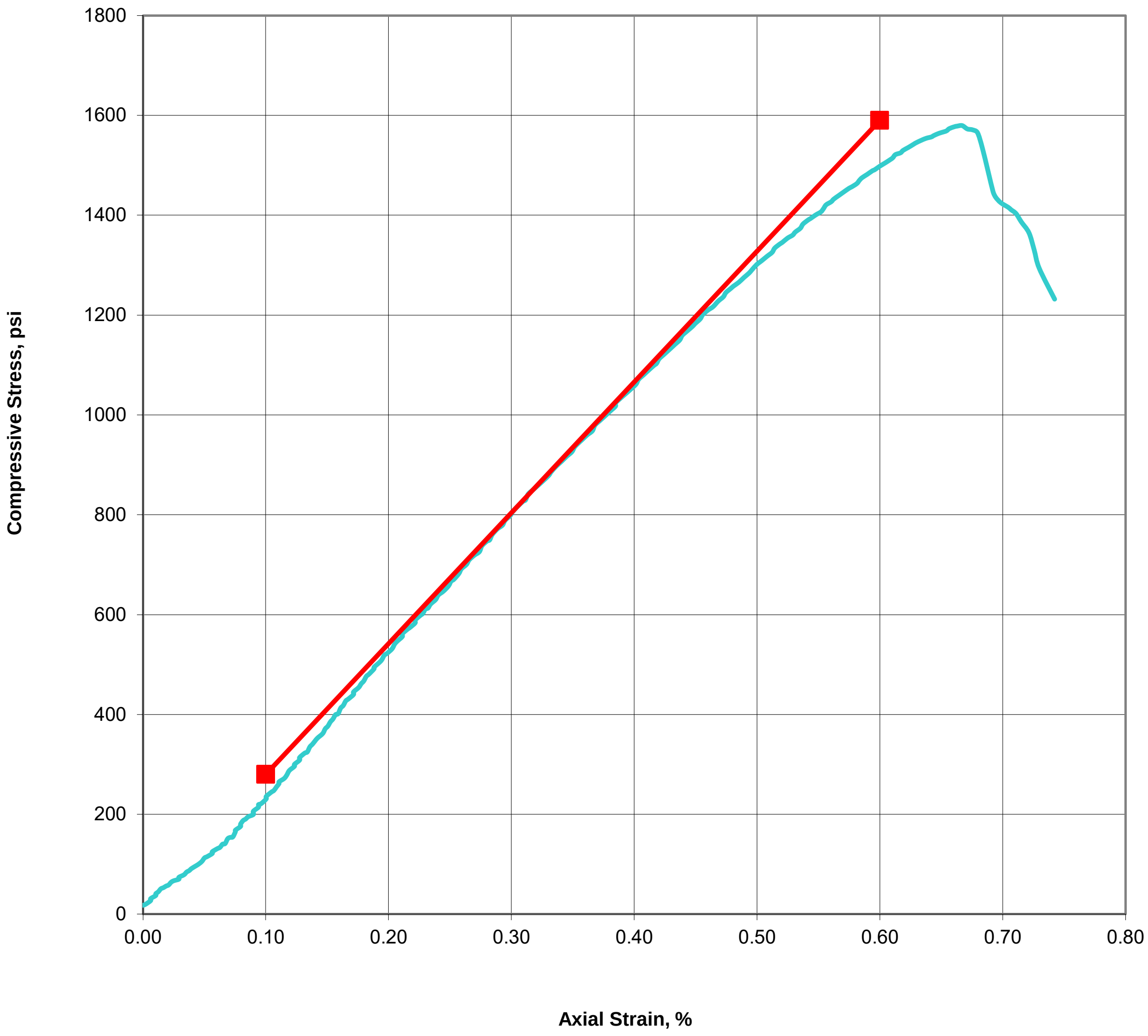
Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D7012D)

CTL Job No.: 823-008I2
Boring: B-28
Date: 9/22/2016
Client: GRI
Sample: R-1
By: PJ
Project Name: Port of Coos Bay Channel Modification Project
Depth,ft.: 10
Checked: DC
Project No.: 5128
Visual Description: Very Dark Bluish Gray Rock
Moisture Condition at Test Sample was washed and in a moist state.
Test Temperature, (^{o}C) Ambient
Remarks:

Sample Height, in.	4.78	**Unconfined Compressive Strength (psi)**	**1580**
Sample Diameter, in.	2.39		
Height / Diameter	2.0		
Sample Area, in^2	4.49		
Wet Density, pcf	123.7	**Young's Modulus (E) (psi)**	**262,000**
Dry Density, pcf	99.6		
Moisture Content, %	24.2		
Strain Rate, % / min	0.25		



Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D7012D)

CTL Job No.:	823-008I3	Boring:	B-28	Date:	9/22/2016
Client:	GRI	Sample:	R-2	By:	PJ
Project Name:	Port of Coos Bay Channel Modification Project	Depth,ft.:	12	Checked:	DC
Project No.:	5128				

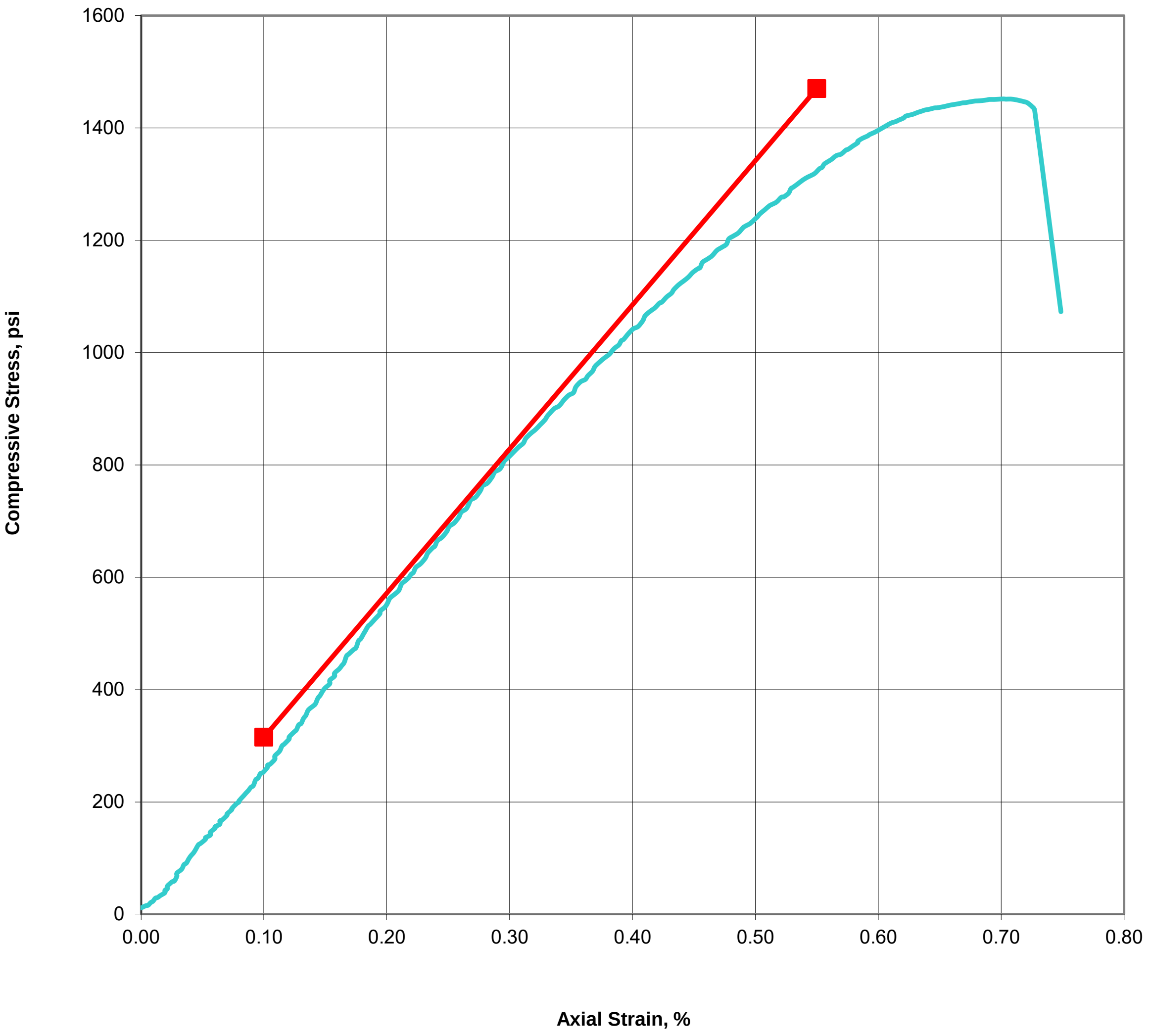
Visual Description: Very Dark Bluish Gray Rock

Moisture Condition at Test Sample was washed and in a moist state.

Test Temperature, (^{o}C) Ambient

Remarks:

Sample Height, in.	5.14	**Unconfined Compressive Strength (psi)**	**1451**
Sample Diameter, in.	2.39		
Height / Diameter	2.2		
Sample Area, in^2	4.49		
Wet Density, pcf	123.2	**Young's Modulus (E) (psi)**	**256,700**
Dry Density, pcf	96.1		
Moisture Content, %	28.2		
Strain Rate, % / min	0.25		



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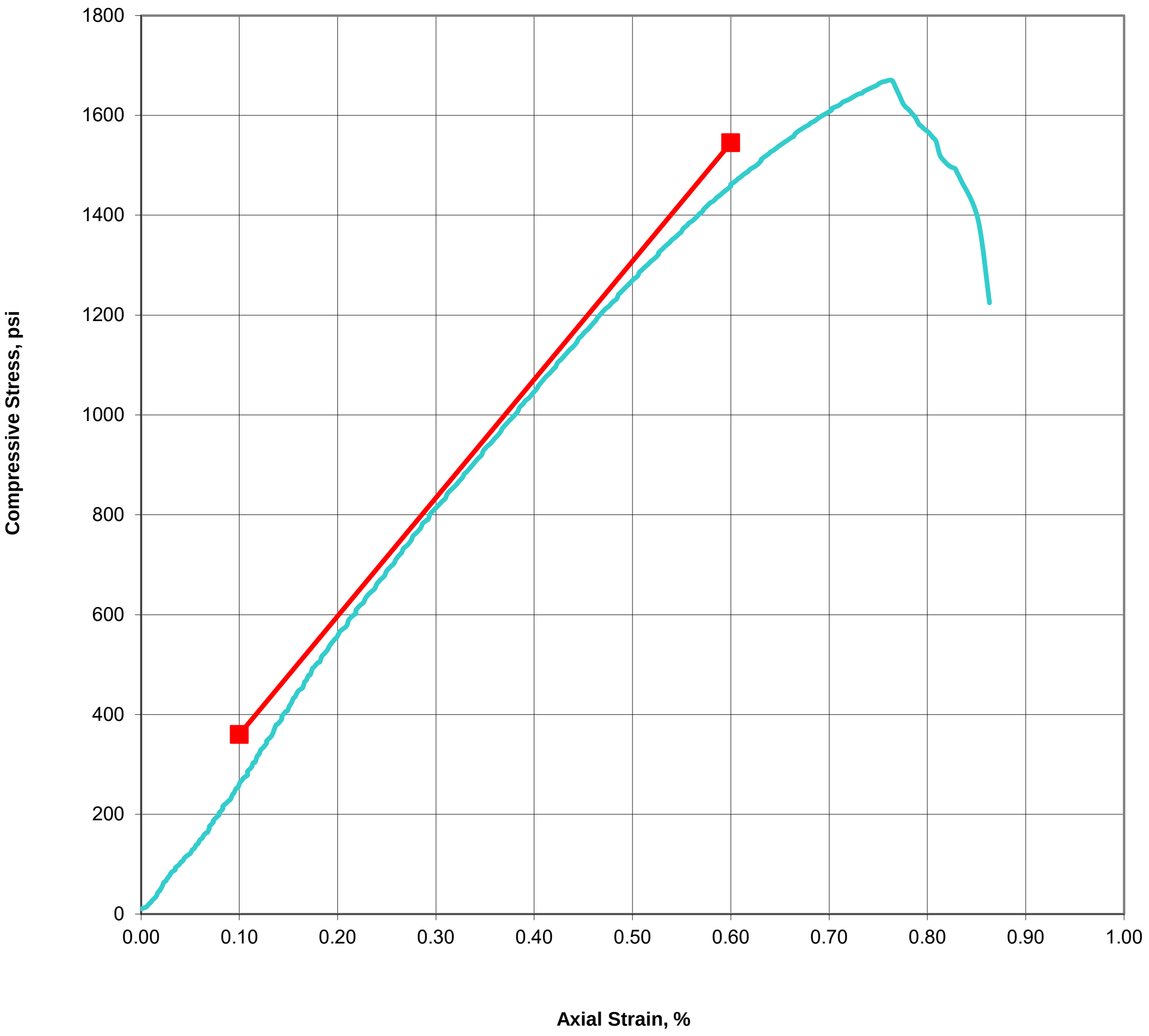
Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D7012D)

CTL Job No.: 823-008I4 Boring: B-28 Date: 9/22/2016
Client: GRI Sample: R-2 By: PJ
Project Name: Port of Coos Bay Channel Modification Project Depth,ft.: 15 Checked: DC
Project No.: 5128
Visual Description: Very Dark Bluish Gray Rock
Moisture Condition at Test Sample was washed and in a moist state.
Test Temperature, (^{o}C) Ambient
Remarks:

Sample Height, in.	5.17	**Unconfined Compressive Strength (psi)**	**1670**
Sample Diameter, in.	2.40		
Height / Diameter	2.2		
Sample Area, in^2	4.52		
Wet Density, pcf	122.8	**Young's Modulus (E) (psi)**	**237,000**
Dry Density, pcf	98.3		
Moisture Content, %	24.9		
Strain Rate, % / min	0.25		



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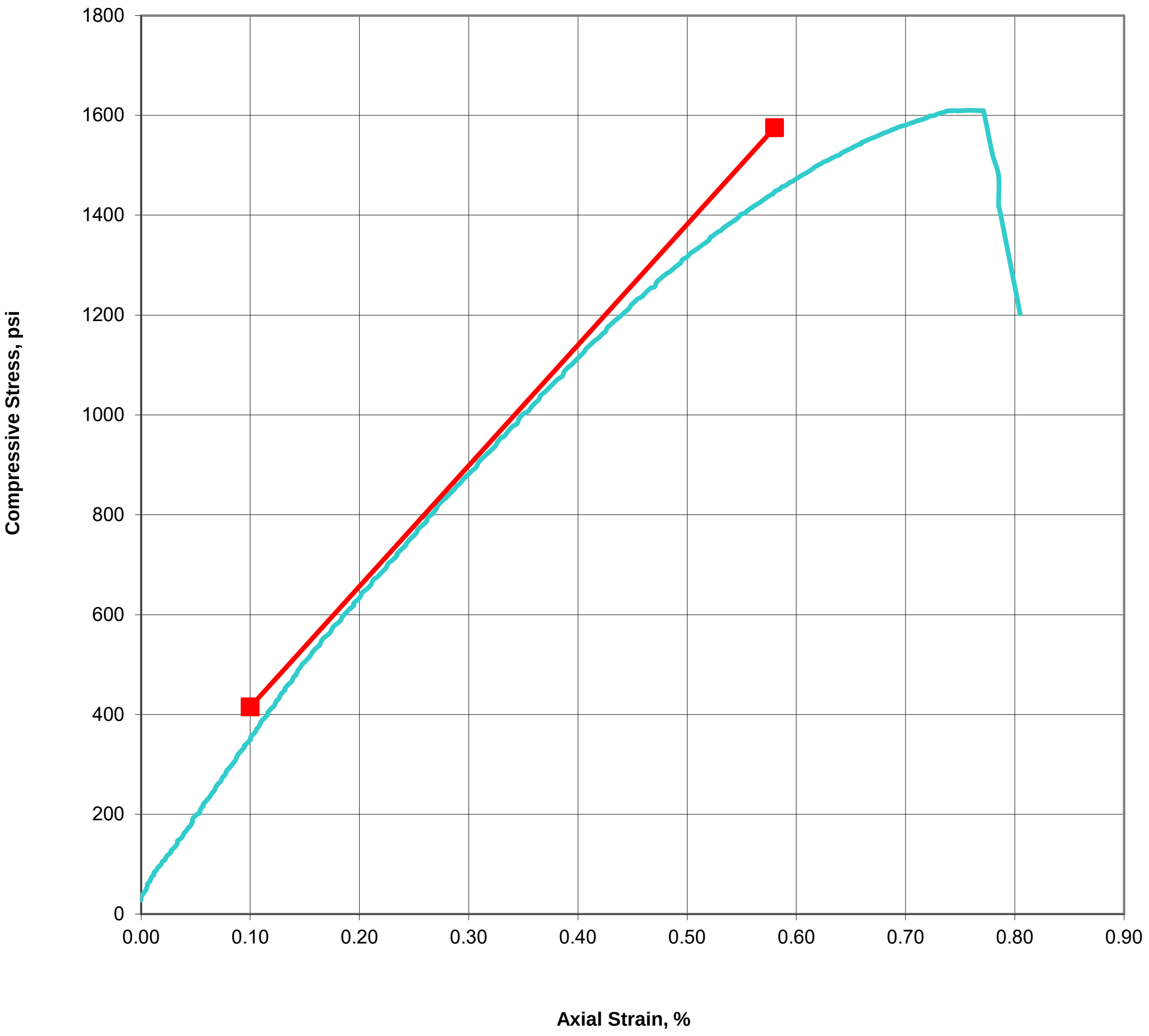
Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D7012D)

CTL Job No.:	823-008I5	Boring:	B-28	Date:	9/22/2016
Client:	GRI	Sample:	R-3	By:	PJ
Project Name:	Port of Coos Bay Channel Modification Project	Depth,ft.:	17	Checked:	DC
Project No.:	5128				

Visual Description: Very Dark Bluish Gray Rock
Moisture Condition at Test Sample was washed and in a moist state.
Test Temperature, (^{o}C) Ambient
Remarks:

Sample Height, in.	5.08
Sample Diameter, in.	2.37
Height / Diameter	2.1
Sample Area, in^2	4.42
Wet Density, pcf	123.7
Dry Density, pcf	98.3
Moisture Content, %	25.9
Strain Rate, % / min	0.25

Unconfined Compressive Strength (psi)	**1610**
Young's Modulus (E) (psi)	**241,700**



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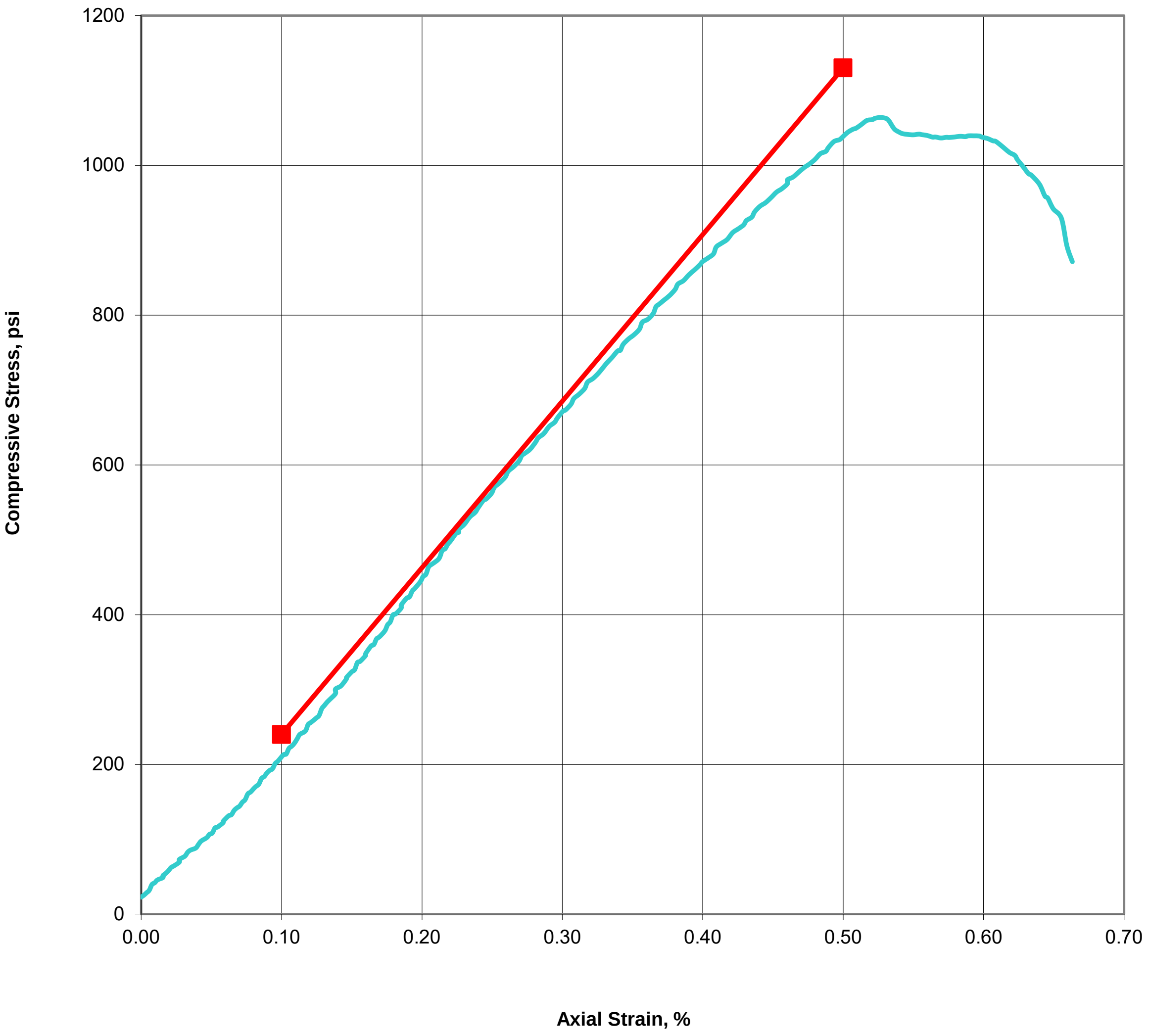
Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D7012D)

CTL Job No.: 823-008I6
Boring: B-28
Date: 9/22/2016
Client: GRI
Sample: R-3
By: PJ
Project Name: Port of Coos Bay Channel Modification Project
Depth,ft.: 19
Checked: DC
Project No.: 5128
Visual Description: Very Dark Bluish Gray Rock
Moisture Condition at Test Sample was washed and in a moist state.
Test Temperature, (^{o}C) Ambient
Remarks:

Sample Height, in.	5.13
Sample Diameter, in.	2.39
Height / Diameter	2.1
Sample Area, in^2	4.48
Wet Density, pcf	123.7
Dry Density, pcf	98.2
Moisture Content, %	26.0
Strain Rate, % / min	0.25

Unconfined Compressive Strength (psi)	**1064**
Young's Modulus (E) (psi)	**222,500**



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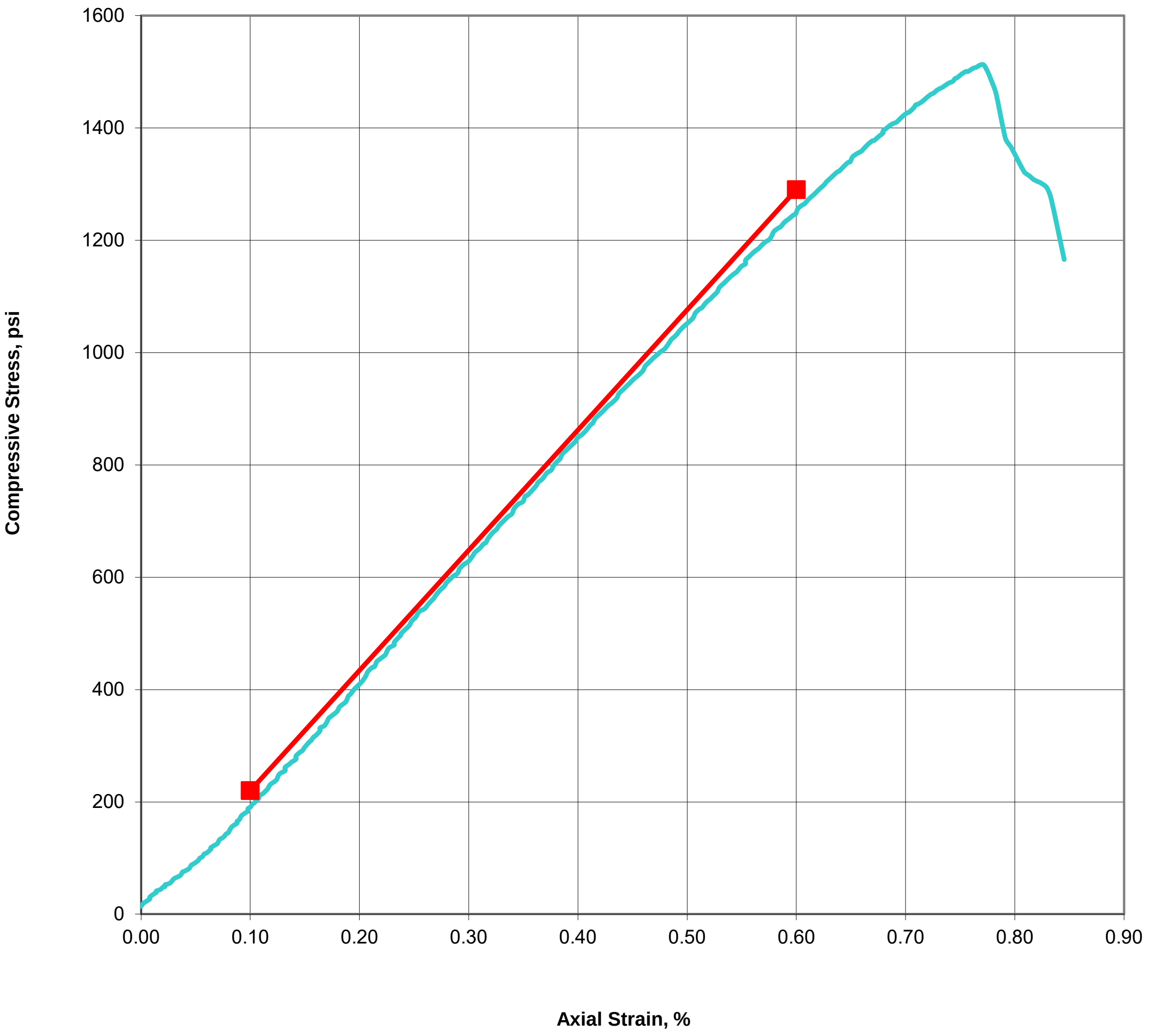
Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D7012D)

CTL Job No.: 823-008J4
Boring: B-29
Date: 9/22/2016
Client: GRI
Sample: R-3
By: PJ
Project Name: Port of Coos Bay Channel Modification Project
Depth,ft.: 12
Checked: DC
Project No.: 5128
Visual Description: Very Dark Bluish Gray Rock
Moisture Condition at Test Sample was washed and in a moist state.
Test Temperature, (^{o}C) Ambient
Remarks:

Sample Height, in.	5.00	**Unconfined Compressive Strength (psi)**	**1512**
Sample Diameter, in.	2.34		
Height / Diameter	2.1		
Sample Area, in^2	4.29		
Wet Density, pcf	123.6	**Young's Modulus (E) (psi)**	**214,000**
Dry Density, pcf	98.6		
Moisture Content, %	25.4		
Strain Rate, % / min	0.25		



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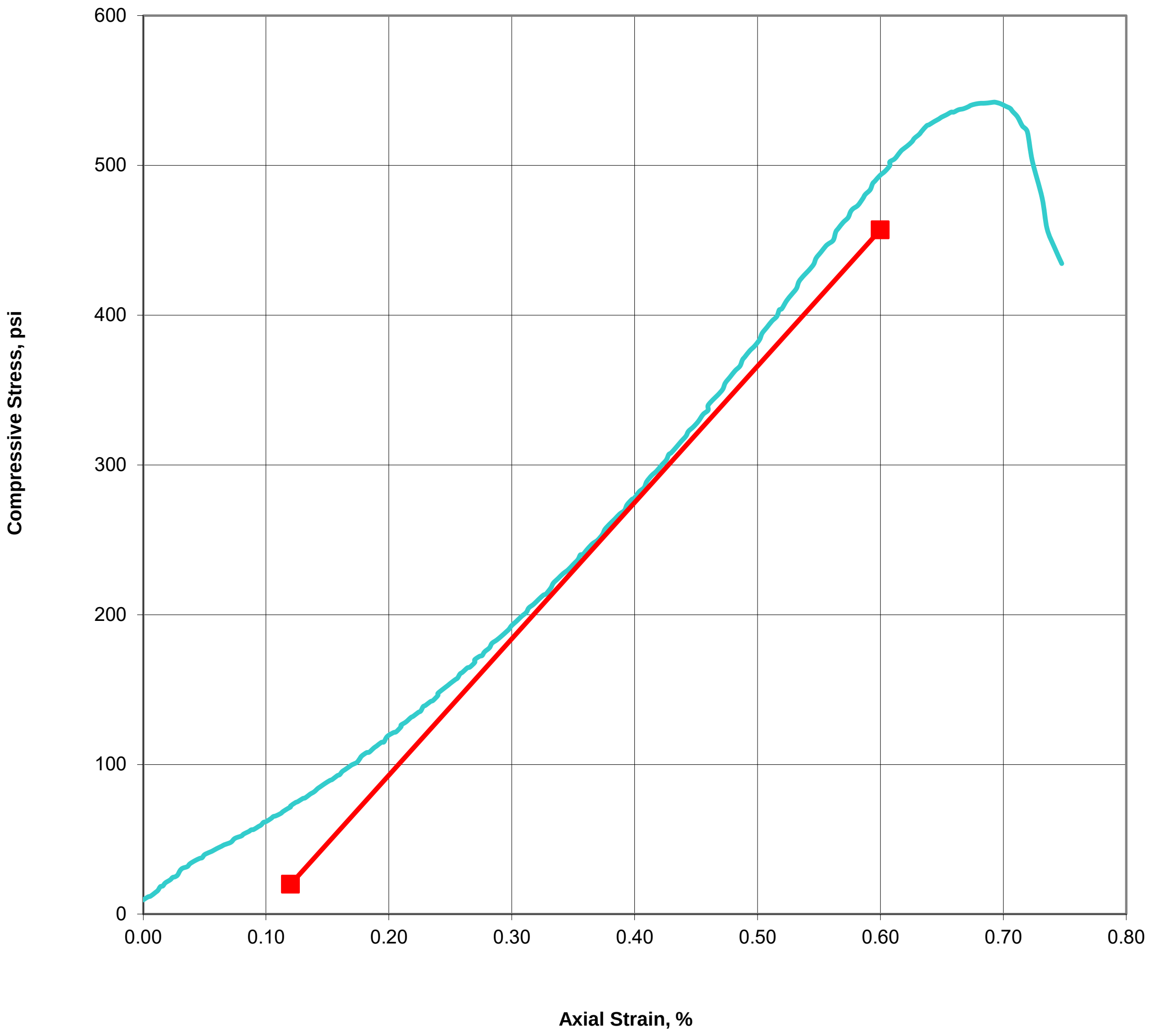
Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D7012D)

CTL Job No.: 823-008K1
Boring: B-30
Date: 9/22/2016
Client: GRI
Sample: R-1
By: PJ
Project Name: Port of Coos Bay Channel Modification Project
Depth,ft.: 12
Checked: DC
Project No.: 5128
Visual Description: Very Dark Bluish Gray Rock
Moisture Condition at Test Sample was washed and in a moist state.
Test Temperature, (^oC) Ambient
Remarks:

Sample Height, in.	5.00	**Unconfined Compressive Strength (psi)**	**542**
Sample Diameter, in.	2.37		
Height / Diameter	2.1		
Sample Area, in^2	4.40		
Wet Density, pcf	131.8	**Young's Modulus (E) (psi)**	**91,000**
Dry Density, pcf	110.4		
Moisture Content, %	19.4		
Strain Rate, % / min	0.25		



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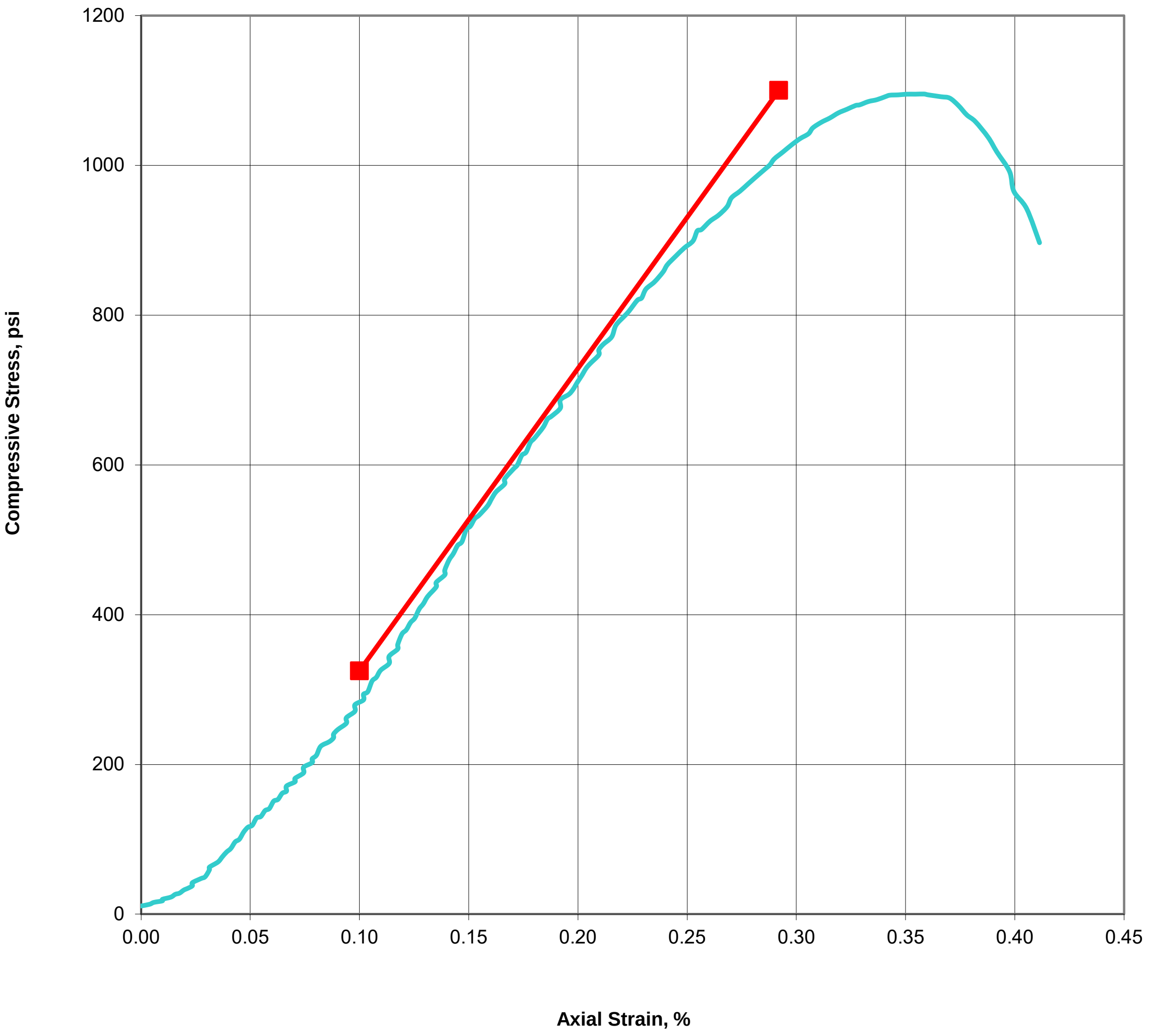
Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D7012D)

CTL Job No.: 823-008K2 Boring: B-30 Date: 9/22/2016
Client: GRI Sample: R-1 By: PJ
Project Name: Port of Coos Bay Channel Modification Project Depth,ft.: 14.5 Checked: DC
Project No.: 5128
Visual Description: Very Dark Bluish Gray Rock
Moisture Condition at Test Sample was washed and in a moist state.
Test Temperature, (^{o}C) Ambient
Remarks:

Sample Height, in.	5.11	**Unconfined Compressive Strength (psi)**	**1095**
Sample Diameter, in.	2.36		
Height / Diameter	2.2		
Sample Area, in^2	4.37		
Wet Density, pcf	147.3	**Young's Modulus (E) (psi)**	**403,600**
Dry Density, pcf	126.5		
Moisture Content, %	16.4		
Strain Rate, % / min	0.25		



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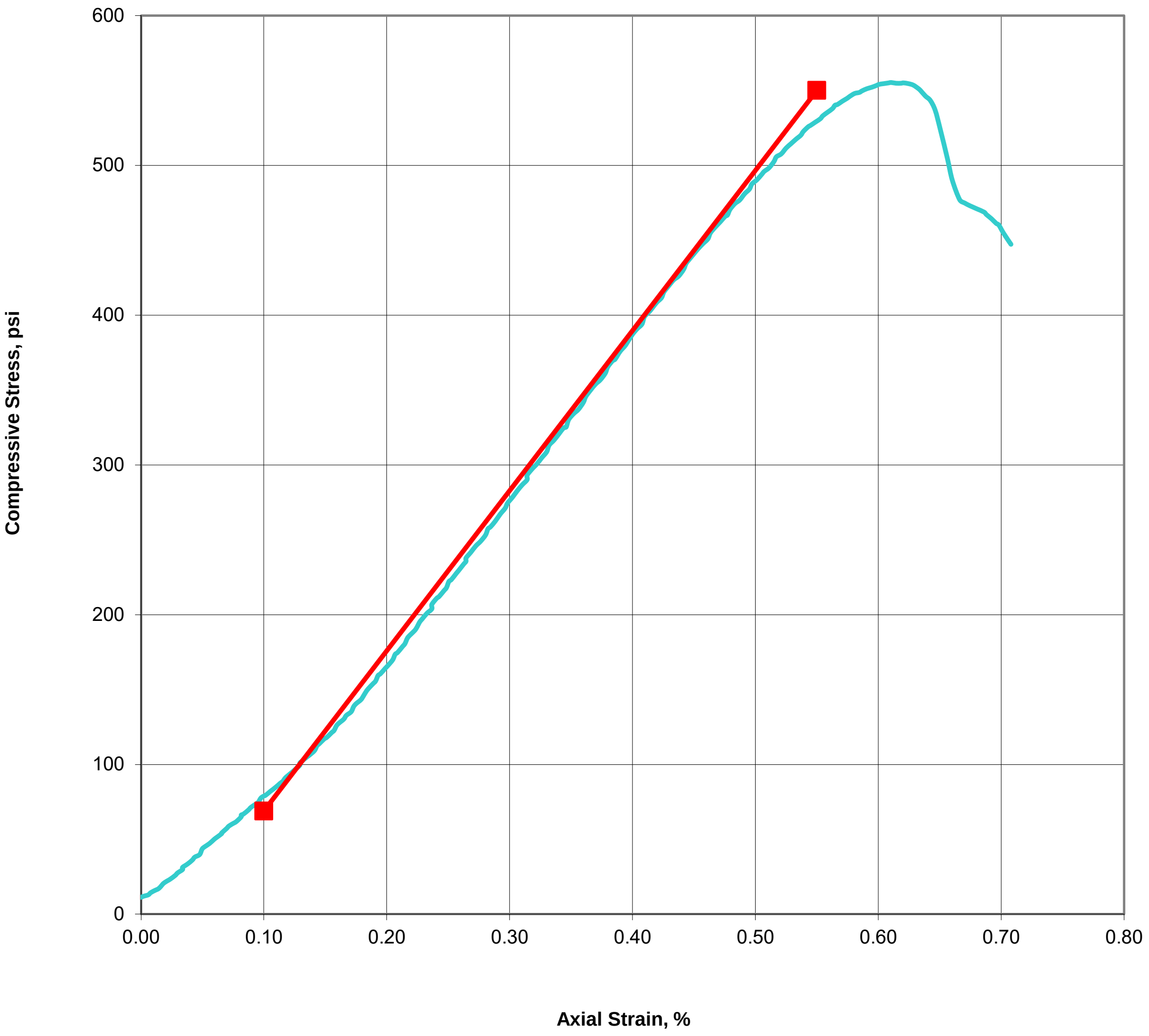
Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D7012D)

CTL Job No.: 823-008K3
Boring: B-30
Date: 9/22/2016
Client: GRI
Sample: R-2
By: PJ
Project Name: Port of Coos Bay Channel Modification Project
Depth,ft.: 17.75
Checked: DC
Project No.: 5128
Visual Description: Very Dark Bluish Gray Rock
Moisture Condition at Test: Sample was washed and in a moist state.
Test Temperature, (°C): Ambient
Remarks:

Sample Height, in.	5.03
Sample Diameter, in.	2.28
Height / Diameter	2.2
Sample Area, in^2	4.09
Wet Density, pcf	133.8
Dry Density, pcf	112.1
Moisture Content, %	19.4
Strain Rate, % / min	0.25

Unconfined Compressive Strength (psi)	**555**
Young's Modulus (E) (psi)	**106,900**



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Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D7012D)

CTL Job No.:	823-008K4	Boring:	B-30	Date:	9/22/2016
Client:	GRI	Sample:	R-3	By:	PJ
Project Name:	Port of Coos Bay Channel Modification Project	Depth,ft.:	22	Checked:	DC
Project No.:	5128				

Visual Description: Very Dark Bluish Gray Rock

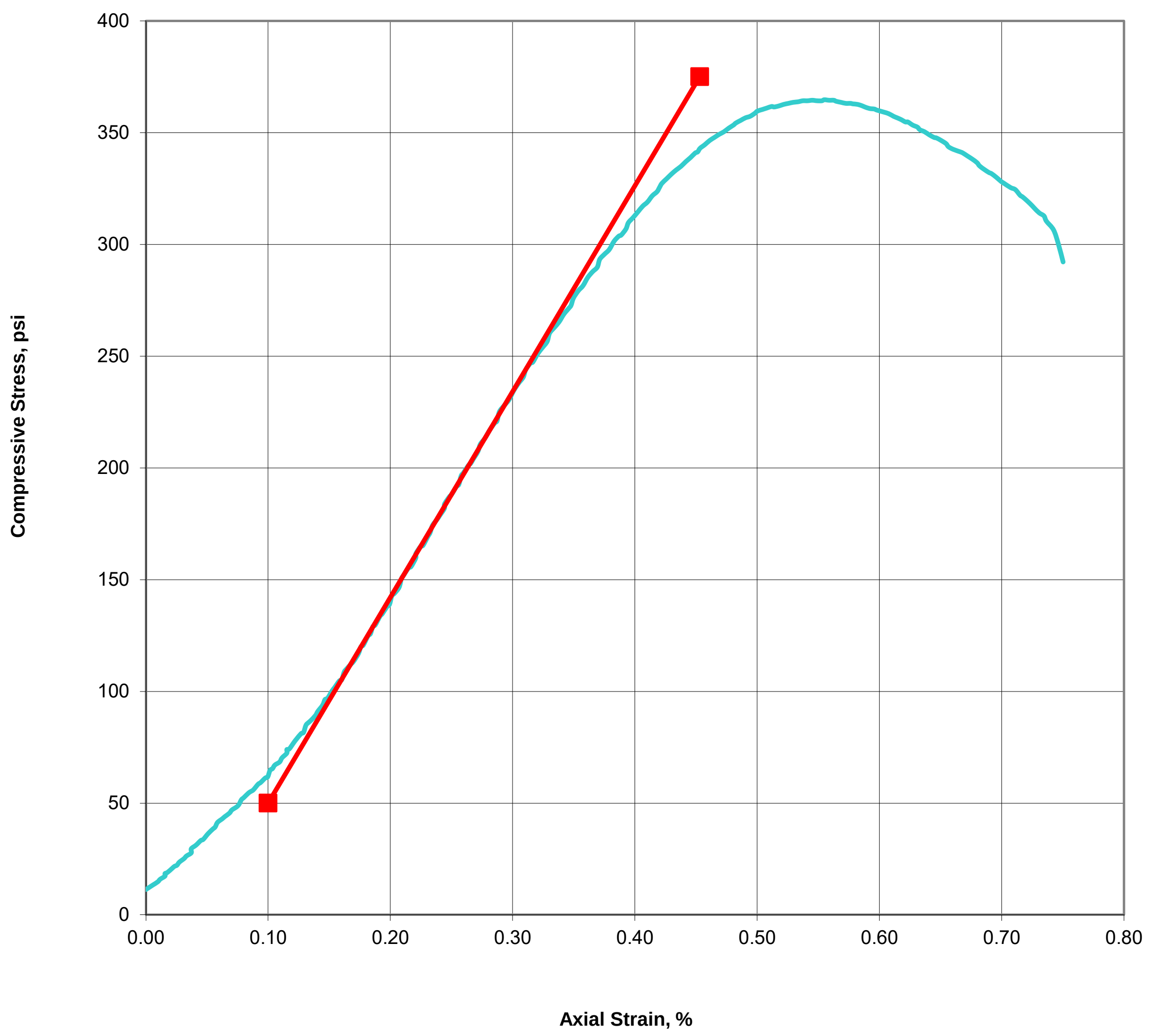
Moisture Condition at Test Sample was washed and in a moist state.

Test Temperature, (^oC) Ambient

Remarks:

Sample Height, in.	5.12
Sample Diameter, in.	2.35
Height / Diameter	2.2
Sample Area, in^2	4.33
Wet Density, pcf	131.7
Dry Density, pcf	110.6
Moisture Content, %	19.1
Strain Rate, % / min	0.25

Unconfined Compressive Strength (psi)	**365**
Young's Modulus (E) (psi)	**92,100**



Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D7012D)

CTL Job No.:	823-008K5	Boring:	B-30	Date:	9/22/2016
Client:	GRI	Sample:	R-3	By:	PJ
Project Name:	Port of Coos Bay Channel Modification Project	Depth,ft.:	25	Checked:	DC
Project No.:	5128				

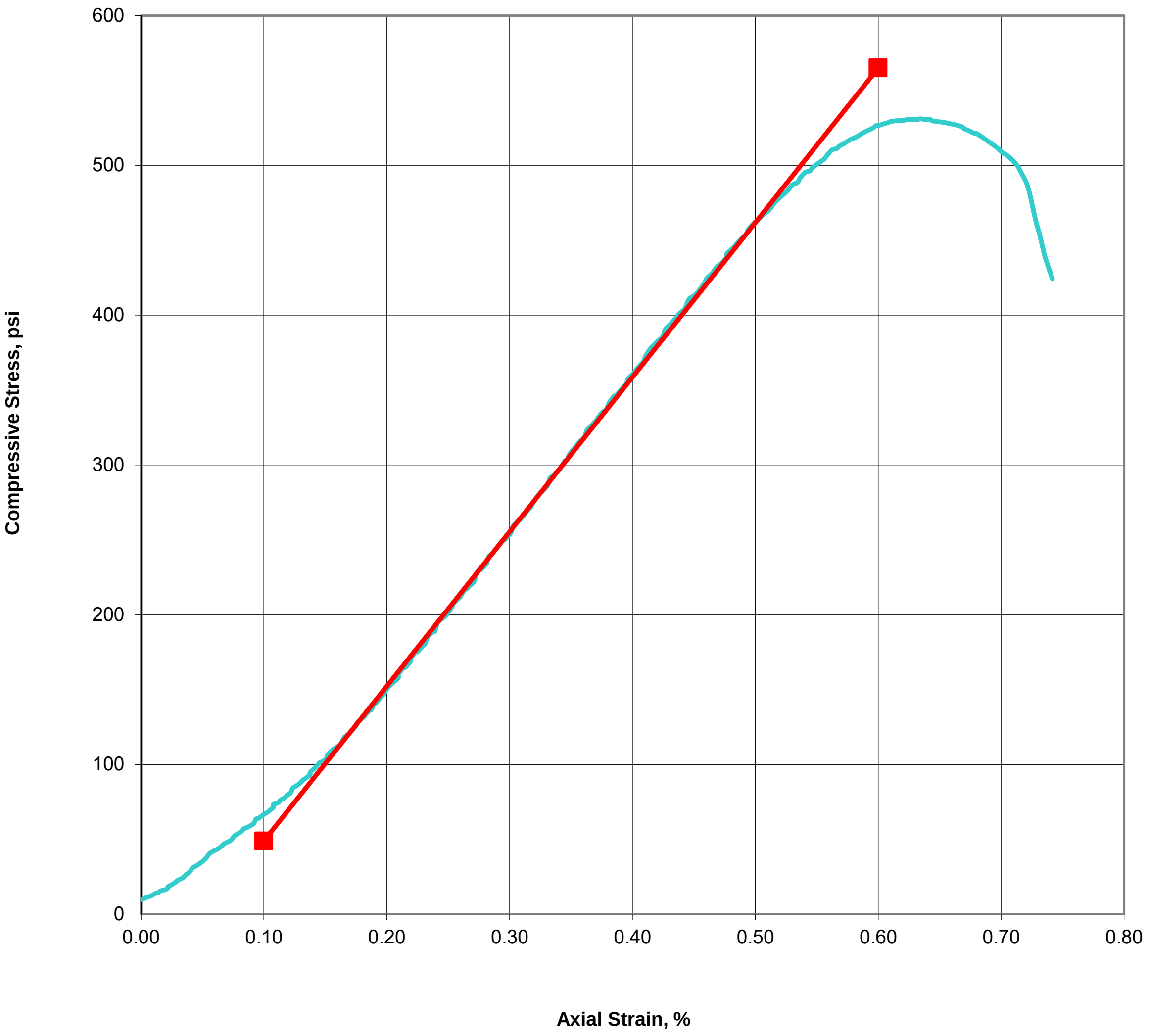
Visual Description: Very Dark Bluish Gray Rock

Moisture Condition at Test Sample was washed and in a moist state.

Test Temperature, (^{o}C) Ambient

Remarks:

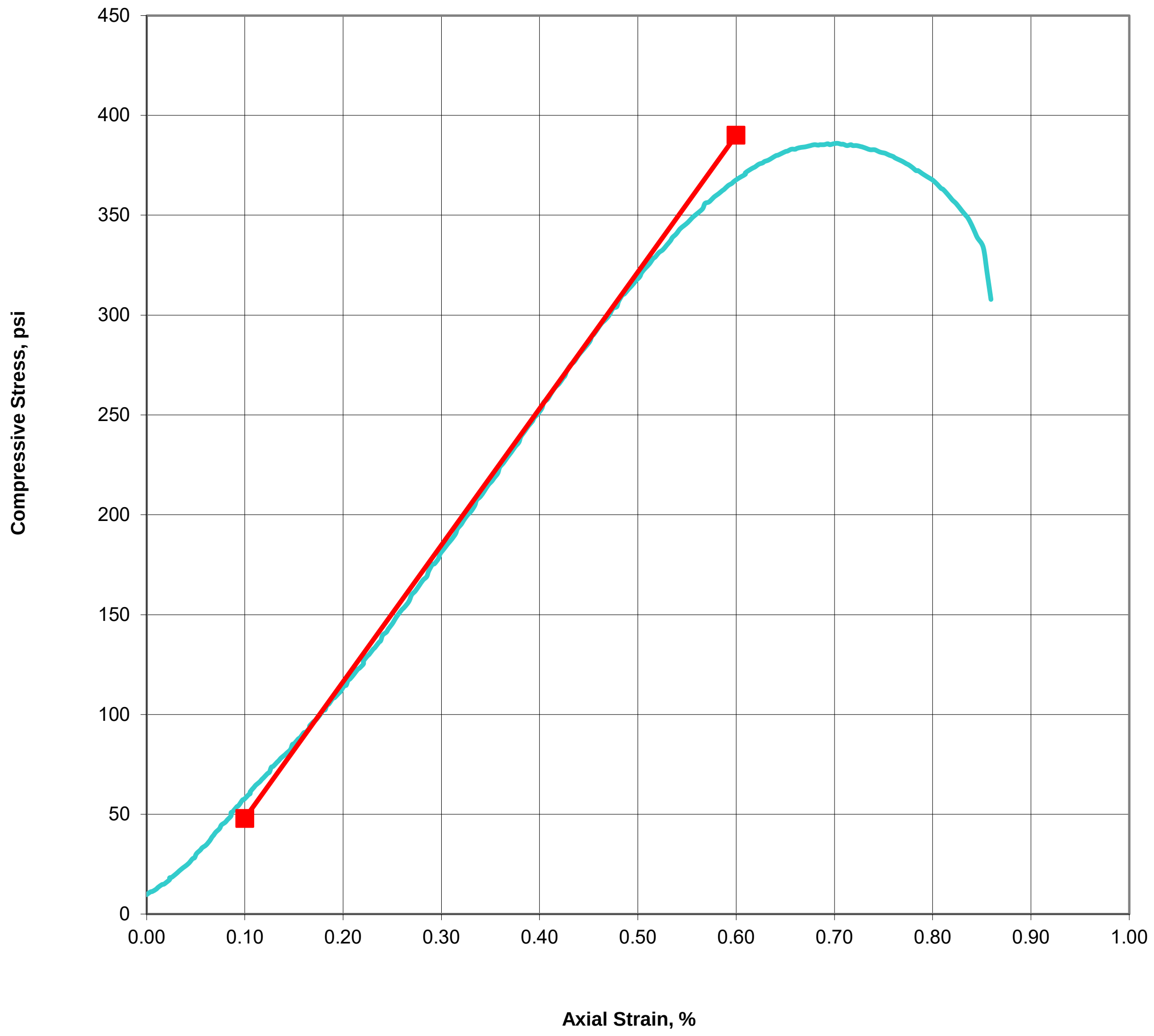
Sample Height, in.	5.02	**Unconfined Compressive Strength (psi)**	**531**
Sample Diameter, in.	2.36		
Height / Diameter	2.1		
Sample Area, in^2	4.37		
Wet Density, pcf	133.8	**Young's Modulus (E) (psi)**	**103,200**
Dry Density, pcf	113.5		
Moisture Content, %	18.0		
Strain Rate, % / min	0.25		



Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D7012D)

CTL Job No.: 823-008K6
Boring: B-30
Date: 9/22/2016
Client: GRI
Sample: R-4
By: PJ
Project Name: Port of Coos Bay Channel Modification Project
Depth,ft.: 28
Checked: DC
Project No.: 5128
Visual Description: Very Dark Bluish Gray Rock
Moisture Condition at Test Sample was washed and in a moist state.
Test Temperature, (^{o}C) Ambient
Remarks:

Sample Height, in.	5.12	**Unconfined Compressive Strength (psi)**	**386**
Sample Diameter, in.	2.36		
Height / Diameter	2.2		
Sample Area, in^2	4.39		
Wet Density, pcf	133.5	**Young's Modulus (E) (psi)**	**68,400**
Dry Density, pcf	113.4		
Moisture Content, %	17.7		
Strain Rate, % / min	0.25		



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Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D7012D)

CTL Job No.:	823-008K7	Boring:	B-30	Date:	9/22/2016
Client:	GRI	Sample:	R-4	By:	PJ
Project Name:	Port of Coos Bay Channel Modification Project	Depth,ft.:	30	Checked:	DC
Project No.:	5128				

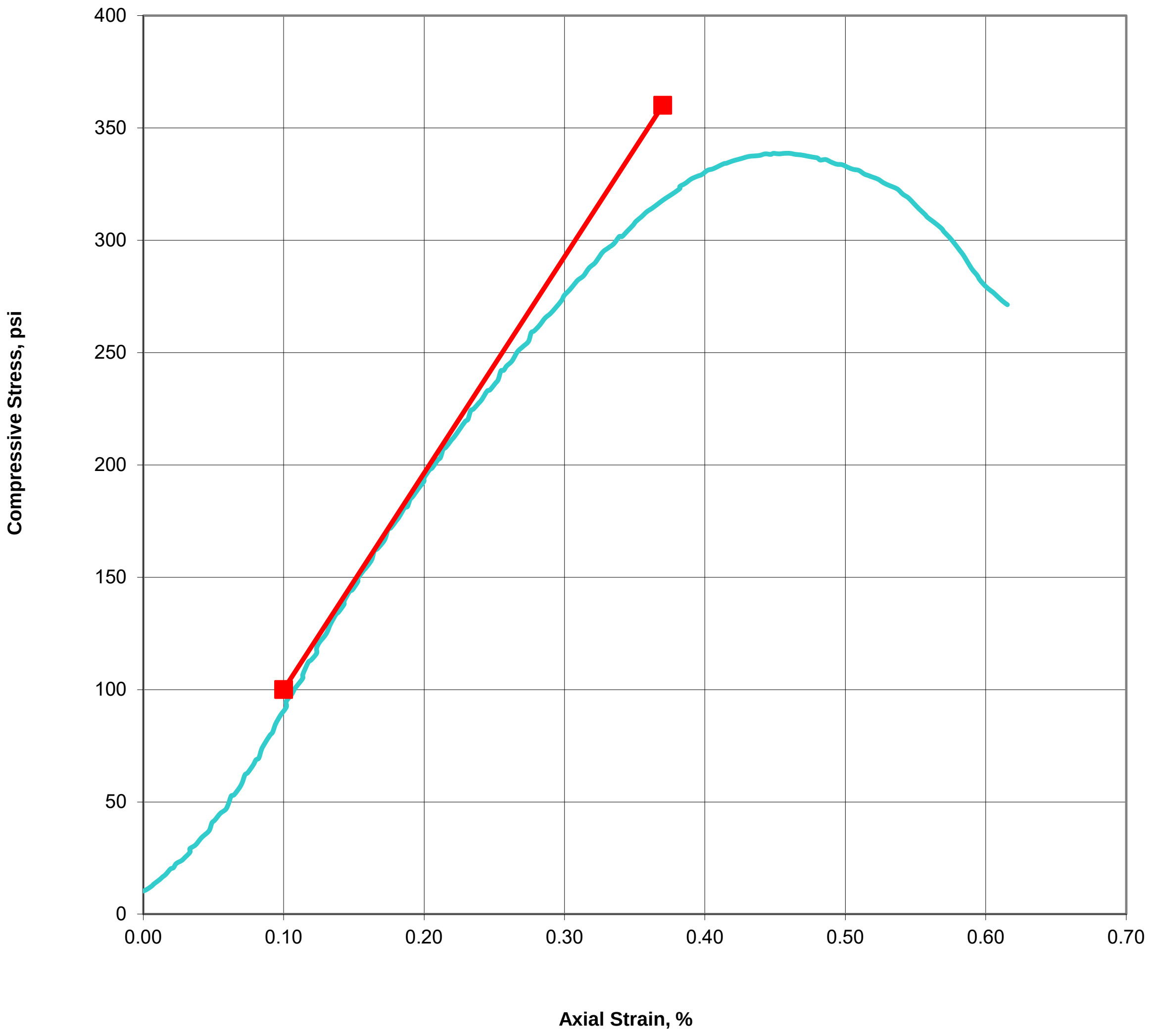
Visual Description: Very Dark Bluish Gray Rock

Moisture Condition at Test Sample was washed and in a moist state.

Test Temperature, (^{o}C) Ambient

Remarks:

Sample Height, in.	5.10	**Unconfined Compressive Strength (psi)**	**339**
Sample Diameter, in.	2.35		
Height / Diameter	2.2		
Sample Area, in^2	4.35		
Wet Density, pcf	131.6	**Young's Modulus (E) (psi)**	**96,300**
Dry Density, pcf	112.6		
Moisture Content, %	16.9		
Strain Rate, % / min	0.25		



Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D7012D)

CTL Job No.:	823-008L1	Boring:	B-31	Date:	9/22/2016
Client:	GRI	Sample:	R-1	By:	PJ
Project Name:	Port of Coos Bay Channel Modification Project	Depth,ft.:	4	Checked:	DC
Project No.:	5128				

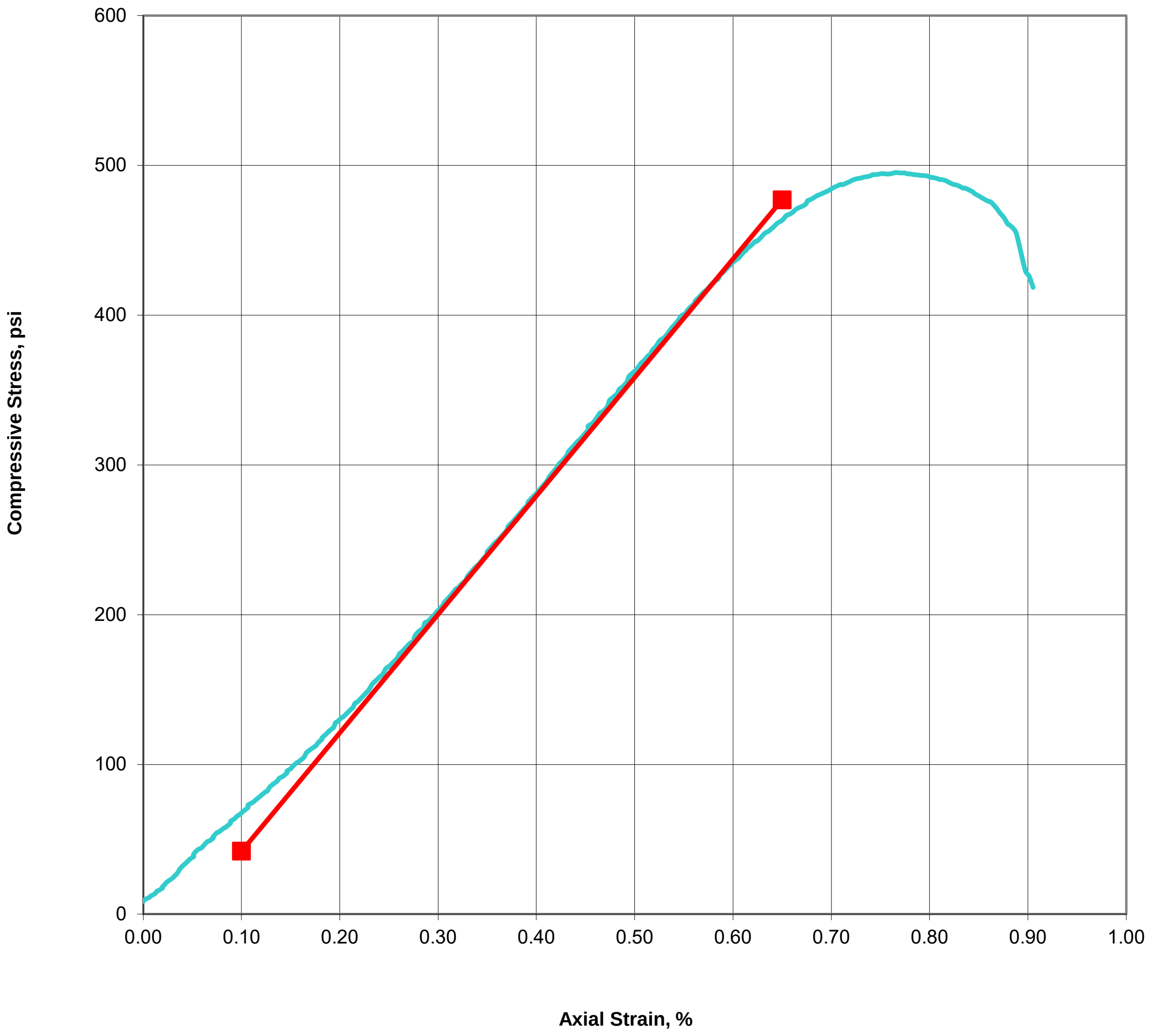
Visual Description: Very Dark Bluish Gray Rock

Moisture Condition at Test Sample was washed and in a moist state.

Test Temperature, (^{o}C) Ambient

Remarks:

Sample Height, in.	5.06	**Unconfined Compressive Strength (psi)**	**495**
Sample Diameter, in.	2.35		
Height / Diameter	2.2		
Sample Area, in^2	4.33		
Wet Density, pcf	132.4	**Young's Modulus (E) (psi)**	**79,100**
Dry Density, pcf	110.6		
Moisture Content, %	19.7		
Strain Rate, % / min	0.25		



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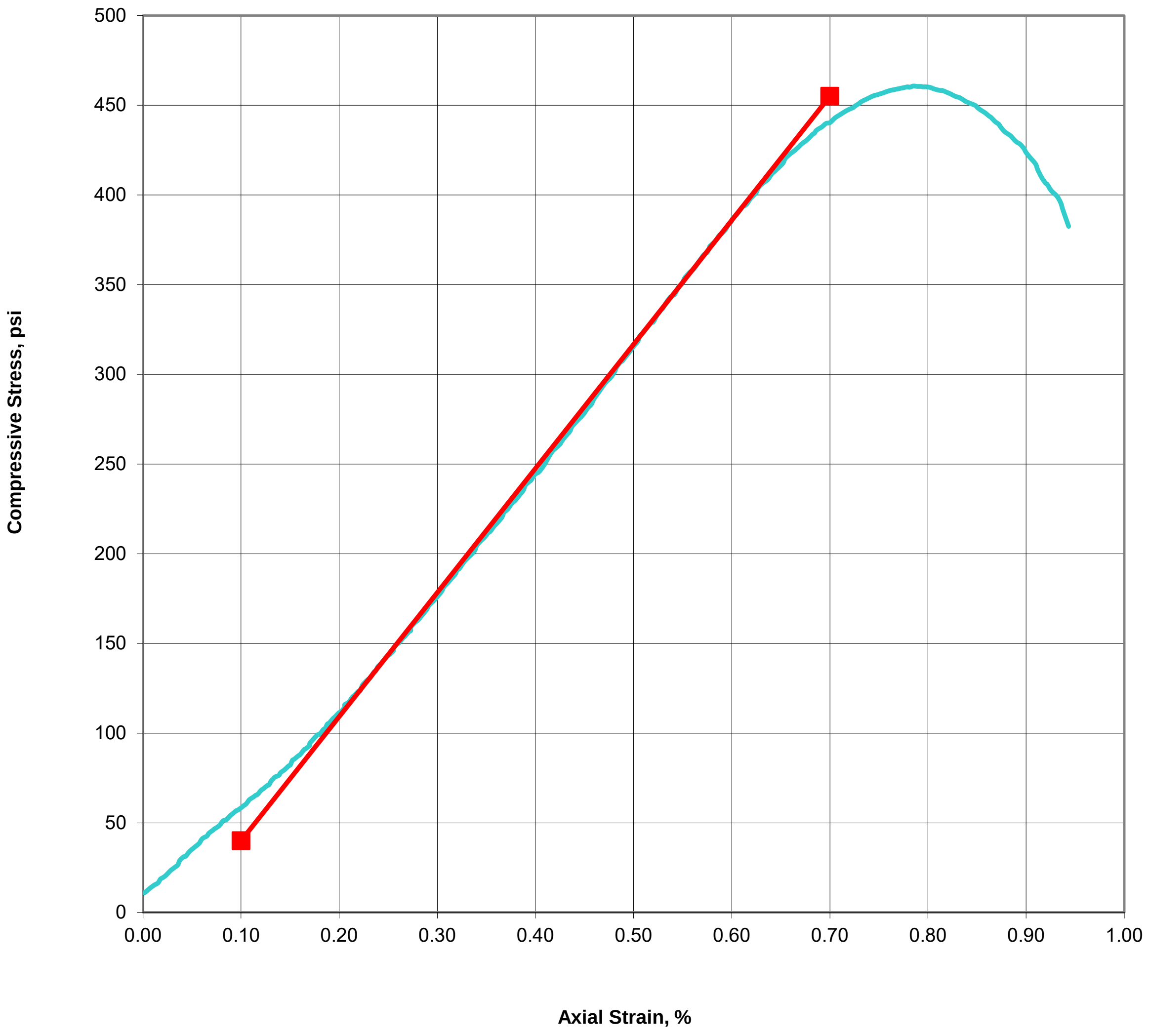
Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D7012D)

CTL Job No.:	823-008L2	Boring:	B-31	Date:	9/22/2016
Client:	GRI	Sample:	R-1	By:	PJ
Project Name:	Port of Coos Bay Channel Modification Project	Depth,ft.:	7	Checked:	DC
Project No.:	5128				

Visual Description: Very Dark Bluish Gray Rock
Moisture Condition at Test Sample was washed and in a moist state.
Test Temperature, (^{o}C) Ambient
Remarks:

Sample Height, in.	5.06	**Unconfined Compressive Strength (psi)**	**461**
Sample Diameter, in.	2.37		
Height / Diameter	2.1		
Sample Area, in^2	4.41		
Wet Density, pcf	131.1	**Young's Modulus (E) (psi)**	**69,200**
Dry Density, pcf	109.9		
Moisture Content, %	19.3		
Strain Rate, % / min	0.25		



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Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D7012D)

CTL Job No.:	823-008L3	Boring:	B-31	Date:	9/22/2016
Client:	GRI	Sample:	R-2	By:	PJ
Project Name:	Port of Coos Bay Channel Modification Project	Depth,ft.:	10	Checked:	DC
Project No.:	5128				

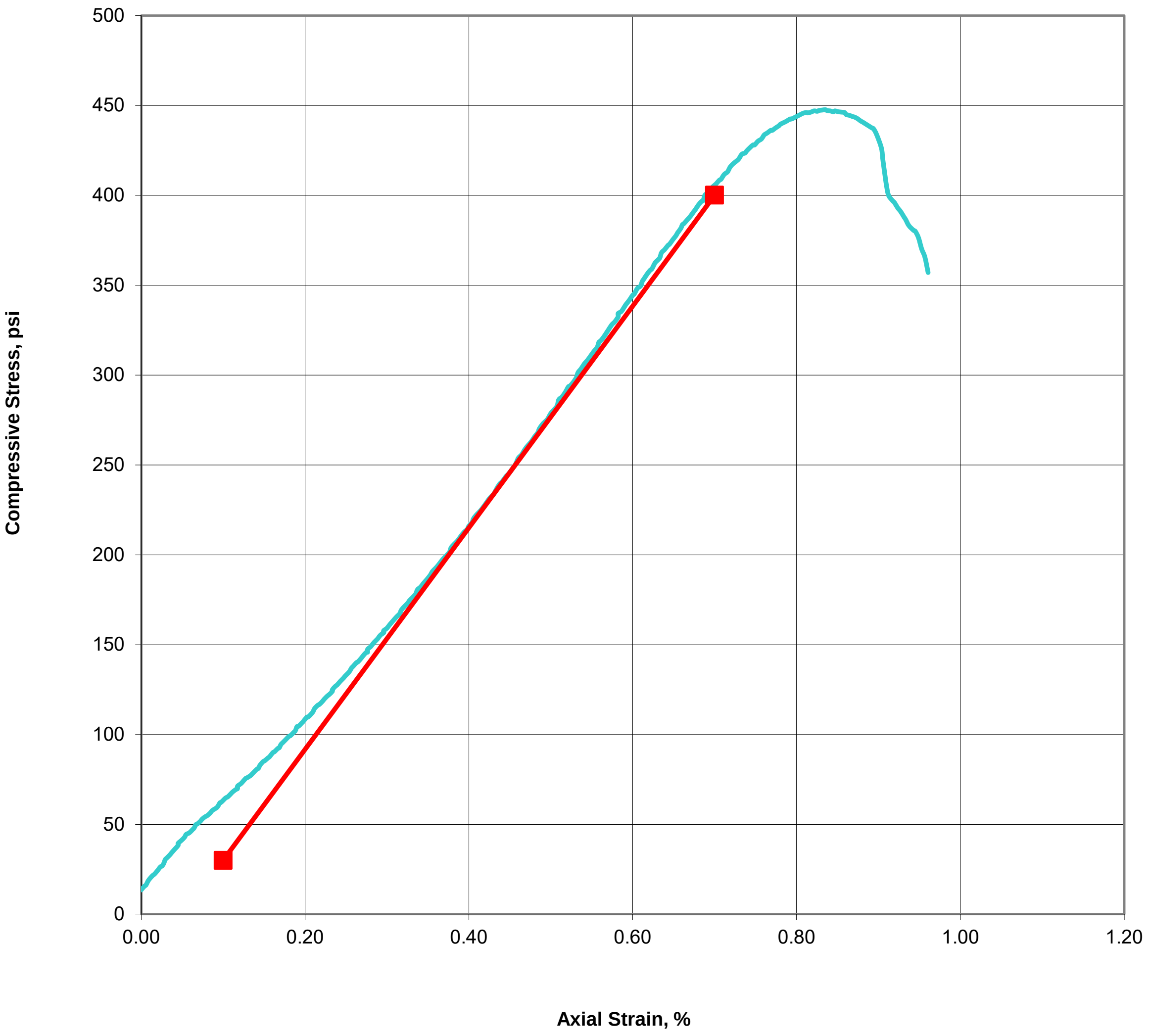
Visual Description: Very Dark Bluish Gray Rock

Moisture Condition at Test: Sample was washed and in a moist state.

Test Temperature, (^oC): Ambient

Remarks:

Sample Height, in.	5.10	**Unconfined Compressive Strength (psi)**	**448**
Sample Diameter, in.	2.38		
Height / Diameter	2.1		
Sample Area, in^2	4.44		
Wet Density, pcf	130.8	**Young's Modulus (E) (psi)**	**61,700**
Dry Density, pcf	108.5		
Moisture Content, %	20.6		
Strain Rate, % / min	0.25		



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Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D7012D)

CTL Job No.:	823-008L4	Boring:	B-31	Date:	9/22/2016
Client:	GRI	Sample:	R-3	By:	PJ
Project Name:	Port of Coos Bay Channel Modification Project	Depth,ft.:	14	Checked:	DC
Project No.:	5128				

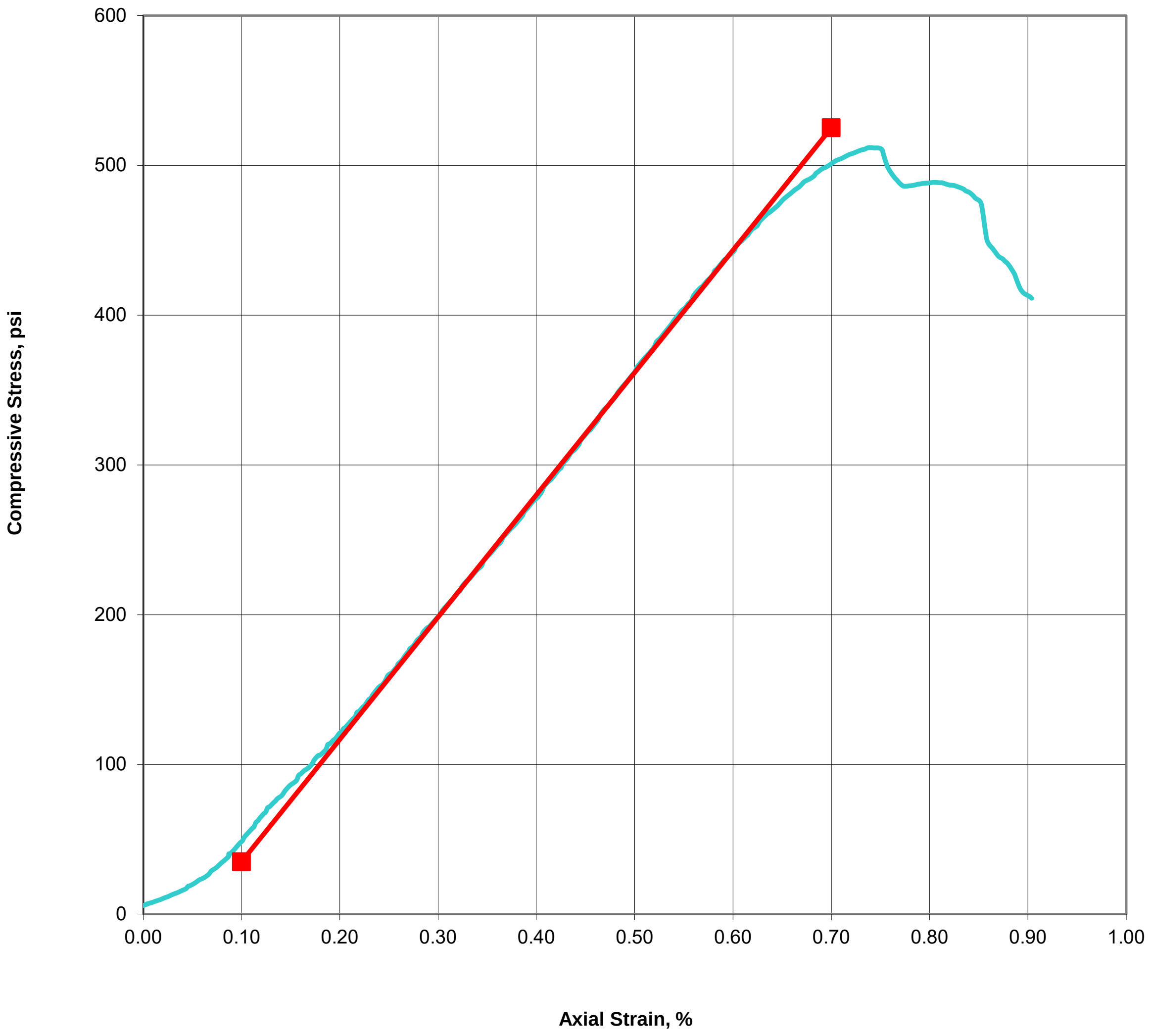
Visual Description: Very Dark Bluish Gray Rock

Moisture Condition at Test Sample was washed and in a moist state.

Test Temperature, (^{o}C) Ambient

Remarks:

Sample Height, in.	5.06	**Unconfined Compressive Strength (psi)**	**512**
Sample Diameter, in.	2.39		
Height / Diameter	2.1		
Sample Area, in^{2}	4.47		
Wet Density, pcf	132.6	**Young's Modulus (E) (psi)**	**81,700**
Dry Density, pcf	111.6		
Moisture Content, %	18.8		
Strain Rate, % / min	0.25		



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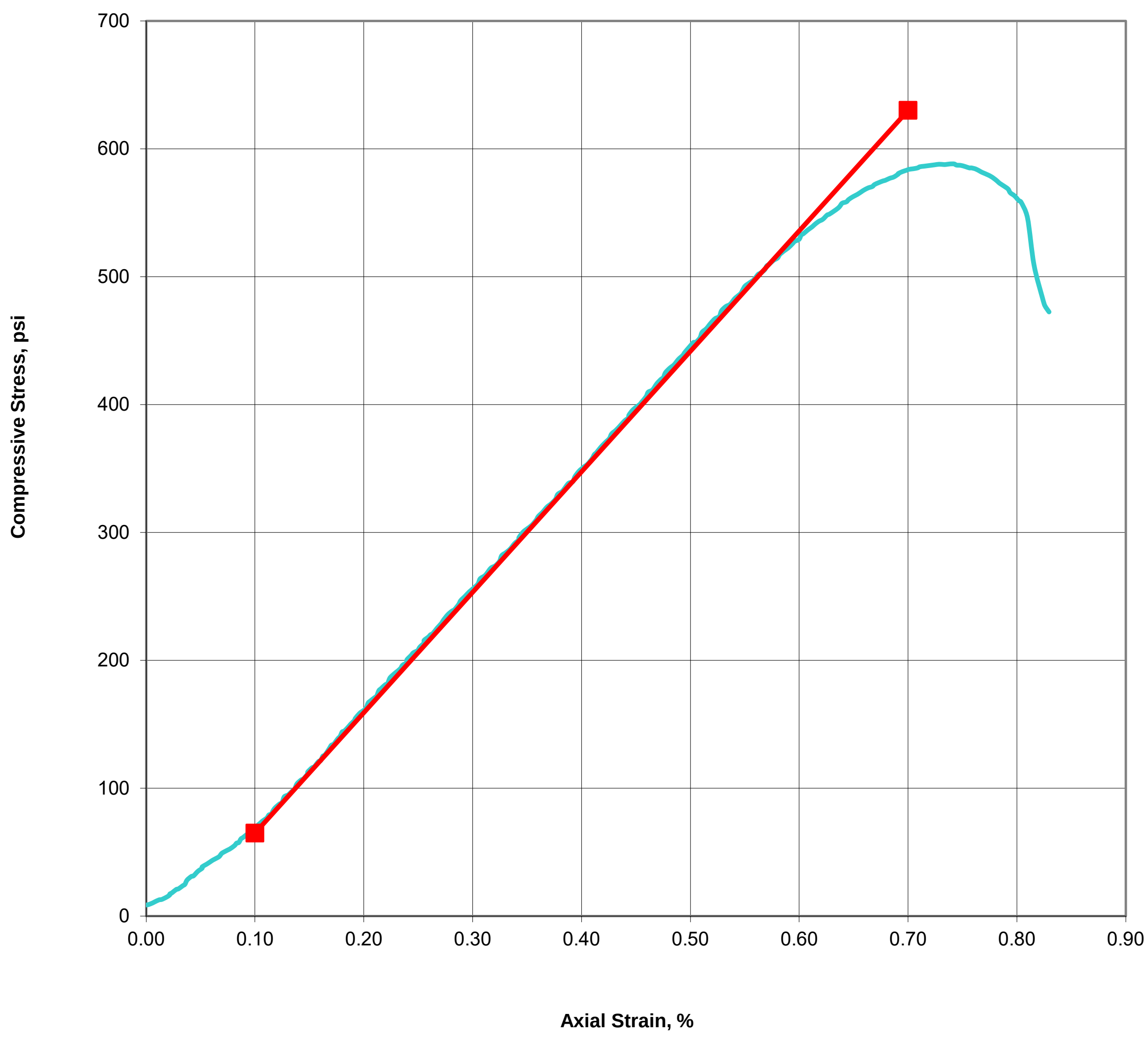
Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D7012D)

CTL Job No.: 823-008L5
Boring: B-31
Date: 9/22/2016
Client: GRI
Sample: R-3
By: PJ
Project Name: Port of Coos Bay Channel Modification Project
Depth,ft.: 17
Checked: DC
Project No.: 5128
Visual Description: Very Dark Bluish Gray Rock
Moisture Condition at Test: Sample was washed and in a moist state.
Test Temperature, (°C): Ambient
Remarks:

Sample Height, in.	5.05	**Unconfined Compressive Strength (psi)**	**588**
Sample Diameter, in.	2.40		
Height / Diameter	2.1		
Sample Area, in^2	4.53		
Wet Density, pcf	132.3	**Young's Modulus (E) (psi)**	**94,200**
Dry Density, pcf	110.8		
Moisture Content, %	19.4		
Strain Rate, % / min	0.25		



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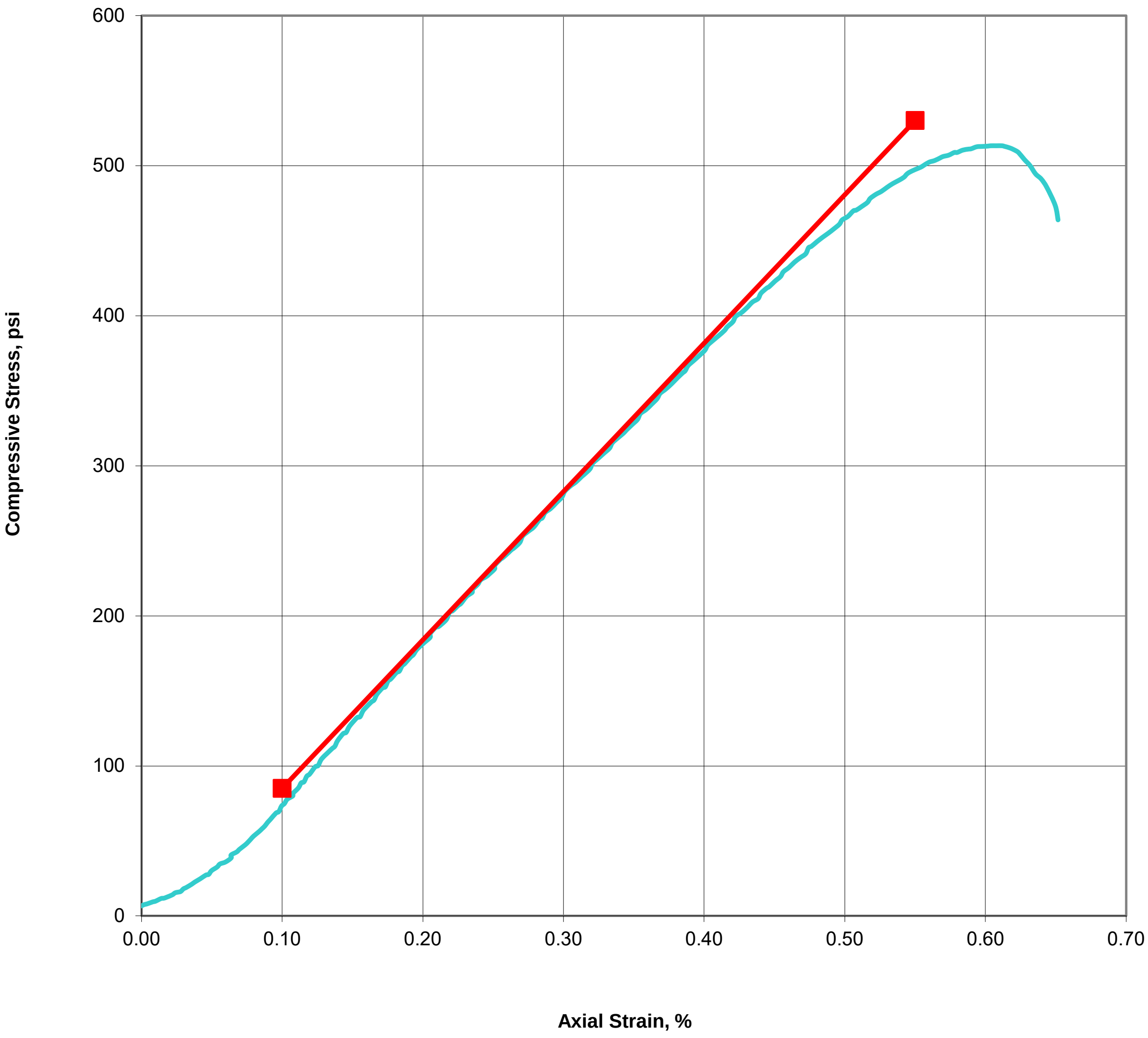
Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D7012D)

CTL Job No.: 823-008L6
Boring: B-31
Date: 9/22/2016
Client: GRI
Sample: R-4
By: PJ
Project Name: Port of Coos Bay Channel Modification Project
Depth,ft.: 20
Checked: DC
Project No.: 5128
Visual Description: Very Dark Bluish Gray Rock
Moisture Condition at Test Sample was washed and in a moist state.
Test Temperature, (^{o}C) Ambient
Remarks:

Sample Height, in.	5.02	**Unconfined Compressive Strength (psi)**	**513**
Sample Diameter, in.	2.39		
Height / Diameter	2.1		
Sample Area, in^2	4.48		
Wet Density, pcf	132.1	**Young's Modulus (E) (psi)**	**98,900**
Dry Density, pcf	113.9		
Moisture Content, %	16.0		
Strain Rate, % / min	0.25		

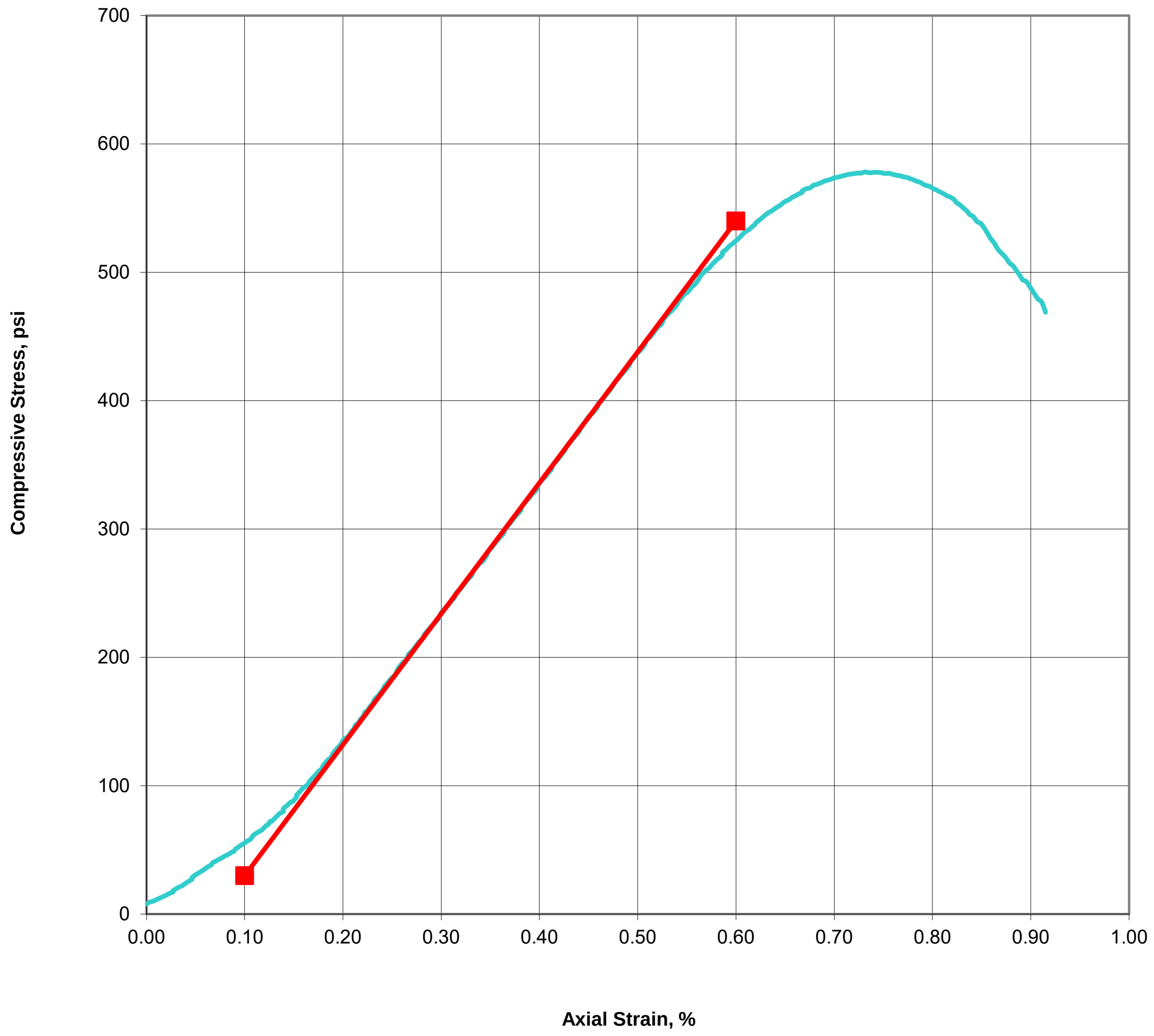


Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D7012D)

CTL Job No.: 823-008L7
Boring: B-31
Date: 9/22/2016
Client: GRI
Sample: R-4
By: PJ
Project Name: Port of Coos Bay Channel Modification Project
Depth,ft.: 22
Checked: DC
Project No.: 5128
Visual Description: Very Dark Bluish Gray Rock
Moisture Condition at Test Sample was washed and in a moist state.
Test Temperature, (^{o}C) Ambient
Remarks:

Sample Height, in.	5.17
Sample Diameter, in.	2.39
Height / Diameter	2.2
Sample Area, in^2	4.48
Wet Density, pcf	132.5
Dry Density, pcf	111.3
Moisture Content, %	19.0
Strain Rate, % / min	0.25

Unconfined Compressive Strength (psi)	**578**
Young's Modulus (E) (psi)	**102,000**



Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D7012D)

CTL Job No.:	823-008L8	Boring:	B-31	Date:	9/22/2016
Client:	GRI	Sample:	R-5	By:	PJ
Project Name:	Port of Coos Bay Channel Modification Project	Depth,ft.:	24	Checked:	DC
Project No.:	5128				

Visual Description: Very Dark Bluish Gray Rock

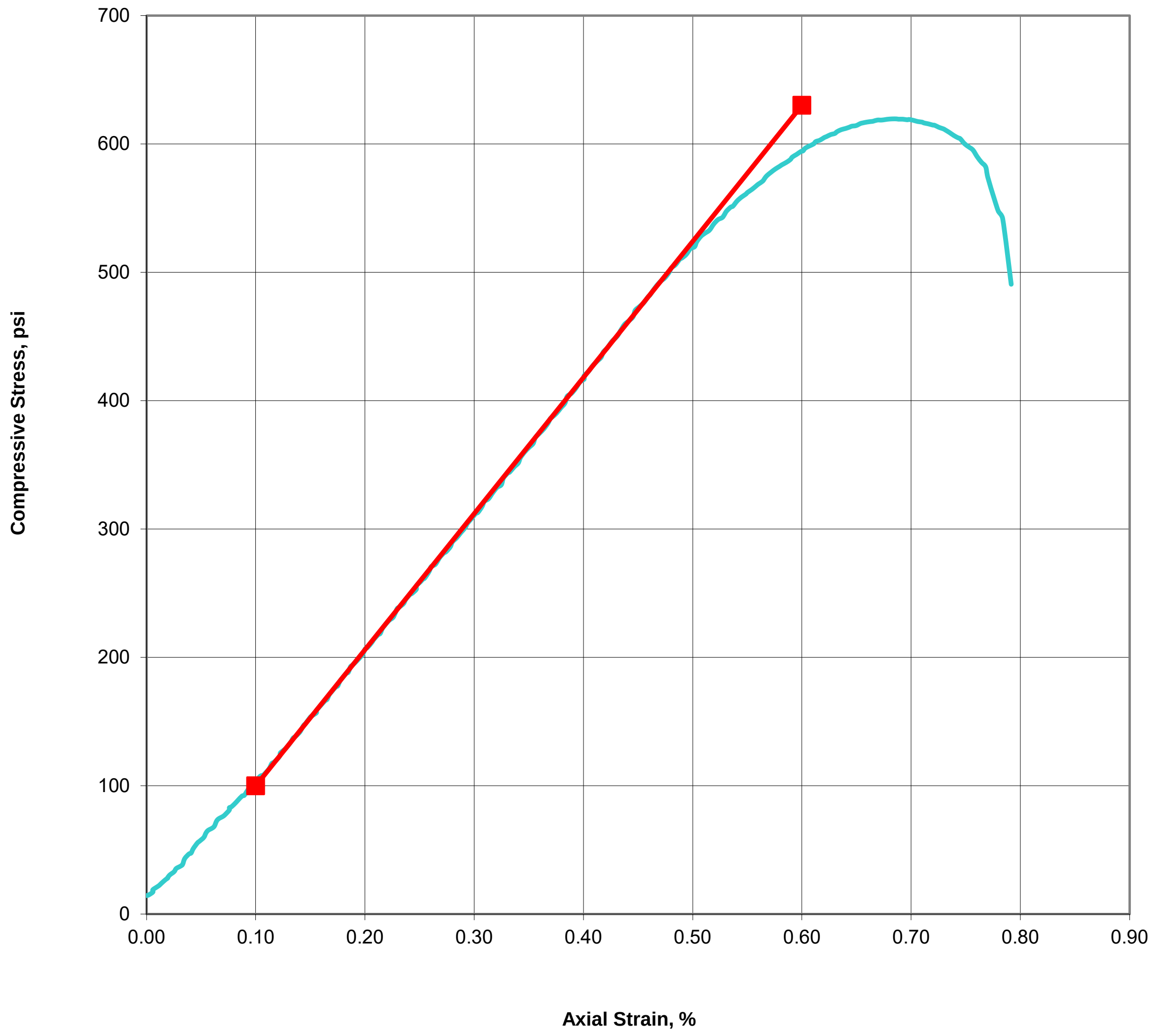
Moisture Condition at Test: Sample was washed and in a moist state.

Test Temperature, (°C): Ambient

Remarks:

Sample Height, in.	5.14
Sample Diameter, in.	2.37
Height / Diameter	2.2
Sample Area, in^2	4.41
Wet Density, pcf	131.7
Dry Density, pcf	108.8
Moisture Content, %	21.0
Strain Rate, % / min	0.25

Unconfined Compressive Strength (psi)	**619**
Young's Modulus (E) (psi)	**106,000**



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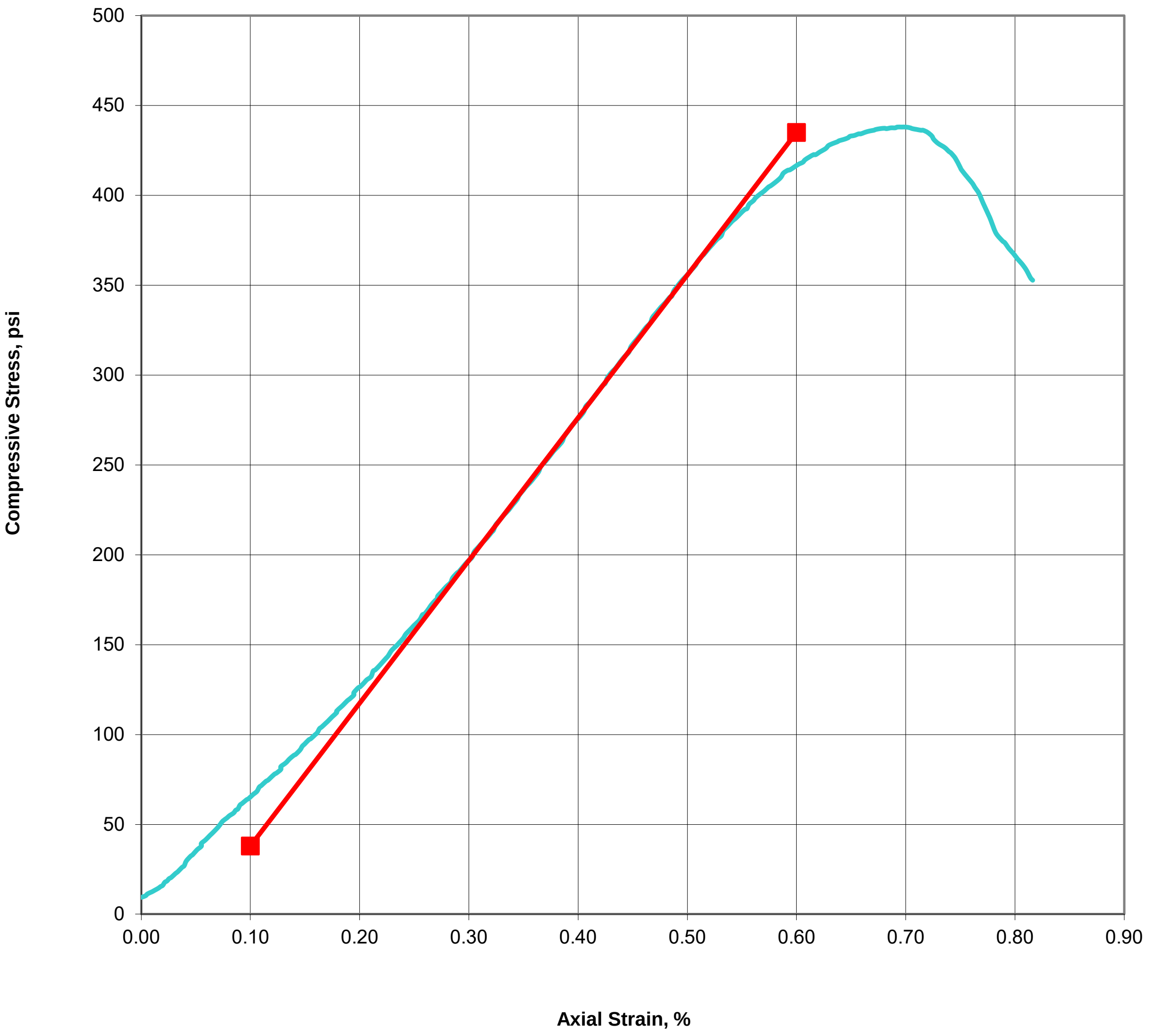
Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D7012D)

CTL Job No.: 823-008L9
Boring: B-31
Date: 9/22/2016
Client: GRI
Sample: R-5
By: PJ
Project Name: Port of Coos Bay Channel Modification Project
Depth,ft.: 28
Checked: DC
Project No.: 5128
Visual Description: Very Dark Bluish Gray Rock
Moisture Condition at Test: Sample was washed and in a moist state.
Test Temperature, (°C): Ambient
Remarks:

Sample Height, in.	5.08	**Unconfined Compressive Strength (psi)**	**438**
Sample Diameter, in.	2.39		
Height / Diameter	2.1		
Sample Area, in^2	4.49		
Wet Density, pcf	132.0	**Young's Modulus (E) (psi)**	**79,400**
Dry Density, pcf	109.4		
Moisture Content, %	20.6		
Strain Rate, % / min	0.25		

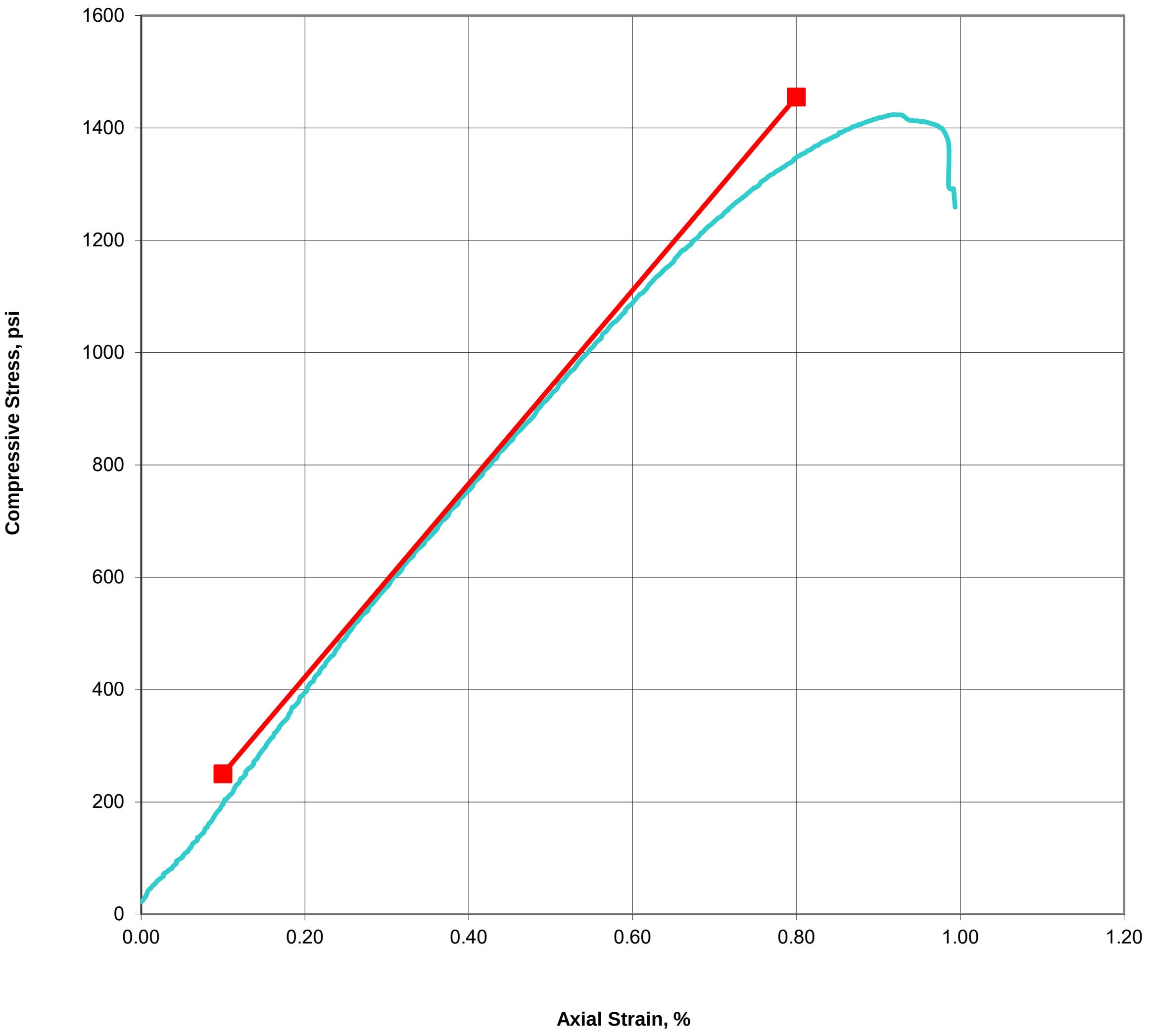


Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D7012D)

CTL Job No.: 823-008M1
Boring: B-32
Date: 9/22/2016
Client: GRI
Sample: R-1
By: PJ
Project Name: Port of Coos Bay Channel Modification Project
Depth,ft.: 2.5
Checked: DC
Project No.: 5128
Visual Description: Very Dark Bluish Gray Rock
Moisture Condition at Test Sample was washed and in a moist state.
Test Temperature, (^{o}C) Ambient
Remarks:

Sample Height, in.	5.09
Sample Diameter, in.	2.38
Height / Diameter	2.1
Sample Area, in^{2}	4.45
Wet Density, pcf	125.5
Dry Density, pcf	101.9
Moisture Content, %	23.1
Strain Rate, % / min	0.25

Unconfined Compressive Strength (psi)	**1424**
Young's Modulus (E) (psi)	**172,100**



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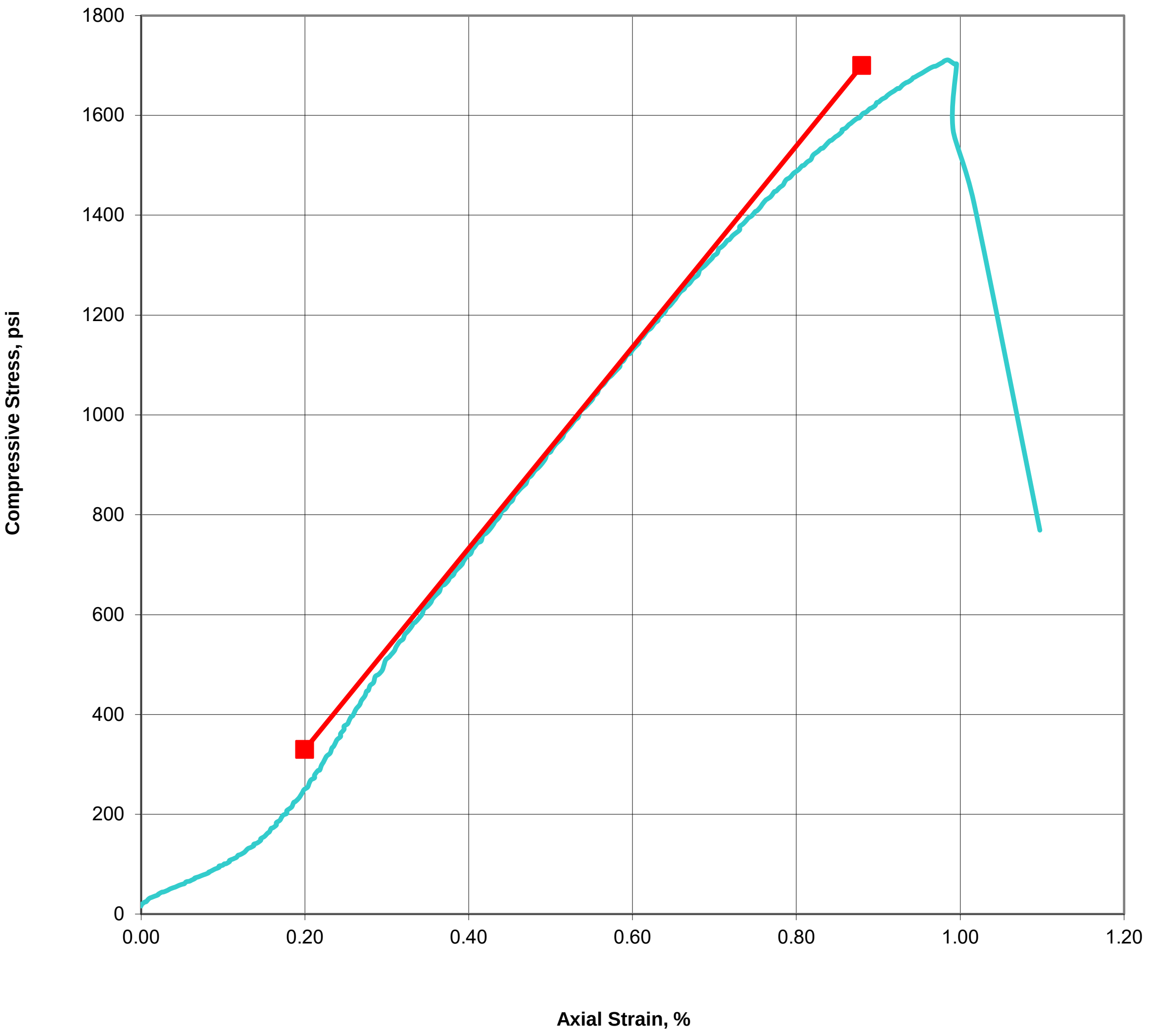
Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D7012D)

CTL Job No.: 823-008M2
Boring: B-32
Date: 9/22/2016
Client: GRI
Sample: R-1
By: PJ
Project Name: Port of Coos Bay Channel Modification Project
Depth,ft.: 6.5
Checked: DC
Project No.: 5128
Visual Description: Very Dark Bluish Gray Rock
Moisture Condition at Test: Sample was washed and in a moist state.
Test Temperature, (^oC): Ambient
Remarks:

Sample Height, in.	4.72
Sample Diameter, in.	2.35
Height / Diameter	2.0
Sample Area, in^2	4.35
Wet Density, pcf	118.0
Dry Density, pcf	96.2
Moisture Content, %	22.6
Strain Rate, % / min	0.25

Unconfined Compressive Strength (psi)	**1711**
Young's Modulus (E) (psi)	**201,500**



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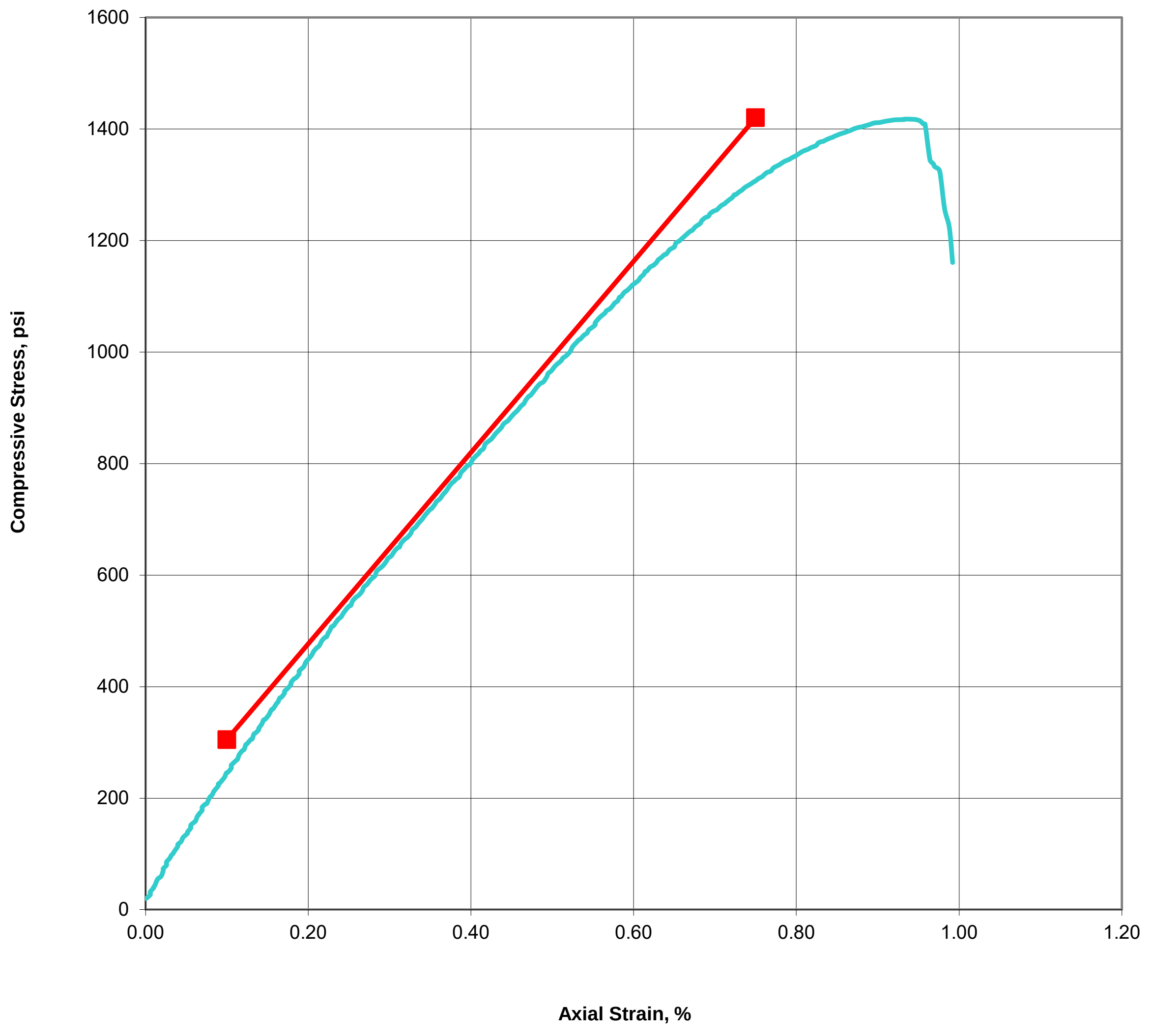
Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D7012D)

CTL Job No.: 823-008M3
Boring: B-32
Date: 9/22/2016
Client: GRI
Sample: R-2
By: PJ
Project Name: Port of Coos Bay Channel Modification Project
Depth,ft.: 8.5
Checked: DC
Project No.: 5128
Visual Description: Very Dark Bluish Gray Rock
Moisture Condition at Test Sample was washed and in a moist state.
Test Temperature, (°C) Ambient
Remarks:

Sample Height, in.	5.03
Sample Diameter, in.	2.36
Height / Diameter	2.1
Sample Area, in^2	4.36
Wet Density, pcf	124.3
Dry Density, pcf	100.8
Moisture Content, %	23.3
Strain Rate, % / min	0.25

Unconfined Compressive Strength (psi)	**1418**
Young's Modulus (E) (psi)	**171,500**



Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D7012D)

CTL Job No.:	823-008M4	Boring:	B-32	Date:	9/22/2016
Client:	GRI	Sample:	R-2	By:	PJ
Project Name:	Port of Coos Bay Channel Modification Project	Depth,ft.:	10.5	Checked:	DC
Project No.:	5128				

Visual Description: Very Dark Bluish Gray Rock

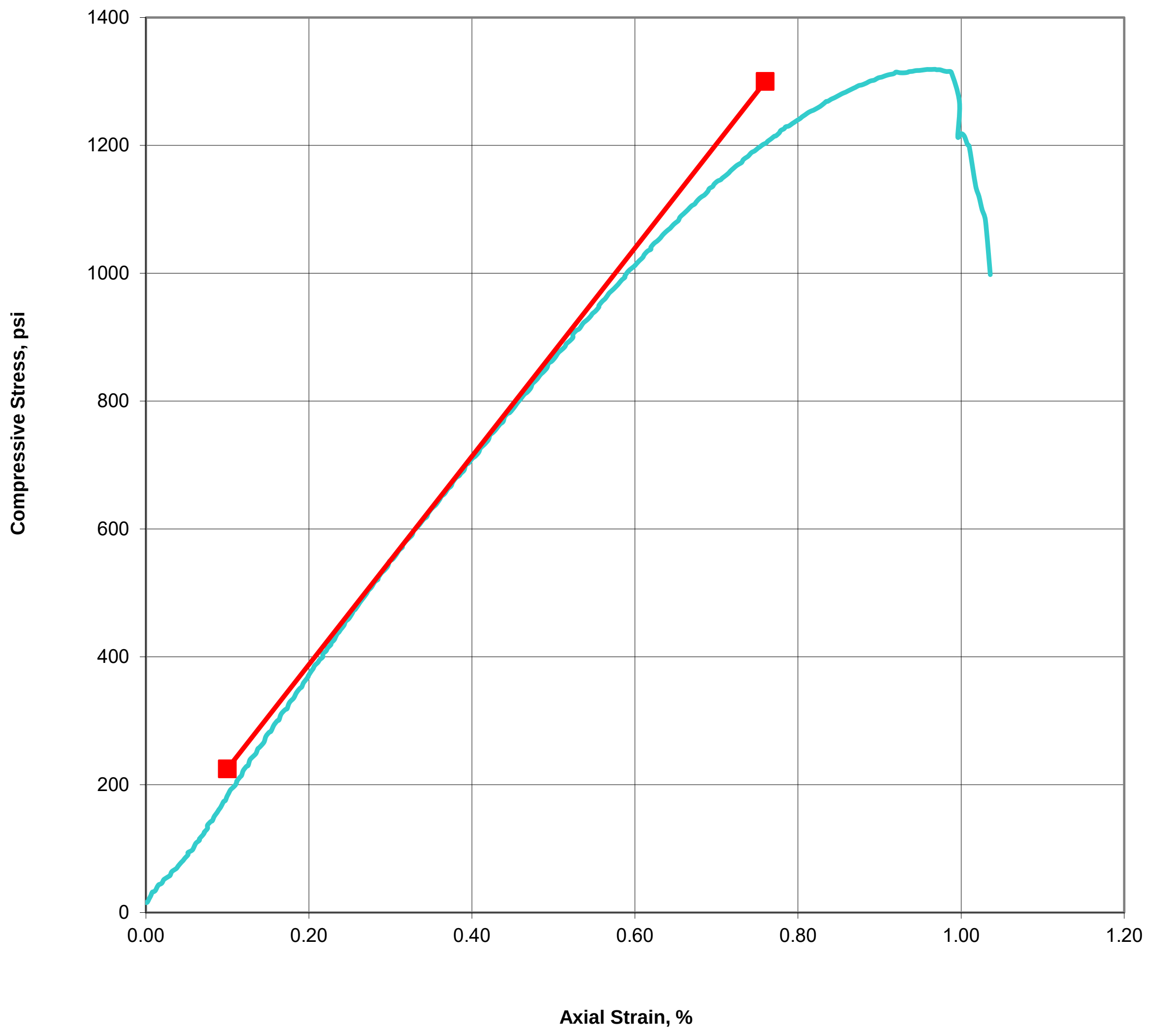
Moisture Condition at Test Sample was washed and in a moist state.

Test Temperature, (^oC) Ambient

Remarks:

Sample Height, in.	5.02
Sample Diameter, in.	2.37
Height / Diameter	2.1
Sample Area, in^2	4.40
Wet Density, pcf	125.8
Dry Density, pcf	102.3
Moisture Content, %	23.0
Strain Rate, % / min	0.25

Unconfined Compressive Strength (psi)	**1319**
Young's Modulus (E) (psi)	**162,900**



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Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D7012D)

CTL Job No.:	823-008M5	Boring:	B-32	Date:	9/23/2016
Client:	GRI	Sample:	R-3	By:	PJ
Project Name:	Port of Coos Bay Channel Modification Project	Depth,ft.:	12.5	Checked:	DC
Project No.:	5128				

Visual Description: Very Dark Greenish Gray Rock

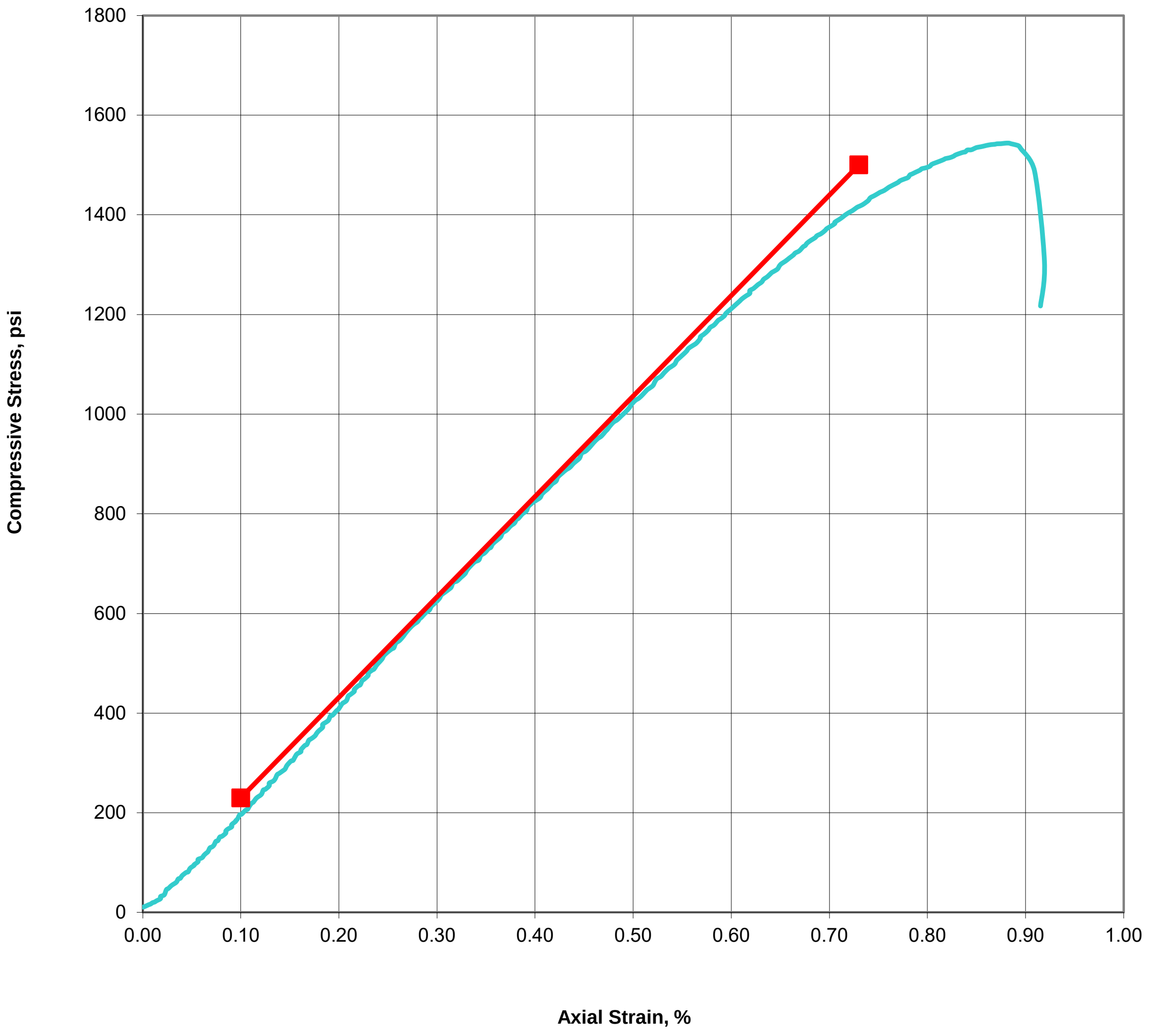
Moisture Condition at Test Sample was washed and in a moist state.

Test Temperature, (°C) Ambient

Remarks:

Sample Height, in.	4.96
Sample Diameter, in.	2.34
Height / Diameter	2.1
Sample Area, in^2	4.32
Wet Density, pcf	123.2
Dry Density, pcf	99.3
Moisture Content, %	24.0
Strain Rate, % / min	0.25

Unconfined Compressive Strength (psi)	**1544**
Young's Modulus (E) (psi)	**201,600**



Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D7012D)

CTL Job No.: 823-008M6

Boring: B-32

Date: 9/23/2016

Client: GRI

Sample: R-4

By: PJ

Project Name: Port of Coos Bay Channel Modification Project

Depth,ft.: 17

Checked: DC

Project No.: 5128

Visual Description: Very Dark Greenish Gray Rock

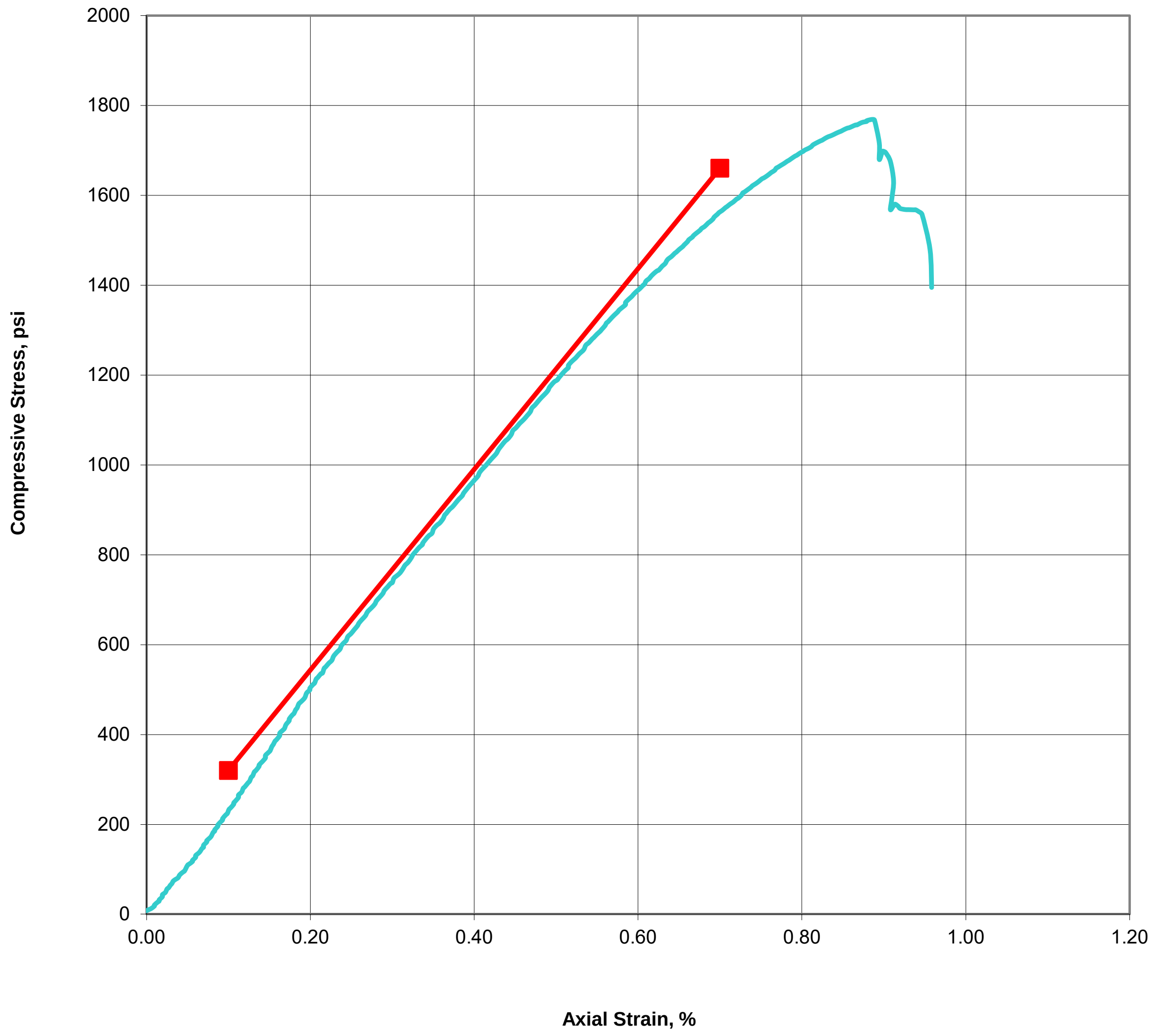
Moisture Condition at Test: Sample was washed and in a moist state.

Test Temperature, (°C): Ambient

Remarks:

Sample Height, in.	5.17
Sample Diameter, in.	2.33
Height / Diameter	2.2
Sample Area, in^2	4.26
Wet Density, pcf	117.9
Dry Density, pcf	94.2
Moisture Content, %	25.2
Strain Rate, % / min	0.25

Unconfined Compressive Strength (psi)	**1769**
Young's Modulus (E) (psi)	**223,300**



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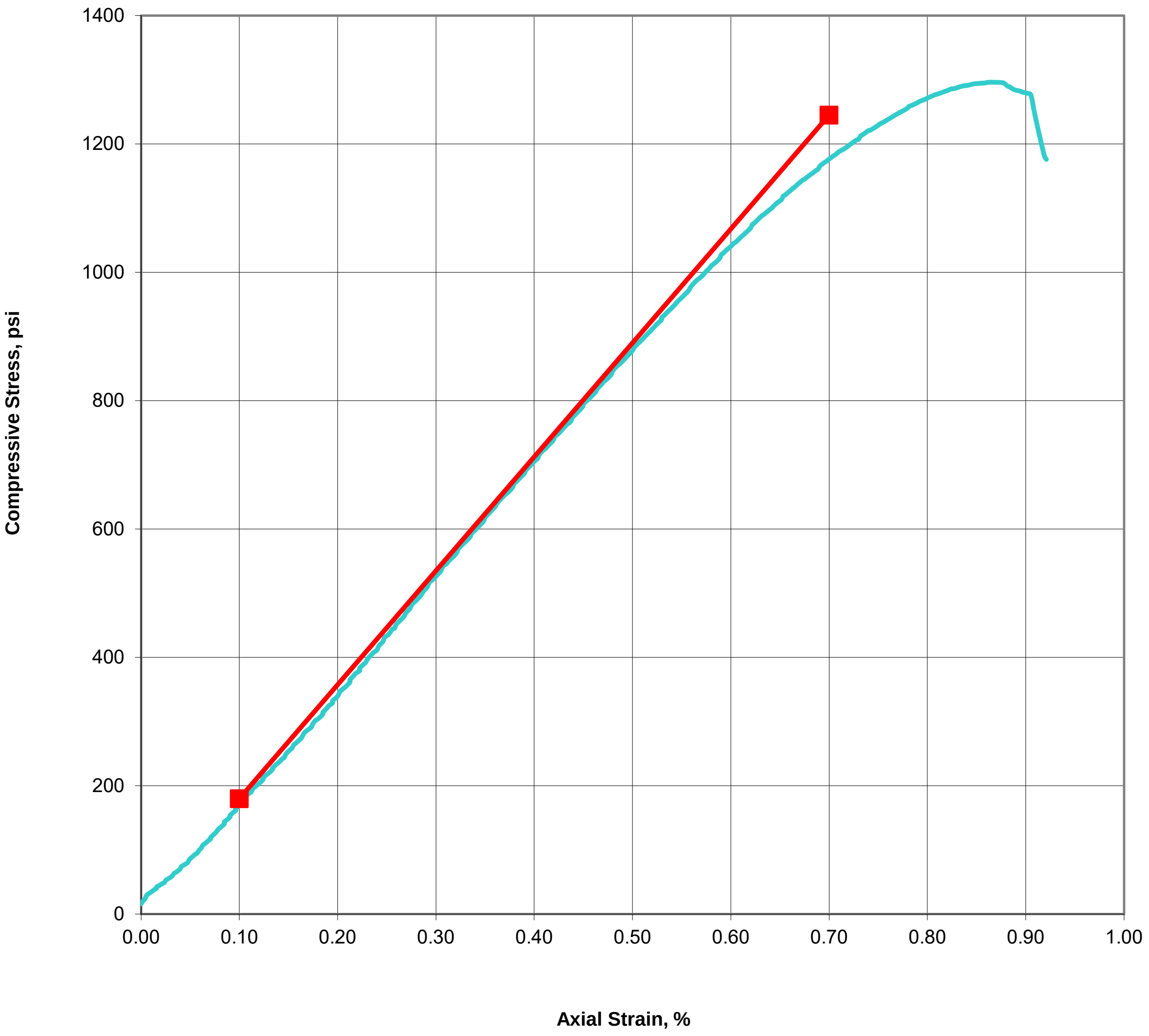
Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D7012D)

CTL Job No.: 823-008M7
Boring: B-32
Date: 9/23/2016
Client: GRI
Sample: R-4
By: PJ
Project Name: Port of Coos Bay Channel Modification Project
Depth,ft.: 19.5
Checked: DC
Project No.: 5128
Visual Description: Very Dark Bluish Gray Rock
Moisture Condition at Test Sample was washed and in a moist state.
Test Temperature, (^{o}C) Ambient
Remarks:

Sample Height, in.	5.08	**Unconfined Compressive Strength (psi)**	**1296**
Sample Diameter, in.	2.33		
Height / Diameter	2.2		
Sample Area, in^{2}	4.28		
Wet Density, pcf	124.3	**Young's Modulus (E) (psi)**	**177,500**
Dry Density, pcf	100.5		
Moisture Content, %	23.7		
Strain Rate, % / min	0.25		



Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D7012D)

CTL Job No.:	823-008N1	Boring:	B-33	Date:	9/23/2016
Client:	GRI	Sample:	R-1	By:	PJ
Project Name:	Port of Coos Bay Channel Modification Project	Depth,ft.:	2	Checked:	DC
Project No.:	5128				

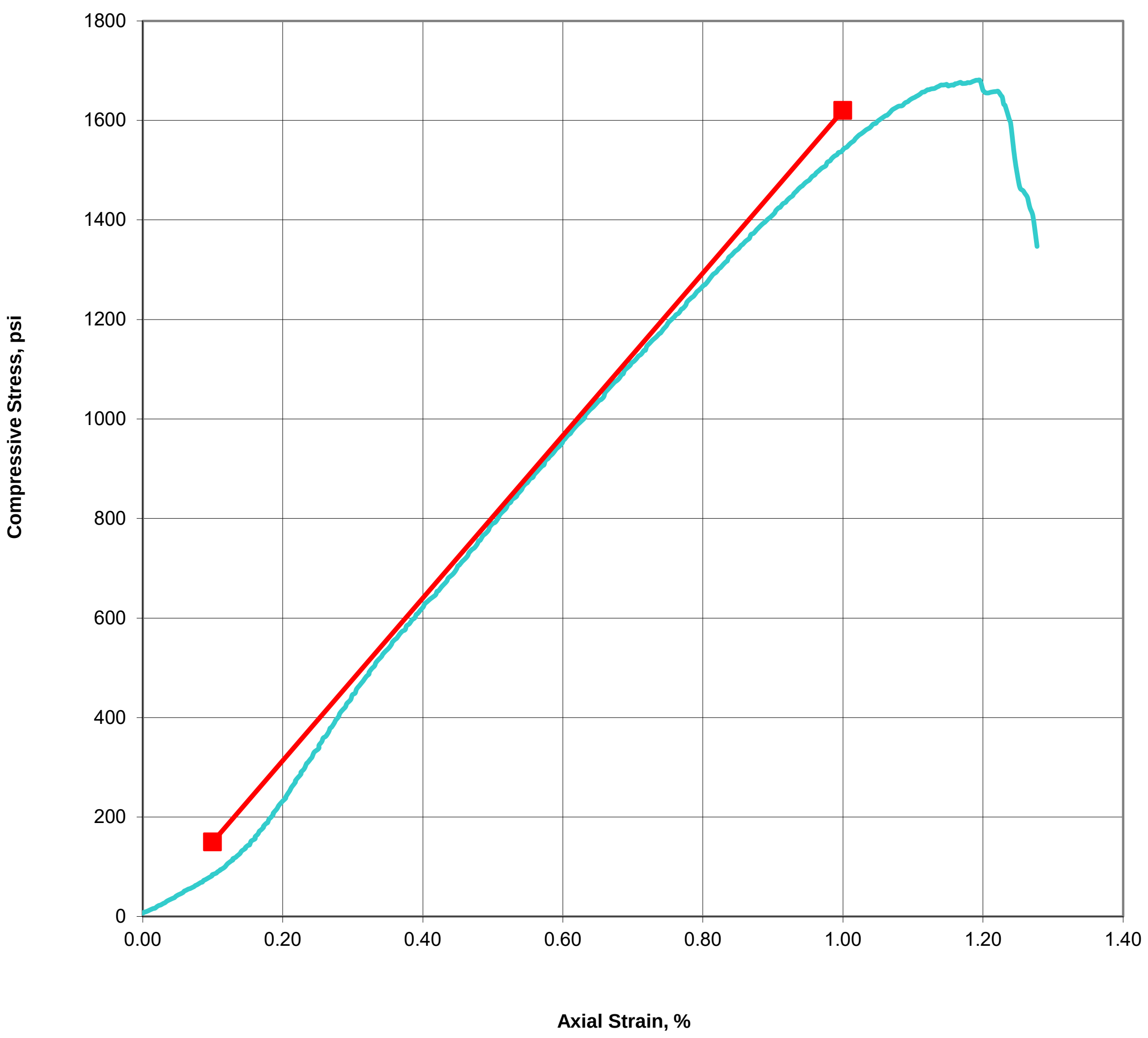
Visual Description: Very Dark Greenish Gray Rock

Moisture Condition at Test Sample was washed and in a moist state.

Test Temperature, (^{o}C) Ambient

Remarks:

Sample Height, in.	5.04	**Unconfined Compressive Strength (psi)**	**1681**
Sample Diameter, in.	2.36		
Height / Diameter	2.1		
Sample Area, in^2	4.36		
Wet Density, pcf	0.0	**Young's Modulus (E) (psi)**	**163,300**
Dry Density, pcf	0.0		
Moisture Content, %	23.9		
Strain Rate, % / min	0.25		



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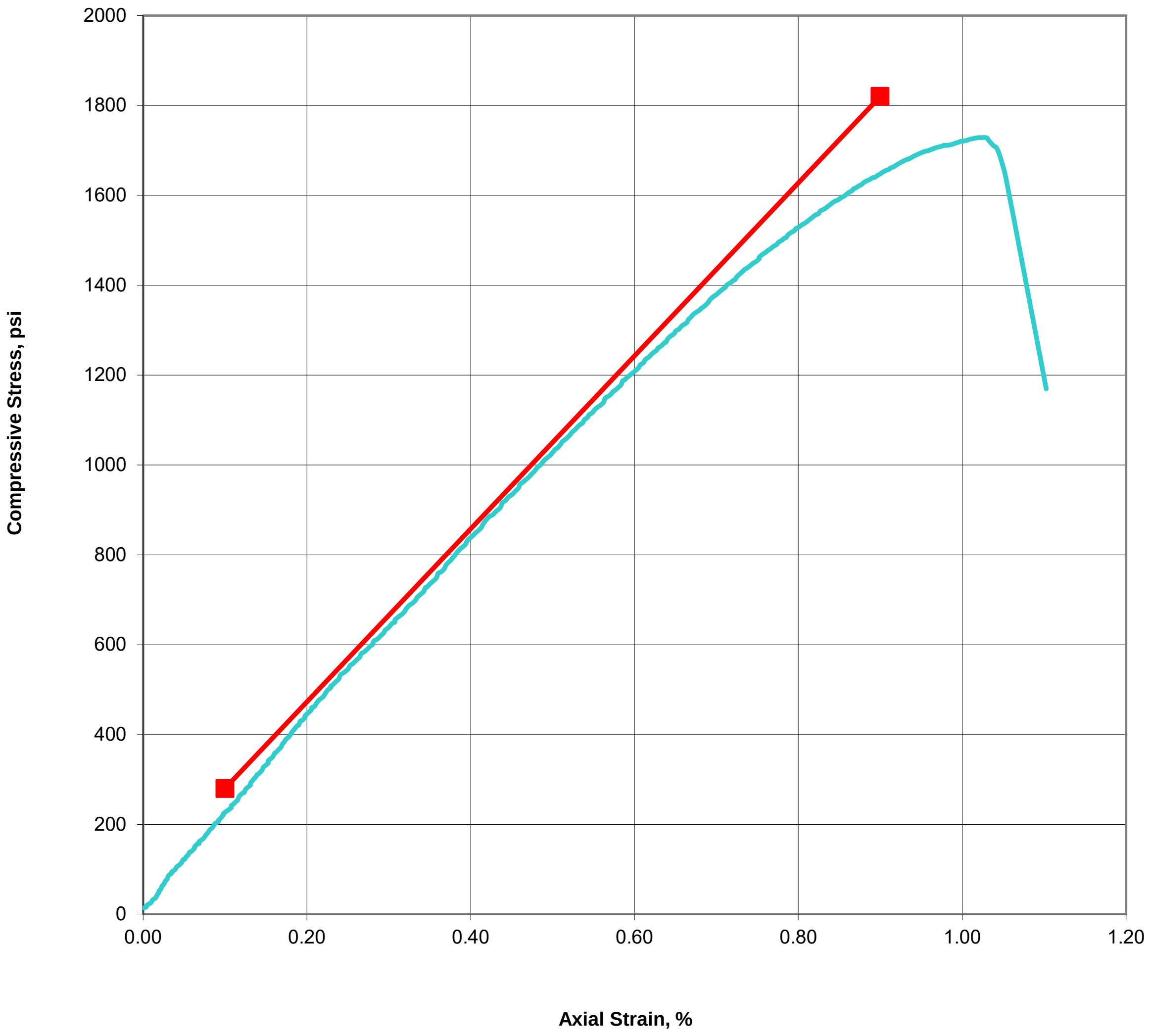
Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D7012D)

CTL Job No.: 823-008N2
Boring: B-33
Date: 9/23/2016
Client: GRI
Sample: R-2
By: PJ
Project Name: Port of Coos Bay Channel Modification Project
Depth,ft.: 6
Checked: DC
Project No.: 5128
Visual Description: Very Dark Bluish Gray Rock
Moisture Condition at Test: Sample was washed and in a moist state.
Test Temperature, (°C): Ambient
Remarks:

Sample Height, in.	5.11	**Unconfined Compressive Strength (psi)**	**1729**
Sample Diameter, in.	2.36		
Height / Diameter	2.2		
Sample Area, in^2	4.37		
Wet Density, pcf	121.3	**Young's Modulus (E) (psi)**	**192,500**
Dry Density, pcf	97.7		
Moisture Content, %	24.2		
Strain Rate, % / min	0.25		

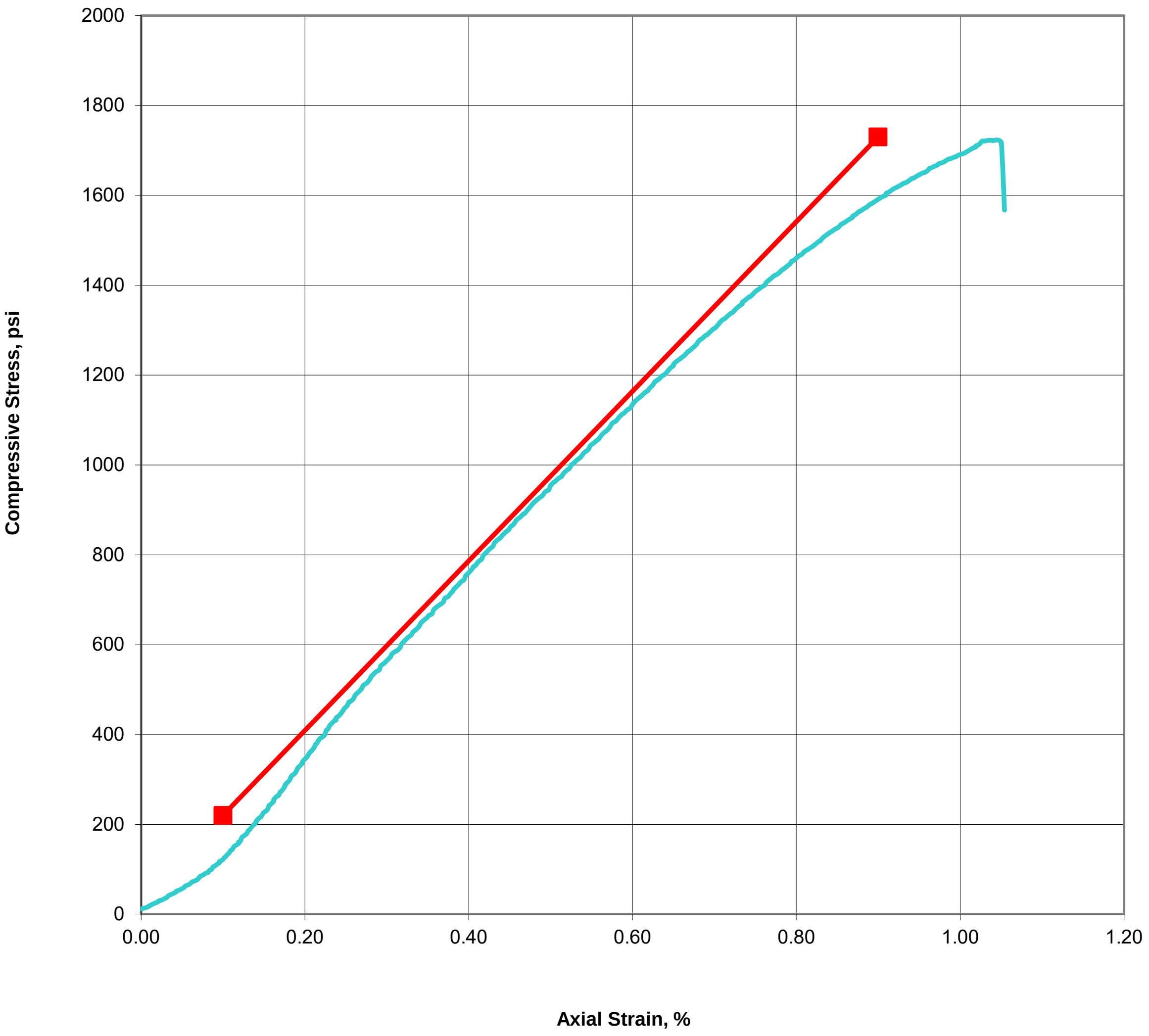


Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D7012D)

CTL Job No.: 823-008N3
Boring: B-33
Date: 9/23/2016
Client: GRI
Sample: R-2
By: PJ
Project Name: Port of Coos Bay Channel Modification Project
Depth,ft.: 9
Checked: DC
Project No.: 5128
Visual Description: Very Dark Greenish Gray Rock
Moisture Condition at Test Sample was washed and in a moist state.
Test Temperature, (^{o}C) Ambient
Remarks:

Sample Height, in.	5.12
Sample Diameter, in.	2.37
Height / Diameter	2.2
Sample Area, in^{2}	4.40
Wet Density, pcf	117.7
Dry Density, pcf	92.0
Moisture Content, %	27.9
Strain Rate, % / min	0.25

Unconfined Compressive Strength (psi)	**1723**
Young's Modulus (E) (psi)	**188,800**



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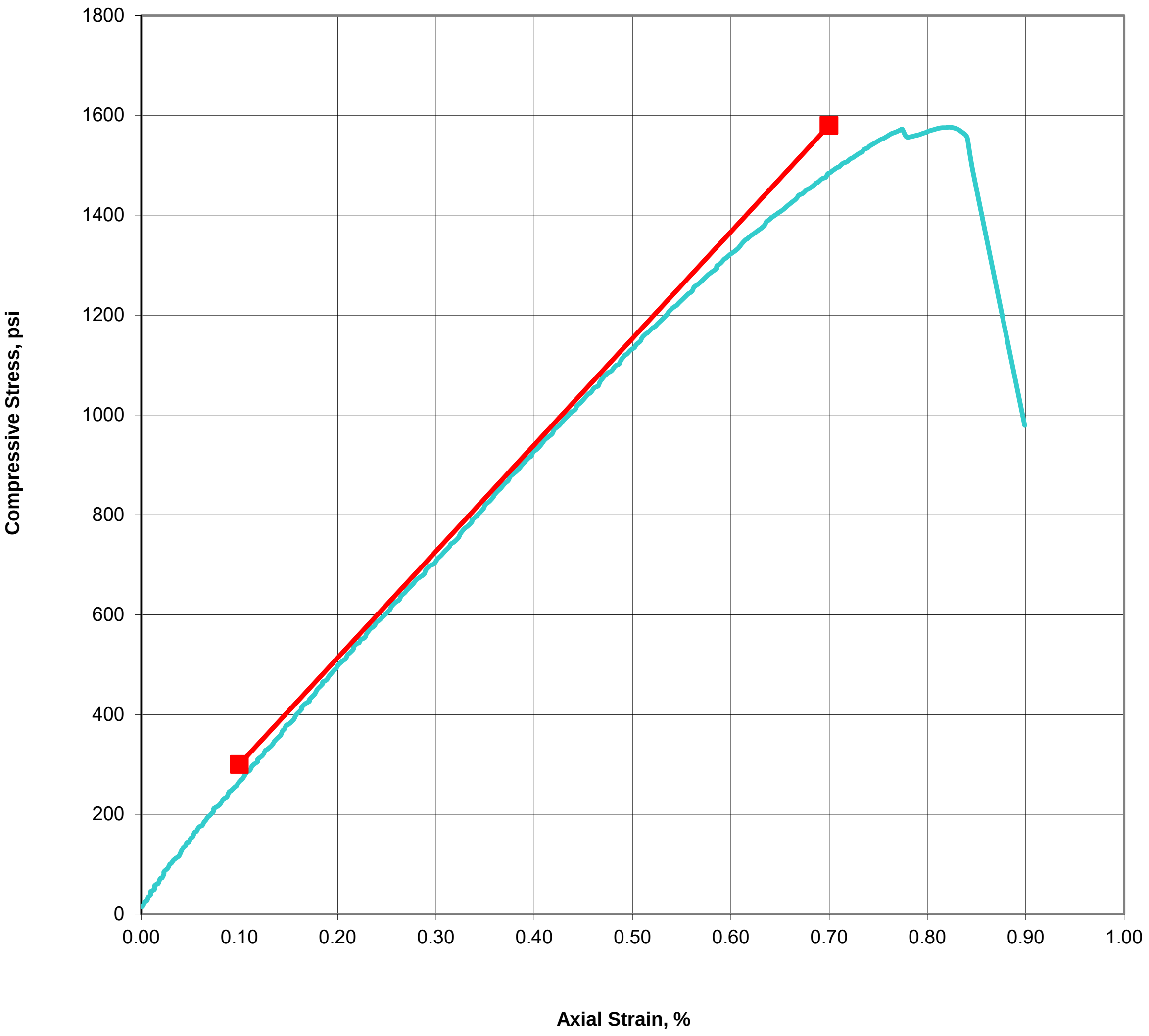
Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D7012D)

CTL Job No.: 823-008N4
Boring: B-33
Date: 9/23/2016
Client: GRI
Sample: R-5
By: PJ
Project Name: Port of Coos Bay Channel Modification Project
Depth,ft.: 16
Checked: DC
Project No.: 5128
Visual Description: Very Dark Bluish Gray Rock
Moisture Condition at Test Sample was washed and in a moist state.
Test Temperature, (^oC) Ambient
Remarks:

Sample Height, in.	5.14	**Unconfined Compressive Strength (psi)**	**1576**
Sample Diameter, in.	2.34		
Height / Diameter	2.2		
Sample Area, in^2	4.31		
Wet Density, pcf	116.9	**Young's Modulus (E) (psi)**	**213,300**
Dry Density, pcf	90.0		
Moisture Content, %	29.9		
Strain Rate, % / min	0.25		



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Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D7012D)

CTL Job No.:	823-008N5	Boring:	B-33	Date:	9/23/2016
Client:	GRI	Sample:	R-7	By:	PJ
Project Name:	Port of Coos Bay Channel Modification Project	Depth,ft.:	21	Checked:	DC
Project No.:	5128				

Visual Description: Very Dark Greenish Gray Rock

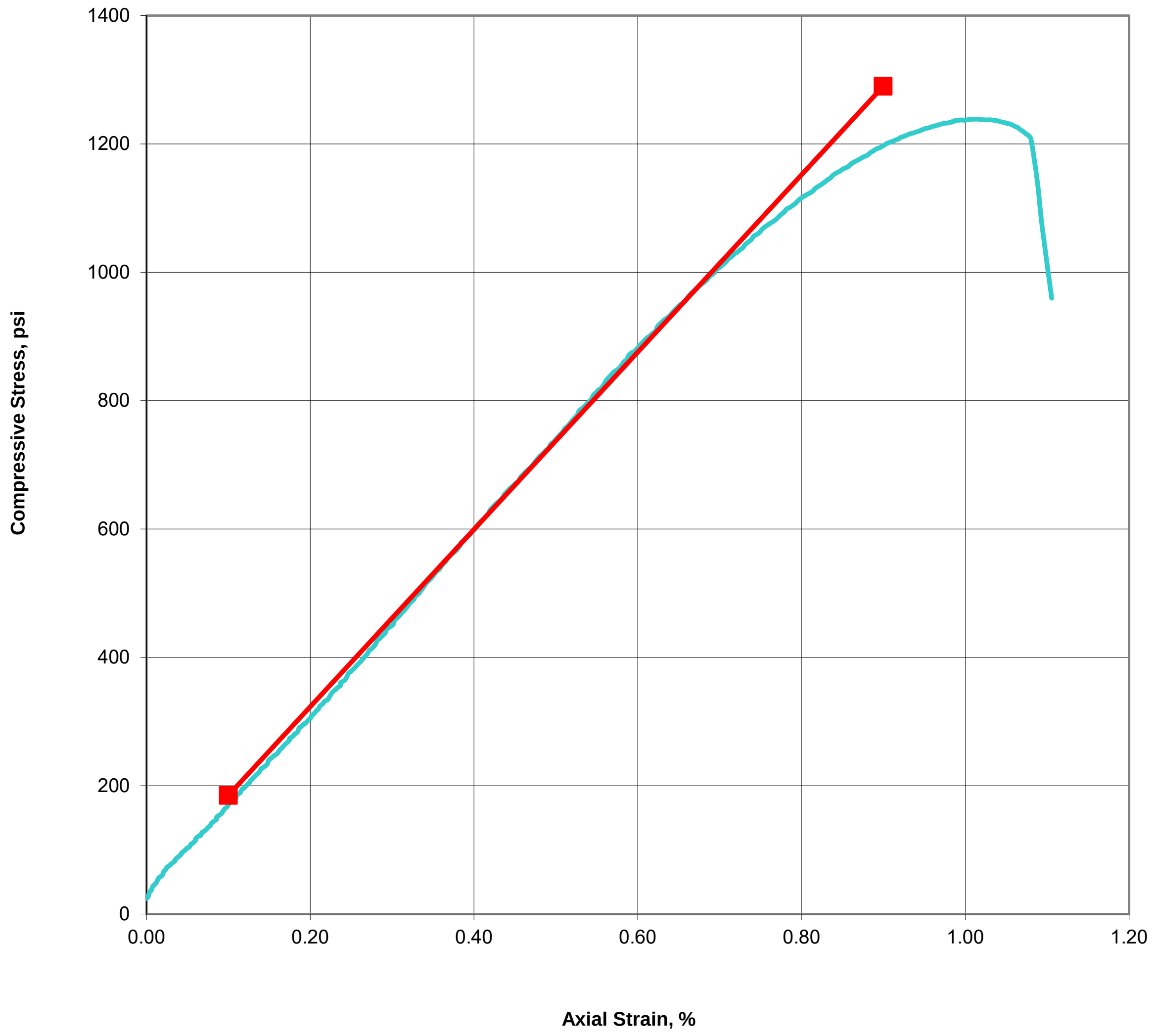
Moisture Condition at Test Sample was washed and in a moist state.

Test Temperature, (^{o}C) Ambient

Remarks:

Sample Height, in.	5.15
Sample Diameter, in.	2.36
Height / Diameter	2.2
Sample Area, in^2	4.36
Wet Density, pcf	126.4
Dry Density, pcf	103.1
Moisture Content, %	22.6
Strain Rate, % / min	0.25

Unconfined Compressive Strength (psi)	**1239**
Young's Modulus (E) (psi)	**138,100**

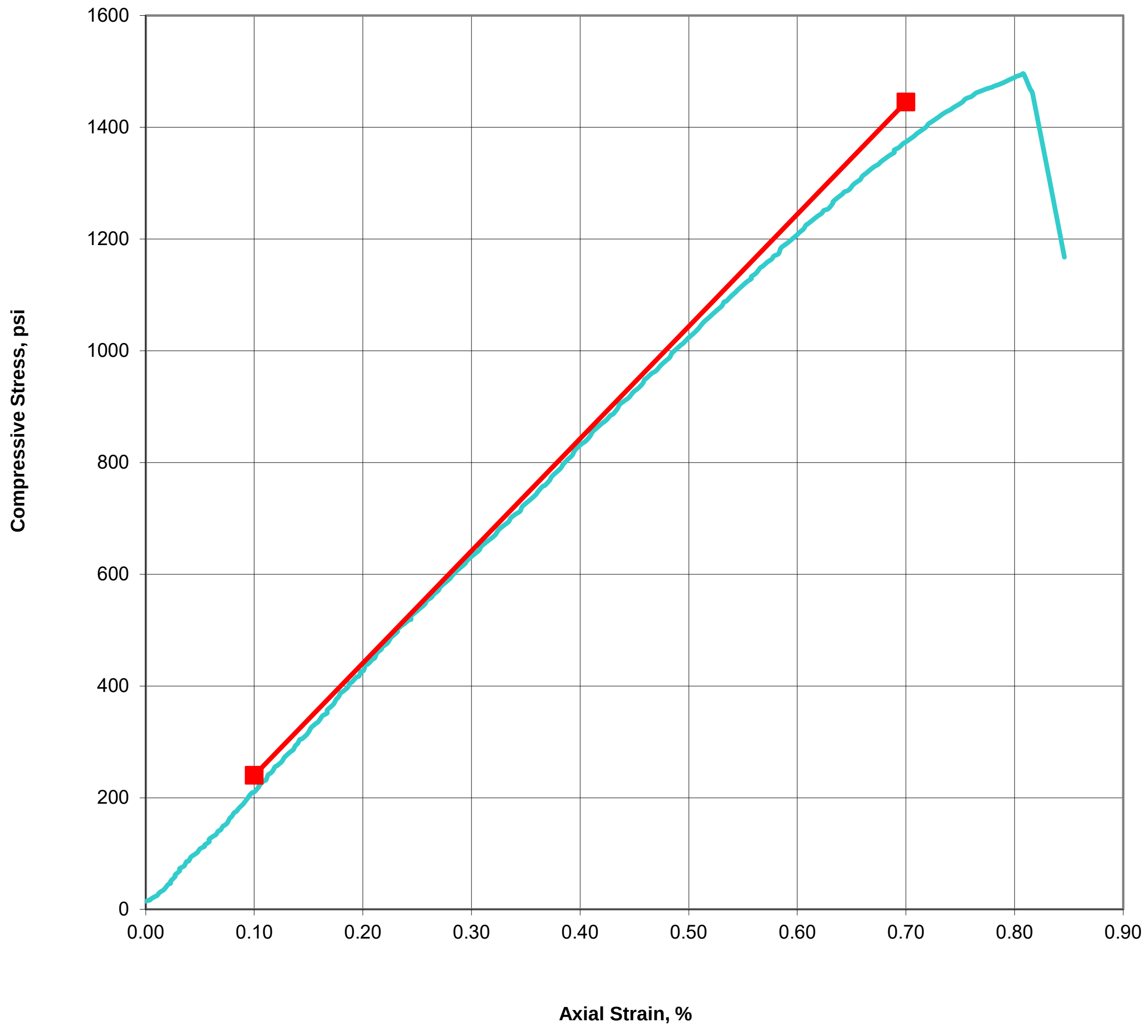


Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D7012D)

CTL Job No.: 823-008N6
Boring: B-33
Date: 9/23/2016
Client: GRI
Sample: R-8
By: PJ
Project Name: Port of Coos Bay Channel Modification Project
Depth,ft.: 26
Checked: DC
Project No.: 5128
Visual Description: Very Dark Bluish Gray Rock
Moisture Condition at Test: Sample was washed and in a moist state.
Test Temperature, (^{o}C): Ambient
Remarks:

Sample Height, in.	4.79
Sample Diameter, in.	2.37
Height / Diameter	2.0
Sample Area, in^2	4.41
Wet Density, pcf	120.6
Dry Density, pcf	96.3
Moisture Content, %	25.3
Strain Rate, % / min	0.25

Unconfined Compressive Strength (psi)	**1495**
Young's Modulus (E) (psi)	**200,800**



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Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D7012D)

CTL Job No.:	823-008O1	Boring:	B-40	Date:	9/23/2016
Client:	GRI	Sample:	R-1	By:	PJ
Project Name:	Port of Coos Bay Channel Modification Project	Depth,ft.:	3	Checked:	DC
Project No.:	5128				

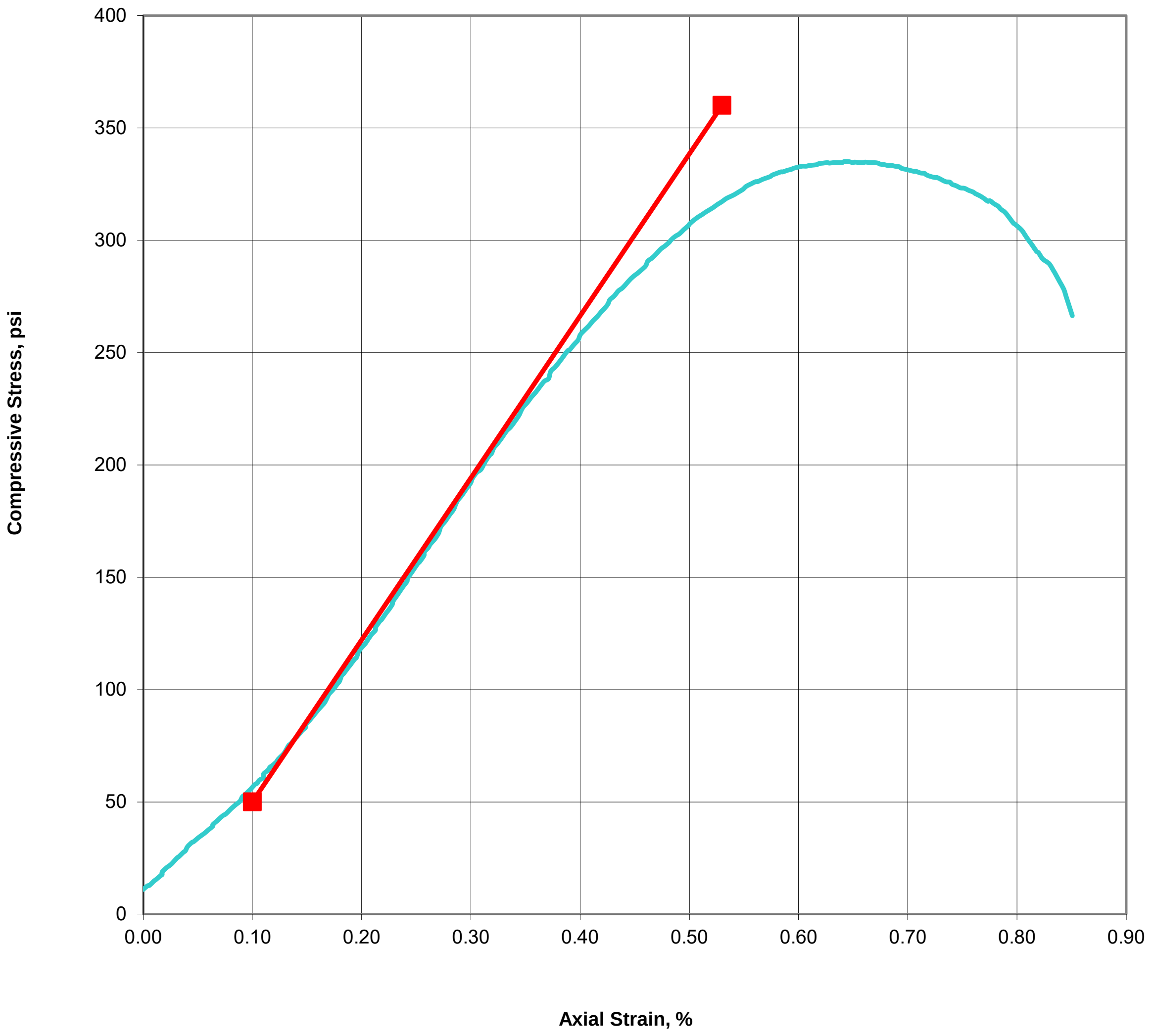
Visual Description: Very Dark Greenish Gray Rock

Moisture Condition at Test: Sample was washed and in a moist state.

Test Temperature, (^{o}C): Ambient

Remarks:

Sample Height, in.	5.17	**Unconfined Compressive Strength (psi)**	**335**
Sample Diameter, in.	2.36		
Height / Diameter	2.2		
Sample Area, in^2	4.36		
Wet Density, pcf	132.5	**Young's Modulus (E) (psi)**	**72,100**
Dry Density, pcf	111.1		
Moisture Content, %	19.2		
Strain Rate, % / min	0.25		



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Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D7012D)

CTL Job No.:	823-008O2	Boring:	B-40	Date:	9/23/2016
Client:	GRI	Sample:	R-1	By:	PJ
Project Name:	Port of Coos Bay Channel Modification Project	Depth,ft.:	6	Checked:	DC
Project No.:	5128				

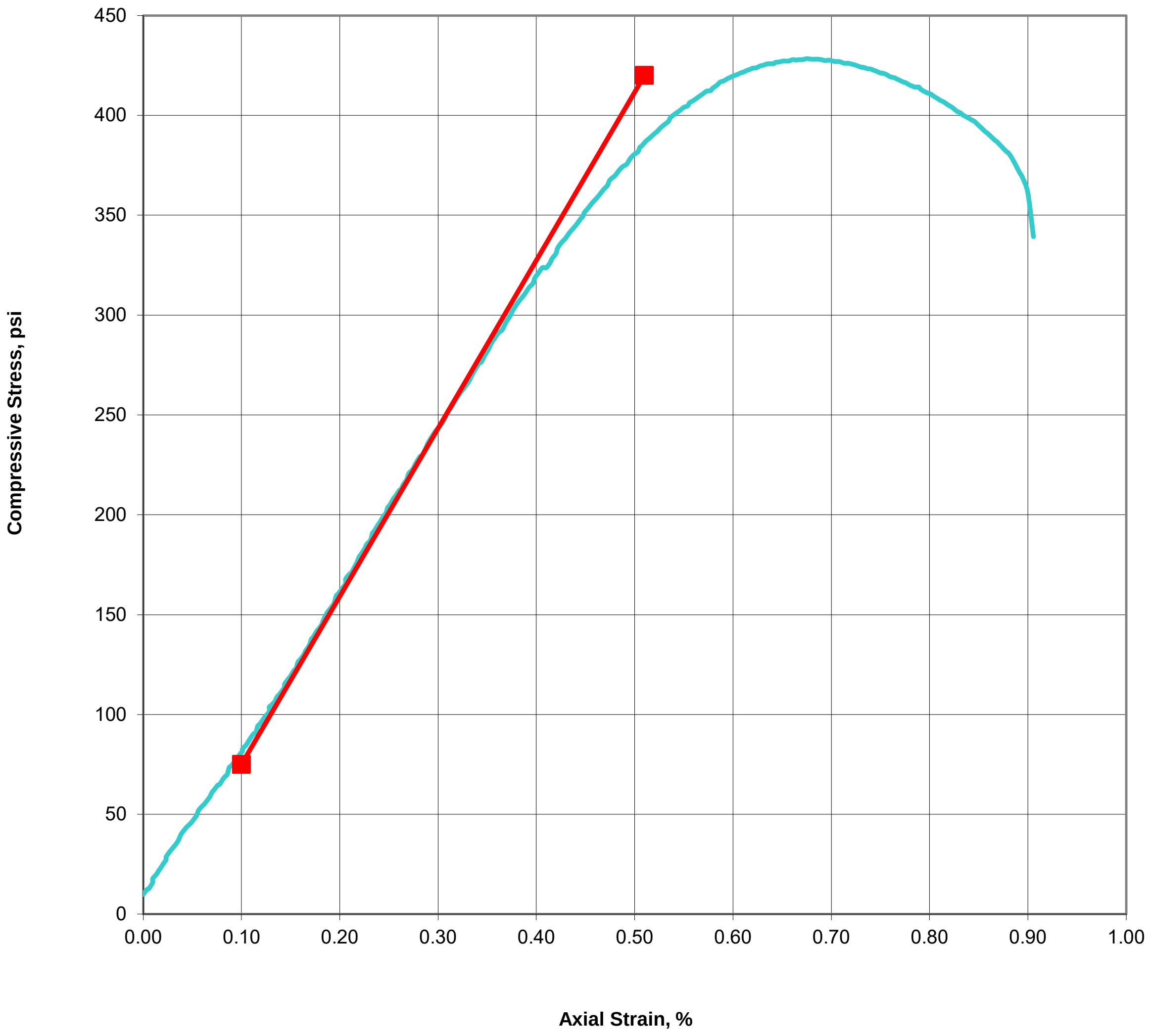
Visual Description: Very Dark Bluish Gray Rock

Moisture Condition at Test Sample was washed and in a moist state.

Test Temperature, (^{o}C) Ambient

Remarks:

Sample Height, in.	5.15	**Unconfined Compressive Strength (psi)**	**428**
Sample Diameter, in.	2.38		
Height / Diameter	2.2		
Sample Area, in^2	4.45		
Wet Density, pcf	132.4	**Young's Modulus (E) (psi)**	**84,100**
Dry Density, pcf	111.4		
Moisture Content, %	18.8		
Strain Rate, % / min	0.25		



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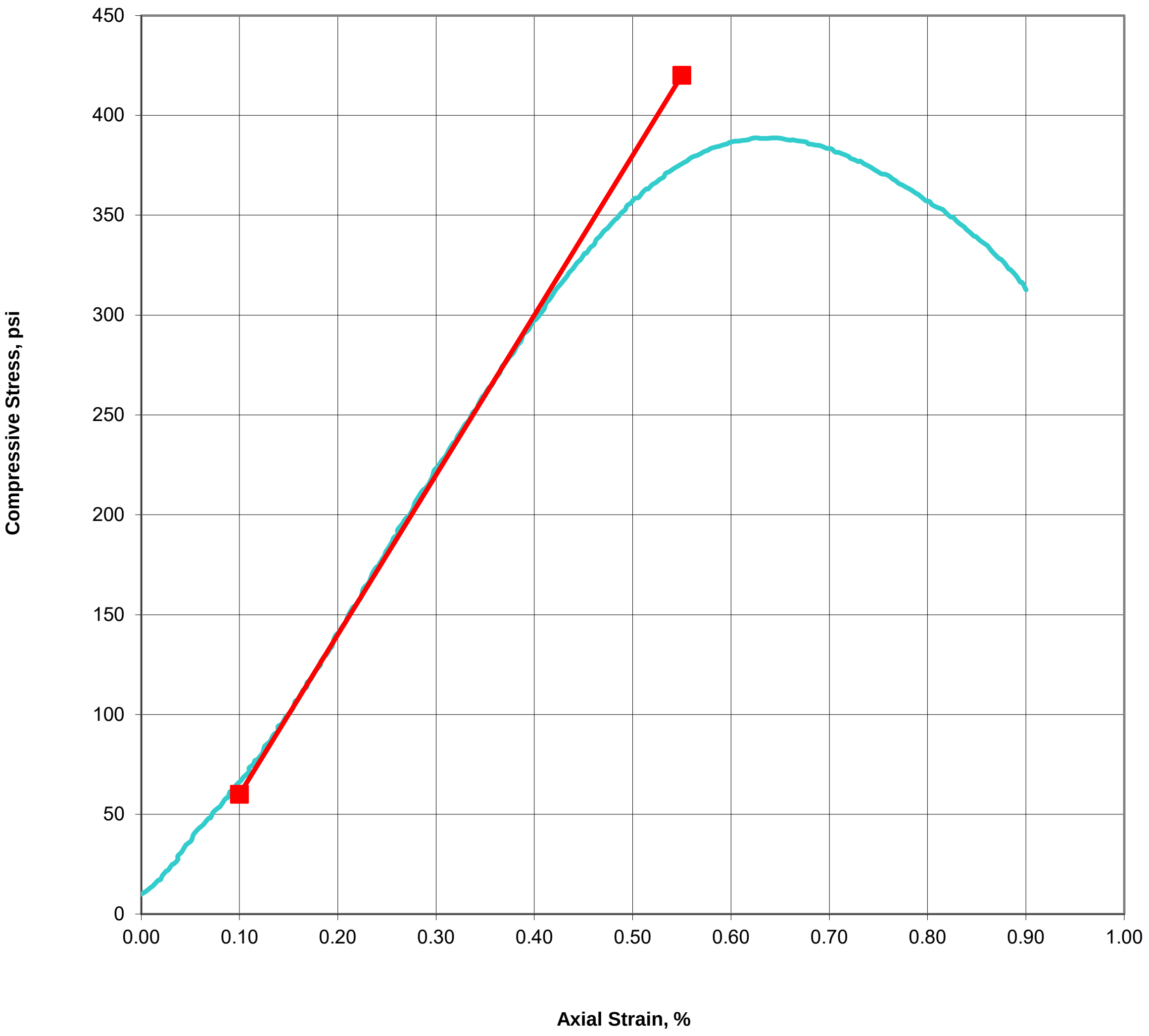
Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D7012D)

CTL Job No.: 823-008O3
Boring: B-40
Date: 9/23/2016
Client: GRI
Sample: R-2
By: PJ
Project Name: Port of Coos Bay Channel Modification Project
Depth,ft.: 10
Checked: DC
Project No.: 5128
Visual Description: Very Dark Bluish Gray Rock
Moisture Condition at Test Sample was washed and in a moist state.
Test Temperature, (^{o}C) Ambient
Remarks:

Sample Height, in.	5.10	**Unconfined Compressive Strength (psi)**	**389**
Sample Diameter, in.	2.36		
Height / Diameter	2.2		
Sample Area, in^2	4.39		
Wet Density, pcf	132.9	**Young's Modulus (E) (psi)**	**80,000**
Dry Density, pcf	111.9		
Moisture Content, %	18.7		
Strain Rate, % / min	0.25		



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Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D7012D)

CTL Job No.:	823-008O4	Boring:	B-40	Date:	9/23/2016
Client:	GRI	Sample:	R-2	By:	PJ
Project Name:	Port of Coos Bay Channel Modification Project	Depth,ft.:	11	Checked:	DC
Project No.:	5128				

Visual Description: Very Dark Bluish Gray Rock

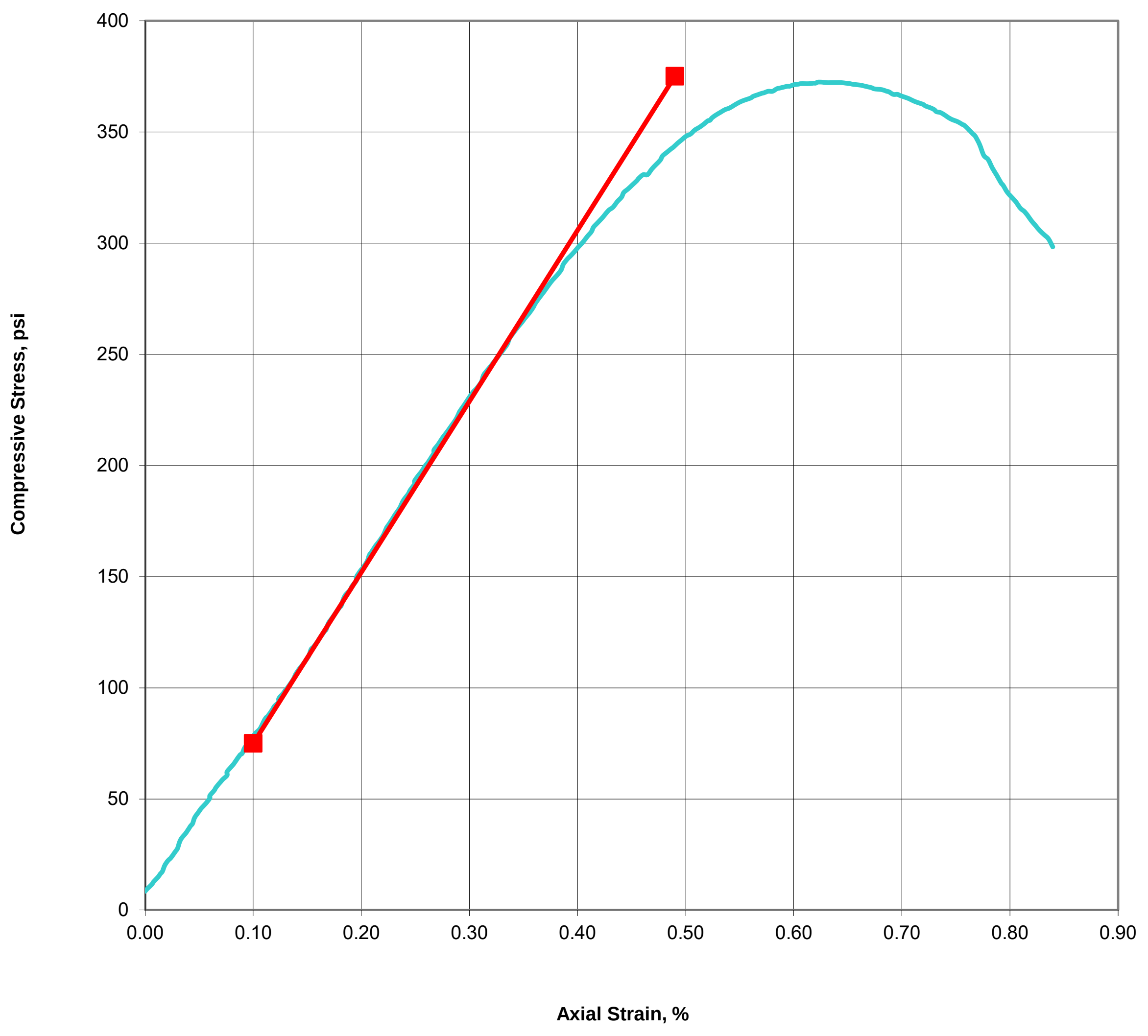
Moisture Condition at Test: Sample was washed and in a moist state.

Test Temperature, (^{o}C): Ambient

Remarks:

Sample Height, in.	5.01
Sample Diameter, in.	2.36
Height / Diameter	2.1
Sample Area, in^2	4.37
Wet Density, pcf	133.2
Dry Density, pcf	112.1
Moisture Content, %	18.8
Strain Rate, % / min	0.25

Unconfined Compressive Strength (psi)	**372**
Young's Modulus (E) (psi)	**76,900**



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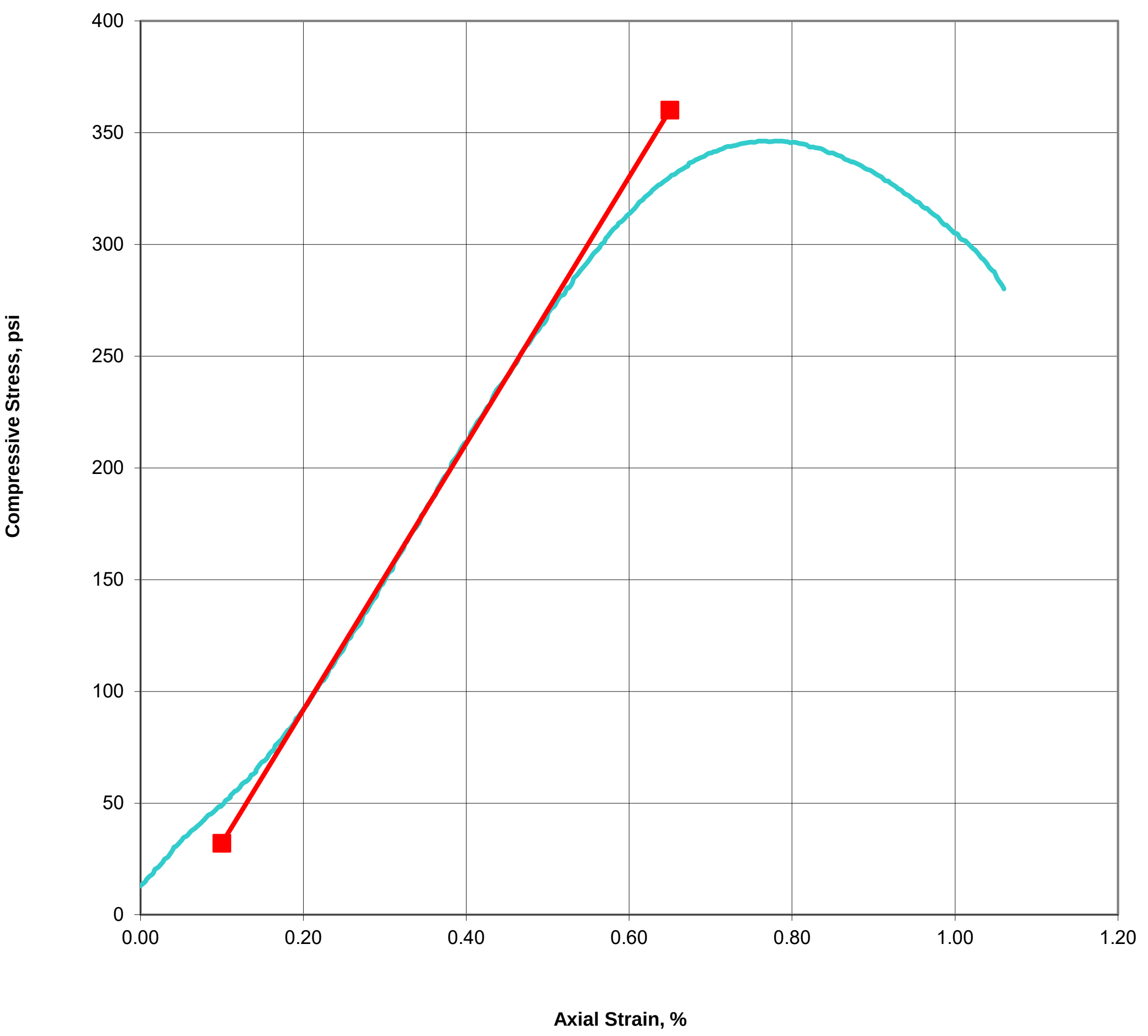
Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D7012D)

CTL Job No.: 823-008O5 Boring: B-40 Date: 9/23/2016
Client: GRI Sample: R-3 By: PJ
Project Name: Port of Coos Bay Channel Modification Project Depth,ft.: 16 Checked: DC
Project No.: 5128
Visual Description: Very Dark Bluish Gray Rock
Moisture Condition at Test Sample was washed and in a moist state.
Test Temperature, (°C) Ambient
Remarks:

Sample Height, in.	5.08
Sample Diameter, in.	2.31
Height / Diameter	2.2
Sample Area, in^2	4.19
Wet Density, pcf	132.3
Dry Density, pcf	111.0
Moisture Content, %	19.2
Strain Rate, % / min	0.25

Unconfined Compressive Strength (psi)	**346**
Young's Modulus (E) (psi)	**59,600**



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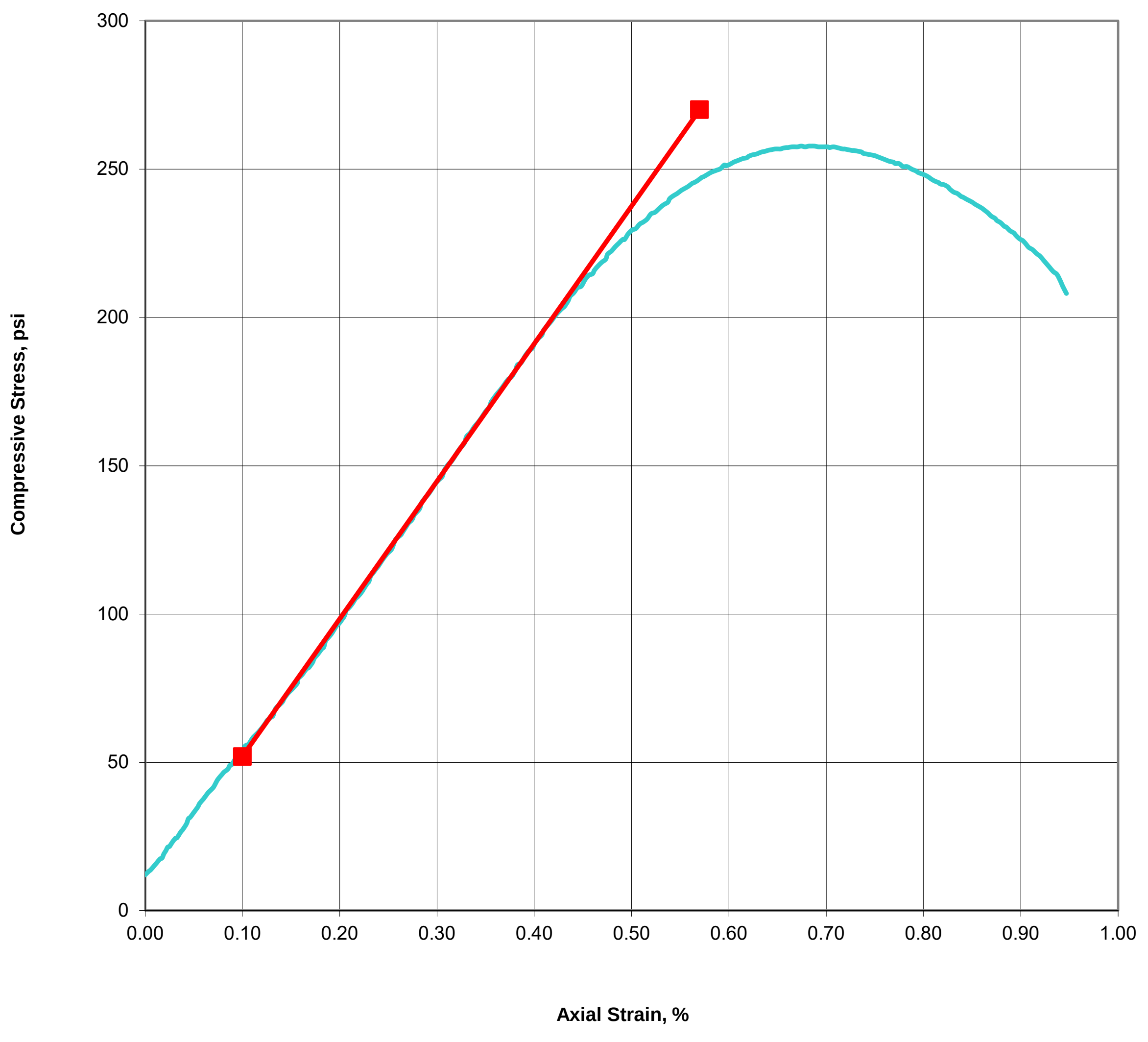
Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D7012D)

CTL Job No.: 823-008O6
Boring: B-40
Date: 9/23/2016
Client: GRI
Sample: R-5
By: PJ
Project Name: Port of Coos Bay Channel Modification Project
Depth,ft.: 21
Checked: DC
Project No.: 5128
Visual Description: Very Dark Greenish Gray Rock
Moisture Condition at Test: Sample was washed and in a moist state.
Test Temperature, (^oC): Ambient
Remarks: The height to diamter ratio is very slightly higher than allowed by the spec.

Sample Height, in.	5.17
Sample Diameter, in.	2.28
Height / Diameter	2.27
Sample Area, in^2	4.07
Wet Density, pcf	129.6
Dry Density, pcf	108.5
Moisture Content, %	19.5
Strain Rate, % / min	0.25

Unconfined Compressive Strength (psi)	**258**
Young's Modulus (E) (psi)	**46,400**



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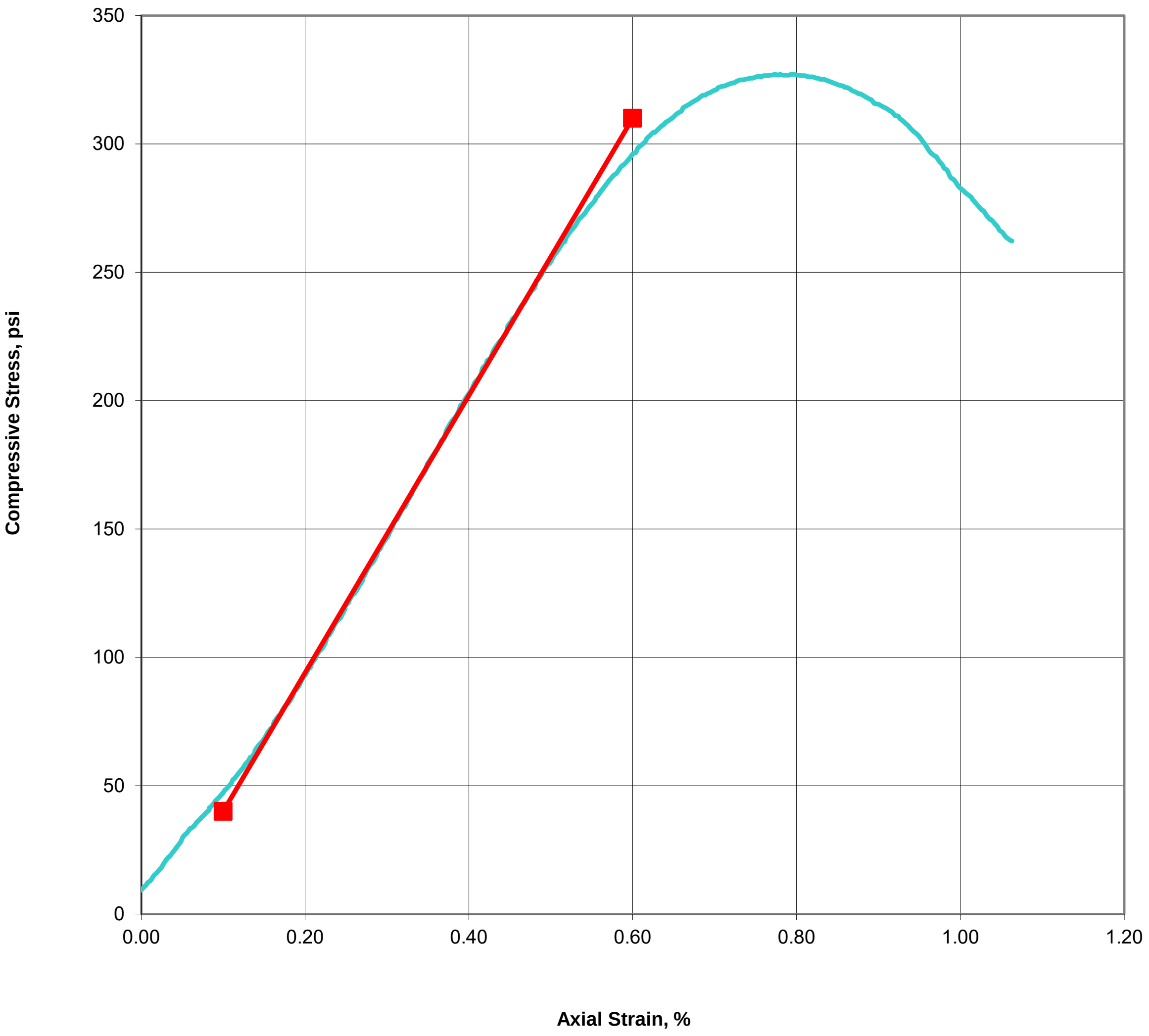
Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D7012D)

CTL Job No.: 823-008O7
Boring: B-40
Date: 9/23/2016
Client: GRI
Sample: R-5
By: PJ
Project Name: Port of Coos Bay Channel Modification Project
Depth,ft.: 23
Checked: DC
Project No.: 5128
Visual Description: Very Dark Greenish Gray Rock
Moisture Condition at Test Sample was washed and in a moist state.
Test Temperature, (°C) Ambient
Remarks:

Sample Height, in.	5.18	**Unconfined Compressive Strength (psi)**	**327**
Sample Diameter, in.	2.33		
Height / Diameter	2.2		
Sample Area, in^2	4.26		
Wet Density, pcf	129.3	**Young's Modulus (E) (psi)**	**54,000**
Dry Density, pcf	107.6		
Moisture Content, %	20.1		
Strain Rate, % / min	0.28		

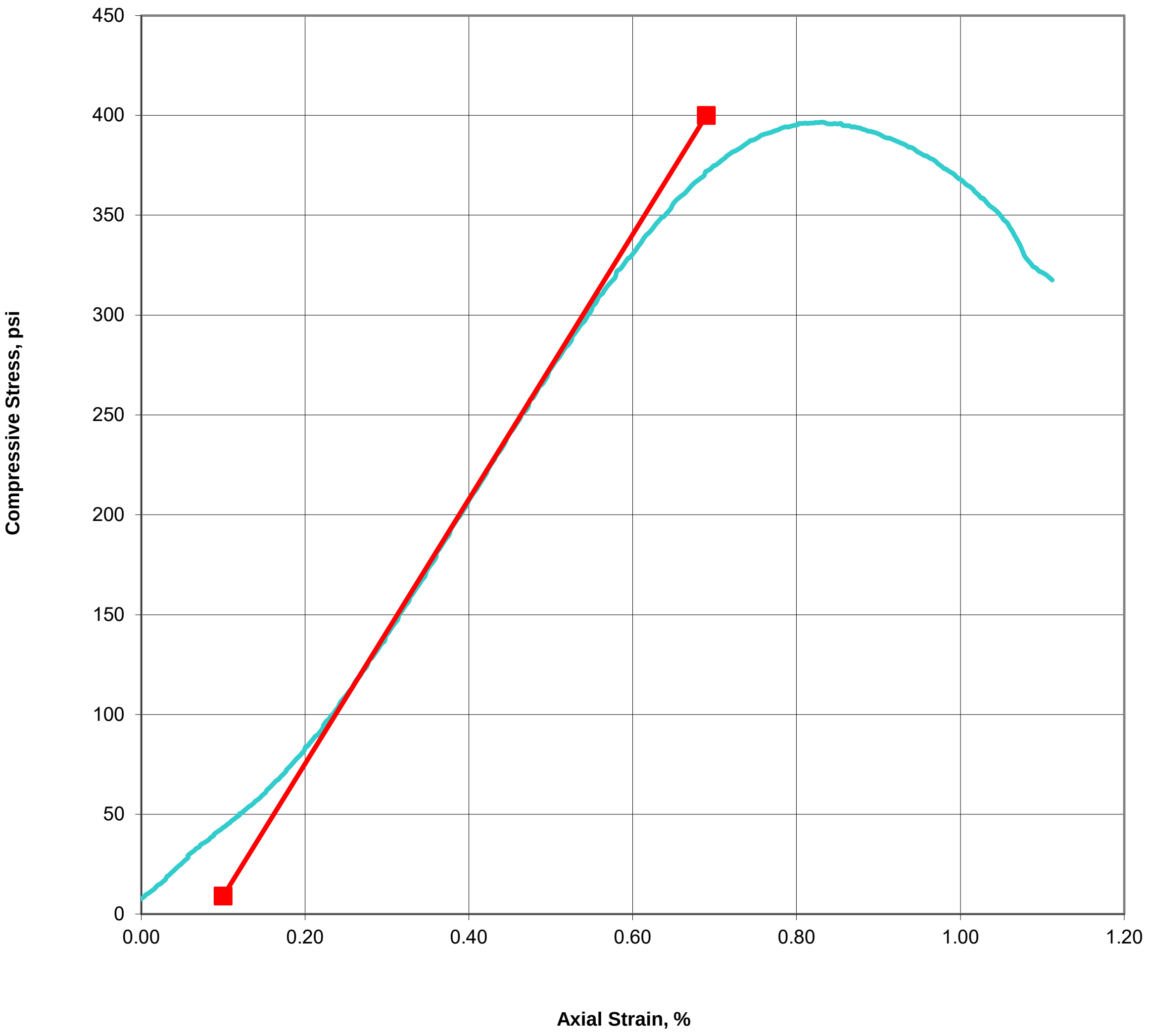


Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D7012D)

CTL Job No.: 823-008O8
Boring: B-40
Date: 9/23/2016
Client: GRI
Sample: R-7
By: PJ
Project Name: Port of Coos Bay Channel Modification Project
Depth,ft.: 26
Checked: DC
Project No.: 5128
Visual Description: Very Dark Greenish Gray Rock
Moisture Condition at Test Sample was washed and in a moist state.
Test Temperature, (°C) Ambient
Remarks:

Sample Height, in.	5.08
Sample Diameter, in.	2.36
Height / Diameter	2.1
Sample Area, in^2	4.39
Wet Density, pcf	131.2
Dry Density, pcf	109.8
Moisture Content, %	19.5
Strain Rate, % / min	0.25

Unconfined Compressive Strength (psi)	**397**
Young's Modulus (E) (psi)	**66,300**



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Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D7012D)

CTL Job No.:	823-008O9	Boring:	B-40	Date:	9/23/2016
Client:	GRI	Sample:	R-7	By:	PJ
Project Name:	Port of Coos Bay Channel Modification Project	Depth,ft.:	28	Checked:	DC
Project No.:	5128				

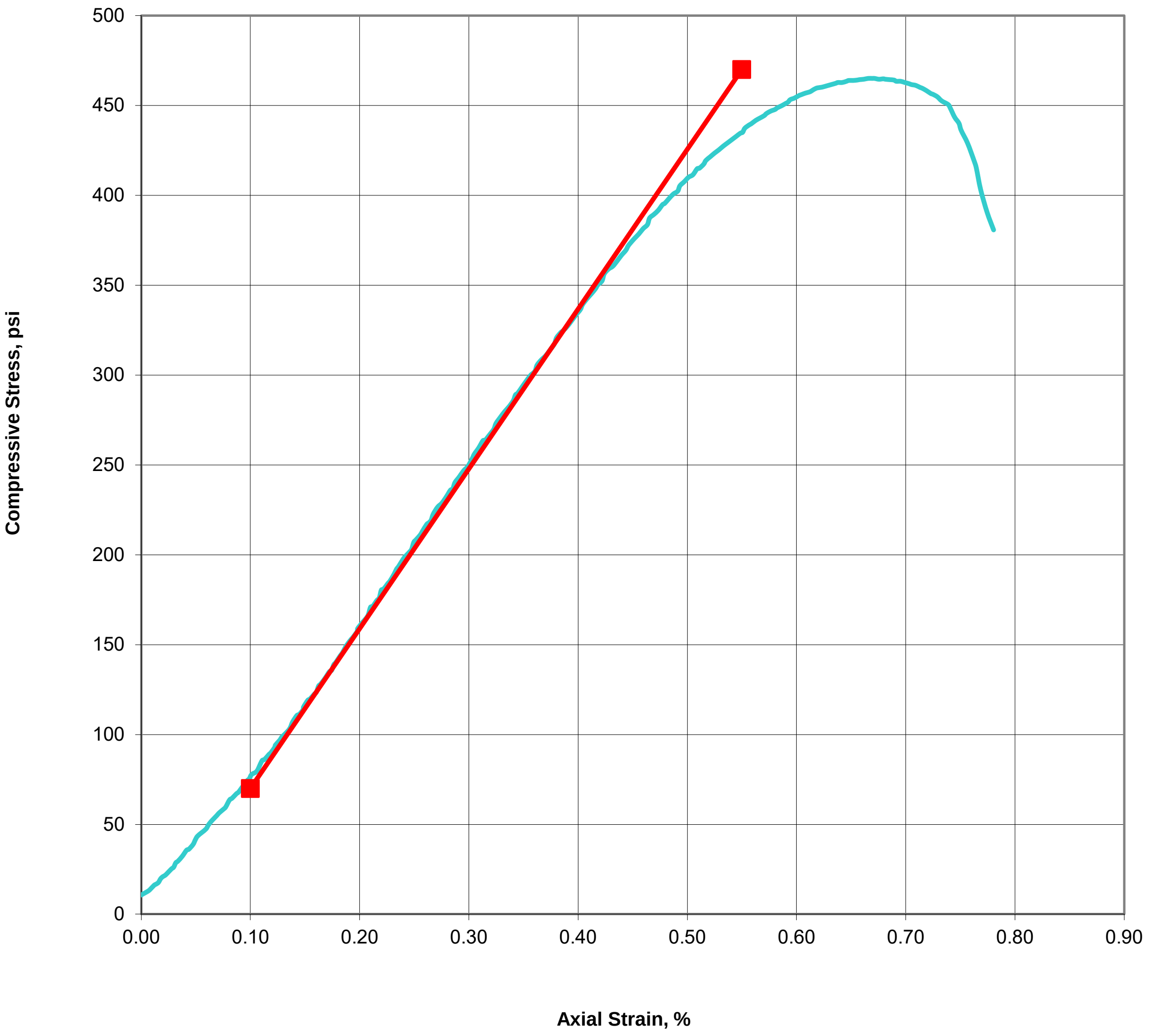
Visual Description: Very Dark Greenish Gray Rock

Moisture Condition at Test: Sample was washed and in a moist state.

Test Temperature, (^{o}C): Ambient

Remarks:

Sample Height, in.	5.05	**Unconfined Compressive Strength (psi)**	**465**
Sample Diameter, in.	2.37		
Height / Diameter	2.1		
Sample Area, in^2	4.40		
Wet Density, pcf	132.4	**Young's Modulus (E) (psi)**	**88,900**
Dry Density, pcf	111.3		
Moisture Content, %	19.0		
Strain Rate, % / min	0.25		



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Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D7012D)

CTL Job No.:	823-010A1	Boring:	UB-1	Date:	2/14/2017
Client:	GRI	Sample:	R-1	By:	PJ
Project Name:	Port of Coos Bay Channel Modification Project	Depth,ft.:	48.5	Checked:	DC
Project No.:	5128 T2.021				

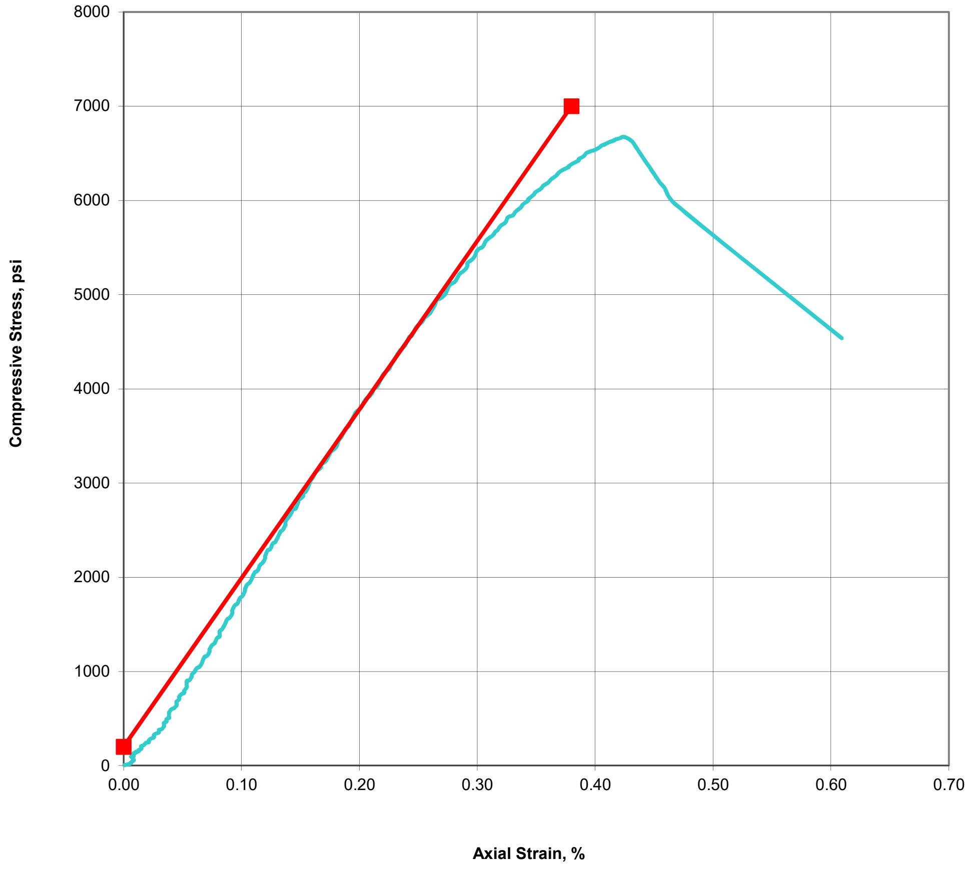
Visual Description: Olive Gray Rock

Moisture Condition at Test Sample was washed and in a moist state.

Test Temperature, (^{o}C) Ambient

Remarks:

Sample Height, in.	4.66	**Unconfined Compressive Strength (psi)**	**6673**
Sample Diameter, in.	2.23		
Height / Diameter	2.1		
Sample Area, in^2	3.91		
Wet Density, pcf	153.6	**Young's Modulus (E) (psi)**	**1,790,000**
Dry Density, pcf	132.1		
Moisture Content, %	16.3		
Strain Rate, % / min	0.25		



Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D7012D)

CTL Job No.:	823-010A3	Boring:	UB-1	Date:	2/14/2017
Client:	GRI	Sample:	R-4	By:	PJ
Project Name:	Port of Coos Bay Channel Modification Project	Depth,ft.:	60	Checked:	DC
Project No.:	5128 T2.021				

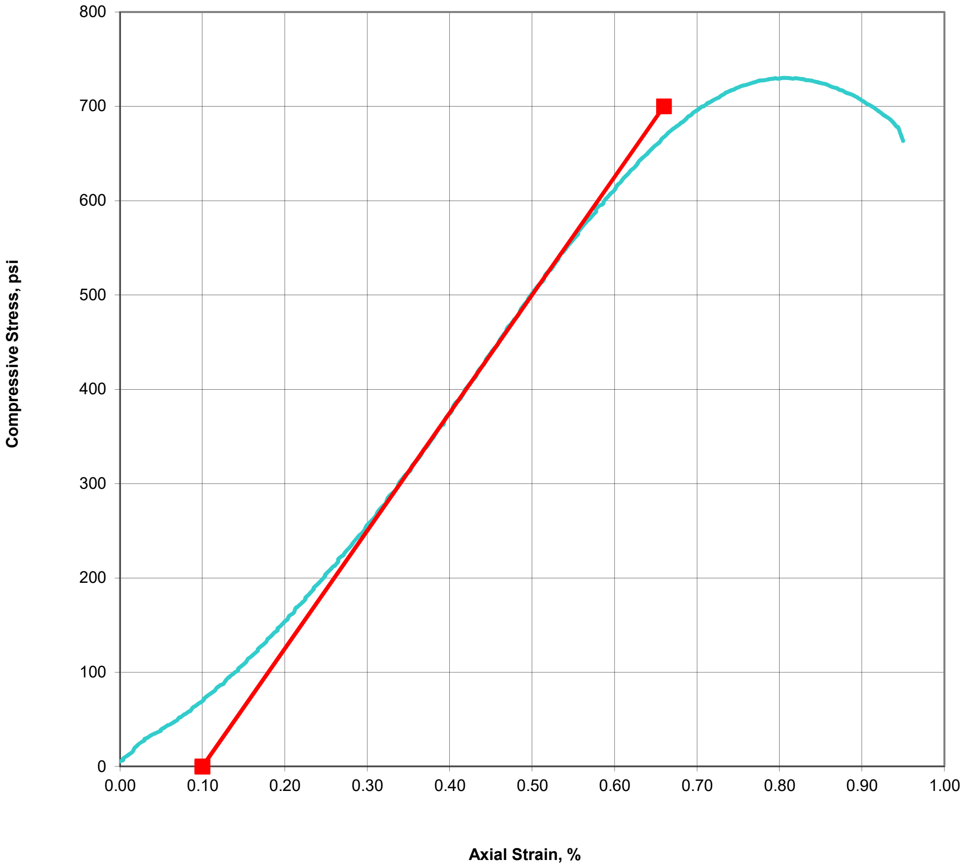
Visual Description: Gray Rock

Moisture Condition at Test Sample was washed and in a moist state.

Test Temperature, (^oC) Ambient

Remarks:

Sample Height, in.	5.02	**Unconfined Compressive Strength (psi)**	**730**
Sample Diameter, in.	2.38		
Height / Diameter	2.1		
Sample Area, in^2	4.45		
Wet Density, pcf	135.5	**Young's Modulus (E) (psi)**	**125,000**
Dry Density, pcf	115.8		
Moisture Content, %	17.0		
Strain Rate, % / min	0.25		



Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D7012D)

CTL Job No.:	823-010A4	Boring:	UB-1	Date:	2/14/2017
Client:	GRI	Sample:	R-5	By:	PJ
Project Name:	Port of Coos Bay Channel Modification Project	Depth,ft.:	67	Checked:	DC
Project No.:	5128 T2.021				

Visual Description: Olive Brown Rock

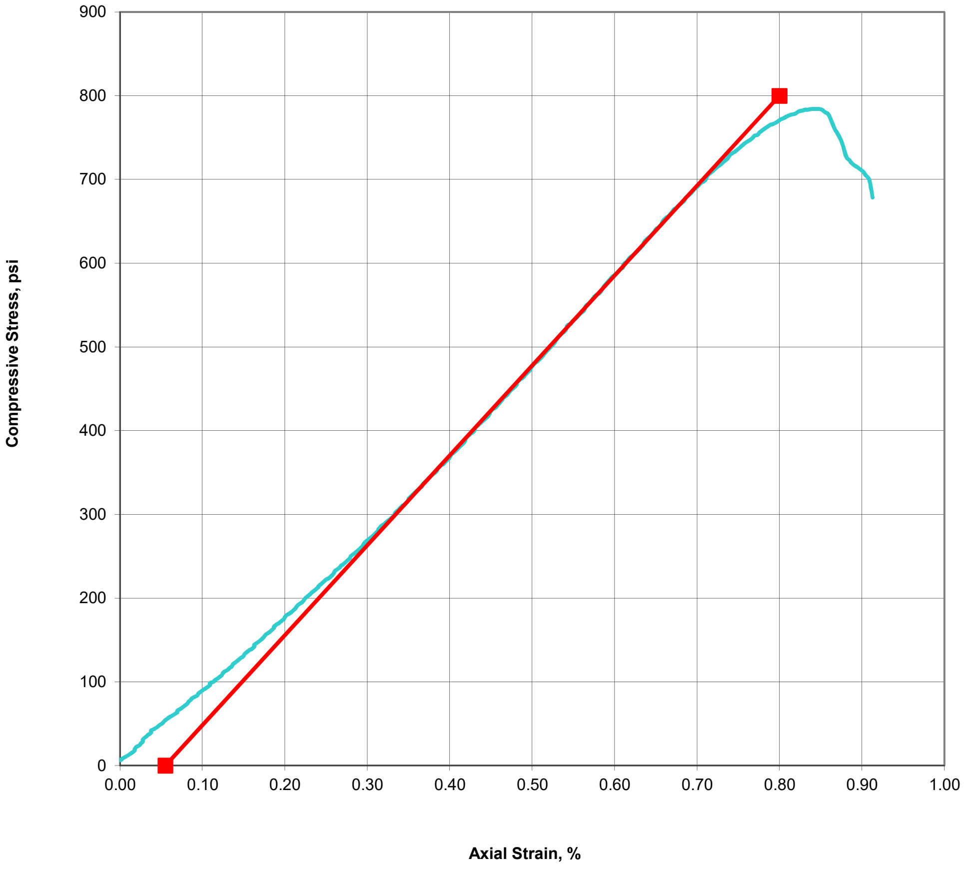
Moisture Condition at Test Sample was washed and in a moist state.

Test Temperature, (^{o}C) Ambient

Remarks:

Sample Height, in.	5.03
Sample Diameter, in.	2.32
Height / Diameter	2.2
Sample Area, in^2	4.21
Wet Density, pcf	135.4
Dry Density, pcf	115.5
Moisture Content, %	17.2
Strain Rate, % / min	0.25

Unconfined Compressive Strength (psi)	**784**
Young's Modulus (E) (psi)	**107,400**

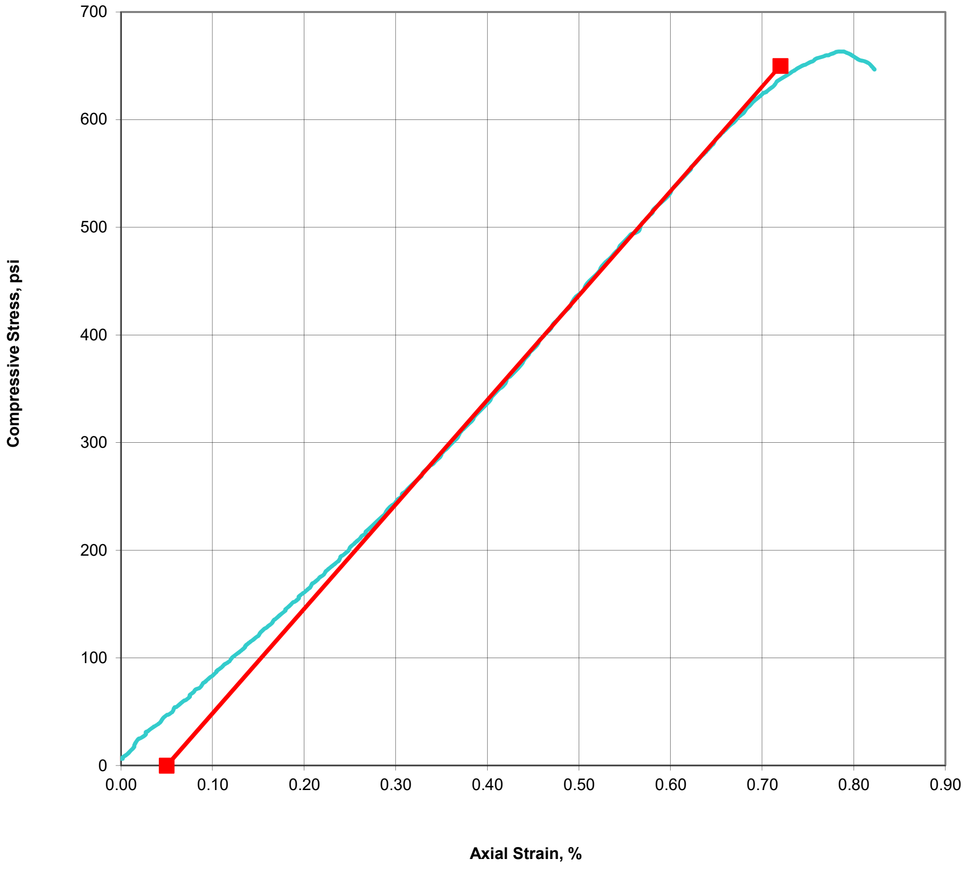


Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D7012D)

CTL Job No.: 823-010A5
Boring: UB-1
Date: 2/14/2017
Client: GRI
Sample: R-6
By: PJ
Project Name: Port of Coos Bay Channel Modification Project
Depth,ft.: 71
Checked: DC
Project No.: 5128 T2.021
Visual Description: Olive Gray Rock
Moisture Condition at Test Sample was washed and in a moist state.
Test Temperature, (°C) Ambient
Remarks:

Sample Height, in.	4.79
Sample Diameter, in.	2.30
Height / Diameter	2.1
Sample Area, in^2	4.15
Wet Density, pcf	135.3
Dry Density, pcf	115.8
Moisture Content, %	16.8
Strain Rate, % / min	0.25

Unconfined Compressive Strength (psi)	**663**
Young's Modulus (E) (psi)	**97,000**



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Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D7012D)

CTL Job No.:	823-010A6	Boring:	UB-1	Date:	2/14/2017
Client:	GRI	Sample:	R-7	By:	PJ
Project Name:	Port of Coos Bay Channel Modification Project	Depth,ft.:	77	Checked:	DC
Project No.:	5128 T2.021				

Visual Description: Olive Gray Rock

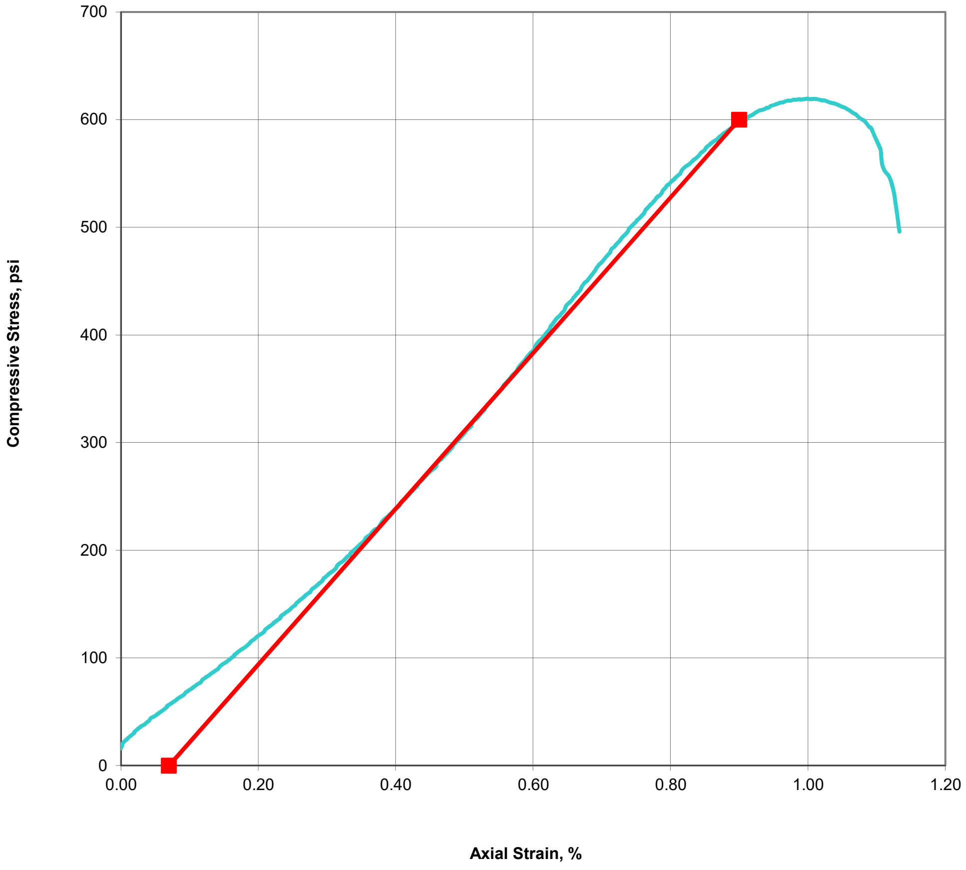
Moisture Condition at Test: Sample was washed and in a moist state.

Test Temperature, (^oC): Ambient

Remarks:

Sample Height, in.	5.08
Sample Diameter, in.	2.26
Height / Diameter	2.2
Sample Area, in^2	4.01
Wet Density, pcf	135.7
Dry Density, pcf	115.8
Moisture Content, %	17.2
Strain Rate, % / min	0.25

Unconfined Compressive Strength (psi)	**619**
Young's Modulus (E) (psi)	**72,300**



Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D7012D)

CTL Job No.:	823-010B1	Boring:	UB-2	Date:	2/14/2017
Client:	GRI	Sample:	R-2	By:	PJ
Project Name:	Port of Coos Bay Channel Modification Project	Depth,ft.:	46	Checked:	DC
Project No.:	5128 T2.021				

Visual Description: Dark Olive Brown Rock

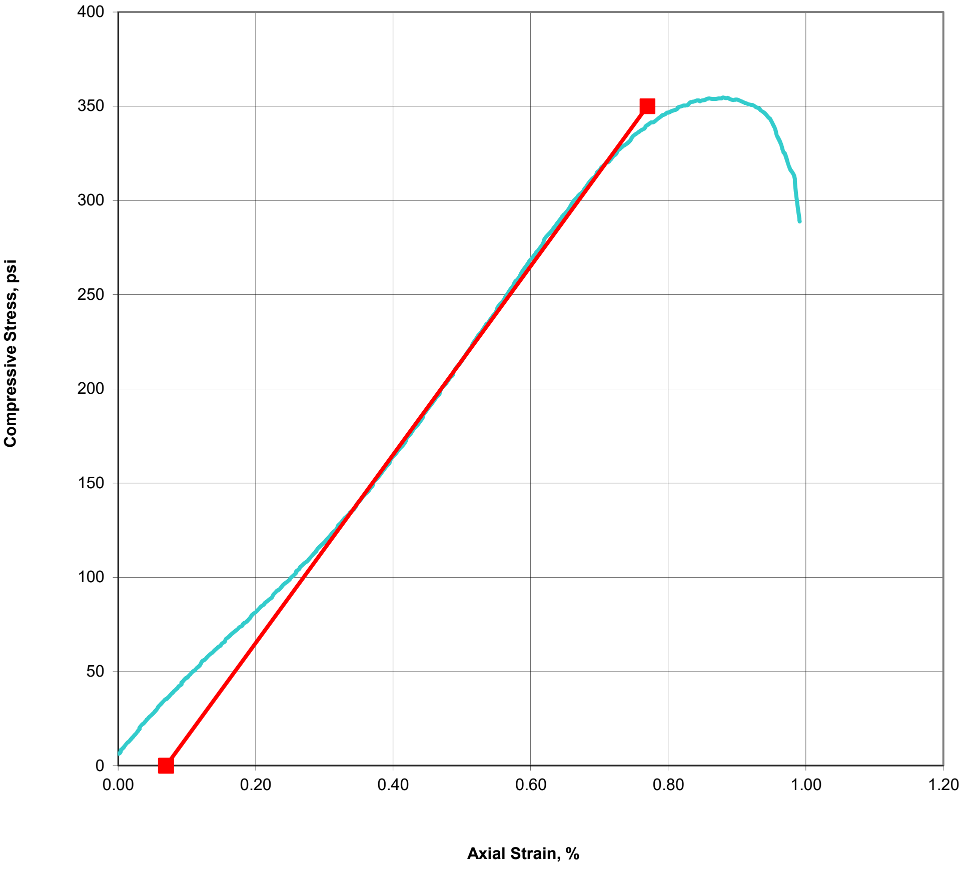
Moisture Condition at Test: Sample was washed and in a moist state.

Test Temperature, (°C): Ambient

Remarks:

Sample Height, in.	5.10
Sample Diameter, in.	2.26
Height / Diameter	2.3
Sample Area, in^2	4.01
Wet Density, pcf	135.3
Dry Density, pcf	114.9
Moisture Content, %	17.8
Strain Rate, % / min	0.25

Unconfined Compressive Strength (psi)	**355**
Young's Modulus (E) (psi)	**50,000**



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Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D7012D)

CTL Job No.:	823-010B2	Boring:	UB-2	Date:	2/14/2017
Client:	GRI	Sample:	R-3	By:	PJ
Project Name:	Port of Coos Bay Channel Modification Project	Depth,ft.:	50	Checked:	DC
Project No.:	5128 T2.021				

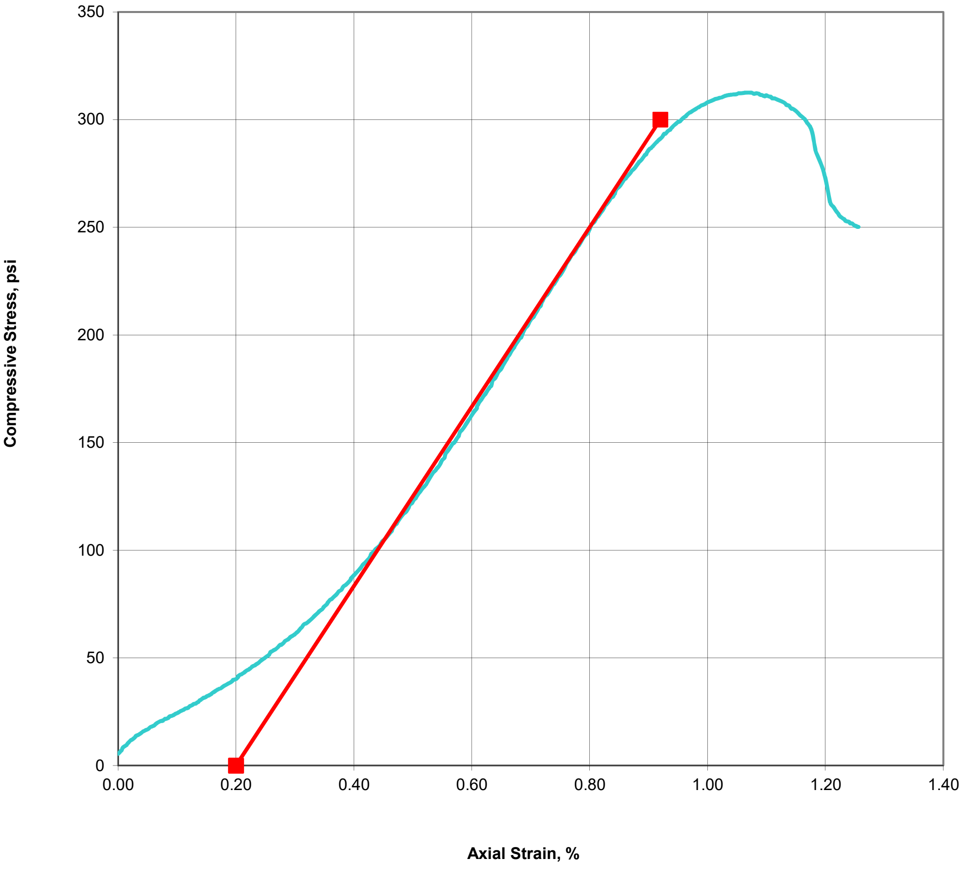
Visual Description: Gray Rock

Moisture Condition at Test Sample was washed and in a moist state.

Test Temperature, (^{o}C) Ambient

Remarks:

Sample Height, in.	4.91	**Unconfined Compressive Strength (psi)**	**312**
Sample Diameter, in.	2.31		
Height / Diameter	2.1		
Sample Area, in^2	4.19		
Wet Density, pcf	136.0	**Young's Modulus (E) (psi)**	**41,700**
Dry Density, pcf	116.6		
Moisture Content, %	16.6		
Strain Rate, % / min	0.25		



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Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D7012D)

CTL Job No.: 823-010B3
Boring: UB-2
Date: 2/14/2017

Client: GRI
Sample: R-4
By: PJ

Project Name: Port of Coos Bay Channel Modification Project
Depth,ft.: 56
Checked: DC

Project No.: 5128 T2.021

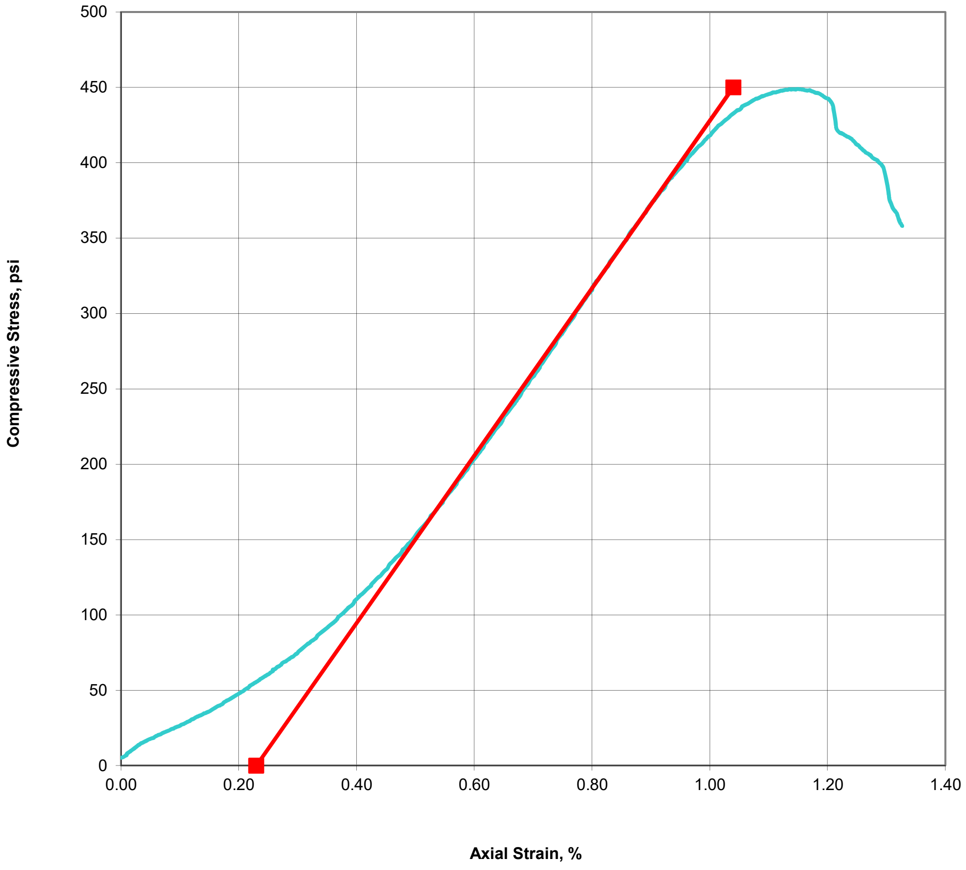
Visual Description: Gray Rock

Moisture Condition at Test Sample was washed and in a moist state.

Test Temperature, (^oC) Ambient

Remarks:

Sample Height, in.	5.04	**Unconfined Compressive Strength (psi)**	**449**
Sample Diameter, in.	2.32		
Height / Diameter	2.2		
Sample Area, in^2	4.22		
Wet Density, pcf	135.7	**Young's Modulus (E) (psi)**	**55,600**
Dry Density, pcf	115.1		
Moisture Content, %	17.9		
Strain Rate, % / min	0.25		



Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D7012D)

CTL Job No.:	823-010B4	Boring:	UB-2	Date:	2/14/2017
Client:	GRI	Sample:	R-5	By:	PJ
Project Name:	Port of Coos Bay Channel Modification Project	Depth,ft.:	63	Checked:	DC
Project No.:	5128 T2.021				

Visual Description: Gray Rock

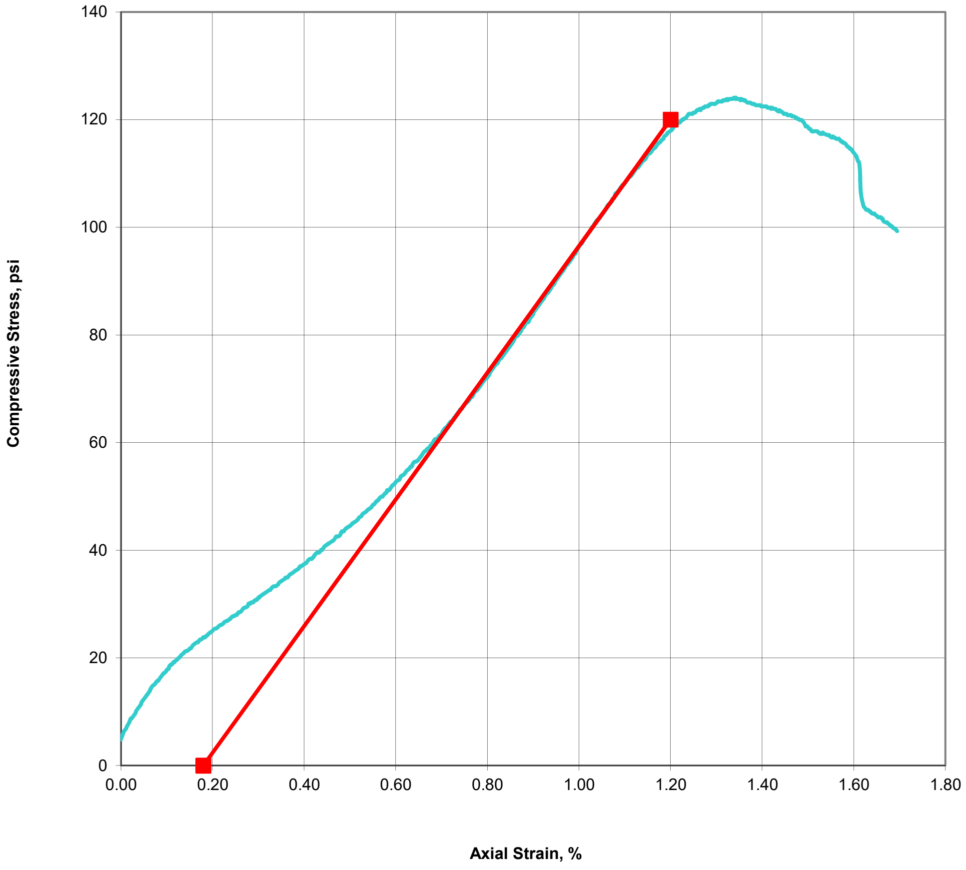
Moisture Condition at Test Sample was washed and in a moist state.

Test Temperature, (^{o}C) Ambient

Remarks:

Sample Height, in.	5.06
Sample Diameter, in.	2.35
Height / Diameter	2.2
Sample Area, in^2	4.32
Wet Density, pcf	135.9
Dry Density, pcf	114.8
Moisture Content, %	18.4
Strain Rate, % / min	0.25

Unconfined Compressive Strength (psi)	**124**
Young's Modulus (E) (psi)	**11,800**



Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D7012D)

CTL Job No.:	823-010B5	Boring:	UB-2	Date:	2/14/2017
Client:	GRI	Sample:	R-6	By:	PJ
Project Name:	Port of Coos Bay Channel Modification Project	Depth,ft.:	65	Checked:	DC
Project No.:	5128 T2.021				

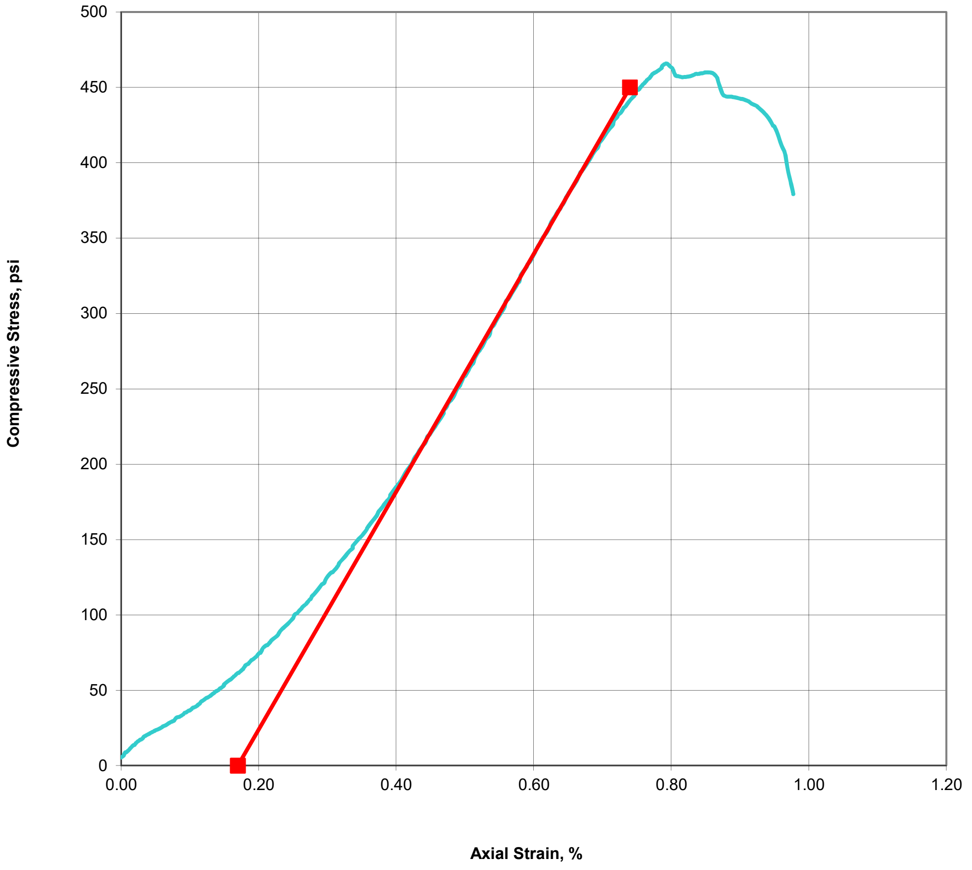
Visual Description: Gray Rock

Moisture Condition at Test Sample was washed and in a moist state.

Test Temperature, (^{o}C) Ambient

Remarks:

Sample Height, in.	5.07	**Unconfined Compressive Strength (psi)**	**466**
Sample Diameter, in.	2.30		
Height / Diameter	2.2		
Sample Area, in^2	4.14		
Wet Density, pcf	136.0	**Young's Modulus (E) (psi)**	**78,900**
Dry Density, pcf	116.8		
Moisture Content, %	16.5		
Strain Rate, % / min	0.24		



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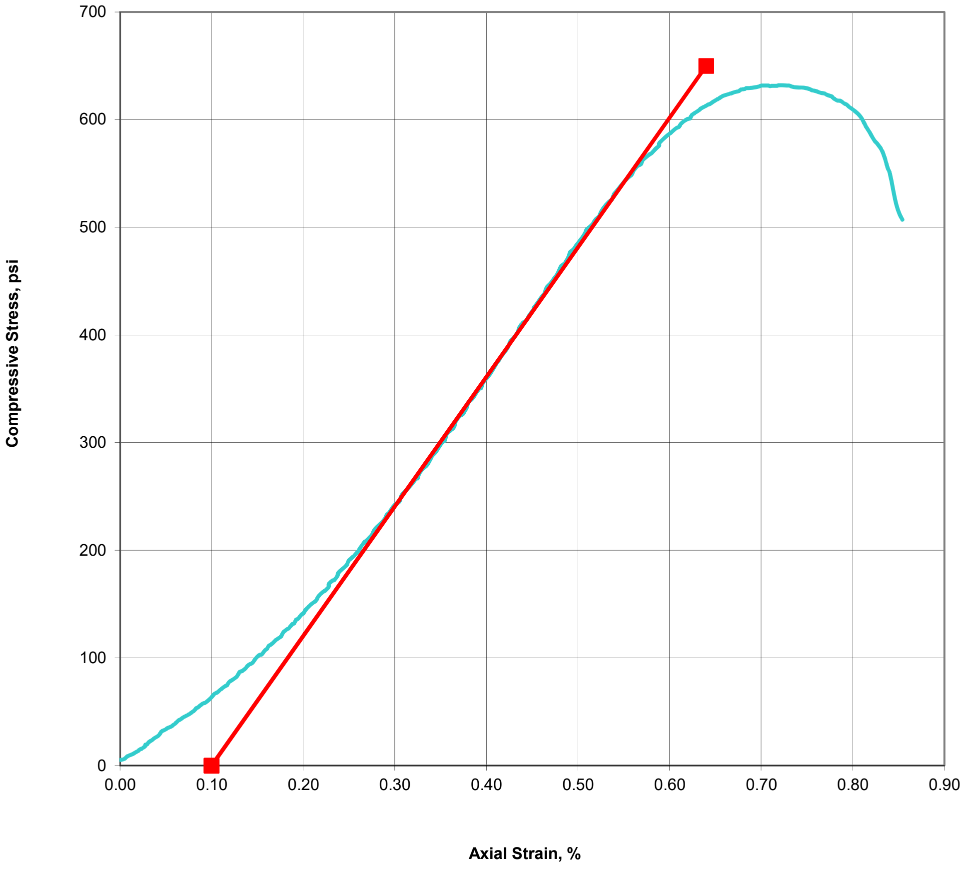
Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D7012D)

CTL Job No.: 823-010B6
Boring: UB-2
Date: 2/14/2017
Client: GRI
Sample: R-7
By: PJ
Project Name: Port of Coos Bay Channel Modification Project
Depth,ft.: 72
Checked: DC
Project No.: 5128 T2.021
Visual Description: Gray Rock
Moisture Condition at Test Sample was washed and in a moist state.
Test Temperature, (°C) Ambient
Remarks:

Sample Height, in.	5.05
Sample Diameter, in.	2.31
Height / Diameter	2.2
Sample Area, in^2	4.18
Wet Density, pcf	140.8
Dry Density, pcf	123.4
Moisture Content, %	14.2
Strain Rate, % / min	0.25

Unconfined Compressive Strength (psi)	**632**
Young's Modulus (E) (psi)	**120,400**



Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D7012D)

CTL Job No.:	823-010C1	Boring:	UB-3	Date:	2/14/2017
Client:	GRI	Sample:	R-2	By:	PJ
Project Name:	Port of Coos Bay Channel Modification Project	Depth,ft.:	35.5	Checked:	DC
Project No.:	5128 T2.021				

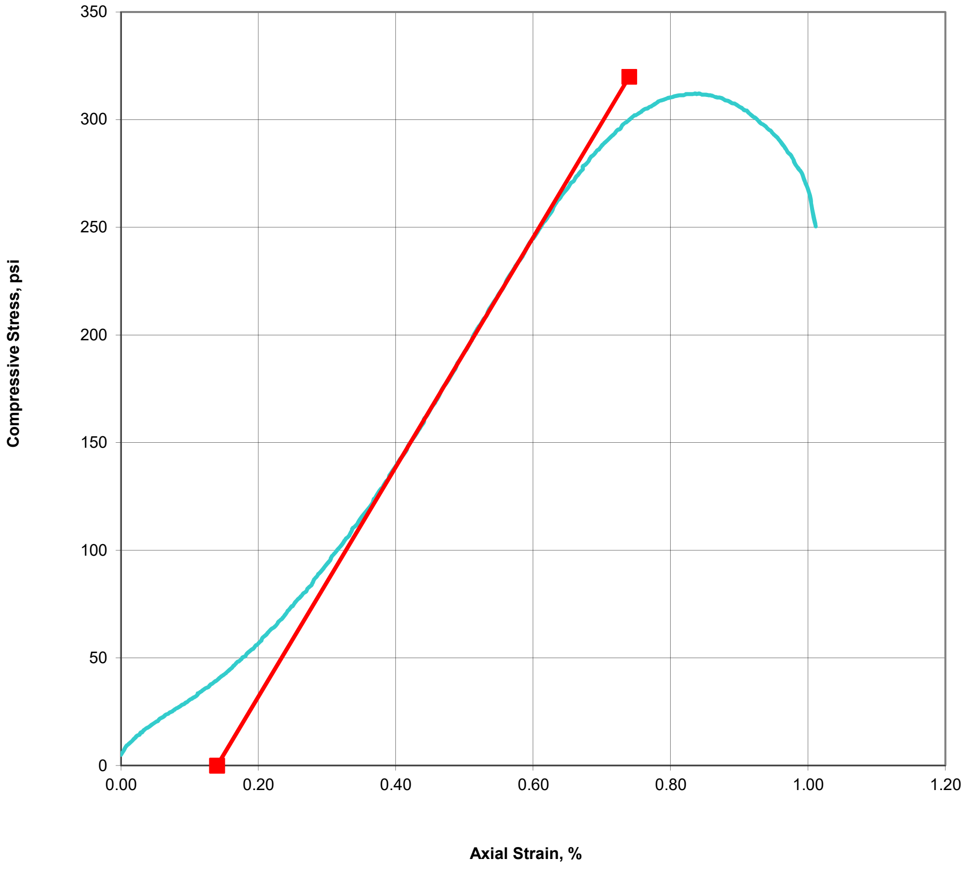
Visual Description: Gray Rock

Moisture Condition at Test: Sample was washed and in a moist state.

Test Temperature, (^{o}C): Ambient

Remarks:

Sample Height, in.	5.19	**Unconfined Compressive Strength (psi)**	**312**
Sample Diameter, in.	2.19		
Height / Diameter	2.4		
Sample Area, in^2	3.76		
Wet Density, pcf	130.6	**Young's Modulus (E) (psi)**	**53,300**
Dry Density, pcf	111.0		
Moisture Content, %	17.7		
Strain Rate, % / min	0.25		



Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D7012D)

CTL Job No.:	823-010C2	Boring:	UB-3	Date:	2/14/2017
Client:	GRI	Sample:	R-3	By:	PJ
Project Name:	Port of Coos Bay Channel Modification Project	Depth,ft.:	40	Checked:	DC
Project No.:	5128 T2.021				

Visual Description: Gray Rock

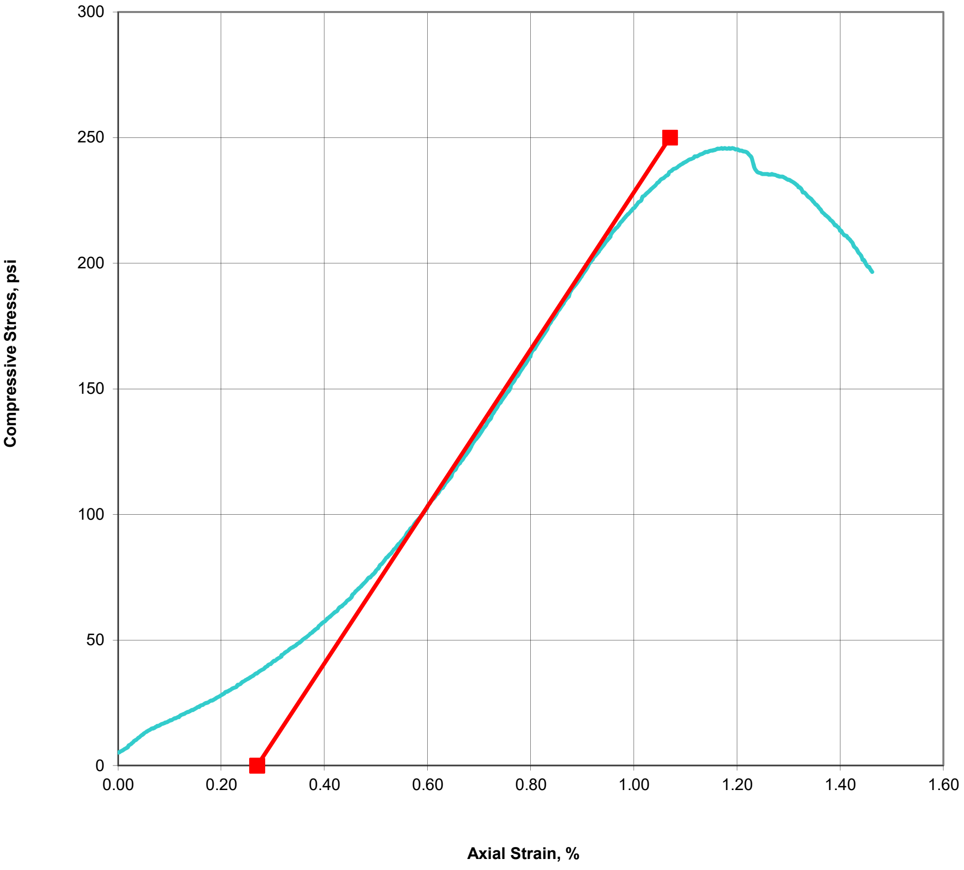
Moisture Condition at Test: Sample was washed and in a moist state.

Test Temperature, (°C): Ambient

Remarks:

Sample Height, in.	4.83
Sample Diameter, in.	2.25
Height / Diameter	2.1
Sample Area, in²	3.98
Wet Density, pcf	131.2
Dry Density, pcf	111.3
Moisture Content, %	17.9
Strain Rate, % / min	0.25

Unconfined Compressive Strength (psi)	**246**
Young's Modulus (E) (psi)	**31,300**



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Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D7012D)

CTL Job No.:	823-010C3	Boring:	UB-3	Date:	2/14/2017
Client:	GRI	Sample:	R-6	By:	PJ
Project Name:	Port of Coos Bay Channel Modification Project	Depth,ft.:	55	Checked:	DC
Project No.:	5128 T2.021				

Visual Description: Gray Rock

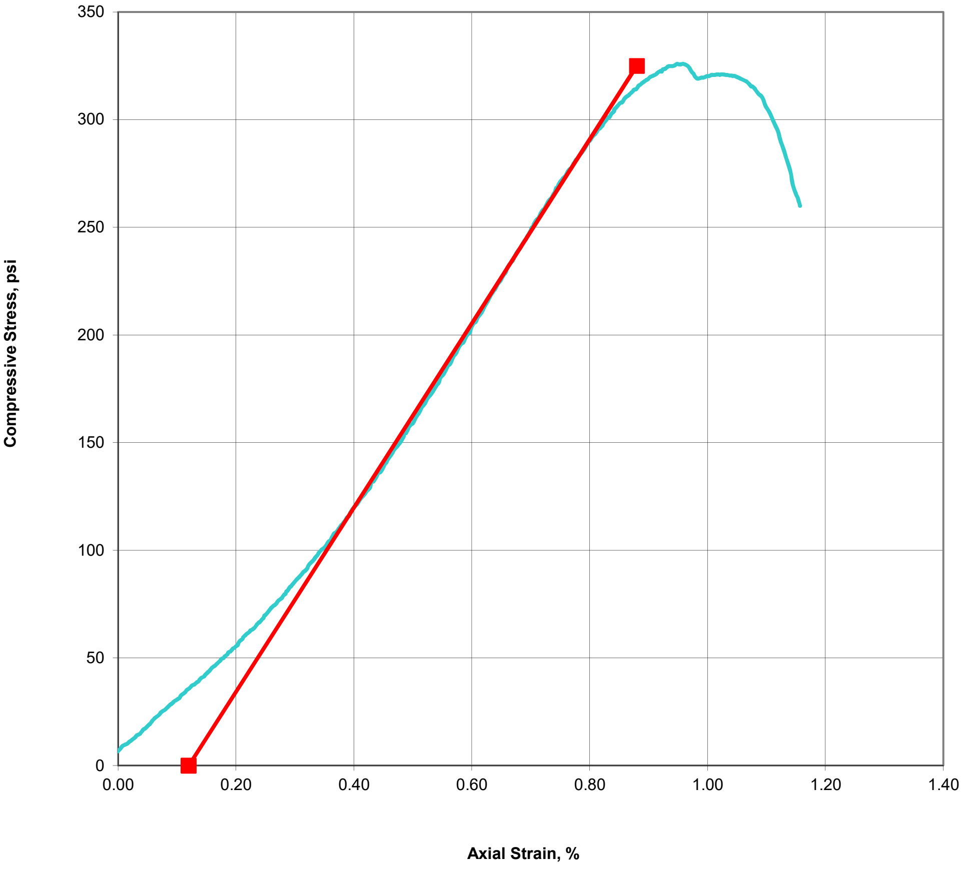
Moisture Condition at Test Sample was washed and in a moist state.

Test Temperature, (°C) Ambient

Remarks:

Sample Height, in.	5.07
Sample Diameter, in.	2.23
Height / Diameter	2.3
Sample Area, in^2	3.92
Wet Density, pcf	136.1
Dry Density, pcf	118.0
Moisture Content, %	15.3
Strain Rate, % / min	0.25

Unconfined Compressive Strength (psi)	**326**
Young's Modulus (E) (psi)	**42,800**



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Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D7012D)

CTL Job No.:	823-010C4	Boring:	UB-3	Date:	2/14/2017
Client:	GRI	Sample:	R-7	By:	PJ
Project Name:	Port of Coos Bay Channel Modification Project	Depth,ft.:	62	Checked:	DC
Project No.:	5128 T2.021				

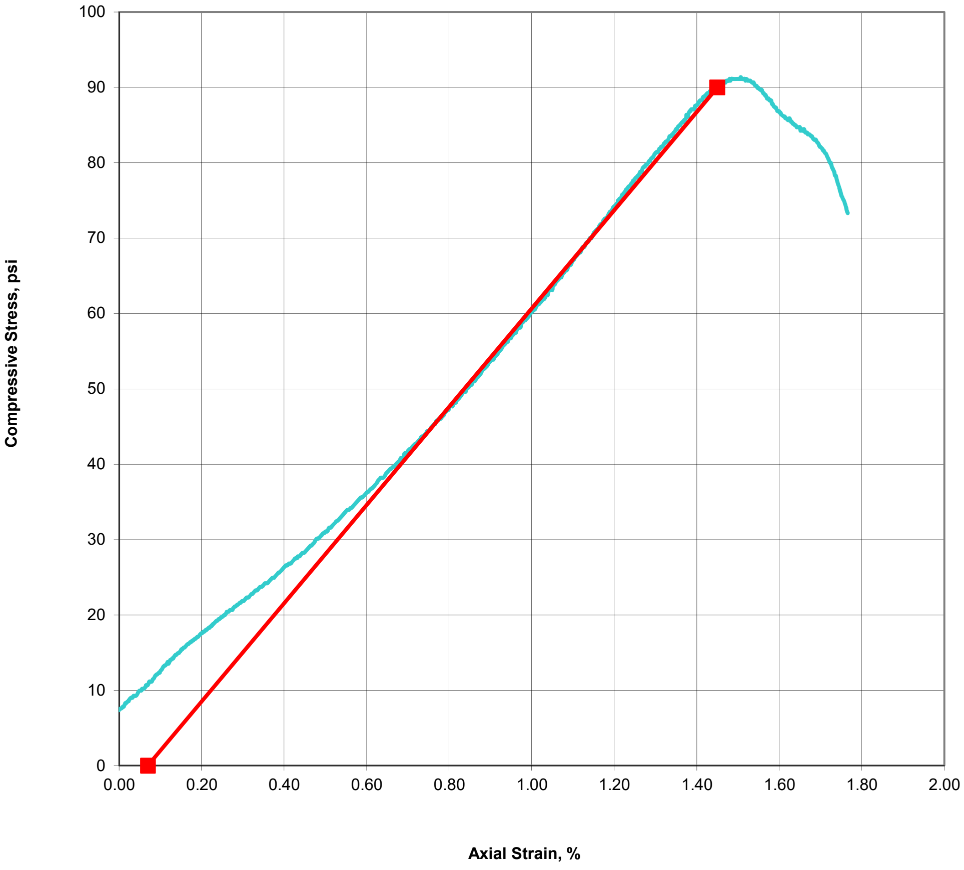
Visual Description: Gray Rock

Moisture Condition at Test: Sample was washed and in a moist state.

Test Temperature, (°C): Ambient

Remarks:

Sample Height, in.	5.17	**Unconfined Compressive Strength (psi)**	**91**
Sample Diameter, in.	2.32		
Height / Diameter	2.2		
Sample Area, in^2	4.21		
Wet Density, pcf	131.9	**Young's Modulus (E) (psi)**	**6,500**
Dry Density, pcf	112.4		
Moisture Content, %	17.3		
Strain Rate, % / min	0.25		



Unconfined Compressive Strength and Young's Modulus of Rock Core (ASTM D7012D)

CTL Job No.:	823-010C5	Boring:	UB-3	Date:	2/14/2017
Client:	GRI	Sample:	R-8	By:	PJ
Project Name:	Port of Coos Bay Channel Modification Project	Depth,ft.:	66	Checked:	DC
Project No.:	5128 T2.021				

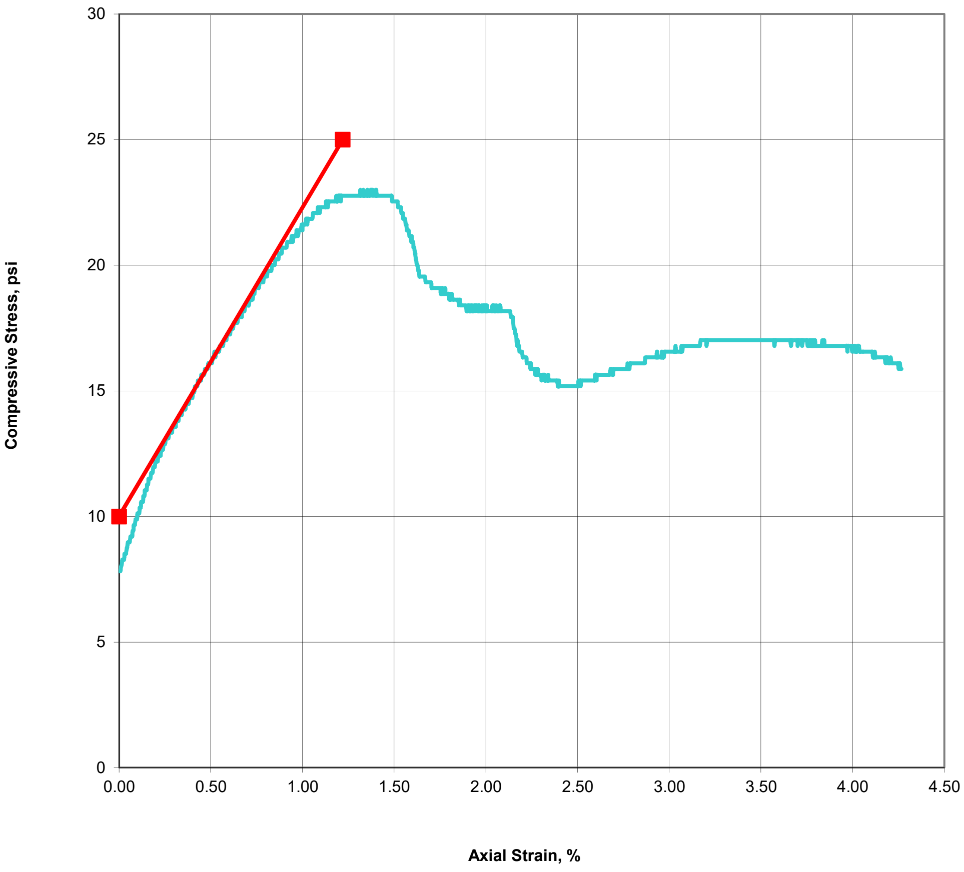
Visual Description: Gray Rock

Moisture Condition at Test Sample was washed and in a moist state.

Test Temperature, (^{o}C) Ambient

Remarks: Some pre-test fractures were observed.

Sample Height, in.	4.97	**Unconfined Compressive Strength (psi)**	**23**
Sample Diameter, in.	2.35		
Height / Diameter	2.1		
Sample Area, in^2	4.35		
Wet Density, pcf	131.9	**Young's Modulus (E) (psi)**	**1,200**
Dry Density, pcf	111.6		
Moisture Content, %	18.2		
Strain Rate, % / min	0.26		



Professional Service Industries, Inc.
6032 N. Cutter Circle, Suite 480
Portland, OR 97217
CCB No. 176269
Phone: (503) 289-1778
Fax: (503) 289-1918

Report No: UCS:07023180-1-S1
Issue No: 1

Unconfined Compressive Strength

Approved Signatory: Warren McElhaney (Laboratory Supervisor)
Date of Issue: 1/5/2024

Client: GRI
16520 SW UPPER BOONES FERRY
RD, SUITE 100
TIGARD, OR 97224

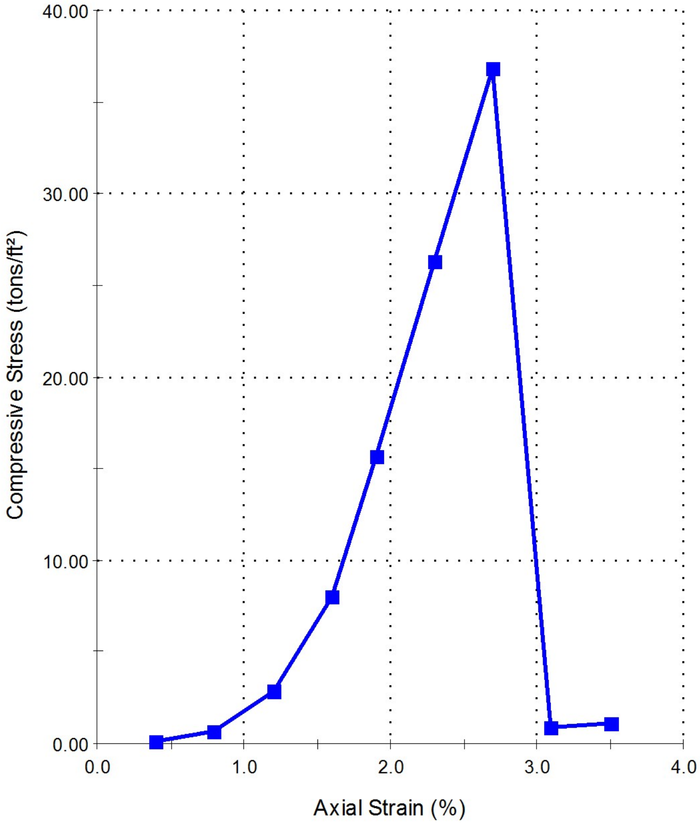
CC:

Project: GRI ON CALL TESTING

Sample Details

Sample ID: 07023180-1-S1
Date Sampled: 12/11/2023
Sampling Method:
Source:
Material:
Specification:
Location: B13-23, R1, 15.3-15.9
Tested By: Evans Lineweaver
Date Tested: 1/4/2024

Stress vs Strain



Test Results

ASTM D 2166

Unconfined Compressive Strength (tons/ft²):	36.8
Shear Strength (tons/ft²):	18.4
Average Rate Strain to Failure (%):	0.4
Strain at Failure (%):	2.7
Average Height (in.):	5.2
Average Diameter (in.):	2.4
Height-Diameter Ratio:	2.2
Initial Dry Density (lb/ft³):	119.6
Initial Water Content (%):	
Water Content Determined:	After Shear
Water Content Taken From:	Entire Specimen
Liquid Limit:	
Plastic Limit:	
Preparation Method:	Undisturbed Specimens

Comments

Professional Service Industries, Inc.
6032 N. Cutter Circle, Suite 480
Portland, OR 97217
CCB No. 176269
Phone: (503) 289-1778
Fax: (503) 289-1918

Report No: UCS:07023180-1-S2
Issue No: 1

Unconfined Compressive Strength

Client: GRI
16520 SW UPPER BOONES FERRY
RD, SUITE 100
TIGARD, OR 97224

CC:

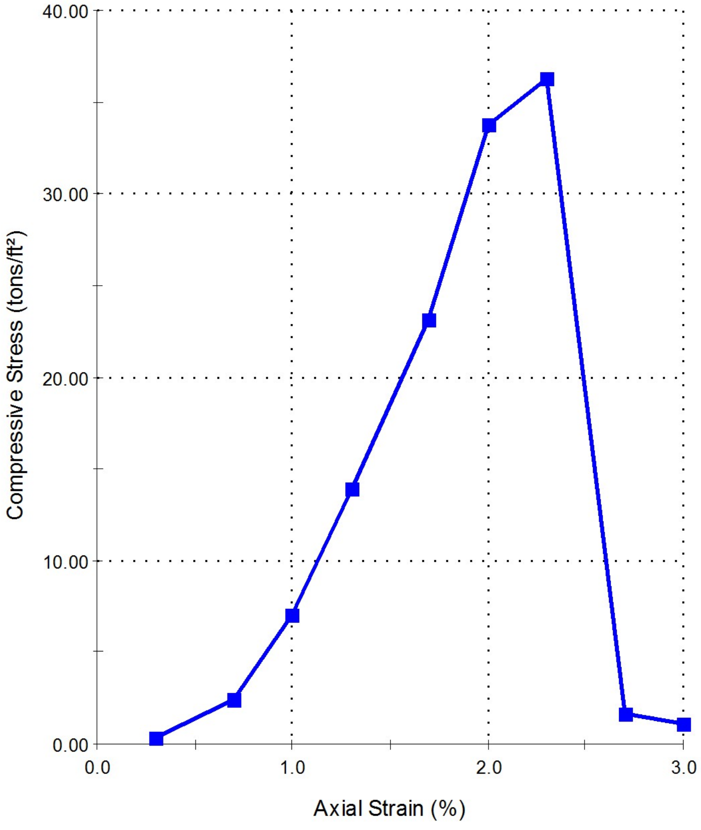
Project: GRI ON CALL TESTING

Approved Signatory: Warren McElhaney (Laboratory Supervisor)
Date of Issue: 1/5/2024

Sample Details

Sample ID:	07023180-1-S2	**Date Sampled:**	
Sampling Method:			
Source:		**Material:**	
Specification:			
Location:	B13-23, R1, 17-17.9		
Tested By:	Evans Lineweaver	**Date Tested:**	1/4/2024

Stress vs Strain



Test Results

ASTM D 2166

Unconfined Compressive Strength (tons/ft²):	36.3
Shear Strength (tons/ft²):	18.1
Average Rate Strain to Failure (%):	0.3
Strain at Failure (%):	2.3
Average Height (in.):	6.0
Average Diameter (in.):	2.4
Height-Diameter Ratio:	2.5
Initial Dry Density (lb/ft³):	120.5
Initial Water Content (%):	
Water Content Determined:	After Shear
Water Content Taken From:	Entire Specimen
Liquid Limit:	
Plastic Limit:	
Preparation Method:	Undisturbed Specimens

Comments

Professional Service Industries, Inc.
6032 N. Cutter Circle, Suite 480
Portland, OR 97217
CCB No. 176269
Phone: (503) 289-1778
Fax: (503) 289-1918

Report No: UCS:07023180-1-S3
Issue No: 1

Unconfined Compressive Strength

Approved Signatory: Warren McElhaney (Laboratory Supervisor)
Date of Issue: 1/5/2024

Client: GRI
16520 SW UPPER BOONES FERRY
RD, SUITE 100
TIGARD, OR 97224

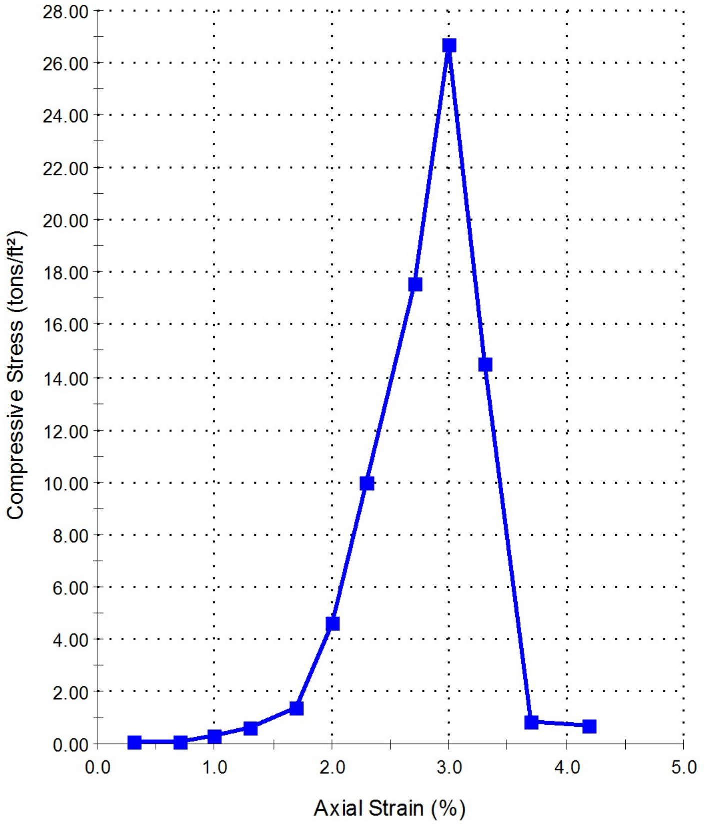
CC:

Project: GRI ON CALL TESTING

Sample Details

Sample ID: 07023180-1-S3
Date Sampled:
Sampling Method:
Source:
Material:
Specification:
Location: B13-23, R1, 17.9-18.5
Tested By: Evans Lineweaver
Date Tested: 1/4/2024

Stress vs Strain



Test Results

ASTM D 2166

Unconfined Compressive Strength (tons/ft²):	26.7
Shear Strength (tons/ft²):	13.4
Average Rate Strain to Failure (%):	0.3
Strain at Failure (%):	3.0
Average Height (in.):	6.0
Average Diameter (in.):	2.4
Height-Diameter Ratio:	2.5
Initial Dry Density (lb/ft³):	118.8
Initial Water Content (%):	
Water Content Determined:	After Shear
Water Content Taken From:	Entire Specimen
Liquid Limit:	
Plastic Limit:	
Preparation Method:	Undisturbed Specimens

Comments

FIG. 120B

Professional Service Industries, Inc.
6032 N. Cutter Circle, Suite 480
Portland, OR 97217
CCB No. 176269
Phone: (503) 289-1778
Fax: (503) 289-1918

Report No: UCS:07023180-1-S4
Issue No: 1

Unconfined Compressive Strength

These test results apply only to the specific locations and materials noted and may not represent any other locations or elevations. This report may not be reproduced, except in full, without written permission by Professional Service Industries, Inc. If a non-compliance appears on this report, to the extent that the reported non-compliance impacts the project, the resolution is outside the PSI scope of engagement. Tests and inspections are considered to be simple acceptance criteria

Approved Signatory: Warren McElhaney (Laboratory Supervisor)
Date of Issue: 1/5/2024

Client: GRI
16520 SW UPPER BOONES FERRY
RD, SUITE 100
TIGARD, OR 97224

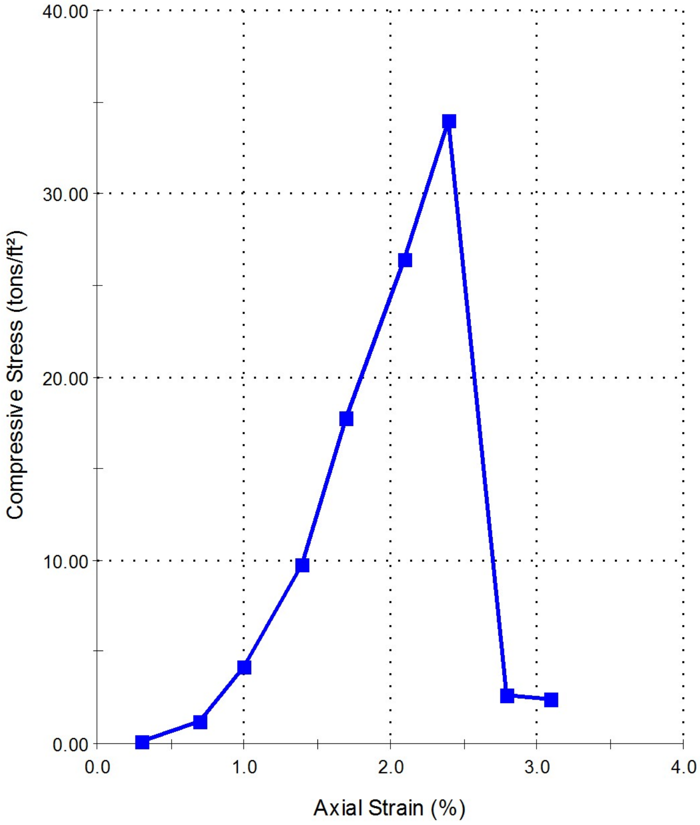
CC:

Project: GRI ON CALL TESTING

Sample Details

Sample ID:	07023180-1-S4	**Date Sampled:**	
Sampling Method:			
Source:		**Material:**	
Specification:			
Location:	B13-23, R1, 18.5-19.0		
Tested By:	Evans Lineweaver	**Date Tested:**	1/4/2024

Stress vs Strain



Test Results

ASTM D 2166

Unconfined Compressive Strength (tons/ft²):	34.0
Shear Strength (tons/ft²):	17.0
Average Rate Strain to Failure (%):	0.4
Strain at Failure (%):	2.4
Average Height (in.):	5.8
Average Diameter (in.):	2.4
Height-Diameter Ratio:	2.4
Initial Dry Density (lb/ft³):	118.5
Initial Water Content (%):	
Water Content Determined:	After Shear
Water Content Taken From:	Entire Specimen
Liquid Limit:	
Plastic Limit:	
Preparation Method:	Undisturbed Specimens

Comments

FIG. 121B

Professional Service Industries, Inc.
6032 N. Cutter Circle, Suite 480
Portland, OR 97217
CCB No. 176269
Phone: (503) 289-1778
Fax: (503) 289-1918

Report No: UCS:07023180-1-S5
Issue No: 1

Unconfined Compressive Strength

Client: GRI
16520 SW UPPER BOONES FERRY
RD, SUITE 100
TIGARD, OR 97224

CC:

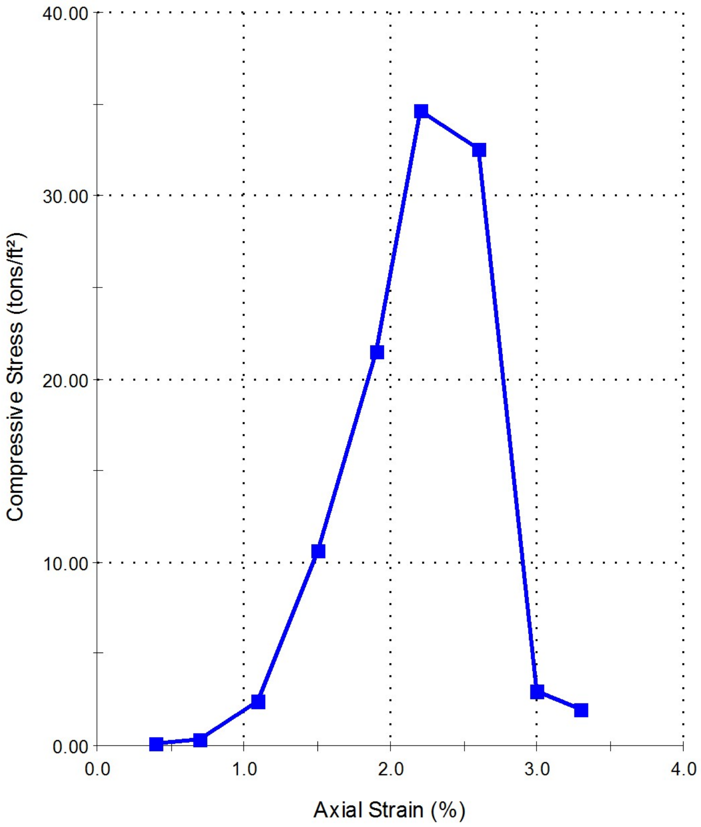
Project: GRI ON CALL TESTING

Approved Signatory: Warren McElhaney (Laboratory Supervisor)
Date of Issue: 1/5/2024

Sample Details

Sample ID:	07023180-1-S5	**Date Sampled:**	
Sampling Method:			
Source:		**Material:**	
Specification:			
Location:	B13-23, R1, 19.0-19.7		
Tested By:	Evans Lineweaver	**Date Tested:**	1/4/2024

Stress vs Strain



Test Results

ASTM D 2166

Unconfined Compressive Strength (tons/ft²):	34.6
Shear Strength (tons/ft²):	17.3
Average Rate Strain to Failure (%):	0.4
Strain at Failure (%):	2.2
Average Height (in.):	5.4
Average Diameter (in.):	2.4
Height-Diameter Ratio:	2.3
Initial Dry Density (lb/ft³):	119.4
Initial Water Content (%):	
Water Content Determined:	After Shear
Water Content Taken From:	Entire Specimen
Liquid Limit:	
Plastic Limit:	
Preparation Method:	Undisturbed Specimens

Comments

Professional Service Industries, Inc.
6032 N. Cutter Circle, Suite 480
Portland, OR 97217
CCB No. 176269
Phone: (503) 289-1778
Fax: (503) 289-1918

Report No: UCS:07023180-1-S6
Issue No: 1

Unconfined Compressive Strength

Client: GRI
16520 SW UPPER BOONES FERRY
RD, SUITE 100
TIGARD, OR 97224

CC:

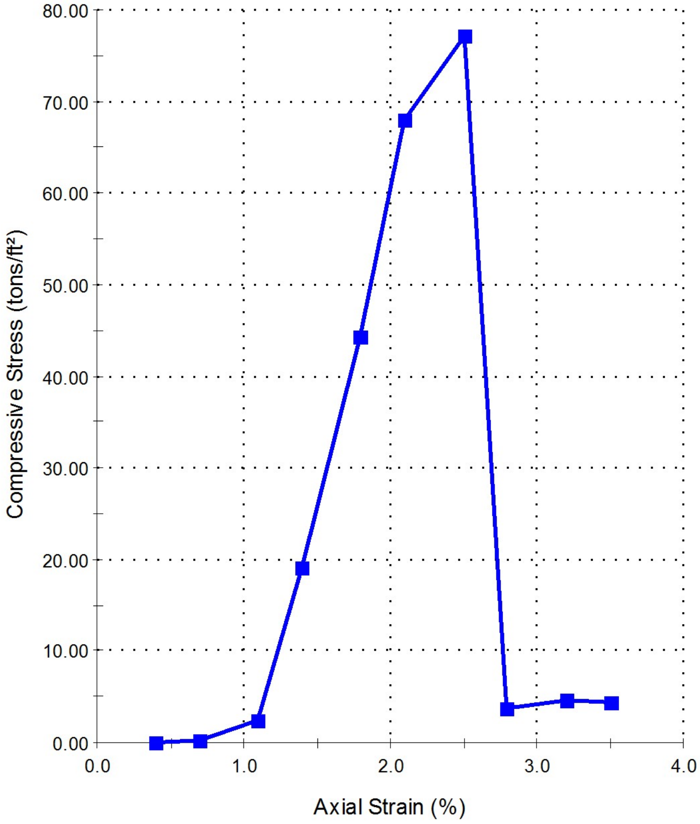
Project: GRI ON CALL TESTING

Approved Signatory: Warren McElhaney (Laboratory Supervisor)
Date of Issue: 1/5/2024

Sample Details

Sample ID:	07023180-1-S6	**Date Sampled:**	
Sampling Method:			
Source:		**Material:**	
Specification:			
Location:	B13-23, R2, 20.3-20.8		
Tested By:	Evans Lineweaver	**Date Tested:**	1/4/2024

Stress vs Strain



Test Results

ASTM D 2166

Unconfined Compressive Strength (tons/ft²):	77.2
Shear Strength (tons/ft²):	38.6
Average Rate Strain to Failure (%):	0.4
Strain at Failure (%):	2.5
Average Height (in.):	5.7
Average Diameter (in.):	2.3
Height-Diameter Ratio:	2.4
Initial Dry Density (lb/ft³):	120.3
Initial Water Content (%):	
Water Content Determined:	After Shear
Water Content Taken From:	Entire Specimen
Liquid Limit:	
Plastic Limit:	
Preparation Method:	Undisturbed Specimens

Comments

FIG. 123B

Professional Service Industries, Inc.
6032 N. Cutter Circle, Suite 480
Portland, OR 97217
CCB No. 176269
Phone: (503) 289-1778
Fax: (503) 289-1918

Report No: UCS:07023180-1-S7
Issue No: 1

Unconfined Compressive Strength

Client: GRI
16520 SW UPPER BOONES FERRY
RD, SUITE 100
TIGARD, OR 97224

CC:

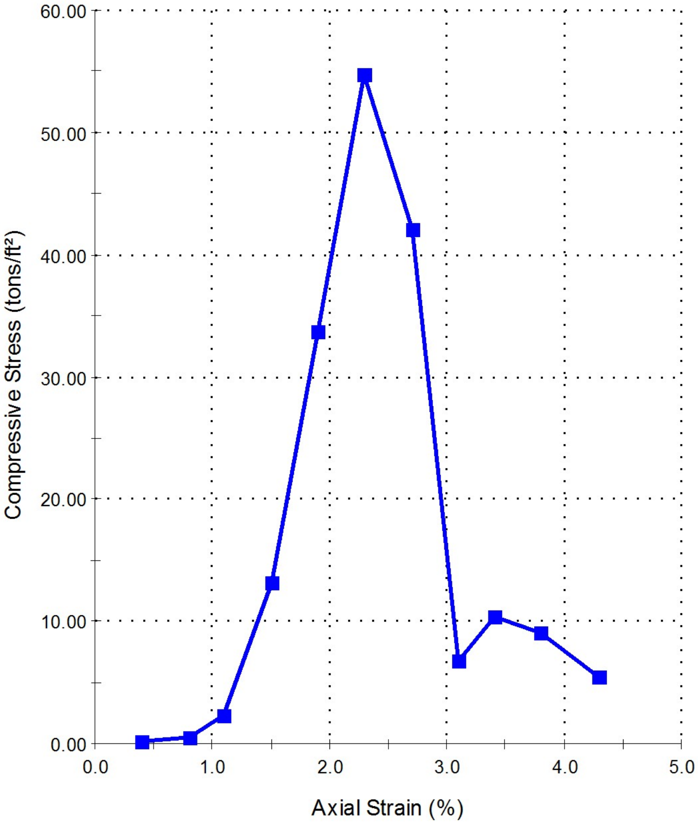
Project: GRI ON CALL TESTING

Approved Signatory: Warren McElhaney (Laboratory Supervisor)
Date of Issue: 1/5/2024

Sample Details

Sample ID:	07023180-1-S7	**Date Sampled:**	
Sampling Method:			
Source:		**Material:**	
Specification:			
Location:	B13-23, R2, 21.6-22.1		
Tested By:	Evans Lineweaver	**Date Tested:**	1/4/2024

Stress vs Strain



Test Results

ASTM D 2166

Unconfined Compressive Strength (tons/ft²):	54.8
Shear Strength (tons/ft²):	27.4
Average Rate Strain to Failure (%):	0.4
Strain at Failure (%):	2.3
Average Height (in.):	5.2
Average Diameter (in.):	2.4
Height-Diameter Ratio:	2.2
Initial Dry Density (lb/ft³):	118.7
Initial Water Content (%):	
Water Content Determined:	After Shear
Water Content Taken From:	Entire Specimen
Liquid Limit:	
Plastic Limit:	
Preparation Method:	Undisturbed Specimens

Comments

FIG. 124B

Professional Service Industries, Inc.
6032 N. Cutter Circle, Suite 480
Portland, OR 97217
CCB No. 176269
Phone: (503) 289-1778
Fax: (503) 289-1918

Report No: UCS:07023180-1-S8
Issue No: 1

Unconfined Compressive Strength

Client: GRI
16520 SW UPPER BOONES FERRY
RD, SUITE 100
TIGARD, OR 97224

CC:

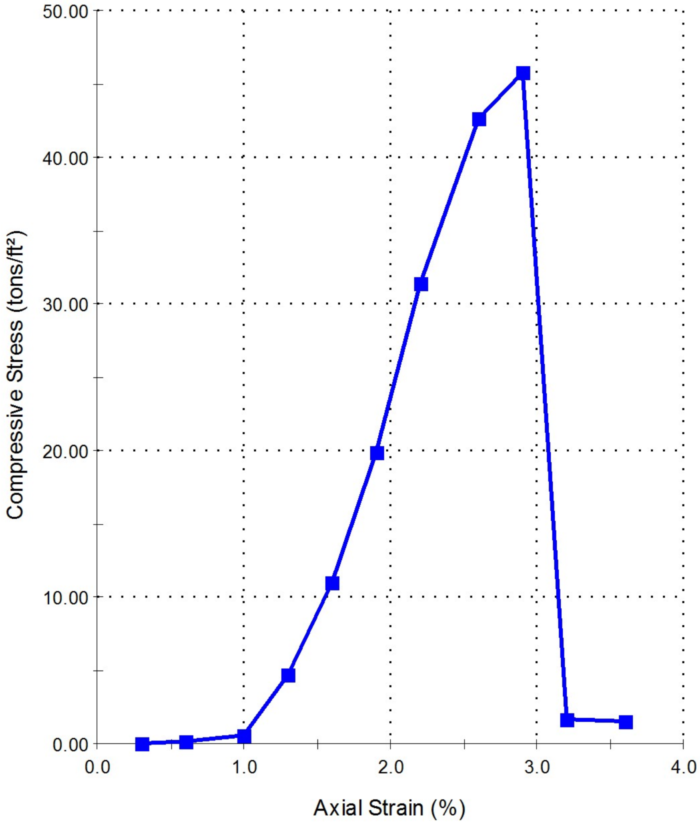
Project: GRI ON CALL TESTING

Approved Signatory: Warren McElhaney (Laboratory Supervisor)
Date of Issue: 1/5/2024

Sample Details

Sample ID:	07023180-1-S8	**Date Sampled:**	
Sampling Method:			
Source:		**Material:**	
Specification:			
Location:	B13-23, R2, 22.9-23.6		
Tested By:	Evans Lineweaver	**Date Tested:**	1/4/2024

Stress vs Strain



Test Results

ASTM D 2166

Unconfined Compressive Strength (tons/ft²):	45.8
Shear Strength (tons/ft²):	22.9
Average Rate Strain to Failure (%):	0.3
Strain at Failure (%):	2.9
Average Height (in.):	6.2
Average Diameter (in.):	2.4
Height-Diameter Ratio:	2.6
Initial Dry Density (lb/ft³):	120.0
Initial Water Content (%):	
Water Content Determined:	After Shear
Water Content Taken From:	Entire Specimen
Liquid Limit:	
Plastic Limit:	
Preparation Method:	Undisturbed Specimens

Comments

FIG. 125B

Professional Service Industries, Inc.
6032 N. Cutter Circle, Suite 480
Portland, OR 97217
CCB No. 176269
Phone: (503) 289-1778
Fax: (503) 289-1918

Report No: UCS:07023180-1-S9
Issue No: 1

Unconfined Compressive Strength

Approved Signatory: Warren McElhaney (Laboratory Supervisor)
Date of Issue: 1/5/2024

Client: GRI
16520 SW UPPER BOONES FERRY
RD, SUITE 100
TIGARD, OR 97224

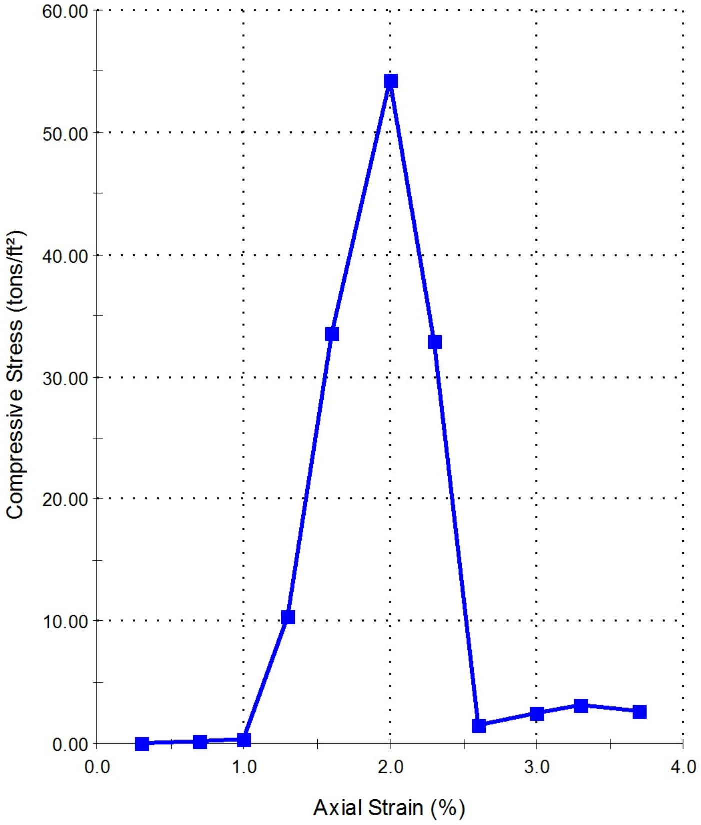
CC:

Project: GRI ON CALL TESTING

Sample Details

Sample ID:	07023180-1-S9	**Date Sampled:**	
Sampling Method:			
Source:		**Material:**	
Specification:			
Location:	B14-23, R5, 8.6-9.5		
Tested By:	Evans Lineweaver	**Date Tested:**	1/4/2024

Stress vs Strain



Test Results

ASTM D 2166

Unconfined Compressive Strength (tons/ft²):	54.2
Shear Strength (tons/ft²):	27.1
Average Rate Strain to Failure (%):	0.3
Strain at Failure (%):	2.0
Average Height (in.):	6.1
Average Diameter (in.):	2.4
Height-Diameter Ratio:	2.6
Initial Dry Density (lb/ft³):	124.4
Initial Water Content (%):	
Water Content Determined:	After Shear
Water Content Taken From:	Entire Specimen
Liquid Limit:	
Plastic Limit:	
Preparation Method:	Undisturbed Specimens

Comments

FIG. 126B

Professional Service Industries, Inc.
6032 N. Cutter Circle, Suite 480
Portland, OR 97217
CCB No. 176269
Phone: (503) 289-1778
Fax: (503) 289-1918

Report No: UCS:07023180-1-S10
Issue No: 1

Unconfined Compressive Strength

Client: GRI
16520 SW UPPER BOONES FERRY
RD, SUITE 100
TIGARD, OR 97224

CC:

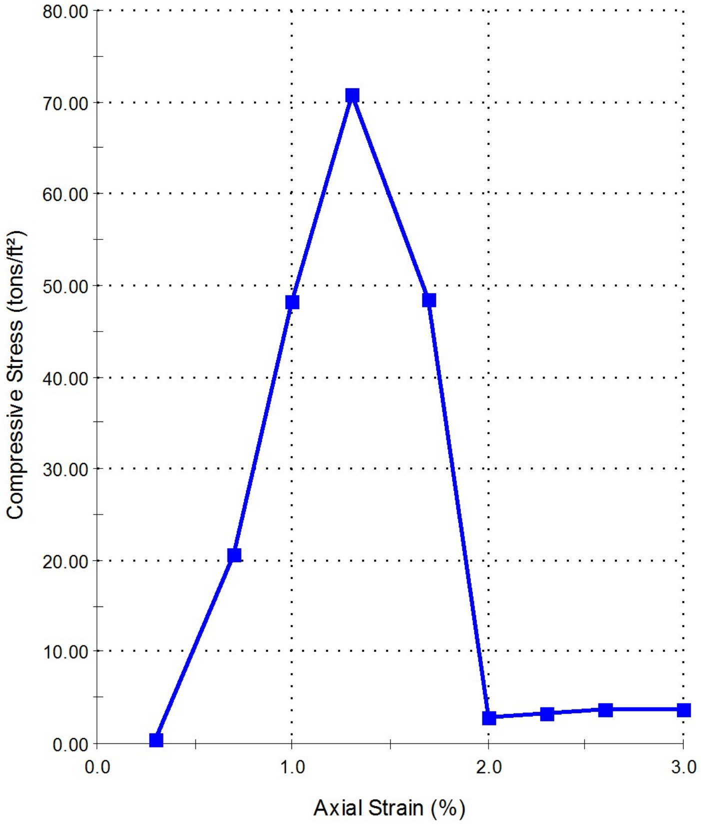
Project: GRI ON CALL TESTING

Approved Signatory: Warren McElhaney (Laboratory Supervisor)
Date of Issue: 1/5/2024

Sample Details

Sample ID:	07023180-1-S10	**Date Sampled:**	
Sampling Method:			
Source:		**Material:**	
Specification:			
Location:	B14-23, R6, 12.1-12.9		
Tested By:	Evans Lineweaver	**Date Tested:**	1/4/2024

Stress vs Strain



Test Results

ASTM D 2166

Unconfined Compressive Strength (tons/ft²):	70.8
Shear Strength (tons/ft²):	35.4
Average Rate Strain to Failure (%):	0.3
Strain at Failure (%):	1.3
Average Height (in.):	6.0
Average Diameter (in.):	2.4
Height-Diameter Ratio:	2.5
Initial Dry Density (lb/ft³):	123.7
Initial Water Content (%):	
Water Content Determined:	After Shear
Water Content Taken From:	Entire Specimen
Liquid Limit:	
Plastic Limit:	
Preparation Method:	Undisturbed Specimens

Comments

FIG. 127B

Professional Service Industries, Inc.
6032 N. Cutter Circle, Suite 480
Portland, OR 97217
CCB No. 176269
Phone: (503) 289-1778
Fax: (503) 289-1918

Report No: UCS:07023180-1-S11
Issue No: 1

Unconfined Compressive Strength

Client: GRI
16520 SW UPPER BOONES FERRY
RD, SUITE 100
TIGARD, OR 97224

CC:

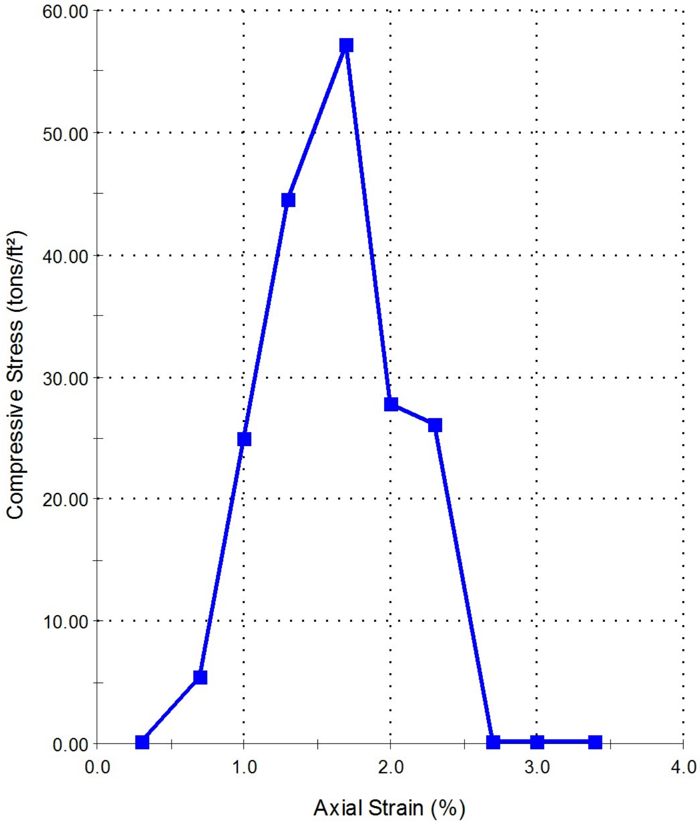
Project: GRI ON CALL TESTING

Approved Signatory: Warren McElhaney (Laboratory Supervisor)
Date of Issue: 1/5/2024

Sample Details

Sample ID:	07023180-1-S11	**Date Sampled:**	
Sampling Method:			
Source:		**Material:**	
Specification:			
Location:	B14-23, R6, 13.6-14.4		
Tested By:	Evans Lineweaver	**Date Tested:**	1/4/2024

Stress vs Strain



Test Results

ASTM D 2166

Unconfined Compressive Strength (tons/ft²):	57.2
Shear Strength (tons/ft²):	28.6
Average Rate Strain to Failure (%):	0.4
Strain at Failure (%):	1.7
Average Height (in.):	6.0
Average Diameter (in.):	2.4
Height-Diameter Ratio:	2.5
Initial Dry Density (lb/ft³):	122.1
Initial Water Content (%):	
Water Content Determined:	After Shear
Water Content Taken From:	Entire Specimen
Liquid Limit:	
Plastic Limit:	
Preparation Method:	Undisturbed Specimens

Comments

Professional Service Industries, Inc.
6032 N. Cutter Circle, Suite 480
Portland, OR 97217
CCB No. 176269
Phone: (503) 289-1778
Fax: (503) 289-1918

Report No: UCS:07023180-1-S12
Issue No: 1

Unconfined Compressive Strength

Approved Signatory: Warren McElhaney (Laboratory Supervisor)
Date of Issue: 1/5/2024

Client: GRI
16520 SW UPPER BOONES FERRY
RD, SUITE 100
TIGARD, OR 97224

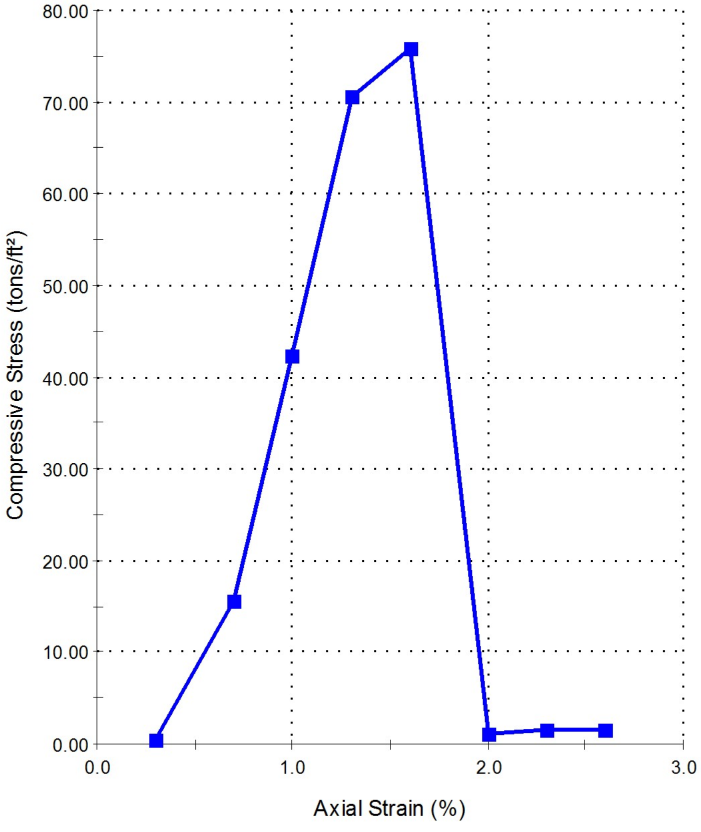
CC:

Project: GRI ON CALL TESTING

Sample Details

Sample ID:	07023180-1-S12	**Date Sampled:**	
Sampling Method:			
Source:		**Material:**	
Specification:			
Location:	B16-23, R3, 13.1-14.4		
Tested By:	Evans Lineweaver	**Date Tested:**	1/4/2024

Stress vs Strain



Test Results

ASTM D 2166

Unconfined Compressive Strength (tons/ft²):	75.9
Shear Strength (tons/ft²):	38.0
Average Rate Strain to Failure (%):	0.3
Strain at Failure (%):	1.6
Average Height (in.):	6.1
Average Diameter (in.):	2.3
Height-Diameter Ratio:	2.7
Initial Dry Density (lb/ft³):	122.5
Initial Water Content (%):	
Water Content Determined:	After Shear
Water Content Taken From:	Entire Specimen
Liquid Limit:	
Plastic Limit:	
Preparation Method:	Undisturbed Specimens

Comments

FIG. 129B

Professional Service Industries, Inc.
6032 N. Cutter Circle, Suite 480
Portland, OR 97217
CCB No. 176269
Phone: (503) 289-1778
Fax: (503) 289-1918

Report No: UCS:07023180-1-S13
Issue No: 1

Unconfined Compressive Strength

Approved Signatory: Warren McElhaney (Laboratory Supervisor)
Date of Issue: 1/5/2024

Client: GRI
16520 SW UPPER BOONES FERRY
RD, SUITE 100
TIGARD, OR 97224

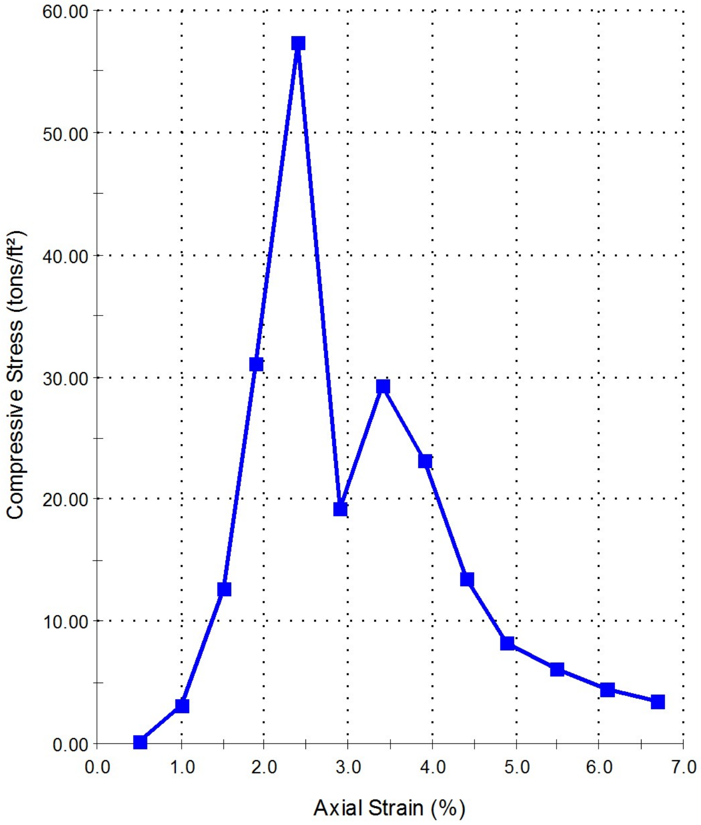
CC:

Project: GRI ON CALL TESTING

Sample Details

Sample ID:	07023180-1-S13	**Date Sampled:**	
Sampling Method:			
Source:		**Material:**	
Specification:			
Location:	B16-23, R1, 7.8-8.3		
Tested By:	Evans Lineweaver	**Date Tested:**	1/4/2024

Stress vs Strain



Test Results

ASTM D 2166

Unconfined Compressive Strength (tons/ft²):	57.4
Shear Strength (tons/ft²):	28.7
Average Rate Strain to Failure (%):	0.5
Strain at Failure (%):	2.4
Average Height (in.):	4.1
Average Diameter (in.):	2.3
Height-Diameter Ratio:	1.8
Initial Dry Density (lb/ft³):	109.6
Initial Water Content (%):	
Water Content Determined:	After Shear
Water Content Taken From:	Entire Specimen
Liquid Limit:	
Plastic Limit:	
Preparation Method:	Undisturbed Specimens

Comments

FIG. 130B

Professional Service Industries, Inc.
6032 N. Cutter Circle, Suite 480
Portland, OR 97217
CCB No. 176269
Phone: (503) 289-1778
Fax: (503) 289-1918

Report No: UCS:07023180-1-S14

Issue No: 1

Unconfined Compressive Strength

Approved Signatory: Warren McElhaney (Laboratory Supervisor)
Date of Issue: 1/5/2024

Client: GRI
16520 SW UPPER BOONES FERRY
RD, SUITE 100
TIGARD, OR 97224

CC:

Project: GRI ON CALL TESTING

Sample Details

Sample ID: 07023180-1-S14

Date Sampled:

Sampling Method:

Source:

Material:

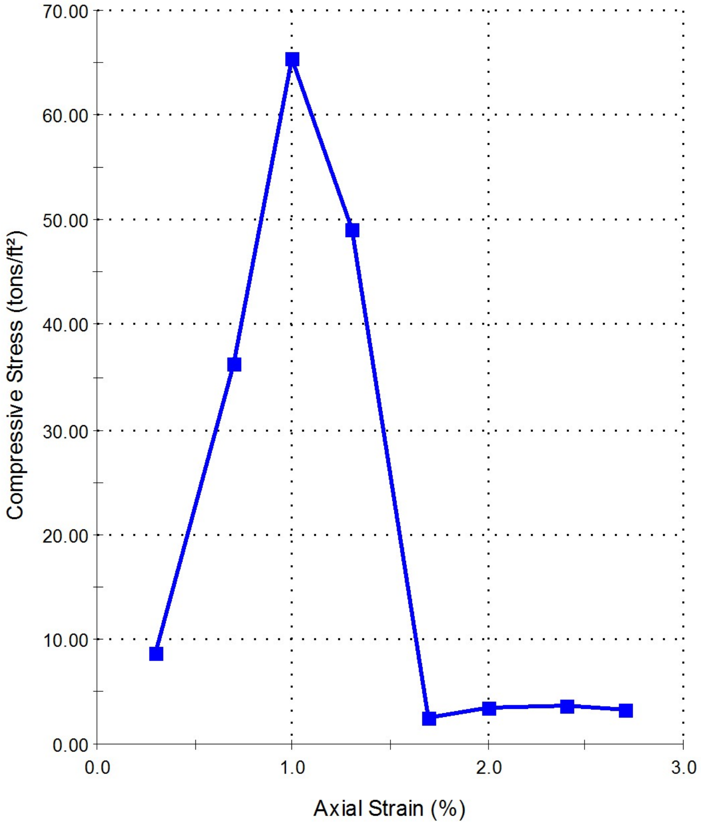
Specification:

Location: B16-23, R3, 14.5-15.3

Tested By: Evans Lineweaver

Date Tested: 1/4/2024

Stress vs Strain



Test Results

ASTM D 2166

Unconfined Compressive Strength (tons/ft²):	65.4
Shear Strength (tons/ft²):	32.7
Average Rate Strain to Failure (%):	0.4
Strain at Failure (%):	1.0
Average Height (in.):	6.0
Average Diameter (in.):	2.2
Height-Diameter Ratio:	2.7
Initial Dry Density (lb/ft³):	115.2
Initial Water Content (%):	
Water Content Determined:	After Shear
Water Content Taken From:	Entire Specimen
Liquid Limit:	
Plastic Limit:	
Preparation Method:	Undisturbed Specimens

Comments

FIG. 131B

Professional Service Industries, Inc.
6032 N. Cutter Circle, Suite 480
Portland, OR 97217
CCB No. 176269
Phone: (503) 289-1778
Fax: (503) 289-1918

Report No: UCS:07023180-1-S15
Issue No: 1

Unconfined Compressive Strength

Approved Signatory: Warren McElhaney (Laboratory Supervisor)
Date of Issue: 1/5/2024

Client: GRI
16520 SW UPPER BOONES FERRY
RD, SUITE 100
TIGARD, OR 97224

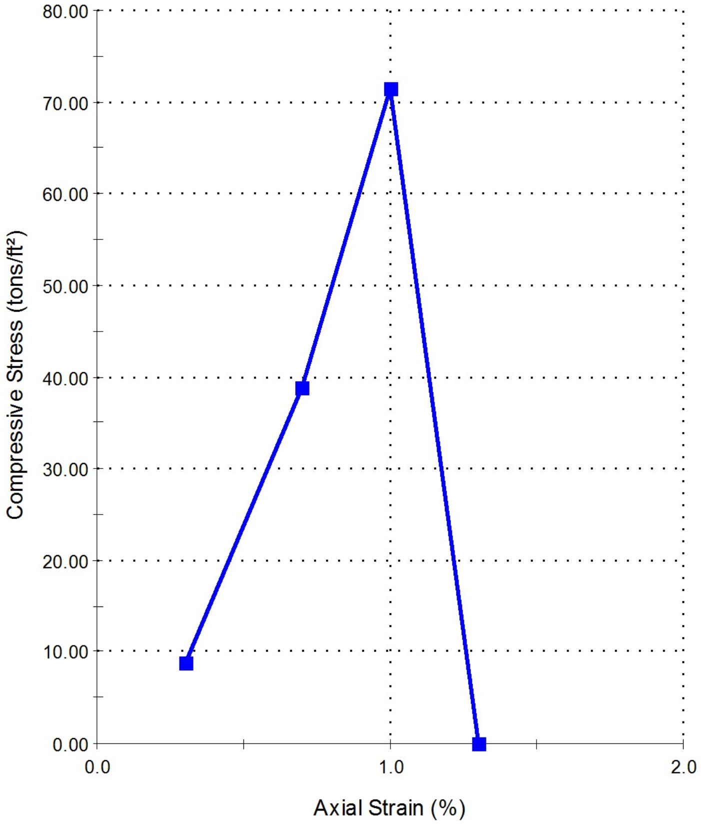
CC:

Project: GRI ON CALL TESTING

Sample Details

Sample ID:	07023180-1-S15	**Date Sampled:**	
Sampling Method:			
Source:		**Material:**	
Specification:			
Location:	B16-23, R4, 18-18.7		
Tested By:	Evans Lineweaver	**Date Tested:**	1/4/2024

Stress vs Strain



Test Results

ASTM D 2166

Unconfined Compressive Strength (tons/ft²):	71.4
Shear Strength (tons/ft²):	35.7
Average Rate Strain to Failure (%):	0.4
Strain at Failure (%):	1.0
Average Height (in.):	5.9
Average Diameter (in.):	2.2
Height-Diameter Ratio:	2.7
Initial Dry Density (lb/ft³):	116.9
Initial Water Content (%):	
Water Content Determined:	After Shear
Water Content Taken From:	Entire Specimen
Liquid Limit:	
Plastic Limit:	
Preparation Method:	Undisturbed Specimens

Comments

Professional Service Industries, Inc.
6032 N. Cutter Circle, Suite 480
Portland, OR 97217
CCB No. 176269
Phone: (503) 289-1778
Fax: (503) 289-1918

Report No: UCS:07023180-1-S16
Issue No: 1

Unconfined Compressive Strength

Client: GRI
16520 SW UPPER BOONES FERRY
RD, SUITE 100
TIGARD, OR 97224

CC:

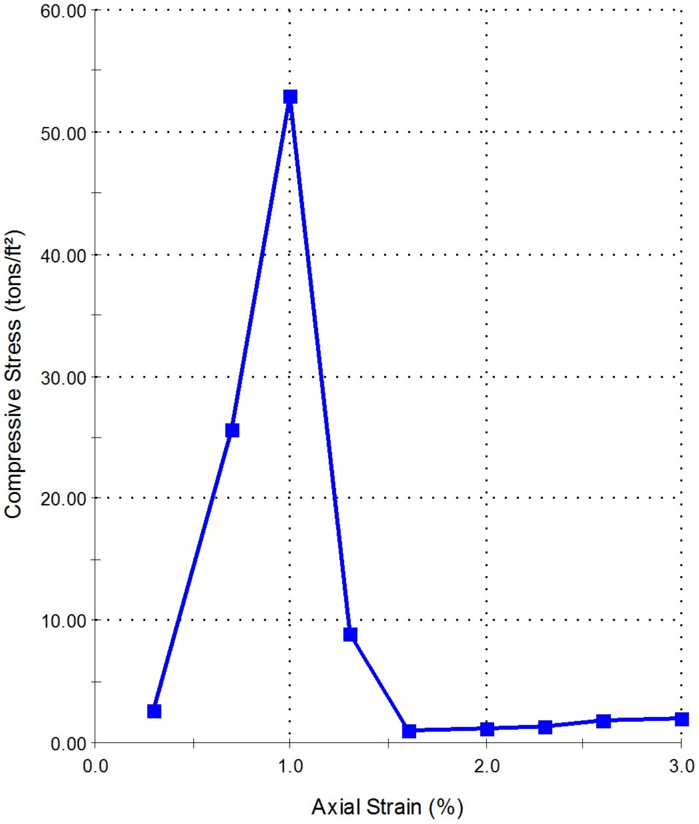
Project: GRI ON CALL TESTING

Approved Signatory: Warren McElhaney (Laboratory Supervisor)
Date of Issue: 1/5/2024

Sample Details

Sample ID:	07023180-1-S16	**Date Sampled:**	
Sampling Method:			
Source:		**Material:**	
Specification:			
Location:	B16-23, R7, 18.6-19.5		
Tested By:	Evans Lineweaver	**Date Tested:**	1/4/2024

Stress vs Strain



Test Results

ASTM D 2166

Unconfined Compressive Strength (tons/ft²):	52.9
Shear Strength (tons/ft²):	26.5
Average Rate Strain to Failure (%):	0.4
Strain at Failure (%):	1.0
Average Height (in.):	6.1
Average Diameter (in.):	2.4
Height-Diameter Ratio:	2.6
Initial Dry Density (lb/ft³):	123.3
Initial Water Content (%):	
Water Content Determined:	After Shear
Water Content Taken From:	Entire Specimen
Liquid Limit:	
Plastic Limit:	
Preparation Method:	Undisturbed Specimens

Comments

FIG. 133B

POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No: 823-008
Client: GRI
Project Name: Port of Coos Bay Channel Modification Project
Project No.: 5128
Date: 9/28/2016
By: PJ

Boring:	B-15					
Sample:	R-1					
Depth, ft:	2					
Visual Description:	Gray Rock					
Test Type	Irregular Lump					
Test Type ID	4					
FOR ANISOTROPIC ROCK:						
Bedding Angle Relative to Axis	None					
Loading Orientation Rel. to Bedding	N/A					
SAMPLE DIMENSIONS						
Width Perpendicular to loading, W, mm	60.9					
Length Perpendicular to Loading, L, mm	32					
Diameter Parallel to Loading, D, mm	55.6					
Diameter at Failure, D', mm	49					
STRENGTH DATA						
Peak Load, P, kN	16.393					
Peak Load, P, lbs	3685.3					
Uncorr. Pt. Load Strength Index, I_S, MPa	4.315					
Uncorr. Pt. Load Strength Index, I_S, psi	**625.8**					
Size Correction Factor, F	1.10					
Corr. Pt. Load Strength Index, $I_{S(50)}$, Mpa	4.74					
Corr. Pt. Load Strength Index, $I_{S(50)}$, psi	**688**					
MOISTURE CONTENT DATA						
Moisture Condition of Specimen	As Received					
Pan No.						
Pan wt. (g)	20.57					
Total wet wt. (g)	348.87					
Total dry wt (g)	330.87					
Moisture Content, %	**5.8**					
Comments:						

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No: 823-008
Client: GRI
Project Name: Port of Coos Bay Channel Modification Project
Project No.: 5128
Date: 9/28/2016
By: PJ

Boring:	B-15	B-15	B-15			
Sample:	R-2	R-2	R-2			
Depth, ft:	5.5	5.5	5.5			
Visual Description:	Gray Rock	Gray Rock	Gray Rock			
Test Type	Diametral	Diametral	Diametral			
Test Type ID	1	1	1			
FOR ANISOTROPIC ROCK:						
Bedding Angle Relative to Axis	None	None	None			
Loading Orientation Rel. to Bedding	N/A	N/A	N/A			
SAMPLE DIMENSIONS						
Width Perpendicular to loading, W, mm	60	60	60			
Length Perpendicular to Loading, L, mm	31	32	31			
Diameter Parallel to Loading, D, mm	60	60	60			
Diameter at Failure, D', mm	58	58	58			
STRENGTH DATA						
Peak Load, P, kN	2.59	2.567	1.416			
Peak Load, P, lbs	582.3	577.1	318.3			
Uncorr. Pt. Load Strength Index, I_S, MPa	0.744	0.738	0.407			
Uncorr. Pt. Load Strength Index, I_S, psi	**107.9**	**107.0**	**59.0**			
Size Correction Factor, F	1.08	1.08	1.08			
Corr. Pt. Load Strength Index, $I_{S(50)}$, Mpa	0.80	0.79	0.44			
Corr. Pt. Load Strength Index, $I_{S(50)}$, psi	**116**	**115**	**64**	**98**		
MOISTURE CONTENT DATA						
Moisture Condition of Specimen	As Received	As Received	As Received			
Pan No.						
Pan wt. (g)	20.49	20.49	20.49			
Total wet wt. (g)	267.34	267.34	267.34			
Total dry wt (g)	237.92	237.92	237.92			
Moisture Content, %	**13.5**	**13.5**	**13.5**			
Comments:						

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No: 823-008
Client: GRI
Project Name: Port of Coos Bay Channel Modification Project
Project No.: 5128
Date: 9/28/2016
By: PJ

Boring:	B-15	B-15				
Sample:	R-3	R-3				
Depth, ft:	9.5	9.5				
Visual Description:	Gray Rock	Gray Rock				
Test Type	Diametral	Axial				
Test Type ID	1	2				

FOR ANISOTROPIC ROCK:

Bedding Angle Relative to Axis	None	None				
Loading Orientation Rel. to Bedding	N/A	N/A				

SAMPLE DIMENSIONS

Width Perpendicular to loading, W, mm	60	60				
Length Perpendicular to Loading, L, mm	32					
Diameter Parallel to Loading, D, mm	60					
Diameter at Failure, D', mm	58	34				

STRENGTH DATA

Peak Load, P, kN	1.196	2.213				
Peak Load, P, lbs	268.9	497.5				
Uncorr. Pt. Load Strength Index,I_S, MPa	0.344	0.852				
Uncorr. Pt. Load Strength Index,I_S, psi	**49.8**	**123.6**				
Size Correction Factor, F	1.08	1.01				
Corr. Pt. Load Strength Index,$I_{S(50)}$, Mpa	0.37	0.86				
Corr. Pt. Load Strength Index,$I_{S(50)}$, psi	**54**	**125**				

MOISTURE CONTENT DATA

Moisture Condition of Specimen	As Received	As Received				
Pan No.						
Pan wt. (g)	19.45	19.45				
Total wet wt. (g)	205.25	205.25				
Total dry wt (g)	191.35	191.35				
Moisture Content, %	**8.1**	**8.1**				
Comments:		Invalid test. Did not fail through both points.				

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No: 823-008
Client: GRI
Project Name: Port of Coos Bay Channel Modification Project
Project No.: 5128
Date: 9/28/2016
By: PJ

Boring:	B-15	B-15	B-15	B-15	B-15	B-15
Sample:	R-4	R-4	R-4	R-4	R-4	R-4
Depth, ft:	15.5	15.5	15.5	15.5	15.5	15.5
Visual Description:	Gray Rock	Gray Rock	Gray Rock	Gray Rock	Gray Rock	Gray Rock
Test Type	Diametral	Diametral	Diametral	Diametral	Diametral	Axial
Test Type ID	1	1	1	1	1	2
FOR ANISOTROPIC ROCK:						
Bedding Angle Relative to Axis	None	None	None	None	None	None
Loading Orientation Rel. to Bedding	N/A	N/A	N/A	N/A	N/A	N/A
SAMPLE DIMENSIONS						
Width Perpendicular to loading, W, mm	60	60	60	60	60	60
Length Perpendicular to Loading, L, mm	31	33	34	32	31	
Diameter Parallel to Loading, D, mm	60	60	60	60	60	
Diameter at Failure, D', mm	57	57	57	57	57	31
STRENGTH DATA						
Peak Load, P, kN	1.359	1.432	1.43	1.262	1.746	1.215
Peak Load, P, lbs	305.5	321.9	321.5	283.7	392.5	273.1
Uncorr. Pt. Load Strength Index, I_S, MPa	0.397	0.419	0.418	0.369	0.511	0.513
Uncorr. Pt. Load Strength Index, I_S, psi	**57.6**	**60.7**	**60.6**	**53.5**	**74.0**	**74.4**
Size Correction Factor, F	1.07	1.07	1.07	1.07	1.07	0.99
Corr. Pt. Load Strength Index, $I_{S(50)}$, Mpa	0.43	0.45	0.45	0.40	0.55	0.51
Corr. Pt. Load Strength Index, $I_{S(50)}$, psi	**62**	**65**	**65**	**57**	**79**	**74**
MOISTURE CONTENT DATA						
Moisture Condition of Specimen	As Received	As Received	As Received	As Received	As Received	As Received
Pan No.						
Pan wt. (g)	21.65	21.65	21.65	21.65	21.65	21.65
Total wet wt. (g)	173.26	173.26	173.26	173.26	173.26	173.26
Total dry wt (g)	156.84	156.84	156.84	156.84	156.84	156.84
Moisture Content, %	**12.1**	**12.1**	**12.1**	**12.1**	**12.1**	**12.1**
Comments:						

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No: 823-008
Client: GRI
Project Name: Port of Coos Bay Channel Modification Project
Project No.: 5128
Date: 9/28/2016
By: PJ

Boring:	B-15	B-15	B-15			
Sample:	R-5	R-5	R-5			
Depth, ft:	18.5	18.5	18.5			
Visual Description:	Gray Rock	Gray Rock	Gray Rock			
Test Type	Diametral	Diametral	Axial			
Test Type ID	1	1	2			

FOR ANISOTROPIC ROCK:

Bedding Angle Relative to Axis	None	None	None			
Loading Orientation Rel. to Bedding	N/A	N/A	N/A			

SAMPLE DIMENSIONS

Width Perpendicular to loading, W, mm	62	61	61			
Length Perpendicular to Loading, L, mm	32	31				
Diameter Parallel to Loading, D, mm	62	61				
Diameter at Failure, D', mm	57	57	31			

STRENGTH DATA

Peak Load, P, kN	0.653	1	1.306			
Peak Load, P, lbs	146.8	224.8	293.6			
Uncorr. Pt. Load Strength Index,I_S, MPa	0.185	0.288	0.542			
Uncorr. Pt. Load Strength Index,I_S, psi	**26.8**	**41.7**	**78.7**			
Size Correction Factor, F	1.08	1.08	0.99			
Corr. Pt. Load Strength Index,$I_{S(50)}$, Mpa	0.20	0.31	0.54			
Corr. Pt. Load Strength Index,$I_{S(50)}$, psi	**29**	**45**	**78**			

MOISTURE CONTENT DATA

Moisture Condition of Specimen	As Received	As Received	As Received			
Pan No.						
Pan wt. (g)	22.21	22.21	22.21			
Total wet wt. (g)	191.56	191.56	191.56			
Total dry wt (g)	179.05	179.05	179.05			
Moisture Content, %	**8.0**	**8.0**	**8.0**			
Comments:						

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

COOPER TESTING LABORATORY

POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No: 823-008 **Project No.:** 5128
Client: GRI **Date:** 9/28/2016
Project Name: Port of Coos Bay Channel Modification Project **By:** PJ

Boring:	B-15	B-15				
Sample:	R-5	R-5				
Depth, ft:	22.5	22.5				
Visual Description:	Dark Gray Rock	Dark Gray Rock				
Test Type	Diametral	Diametral				
Test Type ID	1	1				
FOR ANISOTROPIC ROCK:						
Bedding Angle Relative to Axis	None	None				
Loading Orientation Rel. to Bedding	N/A	N/A				
SAMPLE DIMENSIONS						
Width Perpendicular to loading, W, mm	61	61				
Length Perpendicular to Loading, L, mm	33	31				
Diameter Parallel to Loading, D, mm	61	61				
Diameter at Failure, D', mm	59	58				
STRENGTH DATA						
Peak Load, P, kN	2.558	9.396				
Peak Load, P, lbs	575.1	2112.3				
Uncorr. Pt. Load Strength Index, I_S, MPa	0.711	2.656				
Uncorr. Pt. Load Strength Index, I_S, psi	**103.1**	**385.2**				
Size Correction Factor, F	1.09	1.08				
Corr. Pt. Load Strength Index, $I_{S(50)}$, Mpa	0.77	2.87				
Corr. Pt. Load Strength Index, $I_{S(50)}$, psi	**112**	**416**				
MOISTURE CONTENT DATA						
Moisture Condition of Specimen	As Received	As Received				
Pan No.						
Pan wt. (g)	20.03	20.03				
Total wet wt. (g)	199.95	199.95				
Total dry wt (g)	183.15	183.15				
Moisture Content, %	**10.3**	**10.3**				
Comments:						

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No:	823-008	**Project No.:**	5128
Client:	GRI	**Date:**	9/28/2016
Project Name:	Port of Coos Bay Channel Modification Project	**By:**	PJ

Boring:	B-21					
Sample:	R-3					
Depth, ft:	6.5					
Visual Description:	Very Dark Brown Rock					
Test Type	Axial					
Test Type ID	2					
FOR ANISOTROPIC ROCK:						
Bedding Angle Relative to Axis	None	None	None	None	None	None
Loading Orientation Rel. to Bedding	N/A	N/A	N/A	N/A	N/A	N/A
SAMPLE DIMENSIONS						
Width Perpendicular to loading, W, mm	61					
Length Perpendicular to Loading, L, mm						
Diameter Parallel to Loading, D, mm						
Diameter at Failure, D', mm	27					
STRENGTH DATA						
Peak Load, P, kN	0.512					
Peak Load, P, lbs	115.1	0.0	0.0	0.0	0.0	0.0
Uncorr. Pt. Load Strength Index,I_S, MPa	0.244	Test ID??	Test ID??	Test ID??	Test ID??	Test ID??
Uncorr. Pt. Load Strength Index,I_S, psi	**35.4**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**
Size Correction Factor, F	0.96	Test ID??	Test ID??	Test ID??	Test ID??	Test ID??
Corr. Pt. Load Strength Index,$I_{S(50)}$, Mpa	0.23	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Corr. Pt. Load Strength Index,$I_{S(50)}$, psi	**34**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**
MOISTURE CONTENT DATA						
Moisture Condition of Specimen	As Received	As Received	As Received	As Received	As Received	As Received
Pan No.						
Pan wt. (g)	311.5					
Total wet wt. (g)	843.9					
Total dry wt (g)	722.6					
Moisture Content, %	**29.5**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**
Comments:						

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No: 823-008
Client: GRI
Project Name: Port of Coos Bay Channel Modification Project
Project No.: 5128
Date: 9/28/2016
By: PJ

Boring:	B-21					
Sample:	R-5					
Depth, ft:	16					
Visual Description:	Very Dark Brown Rock					
Test Type	Diametral					
Test Type ID	1					

FOR ANISOTROPIC ROCK:

Bedding Angle Relative to Axis	None					
Loading Orientation Rel. to Bedding	N/A					

SAMPLE DIMENSIONS

Width Perpendicular to loading, W, mm	61					
Length Perpendicular to Loading, L, mm	32					
Diameter Parallel to Loading, D, mm	61					
Diameter at Failure, D', mm	58					

STRENGTH DATA

Peak Load, P, kN	0.115					
Peak Load, P, lbs	25.9					
Uncorr. Pt. Load Strength Index,I_S, MPa	0.033					
Uncorr. Pt. Load Strength Index,I_S, psi	**4.7**					
Size Correction Factor, F	1.08					
Corr. Pt. Load Strength Index,$I_{S(50)}$, Mpa	0.04					
Corr. Pt. Load Strength Index,$I_{S(50)}$, psi	**5**					

MOISTURE CONTENT DATA

Moisture Condition of Specimen	As Received					
Pan No.						
Pan wt. (g)	21.53					
Total wet wt. (g)	117.31					
Total dry wt (g)	96.7					
Moisture Content, %	**27.4**					
Comments:	Invalid test. Did not fail through both loading points.					

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

COOPER TESTING LABORATORY

POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No: 823-008
Client: GRI
Project Name: Port of Coos Bay Channel Modification Project
Project No.: 5128
Date: 9/28/2016
By: PJ

Boring:	B-23	B-23				
Sample:	R-1	R-1				
Depth, ft:	6	6				
Visual Description:	Very Dark Brown Rock	Very Dark Brown Rock				
Test Type	Axial	Axial				
Test Type ID	2	2				
FOR ANISOTROPIC ROCK:						
Bedding Angle Relative to Axis	None	None				
Loading Orientation Rel. to Bedding	N/A	N/A				
SAMPLE DIMENSIONS						
Width Perpendicular to loading, W, mm	61	60				
Length Perpendicular to Loading, L, mm						
Diameter Parallel to Loading, D, mm						
Diameter at Failure, D', mm	27	30				
STRENGTH DATA						
Peak Load, P, kN	0.16	0.046				
Peak Load, P, lbs	36.0	10.3				
Uncorr. Pt. Load Strength Index, I_S, MPa	0.076	0.020				
Uncorr. Pt. Load Strength Index, I_S, psi	**11.1**	**2.9**				
Size Correction Factor, F	0.96	0.98				
Corr. Pt. Load Strength Index, $I_{S(50)}$, Mpa	0.07	0.02				
Corr. Pt. Load Strength Index, $I_{S(50)}$, psi	**11**	**3**				
MOISTURE CONTENT DATA						
Moisture Condition of Specimen	As Received	As Received				
Pan No.						
Pan wt. (g)	19.88	19.88				
Total wet wt. (g)	179.11	179.11				
Total dry wt (g)	145.6	145.6				
Moisture Content, %	**26.7**	**26.7**				
Comments:						

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No: 823-008
Client: GRI
Project Name: Port of Coos Bay Channel Modification Project
Project No.: 5128
Date: 9/28/2016
By: PJ

Boring:	B-23	B-23				
Sample:	R-2	R-2				
Depth, ft:	7	7				
Visual Description:	Very Dark Brown Rock	Very Dark Brown Rock				
Test Type	Axial	Axial				
Test Type ID	2	2				

FOR ANISOTROPIC ROCK:

Bedding Angle Relative to Axis	None	None				
Loading Orientation Rel. to Bedding	N/A	N/A				

SAMPLE DIMENSIONS

Width Perpendicular to loading, W, mm	54	60				
Length Perpendicular to Loading, L, mm						
Diameter Parallel to Loading, D, mm						
Diameter at Failure, D', mm	34	36				

STRENGTH DATA

Peak Load, P, kN	0.145	1.34				
Peak Load, P, lbs	32.6	301.2				
Uncorr. Pt. Load Strength Index,I_S, MPa	0.062	0.487				
Uncorr. Pt. Load Strength Index,I_S, psi	**9.0**	**70.7**				
Size Correction Factor, F	0.99	1.02				
Corr. Pt. Load Strength Index,$I_{S(50)}$, Mpa	0.06	0.50				
Corr. Pt. Load Strength Index,$I_{S(50)}$, psi	**9**	**72**				

MOISTURE CONTENT DATA

Moisture Condition of Specimen	As Received	As Received				
Pan No.						
Pan wt. (g)	20.44	20.44				
Total wet wt. (g)	133.68	133.68				
Total dry wt (g)	110.3	110.3				
Moisture Content, %	**26.0**	**26.0**				
Comments:						

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No: 823-008

Client: GRI

Project Name: Port of Coos Bay Channel Modification Project

Project No.: 5128

Date: 9/26/2016

By: PJ

Boring:	B-24	B-24	B-24	B-24	B-24	B-24
Sample:	R-1	R-1	R-1	R-1	R-1	R-1
Depth, ft:	4	4	4	4	4	4
Visual Description:	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock
Test Type	Axial	Diametral	Diametral	Axial	Axial	Axial
Test Type ID	2	1	1	2	2	2
FOR ANISOTROPIC ROCK:						
Bedding Angle Relative to Axis	None	None	None	None	None	None
Loading Orientation Rel. to Bedding	N/A	N/A	N/A	N/A	N/A	N/A
SAMPLE DIMENSIONS						
Width Perpendicular to loading, W, mm	61	60	60	60	60	60
Length Perpendicular to Loading, L, mm		33	39			
Diameter Parallel to Loading, D, mm		60	60			
Diameter at Failure, D', mm	28	58	58	26	39	48
STRENGTH DATA						
Peak Load, P, kN	0.423	0.108	0.361	0.211	0.224	0.382
Peak Load, P, lbs	95.1	24.3	81.2	47.4	50.4	85.9
Uncorr. Pt. Load Strength Index, I_S, MPa	0.195	0.031	0.104	0.106	0.075	0.104
Uncorr. Pt. Load Strength Index, I_S, psi	**28.2**	**4.5**	**15.0**	**15.4**	**10.9**	**15.1**
Size Correction Factor, F	0.97	1.08	1.08	0.95	1.04	1.09
Corr. Pt. Load Strength Index, $I_{S(50)}$, Mpa	0.19	0.03	0.11	0.10	0.08	0.11
Corr. Pt. Load Strength Index, $I_{S(50)}$, psi	**27**	**5**	**16**	**15**	**11**	**16**
MOISTURE CONTENT DATA						
Moisture Condition of Specimen	As Received	As Received	As Received	As Received	As Received	As Received
Pan No.						
Pan wt. (g)	22.67	22.67	22.67	22.67	22.67	22.67
Total wet wt. (g)	132.21	132.21	132.21	132.21	132.21	132.21
Total dry wt (g)	117.33	117.33	117.33	117.33	117.33	117.33
Moisture Content, %	**15.7**	**15.7**	**15.7**	**15.7**	**15.7**	**15.7**
Comments:						

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No: 823-008
Client: GRI
Project Name: Port of Coos Bay Channel Modification Project
Project No.: 5128
Date: 9/26/2016
By: PJ

Boring:	B-24	B-24	B-24	B-24	B-24	B-24
Sample:	R-2	R-2	R-2	R-2	R-2	R-2
Depth, ft:	6	6	6	6	6	6
Visual Description:	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock
Test Type	Diametral	Diametral	Diametral	Axial	Axial	Axial
Test Type ID	1	1	1	2	2	2
FOR ANISOTROPIC ROCK:						
Bedding Angle Relative to Axis	None	None	None	None	None	None
Loading Orientation Rel. to Bedding	N/A	N/A	N/A	N/A	N/A	N/A
SAMPLE DIMENSIONS						
Width Perpendicular to loading, W, mm	60	60	60	60	60	60
Length Perpendicular to Loading, L, mm	30	30	34			
Diameter Parallel to Loading, D, mm	60	60	60			
Diameter at Failure, D', mm	57	58	57	32	26	30
STRENGTH DATA						
Peak Load, P, kN	0.386	0.399	0.377	0.217	0.213	0.28
Peak Load, P, lbs	86.8	89.7	84.8	48.8	47.9	62.9
Uncorr. Pt. Load Strength Index,I_S, MPa	0.113	0.115	0.110	0.089	0.107	0.122
Uncorr. Pt. Load Strength Index,I_S, psi	**16.4**	**16.6**	**16.0**	**12.9**	**15.6**	**17.7**
Size Correction Factor, F	1.07	1.08	1.07	0.99	0.95	0.98
Corr. Pt. Load Strength Index,$I_{S(50)}$, Mpa	0.12	0.12	0.12	0.09	0.10	0.12
Corr. Pt. Load Strength Index,$I_{S(50)}$, psi	**18**	**18**	**17**	**13**	**15**	**17**
MOISTURE CONTENT DATA						
Moisture Condition of Specimen	As Received	As Received	As Received	As Received	As Received	As Received
Pan No.						
Pan wt. (g)	21.72	21.72	21.72	21.72	21.72	21.72
Total wet wt. (g)	243.42	243.42	243.42	243.42	243.42	243.42
Total dry wt (g)	212.65	212.65	212.65	212.65	212.65	212.65
Moisture Content, %	**16.1**	**16.1**	**16.1**	**16.1**	**16.1**	**16.1**
Comments:						

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No: 823-008
Client: GRI
Project Name: Port of Coos Bay Channel Modification Project
Project No.: 5128
Date: 9/26/2016
By: PJ

Boring:	B-24	B-24	B-24	B-24	B-24	B-24
Sample:	R-2	R-2	R-2	R-2	R-2	R-2
Depth, ft:	8	8	8	8	8	8
Visual Description:	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock
Test Type	Diametral	Diametral	Diametral	Axial	Axial	Axial
Test Type ID	1	1	1	2	2	2
FOR ANISOTROPIC ROCK:						
Bedding Angle Relative to Axis	None	None	None	None	None	None
Loading Orientation Rel. to Bedding	N/A	N/A	N/A	N/A	N/A	N/A
SAMPLE DIMENSIONS						
Width Perpendicular to loading, W, mm	61	61	61	61	61	61
Length Perpendicular to Loading, L, mm	33	30	30			
Diameter Parallel to Loading, D, mm	61	61	61			
Diameter at Failure, D', mm	57	59	58	25	30	33
STRENGTH DATA						
Peak Load, P, kN	0.601	0.55	0.412	0.36	0.594	0.519
Peak Load, P, lbs	135.1	123.6	92.6	80.9	133.5	116.7
Uncorr. Pt. Load Strength Index,I_S, MPa	0.173	0.153	0.116	0.185	0.255	0.202
Uncorr. Pt. Load Strength Index,I_S, psi	**25.1**	**22.2**	**16.9**	**26.9**	**37.0**	**29.4**
Size Correction Factor, F	1.08	1.09	1.08	0.94	0.98	1.01
Corr. Pt. Load Strength Index,$I_{S(50)}$, Mpa	0.19	0.17	0.13	0.18	0.25	0.20
Corr. Pt. Load Strength Index,$I_{S(50)}$, psi	**27**	**24**	**18**	**25**	**36**	**30**
MOISTURE CONTENT DATA						
Moisture Condition of Specimen	As Received	As Received	As Received	As Received	As Received	As Received
Pan No.						
Pan wt. (g)	21.81	21.81	21.81	21.81	21.81	21.81
Total wet wt. (g)	217.79	217.79	217.79	217.79	217.79	217.79
Total dry wt (g)	193.49	193.49	193.49	193.49	193.49	193.49
Moisture Content, %	**14.2**	**14.2**	**14.2**	**14.2**	**14.2**	**14.2**
Comments:						

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No: 823-008
Client: GRI
Project Name: Port of Coos Bay Channel Modification Project
Project No.: 5128
Date: 9/26/2016
By: PJ

Boring:	B-24	B-24	B-24	B-24	B-24	B-24
Sample:	R-3	R-3	R-3	R-3	R-3	R-3
Depth, ft:	11	11	11	11	11	11
Visual Description:	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock
Test Type	Diametral	Diametral	Diametral	Axial	Axial	Axial
Test Type ID	1	1	1	2	2	2

FOR ANISOTROPIC ROCK:

Bedding Angle Relative to Axis	None	None	None	None	None	None
Loading Orientation Rel. to Bedding	N/A	N/A	N/A	N/A	N/A	N/A

SAMPLE DIMENSIONS

Width Perpendicular to loading, W, mm	61	61	61	61	61	61
Length Perpendicular to Loading, L, mm	31	30	30			
Diameter Parallel to Loading, D, mm	61	61	61			
Diameter at Failure, D', mm	56	57	58	25	34	33

STRENGTH DATA

Peak Load, P, kN	0.485	0.464	0.503	0.282	0.381	0.374
Peak Load, P, lbs	109.0	104.3	113.1	63.4	85.7	84.1
Uncorr. Pt. Load Strength Index,I_S, MPa	0.142	0.133	0.142	0.145	0.144	0.146
Uncorr. Pt. Load Strength Index,I_S, psi	**20.6**	**19.4**	**20.6**	**21.1**	**20.9**	**21.2**
Size Correction Factor, F	1.07	1.08	1.08	0.94	1.01	1.01
Corr. Pt. Load Strength Index,$I_{S(50)}$, Mpa	0.15	0.14	0.15	0.14	0.15	0.15
Corr. Pt. Load Strength Index,$I_{S(50)}$, psi	**22**	**21**	**22**	**20**	**21**	**21**

MOISTURE CONTENT DATA

Moisture Condition of Specimen	As Received	As Received	As Received	As Received	As Received	As Received
Pan No.						
Pan wt. (g)	22.74	22.74	22.74	22.74	22.74	22.74
Total wet wt. (g)	228.23	228.23	228.23	228.23	228.23	228.23
Total dry wt (g)	200.76	200.76	200.76	200.76	200.76	200.76
Moisture Content, %	**15.4**	**15.4**	**15.4**	**15.4**	**15.4**	**15.4**
Comments:						

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No: 823-008 **Project No.:** 5128
Client: GRI **Date:** 9/26/2016
Project Name: Port of Coos Bay Channel Modification Project **By:** PJ

Boring:	B-24	B-24	B-24	B-24	B-24	B-24
Sample:	R-3	R-3	R-3	R-3	R-3	R-3
Depth, ft:	15	15	15	15	15	15
Visual Description:	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock
Test Type	Diametral	Diametral	Diametral	Axial	Axial	Axial
Test Type ID	1	1	1	2	2	2
FOR ANISOTROPIC ROCK:						
Bedding Angle Relative to Axis	None	None	None	None	None	None
Loading Orientation Rel. to Bedding	N/A	N/A	N/A	N/A	N/A	N/A
SAMPLE DIMENSIONS						
Width Perpendicular to loading, W, mm	61	61	61	61	61	61
Length Perpendicular to Loading, L, mm	30	34	32			
Diameter Parallel to Loading, D, mm	61	61	61			
Diameter at Failure, D', mm	57	55	57	31	32	25
STRENGTH DATA						
Peak Load, P, kN	0.53	0.489	0.407	0.364	0.353	0.244
Peak Load, P, lbs	119.1	109.9	91.5	81.8	79.4	54.9
Uncorr. Pt. Load Strength Index, I_S, MPa	0.152	0.146	0.117	0.151	0.142	0.126
Uncorr. Pt. Load Strength Index, I_S, psi	**22.1**	**21.1**	**17.0**	**21.9**	**20.6**	**18.2**
Size Correction Factor, F	1.08	1.07	1.08	0.99	1.00	0.94
Corr. Pt. Load Strength Index, $I_{S(50)}$, Mpa	0.16	0.16	0.13	0.15	0.14	0.12
Corr. Pt. Load Strength Index, $I_{S(50)}$, psi	**24**	**23**	**18**	**22**	**21**	**17**
MOISTURE CONTENT DATA						
Moisture Condition of Specimen	As Received	As Received	As Received	As Received	As Received	As Received
Pan No.						
Pan wt. (g)	20.57	20.57	20.57	20.57	20.57	20.57
Total wet wt. (g)	290.98	290.98	290.98	290.98	290.98	290.98
Total dry wt (g)	257.87	257.87	257.87	257.87	257.87	257.87
Moisture Content, %	**14.0**	**14.0**	**14.0**	**14.0**	**14.0**	**14.0**
Comments:						

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No:	823-008	**Project No.:**	5128
Client:	GRI	**Date:**	9/26/2016
Project Name:	Port of Coos Bay Channel Modification Project	**By:**	PJ

Boring:	B-24	B-24	B-24	B-24	B-24	B-24
Sample:	R-4	R-4	R-4	R-4	R-4	R-4
Depth, ft:	18.25	18.25	18.25	18.25	18.25	18.25
Visual Description:	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock
Test Type	Diametral	Diametral	Diametral	Diametral	Axial	Axial
Test Type ID	1	1	1	1	2	2

FOR ANISOTROPIC ROCK:

Bedding Angle Relative to Axis	None	None	None	None	None	None
Loading Orientation Rel. to Bedding	N/A	N/A	N/A	N/A	N/A	N/A

SAMPLE DIMENSIONS

Width Perpendicular to loading, W, mm	61	61	61	61	61	61
Length Perpendicular to Loading, L, mm	30	31	33	31		
Diameter Parallel to Loading, D, mm	61	61	61	61		
Diameter at Failure, D', mm	57	57	58	53	29	31

STRENGTH DATA

Peak Load, P, kN	0.491	0.412	0.436	0.524	0.368	0.244
Peak Load, P, lbs	110.4	92.6	98.0	117.8	82.7	54.9
Uncorr. Pt. Load Strength Index,I_S, MPa	0.141	0.118	0.123	0.162	0.163	0.101
Uncorr. Pt. Load Strength Index,I_S, psi	**20.5**	**17.2**	**17.9**	**23.5**	**23.7**	**14.7**
Size Correction Factor, F	1.08	1.08	1.08	1.06	0.98	0.99
Corr. Pt. Load Strength Index,$I_{S(50)}$, Mpa	0.15	0.13	0.13	0.17	0.16	0.10
Corr. Pt. Load Strength Index,$I_{S(50)}$, psi	**22**	**19**	**19**	**25**	**23**	**15**

MOISTURE CONTENT DATA

Moisture Condition of Specimen	As Received	As Received	As Received	As Received	As Received	As Received
Pan No.						
Pan wt. (g)	22.07	22.07	22.07	22.07	22.07	22.07
Total wet wt. (g)	243.35	243.35	243.35	243.35	243.35	243.35
Total dry wt (g)	220.28	220.28	220.28	220.28	220.28	220.28
Moisture Content, %	**11.6**	**11.6**	**11.6**	**11.6**	**11.6**	**11.6**
Comments:				Invalid test. Did not fail through both points.		

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No: 823-008
Client: GRI
Project Name: Port of Coos Bay Channel Modification Project
Project No.: 5128
Date: 9/26/2016
By: PJ

Boring:	B-24	B-24	B-24	B-24	B-24	B-24
Sample:	R-5	R-5	R-5	R-5	R-5	R-5
Depth, ft:	24	24	24	24	24	24
Visual Description:	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock
Test Type	Diametral	Diametral	Diametral	Diametral	Axial	Axial
Test Type ID	1	1	1	1	2	2
FOR ANISOTROPIC ROCK:						
Bedding Angle Relative to Axis	None	None	None	None	None	None
Loading Orientation Rel. to Bedding	N/A	N/A	N/A	N/A	N/A	N/A
SAMPLE DIMENSIONS						
Width Perpendicular to loading, W, mm	61	61	61	61	61	61
Length Perpendicular to Loading, L, mm	31	32	33	31		
Diameter Parallel to Loading, D, mm	61	61	61	61		
Diameter at Failure, D', mm	58	55	58	58	39	32
STRENGTH DATA						
Peak Load, P, kN	0.318	0.253	0.259	0.272	0.205	0.212
Peak Load, P, lbs	71.5	56.9	58.2	61.1	46.1	47.7
Uncorr. Pt. Load Strength Index,I_S, MPa	0.090	0.075	0.073	0.077	0.068	0.085
Uncorr. Pt. Load Strength Index,I_S, psi	**13.0**	**10.9**	**10.6**	**11.2**	**9.8**	**12.4**
Size Correction Factor, F	1.08	1.07	1.08	1.08	1.04	1.00
Corr. Pt. Load Strength Index,$I_{S(50)}$, Mpa	0.10	0.08	0.08	0.08	0.07	0.09
Corr. Pt. Load Strength Index,$I_{S(50)}$, psi	**14**	**12**	**11**	**12**	**10**	**12**
MOISTURE CONTENT DATA						
Moisture Condition of Specimen	As Received	As Received	As Received	As Received	As Received	As Received
Pan No.						
Pan wt. (g)	19.75	19.75	19.75	19.75	19.75	19.75
Total wet wt. (g)	206.86	206.86	206.86	206.86	206.86	206.86
Total dry wt (g)	181.94	181.94	181.94	181.94	181.94	181.94
Moisture Content, %	**15.4**	**15.4**	**15.4**	**15.4**	**15.4**	**15.4**
Comments:			Invalid test. Did not fail through both points.			

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No: 823-008

Client: GRI

Project Name: Port of Coos Bay Channel Modification Project

Project No.: 5128

Date: 9/28/2016

By: PJ

Boring:	B-25	B-25				
Sample:	R-2	R-2				
Depth, ft:	5	5				
Visual Description:	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock				
Test Type	Axial	Axial				
Test Type ID	2	2				
FOR ANISOTROPIC ROCK:						
Bedding Angle Relative to Axis	None	None				
Loading Orientation Rel. to Bedding	N/A	N/A				
SAMPLE DIMENSIONS						
Width Perpendicular to loading, W, mm	44	54				
Length Perpendicular to Loading, L, mm						
Diameter Parallel to Loading, D, mm						
Diameter at Failure, D', mm	24	25				
STRENGTH DATA						
Peak Load, P, kN	0.109	0.115				
Peak Load, P, lbs	24.5	25.9				
Uncorr. Pt. Load Strength Index, I_S, MPa	0.081	0.067				
Uncorr. Pt. Load Strength Index, I_S, psi	**11.8**	**9.7**				
Size Correction Factor, F	0.87	0.92				
Corr. Pt. Load Strength Index, $I_{S(50)}$, Mpa	0.07	0.06				
Corr. Pt. Load Strength Index, $I_{S(50)}$, psi	**10**	**9**				
MOISTURE CONTENT DATA						
Moisture Condition of Specimen	As Received	As Received				
Pan No.						
Pan wt. (g)	19.77	19.77				
Total wet wt. (g)	124.99	124.99				
Total dry wt (g)	108.09	108.09				
Moisture Content, %	**19.1**	**19.1**				
Comments:						

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No: 823-008
Client: GRI
Project Name: Port of Coos Bay Channel Modification Project

Project No.: 5128
Date: 9/26/2016
By: PJ

Boring:	B-25					
Sample:	R-2					
Depth, ft:	6.25					
Visual Description:	Very Dark Bluish Gray Rock					
Test Type	Axial					
Test Type ID	2					
FOR ANISOTROPIC ROCK:						
Bedding Angle Relative to Axis	None					
Loading Orientation Rel. to Bedding	N/A					
SAMPLE DIMENSIONS						
Width Perpendicular to loading, W, mm	60					
Length Perpendicular to Loading, L, mm						
Diameter Parallel to Loading, D, mm						
Diameter at Failure, D', mm	35					
STRENGTH DATA						
Peak Load, P, kN	0.23					
Peak Load, P, lbs	51.7					
Uncorr. Pt. Load Strength Index,I_S, MPa	0.086					
Uncorr. Pt. Load Strength Index,I_S, psi	**12.5**					
Size Correction Factor, F	1.02					
Corr. Pt. Load Strength Index,$I_{S(50)}$, Mpa	0.09					
Corr. Pt. Load Strength Index,$I_{S(50)}$, psi	**13**					
MOISTURE CONTENT DATA						
Moisture Condition of Specimen	As Received					
Pan No.						
Pan wt. (g)	22.37					
Total wet wt. (g)	254.56					
Total dry wt (g)	212.95					
Moisture Content, %	**21.8**					
Comments:						

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No: 823-008
Client: GRI
Project Name: Port of Coos Bay Channel Modification Project

Project No.: 5128
Date: 9/28/2016
By: PJ

Boring:	B-25					
Sample:	R-2					
Depth, ft:	8					
Visual Description:	Very Dark Bluish Gray Rock					
Test Type	Axial					
Test Type ID	2					
FOR ANISOTROPIC ROCK:						
Bedding Angle Relative to Axis	None					
Loading Orientation Rel. to Bedding	N/A					
SAMPLE DIMENSIONS						
Width Perpendicular to loading, W, mm	61					
Length Perpendicular to Loading, L, mm						
Diameter Parallel to Loading, D, mm						
Diameter at Failure, D', mm	56					
STRENGTH DATA						
Peak Load, P, kN	0.211					
Peak Load, P, lbs	47.4					
Uncorr. Pt. Load Strength Index, I_S, MPa	0.049					
Uncorr. Pt. Load Strength Index, I_S, psi	**7.0**					
Size Correction Factor, F	1.13					
Corr. Pt. Load Strength Index, $I_{S(50)}$, Mpa	0.05					
Corr. Pt. Load Strength Index, $I_{S(50)}$, psi	**8**					
MOISTURE CONTENT DATA						
Moisture Condition of Specimen	As Received					
Pan No.						
Pan wt. (g)	22.11					
Total wet wt. (g)	82.68					
Total dry wt (g)	72.85					
Moisture Content, %	**19.4**					
Comments:						

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No: 823-008 **Project No.:** 5128
Client: GRI **Date:** 9/26/2016
Project Name: Port of Coos Bay Channel Modification Project **By:** PJ

Boring:	B-25	B-25	B-25	B-25	B-25	B-25
Sample:	R-3	R-3	R-3	R-3	R-3	R-3
Depth, ft:	10.5	10.5	10.5	10.5	10.5	10.5
Visual Description:	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock
Test Type	Diametral	Diametral	Diametral	Axial	Axial	Axial
Test Type ID	1	1	1	2	2	2
FOR ANISOTROPIC ROCK:						
Bedding Angle Relative to Axis	None	None	None	None	None	None
Loading Orientation Rel. to Bedding	N/A	N/A	N/A	N/A	N/A	N/A
SAMPLE DIMENSIONS						
Width Perpendicular to loading, W, mm	59	59	59	59	59	59
Length Perpendicular to Loading, L, mm	30	31	31			
Diameter Parallel to Loading, D, mm	59	59	59			
Diameter at Failure, D', mm	55	54	57	34	32	27
STRENGTH DATA						
Peak Load, P, kN	0.091	0.15	0.231	0.076	0.157	0.135
Peak Load, P, lbs	20.5	33.7	51.9	17.1	35.3	30.3
Uncorr. Pt. Load Strength Index, I_S, MPa	0.028	0.047	0.069	0.030	0.065	0.067
Uncorr. Pt. Load Strength Index, I_S, psi	**4.1**	**6.8**	**10.0**	**4.3**	**9.5**	**9.7**
Size Correction Factor, F	1.06	1.06	1.07	1.00	0.99	0.95
Corr. Pt. Load Strength Index, $I_{S(50)}$, Mpa	0.03	0.05	0.07	0.03	0.06	0.06
Corr. Pt. Load Strength Index, $I_{S(50)}$, psi	**4**	**7**	**11**	**4**	**9**	**9**
MOISTURE CONTENT DATA						
Moisture Condition of Specimen	As Received	As Received	As Received	As Received	As Received	As Received
Pan No.						
Pan wt. (g)	21.63	21.63	21.63	21.63	21.63	21.63
Total wet wt. (g)	227.65	227.65	227.65	227.65	227.65	227.65
Total dry wt (g)	194.36	194.36	194.36	194.36	194.36	194.36
Moisture Content, %	**19.3**	**19.3**	**19.3**	**19.3**	**19.3**	**19.3**
Comments:						

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No: 823-008
Client: GRI
Project Name: Port of Coos Bay Channel Modification Project
Project No.: 5128
Date: 9/26/2016
By: PJ

Boring:	B-25	B-25	B-25			
Sample:	R-4	R-4	R-4			
Depth, ft:	15.5	15.5	15.5			
Visual Description:	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock			
Test Type	Diametral	Diametral	Axial			
Test Type ID	1	1	2			
FOR ANISOTROPIC ROCK:						
Bedding Angle Relative to Axis	None	None	None			
Loading Orientation Rel. to Bedding	N/A	N/A	N/A			
SAMPLE DIMENSIONS						
Width Perpendicular to loading, W, mm	59	59	59			
Length Perpendicular to Loading, L, mm	30	31				
Diameter Parallel to Loading, D, mm	59	59				
Diameter at Failure, D', mm	55	56	28			
STRENGTH DATA						
Peak Load, P, kN	0.24	0.24	0.09			
Peak Load, P, lbs	54.0	54.0	20.2			
Uncorr. Pt. Load Strength Index, I_S, MPa	0.074	0.073	0.043			
Uncorr. Pt. Load Strength Index, I_S, psi	**10.7**	**10.5**	**6.2**			
Size Correction Factor, F	1.06	1.06	0.96			
Corr. Pt. Load Strength Index, $I_{S(50)}$, Mpa	0.08	0.08	0.04			
Corr. Pt. Load Strength Index, $I_{S(50)}$, psi	**11**	**11**	**6**			
MOISTURE CONTENT DATA						
Moisture Condition of Specimen	As Received	As Received	As Received			
Pan No.						
Pan wt. (g)	22.27	22.27	22.27			
Total wet wt. (g)	151.19	151.19	151.19			
Total dry wt (g)	130.23	130.23	130.23			
Moisture Content, %	**19.4**	**19.4**	**19.4**			
Comments:						

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No: 823-008
Project No.: 5128
Client: GRI
Date: 9/26/2016
Project Name: Port of Coos Bay Channel Modification Project
By: PJ

Boring:	B-25	B-25	B-25	B-25		
Sample:	R-4	R-4	R-4	R-4		
Depth, ft:	17	17	17	17		
Visual Description:	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock		
Test Type	Diametral	Diametral	Axial	Axial		
Test Type ID	1	1	2	2		
FOR ANISOTROPIC ROCK:						
Bedding Angle Relative to Axis	None	None	None	None		
Loading Orientation Rel. to Bedding	N/A	N/A	N/A	N/A		
SAMPLE DIMENSIONS						
Width Perpendicular to loading, W, mm	59	59	59	59		
Length Perpendicular to Loading, L, mm	30	30				
Diameter Parallel to Loading, D, mm	59	59				
Diameter at Failure, D', mm	55	56	25	37		
STRENGTH DATA						
Peak Load, P, kN	0.233	0.215	0.051	0.093		
Peak Load, P, lbs	52.4	48.3	11.5	20.9		
Uncorr. Pt. Load Strength Index,I_S, MPa	0.072	0.065	0.027	0.033		
Uncorr. Pt. Load Strength Index,I_S, psi	**10.4**	**9.4**	**3.9**	**4.9**		
Size Correction Factor, F	1.06	1.06	0.94	1.02		
Corr. Pt. Load Strength Index,$I_{S(50)}$, Mpa	0.08	0.07	0.03	0.03		
Corr. Pt. Load Strength Index,$I_{S(50)}$, psi	**11**	**10**	**4**	**5**		
MOISTURE CONTENT DATA						
Moisture Condition of Specimen	As Received	As Received	As Received	As Received		
Pan No.						
Pan wt. (g)	20.08	20.08	20.08	20.08		
Total wet wt. (g)	165.22	165.22	165.22	165.22		
Total dry wt (g)	141.79	141.79	141.79	141.79		
Moisture Content, %	**19.3**	**19.3**	**19.3**	**19.3**		
Comments:						

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No: 823-008
Client: GRI
Project Name: Port of Coos Bay Channel Modification Project
Project No.: 5128
Date: 9/29/2016
By: PJ

Boring:	B-26	B-26	B-26			
Sample:	R-1	R-1	R-1			
Depth, ft:	4	4	4			
Visual Description:	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock			
Test Type	Diametral	Axial	Axial			
Test Type ID	1	2	2			
FOR ANISOTROPIC ROCK:						
Bedding Angle Relative to Axis	None	None	None			
Loading Orientation Rel. to Bedding	N/A	N/A	N/A			
SAMPLE DIMENSIONS						
Width Perpendicular to loading, W, mm	58	58	58			
Length Perpendicular to Loading, L, mm	31					
Diameter Parallel to Loading, D, mm	58					
Diameter at Failure, D', mm	57	40	40			
STRENGTH DATA						
Peak Load, P, kN	0.214	0.064	0.246			
Peak Load, P, lbs	48.1	14.4	55.3			
Uncorr. Pt. Load Strength Index,I_S, MPa	0.065	0.022	0.083			
Uncorr. Pt. Load Strength Index,I_S, psi	**9.4**	**3.1**	**12.1**			
Size Correction Factor, F	1.06	1.04	1.04			
Corr. Pt. Load Strength Index,$I_{S(50)}$, Mpa	0.07	0.02	0.09			
Corr. Pt. Load Strength Index,$I_{S(50)}$, psi	**10**	**3**	**13**			
MOISTURE CONTENT DATA						
Moisture Condition of Specimen	As Received	As Received	As Received			
Pan No.						
Pan wt. (g)	1722.1	1722.1	1722.1			
Total wet wt. (g)	2179	2179	2179			
Total dry wt (g)	2102.4	2102.4	2102.4			
Moisture Content, %	**20.1**	**20.1**	**20.1**			
Comments:						

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No: 823-008
Project No.: 5128
Client: GRI
Date: 9/26/2016
Project Name: Port of Coos Bay Channel Modification Project
By: PJ

Boring:	B-26	B-26	B-26	B-26	B-26	
Sample:	R-3	R-3	R-3	R-3	R-3	
Depth, ft:	13	13	13	13	13	
Visual Description:	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	
Test Type	Diametral	Diametral	Axial	Axial	Axial	
Test Type ID	1	1	2	2	2	
FOR ANISOTROPIC ROCK:						
Bedding Angle Relative to Axis	None	None	None	None	None	
Loading Orientation Rel. to Bedding	N/A	N/A	N/A	N/A	N/A	
SAMPLE DIMENSIONS						
Width Perpendicular to loading, W, mm	60	60	60	60	60	
Length Perpendicular to Loading, L, mm	30	30				
Diameter Parallel to Loading, D, mm	60	60				
Diameter at Failure, D', mm	57	58	32	41	29	
STRENGTH DATA						
Peak Load, P, kN	0.143	0.16	0.144	0.225	0.031	
Peak Load, P, lbs	32.1	36.0	32.4	50.6	7.0	
Uncorr. Pt. Load Strength Index, I_S, MPa	0.042	0.046	0.059	0.072	0.014	
Uncorr. Pt. Load Strength Index, I_S, psi	**6.1**	**6.7**	**8.5**	**10.4**	**2.0**	
Size Correction Factor, F	1.07	1.08	0.99	1.05	0.97	
Corr. Pt. Load Strength Index, $I_{S(50)}$, Mpa	0.04	0.05	0.06	0.08	0.01	
Corr. Pt. Load Strength Index, $I_{S(50)}$, psi	**7**	**7**	**9**	**11**	**2**	
MOISTURE CONTENT DATA						
Moisture Condition of Specimen	As Received	As Received	As Received	As Received	As Received	
Pan No.						
Pan wt. (g)	22.91	22.91	22.91	22.91	22.91	
Total wet wt. (g)	212.43	212.43	212.43	212.43	212.43	
Total dry wt (g)	179.73	179.73	179.73	179.73	179.73	
Moisture Content, %	**20.9**	**20.9**	**20.9**	**20.9**	**20.9**	
Comments:						

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No: 823-008
Client: GRI
Project Name: Port of Coos Bay Channel Modification Project
Project No.: 5128
Date: 9/26/2016
By: PJ

Boring:	B-27	B-27	B-27			
Sample:	R-1	R-1	R-1			
Depth, ft:	4	4	4			
Visual Description:	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock			
Test Type	Diametral	Diametral	Axial			
Test Type ID	1	1	2			
FOR ANISOTROPIC ROCK:						
Bedding Angle Relative to Axis	None	None	None			
Loading Orientation Rel. to Bedding	N/A	N/A	N/A			
SAMPLE DIMENSIONS						
Width Perpendicular to loading, W, mm	60	60	60			
Length Perpendicular to Loading, L, mm	30	35				
Diameter Parallel to Loading, D, mm	60	60				
Diameter at Failure, D', mm	52	49	27			
STRENGTH DATA						
Peak Load, P, kN	1.48	1.28	1.2			
Peak Load, P, lbs	332.7	287.8	269.8			
Uncorr. Pt. Load Strength Index, I_S, MPa	0.474	0.435	0.582			
Uncorr. Pt. Load Strength Index, I_S, psi	**68.8**	**63.1**	**84.4**			
Size Correction Factor, F	1.05	1.04	0.96			
Corr. Pt. Load Strength Index, $I_{S(50)}$, Mpa	0.50	0.45	0.56			
Corr. Pt. Load Strength Index, $I_{S(50)}$, psi	**72**	**65**	**81**			
MOISTURE CONTENT DATA						
Moisture Condition of Specimen	As Received	As Received	As Received			
Pan No.						
Pan wt. (g)	22.32	22.32	22.32			
Total wet wt. (g)	183.99	183.99	183.99			
Total dry wt (g)	149.52	149.52	149.52			
Moisture Content, %	**27.1**	**27.1**	**27.1**			
Comments:		Invalid test. Did not fail through both loading points.				

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No: 823-008
Project No.: 5128
Client: GRI
Date: 9/26/2016
Project Name: Port of Coos Bay Channel Modification Project
By: PJ

Boring:	B-27	B-27	B-27	B-27	B-27	B-27
Sample:	R-1	R-1	R-1	R-1	R-1	R-1
Depth, ft:	7	7	7	7	7	7
Visual Description:	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock
Test Type	Diametral	Diametral	Diametral	Diametral	Axial	Axial
Test Type ID	1	1	1	1	2	2
FOR ANISOTROPIC ROCK:						
Bedding Angle Relative to Axis	None	None	None	None	None	None
Loading Orientation Rel. to Bedding	N/A	N/A	N/A	N/A	N/A	N/A
SAMPLE DIMENSIONS						
Width Perpendicular to loading, W, mm	61	61	61	61	61	61
Length Perpendicular to Loading, L, mm	31	31	30	30		
Diameter Parallel to Loading, D, mm	61	61	61	61		
Diameter at Failure, D', mm	52	47	52	57	26	29
STRENGTH DATA						
Peak Load, P, kN	2.072	1.492	1.775	1.405	0.917	1.525
Peak Load, P, lbs	465.8	335.4	399.0	315.9	206.1	342.8
Uncorr. Pt. Load Strength Index,I_S, MPa	0.653	0.520	0.560	0.404	0.454	0.677
Uncorr. Pt. Load Strength Index,I_S, psi	**94.7**	**75.5**	**81.2**	**58.6**	**65.9**	**98.2**
Size Correction Factor, F	1.06	1.03	1.06	1.08	0.95	0.98
Corr. Pt. Load Strength Index,$I_{S(50)}$, Mpa	0.69	0.54	0.59	0.44	0.43	0.66
Corr. Pt. Load Strength Index,$I_{S(50)}$, psi	**100**	**78**	**86**	**63**	**63**	**96**
MOISTURE CONTENT DATA						
Moisture Condition of Specimen	As Received	As Received	As Received	As Received	As Received	As Received
Pan No.						
Pan wt. (g)	22.19	22.19	22.19	22.19	22.19	22.19
Total wet wt. (g)	188.5	188.5	188.5	188.5	188.5	188.5
Total dry wt (g)	153.59	153.59	153.59	153.59	153.59	153.59
Moisture Content, %	**26.6**	**26.6**	**26.6**	**26.6**	**26.6**	**26.6**
Comments:						

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No: 823-008
Client: GRI
Project Name: Port of Coos Bay Channel Modification Project
Project No.: 5128
Date: 9/26/2016
By: PJ

Boring:	B-27	B-27	B-27	B-27	B-27	
Sample:	R-2	R-2	R-2	R-2	R-2	
Depth, ft:	11	11	11	11	11	
Visual Description:	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	
Test Type	Diametral	Diametral	Axial	Axial	Axial	
Test Type ID	1	1	2	2	2	
FOR ANISOTROPIC ROCK:						
Bedding Angle Relative to Axis	None	None	None	None	None	
Loading Orientation Rel. to Bedding	N/A	N/A	N/A	N/A	N/A	
SAMPLE DIMENSIONS						
Width Perpendicular to loading, W, mm	61	61	61	61	61	
Length Perpendicular to Loading, L, mm	30	30				
Diameter Parallel to Loading, D, mm	61	61				
Diameter at Failure, D', mm	57	51	34	26	23	
STRENGTH DATA						
Peak Load, P, kN	1.509	1.494	1.687	1.367	0.574	
Peak Load, P, lbs	339.2	335.9	379.3	307.3	129.0	
Uncorr. Pt. Load Strength Index,I_S, MPa	0.434	0.480	0.639	0.677	0.321	
Uncorr. Pt. Load Strength Index,I_S, psi	**62.9**	**69.7**	**92.7**	**98.2**	**46.6**	
Size Correction Factor, F	1.08	1.05	1.01	0.95	0.93	
Corr. Pt. Load Strength Index,$I_{S(50)}$, Mpa	0.47	0.50	0.65	0.65	0.30	
Corr. Pt. Load Strength Index,$I_{S(50)}$, psi	**68**	**73**	**94**	**94**	**43**	
MOISTURE CONTENT DATA						
Moisture Condition of Specimen	As Received	As Received	As Received	As Received	As Received	
Pan No.						
Pan wt. (g)	22.44	22.44	22.44	22.44	22.44	
Total wet wt. (g)	184.78	184.78	184.78	184.78	184.78	
Total dry wt (g)	148.44	148.44	148.44	148.44	148.44	
Moisture Content, %	**28.8**	**28.8**	**28.8**	**28.8**	**28.8**	
Comments:						

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No: 823-008
Client: GRI
Project Name: Port of Coos Bay Channel Modification Project
Project No.: 5128
Date: 9/26/2016
By: PJ

Boring:	B-27	B-27	B-27	B-27	B-27	B-27
Sample:	R-2	R-2	R-2	R-2	R-2	R-2
Depth, ft:	12.25	12.5	12.5	12.5	12.5	12.5
Visual Description:	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock
Test Type	Diametral	Diametral	Diametral	Diametral	Diametral	Axial
Test Type ID	1	1	1	1	1	2

FOR ANISOTROPIC ROCK:

Bedding Angle Relative to Axis	None	None	None	None	None	None
Loading Orientation Rel. to Bedding	N/A	N/A	N/A	N/A	N/A	N/A

SAMPLE DIMENSIONS

Width Perpendicular to loading, W, mm	60	60	60	60	60	60
Length Perpendicular to Loading, L, mm	31	31	31	31	31	
Diameter Parallel to Loading, D, mm	60	60	60	60	60	
Diameter at Failure, D', mm	55	53	48	54	49	34

STRENGTH DATA

Peak Load, P, kN	0.704	1.474	1.392	1.189	1.406	1.617
Peak Load, P, lbs	158.3	331.4	312.9	267.3	316.1	363.5
Uncorr. Pt. Load Strength Index,I_S, MPa	0.213	0.464	0.483	0.367	0.478	0.623
Uncorr. Pt. Load Strength Index,I_S, psi	**30.9**	**67.2**	**70.1**	**53.2**	**69.4**	**90.3**
Size Correction Factor, F	1.06	1.06	1.03	1.06	1.04	1.01
Corr. Pt. Load Strength Index,$I_{S(50)}$, Mpa	0.23	0.49	0.50	0.39	0.50	0.63
Corr. Pt. Load Strength Index,$I_{S(50)}$, psi	**33**	**71**	**72**	**56**	**72**	**91**

MOISTURE CONTENT DATA

Moisture Condition of Specimen	As Received	As Received	As Received	As Received	As Received	As Received
Pan No.						
Pan wt. (g)	21.6	21.6	21.6	21.6	21.6	21.6
Total wet wt. (g)	148.56	148.56	148.56	148.56	148.56	148.56
Total dry wt (g)	123.29	123.29	123.29	123.29	123.29	123.29
Moisture Content, %	**24.9**	**24.9**	**24.9**	**24.9**	**24.9**	**24.9**
Comments:	Invalid test. Did not fail through both loading points.	Invalid test. Did not fail through both loading points.				

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No: 823-008
Project No.: 5128
Client: GRI
Date: 9/26/2016
Project Name: Port of Coos Bay Channel Modification Project
By: PJ

Boring:	B-27	B-27	B-27	B-27	B-27	B-27
Sample:	R-3	R-3	R-3	R-3	R-3	R-3
Depth, ft:	16	16	16	16	16	16
Visual Description:	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock
Test Type	Diametral	Diametral	Diametral	Axial	Axial	Axial
Test Type ID	1	1	1	2	2	2
FOR ANISOTROPIC ROCK:						
Bedding Angle Relative to Axis	None	None	None	None	None	None
Loading Orientation Rel. to Bedding	N/A	N/A	N/A	N/A	N/A	N/A
SAMPLE DIMENSIONS						
Width Perpendicular to loading, W, mm	60	60	60	60	60	60
Length Perpendicular to Loading, L, mm	30	30	31			
Diameter Parallel to Loading, D, mm	60	60	60			
Diameter at Failure, D', mm	52	56	55	36	21	19
STRENGTH DATA						
Peak Load, P, kN	1.581	1.233	2.072	1.372	0.822	1.194
Peak Load, P, lbs	355.4	277.2	465.8	308.4	184.8	268.4
Uncorr. Pt. Load Strength Index, I_S, MPa	0.507	0.367	0.628	0.499	0.512	0.823
Uncorr. Pt. Load Strength Index, I_S, psi	**73.5**	**53.2**	**91.1**	**72.4**	**74.3**	**119.3**
Size Correction Factor, F	1.05	1.07	1.06	1.02	0.91	0.88
Corr. Pt. Load Strength Index, $I_{S(50)}$, Mpa	0.53	0.39	0.67	0.51	0.46	0.73
Corr. Pt. Load Strength Index, $I_{S(50)}$, psi	**77**	**57**	**97**	**74**	**67**	**106**
MOISTURE CONTENT DATA						
Moisture Condition of Specimen	As Received	As Received	As Received	As Received	As Received	As Received
Pan No.						
Pan wt. (g)	19.91	19.91	19.91	19.91	19.91	19.91
Total wet wt. (g)	174.89	174.89	174.89	174.89	174.89	174.89
Total dry wt (g)	141.33	141.33	141.33	141.33	141.33	141.33
Moisture Content, %	**27.6**	**27.6**	**27.6**	**27.6**	**27.6**	**27.6**
Comments:						

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No: 823-008
Project No.: 5128
Client: GRI
Date: 9/26/2016
Project Name: Port of Coos Bay Channel Modification Project
By: PJ

Boring:	B-27	B-27	B-27	B-27	B-27	B-27
Sample:	R-4	R-4	R-4	R-4	R-4	R-4
Depth, ft:	19	19	19	19	19	19
Visual Description:	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock
Test Type	Diametral	Diametral	Diametral	Axial	Axial	Axial
Test Type ID	1	1	1	2	2	2
FOR ANISOTROPIC ROCK:						
Bedding Angle Relative to Axis	None	None	None	None	None	None
Loading Orientation Rel. to Bedding	N/A	N/A	N/A	N/A	N/A	N/A
SAMPLE DIMENSIONS						
Width Perpendicular to loading, W, mm	59	59	59	59	59	59
Length Perpendicular to Loading, L, mm	31	30	31			
Diameter Parallel to Loading, D, mm	59	59	59			
Diameter at Failure, D', mm	55	48	53	32	34	35
STRENGTH DATA						
Peak Load, P, kN	1.155	1.694	1.068	1.481	1.247	1.438
Peak Load, P, lbs	259.7	380.8	240.1	332.9	280.3	323.3
Uncorr. Pt. Load Strength Index,I_S, MPa	0.356	0.598	0.342	0.616	0.488	0.547
Uncorr. Pt. Load Strength Index,I_S, psi	**51.6**	**86.8**	**49.5**	**89.4**	**70.8**	**79.3**
Size Correction Factor, F	1.06	1.03	1.05	0.99	1.00	1.01
Corr. Pt. Load Strength Index,$I_{S(50)}$, Mpa	0.38	0.62	0.36	0.61	0.49	0.55
Corr. Pt. Load Strength Index,$I_{S(50)}$, psi	**55**	**89**	**52**	**89**	**71**	**80**
MOISTURE CONTENT DATA						
Moisture Condition of Specimen	As Received	As Received	As Received	As Received	As Received	As Received
Pan No.						
Pan wt. (g)	21.98	21.98	21.98	21.98	21.98	21.98
Total wet wt. (g)	183.03	183.03	183.03	183.03	183.03	183.03
Total dry wt (g)	145.37	145.37	145.37	145.37	145.37	145.37
Moisture Content, %	**30.5**	**30.5**	**30.5**	**30.5**	**30.5**	**30.5**
Comments:						

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No: 823-008
Client: GRI
Project Name: Port of Coos Bay Channel Modification Project
Project No.: 5128
Date: 9/26/2016
By: PJ

Boring:	B-27	B-27	B-27	B-27	B-27	B-27
Sample:	R-4	R-4	R-4	R-4	R-4	R-4
Depth, ft:	21	21	21	21	21	21
Visual Description:	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock
Test Type	Diametral	Diametral	Diametral	Axial	Axial	Axial
Test Type ID	1	1	1	2	2	2
FOR ANISOTROPIC ROCK:						
Bedding Angle Relative to Axis	None	None	None	None	None	None
Loading Orientation Rel. to Bedding	N/A	N/A	N/A	N/A	N/A	N/A
SAMPLE DIMENSIONS						
Width Perpendicular to loading, W, mm	60	60	60	60	60	60
Length Perpendicular to Loading, L, mm	30	31	30			
Diameter Parallel to Loading, D, mm	60	60	60			
Diameter at Failure, D', mm	56	51	55	45	36	36
STRENGTH DATA						
Peak Load, P, kN	0.922	1.399	1.093	1.693	1.56	1.352
Peak Load, P, lbs	207.3	314.5	245.7	380.6	350.7	303.9
Uncorr. Pt. Load Strength Index,I_S, MPa	0.274	0.457	0.331	0.492	0.567	0.492
Uncorr. Pt. Load Strength Index,I_S, psi	**39.8**	**66.3**	**48.0**	**71.4**	**82.3**	**71.3**
Size Correction Factor, F	1.07	1.05	1.06	1.07	1.02	1.02
Corr. Pt. Load Strength Index,$I_{S(50)}$, Mpa	0.29	0.48	0.35	0.53	0.58	0.50
Corr. Pt. Load Strength Index,$I_{S(50)}$, psi	**43**	**69**	**51**	**77**	**84**	**73**
MOISTURE CONTENT DATA						
Moisture Condition of Specimen	As Received	As Received	As Received	As Received	As Received	As Received
Pan No.						
Pan wt. (g)	21.76	21.76	21.76	21.76	21.76	21.76
Total wet wt. (g)	180.42	180.42	180.42	180.42	180.42	180.42
Total dry wt (g)	149.32	149.32	149.32	149.32	149.32	149.32
Moisture Content, %	**24.4**	**24.4**	**24.4**	**24.4**	**24.4**	**24.4**
Comments:						

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No: 823-008 **Project No.:** 5128
Client: GRI **Date:** 9/26/2016
Project Name: Port of Coos Bay Channel Modification Project **By:** PJ

Boring:	B-27	B-27	B-27	B-27	B-27	B-27
Sample:	R-5	R-5	R-5	R-5	R-5	R-5
Depth, ft:	23	23	23	23	23	23
Visual Description:	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock
Test Type	Diametral	Diametral	Diametral	Axial	Axial	Axial
Test Type ID	1	1	1	2	2	2
FOR ANISOTROPIC ROCK:						
Bedding Angle Relative to Axis	None	None	None	None	None	None
Loading Orientation Rel. to Bedding	N/A	N/A	N/A	N/A	N/A	N/A
SAMPLE DIMENSIONS						
Width Perpendicular to loading, W, mm	61	61	61	61	61	61
Length Perpendicular to Loading, L, mm	30	31	31			
Diameter Parallel to Loading, D, mm	61	61	61			
Diameter at Failure, D', mm	56	50	50	35	30	19
STRENGTH DATA						
Peak Load, P, kN	1.314	1.499	1.148	1.335	1.405	0.985
Peak Load, P, lbs	295.4	337.0	258.1	300.1	315.9	221.4
Uncorr. Pt. Load Strength Index,I_S, MPa	0.385	0.491	0.376	0.491	0.603	0.667
Uncorr. Pt. Load Strength Index,I_S, psi	**55.8**	**71.3**	**54.6**	**71.2**	**87.5**	**96.8**
Size Correction Factor, F	1.07	1.05	1.05	1.02	0.98	0.89
Corr. Pt. Load Strength Index,$I_{S(50)}$, Mpa	0.41	0.51	0.39	0.50	0.59	0.59
Corr. Pt. Load Strength Index,$I_{S(50)}$, psi	**60**	**75**	**57**	**73**	**86**	**86**
MOISTURE CONTENT DATA						
Moisture Condition of Specimen	As Received	As Received	As Received	As Received	As Received	As Received
Pan No.						
Pan wt. (g)	20.38	20.38	20.38	20.38	20.38	20.38
Total wet wt. (g)	239.34	239.34	239.34	239.34	239.34	239.34
Total dry wt (g)	189	189	189	189	189	189
Moisture Content, %	**29.9**	**29.9**	**29.9**	**29.9**	**29.9**	**29.9**
Comments:						

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No: 823-008

Client: GRI

Project Name: Port of Coos Bay Channel Modification Project

Project No.: 5128

Date: 9/26/2016

By: PJ

Boring:	B-27	B-27	B-27	B-27	B-27	B-27
Sample:	R-5	R-5	R-5	R-5	R-5	R-5
Depth, ft:	25	25	25	25	25	25
Visual Description:	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock
Test Type	Diametral	Diametral	Diametral	Axial	Axial	Axial
Test Type ID	1	1	1	2	2	2
FOR ANISOTROPIC ROCK:						
Bedding Angle Relative to Axis	None	None	None	None	None	None
Loading Orientation Rel. to Bedding	N/A	N/A	N/A	N/A	N/A	N/A
SAMPLE DIMENSIONS						
Width Perpendicular to loading, W, mm	60	60	60	60	60	60
Length Perpendicular to Loading, L, mm	31	30	30			
Diameter Parallel to Loading, D, mm	60	60	60			
Diameter at Failure, D', mm	54	53	52	36	26	31
STRENGTH DATA						
Peak Load, P, kN	1.368	1.368	1.794	1.324	1.201	1.314
Peak Load, P, lbs	307.5	307.5	403.3	297.6	270.0	295.4
Uncorr. Pt. Load Strength Index, I_S, MPa	0.422	0.430	0.575	0.481	0.605	0.555
Uncorr. Pt. Load Strength Index, I_S, psi	**61.2**	**62.4**	**83.4**	**69.8**	**87.7**	**80.5**
Size Correction Factor, F	1.06	1.06	1.05	1.02	0.95	0.99
Corr. Pt. Load Strength Index, $I_{S(50)}$, Mpa	0.45	0.45	0.60	0.49	0.57	0.55
Corr. Pt. Load Strength Index, $I_{S(50)}$, psi	**65**	**66**	**88**	**71**	**83**	**79**
MOISTURE CONTENT DATA						
Moisture Condition of Specimen	As Received	As Received	As Received	As Received	As Received	As Received
Pan No.						
Pan wt. (g)	21.78	21.78	21.78	21.78	21.78	21.78
Total wet wt. (g)	184.85	184.85	184.85	184.85	184.85	184.85
Total dry wt (g)	149.54	149.54	149.54	149.54	149.54	149.54
Moisture Content, %	**27.6**	**27.6**	**27.6**	**27.6**	**27.6**	**27.6**
Comments:						

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No: 823-008
Client: GRI
Project Name: Port of Coos Bay Channel Modification Project
Project No.: 5128
Date: 9/26/2016
By: PJ

Boring:	B-28	B-28				
Sample:	R-1	R-1				
Depth, ft:	10	10				
Visual Description:	Verk Dark Bluish Gray Rock	Verk Dark Bluish Gray Rock				
Test Type	Axial	Axial				
Test Type ID	2	2				
FOR ANISOTROPIC ROCK:						
Bedding Angle Relative to Axis	None	None				
Loading Orientation Rel. to Bedding	N/A	N/A				
SAMPLE DIMENSIONS						
Width Perpendicular to loading, W, mm	60	58				
Length Perpendicular to Loading, L, mm						
Diameter Parallel to Loading, D, mm						
Diameter at Failure, D', mm	29	50				
STRENGTH DATA						
Peak Load, P, kN	1.121	1.483				
Peak Load, P, lbs	252.0	333.4				
Uncorr. Pt. Load Strength Index,I_S, MPa	0.506	0.402				
Uncorr. Pt. Load Strength Index,I_S, psi	**73.4**	**58.3**				
Size Correction Factor, F	0.97	1.09				
Corr. Pt. Load Strength Index,$I_{S(50)}$, Mpa	0.49	0.44				
Corr. Pt. Load Strength Index,$I_{S(50)}$, psi	**71**	**64**				
MOISTURE CONTENT DATA						
Moisture Condition of Specimen	As Received	As Received				
Pan No.						
Pan wt. (g)	22.64	22.64				
Total wet wt. (g)	211.97	211.97				
Total dry wt (g)	175.11	175.11				
Moisture Content, %	**24.2**	**24.2**				
Comments:						

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No: 823-008

Client: GRI

Project Name: Port of Coos Bay Channel Modification Project

Project No.: 5128

Date: 9/26/2016

By: PJ

Boring:	B-28	B-28	B-28	B-28	B-28	B-28
Sample:	R-2	R-2	R-2	R-2	R-2	R-2
Depth, ft:	12	12	12	12	12	12
Visual Description:	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock
Test Type	Diametral	Diametral	Diametral	Axial	Axial	Axial
Test Type ID	1	1	1	2	2	2

FOR ANISOTROPIC ROCK:

Bedding Angle Relative to Axis	None	None	None	None	None	None
Loading Orientation Rel. to Bedding	N/A	N/A	N/A	N/A	N/A	N/A

SAMPLE DIMENSIONS

Width Perpendicular to loading, W, mm	61	61	61	61	61	61
Length Perpendicular to Loading, L, mm	30	31	30			
Diameter Parallel to Loading, D, mm	61	61	61			
Diameter at Failure, D', mm	53	54	47	33	25	34

STRENGTH DATA

Peak Load, P, kN	1.692	1.339	1.362	1.368	1.038	1.558
Peak Load, P, lbs	380.4	301.0	306.2	307.5	233.4	350.3
Uncorr. Pt. Load Strength Index,I_S, MPa	0.523	0.406	0.475	0.534	0.535	0.590
Uncorr. Pt. Load Strength Index,I_S, psi	**75.9**	**59.0**	**68.9**	**77.4**	**77.5**	**85.6**
Size Correction Factor, F	1.06	1.06	1.03	1.01	0.94	1.01
Corr. Pt. Load Strength Index,$I_{S(50)}$, Mpa	0.55	0.43	0.49	0.54	0.51	0.60
Corr. Pt. Load Strength Index,$I_{S(50)}$, psi	**80**	**63**	**71**	**78**	**73**	**87**

MOISTURE CONTENT DATA

Moisture Condition of Specimen	As Received	As Received	As Received	As Received	As Received	As Received
Pan No.						
Pan wt. (g)	20.53	20.53	20.53	20.53	20.53	20.53
Total wet wt. (g)	154.34	154.34	154.34	154.34	154.34	154.34
Total dry wt (g)	124.94	124.94	124.94	124.94	124.94	124.94
Moisture Content, %	**28.2**	**28.2**	**28.2**	**28.2**	**28.2**	**28.2**
Comments:						

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No: 823-008
Client: GRI
Project Name: Port of Coos Bay Channel Modification Project
Project No.: 5128
Date: 9/26/2016
By: PJ

Boring:	B-28	B-28	B-28	B-28	B-28	B-28
Sample:	R-2	R-2	R-2	R-2	R-2	R-2
Depth, ft:	15	15	15	15	15	15
Visual Description:	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock
Test Type	Diametral	Diametral	Diametral	Axial	Axial	Axial
Test Type ID	1	1	1	2	2	2
FOR ANISOTROPIC ROCK:						
Bedding Angle Relative to Axis	None	None	None	None	None	None
Loading Orientation Rel. to Bedding	N/A	N/A	N/A	N/A	N/A	N/A
SAMPLE DIMENSIONS						
Width Perpendicular to loading, W, mm	61	61	61	61	61	61
Length Perpendicular to Loading, L, mm	34	31	30			
Diameter Parallel to Loading, D, mm	61	61	61			
Diameter at Failure, D', mm	49	47	54	36	26	23
STRENGTH DATA						
Peak Load, P, kN	1.371	1.336	1.052	1.11	1.388	1.062
Peak Load, P, lbs	308.2	300.3	236.5	249.5	312.0	238.7
Uncorr. Pt. Load Strength Index,I_S, MPa	0.459	0.466	0.319	0.397	0.687	0.595
Uncorr. Pt. Load Strength Index,I_S, psi	**66.5**	**67.6**	**46.3**	**57.6**	**99.7**	**86.2**
Size Correction Factor, F	1.04	1.03	1.06	1.03	0.95	0.93
Corr. Pt. Load Strength Index,$I_{S(50)}$, Mpa	0.48	0.48	0.34	0.41	0.66	0.55
Corr. Pt. Load Strength Index,$I_{S(50)}$, psi	**69**	**70**	**49**	**59**	**95**	**80**
MOISTURE CONTENT DATA						
Moisture Condition of Specimen	As Received	As Received	As Received	As Received	As Received	As Received
Pan No.						
Pan wt. (g)	22.44	22.44	22.44	22.44	22.44	22.44
Total wet wt. (g)	191.54	191.54	191.54	191.54	191.54	191.54
Total dry wt (g)	157.82	157.82	157.82	157.82	157.82	157.82
Moisture Content, %	**24.9**	**24.9**	**24.9**	**24.9**	**24.9**	**24.9**
Comments:						

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

COOPER TESTING LABORATORY

POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No: 823-008
Client: GRI
Project Name: Port of Coos Bay Channel Modification Project

Project No.: 5128
Date: 9/26/2016
By: PJ

Boring:	B-28	B-28	B-28	B-28		
Sample:	R-3	R-3	R-3	R-3		
Depth, ft:	17	17	17	17		
Visual Description:	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock		
Test Type	Diametral	Axial	Axial	Axial		
Test Type ID	1	2	2	2		
FOR ANISOTROPIC ROCK:						
Bedding Angle Relative to Axis	None	None	None	None		
Loading Orientation Rel. to Bedding	N/A	N/A	N/A	N/A		
SAMPLE DIMENSIONS						
Width Perpendicular to loading, W, mm	60	60	60	60		
Length Perpendicular to Loading, L, mm	31					
Diameter Parallel to Loading, D, mm	60					
Diameter at Failure, D', mm	52	56	51	34		
STRENGTH DATA						
Peak Load, P, kN	1.39	1.295	1.896	1.514		
Peak Load, P, lbs	312.5	291.1	426.2	340.4		
Uncorr. Pt. Load Strength Index, I_S, MPa	0.446	0.303	0.487	0.583		
Uncorr. Pt. Load Strength Index, I_S, psi	**64.6**	**43.9**	**70.6**	**84.5**		
Size Correction Factor, F	1.05	1.13	1.10	1.01		
Corr. Pt. Load Strength Index, $I_{S(50)}$, Mpa	0.47	0.34	0.54	0.59		
Corr. Pt. Load Strength Index, $I_{S(50)}$, psi	**68**	**50**	**78**	**85**		
MOISTURE CONTENT DATA						
Moisture Condition of Specimen	As Received	As Received	As Received	As Received		
Pan No.						
Pan wt. (g)	19.33	19.33	19.33	19.33		
Total wet wt. (g)	167.71	167.71	167.71	167.71		
Total dry wt (g)	137.19	137.19	137.19	137.19		
Moisture Content, %	**25.9**	**25.9**	**25.9**	**25.9**		
Comments:		Invalid test. Did not fail through both points.				

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No: 823-008
Client: GRI
Project Name: Port of Coos Bay Channel Modification Project
Project No.: 5128
Date: 9/26/2016
By: PJ

Boring:	B-28	B-28	B-28	B-28	B-28	B-28
Sample:	R-3	R-3	R-3	R-3	R-3	R-3
Depth, ft:	19	19	19	19	19	19
Visual Description:	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock
Test Type	Diametral	Diametral	Axial	Axial	Axial	Axial
Test Type ID	1	1	2	2	2	2
FOR ANISOTROPIC ROCK:						
Bedding Angle Relative to Axis	None	None	None	None	None	None
Loading Orientation Rel. to Bedding	N/A	N/A	N/A	N/A	N/A	N/A
SAMPLE DIMENSIONS						
Width Perpendicular to loading, W, mm	60	60	60	60	60	60
Length Perpendicular to Loading, L, mm	31	30				
Diameter Parallel to Loading, D, mm	60	60				
Diameter at Failure, D', mm	54	59	40	34	37	25
STRENGTH DATA						
Peak Load, P, kN	1.002	1.019	1.391	1.843	1.429	1.212
Peak Load, P, lbs	225.3	229.1	312.7	414.3	321.3	272.5
Uncorr. Pt. Load Strength Index, I_S, MPa	0.309	0.288	0.455	0.710	0.506	0.635
Uncorr. Pt. Load Strength Index, I_S, psi	**44.9**	**41.7**	**66.0**	**102.9**	**73.3**	**92.0**
Size Correction Factor, F	1.06	1.08	1.05	1.01	1.03	0.94
Corr. Pt. Load Strength Index, $I_{S(50)}$, Mpa	0.33	0.31	0.48	0.72	0.52	0.60
Corr. Pt. Load Strength Index, $I_{S(50)}$, psi	**48**	**45**	**69**	**104**	**75**	**87**
MOISTURE CONTENT DATA						
Moisture Condition of Specimen	As Received	As Received	As Received	As Received	As Received	As Received
Pan No.						
Pan wt. (g)	22.91	22.91	22.91	22.91	22.91	22.91
Total wet wt. (g)	171.64	171.64	171.64	171.64	171.64	171.64
Total dry wt (g)	140.98	140.98	140.98	140.98	140.98	140.98
Moisture Content, %	**26.0**	**26.0**	**26.0**	**26.0**	**26.0**	**26.0**
Comments:			Invalid test. Did not fail through both points.			

Test types: 1- Diametral, 2- Axial, 3- Block, 4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No: 823-008
Client: GRI
Project Name: Port of Coos Bay Channel Modification Project
Project No.: 5128
Date: 9/28/2016
By: PJ

Boring:	B-29	B-29	B-29	B-29	B-29	
Sample:	R-1	R-1	R-1	R-1	R-1	
Depth, ft:	2	2	2	2	2	
Visual Description:	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	
Test Type	Diametral	Axial	Axial	Axial	Axial	
Test Type ID	1	2	2	2	2	
FOR ANISOTROPIC ROCK:						
Bedding Angle Relative to Axis	None	None	None	None	None	
Loading Orientation Rel. to Bedding	N/A	N/A	N/A	N/A	N/A	
SAMPLE DIMENSIONS						
Width Perpendicular to loading, W, mm	60	60	59	59	59	
Length Perpendicular to Loading, L, mm	30					
Diameter Parallel to Loading, D, mm	60					
Diameter at Failure, D', mm	57	39	32	22	29	
STRENGTH DATA						
Peak Load, P, kN	0.982	0.137	1.12	0.792	1.03	
Peak Load, P, lbs	220.8	30.8	251.8	178.0	231.6	
Uncorr. Pt. Load Strength Index, I_S, MPa	0.287	0.046	0.466	0.479	0.473	
Uncorr. Pt. Load Strength Index, I_S, psi	**41.6**	**6.7**	**67.6**	**69.5**	**68.6**	
Size Correction Factor, F	1.07	1.04	0.99	0.91	0.97	
Corr. Pt. Load Strength Index, $I_{S(50)}$, Mpa	0.31	0.05	0.46	0.44	0.46	
Corr. Pt. Load Strength Index, $I_{S(50)}$, psi	**45**	**7**	**67**	**63**	**66**	
MOISTURE CONTENT DATA						
Moisture Condition of Specimen	As Received	As Received	As Received	As Received	As Received	
Pan No.						
Pan wt. (g)	21.69	21.69	21.69	21.69	21.69	
Total wet wt. (g)	150.4	150.4	150.4	150.4	150.4	
Total dry wt (g)	125.31	125.31	125.31	125.31	125.31	
Moisture Content, %	**24.2**	**24.2**	**24.2**	**24.2**	**24.2**	
Comments:					Invalid test. Did not fail through both loading points	

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No: 823-008

Client: GRI

Project Name: Port of Coos Bay Channel Modification Project

Project No.: 5128

Date: 9/28/2016

By: PJ

Boring:	B-29	B-29	B-29			
Sample:	R-2	R-2	R-2			
Depth, ft:	8	8	8			
Visual Description:	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock			
Test Type	Diametral	Axial	Axial			
Test Type ID	1	2	2			
FOR ANISOTROPIC ROCK:						
Bedding Angle Relative to Axis	None	None	None			
Loading Orientation Rel. to Bedding	N/A	N/A	N/A			
SAMPLE DIMENSIONS						
Width Perpendicular to loading, W, mm	60	60	60			
Length Perpendicular to Loading, L, mm	30					
Diameter Parallel to Loading, D, mm	60					
Diameter at Failure, D', mm	57	45	38			
STRENGTH DATA						
Peak Load, P, kN	0.618	1.569	1.227			
Peak Load, P, lbs	138.9	352.7	275.8			
Uncorr. Pt. Load Strength Index,I_S, MPa	0.181	0.456	0.423			
Uncorr. Pt. Load Strength Index,I_S, psi	**26.2**	**66.2**	**61.3**			
Size Correction Factor, F	1.07	1.07	1.03			
Corr. Pt. Load Strength Index,$I_{S(50)}$, Mpa	0.19	0.49	0.44			
Corr. Pt. Load Strength Index,$I_{S(50)}$, psi	**28**	**71**	**63**			
MOISTURE CONTENT DATA						
Moisture Condition of Specimen	As Received	As Received	As Received			
Pan No.						
Pan wt. (g)	20.24	20.24	20.24			
Total wet wt. (g)	154.23	154.23	154.23			
Total dry wt (g)	126.87	126.87	126.87			
Moisture Content, %	**25.7**	**25.7**	**25.7**			
Comments:						

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No: 823-008
Project No.: 5128
Client: GRI
Date: 9/26/2016
Project Name: Port of Coos Bay Channel Modification Project
By: PJ

Boring:	B-29	B-29	B-29	B-29		
Sample:	R-3	R-3	R-3	R-3		
Depth, ft:	12	12	12	12		
Visual Description:	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock		
Test Type	Diametral	Diametral	Axial	Axial		
Test Type ID	1	1	2	2		
FOR ANISOTROPIC ROCK:						
Bedding Angle Relative to Axis	None	None	None	None		
Loading Orientation Rel. to Bedding	N/A	N/A	N/A	N/A		
SAMPLE DIMENSIONS						
Width Perpendicular to loading, W, mm	60	60	60	60		
Length Perpendicular to Loading, L, mm	30	31				
Diameter Parallel to Loading, D, mm	60	60				
Diameter at Failure, D', mm	57	57	26	25		
STRENGTH DATA						
Peak Load, P, kN	0.513	0.611	1.248	1.132		
Peak Load, P, lbs	115.3	137.4	280.6	254.5		
Uncorr. Pt. Load Strength Index,I_S, MPa	0.150	0.179	0.628	0.593		
Uncorr. Pt. Load Strength Index,I_S, psi	**21.8**	**25.9**	**91.1**	**86.0**		
Size Correction Factor, F	1.07	1.07	0.95	0.94		
Corr. Pt. Load Strength Index,$I_{S(50)}$, Mpa	0.16	0.19	0.60	0.56		
Corr. Pt. Load Strength Index,$I_{S(50)}$, psi	**23**	**28**	**87**	**81**		
MOISTURE CONTENT DATA						
Moisture Condition of Specimen	As Received	As Received	As Received	As Received		
Pan No.						
Pan wt. (g)	20.76	20.76	20.76	20.76		
Total wet wt. (g)	135.79	135.79	135.79	135.79		
Total dry wt (g)	112.48	112.48	112.48	112.48		
Moisture Content, %	**25.4**	**25.4**	**25.4**	**25.4**		
Comments:						

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No: 823-008
Client: GRI
Project Name: Port of Coos Bay Channel Modification Project
Project No.: 5128
Date: 9/26/2016
By: PJ

Boring:	B-30	B-30	B-30			
Sample:	R-1	R-1	R-1			
Depth, ft:	12	12	12			
Visual Description:	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock			
Test Type	Diametral	Diametral	Axial			
Test Type ID	1	1	2			

FOR ANISOTROPIC ROCK:

Bedding Angle Relative to Axis	None	None	None			
Loading Orientation Rel. to Bedding	N/A	N/A	N/A			

SAMPLE DIMENSIONS

Width Perpendicular to loading, W, mm	59	59	59			
Length Perpendicular to Loading, L, mm	30	30				
Diameter Parallel to Loading, D, mm	59	59				
Diameter at Failure, D', mm	55	54	34			

STRENGTH DATA

Peak Load, P, kN	0.258	1.067	1.192			
Peak Load, P, lbs	58.0	239.9	268.0			
Uncorr. Pt. Load Strength Index,I_S, MPa	0.080	0.335	0.467			
Uncorr. Pt. Load Strength Index,I_S, psi	**11.5**	**48.6**	**67.7**			
Size Correction Factor, F	1.06	1.06	1.00			
Corr. Pt. Load Strength Index,$I_{S(50)}$, Mpa	0.08	0.35	0.47			
Corr. Pt. Load Strength Index,$I_{S(50)}$, psi	**12**	**51**	**68**			

MOISTURE CONTENT DATA

Moisture Condition of Specimen	As Received	As Received	As Received			
Pan No.						
Pan wt. (g)	20.64	20.64	20.64			
Total wet wt. (g)	101.45	101.45	101.45			
Total dry wt (g)	88.31	88.31	88.31			
Moisture Content, %	**19.4**	**19.4**	**19.4**			
Comments:	Invalid test- Did not fail through both points.					

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No: 823-008
Project No.: 5128
Client: GRI
Date: 9/26/2016
Project Name: Port of Coos Bay Channel Modification Project
By: PJ

Boring:	B-30	B-30	B-30	B-30	B-30	B-30
Sample:	R-1	R-1	R-1	R-1	R-1	R-1
Depth, ft:	14.5	14.5	14.5	14.5	14.5	14.5
Visual Description:	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock
Test Type	Axial	Diametral	Diametral	Diametral	Axial	Axial
Test Type ID	2	1	1	1	2	2
FOR ANISOTROPIC ROCK:						
Bedding Angle Relative to Axis	None	None	None	None	None	None
Loading Orientation Rel. to Bedding	N/A	N/A	N/A	N/A	N/A	N/A
SAMPLE DIMENSIONS						
Width Perpendicular to loading, W, mm	60	60	60	60	60	60
Length Perpendicular to Loading, L, mm		30	30	30		
Diameter Parallel to Loading, D, mm		60	60	60		
Diameter at Failure, D', mm	26	56	57	55	30	27
STRENGTH DATA						
Peak Load, P, kN	0.384	0.842	0.768	0.821	0.821	0.258
Peak Load, P, lbs	86.3	189.3	172.7	184.6	184.6	58.0
Uncorr. Pt. Load Strength Index,I_S, MPa	0.193	0.251	0.225	0.249	0.358	0.125
Uncorr. Pt. Load Strength Index,I_S, psi	**28.0**	**36.3**	**32.6**	**36.1**	**52.0**	**18.1**
Size Correction Factor, F	0.95	1.07	1.07	1.06	0.98	0.96
Corr. Pt. Load Strength Index,$I_{S(50)}$, Mpa	0.18	0.27	0.24	0.26	0.35	0.12
Corr. Pt. Load Strength Index,$I_{S(50)}$, psi	**27**	**39**	**35**	**38**	**51**	**17**
MOISTURE CONTENT DATA						
Moisture Condition of Specimen	As Received	As Received	As Received	As Received	As Received	As Received
Pan No.						
Pan wt. (g)	22.32	22.32	22.32	22.32	22.32	22.32
Total wet wt. (g)	127.01	127.01	127.01	127.01	127.01	127.01
Total dry wt (g)	112.26	112.26	112.26	112.26	112.26	112.26
Moisture Content, %	**16.4**	**16.4**	**16.4**	**16.4**	**16.4**	**16.4**
Comments:	Invalid test- Did not fail through both points.					

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No: 823-008
Client: GRI
Project Name: Port of Coos Bay Channel Modification Project

Project No.: 5128
Date: 9/26/2016
By: PJ

Boring:	B-30	B-30	B-30	B-30		
Sample:	R-3	R-3	R-3	R-3		
Depth, ft:	22	22	22	22		
Visual Description:	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock		
Test Type	Diametral	Axial	Axial	Axial		
Test Type ID	1	2	2	2		
FOR ANISOTROPIC ROCK:						
Bedding Angle Relative to Axis	None	None	None	None		
Loading Orientation Rel. to Bedding	N/A	N/A	N/A	N/A		
SAMPLE DIMENSIONS						
Width Perpendicular to loading, W, mm	58	58	58	58		
Length Perpendicular to Loading, L, mm	78					
Diameter Parallel to Loading, D, mm	58					
Diameter at Failure, D', mm	54	34	34	32		
STRENGTH DATA						
Peak Load, P, kN	0.635	0.537	0.598	0.273		
Peak Load, P, lbs	142.8	120.7	134.4	61.4		
Uncorr. Pt. Load Strength Index, I_S, MPa	0.203	0.214	0.238	0.116		
Uncorr. Pt. Load Strength Index, I_S, psi	**29.4**	**31.0**	**34.5**	**16.8**		
Size Correction Factor, F	1.05	1.00	1.00	0.99		
Corr. Pt. Load Strength Index, $I_{S(50)}$, Mpa	0.21	0.21	0.24	0.11		
Corr. Pt. Load Strength Index, $I_{S(50)}$, psi	**31**	**31**	**35**	**17**		
MOISTURE CONTENT DATA						
Moisture Condition of Specimen	As Received	As Received	As Received	As Received		
Pan No.						
Pan wt. (g)	22.02	22.02	22.02	22.02		
Total wet wt. (g)	182.75	182.75	182.75	182.75		
Total dry wt (g)	156.95	156.95	156.95	156.95		
Moisture Content, %	**19.1**	**19.1**	**19.1**	**19.1**		
Comments:						

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No: 823-008
Client: GRI
Project Name: Port of Coos Bay Channel Modification Project
Project No.: 5128
Date: 9/26/2016
By: PJ

Boring:	B-30	B-30	B-30	B-30	B-30	B-30
Sample:	R-3	R-3	R-3	R-3	R-3	R-3
Depth, ft:	25	25	25	25	25	25
Visual Description:	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock
Test Type	Diametral	Diametral	Diametral	Axial	Axial	Axial
Test Type ID	1	1	1	2	2	2
FOR ANISOTROPIC ROCK:						
Bedding Angle Relative to Axis	None	None	None	None	None	None
Loading Orientation Rel. to Bedding	N/A	N/A	N/A	N/A	N/A	N/A
SAMPLE DIMENSIONS						
Width Perpendicular to loading, W, mm	59	59	59	59	59	59
Length Perpendicular to Loading, L, mm	31	31	30			
Diameter Parallel to Loading, D, mm	59	59	59			
Diameter at Failure, D', mm	54	56	55	25	32	26
STRENGTH DATA						
Peak Load, P, kN	0.719	0.764	0.374	0.429	0.577	0.604
Peak Load, P, lbs	161.6	171.8	84.1	96.4	129.7	135.8
Uncorr. Pt. Load Strength Index,I_S, MPa	0.226	0.231	0.115	0.228	0.240	0.309
Uncorr. Pt. Load Strength Index,I_S, psi	**32.7**	**33.5**	**16.7**	**33.1**	**34.8**	**44.9**
Size Correction Factor, F	1.06	1.06	1.06	0.94	0.99	0.95
Corr. Pt. Load Strength Index,$I_{S(50)}$, Mpa	0.24	0.25	0.12	0.21	0.24	0.29
Corr. Pt. Load Strength Index,$I_{S(50)}$, psi	**35**	**36**	**18**	**31**	**35**	**42**
MOISTURE CONTENT DATA						
Moisture Condition of Specimen	As Received	As Received	As Received	As Received	As Received	As Received
Pan No.						
Pan wt. (g)	21.61	21.61	21.61	21.61	21.61	21.61
Total wet wt. (g)	195.12	195.12	195.12	195.12	195.12	195.12
Total dry wt (g)	168.7	168.7	168.7	168.7	168.7	168.7
Moisture Content, %	**18.0**	**18.0**	**18.0**	**18.0**	**18.0**	**18.0**
Comments:						

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No: 823-008
Client: GRI
Project Name: Port of Coos Bay Channel Modification Project
Project No.: 5128
Date: 9/26/2016
By: PJ

Boring:	B-30	B-30	B-30	B-30	B-30	B-30
Sample:	R-4	R-4	R-4	R-4	R-4	R-4
Depth, ft:	28	28	28	28	28	28
Visual Description:	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock
Test Type	Diametral	Diametral	Diametral	Axial	Axial	Axial
Test Type ID	1	1	1	2	2	2
FOR ANISOTROPIC ROCK:						
Bedding Angle Relative to Axis	None	None	None	None	None	None
Loading Orientation Rel. to Bedding	N/A	N/A	N/A	N/A	N/A	N/A
SAMPLE DIMENSIONS						
Width Perpendicular to loading, W, mm	60	60	60	60	60	60
Length Perpendicular to Loading, L, mm	30	31	30			
Diameter Parallel to Loading, D, mm	60	60	60			
Diameter at Failure, D', mm	58	59	57	24	34	30
STRENGTH DATA						
Peak Load, P, kN	0.834	0.241	0.509	0.509	0.354	0.587
Peak Load, P, lbs	187.5	54.2	114.4	114.4	79.6	132.0
Uncorr. Pt. Load Strength Index,I_S, MPa	0.240	0.068	0.149	0.278	0.136	0.256
Uncorr. Pt. Load Strength Index,I_S, psi	**34.8**	**9.9**	**21.6**	**40.3**	**19.8**	**37.1**
Size Correction Factor, F	1.08	1.08	1.07	0.93	1.01	0.98
Corr. Pt. Load Strength Index,$I_{S(50)}$, Mpa	0.26	0.07	0.16	0.26	0.14	0.25
Corr. Pt. Load Strength Index,$I_{S(50)}$, psi	**37**	**11**	**23**	**38**	**20**	**36**
MOISTURE CONTENT DATA						
Moisture Condition of Specimen	As Received	As Received	As Received	As Received	As Received	As Received
Pan No.						
Pan wt. (g)	22.33	22.33	22.33	22.33	22.33	22.33
Total wet wt. (g)	117.48	117.48	117.48	117.48	117.48	117.48
Total dry wt (g)	103.16	103.16	103.16	103.16	103.16	103.16
Moisture Content, %	**17.7**	**17.7**	**17.7**	**17.7**	**17.7**	**17.7**
Comments:						

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No: 823-008
Client: GRI
Project Name: Port of Coos Bay Channel Modification Project
Project No.: 5128
Date: 9/26/2016
By: PJ

Boring:	B-30	B-30	B-30	B-30	B-30	B-30
Sample:	R-4	R-4	R-4	R-4	R-4	R-4
Depth, ft:	30	30	30	30	30	30
Visual Description:	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock
Test Type	Diametral	Diametral	Diametral	Axial	Axial	Axial
Test Type ID	1	1	1	2	2	2
FOR ANISOTROPIC ROCK:						
Bedding Angle Relative to Axis	None	None	None	None	None	None
Loading Orientation Rel. to Bedding	N/A	N/A	N/A	N/A	N/A	N/A
SAMPLE DIMENSIONS						
Width Perpendicular to loading, W, mm	60	60	60	60	60	60
Length Perpendicular to Loading, L, mm	30	30	30			
Diameter Parallel to Loading, D, mm	60	60	60			
Diameter at Failure, D', mm	57	57	56	24	26	27
STRENGTH DATA						
Peak Load, P, kN	0.462	0.495	0.314	0.126	0.263	0.252
Peak Load, P, lbs	103.9	111.3	70.6	28.3	59.1	56.7
Uncorr. Pt. Load Strength Index,I_S, MPa	0.135	0.145	0.093	0.069	0.132	0.122
Uncorr. Pt. Load Strength Index,I_S, psi	**19.6**	**21.0**	**13.6**	**10.0**	**19.2**	**17.7**
Size Correction Factor, F	1.07	1.07	1.07	0.93	0.95	0.96
Corr. Pt. Load Strength Index,$I_{S(50)}$, Mpa	0.14	0.16	0.10	0.06	0.13	0.12
Corr. Pt. Load Strength Index,$I_{S(50)}$, psi	**21**	**23**	**14**	**9**	**18**	**17**
MOISTURE CONTENT DATA						
Moisture Condition of Specimen	As Received	As Received	As Received	As Received	As Received	As Received
Pan No.						
Pan wt. (g)	22.4	22.4	22.4	22.4	22.4	22.4
Total wet wt. (g)	147.96	147.96	147.96	147.96	147.96	147.96
Total dry wt (g)	129.78	129.78	129.78	129.78	129.78	129.78
Moisture Content, %	**16.9**	**16.9**	**16.9**	**16.9**	**16.9**	**16.9**
Comments:						

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No: 823-008
Project No.: 5128
Client: GRI
Date: 9/26/2016
Project Name: Port of Coos Bay Channel Modification Project
By: PJ

Boring:	B-31	B-31	B-31	B-31	B-31	B-31
Sample:	R-1	R-1	R-1	R-1	R-1	R-1
Depth, ft:	4	4	4	4	4	4
Visual Description:	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock
Test Type	Diametral	Diametral	Diametral	Axial	Axial	Axial
Test Type ID	1	1	1	2	2	2
FOR ANISOTROPIC ROCK:						
Bedding Angle Relative to Axis	None	None	None	None	None	None
Loading Orientation Rel. to Bedding	N/A	N/A	N/A	N/A	N/A	N/A
SAMPLE DIMENSIONS						
Width Perpendicular to loading, W, mm	60	60	60	60	60	60
Length Perpendicular to Loading, L, mm	30	31	31			
Diameter Parallel to Loading, D, mm	60	60	60			
Diameter at Failure, D', mm	56	57	57	32	26	21
STRENGTH DATA						
Peak Load, P, kN	0.737	0.61	0.655	0.493	0.411	0.161
Peak Load, P, lbs	165.7	137.1	147.2	110.8	92.4	36.2
Uncorr. Pt. Load Strength Index,I_S, MPa	0.219	0.178	0.192	0.202	0.207	0.100
Uncorr. Pt. Load Strength Index,I_S, psi	**31.8**	**25.9**	**27.8**	**29.2**	**30.0**	**14.6**
Size Correction Factor, F	1.07	1.07	1.07	0.99	0.95	0.91
Corr. Pt. Load Strength Index,$I_{S(50)}$, Mpa	0.23	0.19	0.21	0.20	0.20	0.09
Corr. Pt. Load Strength Index,$I_{S(50)}$, psi	**34**	**28**	**30**	**29**	**28**	**13**
MOISTURE CONTENT DATA						
Moisture Condition of Specimen	As Received	As Received	As Received	As Received	As Received	As Received
Pan No.						
Pan wt. (g)	22.21	22.21	22.21	22.21	22.21	22.21
Total wet wt. (g)	158.3	158.3	158.3	158.3	158.3	158.3
Total dry wt (g)	135.9	135.9	135.9	135.9	135.9	135.9
Moisture Content, %	**19.7**	**19.7**	**19.7**	**19.7**	**19.7**	**19.7**
Comments:						

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No: 823-008
Client: GRI
Project Name: Port of Coos Bay Channel Modification Project
Project No.: 5128
Date: 9/26/2016
By: PJ

Boring:	B-31	B-31	B-31	B-31	B-31	B-31
Sample:	R-1	R-1	R-1	R-1	R-1	R-1
Depth, ft:	7	7	7	7	7	7
Visual Description:	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock
Test Type	Diametral	Diametral	Diametral	Axial	Axial	Axial
Test Type ID	1	1	1	2	2	2
FOR ANISOTROPIC ROCK:						
Bedding Angle Relative to Axis	None	None	None	None	None	None
Loading Orientation Rel. to Bedding	N/A	N/A	N/A	N/A	N/A	N/A
SAMPLE DIMENSIONS						
Width Perpendicular to loading, W, mm	60	60	60	60	60	60
Length Perpendicular to Loading, L, mm	31	31	30			
Diameter Parallel to Loading, D, mm	60	60	60			
Diameter at Failure, D', mm	54	59	57	25	27	26
STRENGTH DATA						
Peak Load, P, kN	0.659	0.641	0.545	0.305	0.446	0.466
Peak Load, P, lbs	148.1	144.1	122.5	68.6	100.3	104.8
Uncorr. Pt. Load Strength Index, I_S, MPa	0.203	0.181	0.159	0.160	0.216	0.235
Uncorr. Pt. Load Strength Index, I_S, psi	**29.5**	**26.3**	**23.1**	**23.2**	**31.4**	**34.0**
Size Correction Factor, F	1.06	1.08	1.07	0.94	0.96	0.95
Corr. Pt. Load Strength Index, $I_{S(50)}$, Mpa	0.22	0.20	0.17	0.15	0.21	0.22
Corr. Pt. Load Strength Index, $I_{S(50)}$, psi	**31**	**28**	**25**	**22**	**30**	**32**
MOISTURE CONTENT DATA						
Moisture Condition of Specimen	As Received	As Received	As Received	As Received	As Received	As Received
Pan No.						
Pan wt. (g)	22.24	22.24	22.24	22.24	22.24	22.24
Total wet wt. (g)	127.31	127.31	127.31	127.31	127.31	127.31
Total dry wt (g)	110.32	110.32	110.32	110.32	110.32	110.32
Moisture Content, %	**19.3**	**19.3**	**19.3**	**19.3**	**19.3**	**19.3**
Comments:						

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No: 823-008
Project No.: 5128
Client: GRI
Date: 9/26/2016
Project Name: Port of Coos Bay Channel Modification Project
By: PJ

Boring:	B-31	B-31	B-31	B-31		
Sample:	R-2	R-2	R-2	R-2		
Depth, ft:	10	10	10	10		
Visual Description:	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock		
Test Type	Diametral	Axial	Axial	Axial		
Test Type ID	1	2	2	2		
FOR ANISOTROPIC ROCK:						
Bedding Angle Relative to Axis	None	None	None	None		
Loading Orientation Rel. to Bedding	N/A	N/A	N/A	N/A		
SAMPLE DIMENSIONS						
Width Perpendicular to loading, W, mm	59	50	59	59		
Length Perpendicular to Loading, L, mm	30					
Diameter Parallel to Loading, D, mm	59					
Diameter at Failure, D', mm	57	49	36	31		
STRENGTH DATA						
Peak Load, P, kN	0.595	0.84	0.272	0.296		
Peak Load, P, lbs	133.8	188.8	61.1	66.5		
Uncorr. Pt. Load Strength Index, I_S, MPa	0.177	0.269	0.101	0.127		
Uncorr. Pt. Load Strength Index, I_S, psi	**25.7**	**39.1**	**14.6**	**18.4**		
Size Correction Factor, F	1.07	1.05	1.02	0.98		
Corr. Pt. Load Strength Index, $I_{S(50)}$, Mpa	0.19	0.28	0.10	0.13		
Corr. Pt. Load Strength Index, $I_{S(50)}$, psi	**27**	**41**	**15**	**18**		
MOISTURE CONTENT DATA						
Moisture Condition of Specimen	As Received	As Received	As Received	As Received		
Pan No.						
Pan wt. (g)	22.3	22.3	22.3	22.3		
Total wet wt. (g)	183.69	183.69	183.69	183.69		
Total dry wt (g)	156.15	156.15	156.15	156.15		
Moisture Content, %	**20.6**	**20.6**	**20.6**	**20.6**		
Comments:						

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No: 823-008
Client: GRI
Project Name: Port of Coos Bay Channel Modification Project
Project No.: 5128
Date: 9/26/2016
By: PJ

Boring:	B-31	B-31	B-31	B-31	B-31	
Sample:	R-3	R-3	R-3	R-3	R-3	
Depth, ft:	14	14	14	14	14	
Visual Description:	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	
Test Type	Diametral	Axial	Axial	Diametral	Axial	
Test Type ID	1	2	2	1	2	
FOR ANISOTROPIC ROCK:						
Bedding Angle Relative to Axis	None	None	None	None	None	
Loading Orientation Rel. to Bedding	N/A	N/A	N/A	N/A	N/A	
SAMPLE DIMENSIONS						
Width Perpendicular to loading, W, mm	61	61	61	61	61	
Length Perpendicular to Loading, L, mm	30			31		
Diameter Parallel to Loading, D, mm	61			61		
Diameter at Failure, D', mm	52	40	30	53	24	
STRENGTH DATA						
Peak Load, P, kN	1.053	0.731	0.484	0.811	0.537	
Peak Load, P, lbs	236.7	164.3	108.8	182.3	120.7	
Uncorr. Pt. Load Strength Index, I_S, MPa	0.332	0.235	0.208	0.251	0.288	
Uncorr. Pt. Load Strength Index, I_S, psi	**48.1**	**34.1**	**30.1**	**36.4**	**41.8**	
Size Correction Factor, F	1.06	1.05	0.98	1.06	0.94	
Corr. Pt. Load Strength Index, $I_{S(50)}$, Mpa	0.35	0.25	0.20	0.27	0.27	
Corr. Pt. Load Strength Index, $I_{S(50)}$, psi	**51**	**36**	**30**	**39**	**39**	
MOISTURE CONTENT DATA						
Moisture Condition of Specimen	As Received	As Received	As Received	As Received	As Received	
Pan No.						
Pan wt. (g)	20.51	20.51	20.51	20.51	20.51	
Total wet wt. (g)	213.27	213.27	213.27	213.27	213.27	
Total dry wt (g)	182.78	182.78	182.78	182.78	182.78	
Moisture Content, %	**18.8**	**18.8**	**18.8**	**18.8**	**18.8**	
Comments:						

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No: 823-008
Project No.: 5128
Client: GRI
Date: 9/26/2016
Project Name: Port of Coos Bay Channel Modification Project
By: PJ

Boring:	B-31	B-31	B-31	B-31	B-31	B-31
Sample:	R-3	R-3	R-3	R-3	R-3	R-3
Depth, ft:	17	17	17	17	17	17
Visual Description:	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock
Test Type	Diametral	Diametral	Diametral	Axial	Axial	Axial
Test Type ID	1	1	1	2	2	2
FOR ANISOTROPIC ROCK:						
Bedding Angle Relative to Axis	None	None	None	None	None	None
Loading Orientation Rel. to Bedding	N/A	N/A	N/A	N/A	N/A	N/A
SAMPLE DIMENSIONS						
Width Perpendicular to loading, W, mm	61	61	61	61	61	61
Length Perpendicular to Loading, L, mm	31	30	31			
Diameter Parallel to Loading, D, mm	61	61	61			
Diameter at Failure, D', mm	57	57	58	37	31	29
STRENGTH DATA						
Peak Load, P, kN	0.506	0.909	0.714	0.608	0.448	0.471
Peak Load, P, lbs	113.8	204.4	160.5	136.7	100.7	105.9
Uncorr. Pt. Load Strength Index, I_S, MPa	0.146	0.261	0.202	0.212	0.186	0.209
Uncorr. Pt. Load Strength Index, I_S, psi	**21.1**	**37.9**	**29.3**	**30.7**	**27.0**	**30.3**
Size Correction Factor, F	1.08	1.08	1.08	1.03	0.99	0.98
Corr. Pt. Load Strength Index, $I_{S(50)}$, Mpa	0.16	0.28	0.22	0.22	0.18	0.20
Corr. Pt. Load Strength Index, $I_{S(50)}$, psi	**23**	**41**	**32**	**32**	**27**	**30**
MOISTURE CONTENT DATA						
Moisture Condition of Specimen	As Received	As Received	As Received	As Received	As Received	As Received
Pan No.						
Pan wt. (g)	20.49	20.49	20.49	20.49	20.49	20.49
Total wet wt. (g)	176.72	176.72	176.72	176.72	176.72	176.72
Total dry wt (g)	151.31	151.31	151.31	151.31	151.31	151.31
Moisture Content, %	**19.4**	**19.4**	**19.4**	**19.4**	**19.4**	**19.4**
Comments:						

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

COOPER
TESTING LABORATORY

POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No: 823-008
Client: GRI
Project Name: Port of Coos Bay Channel Modification Project
Project No.: 5128
Date: 9/26/2016
By: PJ

Boring:	B-31	B-31	B-31	B-31	B-31	B-31
Sample:	R-4	R-4	R-4	R-4	R-4	R-4
Depth, ft:	20	20	20	20	20	20
Visual Description:	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock
Test Type	Diametral	Diametral	Diametral	Axial	Axial	Axial
Test Type ID	1	1	1	2	2	2
FOR ANISOTROPIC ROCK:						
Bedding Angle Relative to Axis	None	None	None	None	None	None
Loading Orientation Rel. to Bedding	N/A	N/A	N/A	N/A	N/A	N/A
SAMPLE DIMENSIONS						
Width Perpendicular to loading, W, mm	61	61	61	61	61	61
Length Perpendicular to Loading, L, mm	31	30	30			
Diameter Parallel to Loading, D, mm	61	61	61			
Diameter at Failure, D', mm	56	59	56	30	29	24
STRENGTH DATA						
Peak Load, P, kN	0.905	0.621	0.632	0.281	0.836	0.239
Peak Load, P, lbs	203.5	139.6	142.1	63.2	187.9	53.7
Uncorr. Pt. Load Strength Index,I_S, MPa	0.265	0.173	0.185	0.121	0.371	0.128
Uncorr. Pt. Load Strength Index,I_S, psi	**38.4**	**25.0**	**26.8**	**17.5**	**53.8**	**18.6**
Size Correction Factor, F	1.07	1.09	1.07	0.98	0.98	0.94
Corr. Pt. Load Strength Index,$I_{S(50)}$, Mpa	0.28	0.19	0.20	0.12	0.36	0.12
Corr. Pt. Load Strength Index,$I_{S(50)}$, psi	**41**	**27**	**29**	**17**	**53**	**17**
MOISTURE CONTENT DATA						
Moisture Condition of Specimen	As Received	As Received	As Received	As Received	As Received	As Received
Pan No.						
Pan wt. (g)	21.66	21.66	21.66	21.66	21.66	21.66
Total wet wt. (g)	203.9	203.9	203.9	203.9	203.9	203.9
Total dry wt (g)	178.83	178.83	178.83	178.83	178.83	178.83
Moisture Content, %	**16.0**	**16.0**	**16.0**	**16.0**	**16.0**	**16.0**
Comments:						

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No: 823-008
Client: GRI
Project Name: Port of Coos Bay Channel Modification Project
Project No.: 5128
Date: 9/26/2016
By: PJ

Boring:	B-31	B-31	B-31	B-31	B-31	B-31
Sample:	R-4	R-4	R-4	R-4	R-4	R-4
Depth, ft:	22	22	22	22	22	22
Visual Description:	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock
Test Type	Diametral	Diametral	Diametral	Diametral	Axial	Axial
Test Type ID	1	1	1	1	2	2
FOR ANISOTROPIC ROCK:						
Bedding Angle Relative to Axis	None	None	None	None	None	None
Loading Orientation Rel. to Bedding	N/A	N/A	N/A	N/A	N/A	N/A
SAMPLE DIMENSIONS						
Width Perpendicular to loading, W, mm	60	60	60	60	60	60
Length Perpendicular to Loading, L, mm	30	31	30	32		
Diameter Parallel to Loading, D, mm	60	60	60	60		
Diameter at Failure, D', mm	55	54	50	57	34	39
STRENGTH DATA						
Peak Load, P, kN	0.817	1.047	0.943	0.877	0.683	0.763
Peak Load, P, lbs	183.7	235.4	212.0	197.2	153.5	171.5
Uncorr. Pt. Load Strength Index,I_S, MPa	0.248	0.323	0.314	0.256	0.263	0.256
Uncorr. Pt. Load Strength Index,I_S, psi	**35.9**	**46.9**	**45.6**	**37.2**	**38.1**	**37.1**
Size Correction Factor, F	1.06	1.06	1.04	1.07	1.01	1.04
Corr. Pt. Load Strength Index,$I_{S(50)}$, Mpa	0.26	0.34	0.33	0.28	0.27	0.27
Corr. Pt. Load Strength Index,$I_{S(50)}$, psi	**38**	**50**	**47**	**40**	**38**	**39**
MOISTURE CONTENT DATA						
Moisture Condition of Specimen	As Received	As Received	As Received	As Received	As Received	As Received
Pan No.						
Pan wt. (g)	19.84	19.84	19.84	19.84	19.84	19.84
Total wet wt. (g)	241.45	241.45	241.45	241.45	241.45	241.45
Total dry wt (g)	206	206	206	206	206	206
Moisture Content, %	**19.0**	**19.0**	**19.0**	**19.0**	**19.0**	**19.0**
Comments:						

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No: 823-008 **Project No.:** 5128
Client: GRI **Date:** 9/26/2016
Project Name: Port of Coos Bay Channel Modification Project **By:** PJ

Boring:	B-31	B-31	B-31	B-31	B-31	B-31
Sample:	R-5	R-5	R-5	R-5	R-5	R-5
Depth, ft:	24	24	24	24	24	24
Visual Description:	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock
Test Type	Diametral	Diametral	Diametral	Axial	Axial	Axial
Test Type ID	1	1	1	2	2	2
FOR ANISOTROPIC ROCK:						
Bedding Angle Relative to Axis	None	None	None	None	None	None
Loading Orientation Rel. to Bedding	N/A	N/A	N/A	N/A	N/A	N/A
SAMPLE DIMENSIONS						
Width Perpendicular to loading, W, mm	60	60	60	60	60	60
Length Perpendicular to Loading, L, mm	30	30	30			
Diameter Parallel to Loading, D, mm	60	60	60			
Diameter at Failure, D', mm	58	55	57	55	34	24
STRENGTH DATA						
Peak Load, P, kN	0.539	0.675	0.635	0.577	0.548	0.354
Peak Load, P, lbs	121.2	151.7	142.8	129.7	123.2	79.6
Uncorr. Pt. Load Strength Index,I_S, MPa	0.155	0.205	0.186	0.137	0.211	0.193
Uncorr. Pt. Load Strength Index,I_S, psi	**22.5**	**29.7**	**26.9**	**19.9**	**30.6**	**28.0**
Size Correction Factor, F	1.08	1.06	1.07	1.12	1.01	0.93
Corr. Pt. Load Strength Index,$I_{S(50)}$, Mpa	0.17	0.22	0.20	0.15	0.21	0.18
Corr. Pt. Load Strength Index,$I_{S(50)}$, psi	**24**	**32**	**29**	**22**	**31**	**26**
MOISTURE CONTENT DATA						
Moisture Condition of Specimen	As Received	As Received	As Received	As Received	As Received	As Received
Pan No.						
Pan wt. (g)	22.42	22.42	22.42	22.42	22.42	22.42
Total wet wt. (g)	191.16	191.16	191.16	191.16	191.16	191.16
Total dry wt (g)	164.19	164.19	164.19	164.19	164.19	164.19
Moisture Content, %	**19.0**	**19.0**	**19.0**	**19.0**	**19.0**	**19.0**
Comments:						

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No: 823-008
Client: GRI
Project Name: Port of Coos Bay Channel Modification Project
Project No.: 5128
Date: 9/26/2016
By: PJ

Boring:	B-31	B-31	B-31	B-31	B-31	B-31
Sample:	R-5	R-5	R-5	R-5	R-5	R-5
Depth, ft:	28	28	28	28	28	28
Visual Description:	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock
Test Type	Diametral	Diametral	Diametral	Axial	Axial	Axial
Test Type ID	1	1	1	2	2	2

FOR ANISOTROPIC ROCK:

Bedding Angle Relative to Axis	None	None	None	None	None	None
Loading Orientation Rel. to Bedding	N/A	N/A	N/A	N/A	N/A	N/A

SAMPLE DIMENSIONS

Width Perpendicular to loading, W, mm	60	60	60	60	60	60
Length Perpendicular to Loading, L, mm	32	31	31			
Diameter Parallel to Loading, D, mm	60	60	60			
Diameter at Failure, D', mm	57	57	56	36	29	24

STRENGTH DATA

Peak Load, P, kN	0.584	0.405	0.407	0.285	0.314	0.254
Peak Load, P, lbs	131.3	91.0	91.5	64.1	70.6	57.1
Uncorr. Pt. Load Strength Index, I_S, MPa	0.171	0.118	0.121	0.104	0.142	0.139
Uncorr. Pt. Load Strength Index, I_S, psi	**24.8**	**17.2**	**17.6**	**15.0**	**20.6**	**20.1**
Size Correction Factor, F	1.07	1.07	1.07	1.02	0.97	0.93
Corr. Pt. Load Strength Index, $I_{S(50)}$, Mpa	0.18	0.13	0.13	0.11	0.14	0.13
Corr. Pt. Load Strength Index, $I_{S(50)}$, psi	**27**	**18**	**19**	**15**	**20**	**19**

MOISTURE CONTENT DATA

Moisture Condition of Specimen	As Received	As Received	As Received	As Received	As Received	As Received
Pan No.						
Pan wt. (g)	21.66	21.66	21.66	21.66	21.66	21.66
Total wet wt. (g)	234.1	234.1	234.1	234.1	234.1	234.1
Total dry wt (g)	200.37	200.37	200.37	200.37	200.37	200.37
Moisture Content, %	**18.9**	**18.9**	**18.9**	**18.9**	**18.9**	**18.9**
Comments:						

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No: 823-008 **Project No.:** 5128
Client: GRI **Date:** 9/26/2016
Project Name: Port of Coos Bay Channel Modification Project **By:** PJ

Boring:	B-32	B-32	B-32	B-32	B-32	B-32
Sample:	R-1	R-1	R-1	R-1	R-1	R-1
Depth, ft:	2.5	2.5	2.5	2.5	2.5	2.5
Visual Description:	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock
Test Type	Diametral	Diametral	Diametral	Axial	Axial	Axial
Test Type ID	1	1	1	2	2	2
FOR ANISOTROPIC ROCK:						
Bedding Angle Relative to Axis	None	None	None	None	None	None
Loading Orientation Rel. to Bedding	N/A	N/A	N/A	N/A	N/A	N/A
SAMPLE DIMENSIONS						
Width Perpendicular to loading, W, mm	60	60	60	60	60	60
Length Perpendicular to Loading, L, mm	30	31	31			
Diameter Parallel to Loading, D, mm	60	60	60			
Diameter at Failure, D', mm	40	55	58	35	25	20
STRENGTH DATA						
Peak Load, P, kN	1.086	1.032	0.531	1.226	0.973	0.809
Peak Load, P, lbs	244.1	232.0	119.4	275.6	218.7	181.9
Uncorr. Pt. Load Strength Index,I_S, MPa	0.453	0.313	0.153	0.459	0.509	0.529
Uncorr. Pt. Load Strength Index,I_S, psi	**65.6**	**45.4**	**22.1**	**66.5**	**73.9**	**76.8**
Size Correction Factor, F	0.99	1.06	1.08	1.02	0.94	0.90
Corr. Pt. Load Strength Index,$I_{S(50)}$, Mpa	0.45	0.33	0.16	0.47	0.48	0.47
Corr. Pt. Load Strength Index,$I_{S(50)}$, psi	**65**	**48**	**24**	**68**	**70**	**69**
MOISTURE CONTENT DATA						
Moisture Condition of Specimen	As Received	As Received	As Received	As Received	As Received	As Received
Pan No.						
Pan wt. (g)	19.22	19.22	19.22	19.22	19.22	19.22
Total wet wt. (g)	203.61	203.61	203.61	203.61	203.61	203.61
Total dry wt (g)	169	169	169	169	169	169
Moisture Content, %	**23.1**	**23.1**	**23.1**	**23.1**	**23.1**	**23.1**
Comments:			Invalid test- did not fail through both points.			

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

COOPER
TESTING LABORATORY

POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No: 823-008
Client: GRI
Project Name: Port of Coos Bay Channel Modification Project
Project No.: 5128
Date: 9/26/2016
By: PJ

Boring:	B-32	B-32	B-32	B-32	B-32	B-32
Sample:	R-1	R-1	R-1	R-1	R-1	R-1
Depth, ft:	6.5	6.5	6.5	6.5	6.5	6.5
Visual Description:	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock
Test Type	Diametral	Diametral	Diametral	Axial	Axial	Axial
Test Type ID	1	1	1	2	2	2
FOR ANISOTROPIC ROCK:						
Bedding Angle Relative to Axis	None	None	None	None	None	None
Loading Orientation Rel. to Bedding	N/A	N/A	N/A	N/A	N/A	N/A
SAMPLE DIMENSIONS						
Width Perpendicular to loading, W, mm	59	59	59	59	59	59
Length Perpendicular to Loading, L, mm	31	30	30			
Diameter Parallel to Loading, D, mm	59	59	59			
Diameter at Failure, D', mm	60	54	55	39	29	21
STRENGTH DATA						
Peak Load, P, kN	1.133	1.272	1.355	1.403	1.188	0.61
Peak Load, P, lbs	254.7	286.0	304.6	315.4	267.1	137.1
Uncorr. Pt. Load Strength Index,I_S, MPa	0.320	0.399	0.418	0.479	0.545	0.387
Uncorr. Pt. Load Strength Index,I_S, psi	**46.4**	**57.9**	**60.6**	**69.5**	**79.1**	**56.1**
Size Correction Factor, F	1.08	1.06	1.06	1.04	0.97	0.90
Corr. Pt. Load Strength Index,$I_{S(50)}$, Mpa	0.35	0.42	0.44	0.50	0.53	0.35
Corr. Pt. Load Strength Index,$I_{S(50)}$, psi	**50**	**61**	**64**	**72**	**77**	**51**
MOISTURE CONTENT DATA						
Moisture Condition of Specimen	As Received	As Received	As Received	As Received	As Received	As Received
Pan No.						
Pan wt. (g)	21.65	21.65	21.65	21.65	21.65	21.65
Total wet wt. (g)	158.87	158.87	158.87	158.87	158.87	158.87
Total dry wt (g)	133.08	133.08	133.08	133.08	133.08	133.08
Moisture Content, %	**23.1**	**23.1**	**23.1**	**23.1**	**23.1**	**23.1**
Comments:						

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No: 823-008
Client: GRI
Project Name: Port of Coos Bay Channel Modification Project
Project No.: 5128
Date: 9/26/2016
By: PJ

Boring:	B-32	B-32	B-32	B-32	B-32	B-32
Sample:	R-2	R-2	R-2	R-2	R-2	R-2
Depth, ft:	8.5	8.5	8.5	8.5	8.5	8.5
Visual Description:	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock
Test Type	Axial	Diametral	Diametral	Diametral	Axial	Axial
Test Type ID	2	1	1	1	2	2
FOR ANISOTROPIC ROCK:						
Bedding Angle Relative to Axis	None	None	None	None	None	None
Loading Orientation Rel. to Bedding	N/A	N/A	N/A	N/A	N/A	N/A
SAMPLE DIMENSIONS						
Width Perpendicular to loading, W, mm	61	60	60	60	60	60
Length Perpendicular to Loading, L, mm		30	30	30		
Diameter Parallel to Loading, D, mm		60	60	60		
Diameter at Failure, D', mm	26	54	50	57	25	30
STRENGTH DATA						
Peak Load, P, kN	1.055	1.423	1.053	0.866	0.896	0.923
Peak Load, P, lbs	237.2	319.9	236.7	194.7	201.4	207.5
Uncorr. Pt. Load Strength Index,I_S, MPa	0.522	0.439	0.351	0.253	0.469	0.403
Uncorr. Pt. Load Strength Index,I_S, psi	**75.8**	**63.7**	**50.9**	**36.7**	**68.0**	**58.4**
Size Correction Factor, F	0.95	1.06	1.04	1.07	0.94	0.98
Corr. Pt. Load Strength Index,$I_{S(50)}$, Mpa	0.50	0.47	0.37	0.27	0.44	0.39
Corr. Pt. Load Strength Index,$I_{S(50)}$, psi	**72**	**68**	**53**	**39**	**64**	**57**
MOISTURE CONTENT DATA						
Moisture Condition of Specimen	As Received	As Received	As Received	As Received	As Received	As Received
Pan No.						
Pan wt. (g)	20.56	20.56	20.56	20.56	20.56	20.56
Total wet wt. (g)	186.22	186.22	186.22	186.22	186.22	186.22
Total dry wt (g)	153.54	153.54	153.54	153.54	153.54	153.54
Moisture Content, %	**24.6**	**24.6**	**24.6**	**24.6**	**24.6**	**24.6**
Comments:						

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

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POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No: 823-008
Client: GRI
Project Name: Port of Coos Bay Channel Modification Project
Project No.: 5128
Date: 9/27/2016
By: PJ

Boring:	B-32	B-32	B-32	B-32	B-32	B-32
Sample:	R-2	R-2	R-2	R-2	R-2	R-2
Depth, ft:	10.5	10.5	10.5	10.5	10.5	10.5
Visual Description:	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock
Test Type	Diametral	Diametral	Diametral	Axial	Axial	Axial
Test Type ID	1	1	1	2	2	2
FOR ANISOTROPIC ROCK:						
Bedding Angle Relative to Axis	None	None	None	None	None	None
Loading Orientation Rel. to Bedding	N/A	N/A	N/A	N/A	N/A	N/A
SAMPLE DIMENSIONS						
Width Perpendicular to loading, W, mm	60	60	60	60	60	60
Length Perpendicular to Loading, L, mm	30	30	30			
Diameter Parallel to Loading, D, mm	60	60	60			
Diameter at Failure, D', mm	56	51	58	28	32	24
STRENGTH DATA						
Peak Load, P, kN	1.099	1.104	1.068	1.046	1.34	0.895
Peak Load, P, lbs	247.1	248.2	240.1	235.2	301.2	201.2
Uncorr. Pt. Load Strength Index, I_S, MPa	0.327	0.361	0.307	0.489	0.548	0.488
Uncorr. Pt. Load Strength Index, I_S, psi	**47.4**	**52.3**	**44.5**	**70.9**	**79.5**	**70.8**
Size Correction Factor, F	1.07	1.05	1.08	0.97	0.99	0.93
Corr. Pt. Load Strength Index, $I_{S(50)}$, Mpa	0.35	0.38	0.33	0.47	0.55	0.46
Corr. Pt. Load Strength Index, $I_{S(50)}$, psi	**51**	**55**	**48**	**68**	**79**	**66**
MOISTURE CONTENT DATA						
Moisture Condition of Specimen	As Received	As Received	As Received	As Received	As Received	As Received
Pan No.						
Pan wt. (g)	19.67	19.67	19.67	19.67	19.67	19.67
Total wet wt. (g)	207.5	207.5	207.5	207.5	207.5	207.5
Total dry wt (g)	172.4	172.4	172.4	172.4	172.4	172.4
Moisture Content, %	**23.0**	**23.0**	**23.0**	**23.0**	**23.0**	**23.0**
Comments:						

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

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POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No: 823-008
Client: GRI
Project Name: Port of Coos Bay Channel Modification Project
Project No.: 5128
Date: 9/27/2016
By: PJ

Boring:	B-32	B-32	B-32	B-32	B-32	B-32
Sample:	R-3	R-3	R-3	R-3	R-3	R-3
Depth, ft:	12.5	12.5	12.5	12.5	12.5	12.5
Visual Description:	Very Dark Greenish Gray Rock	Very Dark Greenish Gray Rock	Very Dark Greenish Gray Rock	Very Dark Greenish Gray Rock	Very Dark Greenish Gray Rock	Very Dark Greenish Gray Rock
Test Type	Diametral	Diametral	Diametral	Axial	Axial	Axial
Test Type ID	1	1	1	2	2	2
FOR ANISOTROPIC ROCK:						
Bedding Angle Relative to Axis	None	None	None	None	None	None
Loading Orientation Rel. to Bedding	N/A	N/A	N/A	N/A	N/A	N/A
SAMPLE DIMENSIONS						
Width Perpendicular to loading, W, mm	61	61	61	61	61	61
Length Perpendicular to Loading, L, mm	30	31	30			
Diameter Parallel to Loading, D, mm	61	61	61			
Diameter at Failure, D', mm	50	49	56	35	22	24
STRENGTH DATA						
Peak Load, P, kN	1.036	0.722	1.16	1.24	0.953	0.816
Peak Load, P, lbs	232.9	162.3	260.8	278.8	214.2	183.4
Uncorr. Pt. Load Strength Index,I_S, MPa	0.340	0.242	0.340	0.456	0.558	0.438
Uncorr. Pt. Load Strength Index,I_S, psi	**49.3**	**35.0**	**49.3**	**66.2**	**80.9**	**63.5**
Size Correction Factor, F	1.05	1.04	1.07	1.02	0.92	0.94
Corr. Pt. Load Strength Index,$I_{S(50)}$, Mpa	0.36	0.25	0.36	0.46	0.51	0.41
Corr. Pt. Load Strength Index,$I_{S(50)}$, psi	**52**	**36**	**53**	**67**	**74**	**59**
MOISTURE CONTENT DATA						
Moisture Condition of Specimen	As Received	As Received	As Received	As Received	As Received	As Received
Pan No.						
Pan wt. (g)	20.46	20.46	20.46	20.46	20.46	20.46
Total wet wt. (g)	213.28	213.28	213.28	213.28	213.28	213.28
Total dry wt (g)	175.9	175.9	175.9	175.9	175.9	175.9
Moisture Content, %	**24.0**	**24.0**	**24.0**	**24.0**	**24.0**	**24.0**
Comments:						

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No: 823-008
Client: GRI
Project Name: Port of Coos Bay Channel Modification Project
Project No.: 5128
Date: 9/28/2016
By: PJ

Boring:	B-32	B-32	B-32	B-32		
Sample:	R-4	R-4	R-4	R-4		
Depth, ft:	16.5	16.5	16.5	16.5		
Visual Description:	Very Dark Greenish Gray Rock	Very Dark Greenish Gray Rock	Very Dark Greenish Gray Rock	Very Dark Greenish Gray Rock		
Test Type	Diametral	Axial	Axial	Axial		
Test Type ID	1	2	2	2		
FOR ANISOTROPIC ROCK:						
Bedding Angle Relative to Axis	None	None	None	None		
Loading Orientation Rel. to Bedding	N/A	N/A	N/A	N/A		
SAMPLE DIMENSIONS						
Width Perpendicular to loading, W, mm	59	59	59	57		
Length Perpendicular to Loading, L, mm	30					
Diameter Parallel to Loading, D, mm	59					
Diameter at Failure, D', mm	55	35	27	30		
STRENGTH DATA						
Peak Load, P, kN	1.129	1.19	1.288	1.303		
Peak Load, P, lbs	253.8	267.5	289.6	292.9		
Uncorr. Pt. Load Strength Index, I_S, MPa	0.348	0.453	0.635	0.598		
Uncorr. Pt. Load Strength Index, I_S, psi	**50.5**	**65.6**	**92.1**	**86.8**		
Size Correction Factor, F	1.06	1.01	0.95	0.97		
Corr. Pt. Load Strength Index, $I_{S(50)}$, Mpa	0.37	0.46	0.61	0.58		
Corr. Pt. Load Strength Index, $I_{S(50)}$, psi	**54**	**66**	**88**	**84**		
MOISTURE CONTENT DATA						
Moisture Condition of Specimen	As Received	As Received	As Received	As Received		
Pan No.						
Pan wt. (g)	19.46	19.46	19.46	19.46		
Total wet wt. (g)	185.07	185.07	185.07	185.07		
Total dry wt (g)	149.63	149.63	149.63	149.63		
Moisture Content, %	**27.2**	**27.2**	**27.2**	**27.2**		
Comments:						

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No: 823-008
Project No.: 5128
Client: GRI
Date: 9/27/2016
Project Name: Port of Coos Bay Channel Modification Project
By: PJ

Boring:	B-32	B-32	B-32	B-32	B-32	B-32
Sample:	R-4	R-4	R-4	R-4	R-4	R-4
Depth, ft:	19.5	19.5	19.5	19.5	19.5	19.5
Visual Description:	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock
Test Type	Diametral	Diametral	Diametral	Axial	Axial	Axial
Test Type ID	1	1	1	2	2	2
FOR ANISOTROPIC ROCK:						
Bedding Angle Relative to Axis	None	None	None	None	None	None
Loading Orientation Rel. to Bedding	N/A	N/A	N/A	N/A	N/A	N/A
SAMPLE DIMENSIONS						
Width Perpendicular to loading, W, mm	59	59	59	59	59	59
Length Perpendicular to Loading, L, mm	30	31	30			
Diameter Parallel to Loading, D, mm	59	59	59			
Diameter at Failure, D', mm	56	57	55	24	31	27
STRENGTH DATA						
Peak Load, P, kN	0.972	0.634	0.976	0.642	0.87	0.579
Peak Load, P, lbs	218.5	142.5	219.4	144.3	195.6	130.2
Uncorr. Pt. Load Strength Index,I_S, MPa	0.294	0.189	0.301	0.356	0.374	0.285
Uncorr. Pt. Load Strength Index,I_S, psi	**42.7**	**27.3**	**43.6**	**51.6**	**54.2**	**41.4**
Size Correction Factor, F	1.06	1.07	1.06	0.93	0.98	0.95
Corr. Pt. Load Strength Index,$I_{S(50)}$, Mpa	0.31	0.20	0.32	0.33	0.37	0.27
Corr. Pt. Load Strength Index,$I_{S(50)}$, psi	**45**	**29**	**46**	**48**	**53**	**40**
MOISTURE CONTENT DATA						
Moisture Condition of Specimen	As Received	As Received	As Received	As Received	As Received	As Received
Pan No.						
Pan wt. (g)	22.27	22.27	22.27	22.27	22.27	22.27
Total wet wt. (g)	139.28	139.28	139.28	139.28	139.28	139.28
Total dry wt (g)	116.9	116.9	116.9	116.9	116.9	116.9
Moisture Content, %	**23.7**	**23.7**	**23.7**	**23.7**	**23.7**	**23.7**
Comments:						

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No: 823-008
Client: GRI
Project Name: Port of Coos Bay Channel Modification Project
Project No.: 5128
Date: 9/26/2016
By: PJ

Boring:	B-33	B-33	B-33	B-33		
Sample:	R-1	R-1	R-1	R-1		
Depth, ft:	2	2	2	2		
Visual Description:	Very Dark Greenish Gray Rock	Very Dark Greenish Gray Rock	Very Dark Greenish Gray Rock	Very Dark Greenish Gray Rock		
Test Type	Diametral	Diametral	Axial	Axial		
Test Type ID	1	1	2	2		
FOR ANISOTROPIC ROCK:						
Bedding Angle Relative to Axis	None	None	None	None		
Loading Orientation Rel. to Bedding	N/A	N/A	N/A	N/A		
SAMPLE DIMENSIONS						
Width Perpendicular to loading, W, mm	60	60	60	60		
Length Perpendicular to Loading, L, mm	31	31				
Diameter Parallel to Loading, D, mm	60	60				
Diameter at Failure, D', mm	49	48	40	34		
STRENGTH DATA						
Peak Load, P, kN	1.276	1.496	1.275	1.522		
Peak Load, P, lbs	286.9	336.3	286.6	342.2		
Uncorr. Pt. Load Strength Index,I_S, MPa	0.434	0.519	0.417	0.586		
Uncorr. Pt. Load Strength Index,I_S, psi	**62.9**	**75.3**	**60.5**	**85.0**		
Size Correction Factor, F	1.04	1.03	1.05	1.01		
Corr. Pt. Load Strength Index,$I_{S(50)}$, Mpa	0.45	0.54	0.44	0.59		
Corr. Pt. Load Strength Index,$I_{S(50)}$, psi	**65**	**78**	**63**	**86**		
MOISTURE CONTENT DATA						
Moisture Condition of Specimen	As Received	As Received	As Received	As Received		
Pan No.						
Pan wt. (g)	21.77	21.77	21.77	21.77		
Total wet wt. (g)	220.9	220.9	220.9	220.9		
Total dry wt (g)	182.5	182.5	182.5	182.5		
Moisture Content, %	**23.9**	**23.9**	**23.9**	**23.9**		
Comments:						

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No: 823-008 **Project No.:** 5128
Client: GRI **Date:** 9/27/2016
Project Name: Port of Coos Bay Channel Modification Project **By:** PJ

Boring:	B-33	B-33	B-33	B-33	B-33	B-33
Sample:	R-2	R-2	R-2	R-2	R-2	R-2
Depth, ft:	6	6	6	6	6	6
Visual Description:	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock
Test Type	Diametral	Diametral	Diametral	Axial	Axial	Axial
Test Type ID	1	1	1	2	2	2
FOR ANISOTROPIC ROCK:						
Bedding Angle Relative to Axis	None	None	None	None	None	None
Loading Orientation Rel. to Bedding	N/A	N/A	N/A	N/A	N/A	N/A
SAMPLE DIMENSIONS						
Width Perpendicular to loading, W, mm	60	60	60	60	60	60
Length Perpendicular to Loading, L, mm	30	30	30			
Diameter Parallel to Loading, D, mm	60	60	60			
Diameter at Failure, D', mm	48	50	50	30	33	27
STRENGTH DATA						
Peak Load, P, kN	1.169	1.161	1.298	1.508	1.821	1.424
Peak Load, P, lbs	262.8	261.0	291.8	339.0	409.4	320.1
Uncorr. Pt. Load Strength Index,I_S, MPa	0.406	0.387	0.433	0.658	0.722	0.690
Uncorr. Pt. Load Strength Index,I_S, psi	**58.9**	**56.1**	**62.8**	**95.4**	**104.8**	**100.1**
Size Correction Factor, F	1.03	1.04	1.04	0.98	1.00	0.96
Corr. Pt. Load Strength Index,$I_{S(50)}$, Mpa	0.42	0.40	0.45	0.65	0.72	0.66
Corr. Pt. Load Strength Index,$I_{S(50)}$, psi	**61**	**58**	**65**	**94**	**105**	**96**
MOISTURE CONTENT DATA						
Moisture Condition of Specimen	As Received	As Received	As Received	As Received	As Received	As Received
Pan No.						
Pan wt. (g)	22.07	22.07	22.07	22.07	22.07	22.07
Total wet wt. (g)	112.17	112.17	112.17	112.17	112.17	112.17
Total dry wt (g)	94.6	94.6	94.6	94.6	94.6	94.6
Moisture Content, %	**24.2**	**24.2**	**24.2**	**24.2**	**24.2**	**24.2**
Comments:						

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No: 823-008
Client: GRI
Project Name: Port of Coos Bay Channel Modification Project

Project No.: 5128
Date: 9/27/2016
By: PJ

Boring:	B-33	B-33	B-33	B-33	B-33	B-33
Sample:	R-2	R-2	R-2	R-2	R-2	R-2
Depth, ft:	9	9	9	9	9	9
Visual Description:	Very Dark Greenish Gray Gray Rock	Very Dark Greenish Gray Gray Rock	Very Dark Greenish Gray Gray Rock	Very Dark Greenish Gray Gray Rock	Very Dark Greenish Gray Gray Rock	Very Dark Greenish Gray Gray Rock
Test Type	Diametral	Diametral	Diametral	Axial	Axial	Axial
Test Type ID	1	1	1	2	2	2
FOR ANISOTROPIC ROCK:						
Bedding Angle Relative to Axis	None	None	None	None	None	None
Loading Orientation Rel. to Bedding	N/A	N/A	N/A	N/A	N/A	N/A
SAMPLE DIMENSIONS						
Width Perpendicular to loading, W, mm	60	60	60	60	60	60
Length Perpendicular to Loading, L, mm	30	30	30			
Diameter Parallel to Loading, D, mm	60	60	60			
Diameter at Failure, D', mm	56	50	52	33	36	29
STRENGTH DATA						
Peak Load, P, kN	0.789	1.376	1.032	1.289	1.566	1.287
Peak Load, P, lbs	177.4	309.3	232.0	289.8	352.1	289.3
Uncorr. Pt. Load Strength Index,I_S, MPa	0.235	0.459	0.331	0.511	0.569	0.581
Uncorr. Pt. Load Strength Index,I_S, psi	**34.1**	**66.5**	**48.0**	**74.2**	**82.6**	**84.3**
Size Correction Factor, F	1.07	1.04	1.05	1.00	1.02	0.97
Corr. Pt. Load Strength Index,$I_{S(50)}$, Mpa	0.25	0.48	0.35	0.51	0.58	0.57
Corr. Pt. Load Strength Index,$I_{S(50)}$, psi	**36**	**69**	**50**	**74**	**84**	**82**
MOISTURE CONTENT DATA						
Moisture Condition of Specimen	As Received	As Received	As Received	As Received	As Received	As Received
Pan No.						
Pan wt. (g)	20.33	20.33	20.33	20.33	20.33	20.33
Total wet wt. (g)	171.31	171.31	171.31	171.31	171.31	171.31
Total dry wt (g)	138.4	138.4	138.4	138.4	138.4	138.4
Moisture Content, %	**27.9**	**27.9**	**27.9**	**27.9**	**27.9**	**27.9**
Comments:						

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No: 823-008
Client: GRI
Project Name: Port of Coos Bay Channel Modification Project
Project No.: 5128
Date: 9/28/2016
By: PJ

Boring:	B-33	B-33	B-33	B-33	B-33	B-33
Sample:	R-3	R-3	R-3	R-3	R-3	R-3
Depth, ft:	13	13	13	13	13	13
Visual Description:	Very Dark Greenish Gray Rock	Very Dark Greenish Gray Rock	Very Dark Greenish Gray Rock	Very Dark Greenish Gray Rock	Very Dark Greenish Gray Rock	Very Dark Greenish Gray Rock
Test Type	Diametral	Diametral	Diametral	Axial	Axial	Axial
Test Type ID	1	1	1	2	2	2
FOR ANISOTROPIC ROCK:						
Bedding Angle Relative to Axis	None	None	None	None	None	None
Loading Orientation Rel. to Bedding	N/A	N/A	N/A	N/A	N/A	N/A
SAMPLE DIMENSIONS						
Width Perpendicular to loading, W, mm	60	60	60	60	60	60
Length Perpendicular to Loading, L, mm	30	30	30			
Diameter Parallel to Loading, D, mm	60	60	60			
Diameter at Failure, D', mm	58	54	53	37	32	33
STRENGTH DATA						
Peak Load, P, kN	1.175	1.053	1.307	1.167	1.463	1.384
Peak Load, P, lbs	264.2	236.7	293.8	262.4	328.9	311.1
Uncorr. Pt. Load Strength Index, I_S, MPa	0.338	0.325	0.411	0.413	0.598	0.549
Uncorr. Pt. Load Strength Index, I_S, psi	**49.0**	**47.1**	**59.6**	**59.9**	**86.8**	**79.6**
Size Correction Factor, F	1.08	1.06	1.06	1.03	0.99	1.00
Corr. Pt. Load Strength Index, $I_{S(50)}$, Mpa	0.36	0.34	0.43	0.42	0.60	0.55
Corr. Pt. Load Strength Index, $I_{S(50)}$, psi	**53**	**50**	**63**	**62**	**86**	**80**
MOISTURE CONTENT DATA						
Moisture Condition of Specimen	As Received	As Received	As Received	As Received	As Received	As Received
Pan No.						
Pan wt. (g)	22.91	22.91	22.91	22.91	22.91	22.91
Total wet wt. (g)	239.2	239.2	239.2	239.2	239.2	239.2
Total dry wt (g)	194.56	194.56	194.56	194.56	194.56	194.56
Moisture Content, %	**26.0**	**26.0**	**26.0**	**26.0**	**26.0**	**26.0**
Comments:						

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No: 823-008 **Project No.:** 5128
Client: GRI **Date:** 9/27/2016
Project Name: Port of Coos Bay Channel Modification Project **By:** PJ

Boring:	B-33	B-33	B-33	B-33	B-33	B-33
Sample:	R-5	R-5	R-5	R-5	R-5	R-5
Depth, ft:	16	16	16	16	16	16
Visual Description:	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock
Test Type	Diametral	Diametral	Diametral	Axial	Axial	Axial
Test Type ID	1	1	1	2	2	2
FOR ANISOTROPIC ROCK:						
Bedding Angle Relative to Axis	None	None	None	None	None	None
Loading Orientation Rel. to Bedding	N/A	N/A	N/A	N/A	N/A	N/A
SAMPLE DIMENSIONS						
Width Perpendicular to loading, W, mm	60	60	60	60	60	60
Length Perpendicular to Loading, L, mm	30	31	30			
Diameter Parallel to Loading, D, mm	60	60	60			
Diameter at Failure, D', mm	56	56	54	30	29	22
STRENGTH DATA						
Peak Load, P, kN	0.939	1.578	1.307	0.522	0.88	0.907
Peak Load, P, lbs	211.1	354.7	293.8	117.4	197.8	203.9
Uncorr. Pt. Load Strength Index,I_S, MPa	0.279	0.470	0.403	0.228	0.397	0.540
Uncorr. Pt. Load Strength Index,I_S, psi	**40.5**	**68.1**	**58.5**	**33.0**	**57.6**	**78.3**
Size Correction Factor, F	1.07	1.07	1.06	0.98	0.97	0.91
Corr. Pt. Load Strength Index,$I_{S(50)}$, Mpa	0.30	0.50	0.43	0.22	0.39	0.49
Corr. Pt. Load Strength Index,$I_{S(50)}$, psi	**43**	**73**	**62**	**32**	**56**	**72**
MOISTURE CONTENT DATA						
Moisture Condition of Specimen	As Received	As Received	As Received	As Received	As Received	As Received
Pan No.						
Pan wt. (g)	20.7	20.7	20.7	20.7	20.7	20.7
Total wet wt. (g)	107.86	107.86	107.86	107.86	107.86	107.86
Total dry wt (g)	87.8	87.8	87.8	87.8	87.8	87.8
Moisture Content, %	**29.9**	**29.9**	**29.9**	**29.9**	**29.9**	**29.9**
Comments:						

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

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POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No: 823-008
Client: GRI
Project Name: Port of Coos Bay Channel Modification Project
Project No.: 5128
Date: 9/28/2016
By: PJ

Boring:	B-33	B-33	B-33	B-33	B-33	B-33
Sample:	R-6	R-6	R-6	R-6	R-6	R-6
Depth, ft:	20	20	20	20	20	20
Visual Description:	Very Dark Greenish Gray Rock	Very Dark Greenish Gray Rock	Very Dark Greenish Gray Rock	Very Dark Greenish Gray Rock	Very Dark Greenish Gray Rock	Very Dark Greenish Gray Rock
Test Type	Diametral	Diametral	Diametral	Axial	Axial	Axial
Test Type ID	1	1	1	2	2	2
FOR ANISOTROPIC ROCK:						
Bedding Angle Relative to Axis	None	None	None	None	None	None
Loading Orientation Rel. to Bedding	N/A	N/A	N/A	N/A	N/A	N/A
SAMPLE DIMENSIONS						
Width Perpendicular to loading, W, mm	60	60	60	60	60	60
Length Perpendicular to Loading, L, mm	30	30	33			
Diameter Parallel to Loading, D, mm	60	60	60			
Diameter at Failure, D', mm	50	52	55	36	36	35
STRENGTH DATA						
Peak Load, P, kN	1.004	1.071	1.104	1.18	1.245	1.042
Peak Load, P, lbs	225.7	240.8	248.2	265.3	279.9	234.3
Uncorr. Pt. Load Strength Index,I_S, MPa	0.335	0.343	0.335	0.429	0.453	0.390
Uncorr. Pt. Load Strength Index,I_S, psi	**48.5**	**49.8**	**48.5**	**62.2**	**65.7**	**56.5**
Size Correction Factor, F	1.04	1.05	1.06	1.02	1.02	1.02
Corr. Pt. Load Strength Index,$I_{S(50)}$, Mpa	0.35	0.36	0.36	0.44	0.46	0.40
Corr. Pt. Load Strength Index,$I_{S(50)}$, psi	**51**	**52**	**52**	**64**	**67**	**57**
MOISTURE CONTENT DATA						
Moisture Condition of Specimen	As Received	As Received	As Received	As Received	As Received	As Received
Pan No.						
Pan wt. (g)	21.98	21.98	21.98	21.98	21.98	21.98
Total wet wt. (g)	216.83	216.83	216.83	216.83	216.83	216.83
Total dry wt (g)	171.35	171.35	171.35	171.35	171.35	171.35
Moisture Content, %	**30.4**	**30.4**	**30.4**	**30.4**	**30.4**	**30.4**
Comments:						

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No:	823-008	**Project No.:**	5128
Client:	GRI	**Date:**	9/26/2016
Project Name:	Port of Coos Bay Channel Modification Project	**By:**	PJ

Boring:	B-33	B-33	B-33	B-33	B-33	B-33
Sample:	R-7	R-7	R-7	R-7	R-7	R-7
Depth, ft:	21	21	21	21	21	21
Visual Description:	Very Dark Greenish Gray Rock	Very Dark Greenish Gray Rock	Very Dark Greenish Gray Rock	Very Dark Greenish Gray Rock	Very Dark Greenish Gray Rock	Very Dark Greenish Gray Rock
Test Type	Diametral	Diametral	Diametral	Axial	Axial	Axial
Test Type ID	1	1	1	2	2	2
FOR ANISOTROPIC ROCK:						
Bedding Angle Relative to Axis	None	None	None	None	None	None
Loading Orientation Rel. to Bedding	N/A	N/A	N/A	N/A	N/A	N/A
SAMPLE DIMENSIONS						
Width Perpendicular to loading, W, mm	60	60	60	60	60	60
Length Perpendicular to Loading, L, mm	32	30	30			
Diameter Parallel to Loading, D, mm	60	60	60			
Diameter at Failure, D', mm	54	55	49	38	35	28
STRENGTH DATA						
Peak Load, P, kN	1.115	1.099	0.98	1.295	0.976	0.834
Peak Load, P, lbs	250.7	247.1	220.3	291.1	219.4	187.5
Uncorr. Pt. Load Strength Index,I_S, MPa	0.344	0.333	0.333	0.446	0.365	0.390
Uncorr. Pt. Load Strength Index,I_S, psi	**49.9**	**48.3**	**48.3**	**64.7**	**52.9**	**56.5**
Size Correction Factor, F	1.06	1.06	1.04	1.03	1.02	0.97
Corr. Pt. Load Strength Index,$I_{S(50)}$, Mpa	0.36	0.35	0.35	0.46	0.37	0.38
Corr. Pt. Load Strength Index,$I_{S(50)}$, psi	**53**	**51**	**50**	**67**	**54**	**55**
MOISTURE CONTENT DATA						
Moisture Condition of Specimen	As Received	As Received	As Received	As Received	As Received	As Received
Pan No.						
Pan wt. (g)	19.92	19.92	19.92	19.92	19.92	19.92
Total wet wt. (g)	212.66	212.66	212.66	212.66	212.66	212.66
Total dry wt (g)	177.1	177.1	177.1	177.1	177.1	177.1
Moisture Content, %	**22.6**	**22.6**	**22.6**	**22.6**	**22.6**	**22.6**
Comments:						

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No: 823-008
Client: GRI
Project Name: Port of Coos Bay Channel Modification Project
Project No.: 5128
Date: 9/27/2016
By: PJ

Boring:	B-33	B-33	B-33	B-33	B-33	B-33
Sample:	R-8	R-8	R-8	R-8	R-8	R-8
Depth, ft:	26	26	26	26	26	26
Visual Description:	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock
Test Type	Diametral	Diametral	Diametral	Axial	Axial	Axial
Test Type ID	1	1	1	2	2	2
FOR ANISOTROPIC ROCK:						
Bedding Angle Relative to Axis	None	None	None	None	None	None
Loading Orientation Rel. to Bedding	N/A	N/A	N/A	N/A	N/A	N/A
SAMPLE DIMENSIONS						
Width Perpendicular to loading, W, mm	60	60	60	60	60	60
Length Perpendicular to Loading, L, mm	32	30	31			
Diameter Parallel to Loading, D, mm	60	60	60			
Diameter at Failure, D', mm	51	52	49	34	25	32
STRENGTH DATA						
Peak Load, P, kN	1.115	1.057	1.194	1.313	1.004	0.987
Peak Load, P, lbs	250.7	237.6	268.4	295.2	225.7	221.9
Uncorr. Pt. Load Strength Index,I_S, MPa	0.364	0.339	0.406	0.506	0.526	0.404
Uncorr. Pt. Load Strength Index,I_S, psi	**52.8**	**49.1**	**58.9**	**73.3**	**76.2**	**58.6**
Size Correction Factor, F	1.05	1.05	1.04	1.01	0.94	0.99
Corr. Pt. Load Strength Index,$I_{S(50)}$, Mpa	0.38	0.36	0.42	0.51	0.49	0.40
Corr. Pt. Load Strength Index,$I_{S(50)}$, psi	**55**	**52**	**61**	**74**	**72**	**58**
MOISTURE CONTENT DATA						
Moisture Condition of Specimen	As Received	As Received	As Received	As Received	As Received	As Received
Pan No.						
Pan wt. (g)	22.82	22.82	22.82	22.82	22.82	22.82
Total wet wt. (g)	136.16	136.16	136.16	136.16	136.16	136.16
Total dry wt (g)	113.3	113.3	113.3	113.3	113.3	113.3
Moisture Content, %	**25.3**	**25.3**	**25.3**	**25.3**	**25.3**	**25.3**
Comments:				Invalid test. Did not fail through both points.		

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

COOPER TESTING LABORATORY

POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No: 823-008
Client: GRI
Project Name: Port of Coos Bay Channel Modification Project
Project No.: 5128
Date: 9/27/2016
By: PJ

Boring:	B-40	B-40	B-40			
Sample:	R-1	R-1	R-1			
Depth, ft:	3	3	3			
Visual Description:	Very Dark Greenish Gray Rock	Very Dark Greenish Gray Rock	Very Dark Greenish Gray Rock			
Test Type	Diametral	Axial	Axial			
Test Type ID	1	2	2			
FOR ANISOTROPIC ROCK:						
Bedding Angle Relative to Axis	None	None	None			
Loading Orientation Rel. to Bedding	N/A	N/A	N/A			
SAMPLE DIMENSIONS						
Width Perpendicular to loading, W, mm	60	60	60			
Length Perpendicular to Loading, L, mm	30					
Diameter Parallel to Loading, D, mm	60					
Diameter at Failure, D', mm	59	37	34			
STRENGTH DATA						
Peak Load, P, kN	0.457	0.408	0.381			
Peak Load, P, lbs	102.7	91.7	85.7			
Uncorr. Pt. Load Strength Index,I_S, MPa	0.129	0.144	0.147			
Uncorr. Pt. Load Strength Index,I_S, psi	**18.7**	**20.9**	**21.3**			
Size Correction Factor, F	1.08	1.03	1.01			
Corr. Pt. Load Strength Index,$I_{S(50)}$, Mpa	0.14	0.15	0.15			
Corr. Pt. Load Strength Index,$I_{S(50)}$, psi	**20**	**22**	**21**			
MOISTURE CONTENT DATA						
Moisture Condition of Specimen	As Received	As Received	As Received			
Pan No.						
Pan wt. (g)	20.93	20.93	20.93			
Total wet wt. (g)	187.56	187.56	187.56			
Total dry wt (g)	160.7	160.7	160.7			
Moisture Content, %	**19.2**	**19.2**	**19.2**			
Comments:						

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No: 823-008
Client: GRI
Project Name: Port of Coos Bay Channel Modification Project
Project No.: 5128
Date: 9/26/2016
By: PJ

Boring:	B-40	B-40	B-40	B-40	B-40	B-40
Sample:	R-1	R-1	R-1	R-1	R-1	R-1
Depth, ft:	6	6	6	6	6	6
Visual Description:	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock
Test Type	Diametral	Diametral	Diametral	Axial	Axial	Axial
Test Type ID	1	1	1	2	2	2
FOR ANISOTROPIC ROCK:						
Bedding Angle Relative to Axis	None	None	None	None	None	None
Loading Orientation Rel. to Bedding	N/A	N/A	N/A	N/A	N/A	N/A
SAMPLE DIMENSIONS						
Width Perpendicular to loading, W, mm	60	60	60	60	60	60
Length Perpendicular to Loading, L, mm	30	31	30			
Diameter Parallel to Loading, D, mm	60	60	60			
Diameter at Failure, D', mm	58	57	59	26	31	20
STRENGTH DATA						
Peak Load, P, kN	0.504	0.785	0.602	0.395	0.529	0.201
Peak Load, P, lbs	113.3	176.5	135.3	88.8	118.9	45.2
Uncorr. Pt. Load Strength Index, I_S, MPa	0.145	0.230	0.170	0.199	0.223	0.132
Uncorr. Pt. Load Strength Index, I_S, psi	**21.0**	**33.3**	**24.7**	**28.8**	**32.4**	**19.1**
Size Correction Factor, F	1.08	1.07	1.08	0.95	0.99	0.90
Corr. Pt. Load Strength Index, $I_{S(50)}$, Mpa	0.16	0.25	0.18	0.19	0.22	0.12
Corr. Pt. Load Strength Index, $I_{S(50)}$, psi	**23**	**36**	**27**	**27**	**32**	**17**
MOISTURE CONTENT DATA						
Moisture Condition of Specimen	As Received	As Received	As Received	As Received	As Received	As Received
Pan No.						
Pan wt. (g)	22.28	22.28	22.28	22.28	22.28	22.28
Total wet wt. (g)	226.06	226.06	226.06	226.06	226.06	226.06
Total dry wt (g)	193.8	193.8	193.8	193.8	193.8	193.8
Moisture Content, %	**18.8**	**18.8**	**18.8**	**18.8**	**18.8**	**18.8**
Comments:						

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No: 823-008

Client: GRI

Project Name: Port of Coos Bay Channel Modification Project

Project No.: 5128

Date: 9/27/2016

By: PJ

Boring:	B-40	B-40	B-40	B-40	B-40	B-40
Sample:	R-2	R-2	R-2	R-2	R-2	R-2
Depth, ft:	11	11	11	11	11	11
Visual Description:	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock
Test Type	Diametral	Diametral	Diametral	Axial	Axial	Axial
Test Type ID	1	1	1	2	2	2
FOR ANISOTROPIC ROCK:						
Bedding Angle Relative to Axis	None	None	None	None	None	None
Loading Orientation Rel. to Bedding	N/A	N/A	N/A	N/A	N/A	N/A
SAMPLE DIMENSIONS						
Width Perpendicular to loading, W, mm	60	60	60	60	60	60
Length Perpendicular to Loading, L, mm	30	30	30			
Diameter Parallel to Loading, D, mm	60	60	60			
Diameter at Failure, D', mm	57	55	58	30	30	32
STRENGTH DATA						
Peak Load, P, kN	0.552	0.711	0.626	0.158	0.358	0.362
Peak Load, P, lbs	124.1	159.8	140.7	35.5	80.5	81.4
Uncorr. Pt. Load Strength Index,I_S, MPa	0.161	0.215	0.180	0.069	0.156	0.148
Uncorr. Pt. Load Strength Index,I_S, psi	**23.4**	**31.2**	**26.1**	**10.0**	**22.7**	**21.5**
Size Correction Factor, F	1.07	1.06	1.08	0.98	0.98	0.99
Corr. Pt. Load Strength Index,$I_{S(50)}$, Mpa	0.17	0.23	0.19	0.07	0.15	0.15
Corr. Pt. Load Strength Index,$I_{S(50)}$, psi	**25**	**33**	**28**	**10**	**22**	**21**
MOISTURE CONTENT DATA						
Moisture Condition of Specimen	As Received	As Received	As Received	As Received	As Received	As Received
Pan No.						
Pan wt. (g)	22.39	22.39	22.39	22.39	22.39	22.39
Total wet wt. (g)	156.9	156.9	156.9	156.9	156.9	156.9
Total dry wt (g)	135.6	135.6	135.6	135.6	135.6	135.6
Moisture Content, %	**18.8**	**18.8**	**18.8**	**18.8**	**18.8**	**18.8**
Comments:						

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No: 823-008
Project No.: 5128
Client: GRI
Date: 9/27/2016
Project Name: Port of Coos Bay Channel Modification Project
By: PJ

Boring:	B-40	B-40	B-40	B-40	B-40	B-40
Sample:	R-3	R-3	R-3	R-3	R-3	R-3
Depth, ft:	16	16	16	16	16	16
Visual Description:	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock
Test Type	Diametral	Diametral	Diametral	Axial	Axial	Axial
Test Type ID	1	1	1	2	2	2
FOR ANISOTROPIC ROCK:						
Bedding Angle Relative to Axis	None	None	None	None	None	None
Loading Orientation Rel. to Bedding	N/A	N/A	N/A	N/A	N/A	N/A
SAMPLE DIMENSIONS						
Width Perpendicular to loading, W, mm	60	60	60	60	60	60
Length Perpendicular to Loading, L, mm	30	31	30			
Diameter Parallel to Loading, D, mm	60	60	60			
Diameter at Failure, D', mm	57	58	56	30	27	26
STRENGTH DATA						
Peak Load, P, kN	0.666	0.605	0.406	0.357	0.383	0.347
Peak Load, P, lbs	149.7	136.0	91.3	80.3	86.1	78.0
Uncorr. Pt. Load Strength Index,I_S, MPa	0.195	0.174	0.121	0.156	0.186	0.175
Uncorr. Pt. Load Strength Index,I_S, psi	**28.2**	**25.2**	**17.5**	**22.6**	**26.9**	**25.3**
Size Correction Factor, F	1.07	1.08	1.07	0.98	0.96	0.95
Corr. Pt. Load Strength Index,$I_{S(50)}$, Mpa	0.21	0.19	0.13	0.15	0.18	0.17
Corr. Pt. Load Strength Index,$I_{S(50)}$, psi	**30**	**27**	**19**	**22**	**26**	**24**
MOISTURE CONTENT DATA						
Moisture Condition of Specimen	As Received	As Received	As Received	As Received	As Received	As Received
Pan No.						
Pan wt. (g)	20.55	20.55	20.55	20.55	20.55	20.55
Total wet wt. (g)	284.66	284.66	284.66	284.66	284.66	284.66
Total dry wt (g)	242.1	242.1	242.1	242.1	242.1	242.1
Moisture Content, %	**19.2**	**19.2**	**19.2**	**19.2**	**19.2**	**19.2**
Comments:						

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No: 823-008
Client: GRI
Project Name: Port of Coos Bay Channel Modification Project
Project No.: 5128
Date: 9/27/2016
By: PJ

Boring:	B-40	B-40	B-40	B-40	B-40	B-40
Sample:	R-5	R-5	R-5	R-5	R-5	R-5
Depth, ft:	21	21	21	21	21	21
Visual Description:	Very Dark Greenish Gray Rock	Very Dark Greenish Gray Rock	Very Dark Greenish Gray Rock	Very Dark Greenish Gray Rock	Very Dark Greenish Gray Rock	Very Dark Greenish Gray Rock
Test Type	Diametral	Diametral	Diametral	Axial	Axial	Axial
Test Type ID	1	1	1	2	2	2
FOR ANISOTROPIC ROCK:						
Bedding Angle Relative to Axis	None	None	None	None	None	None
Loading Orientation Rel. to Bedding	N/A	N/A	N/A	N/A	N/A	N/A
SAMPLE DIMENSIONS						
Width Perpendicular to loading, W, mm	60	60	60	60	60	60
Length Perpendicular to Loading, L, mm	30	30	31			
Diameter Parallel to Loading, D, mm	60	60	60			
Diameter at Failure, D', mm	56	57	58	28	27	25
STRENGTH DATA						
Peak Load, P, kN	0.513	0.472	0.512	0.23	0.356	0.249
Peak Load, P, lbs	115.3	106.1	115.1	51.7	80.0	56.0
Uncorr. Pt. Load Strength Index,I_S, MPa	0.153	0.138	0.147	0.108	0.173	0.130
Uncorr. Pt. Load Strength Index,I_S, psi	**22.1**	**20.0**	**21.3**	**15.6**	**25.0**	**18.9**
Size Correction Factor, F	1.07	1.07	1.08	0.97	0.96	0.94
Corr. Pt. Load Strength Index,$I_{S(50)}$, Mpa	0.16	0.15	0.16	0.10	0.17	0.12
Corr. Pt. Load Strength Index,$I_{S(50)}$, psi	**24**	**21**	**23**	**15**	**24**	**18**
MOISTURE CONTENT DATA						
Moisture Condition of Specimen	As Received	As Received	As Received	As Received	As Received	As Received
Pan No.						
Pan wt. (g)	20.62	20.62	20.62	20.62	20.62	20.62
Total wet wt. (g)	168.96	168.96	168.96	168.96	168.96	168.96
Total dry wt (g)	144.8	144.8	144.8	144.8	144.8	144.8
Moisture Content, %	**19.5**	**19.5**	**19.5**	**19.5**	**19.5**	**19.5**
Comments:						

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

COOPER
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POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No: 823-008
Client: GRI
Project Name: Port of Coos Bay Channel Modification Project

Project No.: 5128
Date: 9/28/2016
By: PJ

Boring:	B-40	B-40	B-40	B-40	B-40	B-40
Sample:	R-5	R-5	R-5	R-5	R-5	R-5
Depth, ft:	23	23	23	23	23	23
Visual Description:	Very Dark Greenish Gray Rock	Very Dark Greenish Gray Rock	Very Dark Greenish Gray Rock	Very Dark Greenish Gray Rock	Very Dark Greenish Gray Rock	Very Dark Greenish Gray Rock
Test Type	Diametral	Diametral	Diametral	Axial	Axial	Axial
Test Type ID	1	1	1	2	2	2

FOR ANISOTROPIC ROCK:

Bedding Angle Relative to Axis	None	None	None	None	None	None
Loading Orientation Rel. to Bedding	N/A	N/A	N/A	N/A	N/A	N/A

SAMPLE DIMENSIONS

Width Perpendicular to loading, W, mm	60	60	60	60	60	60
Length Perpendicular to Loading, L, mm	30	30	30			
Diameter Parallel to Loading, D, mm	60	60	60			
Diameter at Failure, D', mm	58	57	56	31	29	20

STRENGTH DATA

Peak Load, P, kN	0.525	0.63	0.709	0.603	0.311	0.231
Peak Load, P, lbs	118.0	141.6	159.4	135.6	69.9	51.9
Uncorr. Pt. Load Strength Index,I_S, MPa	0.151	0.184	0.211	0.255	0.140	0.151
Uncorr. Pt. Load Strength Index,I_S, psi	**21.9**	**26.7**	**30.6**	**36.9**	**20.4**	**21.9**
Size Correction Factor, F	1.08	1.07	1.07	0.99	0.97	0.90
Corr. Pt. Load Strength Index,$I_{S(50)}$, Mpa	0.16	0.20	0.23	0.25	0.14	0.14
Corr. Pt. Load Strength Index,$I_{S(50)}$, psi	**24**	**29**	**33**	**36**	**20**	**20**

MOISTURE CONTENT DATA

Moisture Condition of Specimen	As Received	As Received	As Received	As Received	As Received	As Received
Pan No.						
Pan wt. (g)	21.63	21.63	21.63	21.63	21.63	21.63
Total wet wt. (g)	130.56	130.56	130.56	130.56	130.56	130.56
Total dry wt (g)	112.3	112.3	112.3	112.3	112.3	112.3
Moisture Content, %	**20.1**	**20.1**	**20.1**	**20.1**	**20.1**	**20.1**
Comments:						

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No: 823-008
Project No.: 5128
Client: GRI
Date: 9/27/2016
Project Name: Port of Coos Bay Channel Modification Project
By: PJ

Boring:	B-40	B-40	B-40	B-40	B-40	B-40
Sample:	R-7	R-7	R-7	R-7	R-7	R-7
Depth, ft:	26	26	26	26	26	26
Visual Description:	Very Dark Greenish Gray Rock	Very Dark Greenish Gray Rock	Very Dark Greenish Gray Rock	Very Dark Greenish Gray Rock	Very Dark Greenish Gray Rock	Very Dark Greenish Gray Rock
Test Type	Diametral	Diametral	Diametral	Axial	Axial	Axial
Test Type ID	1	1	1	2	2	2

FOR ANISOTROPIC ROCK:

Bedding Angle Relative to Axis	None	None	None	None	None	None
Loading Orientation Rel. to Bedding	N/A	N/A	N/A	N/A	N/A	N/A

SAMPLE DIMENSIONS

Width Perpendicular to loading, W, mm	60	60	60	60	60	60
Length Perpendicular to Loading, L, mm	32	31	30			
Diameter Parallel to Loading, D, mm	60	60	60			
Diameter at Failure, D', mm	57	58	57	33	30	20

STRENGTH DATA

Peak Load, P, kN	0.485	0.454	0.628	0.279	0.381	0.167
Peak Load, P, lbs	109.0	102.1	141.2	62.7	85.7	37.5
Uncorr. Pt. Load Strength Index, I_S, MPa	0.142	0.130	0.184	0.111	0.166	0.109
Uncorr. Pt. Load Strength Index, I_S, psi	**20.6**	**18.9**	**26.6**	**16.1**	**24.1**	**15.9**
Size Correction Factor, F	1.07	1.08	1.07	1.00	0.98	0.90
Corr. Pt. Load Strength Index, $I_{S(50)}$, Mpa	0.15	0.14	0.20	0.11	0.16	0.10
Corr. Pt. Load Strength Index, $I_{S(50)}$, psi	**22**	**20**	**29**	**16**	**24**	**14**

MOISTURE CONTENT DATA

Moisture Condition of Specimen	As Received	As Received	As Received	As Received	As Received	As Received
Pan No.						
Pan wt. (g)	22.17	22.17	22.17	22.17	22.17	22.17
Total wet wt. (g)	195.21	195.21	195.21	195.21	195.21	195.21
Total dry wt (g)	167	167	167	167	167	167
Moisture Content, %	**19.5**	**19.5**	**19.5**	**19.5**	**19.5**	**19.5**
Comments:						

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No: 823-008
Client: GRI
Project Name: Port of Coos Bay Channel Modification Project
Project No.: 5128
Date: 9/28/2016
By: PJ

Boring:	B-40	B-40	B-40	B-40	B-40	B-40
Sample:	R-7	R-7	R-7	R-7	R-7	R-7
Depth, ft:	28	28	28	28	28	28
Visual Description:	Very Dark Greenish Gray Rock	Very Dark Greenish Gray Rock	Very Dark Greenish Gray Rock	Very Dark Greenish Gray Rock	Very Dark Greenish Gray Rock	Very Dark Greenish Gray Rock
Test Type	Diametral	Diametral	Diametral	Axial	Axial	Axial
Test Type ID	1	1	1	2	2	2
FOR ANISOTROPIC ROCK:						
Bedding Angle Relative to Axis	None	None	None	None	None	None
Loading Orientation Rel. to Bedding	N/A	N/A	N/A	N/A	N/A	N/A
SAMPLE DIMENSIONS						
Width Perpendicular to loading, W, mm	60	60	60	60	60	60
Length Perpendicular to Loading, L, mm	31	32	30			
Diameter Parallel to Loading, D, mm	60	60	60			
Diameter at Failure, D', mm	58	57	57	27	41	41
STRENGTH DATA						
Peak Load, P, kN	0.626	0.794	0.458	0.065	0.696	0.481
Peak Load, P, lbs	140.7	178.5	103.0	14.6	156.5	108.1
Uncorr. Pt. Load Strength Index,I_S, MPa	0.180	0.232	0.134	0.032	0.222	0.154
Uncorr. Pt. Load Strength Index,I_S, psi	**26.1**	**33.7**	**19.4**	**4.6**	**32.2**	**22.3**
Size Correction Factor, F	1.08	1.07	1.07	0.96	1.05	1.05
Corr. Pt. Load Strength Index,$I_{S(50)}$, Mpa	0.19	0.25	0.14	0.03	0.23	0.16
Corr. Pt. Load Strength Index,$I_{S(50)}$, psi	**28**	**36**	**21**	**4**	**34**	**23**
MOISTURE CONTENT DATA						
Moisture Condition of Specimen	As Received	As Received	As Received	As Received	As Received	As Received
Pan No.						
Pan wt. (g)	22.33	22.33	22.33	22.33	22.33	22.33
Total wet wt. (g)	154.51	154.51	154.51	154.51	154.51	154.51
Total dry wt (g)	133.4	133.4	133.4	133.4	133.4	133.4
Moisture Content, %	**19.0**	**19.0**	**19.0**	**19.0**	**19.0**	**19.0**
Comments:						

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No: 823-010

Client: GRI

Project Name: Port of Coos Bay Channel Modification Project

Project No.: 5128 T.021

Date: 2/8/2017

By: PJ

Boring:	UB-1	UB-1	UB-1			
Sample:	R-1	R-1	R-1			
Depth, ft:	46	46	46			
Visual Description:	Olive Brown Rock	Olive Brown Rock	Olive Brown Rock			
Test Type	Axial	Axial	Axial			
Test Type ID	2	2	2			
FOR ANISOTROPIC ROCK:						
Bedding Angle Relative to Axis	None	None	None			
Loading Orientation Rel. to Bedding	N/A	N/A	N/A			
SAMPLE DIMENSIONS						
Width Perpendicular to loading, W, mm	59	58	59			
Length Perpendicular to Loading, L, mm						
Diameter Parallel to Loading, D, mm	50.3	48	25			
Diameter at Failure, D', mm	42	37	24			
STRENGTH DATA						
Peak Load, P, kN	0.136	0.51	0.167			
Peak Load, P, lbs	30.6	114.7	37.5			
Uncorr. Pt. Load Strength Index, I_S, MPa	0.043	0.187	0.093			
Uncorr. Pt. Load Strength Index, I_S, psi	**6.3**	**27.1**	**13.4**			
Size Correction Factor, F	1.05	1.02	0.93			
Corr. Pt. Load Strength Index, $I_{S(50)}$, Mpa	0.05	0.19	0.09			
Corr. Pt. Load Strength Index, $I_{S(50)}$, psi	**7**	**28**	**12**			
MOISTURE CONTENT DATA						
Moisture Condition of Specimen	As Received	As Received	As Received			
Pan No.						
Pan wt. (g)	115.45	115.45	115.45			
Total wet wt. (g)	390.07	390.07	390.07			
Total dry wt (g)	344.57	344.57	344.57			
Moisture Content, %	**19.9**	**19.9**	**19.9**			
Comments:						

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No: 823-010
Project No.: 5128 T.021
Client: GRI
Date: 2/8/2017
Project Name: Port of Coos Bay Channel Modification Project
By: PJ

Boring:	UB-1	UB-1	UB-1	UB-1	UB-1	
Sample:	R-1	R-1	R-1	R-1	R-1	
Depth, ft:	48	48	48	48	48	
Visual Description:	Olive Gray Rock	Olive Gray Rock	Olive Gray Rock	Olive Gray Rock	Olive Gray Rock	
Test Type	Axial	Axial	Axial	Diametral	Axial	
Test Type ID	2	2	2	1	2	
FOR ANISOTROPIC ROCK:						
Bedding Angle Relative to Axis	None	None	None	None	None	
Loading Orientation Rel. to Bedding	N/A	N/A	N/A	N/A	N/A	
SAMPLE DIMENSIONS						
Width Perpendicular to loading, W, mm	35	52	56	58	58	
Length Perpendicular to Loading, L, mm				30		
Diameter Parallel to Loading, D, mm	54	56	31	58	30	
Diameter at Failure, D', mm	39	52	28	57	21	
STRENGTH DATA						
Peak Load, P, kN	0.107	0.316	0.197	0.146	0.153	
Peak Load, P, lbs	24.1	71.0	44.3	32.8	34.4	
Uncorr. Pt. Load Strength Index, I_S, MPa	0.062	0.092	0.099	0.044	0.099	
Uncorr. Pt. Load Strength Index, I_S, psi	**8.9**	**13.3**	**14.3**	**6.4**	**14.3**	
Size Correction Factor, F	0.92	1.07	0.95	1.06	0.90	
Corr. Pt. Load Strength Index, $I_{S(50)}$, Mpa	0.06	0.10	0.09	0.05	0.09	
Corr. Pt. Load Strength Index, $I_{S(50)}$, psi	**8**	**14**	**14**	**7**	**13**	
MOISTURE CONTENT DATA						
Moisture Condition of Specimen	As Received	As Received	As Received	As Received	As Received	
Pan No.						
Pan wt. (g)	22.93	22.93	22.93	22.93	22.93	
Total wet wt. (g)	241.14	241.14	241.14	241.14	241.14	
Total dry wt (g)	207.39	207.39	207.39	207.39	207.39	
Moisture Content, %	**18.3**	**18.3**	**18.3**	**18.3**	**18.3**	
Comments:						

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No: 823-010
Client: GRI
Project Name: Port of Coos Bay Channel Modification Project
Project No.: 5128 T.021
Date: 2/8/2017
By: PJ

Boring:	UB-1	UB-1	UB-1	UB-1	UB-1	
Sample:	R-3	R-3	R-3	R-3	R-3	
Depth, ft:	57	57	57	57	57	
Visual Description:	Olive Gray Rock	Olive Gray Rock	Olive Gray Rock	Olive Gray Rock	Olive Gray Rock	
Test Type	Axial	Diametral	Diametral	Axial	Axial	
Test Type ID	2	1	1	2	2	
FOR ANISOTROPIC ROCK:						
Bedding Angle Relative to Axis	None	None	None	None	None	
Loading Orientation Rel. to Bedding	N/A	N/A	N/A	N/A	N/A	
SAMPLE DIMENSIONS						
Width Perpendicular to loading, W, mm	58	59	59	59	59	
Length Perpendicular to Loading, L, mm		30	30			
Diameter Parallel to Loading, D, mm	37	59	59	36	32	
Diameter at Failure, D', mm	30	58	55	35	30	
STRENGTH DATA						
Peak Load, P, kN	0.384	0.263	0.748	0.219	0.412	
Peak Load, P, lbs	86.3	59.1	168.2	49.2	92.6	
Uncorr. Pt. Load Strength Index,I_S, MPa	0.173	0.077	0.231	0.083	0.183	
Uncorr. Pt. Load Strength Index,I_S, psi	**25.1**	**11.1**	**33.4**	**12.1**	**26.5**	
Size Correction Factor, F	0.97	1.07	1.06	1.01	0.98	
Corr. Pt. Load Strength Index,$I_{S(50)}$, Mpa	0.17	0.08	0.24	0.08	0.18	
Corr. Pt. Load Strength Index,$I_{S(50)}$, psi	**24**	**12**	**35**	**12**	**26**	
MOISTURE CONTENT DATA						
Moisture Condition of Specimen	As Received	As Received	As Received	As Received	As Received	
Pan No.						
Pan wt. (g)	22.63	22.63	22.63	22.63	22.63	
Total wet wt. (g)	218.46	218.46	218.46	218.46	218.46	
Total dry wt (g)	188.61	188.61	188.61	188.61	188.61	
Moisture Content, %	**18.0**	**18.0**	**18.0**	**18.0**	**18.0**	
Comments:						

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

COOPER TESTING LABORATORY

POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No: 823-010
Client: GRI
Project Name: Port of Coos Bay Channel Modification Project

Project No.: 5128 T.021
Date: 2/8/2017
By: PJ

Boring:	UB-1	UB-1	UB-1	UB-1	UB-1	UB-1
Sample:	R-4	R-4	R-4	R-4	R-4	R-4
Depth, ft:	60	60	60	60	60	60
Visual Description:	Gray Rock	Gray Rock	Gray Rock	Gray Rock	Gray Rock	Gray Rock
Test Type	Diametral	Diametral	Diametral	Axial	Axial	Axial
Test Type ID	1	1	1	2	2	2
FOR ANISOTROPIC ROCK:						
Bedding Angle Relative to Axis	None	None	None	None	None	None
Loading Orientation Rel. to Bedding	N/A	N/A	N/A	N/A	N/A	N/A
SAMPLE DIMENSIONS						
Width Perpendicular to loading, W, mm	58	58	58	58	58	58
Length Perpendicular to Loading, L, mm	30	30	30			
Diameter Parallel to Loading, D, mm	58	58	58	38	25	23
Diameter at Failure, D', mm	55	54	56	34	26	23
STRENGTH DATA						
Peak Load, P, kN	0.674	0.596	0.552	0.429	0.456	0.332
Peak Load, P, lbs	151.5	134.0	124.1	96.4	102.5	74.6
Uncorr. Pt. Load Strength Index,I_S, MPa	0.211	0.190	0.170	0.171	0.237	0.195
Uncorr. Pt. Load Strength Index,I_S, psi	**30.6**	**27.6**	**24.6**	**24.8**	**34.4**	**28.4**
Size Correction Factor, F	1.06	1.05	1.06	1.00	0.94	0.92
Corr. Pt. Load Strength Index,$I_{S(50)}$, Mpa	0.22	0.20	0.18	0.17	0.22	0.18
Corr. Pt. Load Strength Index,$I_{S(50)}$, psi	**32**	**29**	**26**	**25**	**32**	**26**
MOISTURE CONTENT DATA						
Moisture Condition of Specimen	As Received	As Received	As Received	As Received	As Received	As Received
Pan No.						
Pan wt. (g)	22.03	22.03	22.03	22.03	22.03	22.03
Total wet wt. (g)	178.3	178.3	178.3	178.3	178.3	178.3
Total dry wt (g)	155.84	155.84	155.84	155.84	155.84	155.84
Moisture Content, %	**16.8**	**16.8**	**16.8**	**16.8**	**16.8**	**16.8**
Comments:						

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No: 823-010
Client: GRI
Project Name: Port of Coos Bay Channel Modification Project
Project No.: 5128 T.021
Date: 2/8/2017
By: PJ

Boring:	UB-1	UB-1	UB-1	UB-1	UB-1	UB-1
Sample:	R-5	R-5	R-5	R-5	R-5	R-5
Depth, ft:	67	67	67	67	67	67
Visual Description:	Olive Brown Rock	Olive Brown Rock	Olive Brown Rock	Olive Brown Rock	Olive Brown Rock	Olive Brown Rock
Test Type	Diametral	Diametral	Diametral	Axial	Axial	Axial
Test Type ID	1	1	1	2	2	2
FOR ANISOTROPIC ROCK:						
Bedding Angle Relative to Axis	None	None	None	None	None	None
Loading Orientation Rel. to Bedding	N/A	N/A	N/A	N/A	N/A	N/A
SAMPLE DIMENSIONS						
Width Perpendicular to loading, W, mm	58	58	58	58	58	58
Length Perpendicular to Loading, L, mm	30	31	31			
Diameter Parallel to Loading, D, mm	58	58	58	35	27	33
Diameter at Failure, D', mm	57	56	57	35	32	29
STRENGTH DATA						
Peak Load, P, kN	0.917	0.814	0.686	0.543	0.667	0.515
Peak Load, P, lbs	206.1	183.0	154.2	122.1	149.9	115.8
Uncorr. Pt. Load Strength Index,I_S, MPa	0.277	0.251	0.208	0.210	0.282	0.240
Uncorr. Pt. Load Strength Index,I_S, psi	**40.2**	**36.3**	**30.1**	**30.5**	**40.9**	**34.9**
Size Correction Factor, F	1.06	1.06	1.06	1.01	0.99	0.97
Corr. Pt. Load Strength Index,$I_{S(50)}$, Mpa	0.30	0.27	0.22	0.21	0.28	0.23
Corr. Pt. Load Strength Index,$I_{S(50)}$, psi	**43**	**39**	**32**	**31**	**40**	**34**
MOISTURE CONTENT DATA						
Moisture Condition of Specimen	As Received	As Received	As Received	As Received	As Received	As Received
Pan No.						
Pan wt. (g)	22.18	22.18	22.18	22.18	22.18	22.18
Total wet wt. (g)	222.05	222.05	222.05	222.05	222.05	222.05
Total dry wt (g)	192.62	192.62	192.62	192.62	192.62	192.62
Moisture Content, %	**17.3**	**17.3**	**17.3**	**17.3**	**17.3**	**17.3**
Comments:						

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No: 823-010
Client: GRI
Project Name: Port of Coos Bay Channel Modification Project

Project No.: 5128 T.021
Date: 2/8/2017
By: PJ

Boring:	UB-1	UB-1	UB-1	UB-1	UB-1	UB-1
Sample:	R-6	R-6	R-6	R-6	R-6	R-6
Depth, ft:	71	71	71	71	71	71
Visual Description:	Olive Gray Rock	Olive Gray Rock	Olive Gray Rock	Olive Gray Rock	Olive Gray Rock	Olive Gray Rock
Test Type	Diametral	Diametral	Diametral	Axial	Axial	Axial
Test Type ID	1	1	1	2	2	2
FOR ANISOTROPIC ROCK:						
Bedding Angle Relative to Axis	None	None	None	None	None	None
Loading Orientation Rel. to Bedding	N/A	N/A	N/A	N/A	N/A	N/A
SAMPLE DIMENSIONS						
Width Perpendicular to loading, W, mm	59	59	59	59	59	59
Length Perpendicular to Loading, L, mm	31	30	31			
Diameter Parallel to Loading, D, mm	59	59	59	27	27	30
Diameter at Failure, D', mm	56	54	52	19	26	30
STRENGTH DATA						
Peak Load, P, kN	0.745	1.003	0.917	0.338	0.497	0.744
Peak Load, P, lbs	167.5	225.5	206.1	76.0	111.7	167.3
Uncorr. Pt. Load Strength Index,I_S, MPa	0.225	0.315	0.299	0.237	0.254	0.330
Uncorr. Pt. Load Strength Index,I_S, psi	**32.7**	**45.7**	**43.4**	**34.3**	**36.9**	**47.9**
Size Correction Factor, F	1.06	1.06	1.05	0.88	0.95	0.98
Corr. Pt. Load Strength Index,$I_{S(50)}$, Mpa	0.24	0.33	0.31	0.21	0.24	0.32
Corr. Pt. Load Strength Index,$I_{S(50)}$, psi	**35**	**48**	**45**	**30**	**35**	**47**
MOISTURE CONTENT DATA						
Moisture Condition of Specimen	As Received	As Received	As Received	As Received	As Received	As Received
Pan No.						
Pan wt. (g)	22.38	22.38	22.38	22.38	22.38	22.38
Total wet wt. (g)	184.45	184.45	184.45	184.45	184.45	184.45
Total dry wt (g)	160.19	160.19	160.19	160.19	160.19	160.19
Moisture Content, %	**17.6**	**17.6**	**17.6**	**17.6**	**17.6**	**17.6**
Comments:						

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No: 823-010
Client: GRI
Project Name: Port of Coos Bay Channel Modification Project
Project No.: 5128 T.021
Date: 2/8/2017
By: PJ

Boring:	UB-1	UB-1	UB-1	UB-1	UB-1	
Sample:	R-7	R-7	R-7	R-7	R-7	
Depth, ft:	77	77	77	77	77	
Visual Description:	Olive Gray Rock	Olive Gray Rock	Olive Gray Rock	Olive Gray Rock	Olive Gray Rock	
Test Type	Diametral	Diametral	Axial	Axial	Axial	
Test Type ID	1	1	2	2	2	

FOR ANISOTROPIC ROCK:

Bedding Angle Relative to Axis	None	None	None	None	None	
Loading Orientation Rel. to Bedding	N/A	N/A	N/A	N/A	N/A	

SAMPLE DIMENSIONS

Width Perpendicular to loading, W, mm	58	58	58	58	58	
Length Perpendicular to Loading, L, mm	30	38				
Diameter Parallel to Loading, D, mm	58	58	47	35	31	
Diameter at Failure, D', mm	55	56	45	35	30	

STRENGTH DATA

Peak Load, P, kN	0.496	0.52	0.371	0.419	0.429	
Peak Load, P, lbs	111.5	116.9	83.4	94.2	96.4	
Uncorr. Pt. Load Strength Index,I_S, MPa	0.155	0.160	0.112	0.162	0.194	
Uncorr. Pt. Load Strength Index,I_S, psi	**22.6**	**23.2**	**16.2**	**23.5**	**28.1**	
Size Correction Factor, F	1.06	1.06	1.07	1.01	0.97	
Corr. Pt. Load Strength Index,$I_{S(50)}$, Mpa	0.16	0.17	0.12	0.16	0.19	
Corr. Pt. Load Strength Index,$I_{S(50)}$, psi	**24**	**25**	**17**	**24**	**27**	

MOISTURE CONTENT DATA

Moisture Condition of Specimen	As Received	As Received	As Received	As Received	As Received	
Pan No.						
Pan wt. (g)	22.19	22.19	22.19	22.19	22.19	
Total wet wt. (g)	205.46	205.46	205.46	205.46	205.46	
Total dry wt (g)	178.32	178.32	178.32	178.32	178.32	
Moisture Content, %	**17.4**	**17.4**	**17.4**	**17.4**	**17.4**	
Comments:						

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No: 823-010
Client: GRI
Project Name: Port of Coos Bay Channel Modification Project
Project No.: 5128 T.021
Date: 2/8/2017
By: PJ

Boring:	UB-2	UB-2	UB-2	UB-2	UB-2	
Sample:	R-2	R-2	R-2	R-2	R-2	
Depth, ft:	46	46	46	46	46	
Visual Description:	Dark Olive Brown Rock	Dark Olive Brown Rock	Dark Olive Brown Rock	Dark Olive Brown Rock	Dark Olive Brown Rock	
Test Type	Diametral	Axial	Diametral	Axial	Diametral	
Test Type ID	1	2	1	2	1	
FOR ANISOTROPIC ROCK:						
Bedding Angle Relative to Axis	None	None	None	None	None	
Loading Orientation Rel. to Bedding	N/A	N/A	N/A	N/A	N/A	
SAMPLE DIMENSIONS						
Width Perpendicular to loading, W, mm	57	57	58	58	59	
Length Perpendicular to Loading, L, mm	30		32		30	
Diameter Parallel to Loading, D, mm	57	40	58	38	59	
Diameter at Failure, D', mm	54	39	56	35	57	
STRENGTH DATA						
Peak Load, P, kN	0.261	0.241	0.342	0.275	0.358	
Peak Load, P, lbs	58.7	54.2	76.9	61.8	80.5	
Uncorr. Pt. Load Strength Index,I_S, MPa	0.085	0.085	0.105	0.106	0.106	
Uncorr. Pt. Load Strength Index,I_S, psi	**12.3**	**12.3**	**15.3**	**15.4**	**15.4**	
Size Correction Factor, F	1.05	1.03	1.06	1.01	1.07	
Corr. Pt. Load Strength Index,$I_{S(50)}$, Mpa	0.09	0.09	0.11	0.11	0.11	
Corr. Pt. Load Strength Index,$I_{S(50)}$, psi	**13**	**13**	**16**	**16**	**17**	
MOISTURE CONTENT DATA						
Moisture Condition of Specimen	As Received	As Received	As Received	As Received	As Received	
Pan No.						
Pan wt. (g)	22.35	22.35	22.35	22.35	22.35	
Total wet wt. (g)	250.52	250.52	250.52	250.52	250.52	
Total dry wt (g)	218.15	218.15	218.15	218.15	218.15	
Moisture Content, %	**16.5**	**16.5**	**16.5**	**16.5**	**16.5**	
Comments:						

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No:	823-010	**Project No.:**	5128 T.021
Client:	GRI	**Date:**	2/8/2017
Project Name:	Port of Coos Bay Channel Modification Project	**By:**	PJ

Boring:	UB-2	UB-2	UB-2	UB-2	UB-2	UB-2
Sample:	R-3	R-3	R-3	R-3	R-3	R-3
Depth, ft:	50	50	50	50	50	50
Visual Description:	Gray Rock	Gray Rock	Gray Rock	Gray Rock	Gray Rock	Gray Rock
Test Type	Diametral	Diametral	Diametral	Axial	Axial	Axial
Test Type ID	1	1	1	2	2	2
FOR ANISOTROPIC ROCK:						
Bedding Angle Relative to Axis	None	None	None	None	None	None
Loading Orientation Rel. to Bedding	N/A	N/A	N/A	N/A	N/A	N/A
SAMPLE DIMENSIONS						
Width Perpendicular to loading, W, mm	58	58	58	58	58	58
Length Perpendicular to Loading, L, mm	31	35	32			
Diameter Parallel to Loading, D, mm	58	58	58	36	28	27
Diameter at Failure, D', mm	56	57	55	35	26	25
STRENGTH DATA						
Peak Load, P, kN	0.399	0.375	0.312	0.241	0.122	0.144
Peak Load, P, lbs	89.7	84.3	70.1	54.2	27.4	32.4
Uncorr. Pt. Load Strength Index,I_S, MPa	0.123	0.113	0.098	0.093	0.064	0.078
Uncorr. Pt. Load Strength Index,I_S, psi	**17.8**	**16.5**	**14.2**	**13.5**	**9.2**	**11.3**
Size Correction Factor, F	1.06	1.06	1.06	1.01	0.94	0.93
Corr. Pt. Load Strength Index,$I_{S(50)}$, Mpa	0.13	0.12	0.10	0.09	0.06	0.07
Corr. Pt. Load Strength Index,$I_{S(50)}$, psi	**19**	**18**	**15**	**14**	**9**	**11**
MOISTURE CONTENT DATA						
Moisture Condition of Specimen	As Received	As Received	As Received	As Received	As Received	As Received
Pan No.						
Pan wt. (g)	22.34	22.34	22.34	22.34	22.34	22.34
Total wet wt. (g)	177.91	177.91	177.91	177.91	177.91	177.91
Total dry wt (g)	156.16	156.16	156.16	156.16	156.16	156.16
Moisture Content, %	**16.3**	**16.3**	**16.3**	**16.3**	**16.3**	**16.3**
Comments:						

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No: 823-010
Client: GRI
Project Name: Port of Coos Bay Channel Modification Project
Project No.: 5128 T.021
Date: 2/8/2017
By: PJ

Boring:	UB-2	UB-2	UB-2	UB-2	UB-2	UB-2
Sample:	R-4	R-4	R-4	R-4	R-4	R-4
Depth, ft:	56	56	56	56	56	56
Visual Description:	Gray Rock	Gray Rock	Gray Rock	Gray Rock	Gray Rock	Gray Rock
Test Type	Diametral	Diametral	Diametral	Axial	Axial	Axial
Test Type ID	1	1	1	2	2	2
FOR ANISOTROPIC ROCK:						
Bedding Angle Relative to Axis	None	None	None	None	None	None
Loading Orientation Rel. to Bedding	N/A	N/A	N/A	N/A	N/A	N/A
SAMPLE DIMENSIONS						
Width Perpendicular to loading, W, mm	59	59	59	59	59	59
Length Perpendicular to Loading, L, mm	31	32	30			
Diameter Parallel to Loading, D, mm	59	59	59	35	38	34
Diameter at Failure, D', mm	55	57	56	23	34	24
STRENGTH DATA						
Peak Load, P, kN	0.231	0.176	0.111	0.043	0.141	0.142
Peak Load, P, lbs	51.9	39.6	25.0	9.7	31.7	31.9
Uncorr. Pt. Load Strength Index,I_S, MPa	0.071	0.052	0.034	0.025	0.055	0.079
Uncorr. Pt. Load Strength Index,I_S, psi	**10.3**	**7.6**	**4.9**	**3.6**	**8.0**	**11.4**
Size Correction Factor, F	1.06	1.07	1.06	0.92	1.00	0.93
Corr. Pt. Load Strength Index,$I_{S(50)}$, Mpa	0.08	0.06	0.04	0.02	0.06	0.07
Corr. Pt. Load Strength Index,$I_{S(50)}$, psi	**11**	**8**	**5**	**3**	**8**	**11**
MOISTURE CONTENT DATA						
Moisture Condition of Specimen	As Received	As Received	As Received	As Received	As Received	As Received
Pan No.						
Pan wt. (g)	20.71	20.71	20.71	20.71	20.71	20.71
Total wet wt. (g)	182.38	182.38	182.38	182.38	182.38	182.38
Total dry wt (g)	156.25	156.25	156.25	156.25	156.25	156.25
Moisture Content, %	**19.3**	**19.3**	**19.3**	**19.3**	**19.3**	**19.3**
Comments:						

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No: 823-010
Client: GRI
Project Name: Port of Coos Bay Channel Modification Project
Project No.: 5128 T.021
Date: 2/8/2017
By: PJ

Boring:	UB-2	UB-2	UB-2	UB-2	UB-2	UB-2
Sample:	R-5	R-5	R-5	R-5	R-5	R-5
Depth, ft:	63	63	63	63	63	63
Visual Description:	Gray Rock	Gray Rock	Gray Rock	Gray Rock	Gray Rock	Gray Rock
Test Type	Diametral	Diametral	Diametral	Diametral	Axial	Axial
Test Type ID	1	1	1	1	2	2
FOR ANISOTROPIC ROCK:						
Bedding Angle Relative to Axis	None	None	None	None	None	None
Loading Orientation Rel. to Bedding	N/A	N/A	N/A	N/A	N/A	N/A
SAMPLE DIMENSIONS						
Width Perpendicular to loading, W, mm	60	60	60	60	60	60
Length Perpendicular to Loading, L, mm	30	30	32	31		
Diameter Parallel to Loading, D, mm	60	60	60	60	36	34
Diameter at Failure, D', mm	57	55	56	56	35	30
STRENGTH DATA						
Peak Load, P, kN	0.136	0.156	0.157	0.25	0.141	0.188
Peak Load, P, lbs	30.6	35.1	35.3	56.2	31.7	42.3
Uncorr. Pt. Load Strength Index, I_S, MPa	0.040	0.047	0.047	0.074	0.053	0.082
Uncorr. Pt. Load Strength Index, I_S, psi	**5.8**	**6.9**	**6.8**	**10.8**	**7.6**	**11.9**
Size Correction Factor, F	1.07	1.06	1.07	1.07	1.02	0.98
Corr. Pt. Load Strength Index, $I_{S(50)}$, Mpa	0.04	0.05	0.05	0.08	0.05	0.08
Corr. Pt. Load Strength Index, $I_{S(50)}$, psi	**6**	**7**	**7**	**12**	**8**	**12**
MOISTURE CONTENT DATA						
Moisture Condition of Specimen	As Received	As Received	As Received	As Received	As Received	As Received
Pan No.						
Pan wt. (g)	22.28	22.28	22.28	22.28	22.28	22.28
Total wet wt. (g)	218.44	218.44	218.44	218.44	218.44	218.44
Total dry wt (g)	190.18	190.18	190.18	190.18	190.18	190.18
Moisture Content, %	**16.8**	**16.8**	**16.8**	**16.8**	**16.8**	**16.8**
Comments:						Invalid Test. Did not fail through both loading points.

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No: 823-010
Client: GRI
Project Name: Port of Coos Bay Channel Modification Project
Project No.: 5128 T.021
Date: 2/8/2017
By: PJ

Boring:	UB-2	UB-2	UB-2	UB-2	UB-2	
Sample:	R-6	R-6	R-6	R-6	R-6	
Depth, ft:	65	65	65	65	65	
Visual Description:	Gray Rock	Gray Rock	Gray Rock	Gray Rock	Gray Rock	
Test Type	Diametral	Diametral	Axial	Axial	Axial	
Test Type ID	1	1	2	2	2	
FOR ANISOTROPIC ROCK:						
Bedding Angle Relative to Axis	None	None	None	None	None	
Loading Orientation Rel. to Bedding	N/A	N/A	N/A	N/A	N/A	
SAMPLE DIMENSIONS						
Width Perpendicular to loading, W, mm	59	59	59	59	59	
Length Perpendicular to Loading, L, mm	34	30				
Diameter Parallel to Loading, D, mm	59	59	35	34	25	
Diameter at Failure, D', mm	55	54	46	36	25	
STRENGTH DATA						
Peak Load, P, kN	0.331	0.247	0.335	0.142	0.97	
Peak Load, P, lbs	74.4	55.5	75.3	31.9	218.1	
Uncorr. Pt. Load Strength Index,I_S, MPa	0.102	0.078	0.097	0.053	0.516	
Uncorr. Pt. Load Strength Index,I_S, psi	**14.8**	**11.2**	**14.1**	**7.6**	**74.9**	
Size Correction Factor, F	1.06	1.06	1.08	1.02	0.94	
Corr. Pt. Load Strength Index,$I_{S(50)}$, Mpa	0.11	0.08	0.10	0.05	0.48	
Corr. Pt. Load Strength Index,$I_{S(50)}$, psi	**16**	**12**	**15**	**8**	**70**	
MOISTURE CONTENT DATA						
Moisture Condition of Specimen	As Received	As Received	As Received	As Received	As Received	
Pan No.						
Pan wt. (g)	20.28	20.28	20.28	20.28	20.28	
Total wet wt. (g)	193.73	193.73	193.73	193.73	193.73	
Total dry wt (g)	168.35	168.35	168.35	168.35	168.35	
Moisture Content, %	**17.1**	**17.1**	**17.1**	**17.1**	**17.1**	
Comments:				Invalid Test. Did not fail through both loading points.		

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No: 823-010
Client: GRI
Project Name: Port of Coos Bay Channel Modification Project
Project No.: 5128 T.021
Date: 2/8/2017
By: PJ

Boring:	UB-2	UB-2	UB-2	UB-2	UB-2	
Sample:	R-7	R-7	R-7	R-7	R-7	
Depth, ft:	72	72	72	72	72	
Visual Description:	Gray Rock	Gray Rock	Gray Rock	Gray Rock	Gray Rock	
Test Type	Diametral	Diametral	Diametral	Diametral	Diametral	
Test Type ID	1	1	1	1	1	
FOR ANISOTROPIC ROCK:						
Bedding Angle Relative to Axis	None	None	None	None	None	
Loading Orientation Rel. to Bedding	N/A	N/A	N/A	N/A	N/A	
SAMPLE DIMENSIONS						
Width Perpendicular to loading, W, mm	58	58	58	58	58	
Length Perpendicular to Loading, L, mm	30	30	30	30	30	
Diameter Parallel to Loading, D, mm	58	58	58	58	58	
Diameter at Failure, D', mm	56	57	56	57	56	
STRENGTH DATA						
Peak Load, P, kN	0.672	0.612	0.725	0.691	0.563	
Peak Load, P, lbs	151.1	137.6	163.0	155.3	126.6	
Uncorr. Pt. Load Strength Index,I_S, MPa	0.207	0.185	0.223	0.209	0.173	
Uncorr. Pt. Load Strength Index,I_S, psi	**30.0**	**26.8**	**32.4**	**30.3**	**25.1**	
Size Correction Factor, F	1.06	1.06	1.06	1.06	1.06	
Corr. Pt. Load Strength Index,$I_{S(50)}$, Mpa	0.22	0.20	0.24	0.22	0.18	
Corr. Pt. Load Strength Index,$I_{S(50)}$, psi	**32**	**29**	**34**	**32**	**27**	
MOISTURE CONTENT DATA						
Moisture Condition of Specimen	As Received	As Received	As Received	As Received	As Received	
Pan No.						
Pan wt. (g)	22.1	22.1	22.1	22.1	22.1	
Total wet wt. (g)	185.7	185.7	185.7	185.7	185.7	
Total dry wt (g)	163.77	163.77	163.77	163.77	163.77	
Moisture Content, %	**15.5**	**15.5**	**15.5**	**15.5**	**15.5**	
Comments:						

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No: 823-010
Project No.: 5128 T.021
Client: GRI
Date: 2/8/2017
Project Name: Port of Coos Bay Channel Modification Project
By: PJ

Boring:	UB-3	UB-3	UB-3	UB-3	UB-3	
Sample:	R-1	R-1	R-1	R-1	R-1	
Depth, ft:	30.3	30.3	30.3	30.3	30.3	
Visual Description:	Gray Rock	Gray Rock	Gray Rock	Gray Rock	Gray Rock	
Test Type	Diametral	Diametral	Axial	Axial	Axial	
Test Type ID	1	1	2	2	2	
FOR ANISOTROPIC ROCK:						
Bedding Angle Relative to Axis	None	None	None	None	None	
Loading Orientation Rel. to Bedding	N/A	N/A	N/A	N/A	N/A	
SAMPLE DIMENSIONS						
Width Perpendicular to loading, W, mm	58	58	58	58	58	
Length Perpendicular to Loading, L, mm	30	30				
Diameter Parallel to Loading, D, mm	58	58	40	36	31	
Diameter at Failure, D', mm	56	56	41	37	30	
STRENGTH DATA						
Peak Load, P, kN	0.372	0.319	0.187	0.126	0.114	
Peak Load, P, lbs	83.6	71.7	42.0	28.3	25.6	
Uncorr. Pt. Load Strength Index,I_S, MPa	0.115	0.098	0.062	0.046	0.051	
Uncorr. Pt. Load Strength Index,I_S, psi	**16.6**	**14.2**	**9.0**	**6.7**	**7.5**	
Size Correction Factor, F	1.06	1.06	1.04	1.02	0.97	
Corr. Pt. Load Strength Index,$I_{S(50)}$, Mpa	0.12	0.10	0.06	0.05	0.05	
Corr. Pt. Load Strength Index,$I_{S(50)}$, psi	**18**	**15**	**9**	**7**	**7**	
MOISTURE CONTENT DATA						
Moisture Condition of Specimen	As Received	As Received	As Received	As Received	As Received	
Pan No.						
Pan wt. (g)	20.38	20.38	20.38	20.38	20.38	
Total wet wt. (g)	204.6	204.6	204.6	204.6	204.6	
Total dry wt (g)	176.28	176.28	176.28	176.28	176.28	
Moisture Content, %	**18.2**	**18.2**	**18.2**	**18.2**	**18.2**	
Comments:						

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No: 823-010
Client: GRI
Project Name: Port of Coos Bay Channel Modification Project
Project No.: 5128 T.021
Date: 2/8/2017
By: PJ

Boring:	UB-3	UB-3	UB-3	UB-3	UB-3	
Sample:	R-2	R-2	R-2	R-2	R-2	
Depth, ft:	35	35	35	35	35	
Visual Description:	Gray Rock	Gray Rock	Gray Rock	Gray Rock	Gray Rock	
Test Type	Diametral	Axial	Axial	Axial	Axial	
Test Type ID	1	2	2	2	2	
FOR ANISOTROPIC ROCK:						
Bedding Angle Relative to Axis	None	None	None	None	None	
Loading Orientation Rel. to Bedding	N/A	N/A	N/A	N/A	N/A	
SAMPLE DIMENSIONS						
Width Perpendicular to loading, W, mm	55	55	55	55	55	
Length Perpendicular to Loading, L, mm	32					
Diameter Parallel to Loading, D, mm	55	37	34	36	26	
Diameter at Failure, D', mm	50	40	36	38	24	
STRENGTH DATA						
Peak Load, P, kN	0.254	0.254	0.238	0.241	0.059	
Peak Load, P, lbs	57.1	57.1	53.5	54.2	13.3	
Uncorr. Pt. Load Strength Index,I_S, MPa	0.092	0.091	0.094	0.091	0.035	
Uncorr. Pt. Load Strength Index,I_S, psi	**13.4**	**13.2**	**13.7**	**13.1**	**5.1**	
Size Correction Factor, F	1.02	1.03	1.00	1.01	0.91	
Corr. Pt. Load Strength Index,$I_{S(50)}$, Mpa	0.09	0.09	0.09	0.09	0.03	
Corr. Pt. Load Strength Index,$I_{S(50)}$, psi	**14**	**13**	**14**	**13**	**5**	
MOISTURE CONTENT DATA						
Moisture Condition of Specimen	As Received	As Received	As Received	As Received	As Received	
Pan No.						
Pan wt. (g)	22.25	22.25	22.25	22.25	22.25	
Total wet wt. (g)	162.5	162.5	162.5	162.5	162.5	
Total dry wt (g)	141.78	141.78	141.78	141.78	141.78	
Moisture Content, %	**17.3**	**17.3**	**17.3**	**17.3**	**17.3**	
Comments:						

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No: 823-010
Project No.: 5128 T.021
Client: GRI
Date: 2/8/2017
Project Name: Port of Coos Bay Channel Modification Project
By: PJ

Boring:	UB-3	UB-3	UB-3	UB-3	UB-3	UB-3
Sample:	R-3	R-3	R-3	R-3	R-3	R-3
Depth, ft:	40	40	40	40	40	40
Visual Description:	Gray Rock	Gray Rock	Gray Rock	Gray Rock	Gray Rock	Gray Rock
Test Type	Diametral	Diametral	Diametral	Axial	Axial	Axial
Test Type ID	1	1	1	2	2	2
FOR ANISOTROPIC ROCK:						
Bedding Angle Relative to Axis	None	None	None	None	None	None
Loading Orientation Rel. to Bedding	N/A	N/A	N/A	N/A	N/A	N/A
SAMPLE DIMENSIONS						
Width Perpendicular to loading, W, mm	56	56	56	56	56	56
Length Perpendicular to Loading, L, mm	30	30	30			
Diameter Parallel to Loading, D, mm	56	56	56	39	26	33
Diameter at Failure, D', mm	55	52	52	42	27	29
STRENGTH DATA						
Peak Load, P, kN	0.195	0.135	0.253	0.332	0.169	0.224
Peak Load, P, lbs	43.8	30.3	56.9	74.6	38.0	50.4
Uncorr. Pt. Load Strength Index,I_S, MPa	0.063	0.046	0.087	0.111	0.088	0.108
Uncorr. Pt. Load Strength Index,I_S, psi	**9.2**	**6.7**	**12.6**	**16.1**	**12.7**	**15.7**
Size Correction Factor, F	1.05	1.03	1.03	1.04	0.94	0.96
Corr. Pt. Load Strength Index,$I_{S(50)}$, Mpa	0.07	0.05	0.09	0.12	0.08	0.10
Corr. Pt. Load Strength Index,$I_{S(50)}$, psi	**10**	**7**	**13**	**17**	**12**	**15**
MOISTURE CONTENT DATA						
Moisture Condition of Specimen	As Received	As Received	As Received	As Received	As Received	As Received
Pan No.						
Pan wt. (g)	19.44	19.44	19.44	19.44	19.44	19.44
Total wet wt. (g)	183.67	183.67	183.67	183.67	183.67	183.67
Total dry wt (g)	160.6	160.6	160.6	160.6	160.6	160.6
Moisture Content, %	**16.3**	**16.3**	**16.3**	**16.3**	**16.3**	**16.3**
Comments:						

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No: 823-010
Client: GRI
Project Name: Port of Coos Bay Channel Modification Project

Project No.: 5128 T.021
Date: 2/8/2017
By: PJ

Boring:	UB-3	UB-3	UB-3	UB-3	UB-3	UB-3
Sample:	R-5	R-5	R-5	R-5	R-5	R-5
Depth, ft:	51	51	51	51	51	51
Visual Description:	Gray Rock	Gray Rock	Gray Rock	Gray Rock	Gray Rock	Gray Rock
Test Type	Diametral	Diametral	Diametral	Axial	Axial	Axial
Test Type ID	1	1	1	2	2	2
FOR ANISOTROPIC ROCK:						
Bedding Angle Relative to Axis	None	None	None	None	None	None
Loading Orientation Rel. to Bedding	N/A	N/A	N/A	N/A	N/A	N/A
SAMPLE DIMENSIONS						
Width Perpendicular to loading, W, mm	60	60	60	60	60	60
Length Perpendicular to Loading, L, mm	30	31	31			
Diameter Parallel to Loading, D, mm	60	60	60	34	35	31
Diameter at Failure, D', mm	56	55	58	28	29	26
STRENGTH DATA						
Peak Load, P, kN	0.103	0.513	0.153	0.142	0.236	0.285
Peak Load, P, lbs	23.2	115.3	34.4	31.9	53.1	64.1
Uncorr. Pt. Load Strength Index,I_S, MPa	0.031	0.155	0.044	0.066	0.107	0.143
Uncorr. Pt. Load Strength Index,I_S, psi	**4.4**	**22.5**	**6.4**	**9.6**	**15.5**	**20.8**
Size Correction Factor, F	1.07	1.06	1.08	0.97	0.97	0.95
Corr. Pt. Load Strength Index,$I_{S(50)}$, Mpa	0.03	0.17	0.05	0.06	0.10	0.14
Corr. Pt. Load Strength Index,$I_{S(50)}$, psi	**5**	**24**	**7**	**9**	**15**	**20**
MOISTURE CONTENT DATA						
Moisture Condition of Specimen	As Received	As Received	As Received	As Received	As Received	As Received
Pan No.						
Pan wt. (g)	22.37	22.37	22.37	22.37	22.37	22.37
Total wet wt. (g)	196.92	196.92	196.92	196.92	196.92	196.92
Total dry wt (g)	170.39	170.39	170.39	170.39	170.39	170.39
Moisture Content, %	**17.9**	**17.9**	**17.9**	**17.9**	**17.9**	**17.9**
Comments:						

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No: 823-010
Client: GRI
Project Name: Port of Coos Bay Channel Modification Project
Project No.: 5128 T.021
Date: 2/8/2017
By: PJ

Boring:	UB-3	UB-3	UB-3	UB-3	UB-3	UB-3
Sample:	R-6	R-6	R-6	R-6	R-6	R-6
Depth, ft:	55	55	55	55	55	55
Visual Description:	Gray Rock	Gray Rock	Gray Rock	Gray Rock	Gray Rock	Gray Rock
Test Type	Diametral	Axial	Axial	Diametral	Diametral	Axial
Test Type ID	1	2	2	1	1	2
FOR ANISOTROPIC ROCK:						
Bedding Angle Relative to Axis	None	None	None	None	None	None
Loading Orientation Rel. to Bedding	N/A	N/A	N/A	N/A	N/A	N/A
SAMPLE DIMENSIONS						
Width Perpendicular to loading, W, mm	58	58	58	56	56	56
Length Perpendicular to Loading, L, mm	34			30	31	
Diameter Parallel to Loading, D, mm	58	40	38	56	56	27
Diameter at Failure, D', mm	55	34	36	54	54	26
STRENGTH DATA						
Peak Load, P, kN	0.413	0.232	0.266	0.366	0.341	0.141
Peak Load, P, lbs	92.8	52.2	59.8	82.3	76.7	31.7
Uncorr. Pt. Load Strength Index,I_S, MPa	0.129	0.092	0.100	0.121	0.113	0.076
Uncorr. Pt. Load Strength Index,I_S, psi	**18.8**	**13.4**	**14.5**	**17.6**	**16.4**	**11.0**
Size Correction Factor, F	1.06	1.00	1.01	1.04	1.04	0.93
Corr. Pt. Load Strength Index,$I_{S(50)}$, Mpa	0.14	0.09	0.10	0.13	0.12	0.07
Corr. Pt. Load Strength Index,$I_{S(50)}$, psi	**20**	**13**	**15**	**18**	**17**	**10**
MOISTURE CONTENT DATA						
Moisture Condition of Specimen	As Received	As Received	As Received	As Received	As Received	As Received
Pan No.						
Pan wt. (g)	20.51	20.51	20.51	20.51	20.51	20.51
Total wet wt. (g)	170.69	170.69	170.69	170.69	170.69	170.69
Total dry wt (g)	152	152	152	152	152	152
Moisture Content, %	**14.2**	**14.2**	**14.2**	**14.2**	**14.2**	**14.2**
Comments:			Invalid Test. Did not fail through both loading points.			

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No: 823-010
Client: GRI
Project Name: Port of Coos Bay Channel Modification Project

Project No.: 5128 T.021
Date: 2/8/2017
By: PJ

Boring:	UB-3	UB-3	UB-3	UB-3	UB-3	UB-3
Sample:	R-7	R-7	R-7	R-7	R-7	R-7
Depth, ft:	62	62	62	62	62	62
Visual Description:	Gray Rock	Gray Rock	Gray Rock	Gray Rock	Gray Rock	Gray Rock
Test Type	Diametral	Diametral	Diametral	Axial	Axial	Axial
Test Type ID	1	1	1	2	2	2

FOR ANISOTROPIC ROCK:

Bedding Angle Relative to Axis	None	None	None	None	None	None
Loading Orientation Rel. to Bedding	N/A	N/A	N/A	N/A	N/A	N/A

SAMPLE DIMENSIONS

Width Perpendicular to loading, W, mm	57	57	57	57	57	57
Length Perpendicular to Loading, L, mm	30	30	30			
Diameter Parallel to Loading, D, mm	57	57	57	44	33	30
Diameter at Failure, D', mm	55	55	56	46	29	25

STRENGTH DATA

Peak Load, P, kN	0.524	0.546	0.314	0.297	0.309	0.298
Peak Load, P, lbs	117.8	122.7	70.6	66.8	69.5	67.0
Uncorr. Pt. Load Strength Index,I_S, MPa	0.167	0.174	0.098	0.089	0.147	0.164
Uncorr. Pt. Load Strength Index,I_S, psi	**24.2**	**25.3**	**14.3**	**12.9**	**21.3**	**23.8**
Size Correction Factor, F	1.05	1.05	1.06	1.07	0.96	0.93
Corr. Pt. Load Strength Index,$I_{S(50)}$, Mpa	0.18	0.18	0.10	0.09	0.14	0.15
Corr. Pt. Load Strength Index,$I_{S(50)}$, psi	**26**	**27**	**15**	**14**	**20**	**22**

MOISTURE CONTENT DATA

Moisture Condition of Specimen	As Received	As Received	As Received	As Received	As Received	As Received
Pan No.						
Pan wt. (g)	22.28	22.28	22.28	22.28	22.28	22.28
Total wet wt. (g)	199.52	199.52	199.52	199.52	199.52	199.52
Total dry wt (g)	173.61	173.61	173.61	173.61	173.61	173.61
Moisture Content, %	**17.1**	**17.1**	**17.1**	**17.1**	**17.1**	**17.1**
Comments:						

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

POINT LOAD STRENGTH INDEX OF ROCK - ASTM D 5731

CTL Job No: 823-010
Client: GRI
Project Name: Port of Coos Bay Channel Modification Project
Project No.: 5128 T.021
Date: 2/8/2017
By: PJ

Boring:	UB-3	UB-3	UB-3	UB-3	UB-3	UB-3
Sample:	R-8	R-8	R-8	R-8	R-8	R-8
Depth, ft:	66	66	66	66	66	66
Visual Description:	Gray Rock	Gray Rock	Gray Rock	Gray Rock	Gray Rock	Gray Rock
Test Type	Diametral	Diametral	Diametral	Axial	Axial	Axial
Test Type ID	1	1	1	2	2	2
FOR ANISOTROPIC ROCK:						
Bedding Angle Relative to Axis	None	None	None	None	None	None
Loading Orientation Rel. to Bedding	N/A	N/A	N/A	N/A	N/A	N/A
SAMPLE DIMENSIONS						
Width Perpendicular to loading, W, mm	60	60	59	60	59	59
Length Perpendicular to Loading, L, mm	30	31	32			
Diameter Parallel to Loading, D, mm	60	60	59	45	26	30
Diameter at Failure, D', mm	56	55	56	43	26	24
STRENGTH DATA						
Peak Load, P, kN	0.63	0.446	0.096	0.146	0.056	0.115
Peak Load, P, lbs	141.6	100.3	21.6	32.8	12.6	25.9
Uncorr. Pt. Load Strength Index,I_S, MPa	0.188	0.135	0.029	0.044	0.029	0.064
Uncorr. Pt. Load Strength Index,I_S, psi	**27.2**	**19.6**	**4.2**	**6.4**	**4.2**	**9.3**
Size Correction Factor, F	1.07	1.06	1.06	1.06	0.95	0.93
Corr. Pt. Load Strength Index,$I_{S(50)}$, Mpa	0.20	0.14	0.03	0.05	0.03	0.06
Corr. Pt. Load Strength Index,$I_{S(50)}$, psi	**29**	**21**	**4**	**7**	**4**	**9**
MOISTURE CONTENT DATA						
Moisture Condition of Specimen	As Received	As Received	As Received	As Received	As Received	As Received
Pan No.						
Pan wt. (g)	20.55	20.55	20.55	20.55	20.55	20.55
Total wet wt. (g)	204.62	204.62	204.62	204.62	204.62	204.62
Total dry wt (g)	172.96	172.96	172.96	172.96	172.96	172.96
Moisture Content, %	**20.8**	**20.8**	**20.8**	**20.8**	**20.8**	**20.8**
Comments:				Invalid Test. Did not fail through both loading points.		

Test types: 1- Diametral, 2- Axial, 3- Block,4- Irregular Lump
Diametral - L/D ratio>1
Axial - L/D ratio 1/3 to 1
Block or Irregular Lumps, D= 30-85 mm; D/W between 1/3 and 1

POINT LOAD STRENGTH TESTING
ASTM D5731

PROJECT NAME Port of Coos Bay Channel Modification - Guano Rock

TESTING DATE December 1, 2017

PROJECT NUMBER 5128

PERFORMED BY CLJ

Exploration	DE-1	DE-1	DE-1	DE-1	DE-1	DE-1	DE-1	DE-1
Sample	1a	1b	2a	2b	3a	3b	4a	4b
Depth, ft	0-1.5	0-1.5	0-1.5	0-1.5	0-1.5	0-1.5	0-1.5	0-1.5
Visual Description	Dark Gray Sandstone	Dark Gray Sandstone	Dark Gray Sandstone	Dark Gray Sandstone	Dark Gray Sandstone	Dark Gray Sandstone	Dark Gray Sandstone	Dark Gray Sandstone
Test Type	Axial - LUMP	Axial - LUMP	Axial - LUMP	Axial - LUMP	Axial - LUMP	Axial - LUMP	Axial - LUMP	Axial - LUMP
Average Width (mm)	46.5	40	47.5	57.5	37.5	60	42.5	45
Aperture at Failure (mm)	30	38	35	27	25	32	31	22
Peak Load (lbf)	100	120	200	200	150	100	180	180
Uncorrected Point Load Strength Index, I_s (N/mm^2)	0.25	0.28	0.42	0.45	0.56	0.18	0.48	0.64
Size Correction Factor, F	0.926	0.944	0.963	0.949	0.847	0.995	0.914	0.857
Corrected Point Load Strength Index, $I_{s(50)}$ (psi)	33.63	37.76	58.72	61.92	68.65	26.26	63.28	78.97

Exploration	DE-1	DE-1	DE-1	DE-1	DE-1	DE-1	DE-1	DE-1
Sample	5a	5b	6a	6b	7a	7b	8a	8b
Depth, ft	0-1.5	0-1.5	0-1.5	0-1.5	0-1.5	0-1.5	0-1.5	0-1.5
Visual Description	Dark Gray Sandstone	Dark Gray Sandstone	Dark Gray Sandstone	Dark Gray Sandstone	Dark Gray Sandstone	Dark Gray Sandstone	Dark Gray Sandstone	Dark Gray Sandstone
Test Type	Axial - LUMP	Axial - LUMP	Axial - LUMP	Axial - LUMP	Axial - LUMP	Axial - LUMP	Axial - LUMP	Axial - LUMP
Average Width (mm)	37.5	35	27.5	30	37.5	40	65	30
Aperture at Failure (mm)	25	27	26	30	33	22	33	36
Peak Load (lbf)	160	180	200	180	240	200	180	120
Uncorrected Point Load Strength Index, I_s (N/mm^2)	0.60	0.67	0.98	0.70	0.68	0.79	0.29	0.39
Size Correction Factor, F	0.847	0.848	0.797	0.839	0.901	0.835	1.020	0.874
Corrected Point Load Strength Index, $I_{s(50)}$ (psi)	73.23	81.87	112.92	85.03	88.58	96.13	43.38	49.22

Exploration	DE-1	DE-1	DE-1	DE-1	DE-1			
Sample	9a	9b	10a	10b	10c			
Depth, ft	0-1.5	0-1.5	0-1.5	0-1.5	0-1.5			
Visual Description	Dark Gray Sandstone	Dark Gray Sandstone	Dark Gray Sandstone	Dark Gray Sandstone	Dark Gray Sandstone			
Test Type	Axial - LUMP	Axial - LUMP	Axial - LUMP	Axial - LUMP	Axial - LUMP			
Average Width (mm)	55	62.5	35	37.5	33.5			
Aperture at Failure (mm)	50	40	30	27	29			
Peak Load (lbf)	420	200	300	200	100			
Uncorrected Point Load Strength Index, I_s (N/mm^2)	0.53	0.28	1.00	0.69	0.36			
Size Correction Factor, F	1.079	1.056	0.869	0.862	0.854			
Corrected Point Load Strength Index, $I_{s(50)}$ (psi)	83.48	42.80	125.75	86.23	44.52			

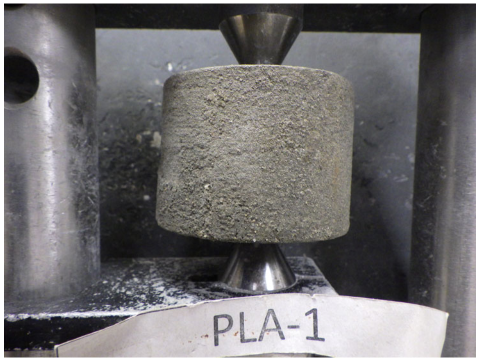
Client: Geotechnical Resources Inc.
Project: Coos Bay Channel Modification
Location: Coos Bay, OR
Project No: GTX-318386

Boring ID: B-13-23
Sample ID: R-1
Depth : 16.6-16.9'
Sample Type: cylinder
Test Date: 01/05/24
Test Id: 752796
Tested By: jss
Checked By: smd

Test Comment: ---
Visual Description: ---
Sample Comment: ---

Axial Point Load Strength Index of Rock
by ASTM D5731

Test No.	Specimen Depth	Diameter, in	Thickness, in	Failure Load (P), lbs	De, sq in	De, in	Is, psi	F	Is(50mm), psi	Generalized Correction Factor, K	Estimated Compressive Strength, psi
PLA-1	16.6-16.9 ft	2.33	1.72	286	5.10	2.26	56	1.064	60	21	1,180



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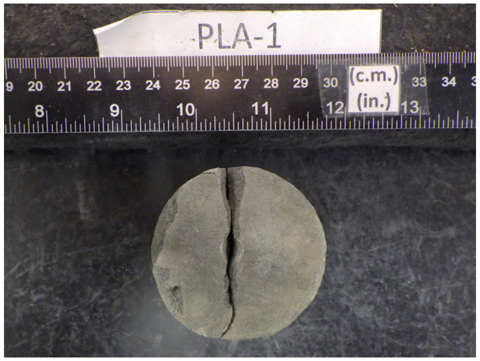


After

Intact Material Failure

Notes: Generalized correction factor, K, used to estimate the compressive strength based on the specimen depth and ASTM D5731 Table 1.
The reported thickness (L) is the average of three measurements.
The reported diameter(D) is the average of three measurements.
De = the equivalent core diameter
Is = the uncorrected point load strength index
F = the size correction factor
Is(50) = the size corrected point load strength index

GeoTesting EXPRESS

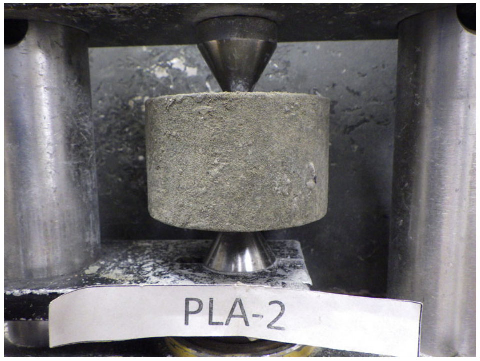
Client: Geotechnical Resources Inc.
Project: Coos Bay Channel Modification
Location: Coos Bay, OR
Project No: GTX-318386

Boring ID: B-14-23
Sample ID: R-5
Depth : 6.8-7.1'
Sample Type: cylinder
Test Date: 01/05/24
Test Id: 752797
Tested By: jss
Checked By: smd

Test Comment: ---
Visual Description: ---
Sample Comment: ---

Axial Point Load Strength Index of Rock
by ASTM D5731

Test No.	Specimen Depth	Diameter, in	Thickness, in	Failure Load (P), lbs	De, sq in	De, in	Is, psi	F	Is(50mm), psi	Generalized Correction Factor, K	Estimated Compressive Strength, psi
PLA-2	6.8-7.1 ft	2.38	1.43	182	4.34	2.08	42	1.026	43	21	882



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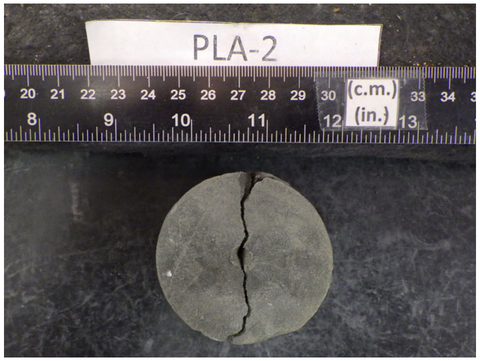


After

Intact Material Failure

Notes: Generalized correction factor, K, used to estimate the compressive strength based on the specimen depth and ASTM D5731 Table 1.
The reported thickness (L) is the average of three measurements.
The reported diameter(D) is the average of three measurements.
De = the equivalent core diameter
Is = the uncorrected point load strength index
F = the size correction factor
Is(50) = the size corrected point load strength index

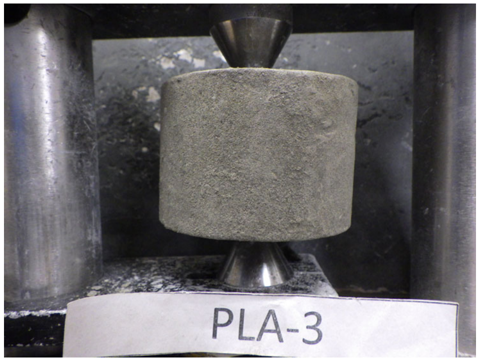
Client: Geotechnical Resources Inc.
Project: Coos Bay Channel Modification
Location: Coos Bay, OR
Project No: GTX-318386

Boring ID: B-14-23
Sample ID: R-7
Depth : 17.8-18.3'
Sample Type: cylinder
Test Date: 01/05/24
Test Id: 752798
Tested By: jss
Checked By: smd

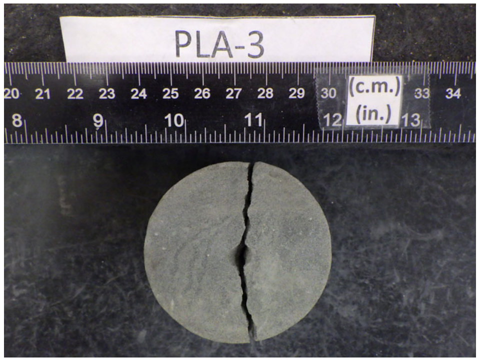
Test Comment: ---
Visual Description: ---
Sample Comment: ---

Axial Point Load Strength Index of Rock
by ASTM D5731

Test No.	Specimen Depth	Diameter, in	Thickness, in	Failure Load (P), lbs	De, sq in	De, in	Is, psi	F	Is(50mm), psi	Generalized Correction Factor, K	Estimated Compressive Strength, psi
PLA-3	17.8-18.3 ft	2.36	1.66	384	4.97	2.23	77	1.058	82	21	1,620



Before



After

Intact Material Failure

Notes: Generalized correction factor, K, used to estimate the compressive strength based on the specimen depth and ASTM D5731 Table 1.
The reported thickness (L) is the average of three measurements.
The reported diameter(D) is the average of three measurements.
De = the equivalent core diameter
Is = the uncorrected point load strength index
F = the size correction factor
Is(50) = the size corrected point load strength index

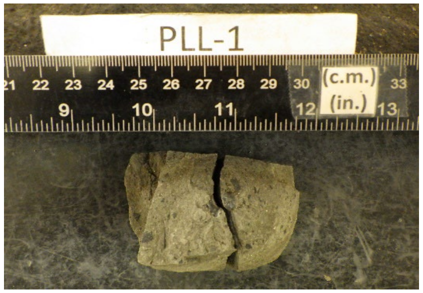
Client:	Geotechnical Resources, Inc.	Test Date:	01/17/24
Project Name:	Coos Bay Channel Modification	Tested By:	jss
Project Location	Coos Bay, OR	Checked By:	smd
GTX #:	318386	Sample Type:	rock core

Point Load Strength Index of Rock by ASTM D5731

Boring No.	Sample No.	Depth, ft.	Test No.	Test Type	Width (W), in.	Depth (D), in.	Area, in^2	Failure Load (P), lb	D_e^2, in^2	D_e, in.	I_s, psi	F	$I_{s(50)}$, psi	Generalized Correction Factor, K	Estimated Compressive Strength, psi
B-4-23	R-2	31.9-32.3	PLL-1	Irregular Lump	1.65	1.30	1.61	423	2.05	1.43	206	0.867	178	19	3,910

PLL-1
before

PLL-1
after



Intact Material Failure

Notes: Generalized correction factor, K, used to estimate the compressive strength based on the specimen depth and ASTM D 5731 Table 1.

D_e = the equivalent core diameter

I_s = the uncorrected point load strength index

F = the size correction factor

$I_{s(50)}$ = the size corrected point load strength index

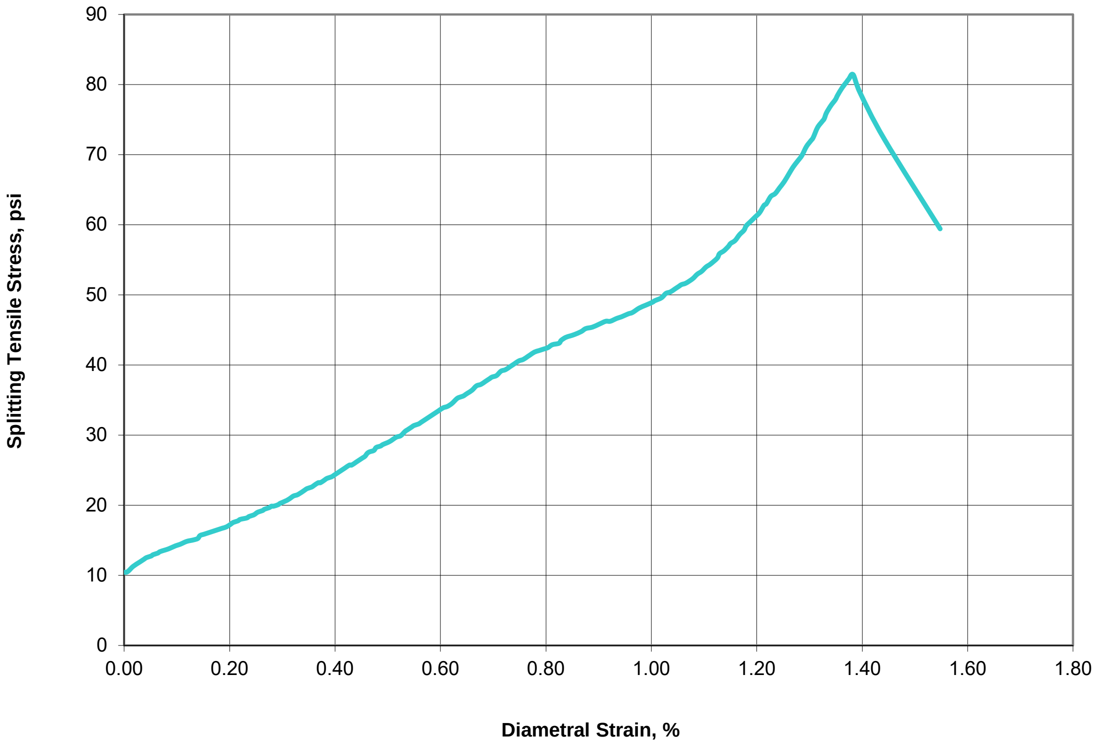
COOPER TESTING LABORATORY

Splitting Tensile Strength of Intact Rock Core Specimens (ASTM D3967)

CTL Job No.: 823-008P1
Boring: B-15
Date: 9/28/2016
Client: GRI
Sample: R-2
By: PJ
Project Name: Port of Coos Bay Channel Modification
Depth,ft.: 5.5
Checked: DC
Project No.: 5128
Visual Description: Gray Rock
Approx. Size of Largest Mineral Grain, in:
Bedding Angle Relative to Axis:
Loading Orientation Rel. to Bedding:
Moisture Condition at Test Sample was washed and in a moist state.
Test Temperature, (^{o}C) Ambient
Bearing Strips: Cardboard
Remarks:

Sample Thickness, in.	1.29	**Splitting Tensile Strength, psi**	**81**
Sample Diameter, in.	2.36		
Thickness / Diameter	0.5		
Sample Cross-Sectional Area, in^2	4.39		
Wet Density, pcf	137.3		
Dry Density, pcf	120.9		
Moisture Content, %	13.5		
Loading Rate, lb / min	260		

Stress-Strain



Splitting Tensile Strength of Intact Rock Core Specimens (ASTM D3967)

CTL Job No.: 823-008P2 Boring: B-15 Date: 9/28/2016

Client: GRI Sample: R-4 By: PJ

Project Name: Port of Coos Bay Channel Modification Depth,ft.: 15.5 Checked: DC

Project No.: 5128

Visual Description: Gray Rock

Approx. Size of Largest Mineral Grain, in:

Bedding Angle Relative to Axis:

Loading Orientation Rel. to Bedding:

Moisture Condition at Test Sample was washed and in a moist state.

Test Temperature, (°C) Ambient

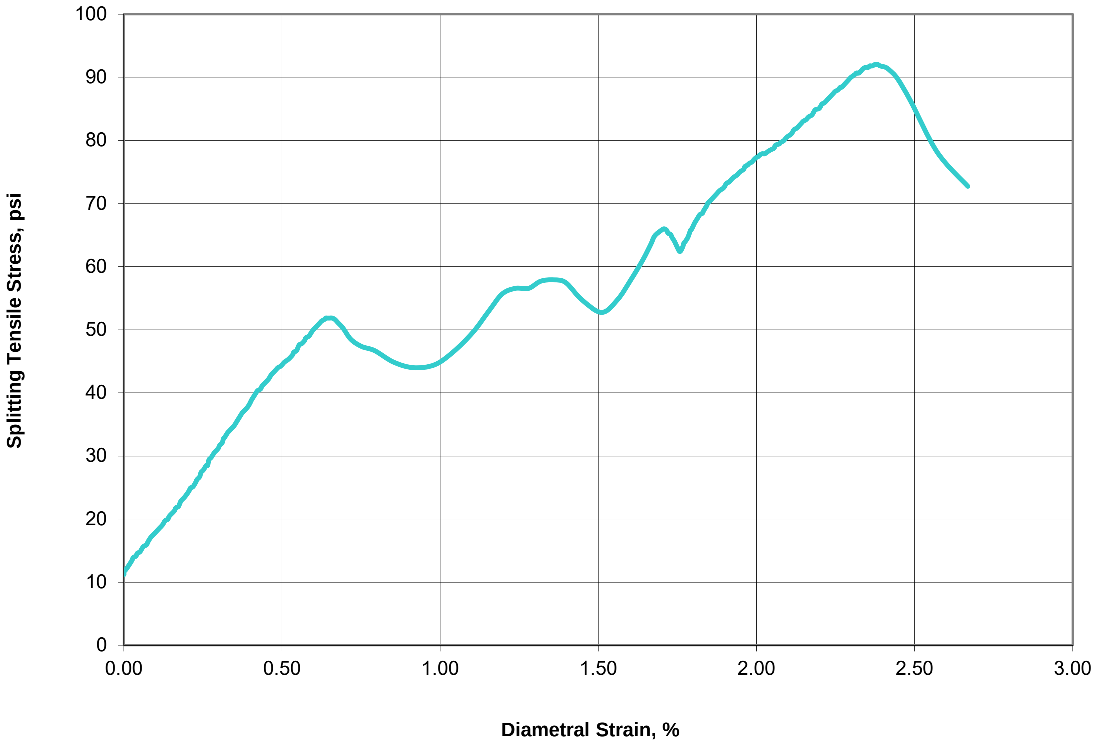
Bearing Strips: Cardboard

Remarks:

Sample Thickness, in.	1.19
Sample Diameter, in.	2.38
Thickness / Diameter	0.5
Sample Cross-Sectional Area, in^2	4.46
Wet Density, pcf	137.9
Dry Density, pcf	122.9
Moisture Content, %	12.1
Loading Rate, lb / min	280

Splitting Tensile Strength, psi **92**

Stress-Strain



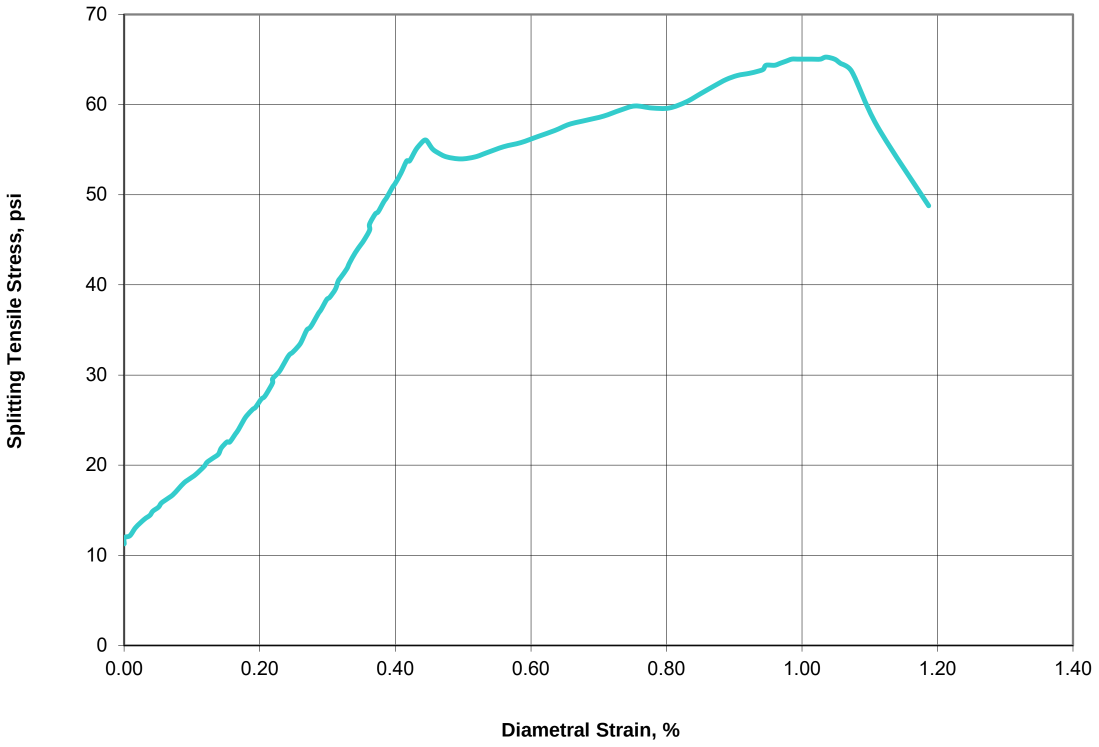
COOPER TESTING LABORATORY

Splitting Tensile Strength of Intact Rock Core Specimens (ASTM D3967)

CTL Job No.: 823-008P3
Boring: B-15
Date: 9/28/2016
Client: GRI
Sample: R-5
By: PJ
Project Name: Port of Coos Bay Channel Modification
Depth,ft.: 22.5
Checked: DC
Project No.: 5128
Visual Description: Dark Gray Rock
Approx. Size of Largest Mineral Grain, in:
Bedding Angle Relative to Axis:
Loading Orientation Rel. to Bedding:
Moisture Condition at Test Sample was washed and in a moist state.
Test Temperature, (^{o}C) Ambient
Bearing Strips: Cardboard
Remarks:

Sample Thickness, in.	1.19	**Splitting Tensile Strength, psi**	**65**
Sample Diameter, in.	2.38		
Thickness / Diameter	0.5		
Sample Cross-Sectional Area, in^2	4.43		
Wet Density, pcf	137.2		
Dry Density, pcf	124.4		
Moisture Content, %	10.3		
Loading Rate, lb / min	280		

Stress-Strain



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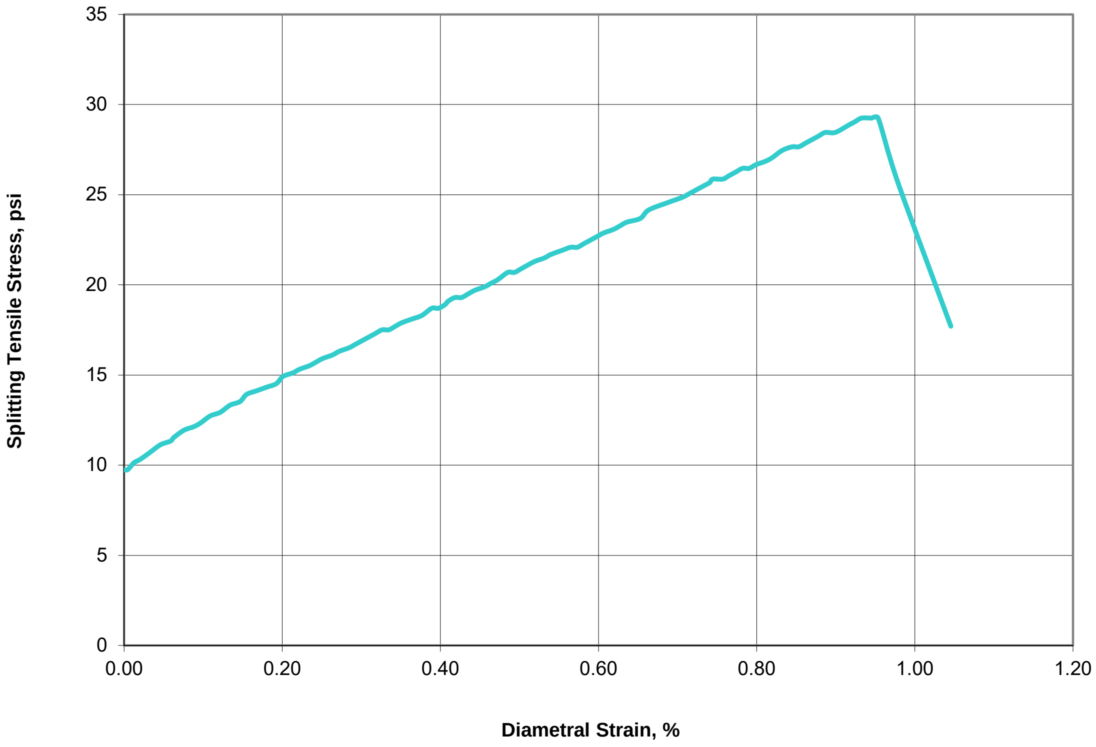
Splitting Tensile Strength of Intact Rock Core Specimens (ASTM D3967)

CTL Job No.: 823-008Q3
Boring: B-21
Date: 9/28/2016
Client: GRI
Sample: R-7
By: PJ
Project Name: Port of Coos Bay Channel Modification
Depth,ft.: 20.5
Checked: DC
Project No.: 5128
Visual Description: Very Dark Brown Rock
Approx. Size of Largest Mineral Grain, in:
Bedding Angle Relative to Axis:
Loading Orientation Rel. to Bedding:
Moisture Condition at Test Sample was washed and in a moist state.
Test Temperature, (^{o}C) Ambient
Bearing Strips: Cardboard
Remarks:

Sample Thickness, in.	1.34	**Splitting Tensile Strength, psi**	**29**
Sample Diameter, in.	2.39		
Thickness / Diameter	0.6		
Sample Cross-Sectional Area, in^2	4.49		
Wet Density, pcf	117.2		
Dry Density, pcf	91.6		
Moisture Content, %	27.9		
Loading Rate, lb / min	250		

Stress-Strain



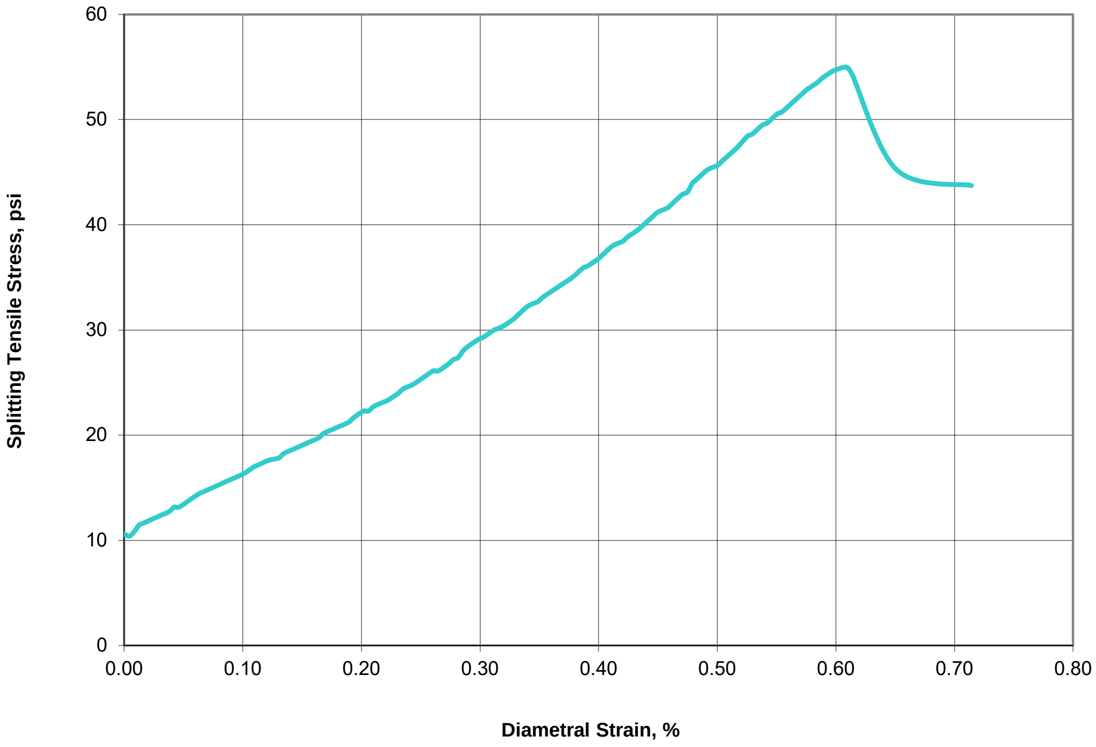
Splitting Tensile Strength of Intact Rock Core Specimens (ASTM D3967)

CTL Job No.: 823-008S1
Boring: B-23
Date: 9/28/2016
Client: GRI
Sample: R-3
By: PJ
Project Name: Port of Coos Bay Channel Modification
Depth,ft.: 9.5
Checked: DC
Project No.: 5128
Visual Description: Very Dark Brown Rock
Approx. Size of Largest Mineral Grain, in:
Bedding Angle Relative to Axis:
Loading Orientation Rel. to Bedding:
Moisture Condition at Test: Sample was washed and in a moist state.
Test Temperature, (°C): Ambient
Bearing Strips: Cardboard
Remarks:

Sample Thickness, in.	1.26
Sample Diameter, in.	2.38
Thickness / Diameter	0.5
Sample Cross-Sectional Area, in^2	4.45
Wet Density, pcf	122.7
Dry Density, pcf	97.8
Moisture Content, %	25.4
Loading Rate, lb / min	270

Splitting Tensile Strength, psi **55**

Stress-Strain



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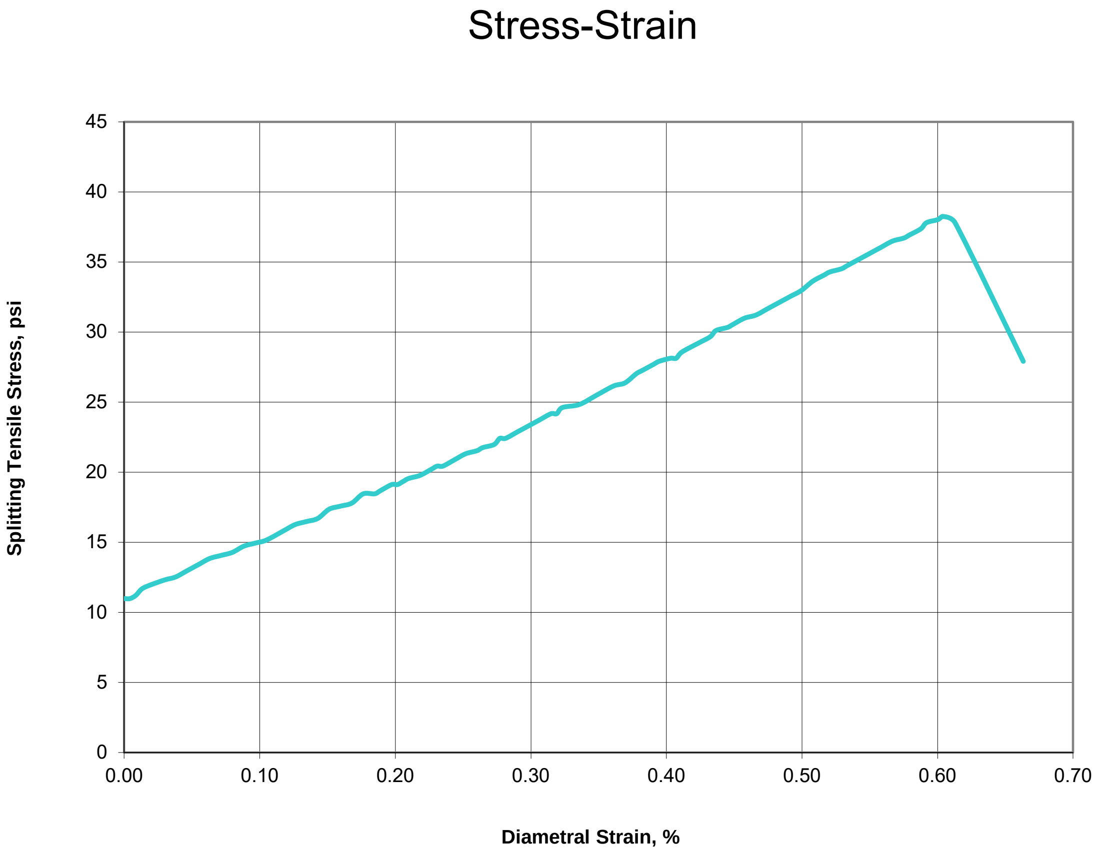
Splitting Tensile Strength of Intact Rock Core Specimens (ASTM D3967)

CTL Job No.: 823-008S2
Boring: B-24
Date: 9/28/2016
Client: GRI
Sample: R-1
By: PJ
Project Name: Port of Coos Bay Channel Modification
Depth,ft.: 4
Checked: DC
Project No.: 5128
Visual Description: Very Dark Bluish Gray Rock
Approx. Size of Largest Mineral Grain, in:
Bedding Angle Relative to Axis:
Loading Orientation Rel. to Bedding:
Moisture Condition at Test Sample was washed and in a moist state.
Test Temperature, (^{o}C) Ambient
Bearing Strips: Cardboard
Remarks:

Sample Thickness, in.	1.22
Sample Diameter, in.	2.38
Thickness / Diameter	0.5
Sample Cross-Sectional Area, in^2	4.46
Wet Density, pcf	136.0
Dry Density, pcf	117.1
Moisture Content, %	16.1
Loading Rate, lb / min	280

Splitting Tensile Strength, psi **38**



Splitting Tensile Strength of Intact Rock Core Specimens (ASTM D3967)

CTL Job No.:	823-008S3	Boring:	B-24	Date:	9/28/2016
Client:	GRI	Sample:	R-4	By:	PJ
Project Name:	Port of Coos Bay Channel Modification	Depth,ft.:	18.75	Checked:	DC
Project No.:	5128				

Visual Description: Very Dark Bluish Gray Rock

Approx. Size of Largest Mineral Grain, in:

Bedding Angle Relative to Axis:

Loading Orientation Rel. to Bedding:

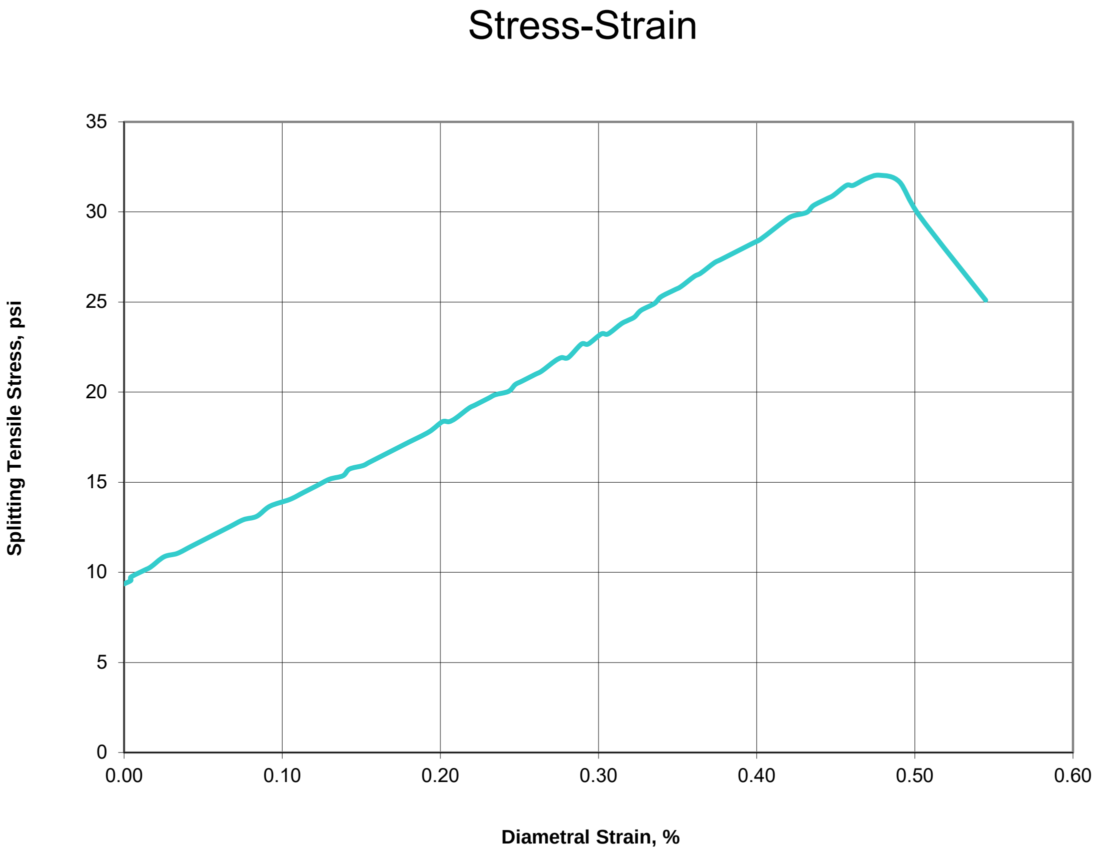
Moisture Condition at Test: Sample was washed and in a moist state.

Test Temperature, (^{o}C): Ambient

Bearing Strips: Cardboard

Remarks:

Sample Thickness, in.	1.42	**Splitting Tensile Strength, psi**	**32**
Sample Diameter, in.	2.39		
Thickness / Diameter	0.6		
Sample Cross-Sectional Area, in^2	4.47		
Wet Density, pcf	139.5		
Dry Density, pcf	123.6		
Moisture Content, %	12.9		
Loading Rate, lb / min	240		



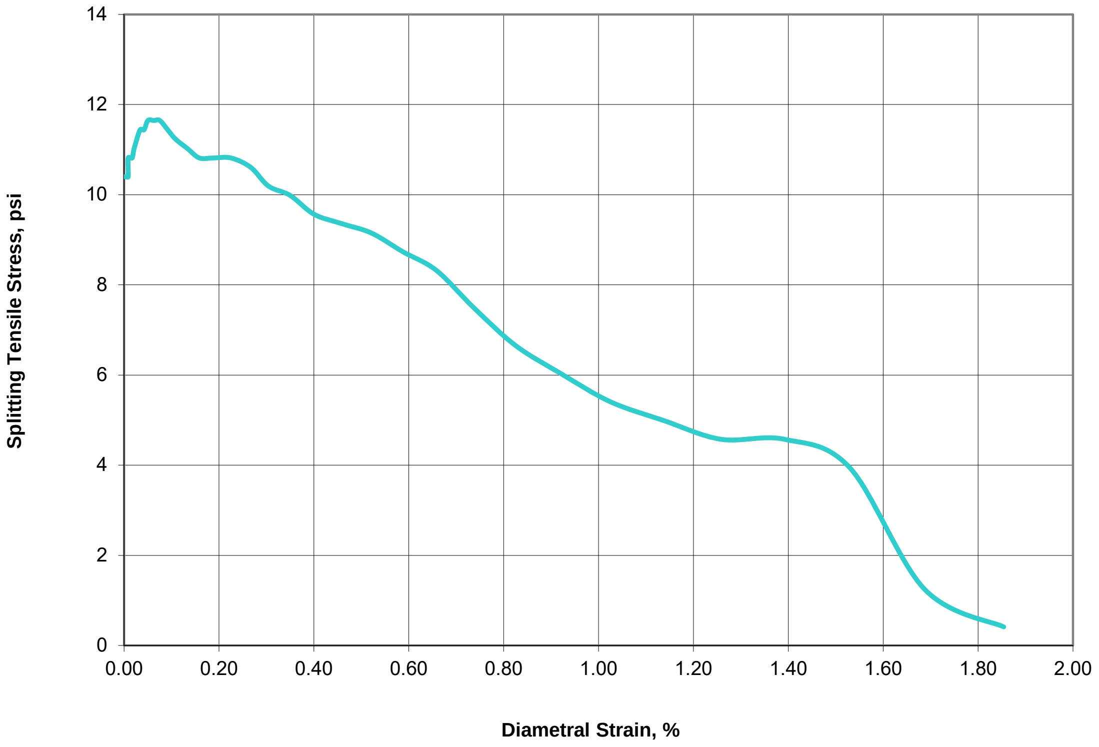
COOPER TESTING LABORATORY

Splitting Tensile Strength of Intact Rock Core Specimens (ASTM D3967)

CTL Job No.: 823-008S4
Boring: B-24
Date: 9/28/2016
Client: GRI
Sample: R-5
By: PJ
Project Name: Port of Coos Bay Channel Modification
Depth,ft.: 24
Checked: DC
Project No.: 5128
Visual Description: Very Dark Bluish Gray Rock
Approx. Size of Largest Mineral Grain, in:
Bedding Angle Relative to Axis:
Loading Orientation Rel. to Bedding:
Moisture Condition at Test Sample was washed and in a moist state.
Test Temperature, (^{o}C) Ambient
Bearing Strips: Cardboard
Remarks: This specimen was so weak that the seating load was very close to the peak load.

Sample Thickness, in.	1.28	**Splitting Tensile Strength, psi**	**12**
Sample Diameter, in.	2.40		
Thickness / Diameter	0.5		
Sample Cross-Sectional Area, in^2	4.53		
Wet Density, pcf	134.7		
Dry Density, pcf	117.0		
Moisture Content, %	15.1		
Loading Rate, lb / min	260		

Stress-Strain



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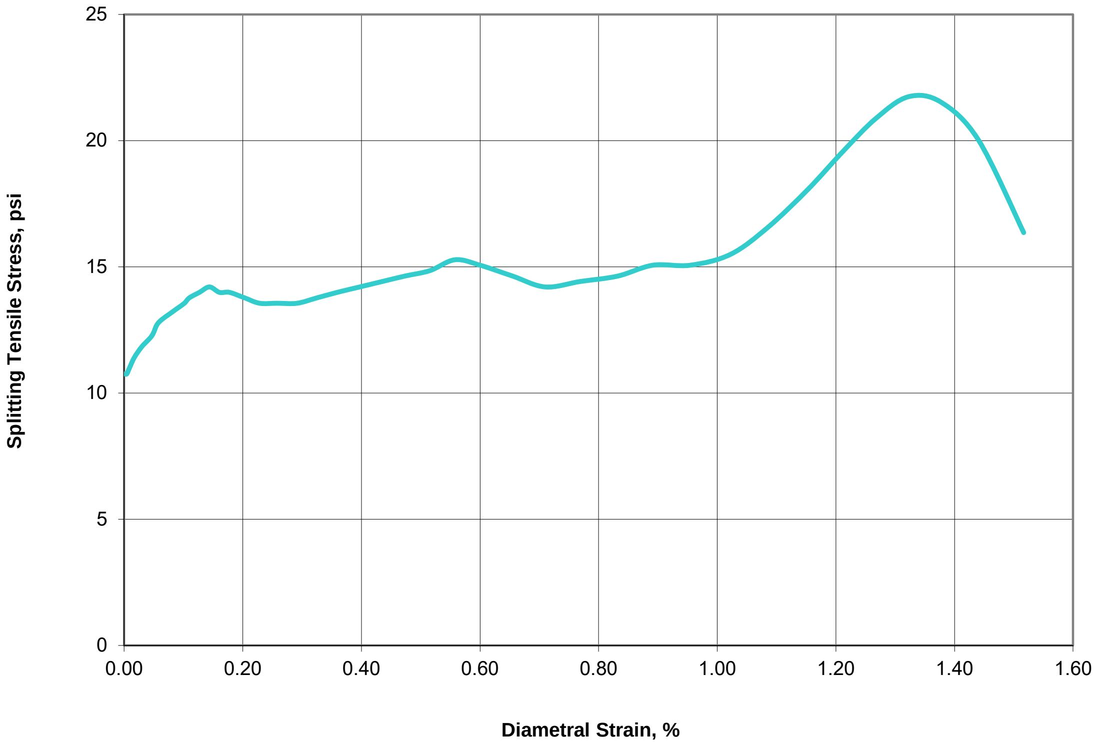
Splitting Tensile Strength of Intact Rock Core Specimens (ASTM D3967)

CTL Job No.: 823-008T1 Boring: B-25 Date: 9/29/2016
Client: GRI Sample: R-2 By: PJ
Project Name: Port of Coos Bay Channel Modification Depth,ft.: 8 Checked: DC
Project No.: 5128
Visual Description: Very Dark Bluish Gray Rock
Approx. Size of Largest Mineral Grain, in:
Bedding Angle Relative to Axis:
Loading Orientation Rel. to Bedding:
Moisture Condition at Test Sample was washed and in a moist state.
Test Temperature, (^{o}C) Ambient
Bearing Strips: Cardboard
Remarks: This specimen was so weak that the seating load was very close to the peak load.

Sample Thickness, in.	1.25
Sample Diameter, in.	2.37
Thickness / Diameter	0.5
Sample Cross-Sectional Area, in^2	4.40
Wet Density, pcf	128.2
Dry Density, pcf	108.5
Moisture Content, %	18.1
Loading Rate, lb / min	270

Splitting Tensile Strength, psi **22**

Stress-Strain



Splitting Tensile Strength of Intact Rock Core Specimens (ASTM D3967)

CTL Job No.:	823-008T2	Boring:	B-25	Date:	9/29/2016
Client:	GRI	Sample:	R-4	By:	PJ
Project Name:	Port of Coos Bay Channel Modification	Depth,ft.:	17	Checked:	DC
Project No.:	5128				

Visual Description: Very Dark Bluish Gray Rock

Approx. Size of Largest Mineral Grain, in:

Bedding Angle Relative to Axis:

Loading Orientation Rel. to Bedding:

Moisture Condition at Test Sample was washed and in a moist state.

Test Temperature, (^{o}C) Ambient

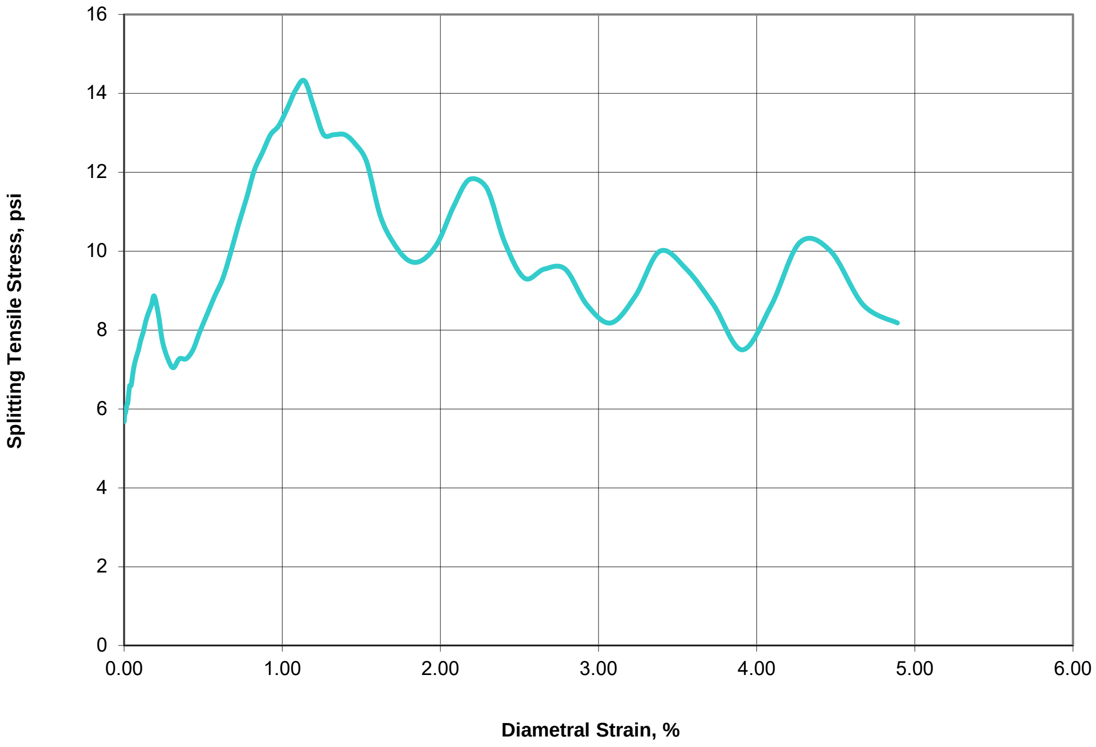
Bearing Strips: Cardboard

Remarks: This specimen was so weak that the seating load was very close to the peak load.

Sample Thickness, in.	1.21
Sample Diameter, in.	2.32
Thickness / Diameter	0.5
Sample Cross-Sectional Area, in^2	4.24
Wet Density, pcf	126.5
Dry Density, pcf	106.0
Moisture Content, %	19.4
Loading Rate, lb / min	290

Splitting Tensile Strength, psi **14**

Stress-Strain



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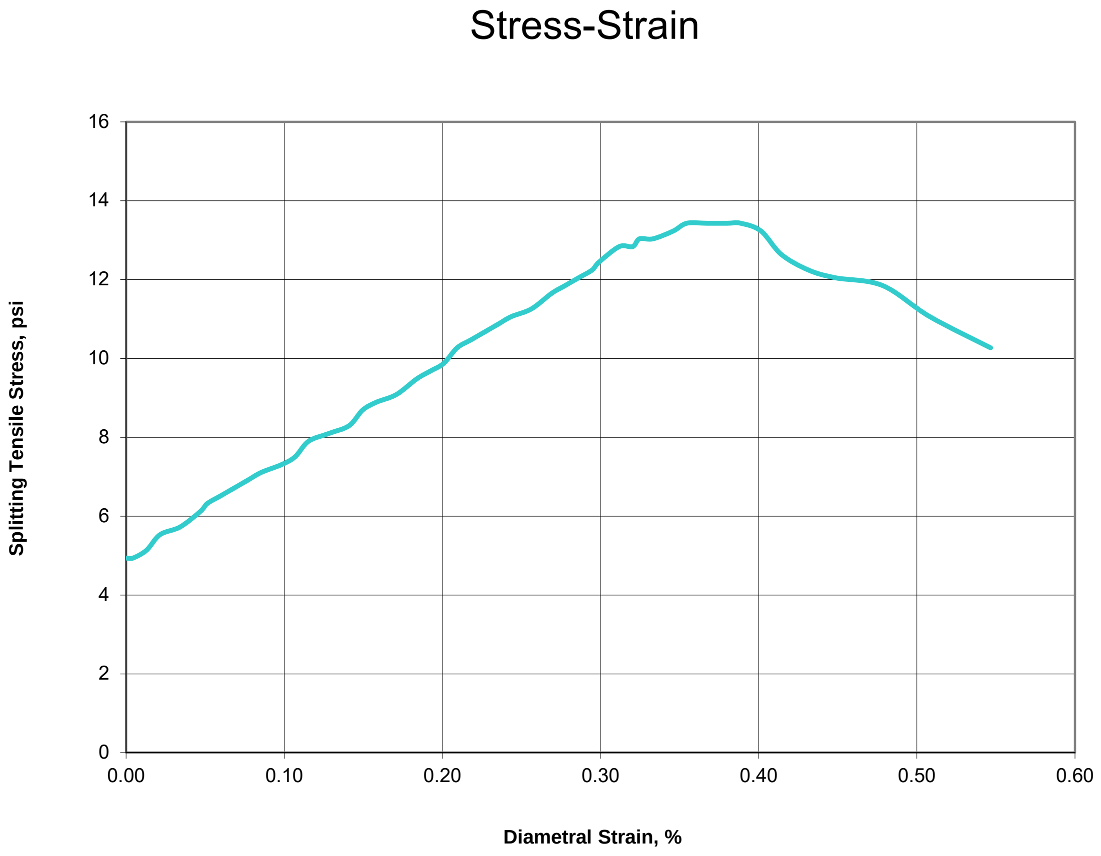
TESTING LABORATORY

Splitting Tensile Strength of Intact Rock Core Specimens (ASTM D3967)

CTL Job No.: 823-008T3
Boring: B-26
Date: 9/29/2016
Client: GRI
Sample: R-3
By: PJ
Project Name: Port of Coos Bay Channel Modification
Depth,ft.: 13
Checked: DC
Project No.: 5128
Visual Description: Very Dark Bluish Gray Rock
Approx. Size of Largest Mineral Grain, in:
Bedding Angle Relative to Axis:
Loading Orientation Rel. to Bedding:
Moisture Condition at Test: Sample was washed and in a moist state.
Test Temperature, (°C): Ambient
Bearing Strips: Cardboard
Remarks:

Sample Thickness, in.	1.38	**Splitting Tensile Strength, psi**	**13**
Sample Diameter, in.	2.34		
Thickness / Diameter	0.6		
Sample Cross-Sectional Area, in^2	4.31		
Wet Density, pcf	126.0		
Dry Density, pcf	104.2		
Moisture Content, %	20.9		
Loading Rate, lb / min	250		


Stress-Strain

COOPER TESTING LABORATORY

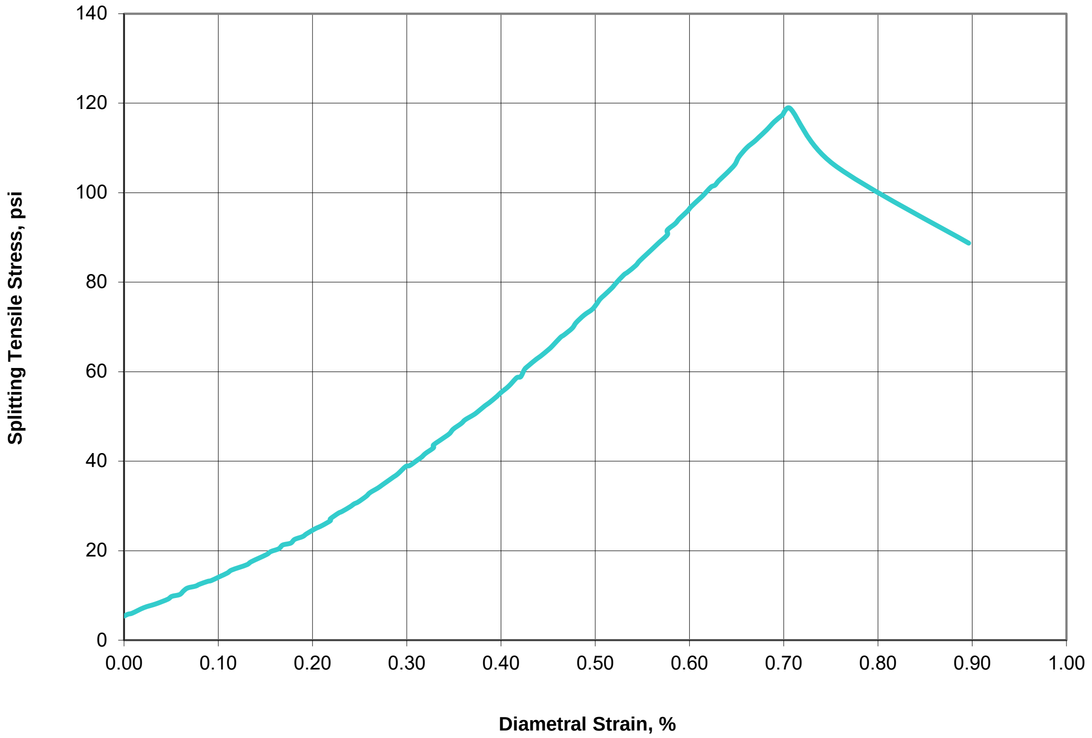
Splitting Tensile Strength of Intact Rock Core Specimens (ASTM D3967)

CTL Job No.: 823-008U1
Boring: B-27
Date: 9/29/2016
Client: GRI
Sample: R-1
By: PJ
Project Name: Port of Coos Bay Channel Modification
Depth,ft.: 4
Checked: DC
Project No.: 5128
Visual Description: Very Dark Bluish Gray Rock
Approx. Size of Largest Mineral Grain, in:
Bedding Angle Relative to Axis:
Loading Orientation Rel. to Bedding:
Moisture Condition at Test Sample was washed and in a moist state.
Test Temperature, (^{o}C) Ambient
Bearing Strips: Cardboard
Remarks:

Sample Thickness, in.	1.28
Sample Diameter, in.	2.38
Thickness / Diameter	0.5
Sample Cross-Sectional Area, in^2	4.44
Wet Density, pcf	122.5
Dry Density, pcf	95.4
Moisture Content, %	28.4
Loading Rate, lb / min	260

Splitting Tensile Strength, psi **119**

Stress-Strain



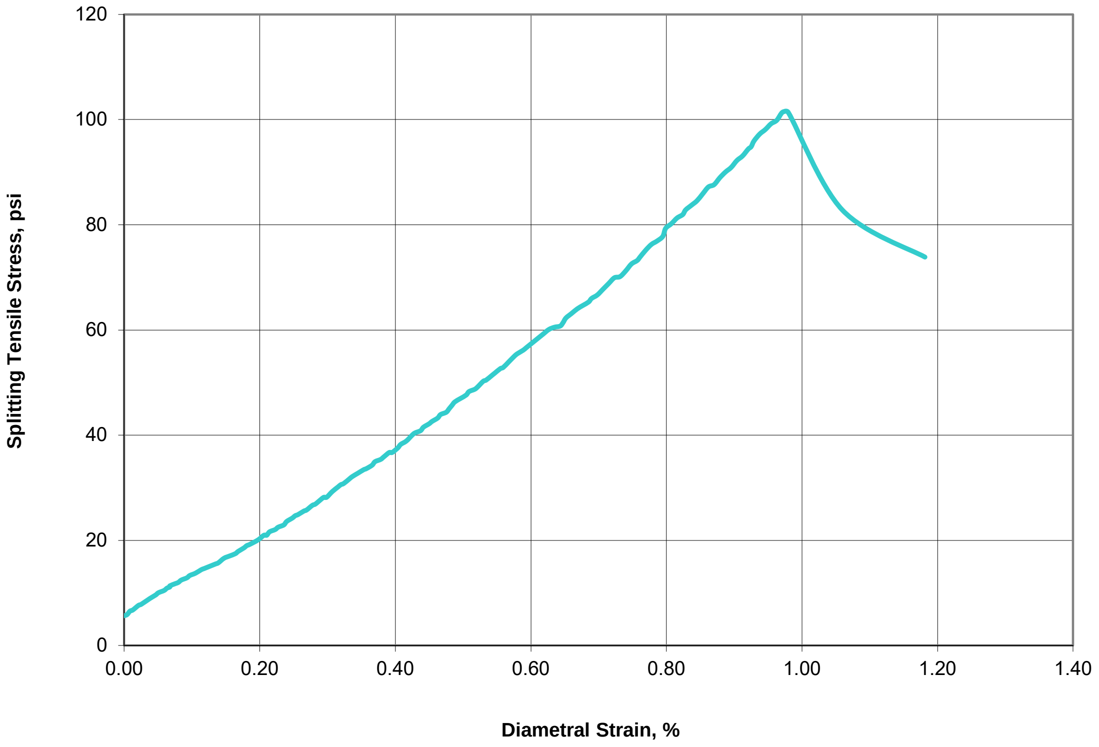
COOPER TESTING LABORATORY

Splitting Tensile Strength of Intact Rock Core Specimens (ASTM D3967)

CTL Job No.: 823-008U2
Boring: B-27
Date: 9/29/2016
Client: GRI
Sample: R-4
By: PJ
Project Name: Port of Coos Bay Channel Modification
Depth,ft.: 21
Checked: DC
Project No.: 5128
Visual Description: Very Dark Bluish Gray
Approx. Size of Largest Mineral Grain, in:
Bedding Angle Relative to Axis:
Loading Orientation Rel. to Bedding:
Moisture Condition at Test Sample was washed and in a moist state.
Test Temperature, (^{o}C) Ambient
Bearing Strips: Cardboard
Remarks:

Sample Thickness, in.	1.22	**Splitting Tensile Strength, psi**	**101**
Sample Diameter, in.	2.38		
Thickness / Diameter	0.5		
Sample Cross-Sectional Area, in^2	4.44		
Wet Density, pcf	116.4		
Dry Density, pcf	93.6		
Moisture Content, %	24.4		
Loading Rate, lb / min	270		

Stress-Strain

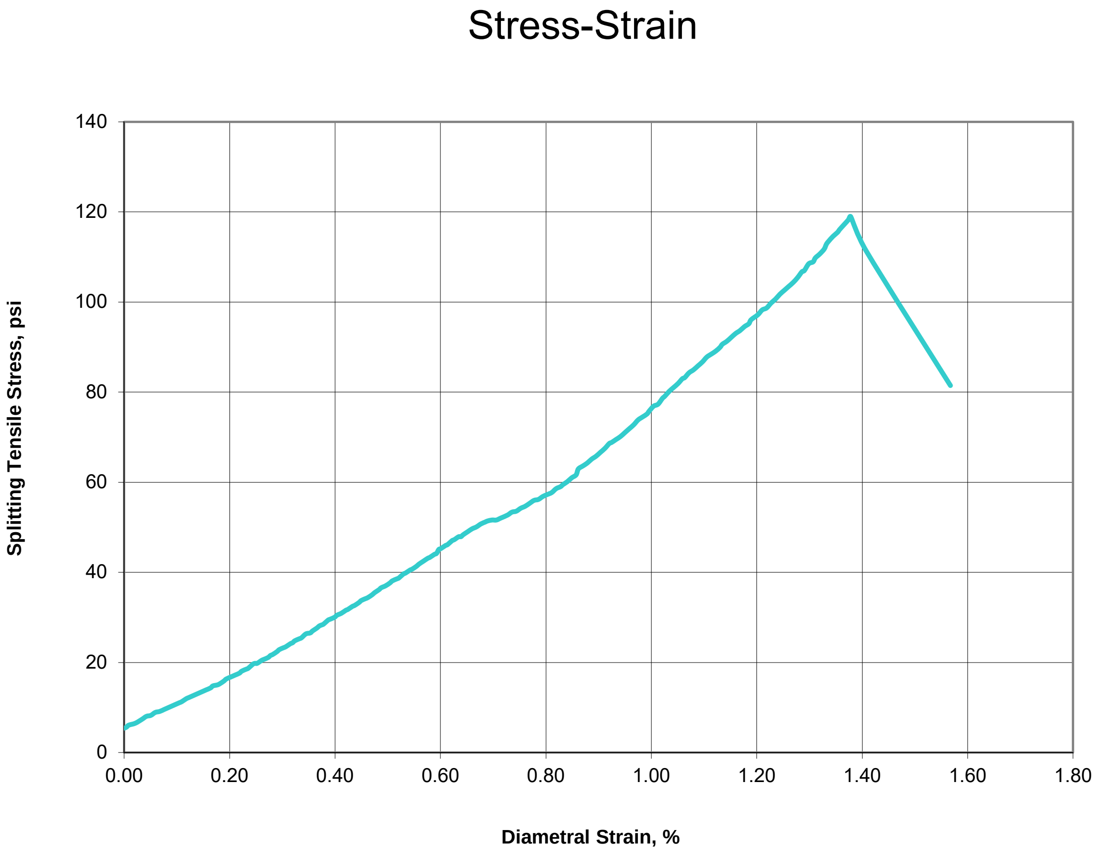


COOPER TESTING LABORATORY

Splitting Tensile Strength of Intact Rock Core Specimens (ASTM D3967)

CTL Job No.: 823-008V1
Boring: B-28
Date: 9/29/2016
Client: GRI
Sample: R-1
By: PJ
Project Name: Port of Coos Bay Channel Modification
Depth,ft.: 10
Checked: DC
Project No.: 5128
Visual Description: Very Dark Bluish Gray Rock
Approx. Size of Largest Mineral Grain, in:
Bedding Angle Relative to Axis:
Loading Orientation Rel. to Bedding:
Moisture Condition at Test Sample was washed and in a moist state.
Test Temperature, (^{o}C) Ambient
Bearing Strips: Cardboard
Remarks:

Sample Thickness, in.	1.23	**Splitting Tensile Strength, psi**	**119**
Sample Diameter, in.	2.38		
Thickness / Diameter	0.5		
Sample Cross-Sectional Area, in^2	4.45		
Wet Density, pcf	121.9		
Dry Density, pcf	98.2		
Moisture Content, %	24.2		
Loading Rate, lb / min	270		



COOPER TESTING LABORATORY

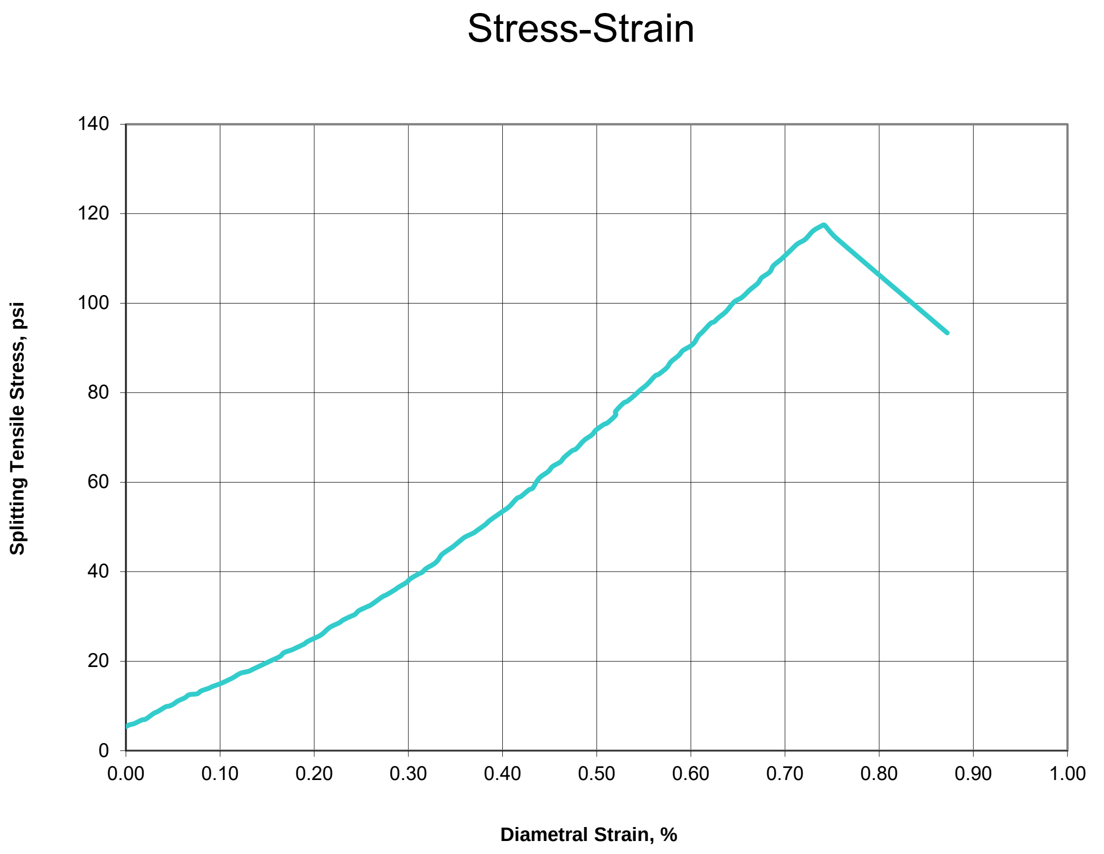
Splitting Tensile Strength of Intact Rock Core Specimens (ASTM D3967)

CTL Job No.: 823-008V2 Boring: B-28 Date: 9/29/2016
Client: GRI Sample: R-2 By: PJ
Project Name: Port of Coos Bay Channel Modification Depth,ft.: 12 Checked: DC
Project No.: 5128

Visual Description: Very Dark Bluish Gray Rock
Approx. Size of Largest Mineral Grain, in:
Bedding Angle Relative to Axis:
Loading Orientation Rel. to Bedding:
Moisture Condition at Test Sample was washed and in a moist state.
Test Temperature, (^{o}C) Ambient
Bearing Strips: Cardboard
Remarks:

Sample Thickness, in.	1.28
Sample Diameter, in.	2.39
Thickness / Diameter	0.5
Sample Cross-Sectional Area, in^2	4.47
Wet Density, pcf	119.8
Dry Density, pcf	93.5
Moisture Content, %	28.2
Loading Rate, lb / min	260

Splitting Tensile Strength, psi **117**



COOPER TESTING LABORATORY

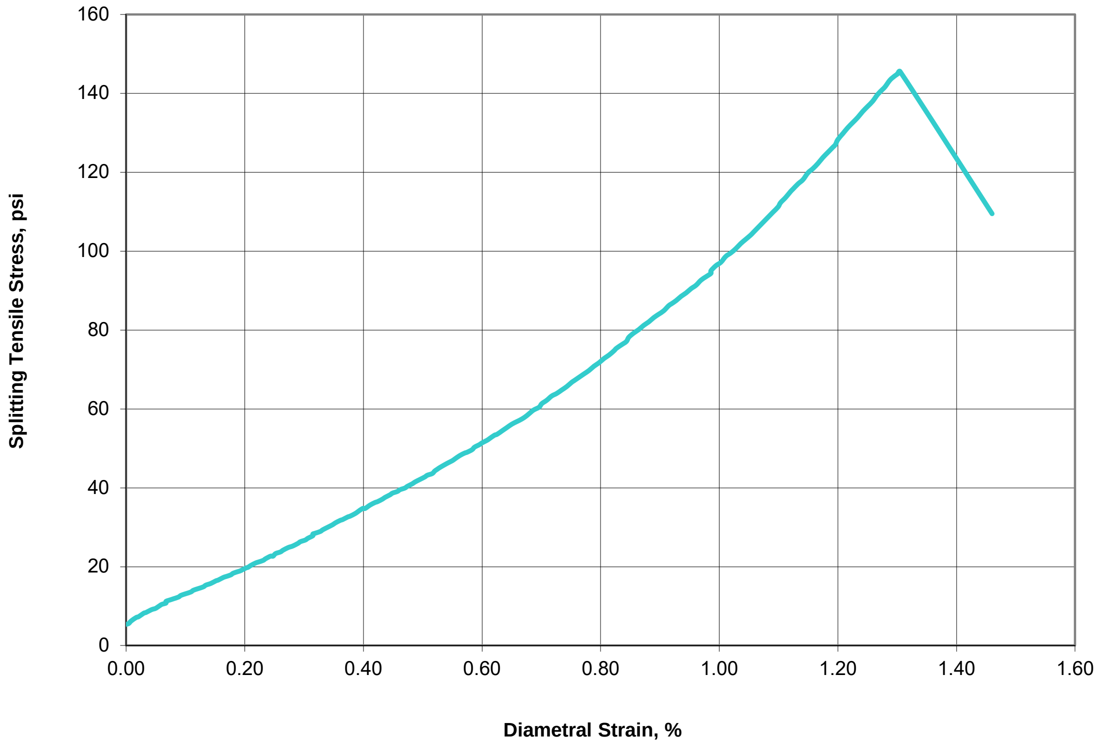
Splitting Tensile Strength of Intact Rock Core Specimens (ASTM D3967)

CTL Job No.: 823-008V3 Boring: B-28 Date: 9/29/2016
Client: GRI Sample: R-3 By: PJ
Project Name: Port of Coos Bay Channel Modification Depth,ft.: 19 Checked: DC
Project No.: 5128
Visual Description: Very Dark Bluish Gray Rock
Approx. Size of Largest Mineral Grain, in:
Bedding Angle Relative to Axis:
Loading Orientation Rel. to Bedding:
Moisture Condition at Test Sample was washed and in a moist state.
Test Temperature, (^{o}C) Ambient
Bearing Strips: Cardboard
Remarks:

Sample Thickness, in.	1.24
Sample Diameter, in.	2.38
Thickness / Diameter	0.5
Sample Cross-Sectional Area, in^2	4.46
Wet Density, pcf	122.7
Dry Density, pcf	97.4
Moisture Content, %	26.0
Loading Rate, lb / min	270

Splitting Tensile Strength, psi **146**

Stress-Strain



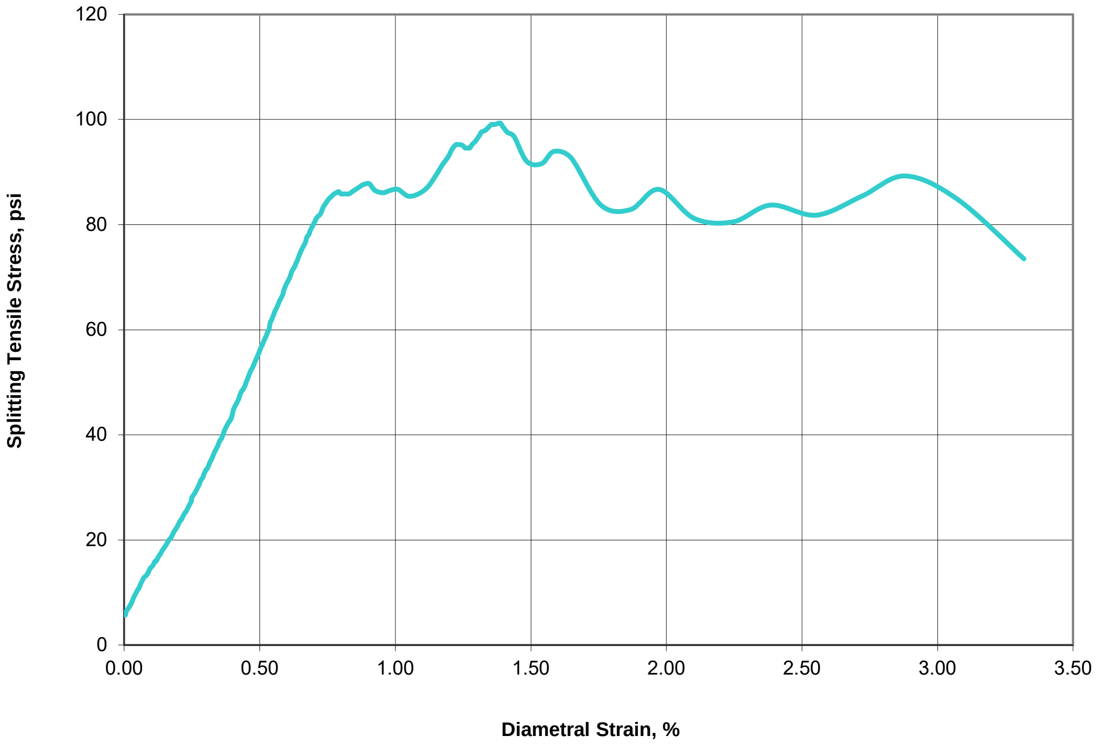
Splitting Tensile Strength of Intact Rock Core Specimens (ASTM D3967)

CTL Job No.: 823-008V4
Boring: B-29
Date: 9/29/2016
Client: GRI
Sample: R-1
By: PJ
Project Name: Port of Coos Bay Channel Modification
Depth,ft.: 2
Checked: DC
Project No.: 5128
Visual Description: Very Dark Bluish Gray Rock
Approx. Size of Largest Mineral Grain, in:
Bedding Angle Relative to Axis:
Loading Orientation Rel. to Bedding:
Moisture Condition at Test Sample was washed and in a moist state.
Test Temperature, (°C) Ambient
Bearing Strips: Cardboard
Remarks:

Sample Thickness, in.	1.26
Sample Diameter, in.	2.38
Thickness / Diameter	0.5
Sample Cross-Sectional Area, in^2	4.44
Wet Density, pcf	125.5
Dry Density, pcf	101.1
Moisture Content, %	24.2
Loading Rate, lb / min	270

Splitting Tensile Strength, psi **99**

Stress-Strain



Splitting Tensile Strength of Intact Rock Core Specimens (ASTM D3967)

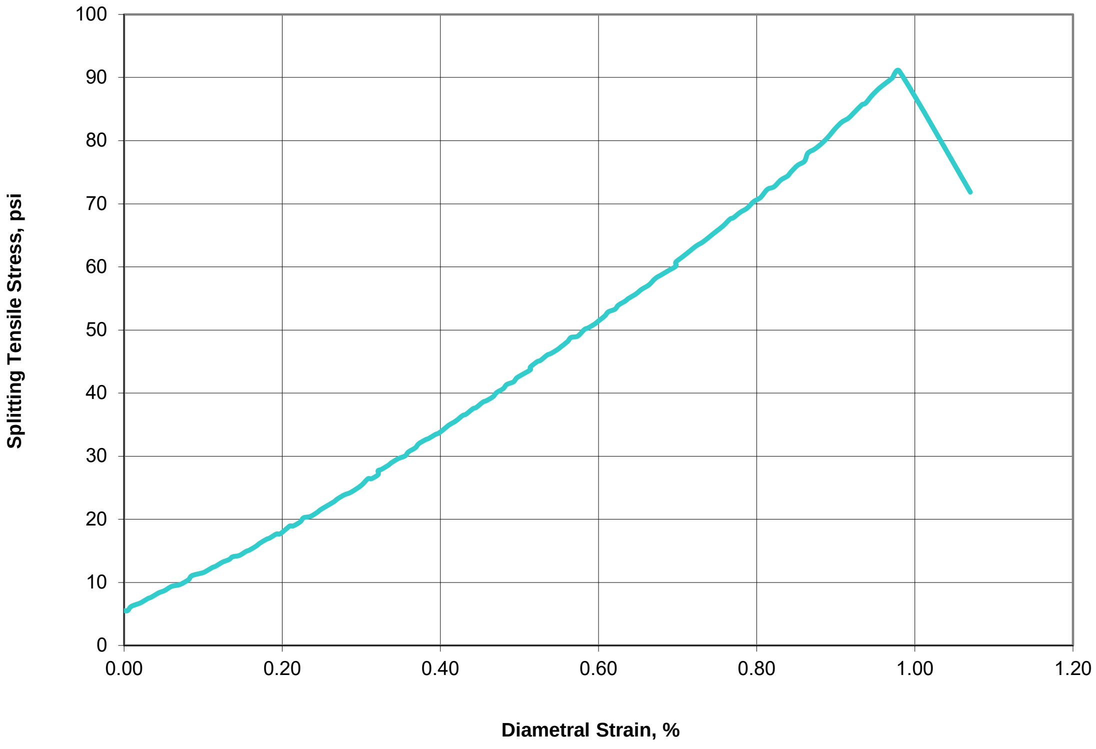
CTL Job No.:	823-008V5	Boring:	B-29	Date:	9/29/2016
Client:	GRI	Sample:	R-3	By:	PJ
Project Name:	Port of Coos Bay Channel Modification	Depth,ft.:	12	Checked:	DC
Project No.:	5128				

Visual Description: Very Dark Bluish Gray Rock
Approx. Size of Largest Mineral Grain, in:
Bedding Angle Relative to Axis:
Loading Orientation Rel. to Bedding:
Moisture Condition at Test Sample was washed and in a moist state.
Test Temperature, (^{o}C) Ambient
Bearing Strips: Cardboard
Remarks:

Sample Thickness, in.	1.28
Sample Diameter, in.	2.34
Thickness / Diameter	0.5
Sample Cross-Sectional Area, in^2	4.29
Wet Density, pcf	119.8
Dry Density, pcf	95.6
Moisture Content, %	25.4
Loading Rate, lb / min	270

Splitting Tensile Strength, psi **91**

Stress-Strain



COOPER TESTING LABORATORY

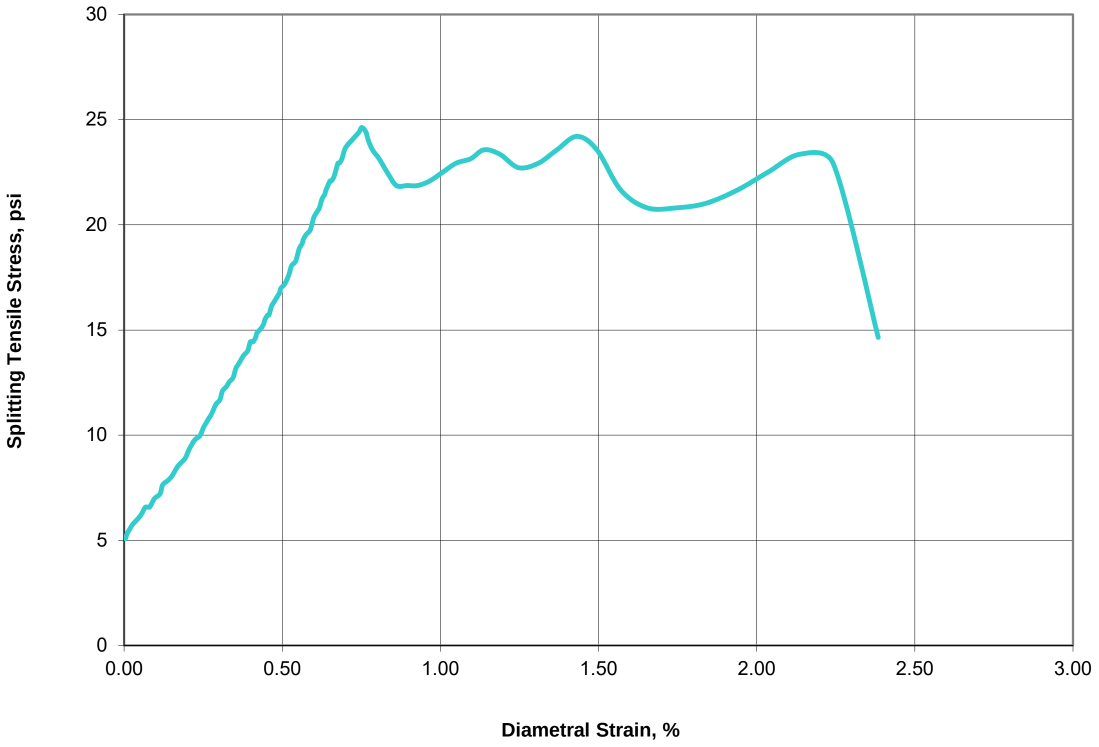
Splitting Tensile Strength of Intact Rock Core Specimens (ASTM D3967)

CTL Job No.: 823-008W1
Boring: B-30
Date: 9/29/2016
Client: GRI
Sample: R-1
By: PJ
Project Name: Port of Coos Bay Channel Modification
Depth,ft.: 14
Checked: DC
Project No.: 5128
Visual Description: Very Dark Bluish Gray Rock
Approx. Size of Largest Mineral Grain, in:
Bedding Angle Relative to Axis:
Loading Orientation Rel. to Bedding:
Moisture Condition at Test: Sample was washed and in a moist state.
Test Temperature, (^{o}C): Ambient
Bearing Strips: Cardboard
Remarks:

Sample Thickness, in.	1.26
Sample Diameter, in.	2.38
Thickness / Diameter	0.5
Sample Cross-Sectional Area, in^2	4.46
Wet Density, pcf	130.7
Dry Density, pcf	112.2
Moisture Content, %	16.4
Loading Rate, lb / min	270

Splitting Tensile Strength, psi **25**

Stress-Strain



Splitting Tensile Strength of Intact Rock Core Specimens (ASTM D3967)

CTL Job No.:	823-008W2	Boring:	B-30	Date:	9/29/2016
Client:	GRI	Sample:	R-3	By:	PJ
Project Name:	Port of Coos Bay Channel Modification	Depth,ft.:	22	Checked:	DC
Project No.:	5128				

Visual Description: Very Dark Bluish Gray Rock

Approx. Size of Largest Mineral Grain, in:

Bedding Angle Relative to Axis:

Loading Orientation Rel. to Bedding:

Moisture Condition at Test Sample was washed and in a moist state.

Test Temperature, (^{o}C) Ambient

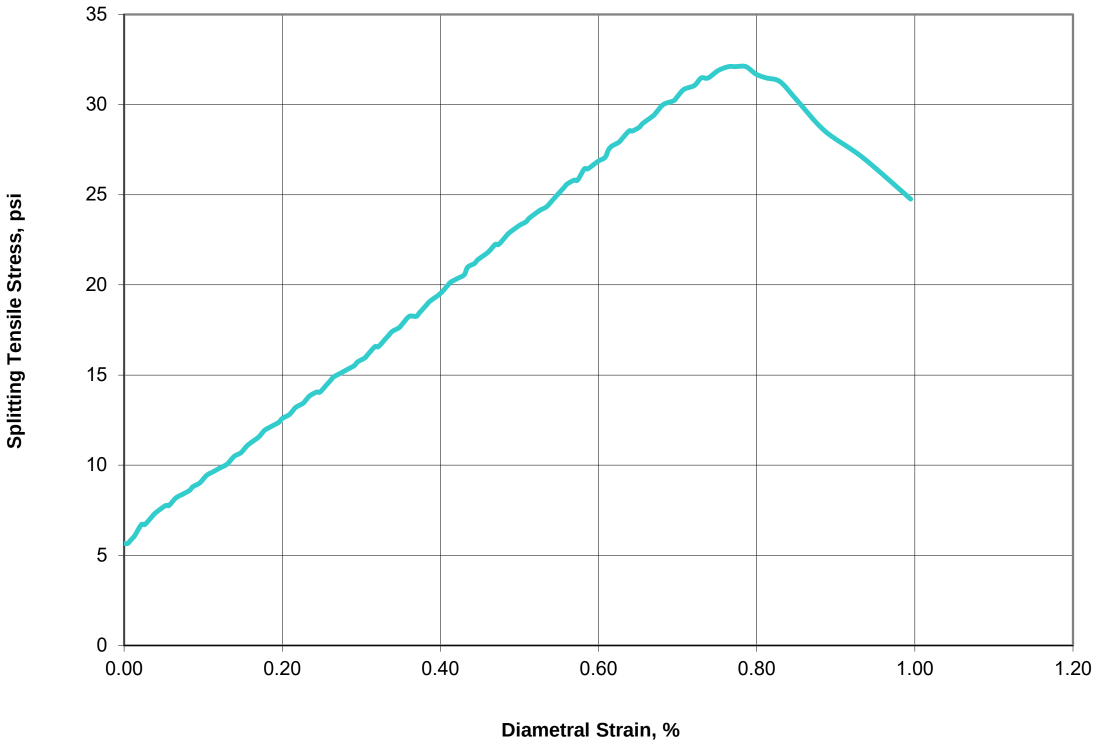
Bearing Strips: Cardboard

Remarks:

Sample Thickness, in.	1.32
Sample Diameter, in.	2.30
Thickness / Diameter	0.6
Sample Cross-Sectional Area, in^2	4.16
Wet Density, pcf	131.8
Dry Density, pcf	110.7
Moisture Content, %	19.1
Loading Rate, lb / min	260

Splitting Tensile Strength, psi **32**

Stress-Strain



COOPER TESTING LABORATORY

Splitting Tensile Strength of Intact Rock Core Specimens (ASTM D3967)

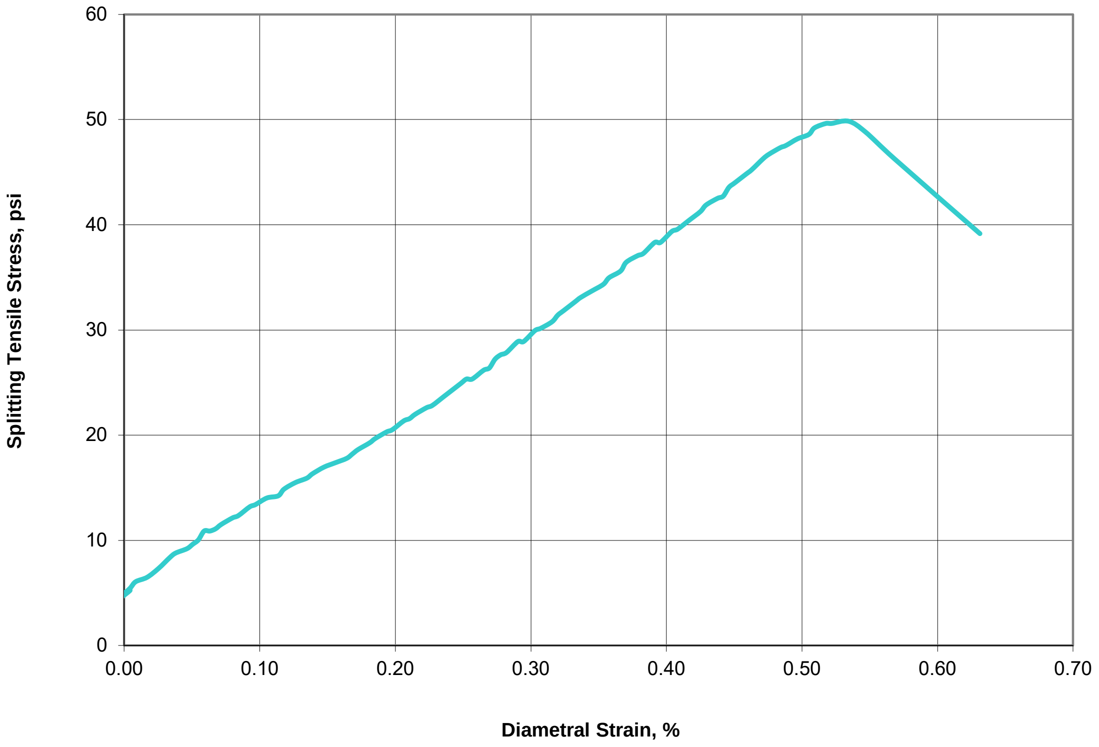
CTL Job No.: 823-008W3
Boring: B-31
Date: 9/29/2016
Client: GRI
Sample: R-2
By: PJ
Project Name: Port of Coos Bay Channel Modification
Depth,ft.: 10
Checked: DC
Project No.: 5128

Visual Description: Very Dark Bluish Gray Rock
Approx. Size of Largest Mineral Grain, in:
Bedding Angle Relative to Axis:
Loading Orientation Rel. to Bedding:
Moisture Condition at Test: Sample was washed and in a moist state.
Test Temperature, (^{o}C): Ambient
Bearing Strips: Cardboard
Remarks:

Sample Thickness, in.	1.28
Sample Diameter, in.	2.38
Thickness / Diameter	0.5
Sample Cross-Sectional Area, in^2	4.44
Wet Density, pcf	130.0
Dry Density, pcf	107.9
Moisture Content, %	20.6
Loading Rate, lb / min	260

Splitting Tensile Strength, psi **50**

Stress-Strain



COOPER TESTING LABORATORY

Splitting Tensile Strength of Intact Rock Core Specimens (ASTM D3967)

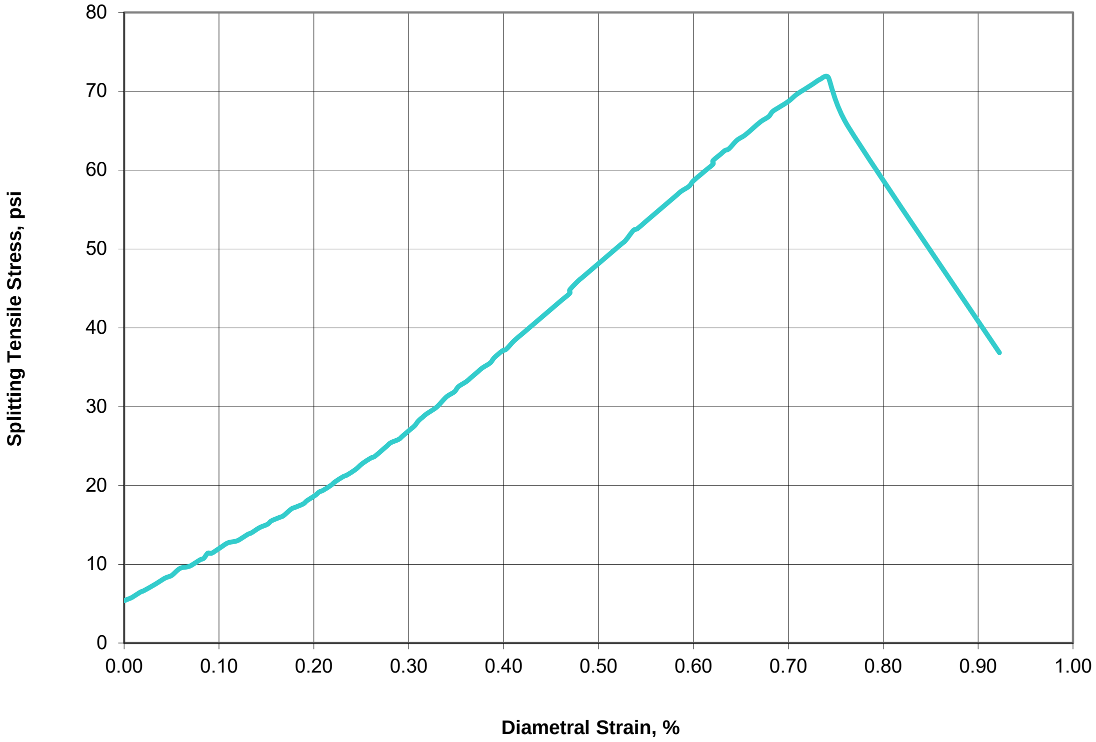
CTL Job No.: 823-008W4
Boring: B-31
Date: 9/29/2016
Client: GRI
Sample: R-4
By: PJ
Project Name: Port of Coos Bay Channel Modification
Depth,ft.: 20
Checked: DC
Project No.: 5128

Visual Description: Very Dark Bluish Gray Rock
Approx. Size of Largest Mineral Grain, in:
Bedding Angle Relative to Axis:
Loading Orientation Rel. to Bedding:
Moisture Condition at Test: Sample was washed and in a moist state.
Test Temperature, (°C): Ambient
Bearing Strips: Cardboard
Remarks:

Sample Thickness, in.	1.24
Sample Diameter, in.	2.39
Thickness / Diameter	0.5
Sample Cross-Sectional Area, in^2	4.47
Wet Density, pcf	130.6
Dry Density, pcf	112.7
Moisture Content, %	16.0
Loading Rate, lb / min	270

Splitting Tensile Strength, psi **72**

Stress-Strain



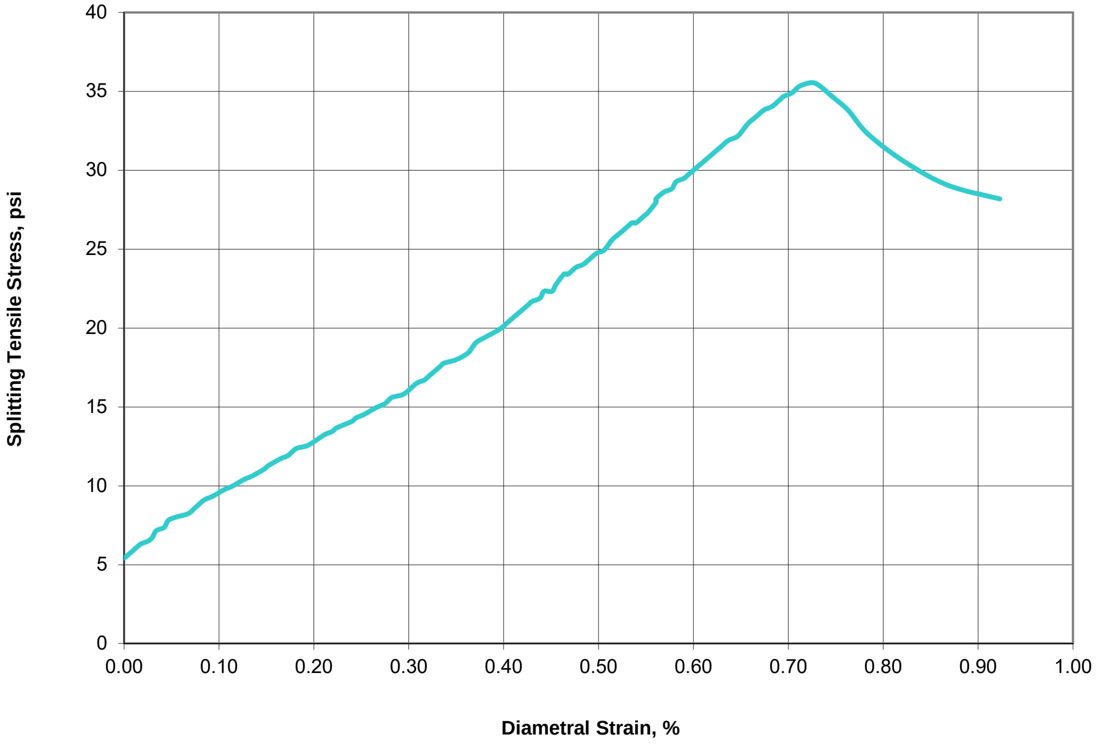
COOPER TESTING LABORATORY

Splitting Tensile Strength of Intact Rock Core Specimens (ASTM D3967)

CTL Job No.: 823-008W5
Boring: B-31
Date: 9/29/2016
Client: GRI
Sample: R-5
By: PJ
Project Name: Port of Coos Bay Channel Modification
Depth,ft.: 24
Checked: DC
Project No.: 5128
Visual Description: Very Dark Bluish Gray Rock
Approx. Size of Largest Mineral Grain, in:
Bedding Angle Relative to Axis:
Loading Orientation Rel. to Bedding:
Moisture Condition at Test Sample was washed and in a moist state.
Test Temperature, (^{o}C) Ambient
Bearing Strips: Cardboard
Remarks:

Sample Thickness, in.	1.24	**Splitting Tensile Strength, psi**	**36**
Sample Diameter, in.	2.37		
Thickness / Diameter	0.5		
Sample Cross-Sectional Area, in^2	4.42		
Wet Density, pcf	129.4		
Dry Density, pcf	106.9		
Moisture Content, %	21.0		
Loading Rate, lb / min	270		

Stress-Strain



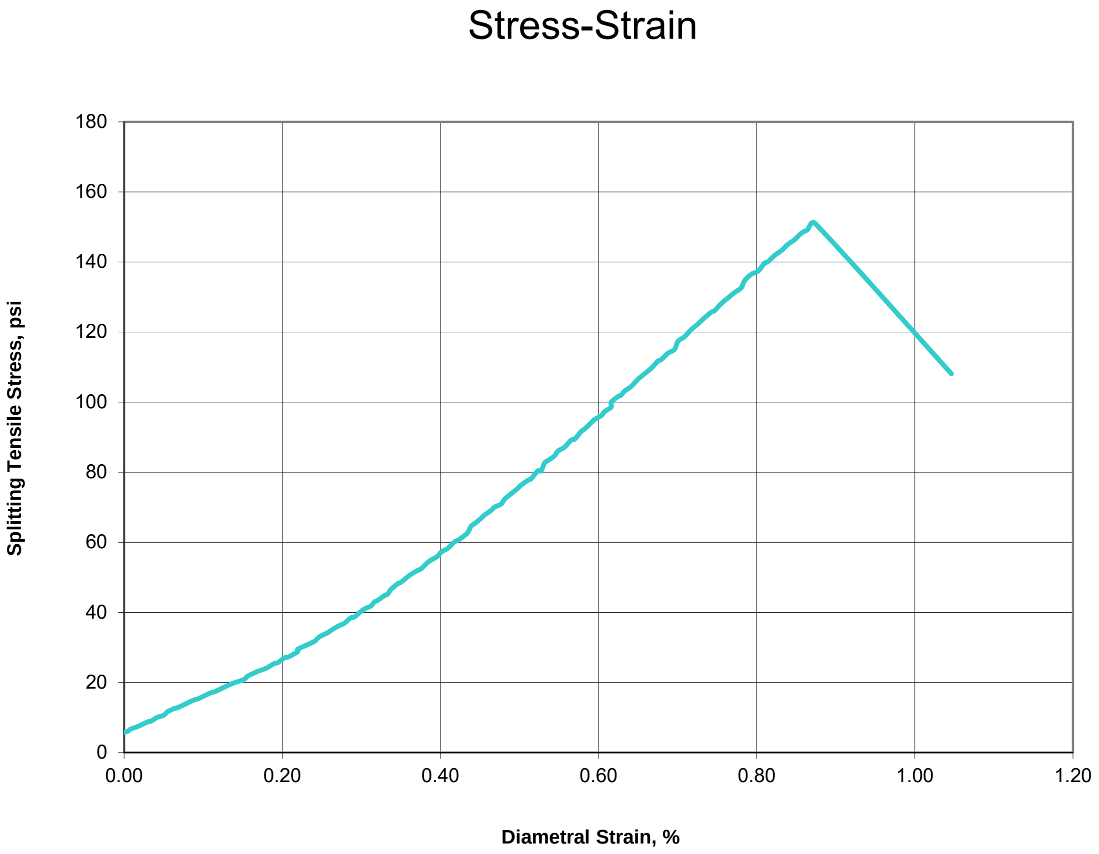
COOPER TESTING LABORATORY

Splitting Tensile Strength of Intact Rock Core Specimens (ASTM D3967)

CTL Job No.: 823-008X1
Boring: B-32
Date: 9/29/2016
Client: GRI
Sample: R-1
By: PJ
Project Name: Port of Coos Bay Channel Modification
Depth,ft.: 2.5
Checked: DC
Project No.: 5128
Visual Description: Very Dark Bluish Gray Rock
Approx. Size of Largest Mineral Grain, in:
Bedding Angle Relative to Axis:
Loading Orientation Rel. to Bedding:
Moisture Condition at Test Sample was washed and in a moist state.
Test Temperature, (^{o}C) Ambient
Bearing Strips: Cardboard
Remarks:

Sample Thickness, in.	1.19
Sample Diameter, in.	2.37
Thickness / Diameter	0.5
Sample Cross-Sectional Area, in^2	4.41
Wet Density, pcf	124.5
Dry Density, pcf	101.2
Moisture Content, %	23.1
Loading Rate, lb / min	280

Splitting Tensile Strength, psi **151**



Splitting Tensile Strength of Intact Rock Core Specimens (ASTM D3967)

CTL Job No.:	823-008X2	Boring:	B-32	Date:	9/29/2016
Client:	GRI	Sample:	R-3	By:	PJ
Project Name:	Port of Coos Bay Channel Modification	Depth,ft.:	12.5	Checked:	DC
Project No.:	5128				

Visual Description: Very Dark Greenish Gray Rock

Approx. Size of Largest Mineral Grain, in:

Bedding Angle Relative to Axis:

Loading Orientation Rel. to Bedding:

Moisture Condition at Test: Sample was washed and in a moist state.

Test Temperature, (°C): Ambient

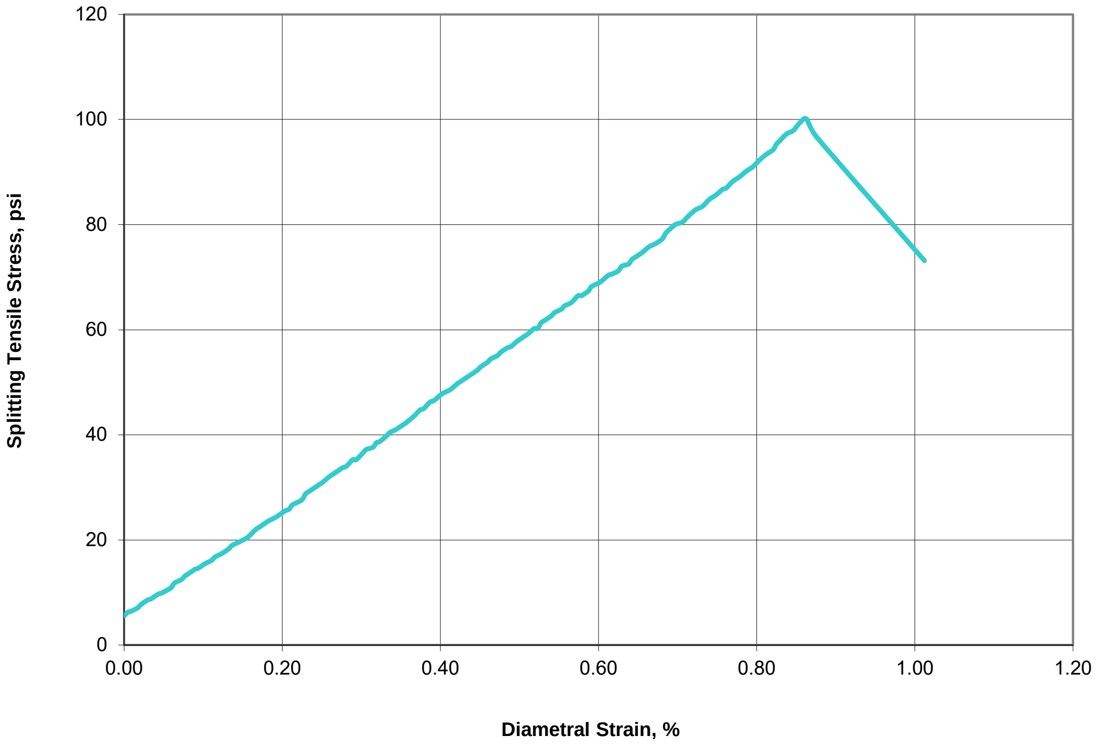
Bearing Strips: Cardboard

Remarks:

Sample Thickness, in.	1.26
Sample Diameter, in.	2.35
Thickness / Diameter	0.5
Sample Cross-Sectional Area, in^2	4.34
Wet Density, pcf	124.2
Dry Density, pcf	100.2
Moisture Content, %	24.0
Loading Rate, lb / min	270

Splitting Tensile Strength, psi **100**

Stress-Strain



COOPER TESTING LABORATORY

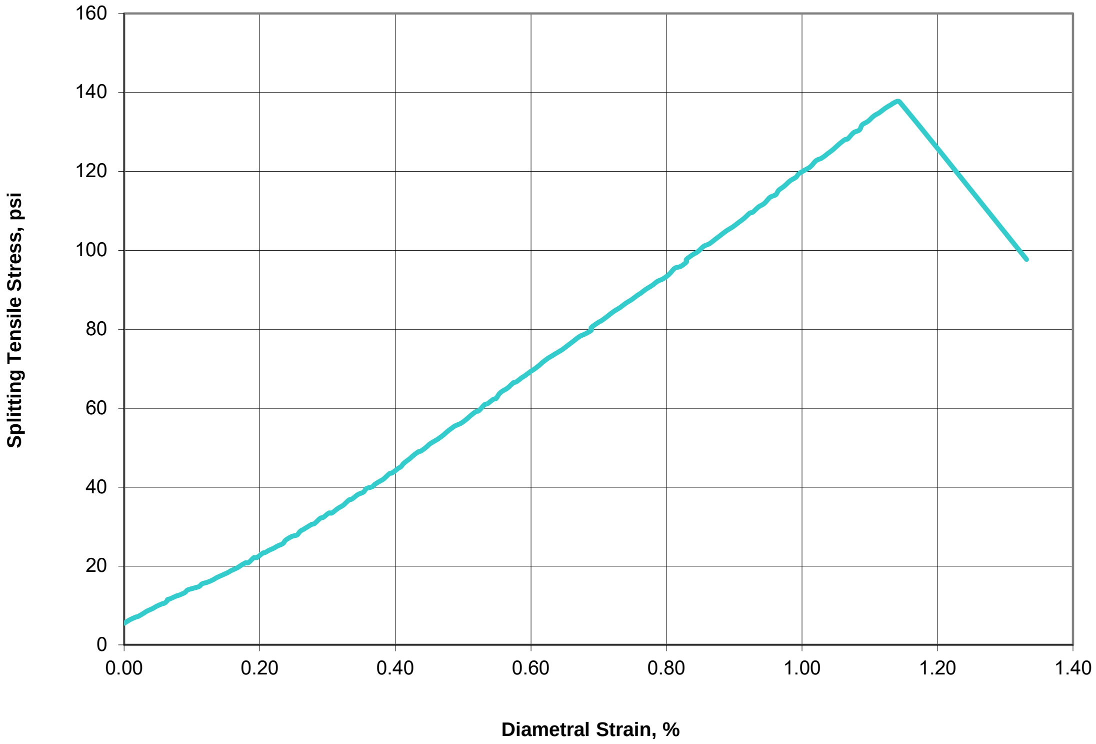
Splitting Tensile Strength of Intact Rock Core Specimens (ASTM D3967)

CTL Job No.: 823-008X3
Boring: B-32
Date: 9/29/2016
Client: GRI
Sample: R-4
By: PJ
Project Name: Port of Coos Bay Channel Modification
Depth,ft.: 16.5
Checked: DC
Project No.: 5128
Visual Description: Very Dark Greenish Gray Rock
Approx. Size of Largest Mineral Grain, in:
Bedding Angle Relative to Axis:
Loading Orientation Rel. to Bedding:
Moisture Condition at Test: Sample was washed and in a moist state.
Test Temperature, (°C): Ambient
Bearing Strips: Cardboard
Remarks:

Sample Thickness, in.	1.22
Sample Diameter, in.	2.35
Thickness / Diameter	0.5
Sample Cross-Sectional Area, in^2	4.34
Wet Density, pcf	117.1
Dry Density, pcf	93.6
Moisture Content, %	25.2
Loading Rate, lb / min	280

Splitting Tensile Strength, psi **138**

Stress-Strain

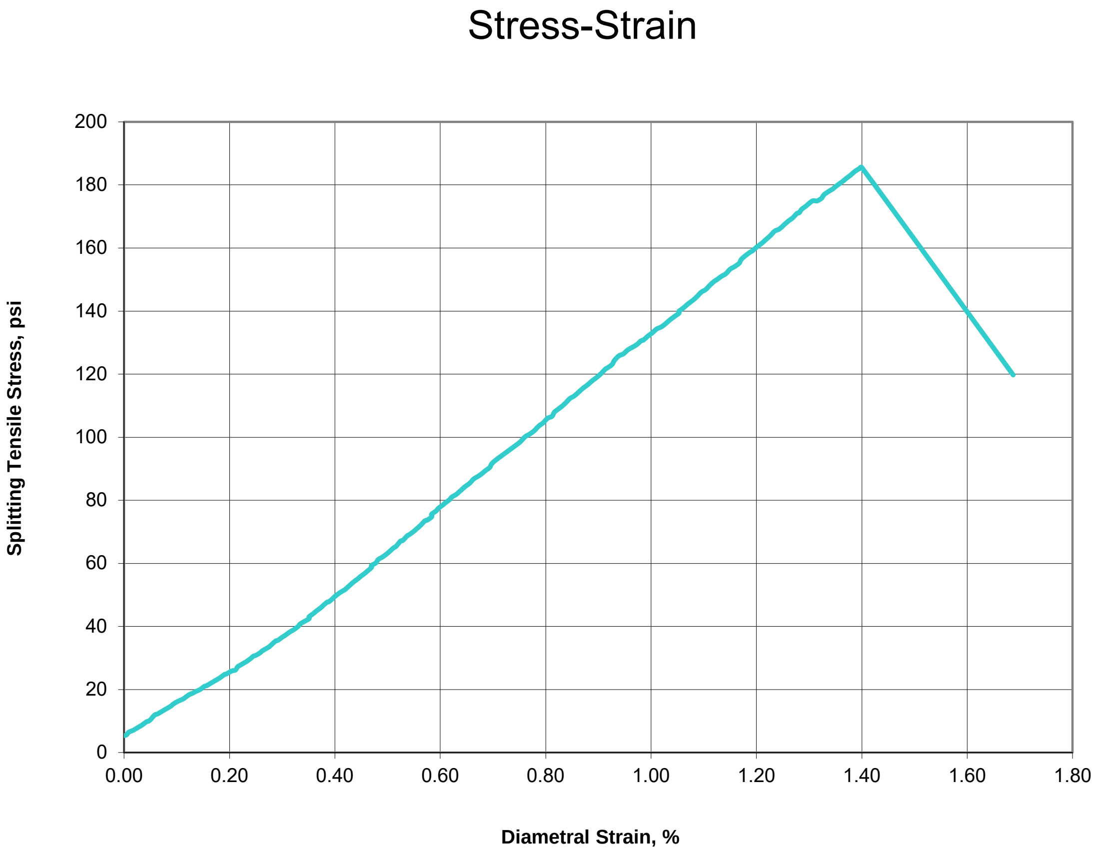


Splitting Tensile Strength of Intact Rock Core Specimens (ASTM D3967)

CTL Job No.: 823-008X4 Boring: B-33 Date: 9/29/2016
Client: GRI Sample: R-1 By: PJ
Project Name: Port of Coos Bay Channel Modification Depth,ft.: 2 Checked: DC
Project No.: 5128
Visual Description: Very Dark Greenish Gray Rock
Approx. Size of Largest Mineral Grain, in:
Bedding Angle Relative to Axis:
Loading Orientation Rel. to Bedding:
Moisture Condition at Test Sample was washed and in a moist state.
Test Temperature, (°C) Ambient
Bearing Strips: Cardboard
Remarks:

Sample Thickness, in.	1.29
Sample Diameter, in.	2.37
Thickness / Diameter	0.5
Sample Cross-Sectional Area, in^2	4.39
Wet Density, pcf	112.8
Dry Density, pcf	91.1
Moisture Content, %	23.9
Loading Rate, lb / min	260

Splitting Tensile Strength, psi **186**



Splitting Tensile Strength of Intact Rock Core Specimens (ASTM D3967)

CTL Job No.:	823-008X5	Boring:	B-33	Date:	9/29/2016
Client:	GRI	Sample:	R-7	By:	PJ
Project Name:	Port of Coos Bay Channel Modification	Depth,ft.:	21	Checked:	DC
Project No.:	5128				

Visual Description: Very Dark Greenish Gray Rock

Approx. Size of Largest Mineral Grain, in:

Bedding Angle Relative to Axis:

Loading Orientation Rel. to Bedding:

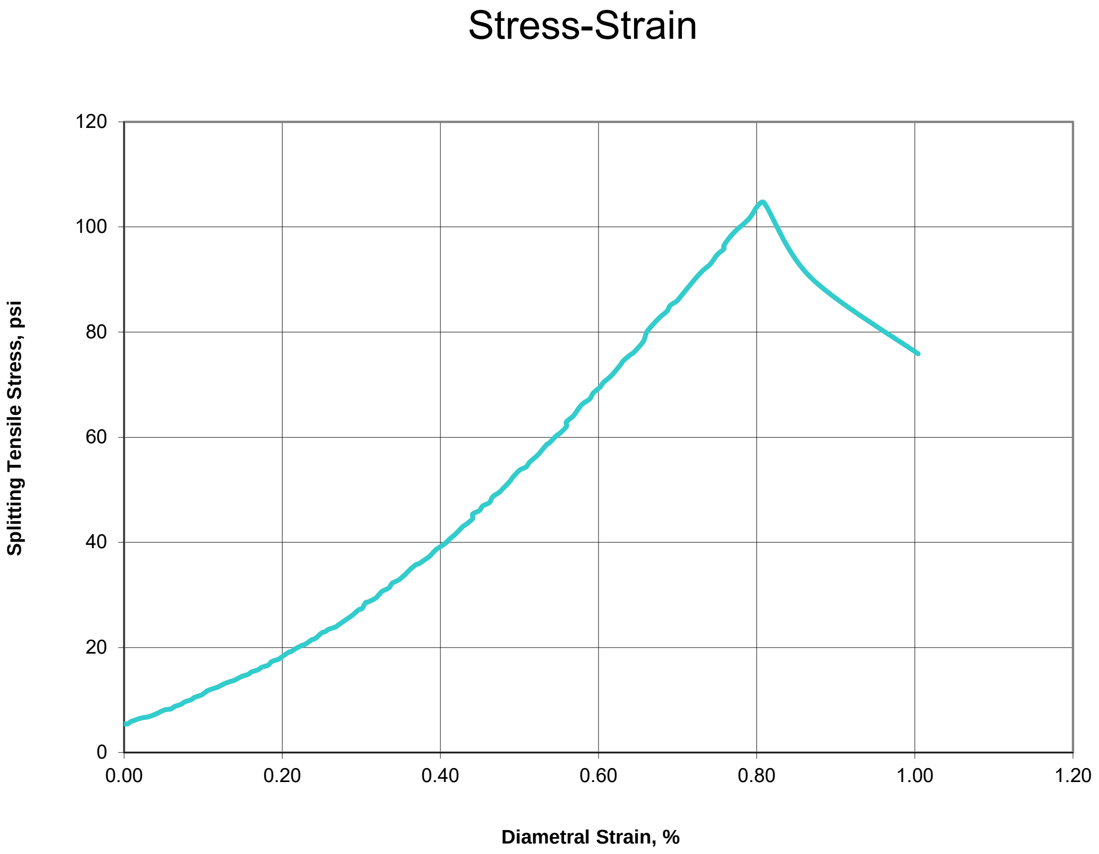
Moisture Condition at Test Sample was washed and in a moist state.

Test Temperature, (^{o}C) Ambient

Bearing Strips: Cardboard

Remarks:

Sample Thickness, in.	1.23	**Splitting Tensile Strength, psi**	**105**
Sample Diameter, in.	2.36		
Thickness / Diameter	0.5		
Sample Cross-Sectional Area, in^2	4.38		
Wet Density, pcf	125.5		
Dry Density, pcf	102.4		
Moisture Content, %	22.6		
Loading Rate, lb / min	280		



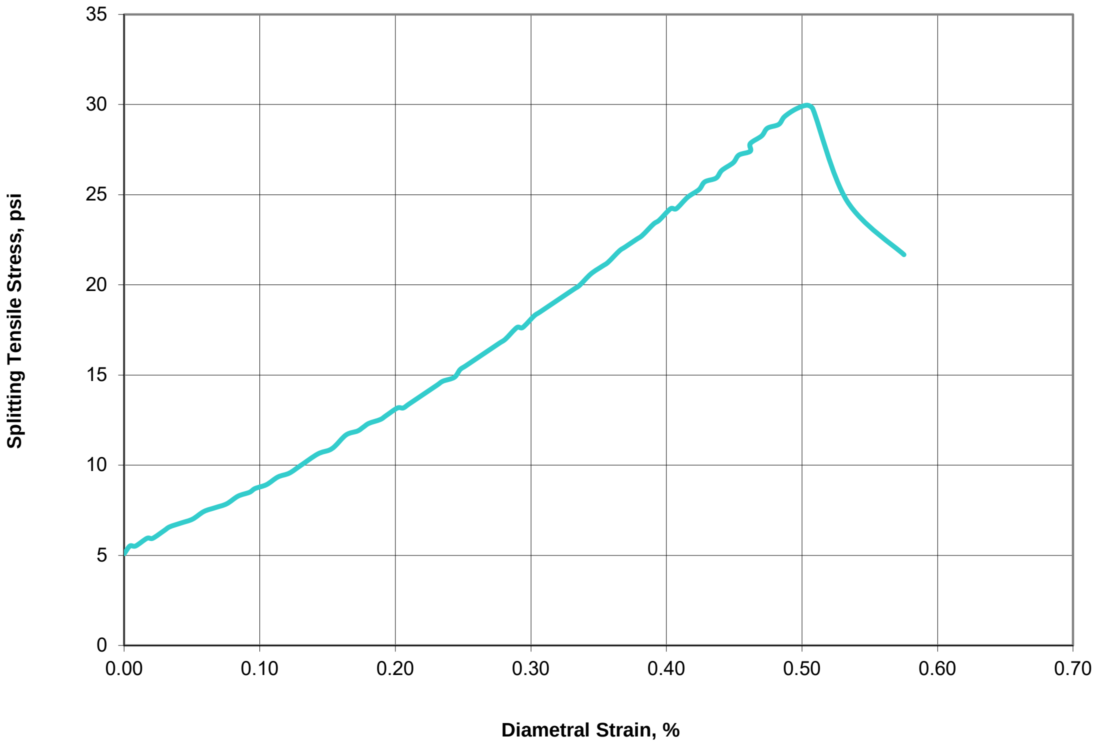
Splitting Tensile Strength of Intact Rock Core Specimens (ASTM D3967)

CTL Job No.: 823-008Y1
Boring: B-40
Date: 9/29/2016
Client: GRI
Sample: R-1
By: PJ
Project Name: Port of Coos Bay Channel Modification
Depth,ft.: 6
Checked: DC
Project No.: 5128
Visual Description: Very Dark Bluish Gray Rock
Approx. Size of Largest Mineral Grain, in:
Bedding Angle Relative to Axis:
Loading Orientation Rel. to Bedding:
Moisture Condition at Test Sample was washed and in a moist state.
Test Temperature, (^{o}C) Ambient
Bearing Strips: Cardboard
Remarks:

Sample Thickness, in.	1.26
Sample Diameter, in.	2.38
Thickness / Diameter	0.5
Sample Cross-Sectional Area, in^2	4.46
Wet Density, pcf	131.2
Dry Density, pcf	110.4
Moisture Content, %	18.8
Loading Rate, lb / min	270

Splitting Tensile Strength, psi **30**

Stress-Strain

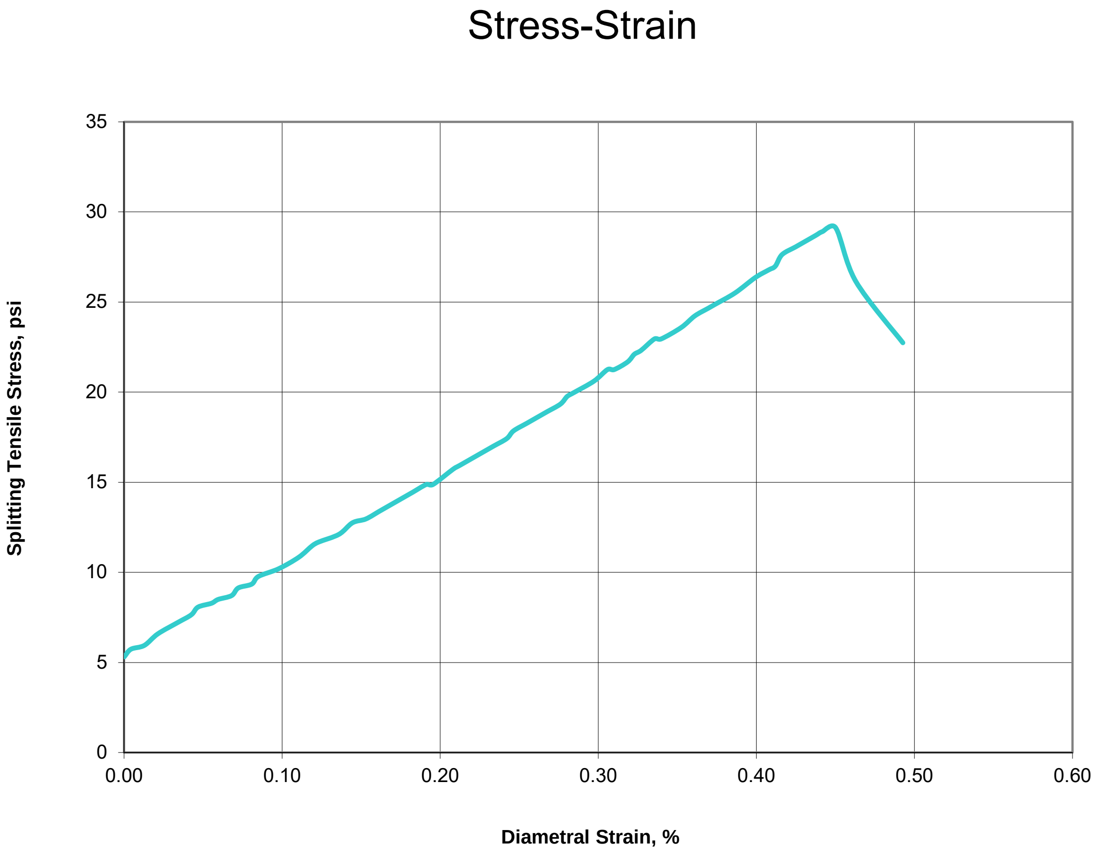


Splitting Tensile Strength of Intact Rock Core Specimens (ASTM D3967)

CTL Job No.: 823-008Y2 Boring: B-40 Date: 9/29/2016
Client: GRI Sample: R-3 By: PJ
Project Name: Port of Coos Bay Channel Modification Depth,ft.: 16 Checked: DC
Project No.: 5128
Visual Description: Very Dark Bluish Gray Rock
Approx. Size of Largest Mineral Grain, in:
Bedding Angle Relative to Axis:
Loading Orientation Rel. to Bedding:
Moisture Condition at Test Sample was washed and in a moist state.
Test Temperature, (^{o}C) Ambient
Bearing Strips: Cardboard
Remarks:

Sample Thickness, in.	1.27
Sample Diameter, in.	2.36
Thickness / Diameter	0.5
Sample Cross-Sectional Area, in^2	4.36
Wet Density, pcf	129.9
Dry Density, pcf	108.9
Moisture Content, %	19.2
Loading Rate, lb / min	270

Splitting Tensile Strength, psi **29**


Stress-Strain

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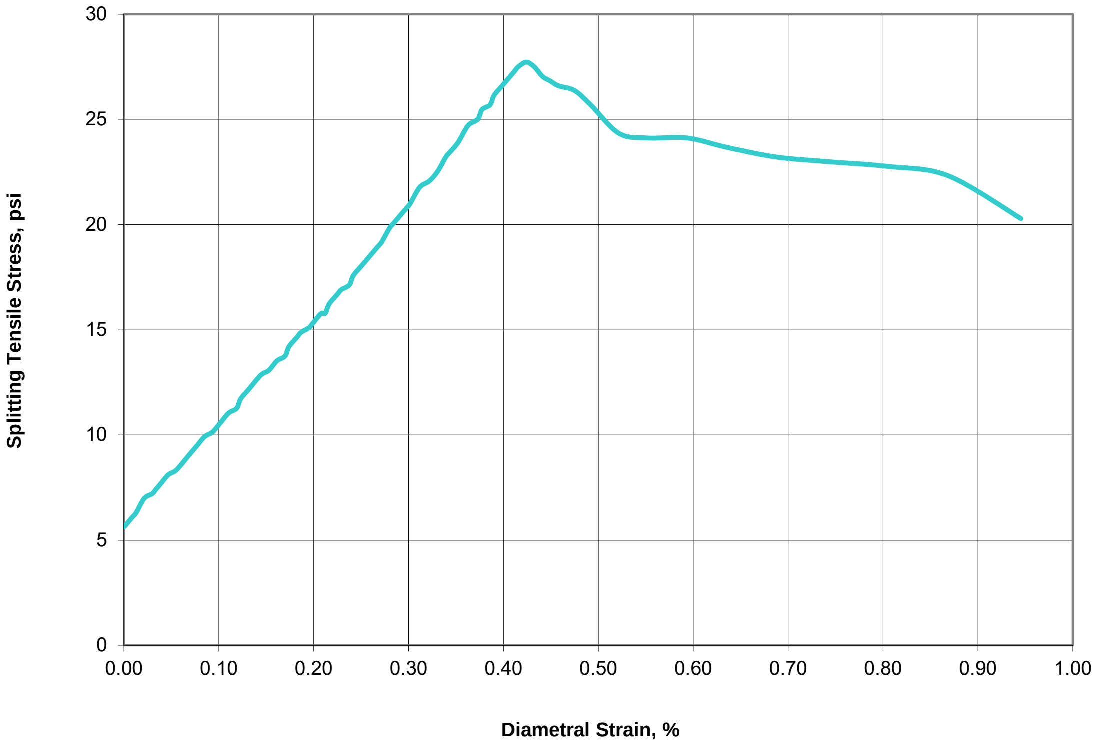
Splitting Tensile Strength of Intact Rock Core Specimens (ASTM D3967)

CTL Job No.: 823-008Y3 Boring: B-40 Date: 9/29/2016
Client: GRI Sample: R-7 By: PJ
Project Name: Port of Coos Bay Channel Modification Depth,ft.: 26 Checked: DC
Project No.: 5128
Visual Description: Very Dark Greenish Gray Rock
Approx. Size of Largest Mineral Grain, in:
Bedding Angle Relative to Axis:
Loading Orientation Rel. to Bedding:
Moisture Condition at Test Sample was washed and in a moist state.
Test Temperature, (^{o}C) Ambient
Bearing Strips: Cardboard
Remarks:

Sample Thickness, in.	1.20
Sample Diameter, in.	2.36
Thickness / Diameter	0.5
Sample Cross-Sectional Area, in^2	4.37
Wet Density, pcf	129.9
Dry Density, pcf	108.7
Moisture Content, %	19.5
Loading Rate, lb / min	280

Splitting Tensile Strength, psi **28**

Stress-Strain



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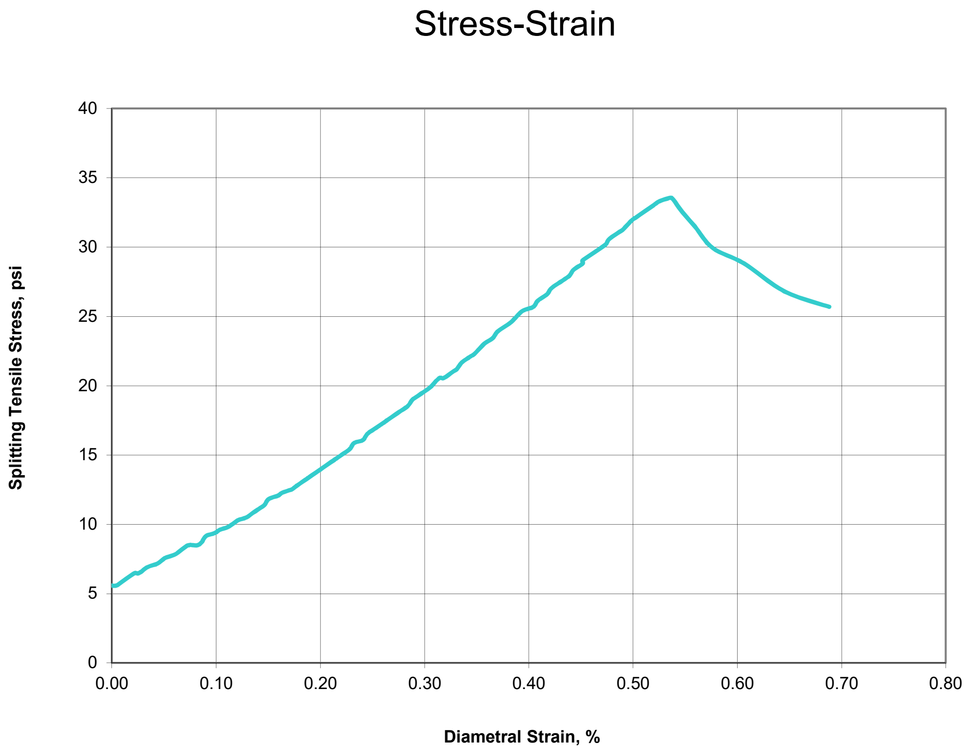
Splitting Tensile Strength of Intact Rock Core Specimens (ASTM D3967)

CTL Job No.: 823-010D2
Boring: UB-1
Date: 2/21/2017
Client: GRI
Sample: R-5
By: PJ
Project Name: Port of Coos Bay Channel Modification
Depth,ft.: 67
Checked: DC
Project No.: 5128 T2.021
Visual Description: Olive Brown Rock
Approx. Size of Largest Mineral Grain, in:
Bedding Angle Relative to Axis:
Loading Orientation Rel. to Bedding:
Moisture Condition at Test: Air Dry
Test Temperature, (°C): Ambient
Bearing Strips: Cardboard
Remarks:

Sample Thickness, in.	1.23	**Splitting Tensile Strength, psi**	**34**
Sample Diameter, in.	2.33		
Thickness / Diameter	0.5		
Sample Cross-Sectional Area, in^2	4.25		
Wet Density, pcf	133.1		
Dry Density, pcf	113.5		
Moisture Content, %	17.2		
Loading Rate, lb / min	180		

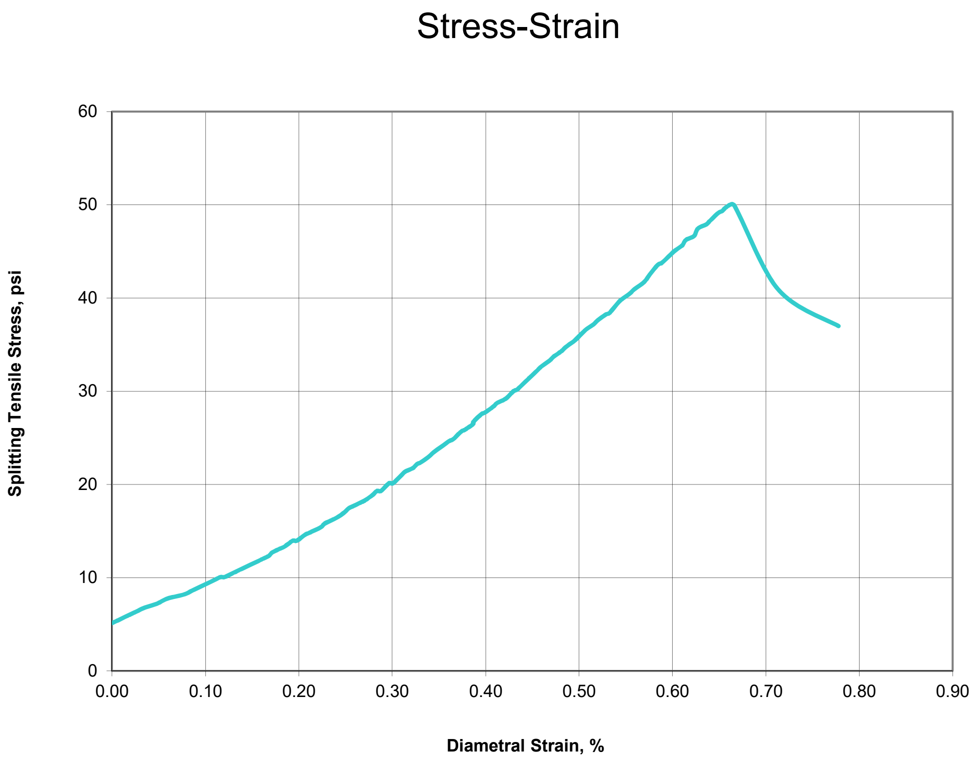


Splitting Tensile Strength of Intact Rock Core Specimens (ASTM D3967)

CTL Job No.: 823-010D3 Boring: UB-1 Date: 2/21/2017
Client: GRI Sample: R-6 By: PJ
Project Name: Port of Coos Bay Channel Modification Depth,ft.: 71 Checked: DC
Project No.: 5128 T2.021
Visual Description: Olive Gray Rock
Approx. Size of Largest Mineral Grain, in:
Bedding Angle Relative to Axis:
Loading Orientation Rel. to Bedding:
Moisture Condition at Test Air Dry
Test Temperature, (^{o}C) Ambient
Bearing Strips: Cardboard
Remarks:

Sample Thickness, in.	1.33
Sample Diameter, in.	2.33
Thickness / Diameter	0.6
Sample Cross-Sectional Area, in^2	4.25
Wet Density, pcf	118.9
Dry Density, pcf	101.8
Moisture Content, %	16.8
Loading Rate, lb / min	160

Splitting Tensile Strength, psi **50**



Splitting Tensile Strength of Intact Rock Core Specimens (ASTM D3967)

CTL Job No.:	823-010E1	Boring:	UB-2	Date:	2/21/2017
Client:	GRI	Sample:	R-3	By:	PJ
Project Name:	Port of Coos Bay Channel Modification	Depth,ft.:	50	Checked:	DC
Project No.:	5128 T2.021				

Visual Description: Gray Rock

Approx. Size of Largest Mineral Grain, in:

Bedding Angle Relative to Axis:

Loading Orientation Rel. to Bedding:

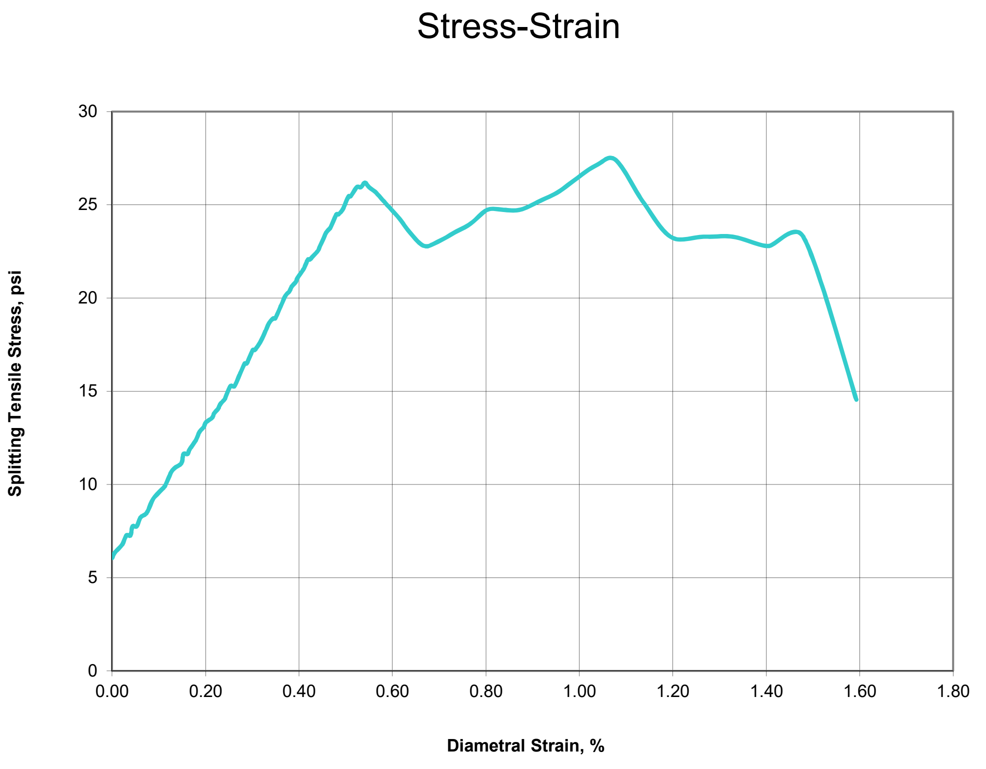
Moisture Condition at Test Air Dry

Test Temperature, (^{o}C) Ambient

Bearing Strips: Cardboard

Remarks:

Sample Thickness, in.	1.15	**Splitting Tensile Strength, psi**	**27**
Sample Diameter, in.	2.29		
Thickness / Diameter	0.5		
Sample Cross-Sectional Area, in^2	4.12		
Wet Density, pcf	133.2		
Dry Density, pcf	114.2		
Moisture Content, %	16.6		
Loading Rate, lb / min	190		



Splitting Tensile Strength of Intact Rock Core Specimens (ASTM D3967)

CTL Job No.:	823-010E2	Boring:	UB-2	Date:	2/21/2017
Client:	GRI	Sample:	R-5	By:	PJ
Project Name:	Port of Coos Bay Channel Modification	Depth,ft.:	63	Checked:	DC
Project No.:	5128 T2.021				

Visual Description: Gray Rock

Approx. Size of Largest Mineral Grain, in:

Bedding Angle Relative to Axis:

Loading Orientation Rel. to Bedding:

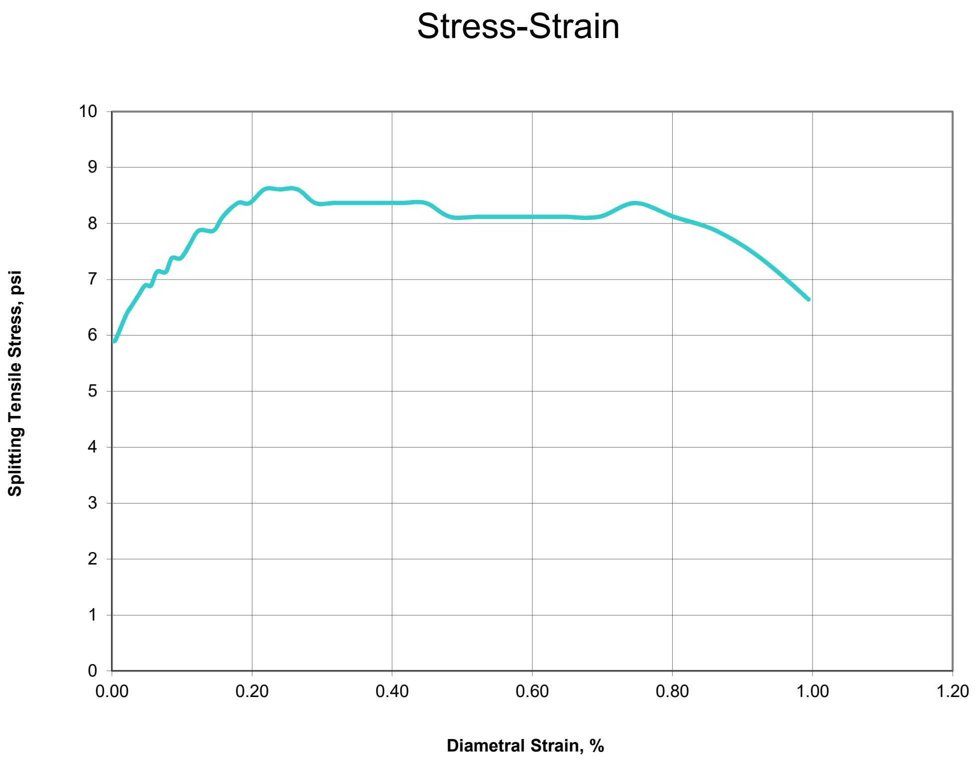
Moisture Condition at Test Air Dry

Test Temperature, (^{o}C) Ambient

Bearing Strips: Cardboard

Remarks:

Sample Thickness, in.	1.10	**Splitting Tensile Strength, psi**	**9**
Sample Diameter, in.	2.34		
Thickness / Diameter	0.5		
Sample Cross-Sectional Area, in^2	4.31		
Wet Density, pcf	132.7		
Dry Density, pcf	112.1		
Moisture Content, %	18.4		
Loading Rate, lb / min	190		

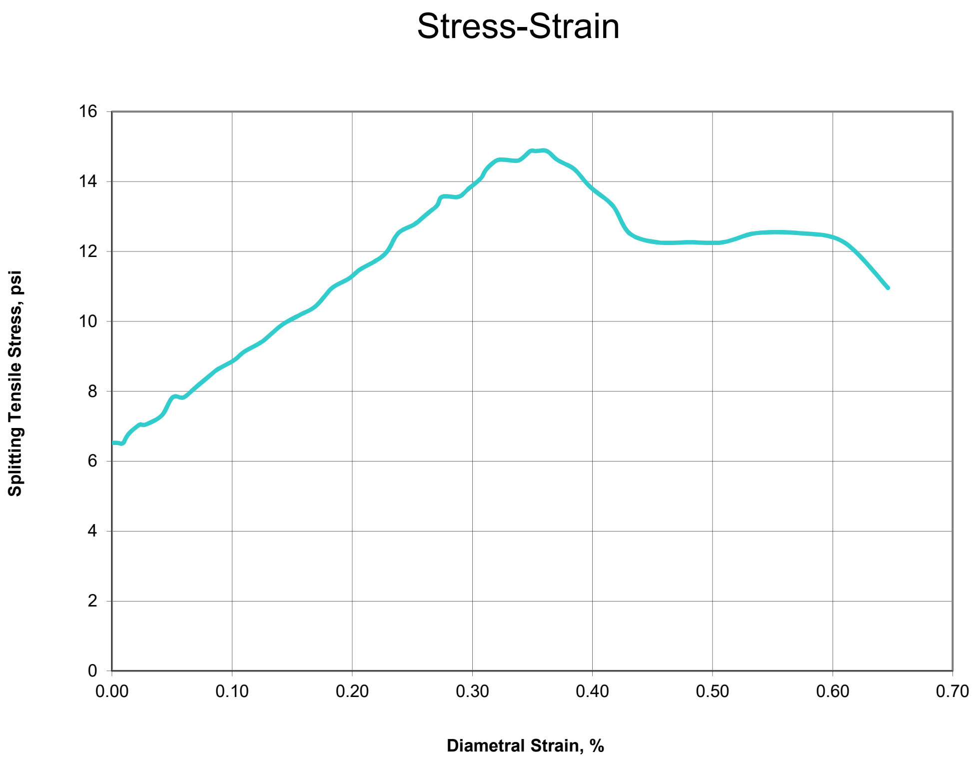


Splitting Tensile Strength of Intact Rock Core Specimens (ASTM D3967)

CTL Job No.: 823-010F1
Boring: UB-3
Date: 2/21/2017
Client: GRI
Sample: R-2
By: PJ
Project Name: Port of Coos Bay Channel Modification
Depth,ft.: 35
Checked: DC
Project No.: 5128 T2.021
Visual Description: Gray Rock
Approx. Size of Largest Mineral Grain, in:
Bedding Angle Relative to Axis:
Loading Orientation Rel. to Bedding:
Moisture Condition at Test Air Dry
Test Temperature, (°C) Ambient
Bearing Strips: Cardboard
Remarks:

Sample Thickness, in.	1.12
Sample Diameter, in.	2.18
Thickness / Diameter	0.5
Sample Cross-Sectional Area, in^2	3.74
Wet Density, pcf	125.3
Dry Density, pcf	106.5
Moisture Content, %	17.7
Loading Rate, lb / min	200

Splitting Tensile Strength, psi **15**



ASTM3967-16 Splitting Tensile Strength of Intact Rock Core Specimens

Test No.	1	Date Sampled:		Date of Test:	1/2/2024	Tested by: Evans Lineweaver
Location of Sample				Report		
Boring -		Sample		Depth-		
Description of Specimens:						

Specimen No.	Diameter (in.)				Thickness (in.)				Rate of loading (in/min)	Moisture Content (%)			Load (Lbf)	Strength: σ t (psi)	Strength: σ t (Mpa)	Failure Type
	1	2	3	Avg.	1	2	3	Avg.		Receiv	Prep	Test				
B13 R2 24.3-24.5	2.400	2.390	2.390	2.39	1.520	1.510	1.200	1.41	0.055			15.8%	149	28	0.19	see photo
B13 R2 22.1-22.3	2.340	2.370	2.370	2.36	1.720	1.700	1.720	1.71	0.055			17.0%	394	62	0.43	see photo
B14 R5 8.3-8.5	3.360	2.360	2.350	2.69	1.740	1.760	1.780	1.76	0.055			17.5%	318	43	0.29	see photo
B14 R5 9.8-10.1	2.370	2.360	2.370	2.37	1.850	1.860	1.850	1.85	0.055			16.8%	191	28	0.19	see photo
B14 R6 11.2-11.6	2.360	2.350	2.350	2.35	1.590	1.570	1.610	1.59	0.055			17.5%	704	120	0.83	see photo
B14 R6 12.9-13.6	2.380	2.370	2.380	2.38	1.950	1.900	1.880	1.91	0.055			19.3%	788	110	0.76	see photo
B15 R2 8.1-8.4	2.290	2.290	2.280	2.29	1.560	1.610	1.620	1.60	0.055			25.6%	368	64	0.44	see photo
B15 R1 6.8-7.0	2.310	2.300	2.300	2.30	1.610	1.620	1.630	1.62	0.055			21.8%	821	140	0.97	see photo
B15 R5 22.2-22.6	2.350	2.370	2.360	2.36	1.040	1.000	1.060	1.03	0.055			16.2%	171	45	0.31	see photo
B4 R2 28.6-28.7	Sample broke apart during preperation and was rendered untestable															
B4 R2 28.9-29.1	Sample broke apart during preperation and was rendered untestable															

Average Strength (σ t):	71	0.49
Standard Deviation:	40	0.27
Coefficient of Variation:	55.6	55.6

FIG. 275B

Slake Durability
ASTM D 4644-87

CTL Job No: 823-006
Project No.: 5128
Client: GRI
Date: 12/4/2015
Project Name:
By: PJ

Boring:	B-4	B-7	B-7			
Sample:						
Depth, ft:	36-39	8-11	20-22.5			
Soil Description:	Brown Rock	Brown Rock	Brown Rock			
NATURAL MOISTURE CONTENT OF SAMPLE:						
DrumNo.						
Drum wt. (g)	1742	1722	1742			
Total wet wt. (g)	2227.6	2244.5	2250.1			
Total dry wt (g)	2190.1	2202.1	2204			
Natural % H2O						
Cycle # 1						
Beginning H2O Temp (^{o}C)	18.8	18.8	18.9			
Ending H2O Temp (^{o}C)	19.0	19.0	19.1			
Average H2O Temp (^{o}C)	18.9	18.9	19.0			
Drum & Dry Rock (g)	1968.2	2181.7	1855.0			
Cycle # 2						
Beginning H2O Temp (^{o}C)	19.1	19.1	19.2			
Ending H2O Temp (^{o}C)	19.2	19.2	19.3			
Average H2O Temp (^{o}C)	19.2	19.2	19.3			
Drum & Dry Rock (g)	1742.7	2153.8	1809.2			
SLAKE DURABILITY INDEX (percent retained after second cycle)	**0.2**	**89.9**	**14.5**			
Standard Verbal Description and comments (Type I - Retained pieces remain virtually unchanged) (Type II - Retained material consists of large & small pieces. (Type III - Retained material is exclusively small fragments)	**Type III**	**Type I**	**Type II**			

Slake Durability
ASTM D 4644-87

CTL Job No: 823-008A
Project No.: 5128
Client: GRI
Date: 9/20/2016
Project Name: Port of Coos Bay Channel Modification Project
By: PJ

Boring:	B-15	B-15	B-21	B-21	B-22	B-23
Sample:	R-3	R-4	R-3	R-7	R-2	R-3
Depth, ft:	9.5	15.5	6.5	20.5	16	8.5
Soil Description:	Gray Rock	Gray Rock	Very Dark Brown Rock	Very Dark Brown Rock	Very Dark Brown Rock	Very Dark Brown Rock
NATURAL MOISTURE CONTENT OF SAMPLE:						
DrumNo.						
Drum wt. (g)	1741.9	1722.1	1741.9	1722.1	1741.9	1722.1
Total wet wt. (g)	2266.4	2208.3	2274.3	2214	2258	2211.9
Total dry wt (g)	2220.6	2158.2	2153	2108	2139.5	2114
Natural % H2O						
Cycle # 1						
Beginning H2O Temp (°C)	22.3	22.3	22.1	22.1	23.4	23.4
Ending H2O Temp (°C)	22.3	22.3	22.1	22.1	23.4	23.4
Average H2O Temp (°C)	22.3	22.3	22.1	22.1	23.4	23.4
Drum & Dry Rock (g)	2127.8	1890.1	1817.3	1895.8	1804.9	2074.1
Cycle # 2						
Beginning H2O Temp (°C)	22.5	22.5	22.2	22.2	23.6	23.6
Ending H2O Temp (°C)	22.5	22.5	22.2	22.2	23.6	23.6
Average H2O Temp (°C)	22.5	22.5	22.2	22.2	23.6	23.6
Drum & Dry Rock (g)	2030.5	1804.6	1742.3	1746.3	1744.2	1903.0
SLAKE DURABILITY INDEX (percent retained after second cycle)	**60.3**	**18.9**	**0.1**	**6.3**	**0.6**	**46.2**
Standard Verbal Description and comments (Type I - Retained pieces remain virtually unchanged) (Type II - Retained material consists of large & small pieces. (Type III - Retained material is exclusively small fragments)	**Type I**	**Type II**	**Type III**	**Type III**	**Type III**	**Type III**

In order to keep as much material intact as possible for additional testing, pieces tested ranged in weight from 30g to 70g rather than 40g to 60g as called from by the spec.

Slake Durability
ASTM D 4644-87

CTL Job No: 823-008B
Project No.: 5128
Client: GRI
Date: 9/29/2016
Project Name: Port of Coos Bay Channel Modification Project
By: PJ

Boring:	B-24	B-24	B-25	B-26	B-27	B-27
Sample:	R-2	R-5	R-3	R-1	R-1	R-4
Depth, ft:	8	24	10	4	7	21
Soil Description:	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock
NATURAL MOISTURE CONTENT OF SAMPLE:						
DrumNo.	1	2	1	2	1	2
Drum wt. (g)	1741.9	1722.1	1741.9	1722.1	1741.9	1722.1
Total wet wt. (g)	2253.9	2257.5	2224.7	2179	2257.9	2261.2
Total dry wt (g)	2192.9	2197.4	2146.9	2102.4	2152.1	2144.1
Natural % H2O	**13.5**	**12.6**	**19.2**	**20.1**	**25.8**	**27.7**
Cycle # 1						
Beginning H2O Temp (°C)	23.1	23.1	22.6	22.6	22.4	22.4
Ending H2O Temp (°C)	23.1	23.1	22.6	22.6	22.4	22.4
Average H2O Temp (°C)	23.1	23.1	22.6	22.6	22.4	22.4
Drum & Dry Rock (g)	1762.0	1722.3	1745.0	1724.8	2139.2	2133.5
Cycle # 2						
Beginning H2O Temp (°C)	23.2	23.2	22.9	22.9	22.3	22.3
Ending H2O Temp (°C)	23.2	23.2	22.9	22.9	22.3	22.3
Average H2O Temp (°C)	23.2	23.2	22.9	22.9	22.3	22.3
Drum & Dry Rock (g)	1742.0	1722.2	1744.4	1722.6	2123.4	2120.1
SLAKE DURABILITY INDEX (percent retained after second cycle)	**0.0**	**0.0**	**0.6**	**0.1**	**93.0**	**94.3**
Standard Verbal Description and comments (Type I - Retained pieces remain virtually unchanged) (Type II - Retained material consists of large & small pieces. (Type III - Retained material is exclusively small fragments)	**Type III**	**Type III**	**Type III**	**Type III**	**Type II**	**Type II**

In order to keep as much material intact as possible for additional testing, pieces tested ranged in weight from 30g to 70g rather than 40g to 60g as called from by the spec.

Slake Durability
ASTM D 4644-87

CTL Job No: 823-008C
Project No.: 5128
Client: GRI
Date: 9/29/2016
Project Name: Port of Coos Bay Channel Modification Project
By: PJ

Boring:	B-28	B-29	B-29	B-30	B-30	B-31
Sample:	R-2	R-2	R-3	R-1	R-3	R-1
Depth, ft:	12	5	12	14.5	25	4
Soil Description:	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Bluish Gray Rock

In order to keep as much material intact as possible for additional testing, pieces tested ranged in weight from 30g to 70g rather than 40g to 60g as called from by the spec.

NATURAL MOISTURE CONTENT OF SAMPLE:

DrumNo.	1	2	1	2	1	2
Drum wt. (g)	1741.9	1722.1	1741.9	1722.1	1741.9	1722.1
Total wet wt. (g)	2262.8	2250	2255.1	2239.4	2262.5	2257.1
Total dry wt (g)	2157.3	2131.8	2150.1	2195.3	2184.8	2171.4
Natural % H2O	**25.4**	**28.9**	**25.7**	**9.3**	**17.5**	**19.1**

Cycle # 1

Beginning H2O Temp (°C)	21.9	21.9	22.2	22.2	21.7	21.7
Ending H2O Temp (°C)	21.9	21.9	22.2	22.2	21.7	21.7
Average H2O Temp (°C)	21.9	21.9	22.2	22.2	21.7	21.7
Drum & Dry Rock (g)	2168.2	2158.2	2133.6	2147.0	1750.1	1730.2

Cycle # 2

Beginning H2O Temp (°C)	22.1	22.1	22.5	22.5	22.1	22.1
Ending H2O Temp (°C)	22.1	22.1	22.5	22.5	22.1	22.1
Average H2O Temp (°C)	22.1	22.1	22.5	22.5	22.1	22.1
Drum & Dry Rock (g)	2115.4	2088.6	2111.7	2119.1	1742.3	1722.3
SLAKE DURABILITY INDEX (percent retained after second cycle)	**89.9**	**89.5**	**90.6**	**83.9**	**0.1**	**0.0**
Standard Verbal Description and comments (Type I - Retained pieces remain virtually unchanged) (Type II - Retained material consists of large & small pieces. (Type III - Retained material is exclusively small fragments)	**Type II**	**Type II**	**Type II**	**Type II**	**Type III**	**Type III**

Slake Durability
ASTM D 4644-87

CTL Job No: 823-008D
Project No.: 5128
Client: GRI
Date: 9/29/2016
Project Name: Port of Coos Bay Channel Modification Project
By: PJ

Boring:	B-32	B-33	B-33	B-40	B-40	
Sample:	R-1	R-1	R-7	R-1	R-7	
Depth, ft:	2.5	2	21	6	26	
Soil Description:	Very Dark Bluish Gray Rock	Very Dark Greenish Gray Rock	Very Dark Greenish Gray Rock	Very Dark Bluish Gray Rock	Very Dark Greenish Gray Rock	

In order to keep as much material intact as possible for additional testing, pieces tested ranged in weight from 30g to 70g rather than 40g to 60g as called from by the spec.

NATURAL MOISTURE CONTENT OF SAMPLE:

DrumNo.	1	2	1	2	1	
Drum wt. (g)	1741.9	1722.1	1741.9	1722.1	1741.9	
Total wet wt. (g)	2263	2234.1	2246.9	2236.5	2227.4	
Total dry wt (g)	2166.2	2121.7	2155.8	2160.2	2155.5	
Natural % H2O	**22.8**	**28.1**	**22.0**	**17.4**	**17.4**	

Cycle # 1

Beginning H2O Temp (°C)	21.8	21.8	22	22	21.6	
Ending H2O Temp (°C)	21.8	21.8	22.0	22.0	21.6	
Average H2O Temp (°C)	21.8	21.8	22.0	22.0	21.6	
Drum & Dry Rock (g)	2141.0	2112.2	2118.4	1722.5	1742.7	

Cycle # 2

Beginning H2O Temp (°C)	21.9	21.9	22.4	22.4	22.0	
Ending H2O Temp (°C)	21.9	21.9	22.4	22.4	22.0	
Average H2O Temp (°C)	21.9	21.9	22.4	22.4	22.0	
Drum & Dry Rock (g)	2102.7	2104.0	2036.9	1722.1	1742.0	
SLAKE DURABILITY INDEX (percent retained after second cycle)	**85.0**	**95.6**	**71.3**	**0.0**	**0.0**	
Standard Verbal Description and comments (Type I - Retained pieces remain virtually unchanged) (Type II - Retained material consists of large & small pieces. (Type III - Retained material is exclusively small fragments)	**Type II**	**Type II**	**Type II**	**Type III**	**Type III**	

Slake Durability
ASTM D 4644-87

CTL Job No: 823-010
Project No.: 5128 T2.021
Client: GRI
Date: 2/21/2017
Project Name: Port of Coos Bay Channel Modification Project
By: PJ

Boring:	UB-1	UB-2	UB-2	UB-3		
Sample:	R-1	R-3	R-7	R-3		
Depth, ft:	46	50	72	35		
Soil Description:	Olive Brown Rock	Gray Rock	Gray Rock	Gray Rock		
NATURAL MOISTURE CONTENT OF SAMPLE:						
DrumNo.	#2	#1	#1	#2		
Drum wt. (g)	1721.7	1741.6	1741.6	1721.7		
Total wet wt. (g)	2199.8	2244.3	2230.5	2225.3		
Total dry wt (g)	2127.5	2172.9	2163.2	2147.2		
Natural % H2O	**17.8**	**16.6**	**16.0**	**18.4**		
Cycle # 1						
Beginning H2O Temp (°C)	19.3	19.3	20.1	20.1		
Ending H2O Temp (°C)	19.4	19.4	20.3	20.3		
Average H2O Temp (°C)	19.4	19.4	20.2	20.2		
Drum & Dry Rock (g)	1722.3	1885.1	2022.6	1721.9		
Cycle # 2						
Beginning H2O Temp (°C)	19.7	19.7	20.3	20.3		
Ending H2O Temp (°C)	19.7	19.7	20.4	20.4		
Average H2O Temp (°C)	19.7	19.7	20.4	20.4		
Drum & Dry Rock (g)	1722.2	1778.9	1920.1	1721.7		
SLAKE DURABILITY INDEX (percent retained after second cycle)	**0.1**	**8.6**	**42.3**	**0.0**		
Standard Verbal Description and comments (Type I - Retained pieces remain virtually unchanged) (Type II - Retained material consists of large & small pieces. (Type III - Retained material is exclusively small fragments)	**Type III**	**Type II**	**Type II**	**Type III**		

Geo Test Unlimited GTU

DATA SHEET
Cerchar Abrasion Index

Client: Cooper Testing Lab, Inc.
Job: #376-1 Port of Coos Bay Channel Modification CTL#823-008

Date: 9/14/16
Technician: A. Bro

Sample ID	Depth (ft)	Sample Description	Point Hardness (RC)	Wear Width (x 0.1mm)		Cerchar Index
B-15	5.5'	Light gray med. grained sandstone	41.9	2.1	2.0	2.3
		(quite hard)		1.6	1.1	
				2.4	2.5	
				2.5	2.5	
				3.0	3.0	
B-23	11.5'	Dark gray claystone	41.9	0	0	0.1
				0	0	
				0.4	0.2	
				0.2	0.1	
				0	0	
B-24	11'	Dark gray silty Fine grained	41.9	0.3	0.3	0.2
		sandstone (Fairly weak)		0.3	0.2	
				0.3	0.2	
			sample broke →	0	0.2	
				–	–	
B-25	15'	Dark gray med. grained sandstone	41.9	0.3	0	NA (.2)
		(Fairly weak)	sample broke	–	–	
				–	–	
				–	–	
				–	–	
B-26	13'	Dark gray med. grained sandstone	41.9	0.2	0.2	NA (.2)
		(Fairly weak)	sample broke	–	–	
				–	–	
				–	–	
				–	–	

Geo Test Unlimited GTU

DATA SHEET
Cerchar Abrasion Index

Client: Cooper Testing Lab, Inc.
Job: #376-1 Port of Coos Bay Channel Modification CTL#823-008

Date: 9/14/16
Technician: A. Bro

Sample ID	Depth (ft)	Sample Description	Point Hardness (RC)	Wear Width (x 0.1mm)		Cerchar Index
B-27	16′	Dark gray siltstone	41.9	0.3	0.3	0.4
				0.3	0.4	
				0.5	0.5	
				0.3	0.4	
				0.5	0.5	
B-28	15′	Dark gray clayey siltstone.	41.9	0.3	0.5	0.3
				0.2	0.3	
				0.5	0.3	
				0.3	0.2	
				0.4	0.3	
B-29	12′	Dark gray clayey siltstone	41.9	0.2	0.3	0.4
				0.4	0.5	
				0.4	0.3	
				0.4	0.3	
				0.4	0.4	
B-30	28′	Dark gray Fine grained sandstone (weak rock)	41.9	0.5	0.4	NA (0.5)
				0.5	0.5	
		sample broke →		0	0	
B-31	14′	Dark gray Fine grained sandstone (weak rock)	41.9	0.4	0.3	0.4
				0.4	0.3	
				0.4	0.4	
				0.3	0.4	
				0.3	0.5	

Geo Test Unlimited GTU

DATA SHEET
Cerchar Abrasion Index

Client: Cooper Testing Lab, Inc.
Job: #376-1 Port of Coos Bay Channel Modification CTL#823-008

Date: 9/14/16
Technician: A. Bro

Sample ID	Depth (ft)	Sample Description	Point Hardness (RC)	Wear Width (x 0.1mm)		Cerchar Index
B-32	8.5'	Dark gray Fine grained sandstone	41.9	0.4	0.5	0.3
				0.2	0.2	
				0.4	0.4	
				0.3	0.3	
				0.4	0.3	
B-33	2'	Dark gray silty Fine grained sandstone	41.9	0.2	0.3	0.3
				0.4	0.5	
				0.3	0.4	
				0.4	0.3	
				0.4	0.1	
B-40	11'	Dark gray Fine to med. grained sandstone	41.9	0.4	0.5	0.4
				0.4	0.4	
				0.4	0.5	
				0.1	0.4	
				0.4	0.4	
			41.9			
			41.9			

Geo Test Unlimited

DATA SHEET
Cerchar Abrasion Index

Client: Cooper Testing Lab, Inc.
Job: #378-1 Port of Coos Bay Channel Modification Project – Cooper Proj. # 5128 T2.021

Date: 2/15/17
Technician: A. Bro

Sample ID	Depth (ft)	Sample Description	Point Hardness (RC)	Wear Width (x 0.1mm)		Cerchar Index
UB-1	60'	Dark gray silty Fine grained sand stone - weak & fractured	41.9	0.7	0.4	.4 *
			sample broke →	0.5	0.4	
				0.2	0.4	
UB-2	72'	Dark gray silty Fine grained sandstone weak	41.9	0.4	0.4	.4 *
			sample broke →	0.3	0.3	
				0.5	0.4	
UB-3	30.3'	Dark gray silty Fine grained sandstone weak	41.9	0.4	0.5	.4
				0.4	0.4	
				0.4	0.3	
				0.6	0.5	
				0.6	0.3	
			41.9			
			41.9			

* Average of the 6 measurements so perhaps not as acurate as the average of 10 measurements possible if the sample had not broken.

Client:	Geotechnical Resources Inc.		
Project:	Coos Bay Channel Modification		
Location:	Coos Bay, OR	Project No:	GTX-318386

Boring ID:	B-4-23	Sample Type:	cylinder	Tested By:	te
Sample ID:	R-2	Test Date:	01/11/24	Checked By:	smd
Depth :	31.9-32.3'	Test Id:	752545		

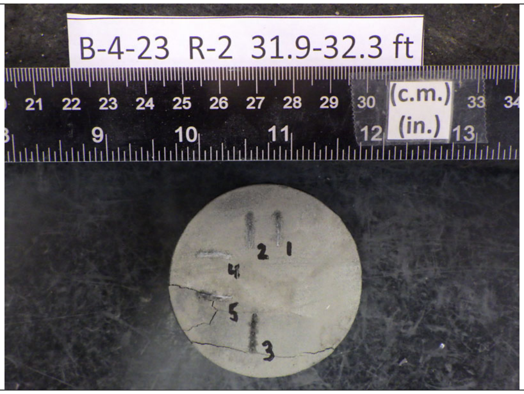
Test Comment: ---
Visual Description: ---
Sample Comment: ---

Abrasiveness of Rock Using the Cerchar Method
by ASTM D7625

Boring ID	Sample ID	Depth	Stylus No	Reading 1	Reading 2	Average	Comments
B-4-23	R-2	31.9-32.3 ft	1	0.1	0.3	0.20	
			2	0.1	0.3	0.20	
			3	0.2	0.1	0.15	
			4	0.5	0.4	0.45	
			5	0.1	0.3	0.20	
			Average CAIs			0.24	
			Average CAI *			0.72	
				CERCHAR Abrasiveness Index Classification		**Low abrasiveness**	

Notes

Test Surface: Saw Cut
Moisture Condition: As Received
Apparatus Type: Original CERCHAR
Stylus Hardness: Rockwell Hardess 54/56 HRC
Stylus Displacement Relative to Rock Fabric:
Styli 1-3: Normal; Styli 4-5: Parallel
* CAI = (0.99 * CAIs) + 0.48
CAIs = CERCHAR index for smooth (saw cut) surface
CAI = CERCHAR index for natural surface
Comments:



GeoTesting EXPRESS

Client: Geotechnical Resources Inc.
Project: Coos Bay Channel Modification
Location: Coos Bay, OR
Project No: GTX-318386

Boring ID: B-13-23
Sample ID: R-2
Depth : 20.8-21.1'
Sample Type: cylinder
Test Date: 01/11/24
Test Id: 752546
Tested By: te
Checked By: smd

Test Comment: ---
Visual Description: ---
Sample Comment: ---

Abrasiveness of Rock Using the Cerchar Method
by ASTM D7625

Boring ID	Sample ID	Depth	Stylus No	Reading 1	Reading 2	Average	Comments
B-13-23	R-2	20.8-21.1 ft	1	0.2	0.3	0.25	
			2	0.3	0.4	0.35	
			3	0.1	0.1	0.10	
			4	0.3	0.2	0.25	
			5	0.2	0.1	0.15	
			Average CAIs			0.22	
			Average CAI *			0.70	
					CERCHAR Abrasiveness Index Classification	**Low abrasiveness**	

Notes

Test Surface: Saw Cut
Moisture Condition: As Received
Apparatus Type: Original CERCHAR
Stylus Hardness: Rockwell Hardess 54/56 HRC
Stylus Displacement Relative to Rock Fabric:
Styli 1-3: Normal; Styli 4-5: Parallel
* CAI = (0.99 * CAIs) + 0.48
CAIs = CERCHAR index for smooth (saw cut) surface
CAI = CERCHAR index for natural surface
Comments:

FIG. 287B

Client:	Geotechnical Resources Inc.		
Project:	Coos Bay Channel Modification		
Location:	Coos Bay, OR	Project No:	GTX-318386

Boring ID:	B-14-23	Sample Type:	cylinder	Tested By:	te
Sample ID:	R-5	Test Date:	01/11/24	Checked By:	smd
Depth :	7.4-7.8'	Test Id:	752547		

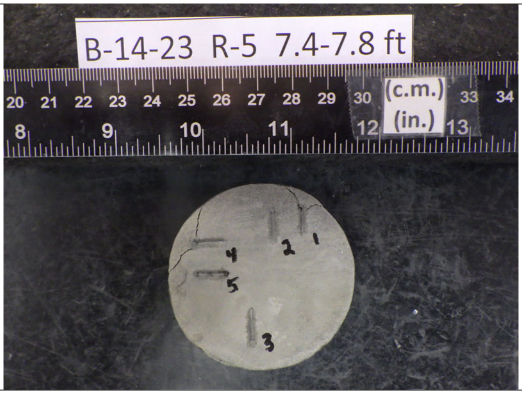
Test Comment: ---
Visual Description: ---
Sample Comment: ---

Abrasiveness of Rock Using the Cerchar Method
by ASTM D7625

Boring ID	Sample ID	Depth	Stylus No	Reading 1	Reading 2	Average	Comments
B-14-23	R-5	7.4-7.8 ft	1	0.4	0.3	0.35	
			2	0.3	0.2	0.25	
			3	0.4	0.3	0.35	
			4	0.5	0.5	0.50	
			5	0.3	0.2	0.25	
			Average CAIs			0.34	
			Average CAI *			0.82	
			CERCHAR Abrasiveness Index Classification		**Low abrasiveness**		

Notes

Test Surface: Saw Cut
Moisture Condition: As Received
Apparatus Type: Original CERCHAR
Stylus Hardness: Rockwell Hardess 54/56 HRC
Stylus Displacement Relative to Rock Fabric:
Styli 1-3: Normal; Styli 4-5: Parallel
* CAI = (0.99 * CAIs) + 0.48
CAIs = CERCHAR index for smooth (saw cut) surface
CAI = CERCHAR index for natural surface
Comments:



GeoTesting EXPRESS

Client: Geotechnical Resources Inc.
Project: Coos Bay Channel Modification
Location: Coos Bay, OR
Project No: GTX-318386

Boring ID: B-14-23
Sample ID: R-6
Depth : 11.6'-12.1'
Sample Type: cylinder
Test Date: 01/19/24
Test Id: 755122
Tested By: jss
Checked By: smd

Test Comment: ---
Visual Description: ---
Sample Comment: ---

Abrasiveness of Rock Using the Cerchar Method
by ASTM D7625

Boring ID	Sample ID	Depth	Stylus No	Reading 1	Reading 2	Average	Comments
B-14-23	R-6	11.6-12.1 ft	1	0.4	0.5	0.45	
			2	0.3	0.3	0.30	
			3	0.2	0.2	0.20	
			4	0.1	0.1	0.10	
			5	0.1	0.3	0.20	
			Average CAIs			0.25	
			Average CAI *			0.73	
			CERCHAR Abrasiveness Index Classification			**Low abrasiveness**	

Notes

Test Surface: Saw Cut
Moisture Condition: As Received
Apparatus Type: Original CERCHAR
Stylus Hardness: Rockwell Hardess 54/56 HRC
Stylus Displacement Relative to Rock Fabric:
Styli 1-3: Normal; Styli 4-5: Parallel
* CAI = (0.99 * CAIs) + 0.48
CAIs = CERCHAR index for smooth (saw cut) surface
CAI = CERCHAR index for natural surface
Comments:

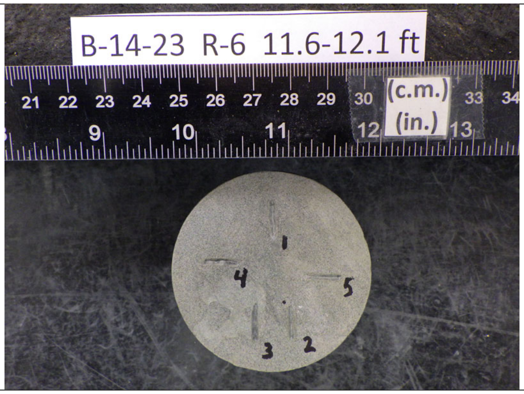


FIG. 289B

GeoTesting EXPRESS

Client: Geotechnical Resources Inc.
Project: Coos Bay Channel Modification
Location: Coos Bay, OR
Project No: GTX-318386

Boring ID: B-14-23
Sample ID: R-7
Depth : 19.5-19.8'
Sample Type: cylinder
Test Date: 01/11/24
Test Id: 752548
Tested By: te
Checked By: smd

Test Comment: ---
Visual Description: ---
Sample Comment: ---

Abrasiveness of Rock Using the Cerchar Method by ASTM D7625

Boring ID	Sample ID	Depth	Stylus No	Reading 1	Reading 2	Average	Comments
B-14-23	R-7	19.5-19.8 ft	1	0.2	0.1	0.15	
			2	0.2	0.3	0.25	
			3	0.2	0.1	0.15	
			4	0.4	0.3	0.35	
			5	0.1	0.2	0.15	
			Average CAIs			0.21	
			Average CAI *			0.69	
					CERCHAR Abrasiveness Index Classification	**Low abrasiveness**	

Notes

Test Surface: Saw Cut
Moisture Condition: As Received
Apparatus Type: Original CERCHAR
Stylus Hardness: Rockwell Hardess 54/56 HRC
Stylus Displacement Relative to Rock Fabric:
Styli 1-3: Normal; Styli 4-5: Parallel
* CAI = (0.99 * CAIs) + 0.48
CAIs = CERCHAR index for smooth (saw cut) surface
CAI = CERCHAR index for natural surface
Comments:

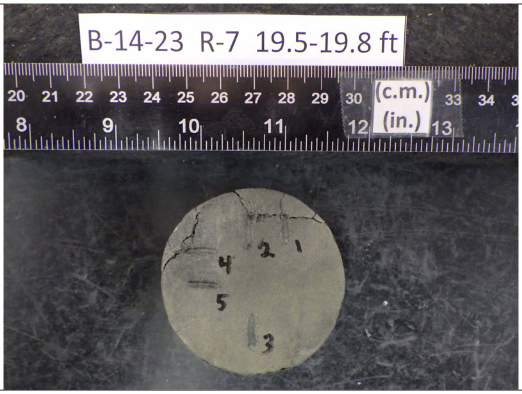


FIG. 290B

GeoTesting
EXPRESS

Client: Geotechnical Resources Inc.
Project: Coos Bay Channel Modification
Location: Coos Bay, OR
Project No: GTX-318386

Boring ID: B-15-23
Sample ID: R-3
Depth : 12.5-12.9'
Sample Type: cylinder
Test Date: 01/11/24
Test Id: 752549
Tested By: te
Checked By: smd

Test Comment: ---
Visual Description: ---
Sample Comment: ---

Abrasiveness of Rock Using the Cerchar Method by ASTM D7625

Boring ID	Sample ID	Depth	Stylus No	Reading 1	Reading 2	Average	Comments
B-15-23	R-3	12.5-12.9 ft	1	0.2	0.1	0.15	
			2	0.4	0.4	0.40	
			3	0.1	0.2	0.15	
			4	0.1	0.1	0.10	
			5	0.1	0.1	0.10	
			Average CAIs			0.18	
			Average CAI *			0.66	
			CERCHAR Abrasiveness Index Classification			**Low abrasiveness**	

Notes

Test Surface: Saw Cut
Moisture Condition: As Received
Apparatus Type: Original CERCHAR
Stylus Hardness: Rockwell Hardess 54/56 HRC
Stylus Displacement Relative to Rock Fabric:
Styli 1-3: Normal; Styli 4-5: Parallel
* CAI = (0.99 * CAIs) + 0.48
CAIs = CERCHAR index for smooth (saw cut) surface
CAI = CERCHAR index for natural surface
Comments:

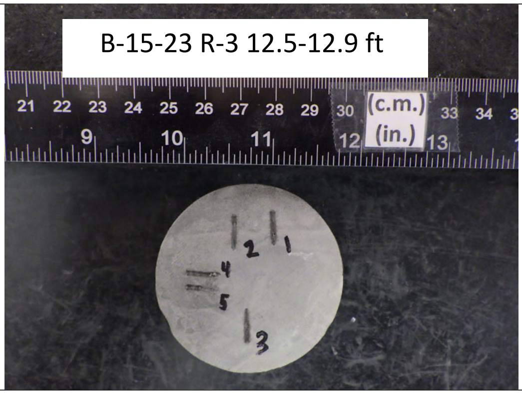
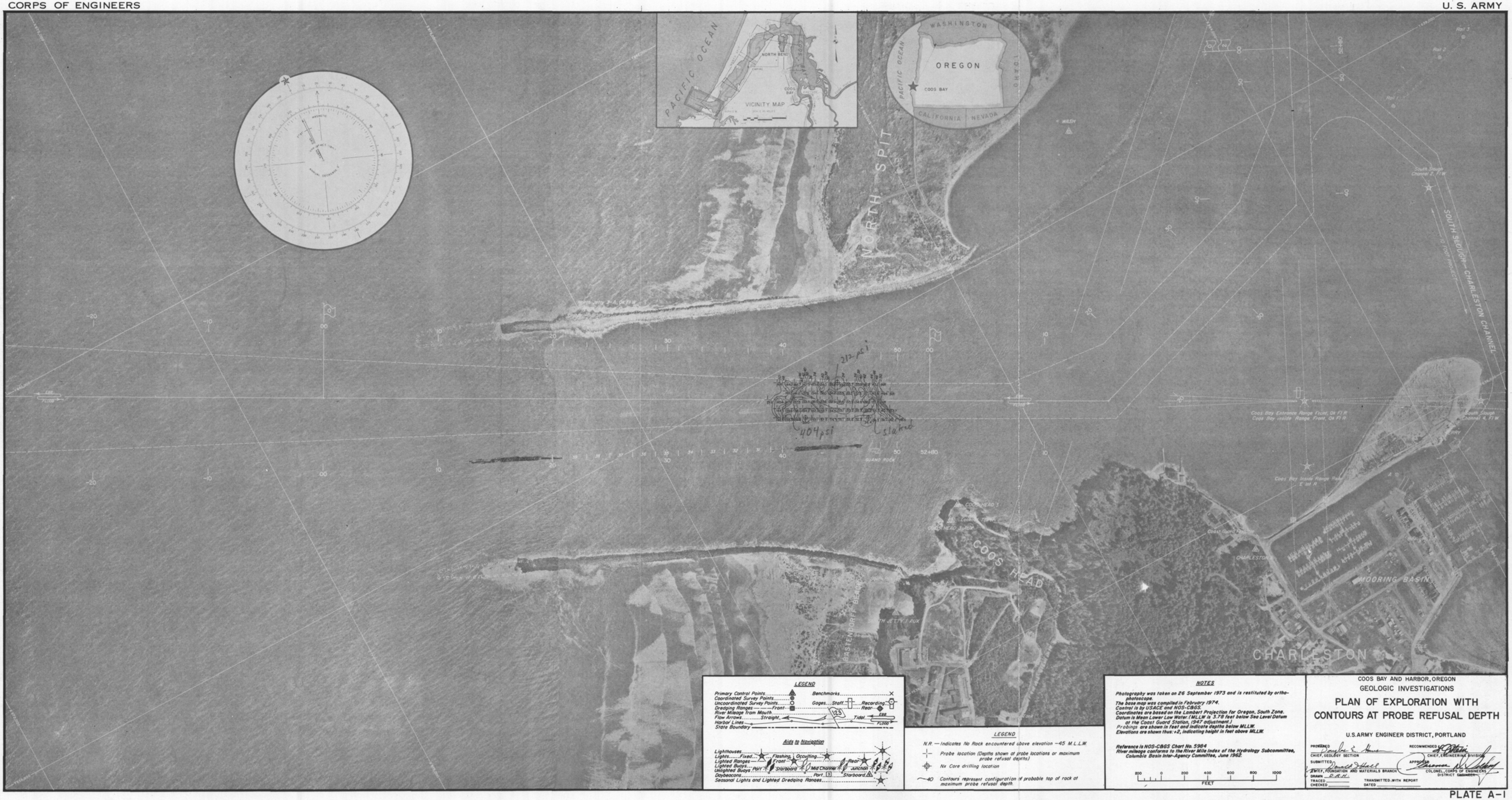


FIG. 291B

APPENDIX C – USACE 1974 Field Explorations



LEGEND

Primary Control Points
Coordinated Survey Points
Uncoordinated Survey Points
Dredging Ranges — Front — Rear
River Mileage from Mouth
Flow Arrows — Straight — Tidal — EBB — FLOOD
Harbor Lines
State Boundary
Benchmarks
Gages — Staff — Recording

Aids to Navigation

Lighthouses
Lights — Fixed — Flashing, Occulting
Lighted Ranges — Front — Rear
Lighted Buoys
Unlighted Buoys — Port — Starboard — Mid Channel — Junction
Daybeacons — Port — Starboard
Seasonal Lights and Lighted Dredging Ranges

LEGEND

N.R. — Indicates No Rock encountered above elevation −45 M.L.L.W.

Probe location (Depths shown at probe locations or maximum probe refusal depths)

Nx Core drilling location

40 Contours represent configuration of probable top of rock at maximum probe refusal depth.

NOTES

Photography was taken on 26 September 1973 and is restituted by orthophotoscope.
The base map was compiled in February 1974.
Control is by USACE and NOS-C&GS.
Coordinates are based on the Lambert Projection for Oregon, South Zone.
Datum is Mean Lower Low Water. (MLLW is 3.78 feet below Sea Level Datum at the Coast Guard Station, 1947 adjustment.)
Probings are shown in feet and indicate depths below MLLW.
Elevations are shown thus: +2, indicating height in feet above MLLW.

Reference is NOS-C&GS Chart No. 5984
River mileage conforms to the River Mile Index of the Hydrology Subcommittee, Columbia Basin Inter-Agency Committee, June 1962.

200 0 200 400 600 800 1000
FEET

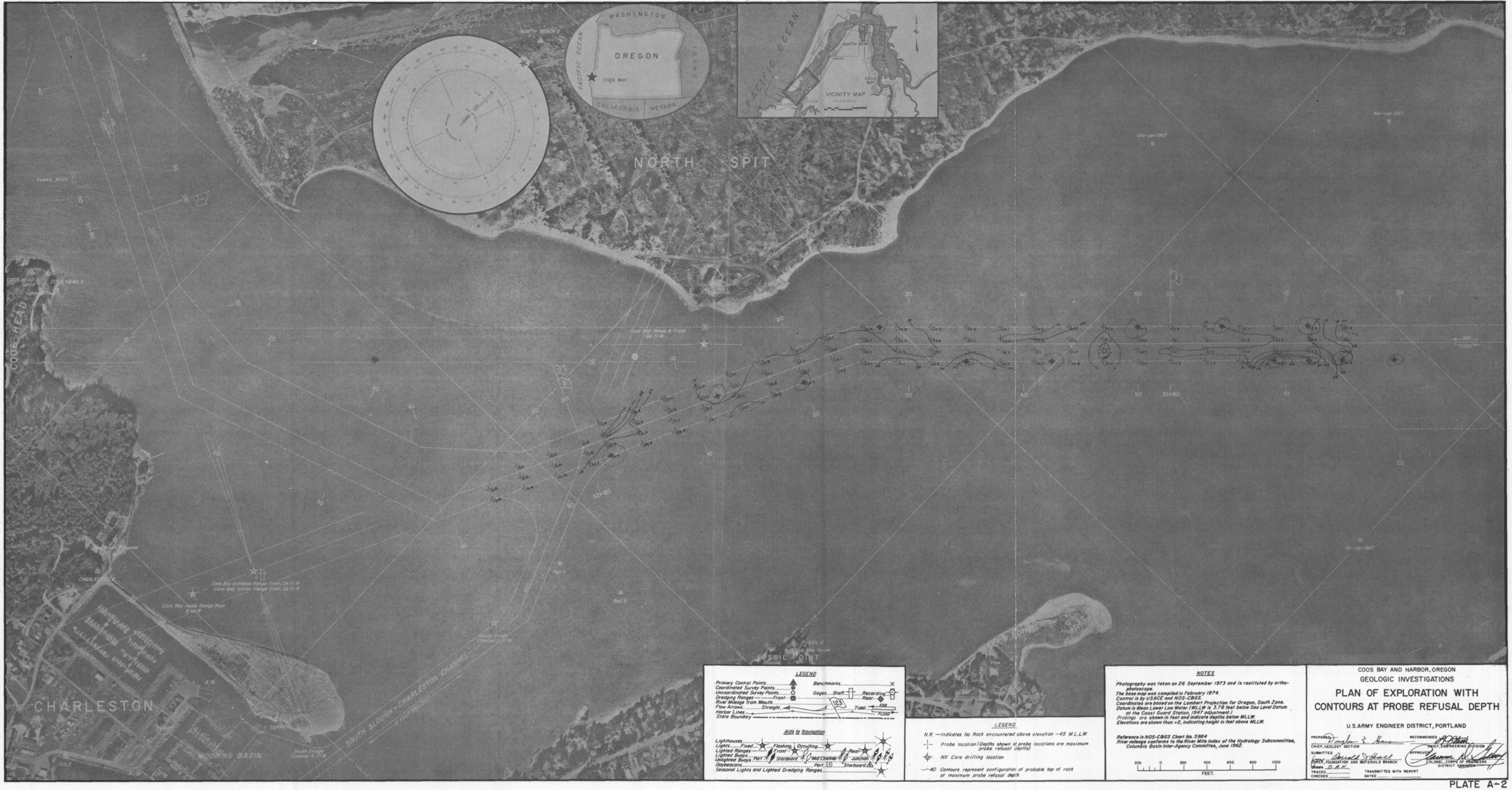
COOS BAY AND HARBOR, OREGON
GEOLOGIC INVESTIGATIONS

PLAN OF EXPLORATION WITH CONTOURS AT PROBE REFUSAL DEPTH

U.S. ARMY ENGINEER DISTRICT, PORTLAND

PREPARED Douglas E. Hume
CHIEF, GEOLOGY SECTION
SUBMITTED Donald J Hall
CHIEF, FOUNDATION AND MATERIALS BRANCH
DRAWN D.R.H.
TRACED
CHECKED
RECOMMENDED
CHIEF, ENGINEERING DIVISION
APPROVED
COLONEL, CORPS OF ENGINEERS
DISTRICT ENGINEER
TRANSMITTED WITH REPORT
DATED

PLATE A-1



LEGEND

Primary Control Points
Coordinated Survey Points
Uncoordinated Survey Points
Dredging Ranges — Front — Rear
River Mileage from Mouth
Flow Arrows — Straight — Tidal — EBB — FLOOD
Harbor Lines
State Boundary
Benchmarks ✕
Gages — Staff — Recording

Aids to Navigation

Lighthouses
Lights — Fixed — Flashing, Occulting
Lighted Ranges — Front — Rear
Lighted Buoys
Unlighted Buoys — Port — Starboard — Mid Channel — Junction
Daybeacons — Port 3 — Starboard 6
Seasonal Lights and Lighted Dredging Ranges

LEGEND

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Probe location (Depths shown at probe locations are maximum probe refusal depths)

NX Core drilling location

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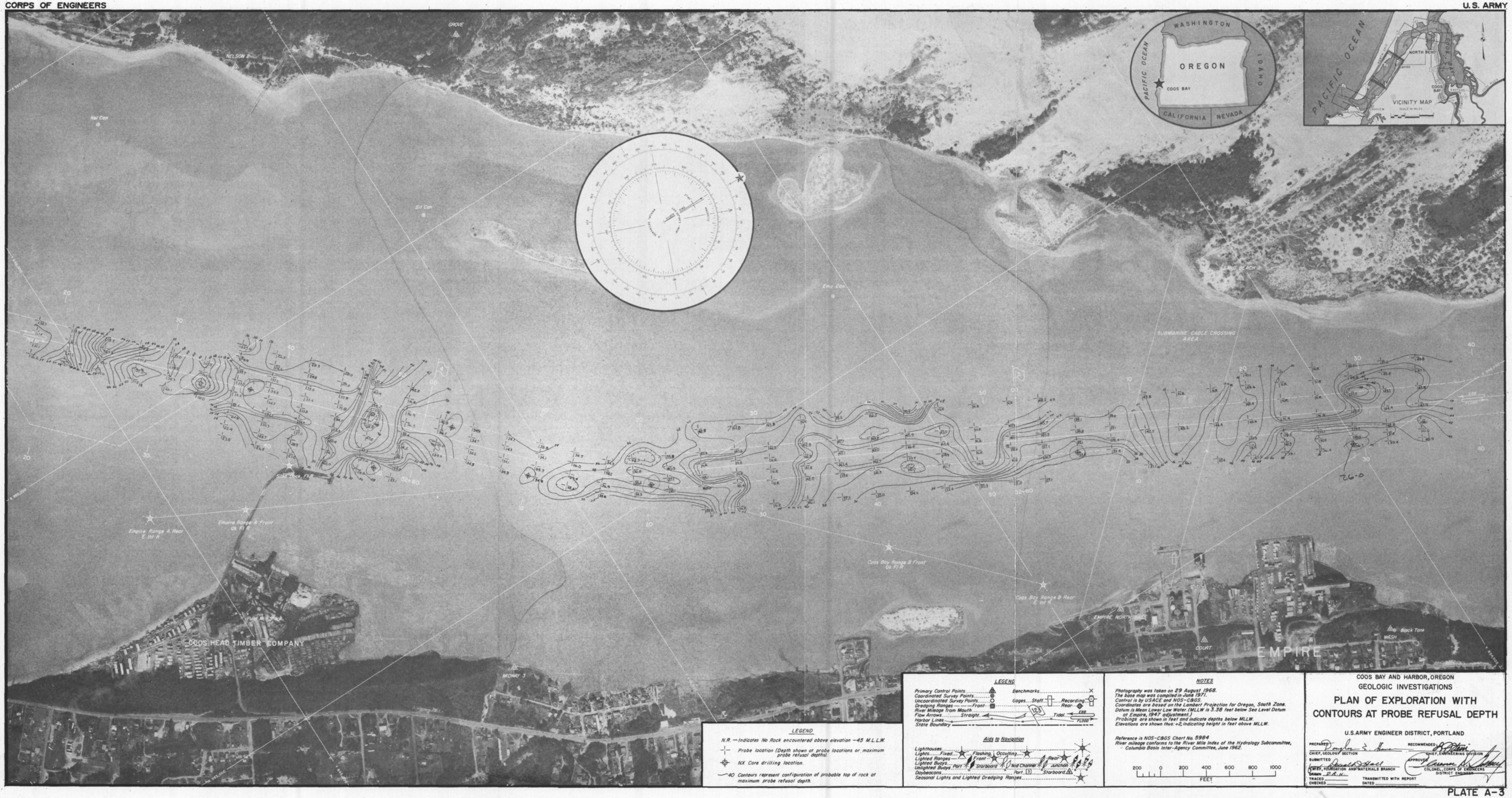
PLAN OF EXPLORATION WITH CONTOURS AT PROBE REFUSAL DEPTH

U.S. ARMY ENGINEER DISTRICT, PORTLAND

PREPARED Douglas E. Ham
CHIEF, GEOLOGY SECTION
SUBMITTED
for Donald J. Hall
CHIEF, FOUNDATION AND MATERIALS BRANCH
DRAWN D.R.H.
TRACED
CHECKED
RECOMMENDED
CHIEF, ENGINEERING DIVISION
APPROVED
Clarence D. Gilkey
COLONEL, CORPS OF ENGINEERS
DISTRICT ENGINEER
TRANSMITTED WITH REPORT
DATED



LEGEND

N.R. —Indicates No Rock encountered above elevation −45 M.L.L.W.

Probe location (Depth shown at probe locations or maximum probe refusal depths).

NX Core drilling location.

40 Contours represent configuration of probable top of rock at maximum probe refusal depth.

LEGEND

Primary Control Points
Coordinated Survey Points
Uncoordinated Survey Points
Dredging Ranges — — —Front · Rear
River Mileage from Mouth
Flow Arrows · Straight · Tidal · EBB · FLOOD
Harbor Lines
State Boundary
Benchmarks
Gages · Staff · Recording

Aids to Navigation

Lighthouses
Lights · Fixed · Flashing, Occulting
Lighted Ranges · Front · Rear
Lighted Buoys
Unlighted Buoys · Port · Starboard · Mid Channel · Junction
Daybeacons · Port 3 · Starboard 4
Seasonal Lights and Lighted Dredging Ranges

NOTES

Photography was taken on 29 August 1968.
The base map was compiled in June 1971.
Control is by USACE and NOS-C&GS.
Coordinates are based on the Lambert Projection for Oregon, South Zone.
Datum is Mean Lower Low Water. (MLLW is 3.38 feet below Sea Level Datum at Empire, 1947 adjustment.)
Probings are shown in feet and indicate depths below MLLW.
Elevations are shown thus: +2, indicating height in feet above MLLW.

Reference is NOS-C&GS Chart No. 5984
River mileage conforms to the River Mile Index of the Hydrology Subcommittee, Columbia Basin Inter-Agency Committee, June 1962.

200 0 200 400 600 800 1000
FEET

COOS BAY AND HARBOR, OREGON
GEOLOGIC INVESTIGATIONS

PLAN OF EXPLORATION WITH CONTOURS AT PROBE REFUSAL DEPTH

U.S. ARMY ENGINEER DISTRICT, PORTLAND

PREPARED Douglas E. Hane
CHIEF, GEOLOGY SECTION
RECOMMENDED
CHIEF, ENGINEERING DIVISION
SUBMITTED Donald J. Hall
CHIEF, FOUNDATION AND MATERIALS BRANCH
APPROVED
COLONEL, CORPS OF ENGINEERS
DISTRICT ENGINEER
DRAWN D.R.H.
TRACED
CHECKED
TRANSMITTED WITH REPORT
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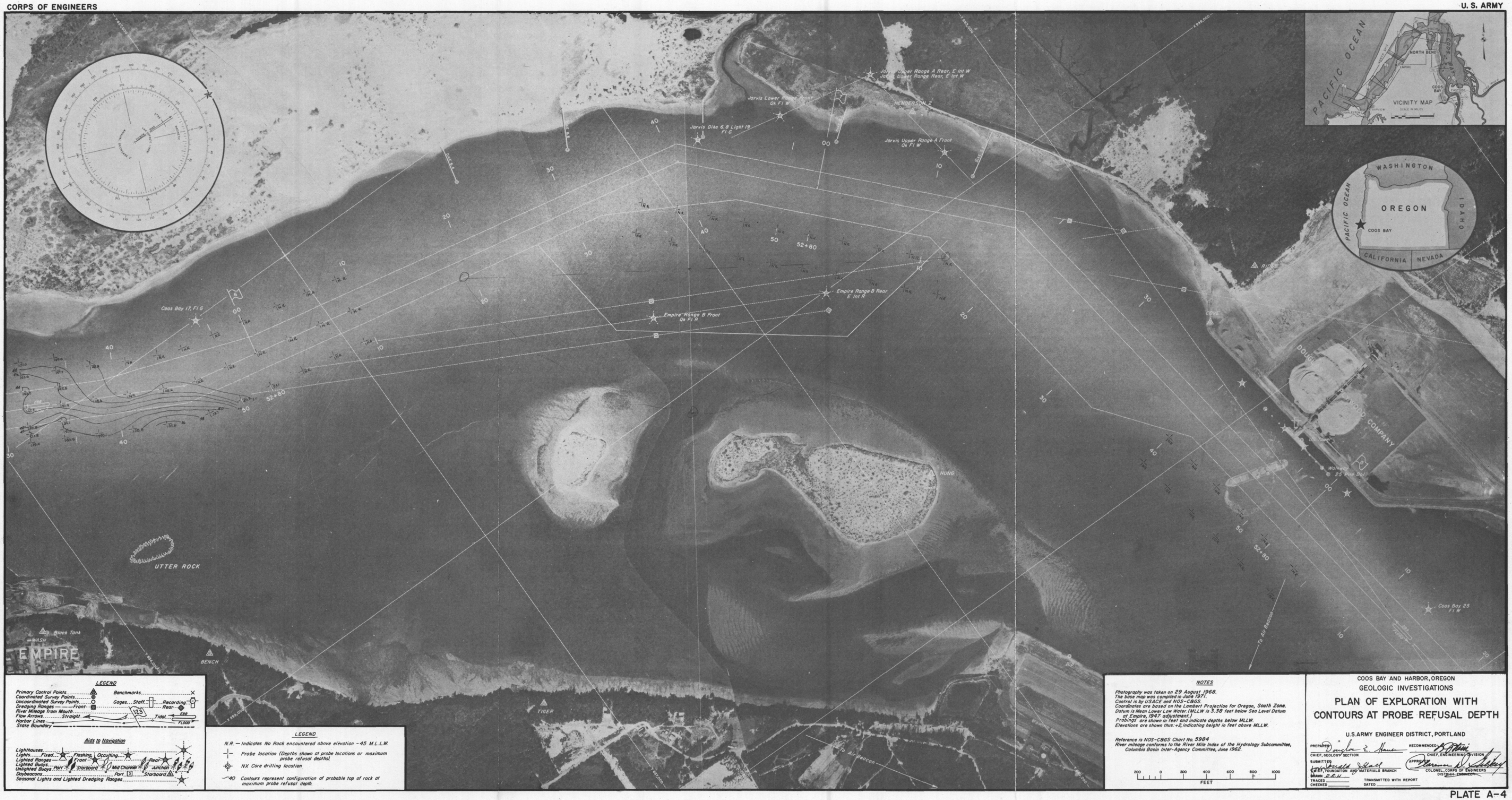

LEGEND

Primary Control Points .... ▲
Coordinated Survey Points .... ◉
Uncoordinated Survey Points .... ○
Dredging Ranges — — —Front .... ▣ .... Rear ◈
River Mileage from Mouth 123
Flow Arrows .... Straight .... Tidal .... EBB FLOOD
Harbor Lines
State Boundary
Benchmarks .... ×
Gages ... Staff .... Recording

Aids to Navigation

Lighthouses
Lights ...... Fixed ...... Flashing, Occulting
Lighted Ranges ...... Front ...... Rear
Lighted Buoys
Unlighted Buoys ...... Port ...... Starboard ...... Mid Channel ...... Junction
Daybeacons ...... Port ...... Starboard
Seasonal Lights and Lighted Dredging Ranges

LEGEND

N.R. — Indicates No Rock encountered above elevation −45 M.L.L.W.

Probe location (Depths shown at probe locations or maximum probe refusal depths)

NX Core drilling location

40 Contours represent configuration of probable top of rock at maximum probe refusal depth.

NOTES

Photography was taken on 29 August 1968.
The base map was compiled in June 1971.
Control is by USACE and NOS-C&GS.
Coordinates are based on the Lambert Projection for Oregon, South Zone.
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Elevations are shown thus: +2, indicating height in feet above MLLW.

Reference is NOS-C&GS Chart No. 5984
River mileage conforms to the River Mile Index of the Hydrology Subcommittee, Columbia Basin Inter-Agency Committee, June 1962.

200 0 200 400 600 800 1000
FEET

COOS BAY AND HARBOR, OREGON
GEOLOGIC INVESTIGATIONS

PLAN OF EXPLORATION WITH CONTOURS AT PROBE REFUSAL DEPTH

U.S. ARMY ENGINEER DISTRICT, PORTLAND

PREPARED Douglas E. Hause
CHIEF, GEOLOGY SECTION
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APPROVED Clarence D. Gilkey
COLONEL, CORPS OF ENGINEERS
DISTRICT ENGINEER
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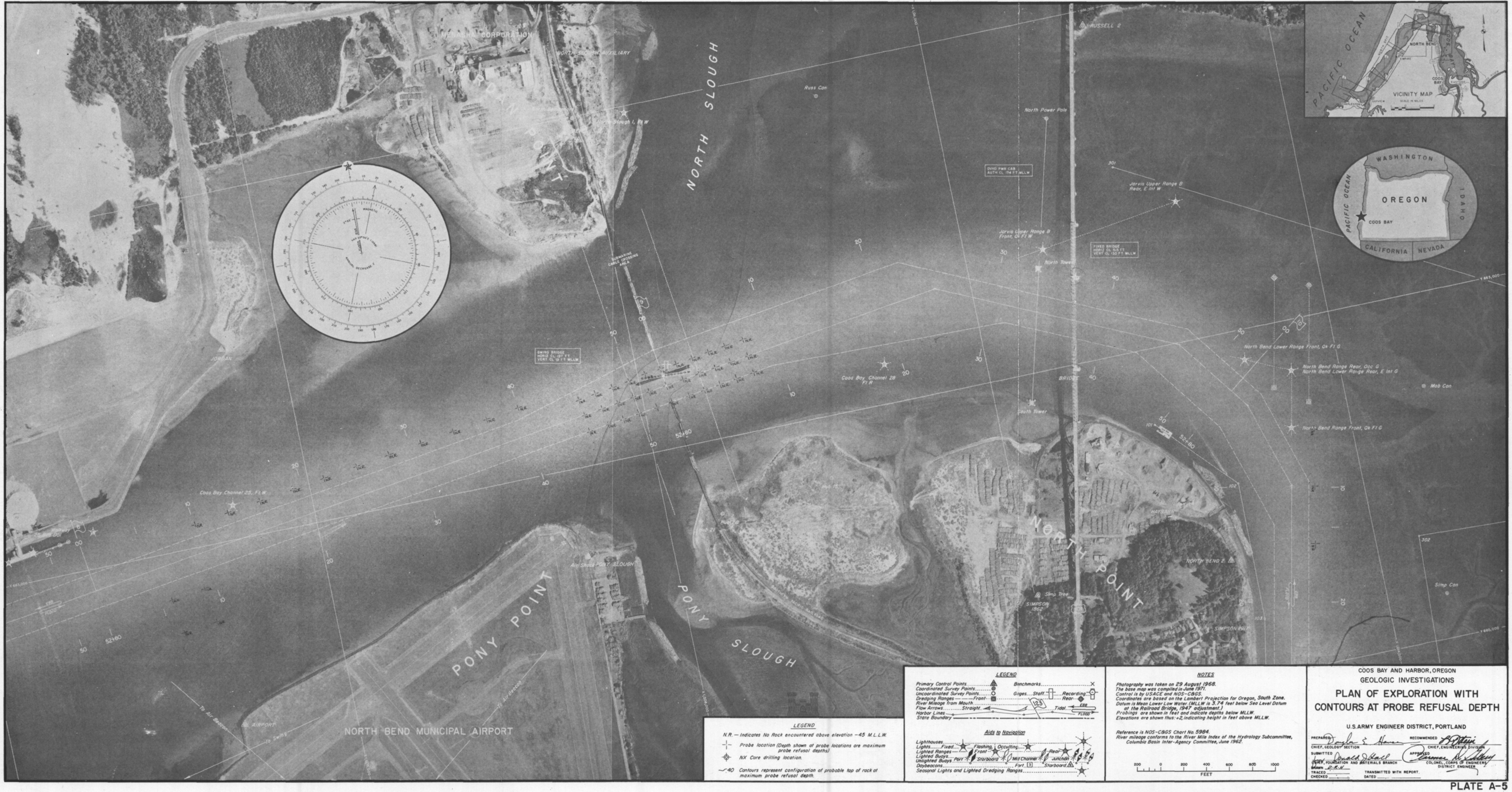

LEGEND

N.R. — Indicates No Rock encountered above elevation −45 M.L.L.W.

Probe location (Depth shown at probe locations are maximum probe refusal depths)

NX Core drilling location.

40 Contours represent configuration of probable top of rock at maximum probe refusal depth.

LEGEND

Primary Control Points
Coordinated Survey Points
Uncoordinated Survey Points
Dredging Ranges — Front — Rear
River Mileage from Mouth
Flow Arrows — Straight — Tidal — EBB — FLOOD
Harbor Lines
State Boundary
Benchmarks
Gages — Staff — Recording

Aids to Navigation

Lighthouses
Lights — Fixed — Flashing, Occulting
Lighted Ranges — Front — Rear
Lighted Buoys
Unlighted Buoys — Port — Starboard — Mid Channel — Junction
Daybeacons — Port — Starboard
Seasonal Lights and Lighted Dredging Ranges

NOTES

Photography was taken on 29 August 1968.
The base map was compiled in June 1971.
Control is by USACE and NOS-C&GS.
Coordinates are based on the Lambert Projection for Oregon, South Zone.
Datum is Mean Lower Low Water. (MLLW is 3.74 feet below Sea Level Datum at the Railroad Bridge, 1947 adjustment.)
Probings are shown in feet and indicate depths below MLLW.
Elevations are shown thus: +2, indicating height in feet above MLLW.

Reference is NOS-C&GS Chart No. 5984.
River mileage conforms to the River Mile Index of the Hydrology Subcommittee, Columbia Basin Inter-Agency Committee, June 1962.

200 0 200 400 600 800 1000
FEET

COOS BAY AND HARBOR, OREGON
GEOLOGIC INVESTIGATIONS

PLAN OF EXPLORATION WITH CONTOURS AT PROBE REFUSAL DEPTH

U.S. ARMY ENGINEER DISTRICT, PORTLAND

PREPARED Douglas E. Hansen
CHIEF, GEOLOGY SECTION
RECOMMENDED
CHIEF, ENGINEERING DIVISION
SUBMITTED for Donald J. Hall
CHIEF, FOUNDATION AND MATERIALS BRANCH
APPROVED Clarence D. Gilkey
COLONEL, CORPS OF ENGINEERS
DISTRICT ENGINEER
DRAWN D.R.H.
TRACED
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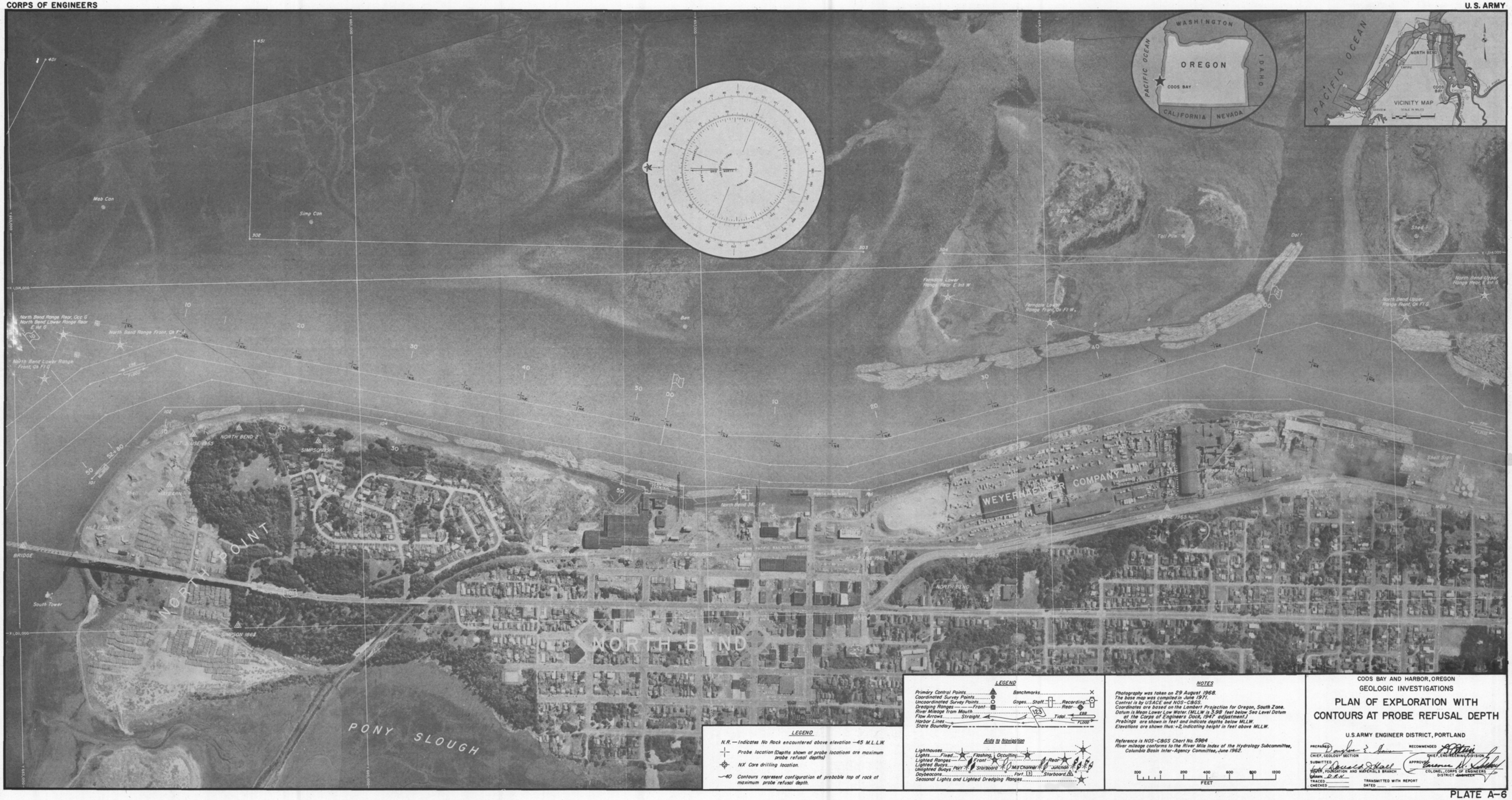

LEGEND

N.R. — Indicates No Rock encountered above elevation −45 M.L.L.W.

Probe location (Depths shown at probe locations are maximum probe refusal depths)

NX Core drilling location.

—40 Contours represent configuration of probable top of rock at maximum probe refusal depth.

LEGEND

Primary Control Points
Coordinated Survey Points
Uncoordinated Survey Points
Dredging Ranges — Front — Rear
River Mileage from Mouth
Flow Arrows ... Straight ... Tidal ... EBB ... FLOOD
Harbor Lines
State Boundary
Benchmarks
Gages ... Staff ... Recording

Aids to Navigation

Lighthouses
Lights ... Fixed ... Flashing, Occulting
Lighted Ranges — Front — Rear
Lighted Buoys
Unlighted Buoys Port ... Starboard ... Mid Channel ... Junction
Daybeacons ... Port 3 ... Starboard
Seasonal Lights and Lighted Dredging Ranges

NOTES

Photography was taken on 29 August 1968.
The base map was compiled in June 1971.
Control is by USACE and NOS-C&GS.
Coordinates are based on the Lambert Projection for Oregon, South Zone.
Datum is Mean Lower Low Water. (MLLW is 3.98 feet below Sea Level Datum at the Corps of Engineers Dock, 1947 adjustment.)
Probings are shown in feet and indicate depths below MLLW.
Elevations are shown thus: +2, indicating height in feet above MLLW.

Reference is NOS-C&GS Chart No. 5984
River mileage conforms to the River Mile Index of the Hydrology Subcommittee, Columbia Basin Inter-Agency Committee, June 1962.

200 0 200 400 600 800 1200
FEET

COOS BAY AND HARBOR, OREGON
GEOLOGIC INVESTIGATIONS

PLAN OF EXPLORATION WITH CONTOURS AT PROBE REFUSAL DEPTH

U.S. ARMY ENGINEER DISTRICT, PORTLAND

PREPARED Douglas E.
CHIEF, GEOLOGY SECTION
RECOMMENDED
CHIEF, ENGINEERING DIVISION
SUBMITTED Donald J. Hall
CHIEF, FOUNDATION AND MATERIALS BRANCH
APPROVED Clarence D.
COLONEL, CORPS OF ENGINEERS
DISTRICT ~~ENGINEER~~
DRAWN D.R.H.
TRACED
CHECKED
TRANSMITTED WITH REPORT
DATED

CORPS OF ENGINEERS

U. S. ARMY

LEGEND

- Primary Control Points
- Coordinated Survey Points
- Uncoordinated Survey Points
- Dredging Ranges — Front — Rear
- River Mileage from Mouth
- Flow Arrows — Straight — Tidal (EBB, FLOOD)
- Harbor Lines
- State Boundary
- Benchmarks
- Gages — Staff — Recording

Aids to Navigation

- Lighthouses
- Lights — Fixed — Flashing, Occulting
- Lighted Ranges — Front — Rear
- Lighted Buoys
- Unlighted Buoys — Port — Starboard — Mid Channel — Junction
- Daybeacons — Port — Starboard
- Seasonal Lights and Lighted Dredging Ranges

NOTES

Photography was taken on 29 August 1968.
The base map was compiled in June 1971.
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Reference is NOS-C&GS Chart No. 5984
River mileage conforms to the River Mile Index of the Hydrology Subcommittee, Columbia Basin Inter-Agency Committee, June 1962.

The information depicted on this map represents the results of surveys made on the dates indicated and can only be considered as indicating the general condition existing at that time.

200 0 200 400 600 800 1000
FEET

LEGEND

N.R. — Indicates No Rock encountered above elevation −45 M.L.L.W.

Probe location (Depth shown at probe locations are maximum probe refusal depths)

NX Core drilling location

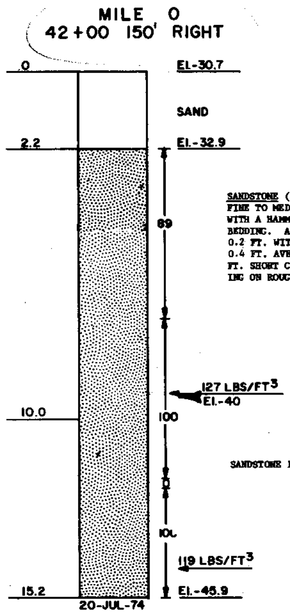
40 Contours represent configuration of probable top of rock at maximum probe refusal depth.

COOS BAY AND HARBOR, OREGON
GEOLOGIC INVESTIGATIONS

PLAN OF EXPLORATION WITH CONTOURS AT PROBE REFUSAL DEPTH

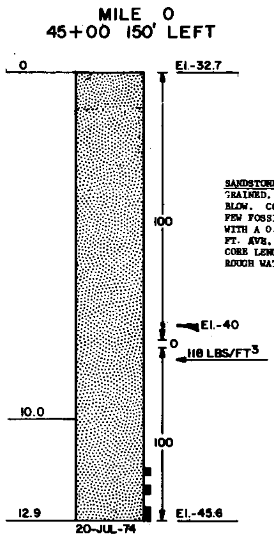
U.S. ARMY ENGINEER DISTRICT, PORTLAND

PREPARED Douglas E. Hansen
CHIEF, GEOLOGY SECTION
SUBMITTED for Donald J. Hall
CHIEF, FOUNDATION AND MATERIALS BRANCH
DRAWN D.R.H.
TRACED
CHECKED
RECOMMENDED
CHIEF, ENGINEERING DIVISION
APPROVED
COLONEL, CORPS OF ENGINEERS
DISTRICT ENGINEER
TRANSMITTED WITH REPORT
DATED

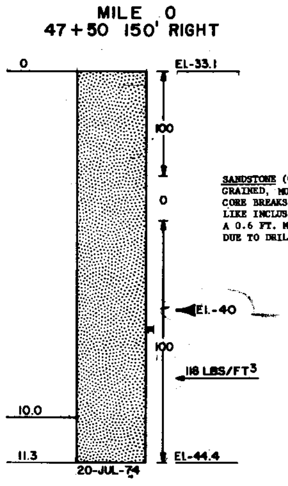


SANDSTONE (2.2 to 15.2), UNWEATHERED, GRAY GREEN, FINE TO MEDIUM-GRAINED. SOFT TO MOD. HARD, DENTS WITH A HAMMER BLOW. CORE BREAKS ALONG HORIZONTAL BEDDING. A FEW FOSSIL SHELLS PRESENT. CORES AVE. 0.2 FT. WITH A 0.6 FT. MAXIMUM TO 7.8 FT. DEPTH, 0.4 FT. AVE. WITH A 1.1 FT. MAXIMUM BLOW 7.8 FT. SHORT CORE LENGTH AND CORE LOSSES DUE TO DRILLING ON ROUGH WATER.

SANDSTONE BECOMES FINE GRAINED WITH DEPTH.

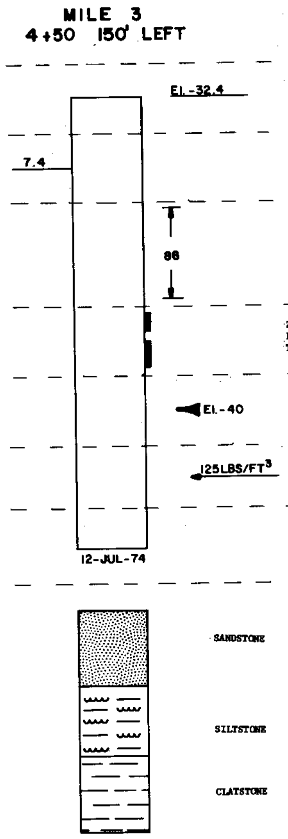


SANDSTONE (0.0 to 12.9), UNWEATHERED, GRAY, FINE-GRAINED. SOFT TO MOD. HARD, DENTS WITH A HAMMER BLOW. CORE BREAKS ALONG HORIZONTAL BEDDING. A FEW FOSSIL SHELLS PRESENT. CORES AVE. 0.2 FOOT WITH A 0.5 FOOT MAX. TO 5.0 FT. DEPTH, 0.4 FT. AVE. WITH A 1.2 FT. MAX. BELOW 5.0 FT. SHORT CORE LENGTHS AND CORE LOSSES DUE TO DRILLING ON ROUGH WATER.



SANDSTONE (0.0 to 11.3), UNWEATHERED, GRAY, FINE-GRAINED, MOD. HARD, DENTS WITH A HAMMER BLOW. CORE BREAKS ALONG HORIZONTAL BEDDING. SEVERAL TAR-LIKE INCLUSIONS PRESENT. CORES AVE. 0.2 FT. WITH A 0.6 FT. MAX. SHORT CORE LENGTHS AND CORE LOSSES DUE TO DRILLING ON ROUGH WATER.

LEGEND



HOLE LOCATION EXAMPLE: HOLE IS LOCATED 150 FEET LEFT (LOOKING UPSTREAM) OF THE CENTERLINE OF COOS BAY NAVIGATION CHANNEL, 450 FEET UPSTREAM OF RIVER MILE THREE.

ELEVATION IN FEET BELOW M.L.L.W. (MEAN LOWER LOW WATER).

DEPTH IN FEET BELOW TOP OF HOLE (TOP OF HOLE IS THAT POINT AT WHICH CASING, WHEN LOWERED GENTLY THROUGH WATER, CAME TO REST ON SAND, MUD, ROCK, ETC.)

CORE RECOVERY PERCENT OF FOOTAGE DRILLED. FIGURES LESS THAN 100% REPRESENT CORE LOSS AREAS. SPECIFIC CORE LOSS LOCATIONS ARE SHOWN ON FIELD LOGS OF DRILL CORE ON FILE IN THE PORTLAND DISTRICT OFFICE.

ZONES OF FRAGMENTAL CORE. MATERIAL RECOVERED IS LESS THAN FULL DIAMETER CORES. SEE PLATE A-24 FOR TYPICAL EXAMPLE.

PROJECT DEPTH IN ELEVATION BELOW M.L.L.W. (MEAN LOWER LOW WATER).

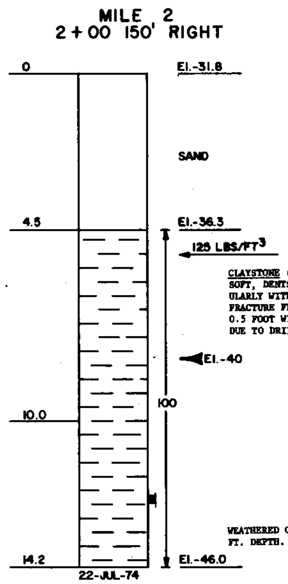
FIELD UNIT WEIGHT - WEIGHT OF CORE AT DEPTH INDICATED IN POUNDS PER CUBIC FOOT.

DATE HOLE DRILLED

SANDSTONE

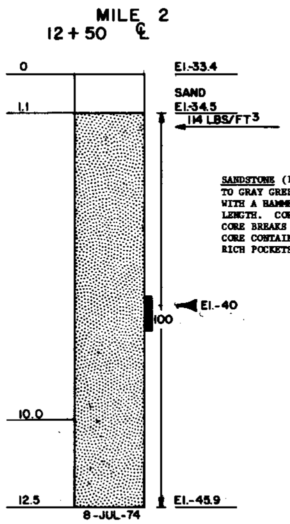
SILTSTONE

CLAYSTONE

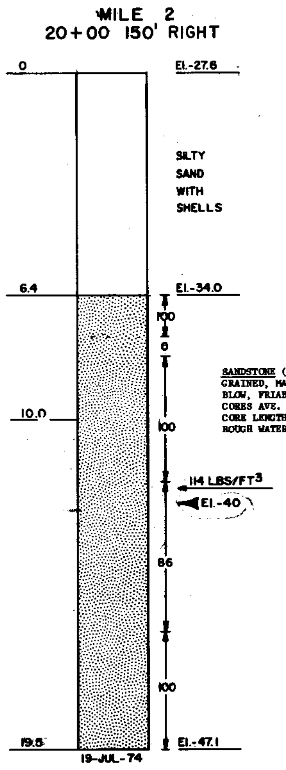


CLAYSTONE (4.5 to 14.2), UNWEATHERED, GRAY, MASSIVE. SOFT, DENTS WITH A HAMMER BLOW. CORE BREAKS IRREGULARLY WITH CONCHOIDAL FRACTURES. VERTICAL IRREGULAR FRACTURE FROM 5.8 TO 12.3 FT. DEPTH. CORES AVE. 0.5 FOOT WITH A 1.8 FT. MAX. SHORT CORE LENGTHS DUE TO DRILLING ALONG VERTICAL FRACTURE.

WEATHERED CLAY SURFACE ON JOINT SURFACE AT 14.0 FT. DEPTH.



SANDSTONE (1.1 to 12.5), UNWEATHERED, DARK GREEN TO GRAY GREEN, FINE-GRAINED, MASSIVE. SOFT, DENTS WITH A HAMMER BLOW. CORE BREAKS NORMAL TO CORE LENGTH. CORES AVE. 0.5 FT. WITH A 1.6 FT. MAX. CORE BREAKS & FRAGMENTAL CORE CAUSED BY DRILLING. CORE CONTAINS NUMEROUS IRREGULARLY SHAPED CLAY RICH POCKETS UP TO 0.1 FT. DIAM.



SANDSTONE (6.4 to 19.5), UNWEATHERED, GRAY, FINE-GRAINED, MASSIVE. SOFT, CRUSHES WITH A HAMMER BLOW, FRIABLE. CORE BREAKS NORMAL TO CORE LENGTH. CORES AVE. 0.3 FT. WITH A 1.5 FT. MAX. SHORT CORE LENGTHS AND CORE LOSSES DUE TO DRILLING ON ROUGH WATER.

NOTES:

1. Detailed descriptions of the physical characteristics of each rock type is presented in paragraphs 33 through 37 of the text.
2. Detailed geologic descriptions for materials below overburden are presented on log plates A-11 through A-13.
3. Additional detailed descriptions of materials on original logs, and photographs of cores are on file in the Portland District Office.
4. All core drilling was NX size.
5. The "hammer blow" referred to in the material descriptions is a moderate swing with a geologic pick.
6. Determination of overburden material was by visual observation of wash samples from water return during placing of casing.
7. HARDNESS SCALE

Soft	-Can be scratched with fingernail
Mod. Hard	-Can be scratched with knife, cannot be scratched with fingernail
Hard	-Difficult to scratch with knife.

REVISION	DATE	DESCRIPTION	BY

U. S. ARMY ENGINEER DISTRICT, PORTLAND

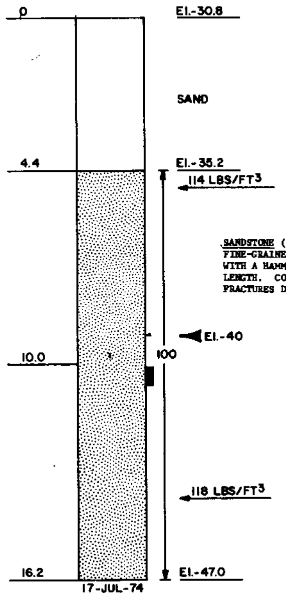
DESIGNED:
DRAWN:
CHECKED:

COOS BAY AND HARBOR, OREGON
GEOLOGIC INVESTIGATIONS
LOGS OF DRILL HOLES

PREPARED: Dennis R. Hopman
SUBMITTED: David J. Hall
CHIEF, FOUNDATION AND MATERIALS BRANCH
DATE: 30 Oct 74
SUPERVISED: Douglas E. Ham
CHIEF, GEOLOGY SECTION
SHEET

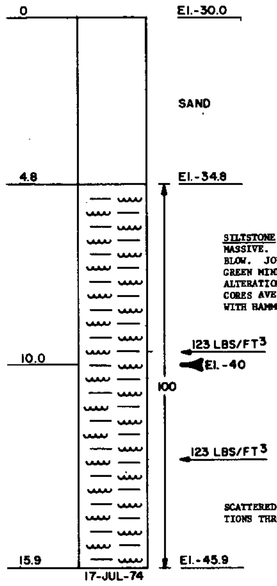
PLATE A-11

MILE 2
27+50 150' LEFT



SANDSTONE (4.4 to 16.2), UNWEATHERED, GRAY GREEN, FINE-GRAINED, MASSIVE. SOFT, CORE CRUSHES TO DENTS WITH A HAMMER BLOW. CORE BREAKS NORMAL TO CORE LENGTH. CORES AVE. 0.7 FT. WITH A 1.3 FT. MAX. ALL FRACTURES DUE TO DRILLING.

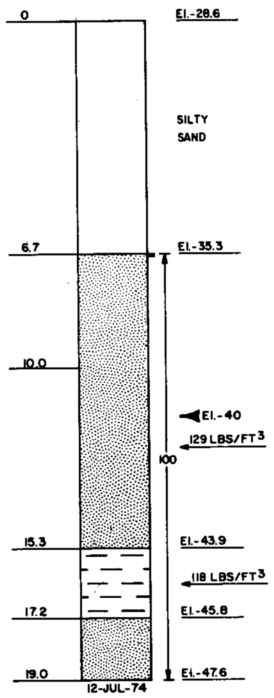
MILE 2
35+00 150' RIGHT



SILTSTONE (4.8 to 15.9), UNWEATHERED, LIGHT GRAY, MASSIVE. SOFT, CRUSHES TO DENTS WITH A HAMMER BLOW. JOINT PATTERN DIPPING 50° FROM HORIZONTAL. GREEN MINERAL ALONG JOINT SURFACES WITH SOME ALTERATION. (JOINTS MAY BE ALONG OLD BEDDING PLANES). CORES AVE. 1.1 FT. WITH A 3.7 FT. MAX. CORE BREAKS WITH HAMMER NORMAL TO CORE LENGTH.

SCATTERED SMALL CARBONACEOUS MATERIAL CONCENTRATIONS THROUGHOUT CORE.

MILE 2
42+50 150' RIGHT

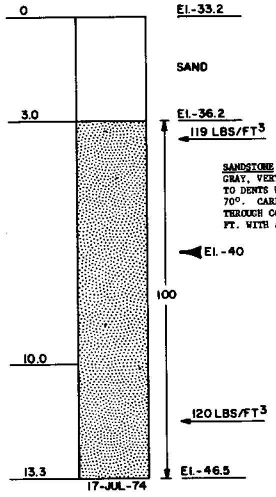


SANDSTONE (6.7 to 15.3), UNWEATHERED, GRAY, FINE-GRAINED. SOME CLAY RICH INTERBEDS. SOFT, CRUSHES TO DENTS WITH A HAMMER BLOW. BEDDING DIPS 10° TO 15°. IRREGULAR CORE BREAKS NORMAL TO CORE LENGTH. CORES AVE. 2 FT. WITH A 3.6 FT. MAX. ALL FRACTURES DUE TO DRILLING.

CLAYSTONE (15.3 to 17.2), LIGHT GRAY. SOFT, DENTS WITH A HAMMER BLOW. CORE BREAKS AND JOINTS FOLLOW 10° TO 15° BEDDING DIP. JOINTS ARE BROWN STAINED. CORES AVE. 0.5 FT. WITH A 1.0 FT. MAX.

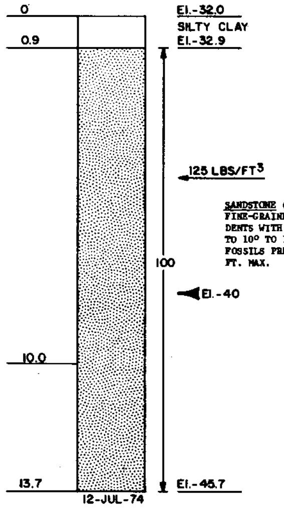
SANDSTONE (17.2 to 19.0), UNWEATHERED, DARK GRAY, FINE-GRAINED, WITH SOME CLAY RICH INTERBEDS. SOFT, DENTS WITH A HAMMER BLOW. BEDDING DIPS 10° TO 15°. CORE BREAKS NORMAL TO CORE LENGTH.

MILE 2
50+00 150' LEFT



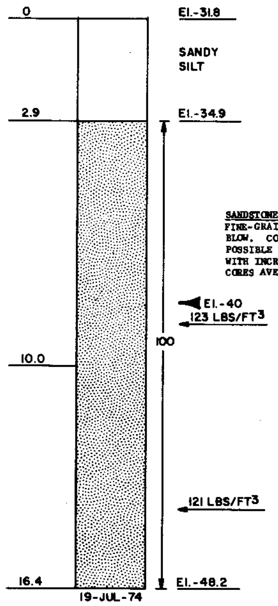
SANDSTONE (3.0 to 13.3), UNWEATHERED, GRAY TO DARK GRAY, VERY FINE-GRAINED, MASSIVE. SOFT, CRUSHES TO DENTS WITH A HAMMER BLOW. JOINTS DIP 45° TO 70°. CARBONACEOUS DEBRIS CONCENTRATIONS SCATTERED THROUGH CORE BELOW 7 FT. DEPTH. CORES AVE. 0.8 FT. WITH A 1.5 FT. MAXIMUM.

MILE 3
4+50 150' LEFT



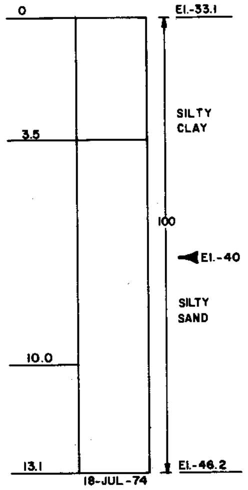
SANDSTONE (0.9 to 13.7), UNWEATHERED, DARK GRAY, FINE-GRAINED. SOME DARK GRAY INTERBEDS. SOFT, DENTS WITH A HAMMER BLOW. CORE BREAKS PARALLEL TO 10° TO 15° BEDDING DIP. SOME CLAY BALLS AND FOSSILS PRESENT. CORES AVE. 0.5 FT. WITH A 3.9 FT. MAX.

MILE 3
9+00 150' RIGHT



SANDSTONE (2.9 to 16.4), UNWEATHERED, GRAY, VERY FINE-GRAINED, MASSIVE. SOFT, DENTS WITH A HAMMER BLOW. CORE BREAKS NORMAL TO CORE LENGTH (ALONG POSSIBLE BEDDING PLANES). SOME FOSSILS PRESENT, WITH INCREASING CARBONACEOUS MATERIAL WITH DEPTH. CORES AVE. 0.7 FT. WITH A 1.2 FT. MAX.

MILE 3
12+00 150' RIGHT



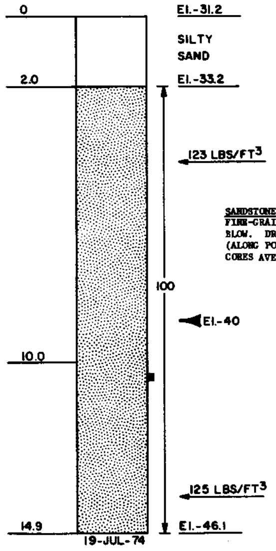
SANDSTONE COBBLE (3.7), UNWEATHERED, GRAY.

NO RECOVERY BELOW - 36.8 ELEVATION (M.L.L.W.) MATERIAL BELOW - 36.8 ELEV. IS EITHER A COMPLETELY DECOMPOSED SANDSTONE OR A COMPACTED RIVER SILTY SAND SIMILAR TO NEAR BY SANDSTONES.

MATERIAL IS GRAY GREEN, FINE-GRAINED, LOOSE, NON PLASTIC.

CARBONACEOUS FRAGMENTS RECOVERED IN WASH SAMPLES.

MILE 3
12+00 150' LEFT



SANDSTONE (2.0 to 14.9), UNWEATHERED, GRAY, VERY FINE-GRAINED, MASSIVE. SOFT, DENTS WITH A HAMMER BLOW. DRILLING BREAKS 10° TO 15° FROM HORIZONTAL (ALONG POSSIBLE BEDDING PLANES) AND AT 45° ANGLE. CORES AVE. 0.5 FT. WITH A 1.3 FT. MAX.

REVISION	DATE	DESCRIPTION	BY

U. S. ARMY ENGINEER DISTRICT, PORTLAND

DESIGNED:

DRAWN:

CHECKED:

COOS BAY AND HARBOR, OREGON
GEOLOGIC INVESTIGATIONS

LOGS OF DRILL HOLES

PREPARED: Dennis R. Hopman

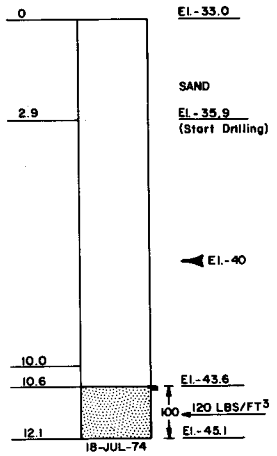
SUBMITTED: for Donald J. Hall DATE: 30 Dec 74
CHIEF, FOUNDATION AND MATERIALS BRANCH

SUPERVISED: Douglas E. [illegible]
CHIEF, GEOLOGY SECTION

SHEET

PLATE A-12

MILE 3
15+00 150' RIGHT

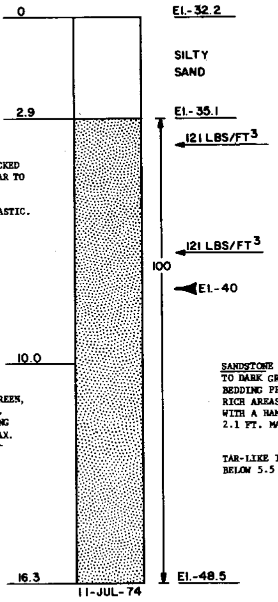


HARD PACKED SAND MATERIAL IS EITHER A HARD PACKED SAND OR COMPLETELY DECOMPOSED SANDSTONE SIMILAR TO MATERIAL AT 3+12+00 150 FT. RIGHT.

MATERIAL IS GRAY, FINE-GRAINED, LOOSE, NON PLASTIC.

SANDSTONE (10.6 to 12.1), UNWEATHERED, GRAY GREEN, FINE-GRAINED. SOFT, DENTS WITH A HAMMER BLOW. HORIZONTAL DRILL BREAKS (ALONG POSSIBLE BEDDING PLANES). CORES AVE. 0.2 FT. WITH A 0.4 FT. MAX. LARGE PIECE (0.1 FT. DIAM.) ORGANIC DEBRIS RECOVERED AT 11.1 FT. DEPTH.

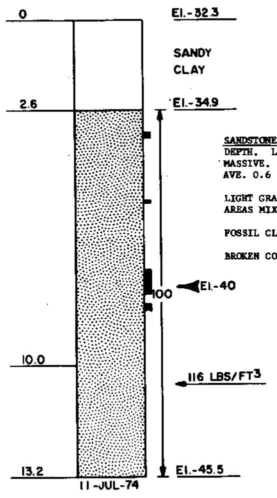
MILE 3
19+50 150' RIGHT



SANDSTONE (2.9 to 16.3) UNWEATHERED, LIGHT GRAY, TO DARK GRAY, FINE-GRAINED, MASSIVE. INDISYINCT BEDDING PRESENT. LIGHT GRAY AND DARK GRAY CLAY RICH AREAS ARE MIXED IRREGULARILY. SOFT, DENTS WITH A HAMMER BLOW. CORES AVE. 1.2 FT. WITH A 2.1 FT. MAX.

TAR-LIKE INCLUSIONS SCATTERED THROUGHOUT CORE BELOW 5.5 FT. DEPTH.

MILE 3
37+50 ℄



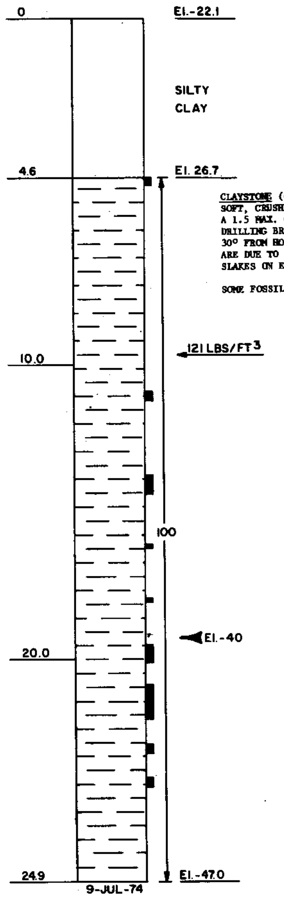
SANDSTONE (2.6 to I3.2), UNWEATHERED BELOW 3.5 FT. DEPTH. LIGHT GRAY TO DARK GRAY, FINE-GRAINED, MASSIVE. SOFT, DENTS WITH A HAMMER BLOW. CORES AVE. 0.6 FT WITH A 1.9 FT. MAX.

LIGHT GRAY AND DARK GRAY CLAY RICH SANDSTONE AREAS MIXED IRREGULARILY.

FOSSIL CLAM SHELLS THROUGHOUT CORE.

BROKEN CORE DUE TO DRILLING.

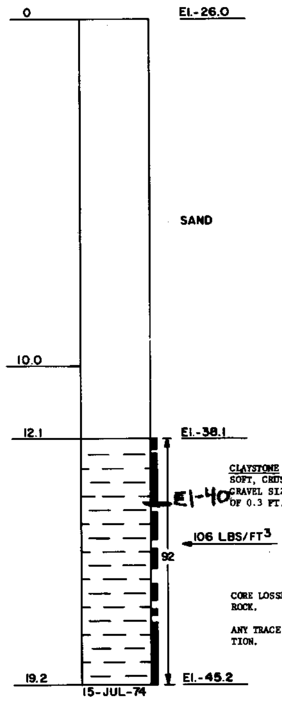
MILE 3
49+50 400' RIGHT



CLAYSTONE (4.6 to 24.9), UNWEATHERED, DARK GRAY. SOFT, CRUSHES WITH HAMMER BLOW, CORES AVE. 0.2 FT. WITH A 1.5 MAX. CORE BREAKS IRREGULAR WITH HAMMER. DRILLING BREAKS PARALLEL TO BEDDING AT 20° TO 30° FROM HORIZONTAL. ZONES OF HIGHLY BROKEN CORE ARE DUE TO DRILLING THROUGH WEAK MATERIAL. CORE SLAKES ON EXPOSURE TO AIR.

SOME FOSSIL SHELLS SCATTERED THROUGHOUT CORE.

MILE 5
29+00 300' RIGHT Left

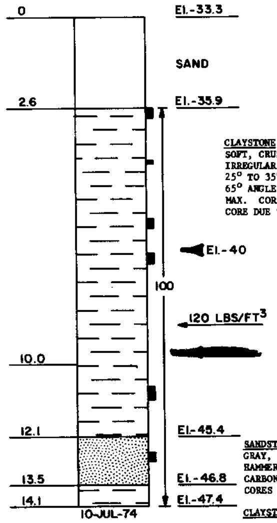


CLAYSTONE (12.1 to 19.2), UNWEATHERED, DARK GRAY. SOFT, CRUSHES WITH A HAMMER BLOW. CORE DRILLS TO GRAVEL SIZE FRAGMENTS WITH MAXIMUM DIAMETER CORE OF 0.3 FT. CORE SLAKES ON EXPOSURE TO AIR.

CORE LOSSES DUE TO DRILLING THROUGH CRUSH QUALITY ROCK.

ANY TRACES OF BEDDING LOST DUE TO CORE FRAGMENTATION.

MILE 4
2+50 100' LEFT

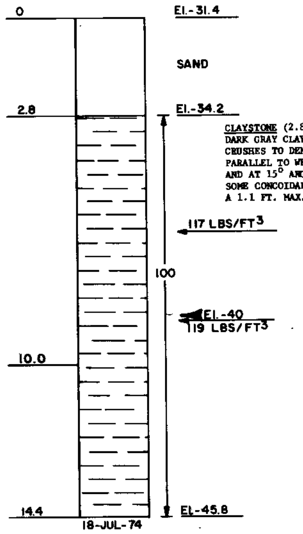


CLAYSTONE (2.6 to 12.1), SOME WEATHERING, GRAY. SOFT, CRUSHES WITH A HAMMER BLOW. CORE BREAKS IRREGULAR, IN SOME PLACES CONCOIDAL. DRILL BREAKS 25° TO 35° (ALONG BEDDING PLANES) AND AT 60° TO 65° ANGLE. CORES AVE. 0.2 FT. WITH A 0.8 FT. MAX. CORE SLAKES ON EXPOSURE TO AIR. FRAGMENTAL CORE DUE TO DRILLING THROUGH CRUSH QUALITY MATERIAL.

SANDSTONE (12.1 to 13.5), UNWEATHERED, DARK GRAY, VERY FINE-GRAINED. SOFT, CRUSHES WITH A HAMMER BLOW. BEDDING DIPS APPROX. 45°. FINE CARBONACEOUS MATERIAL SCATTERED THROUGHOUT. CORES AVE. 0.4 FT. WITH A 0.8 FT. MAX.

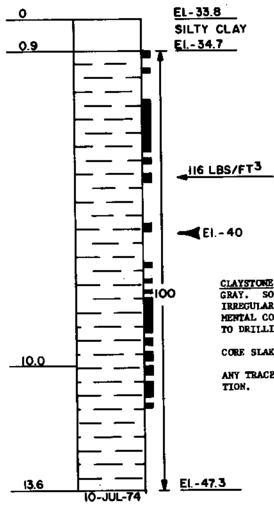
CLAYSTONE (13.5 to 14.1), SAME AS ABOVE SANDSTONE.

MILE 4
10+00 150' RIGHT



CLAYSTONE (2.8 to 14.4), UNWEATHERED. INTERBEDDED DARK GRAY CLAYSTONE AND LIGHT GRAY SILTSTONE. SOFT, CRUSHES TO DENTS WITH HAMMER BLOW. DRILLING BREAKS PARALLEL TO WELL DEFINED BEDDING PLANES AT 75°, AND AT 15° ANGLE. CORE BREAKS IRREGULARILY WITH SOME CONCOIDAL FRACTURES. CORES AVE. 0.5 FT. WITH A 1.1 FT. MAX. CORE SLAKES ON EXPOSURE TO AIR.

MILE 4
20+50 100' RIGHT

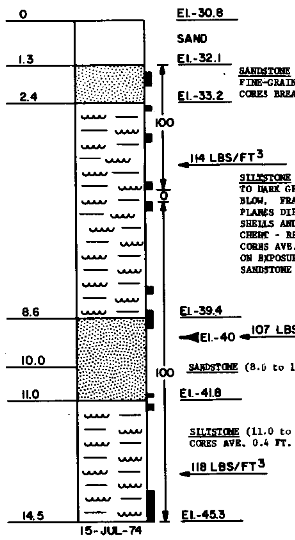


CLAYSTONE (0.9 to 13.6), UNWEATHERED, GRAY TO DARK GRAY. SOFT, CRUSHES WITH A HAMMER BLOW. BREAKS IRREGULAR WITH NO PREFERRED ORIENTATION. FRAGMENTAL CORE WITH 0.8 FT. MAX. FRAGMENTAL CORE DUE TO DRILLING THROUGH CRUSH QUALITY ROCK.

CORE SLAKES ON EXPOSURE TO AIR.

ANY TRACE OF BEDDING LOST DUE TO CORE FRAGMENTATION.

MILE 5
5+00 150' RIGHT



SANDSTONE (1.3 to 2.4), UNWEATHERED, LIGHT GRAY, FINE-GRAINED. SOFT, DENTS WITH A HAMMER BLOW. CORES BREAK ALONG BEDDING DIPPING 45°.

SILTSTONE (2.4 to 8.6), UNWEATHERED, LIGHT GRAY TO DARK GRAY. SOFT, CORE DENTS WITH A HAMMER BLOW. FRACTURES ALONG WELL-DEVELOPED BEDDING PLANES DIPPING 45°. MANY WELL PRESERVED FOSSIL SHELLS AND ROUNDED PEBBLES, PRIMARILY BLACK . CHERT - RESPONSIBLE FOR CORE BREAKS AND LOSSES. CORES AVE. 0.4 FT. WITH A 1.2 FT. MAX. CORE SLAKES ON EXPOSURE TO AIR. SEVERAL SMALL FINE-GRAINED SANDSTONE LENSES PRESENT.

SANDSTONE (8.6 to 11.0), SAME AS ABOVE.

SILTSTONE (11.0 to 14.5), SAME AS ABOVE.: CORES AVE. 0.4 FT. WITH A 1.2 FT. MAX.

REVISION	DATE	DESCRIPTION	BY

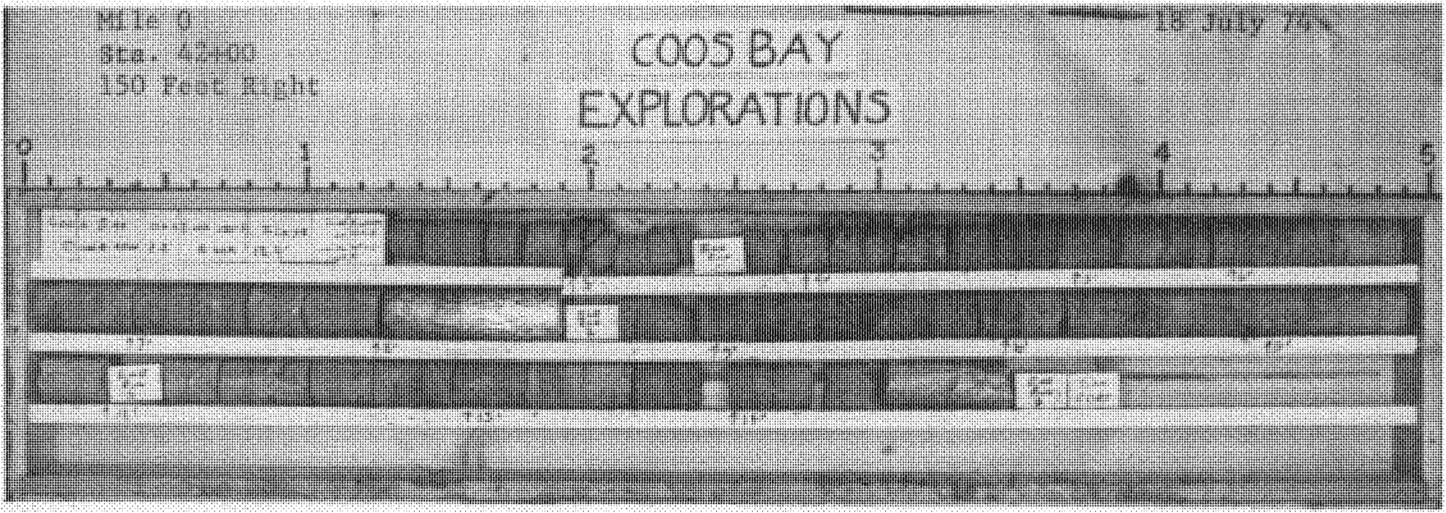
U. S. ARMY ENGINEER DISTRICT, PORTLAND

DESIGNED:
DRAWN:
CHECKED:

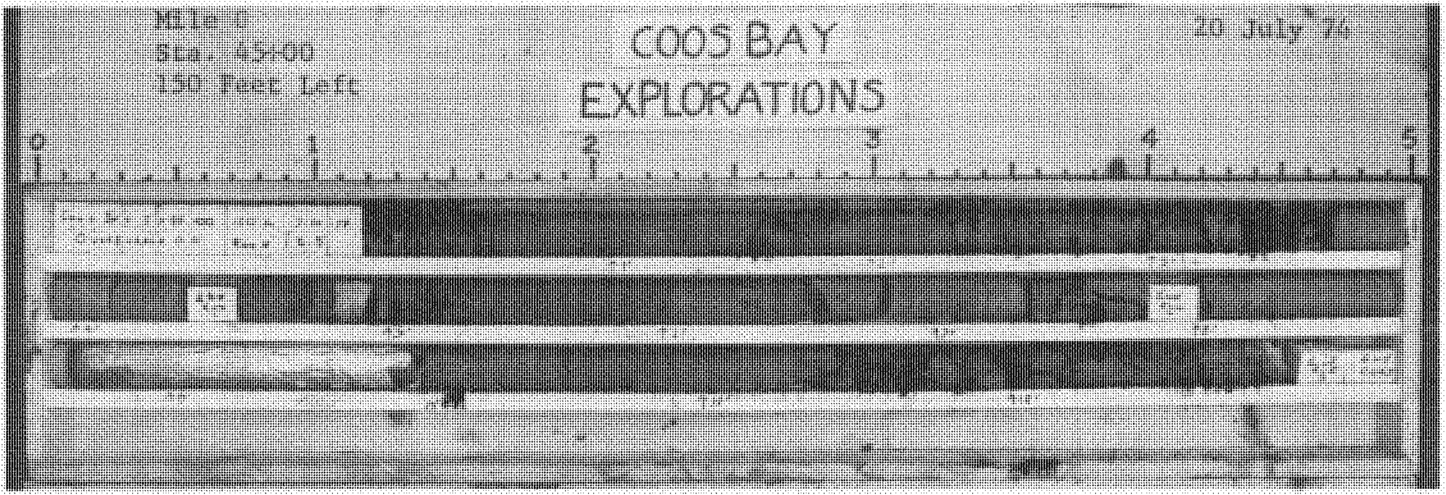
COOS BAY AND HARBOR, OREGON
GEOLOGIC INVESTIGATIONS
LOGS OF DRILL HOLES

PREPARED: Dennis R. Hopman
SUPERVISED: Douglas E. [illegible]
CHIEF, GEOLOGY SECTION
SUBMITTED: for Donald J. Hall DATE: 30 Dec 74
CHIEF, FOUNDATION AND MATERIALS BRANCH
SHEET

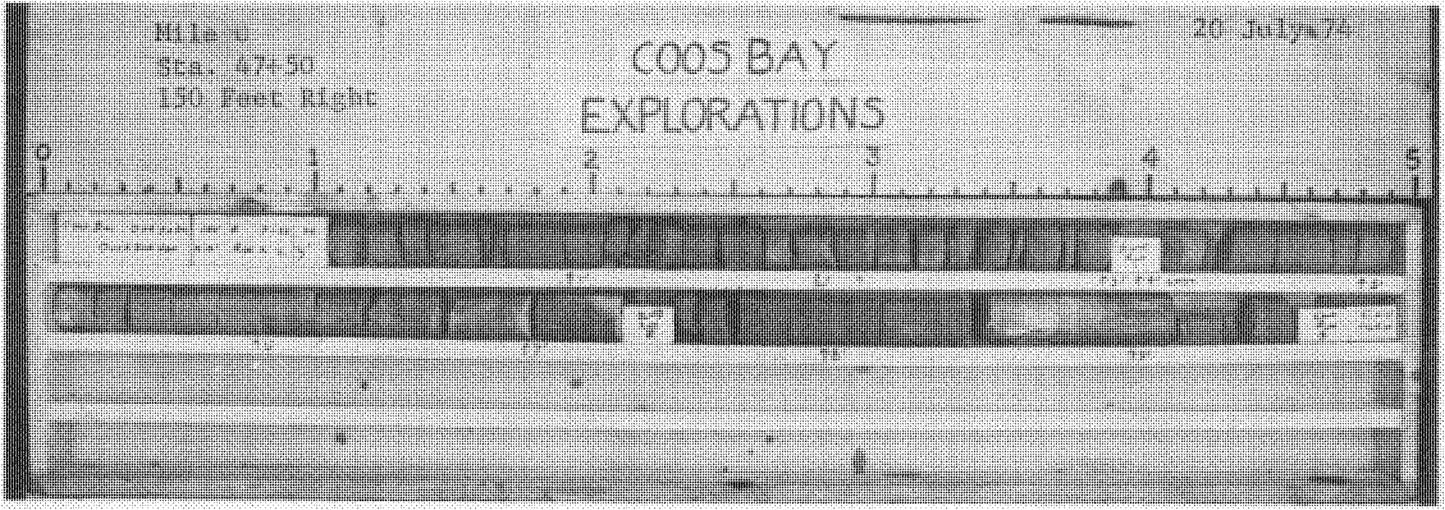
PLATE A-13



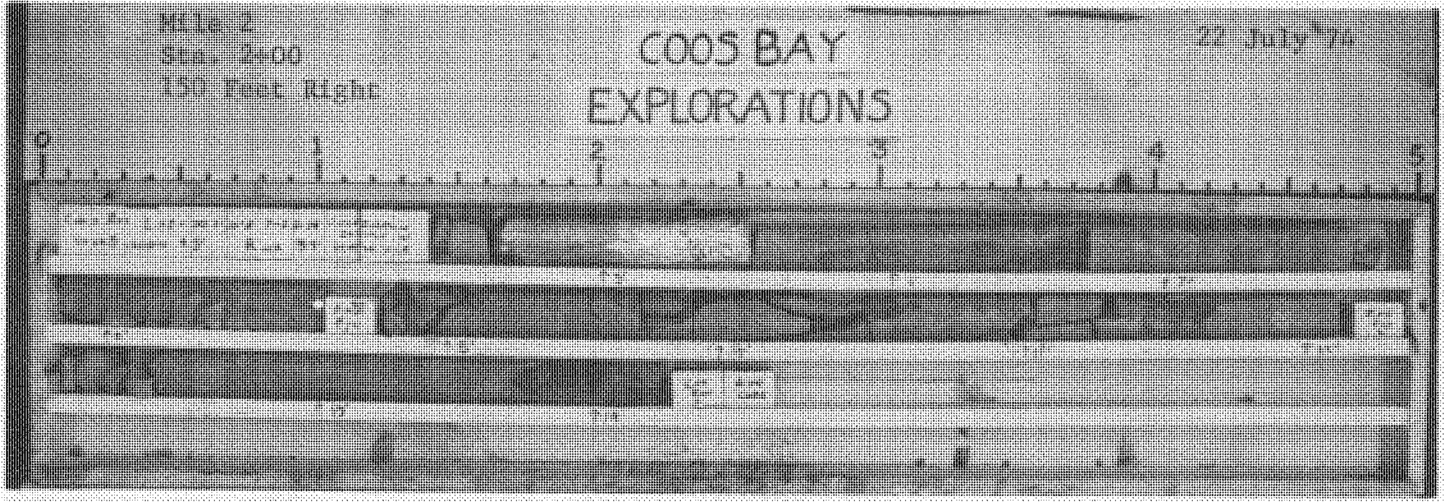
COOS BAY BORING MILE 0 STA. 42+00 150 FEET RIGHT. Sandstone. Top of rock elevation: -32.9, bottom of hole elevation: -45.9. See Plate A-11 for log of core. Note* White pieces shown are core which has been wrapped in aluminum foil and waxed for preservation.



COOS BAY BORING MILE 0 STA. 45+00 150 FEET LEFT. Sandstone. Top of rock elevation: -32.7, bottom of hole elevation: -45.6. See Plate A-11 for log of core.

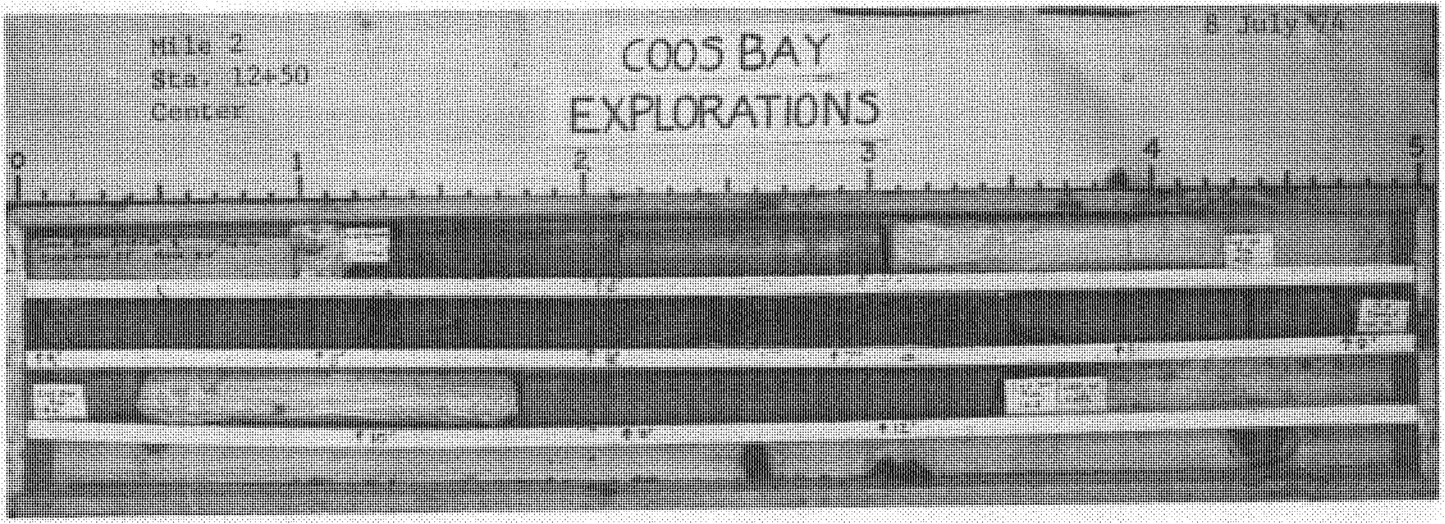


COOS BAY BORING MILE 0 STA. 47+50 150 FEET RIGHT. Sandstone. Top of rock elevation: -33.1, bottom of hole elevation: -44.4. See Plate A-11 for log of core.

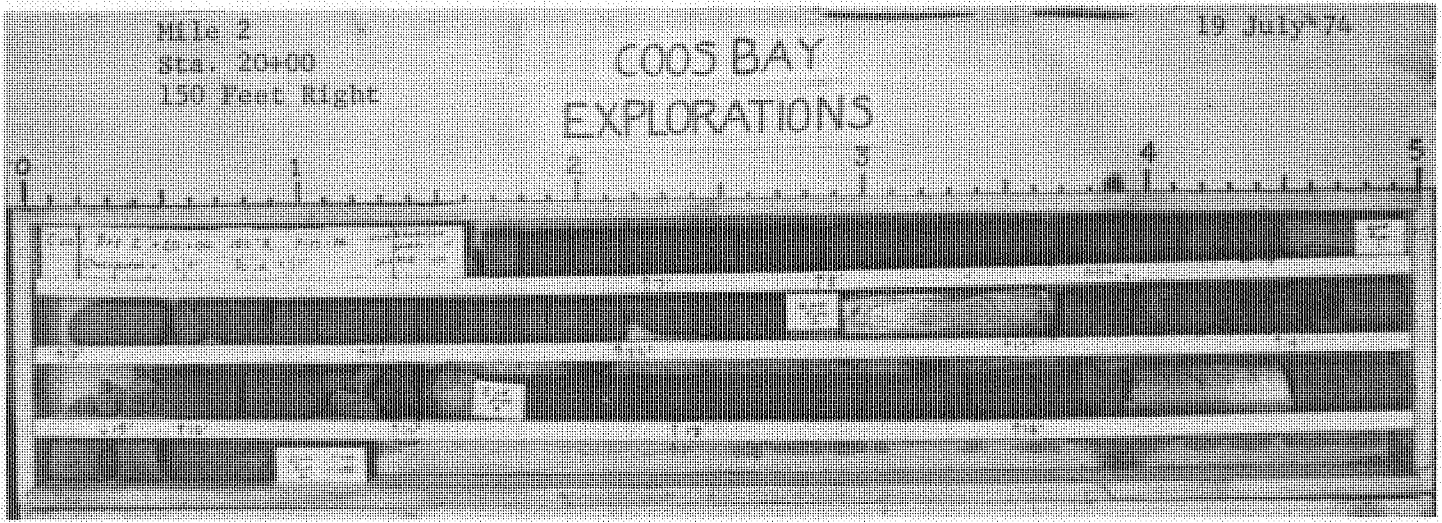


COOS BAY BORING MILE 2 STA. 2+00 150 FEET RIGHT. Claystone. Top of rock elevation: -36.3, bottom of hole elevation: -46.0. See Plate A-11 for log of core.

PLATE A-15

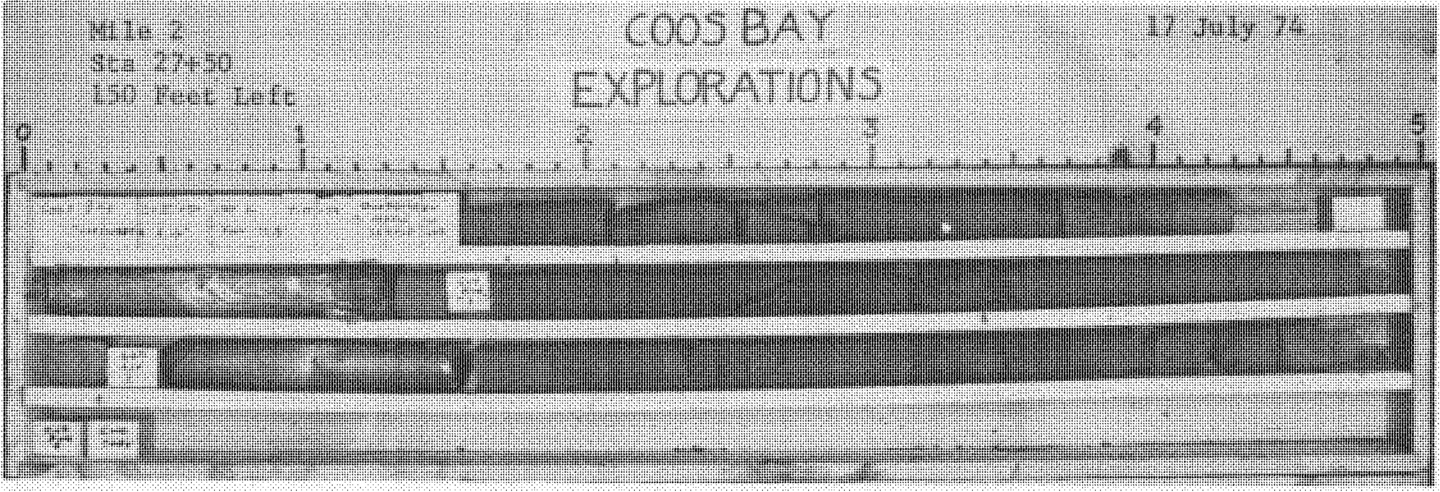


COOS BAY BORING MILE 2 STA. 12+50 CENTERLINE. Sandstone. Top of rock elevation: -34.5, bottom of hole elevation: -45.9. See Plate A-11 For log of core.

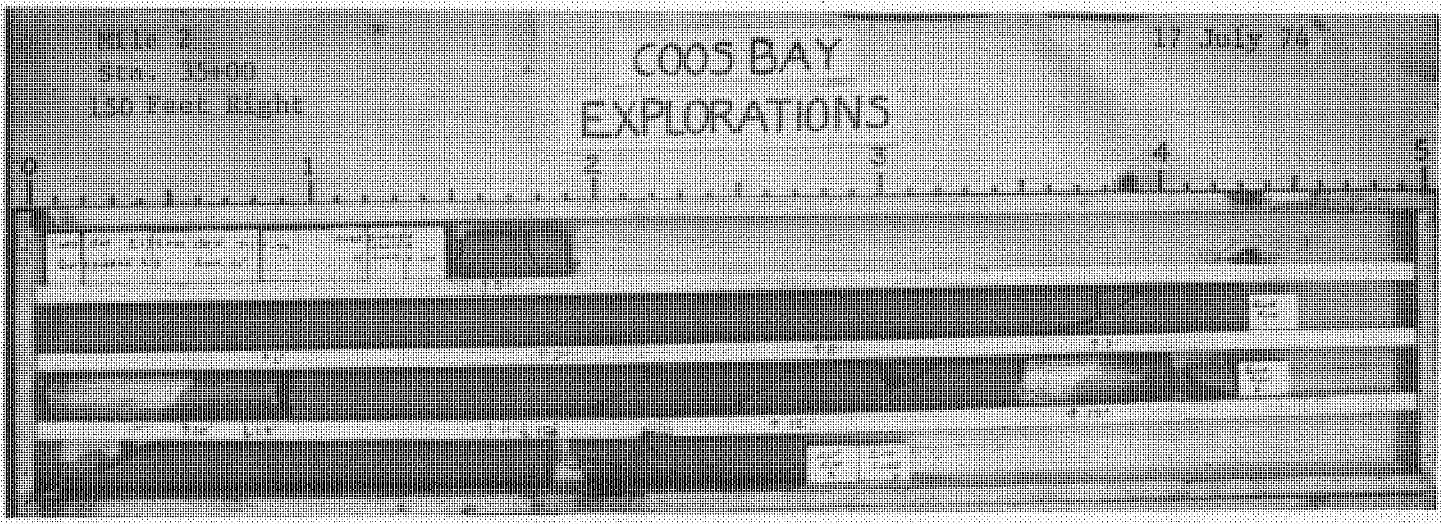


COOS BAY BORING MILE 2 STA. 20+00 150 FEET RIGHT. Sandstone. Top of rock elevation: -34.0, bottom of hole elevation: -47.1. See Plate A-11 for log of core.

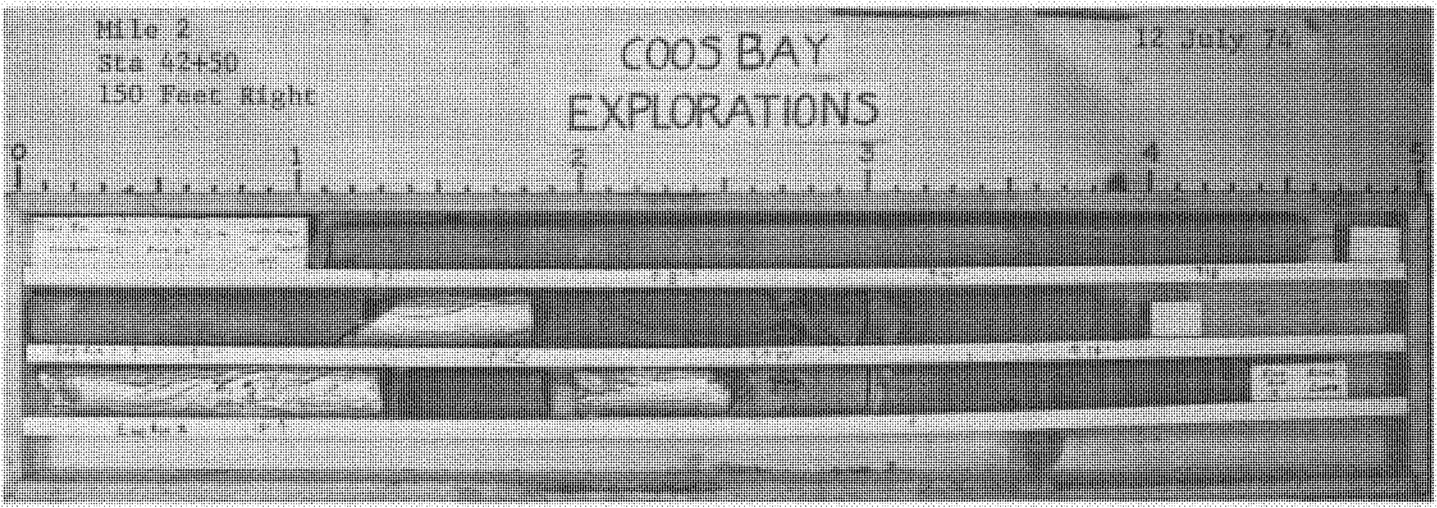
PLATE A-16



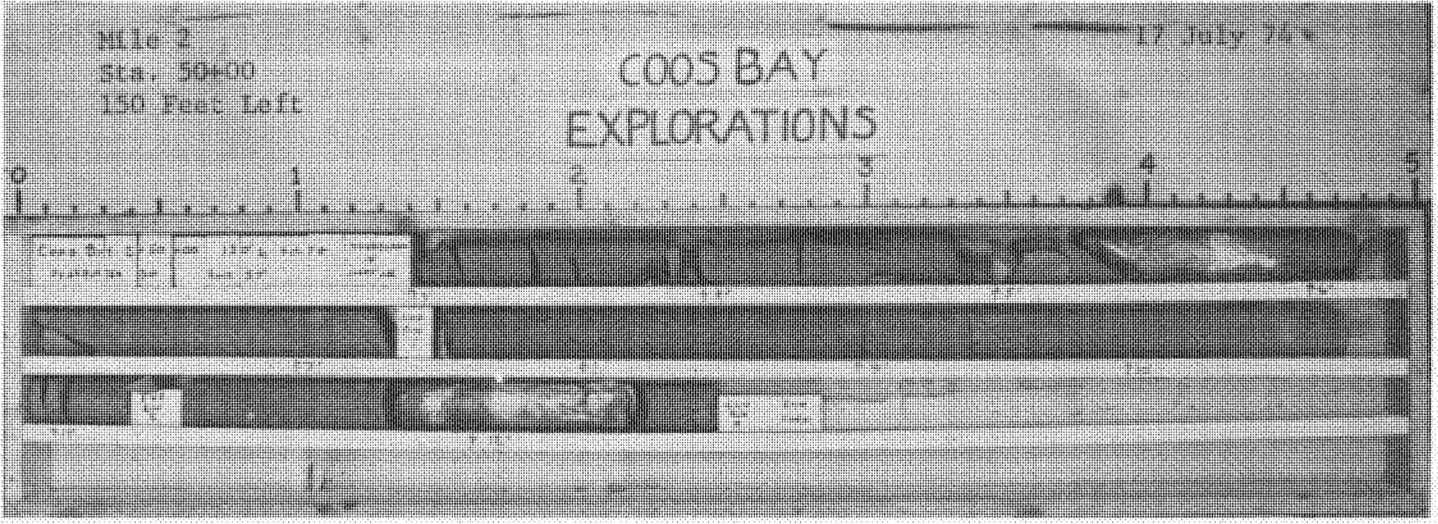
COOS BAY BORING MILE 2 STA. 27+50 150 FEET LEFT. Sandstone. Top of rock elevation: -35.2, bottom of hole elevation: -47.0. See Plate A-12 for log of core.



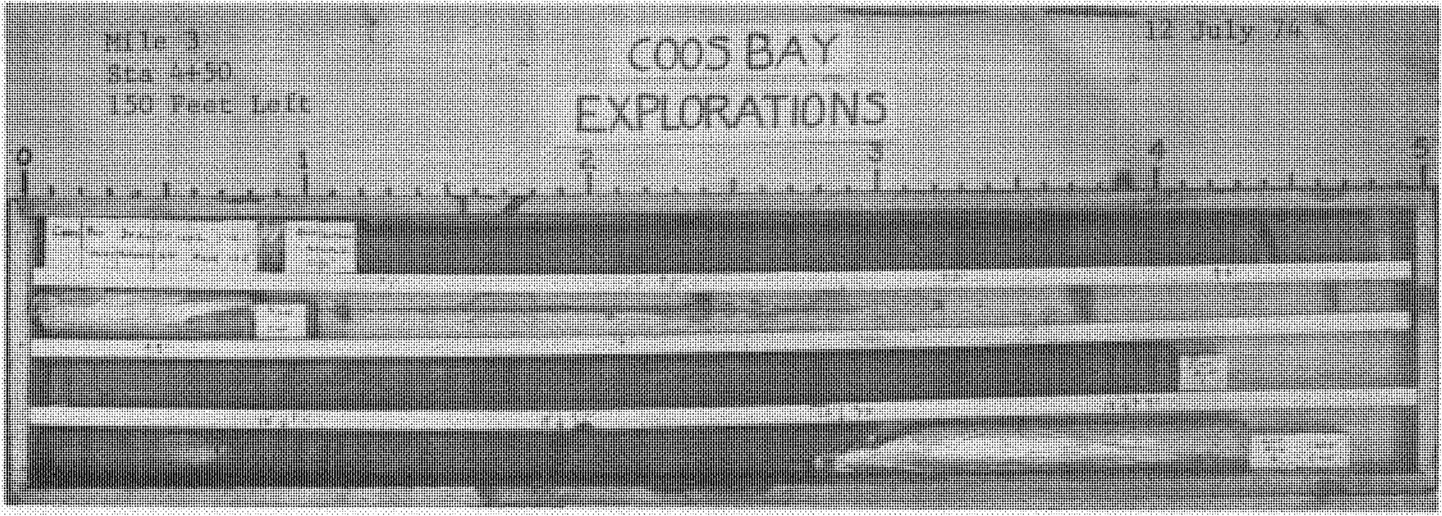
COOS BAY BORING MILE 2 STA. 35+00 150 FEET RIGHT. Siltstone. Top of rock elevation: -34.8, bottom of hole elevation: -45.9. See Plate A-12 for log of core.



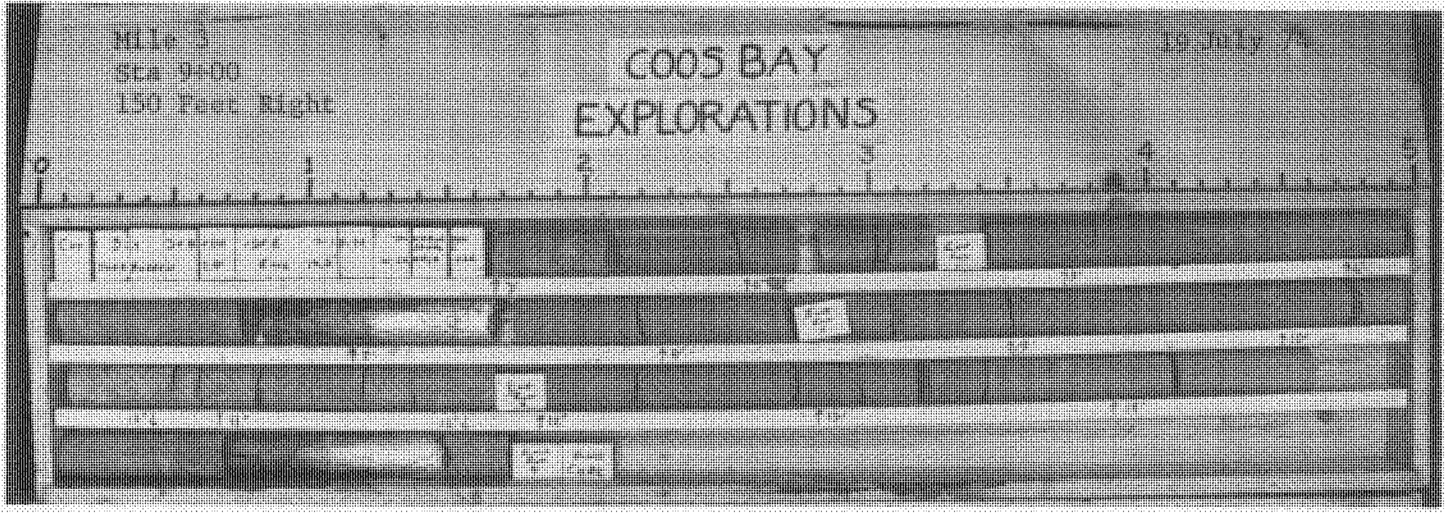
COOS BAY BORING MILE 2 STA. 42+50 150 FEET RIGHT. Sandstone. Top of rock elevation -35.3 to -43.9; Claystone: elevation -43.9 to -45.8; Sandstone: elevation -45.8 to bottom of hole elevation -47.6. See Plate A-12 for log of core.



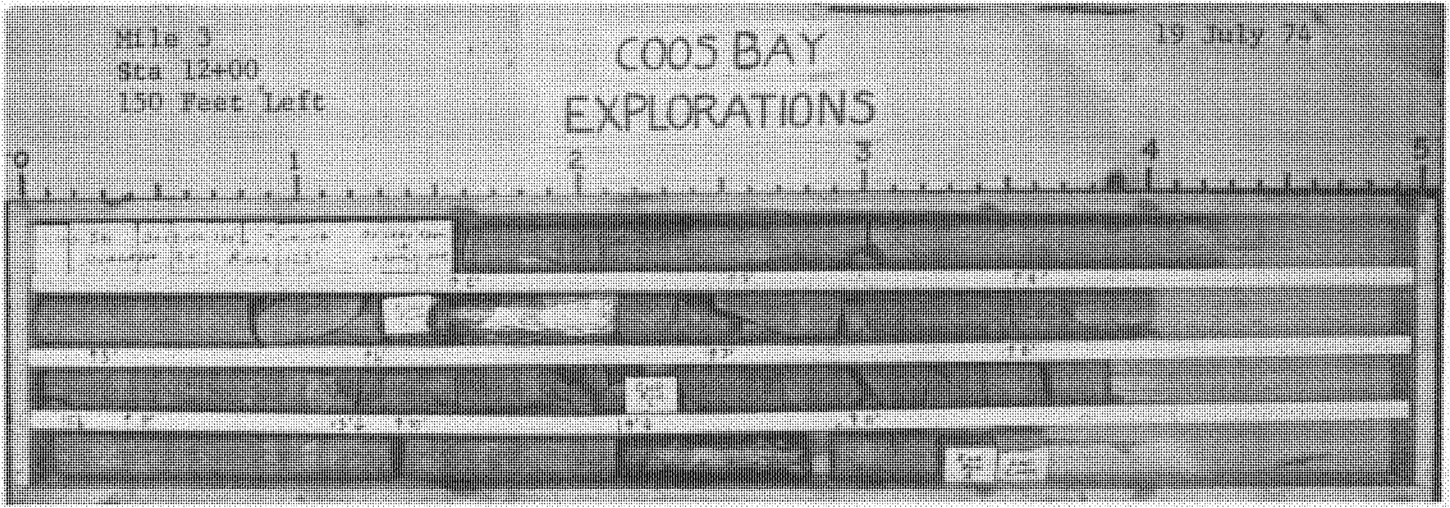
COOS BAY BORING MILE 2 STA. 50+00 150 FEET LEFT. Siltstone. Top of rock elevation: -36.2, bottom of hole elevation: -46.5. See Plate A-12 for log of core.



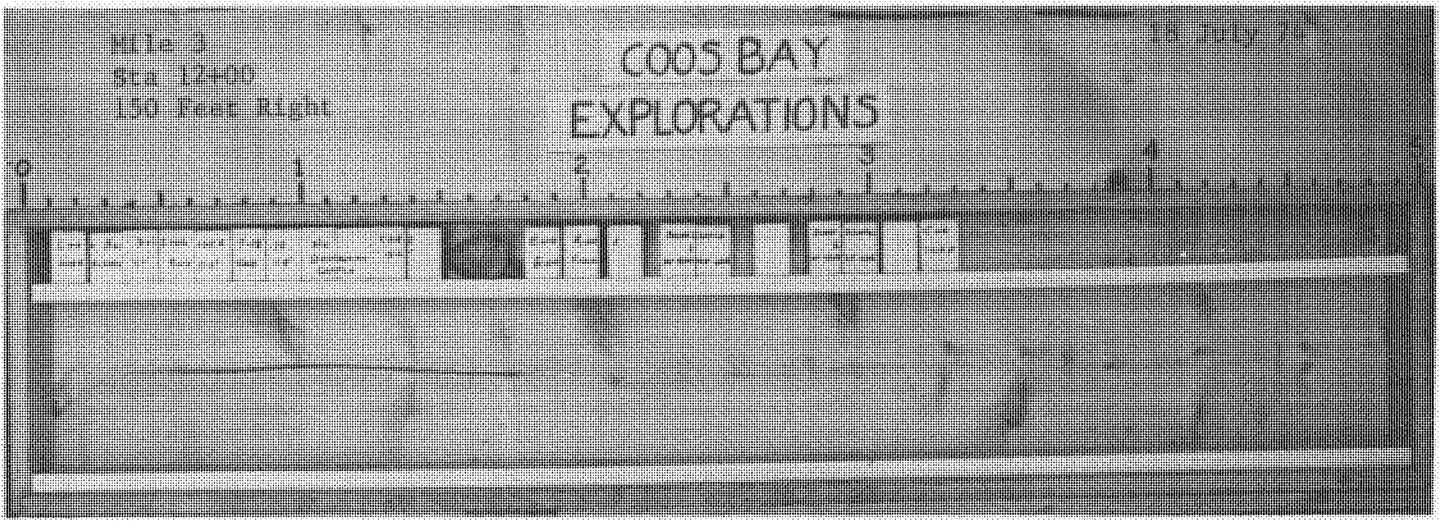
COOS BAY BORING MILE 3 STA. 4+50 150 FEET LEFT. <u>Sandstone</u>. Top of rock elevation: -32.9, bottom of hole elevation: -45.7. See Plate A-12 for log of core.



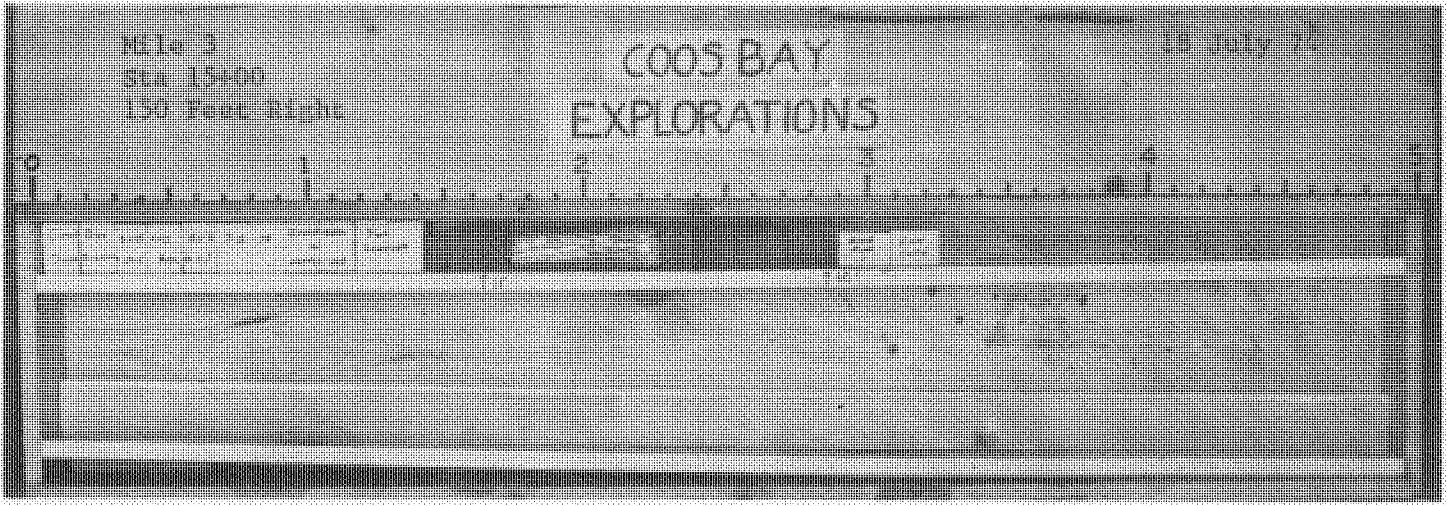
COOS BAY BORING MILE 3 STA. 9+00 150 FEET RIGHT. <u>Siltstone</u>. Top of rock elevation: -34.7, bottom of hole elevation: -48.2. See Plate A-12 for log of core.



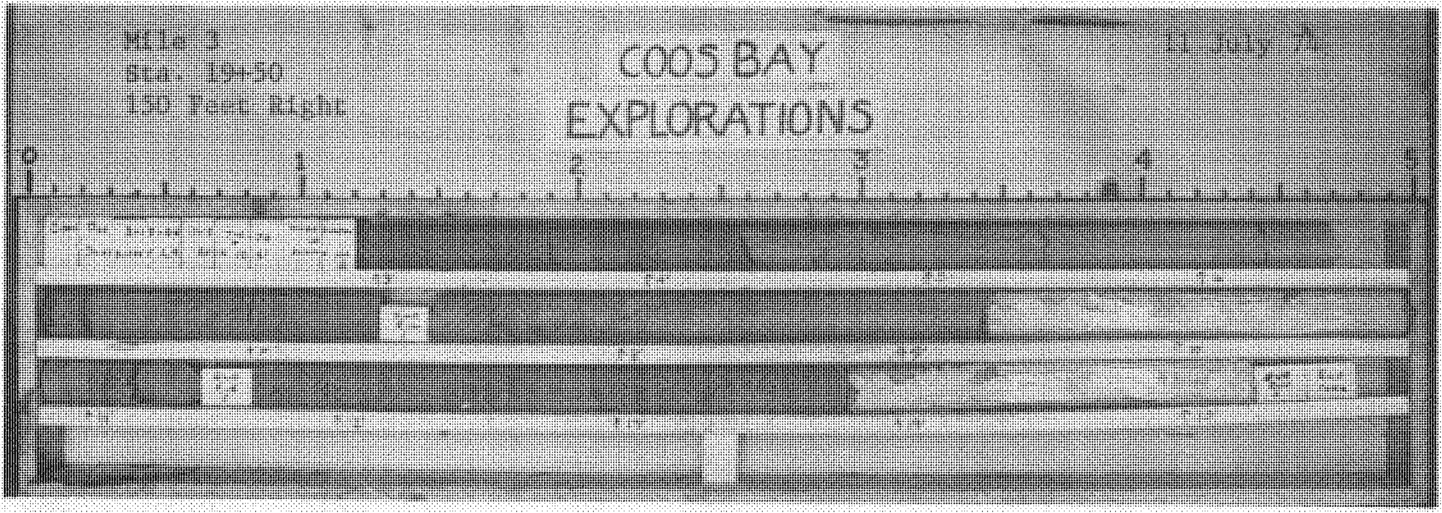
COOS BAY BORING MILE 3 STA. 12+00 150 FEET LEFT. Siltstone. Top of rock elevation: -33.2, bottom of hole elevation: -46.1. See Plate A-12 for log of core.



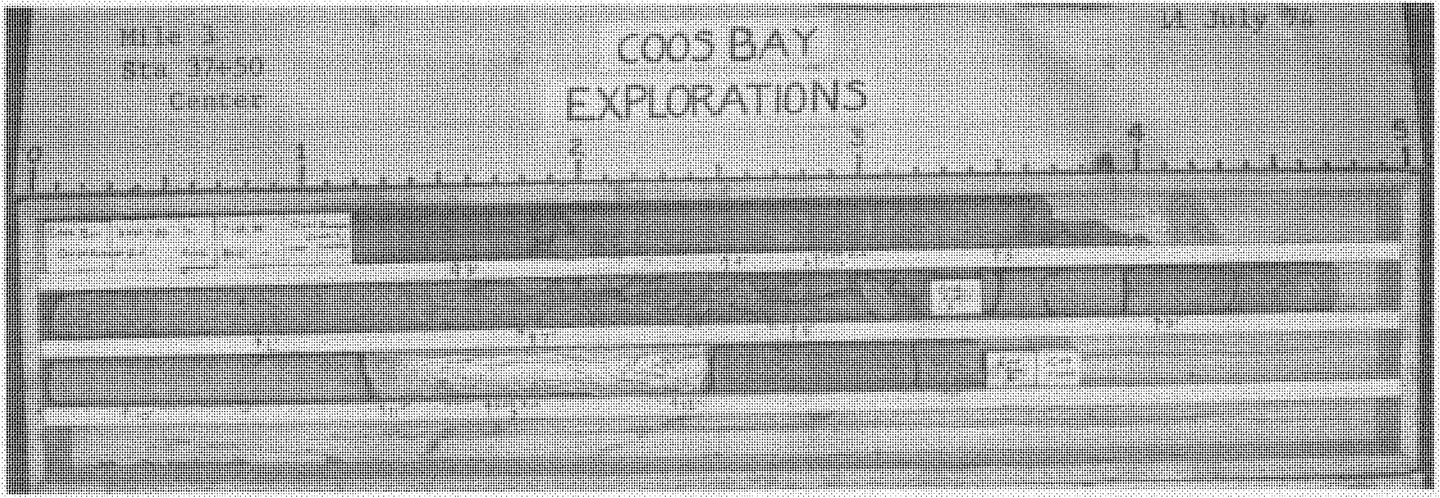
COOS BAY BORING MILE 3 STA. 12+00 150 FEET RIGHT. Sandstone Cobble. Elevation -36.8, bottom of hole elevation: -46.2. See Plate A-12 for log of material.



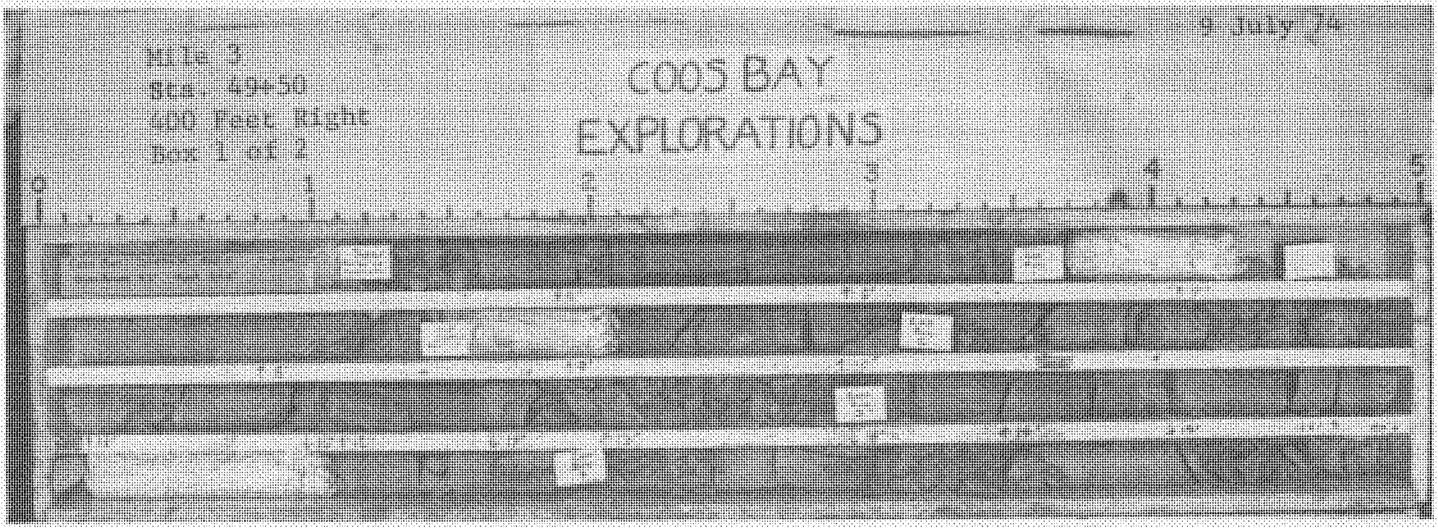
COOS BAY BORING MILE 3 STA. 15+00 150 FEET RIGHT. Sandstone. (top of known rock) Elevation -43.6, bottom of hole elevation: -45.1. See Plate A-13 for log of core.



COOS BAY BORING MILE 3 STA. 19+50 150 FEET RIGHT. Sandstone. Top of rock elevation: -35.1, bottom of hole elevation: -48.5. See Plate A-13 for log of material.

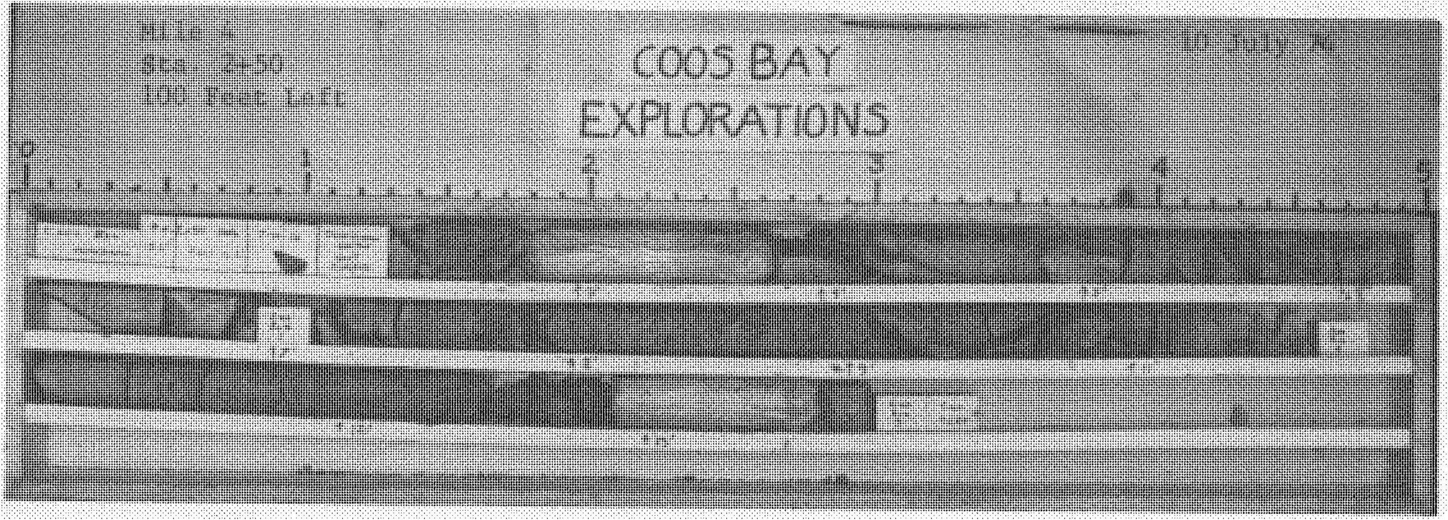


COOS BAY BORING MILE 3 STA. 37+50 CENTERLINE. Sandstone. Top of rock elevation: -34.9, bottom of hole elevation: -45.5. See Plate A-13 for log of material.



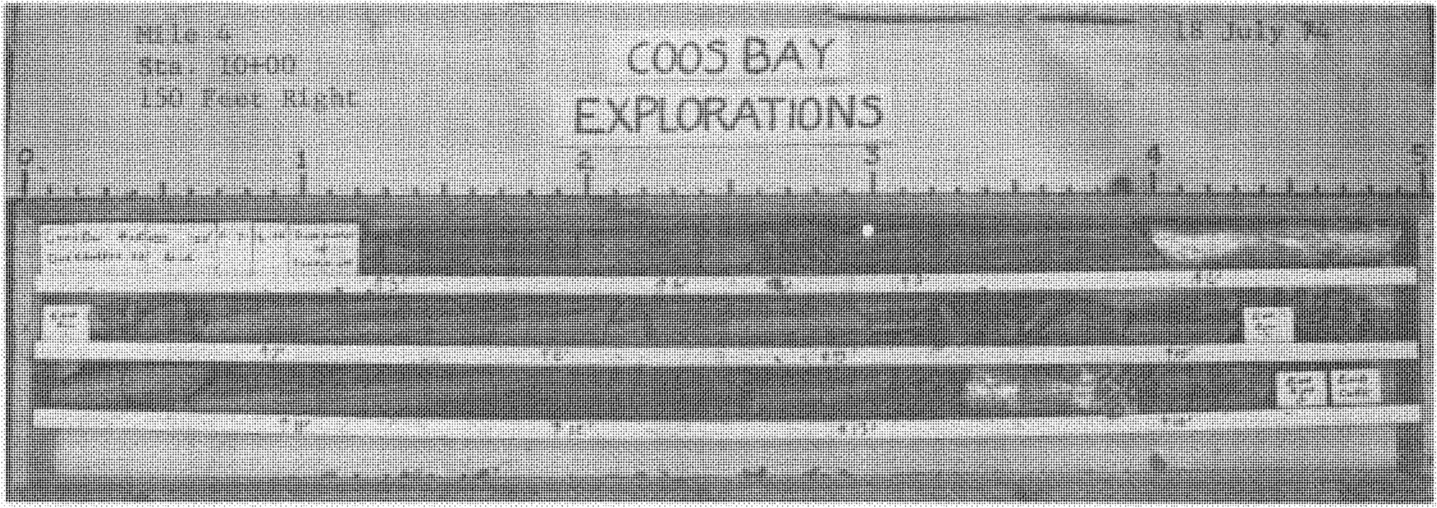
COOS BAY BORING MILE 3 STA. 49+50 400 FEET RIGHT. Claystone. Top of rock elevation: -26.7, bottom of hole elevation: -47.0. See Plate A-13 for log of core.

COOS BAY BORING MILE 3 STA. 49+50 400 FEET RIGHT. Claystone. Top of rock elevation: -26.7, bottom of hole elevation: -47.0. See Plate A-13 for log of core.

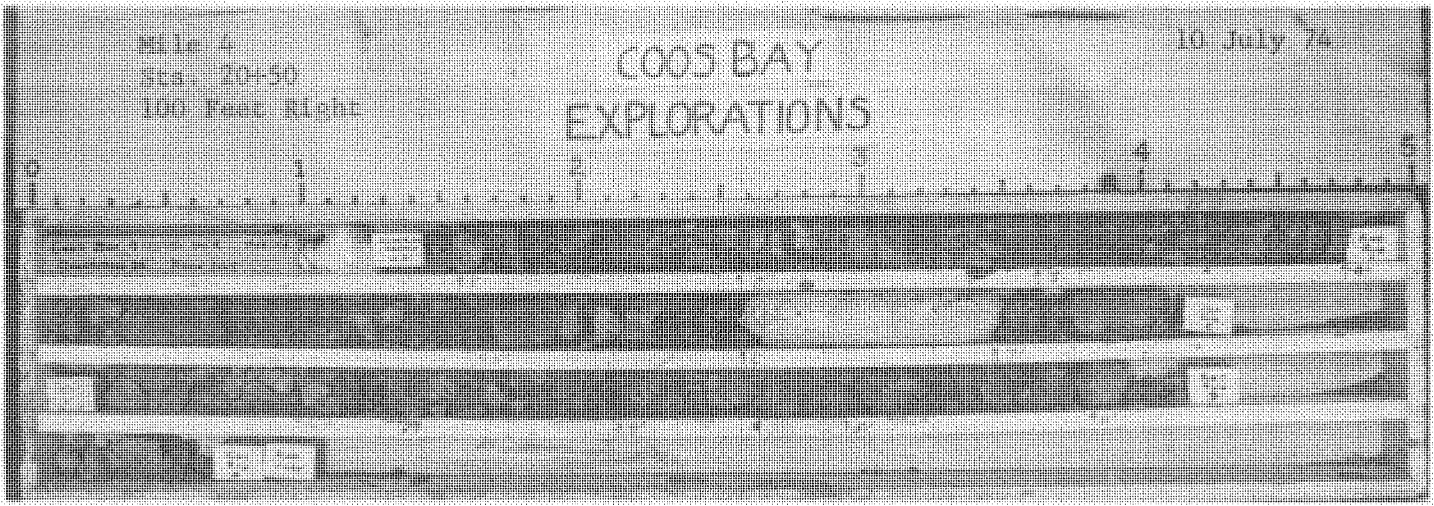


COOS BAY BORING MILE 4 STA. 2+50 100 FEET LEFT. Claystone. Top of rock elevation -35.9 to -45.4; Siltstone: elevation -45.4 to -46.8; Claystone: elevation -46.8 to bottom of hole elevation -47.4. See Plate A-13 for log of core.

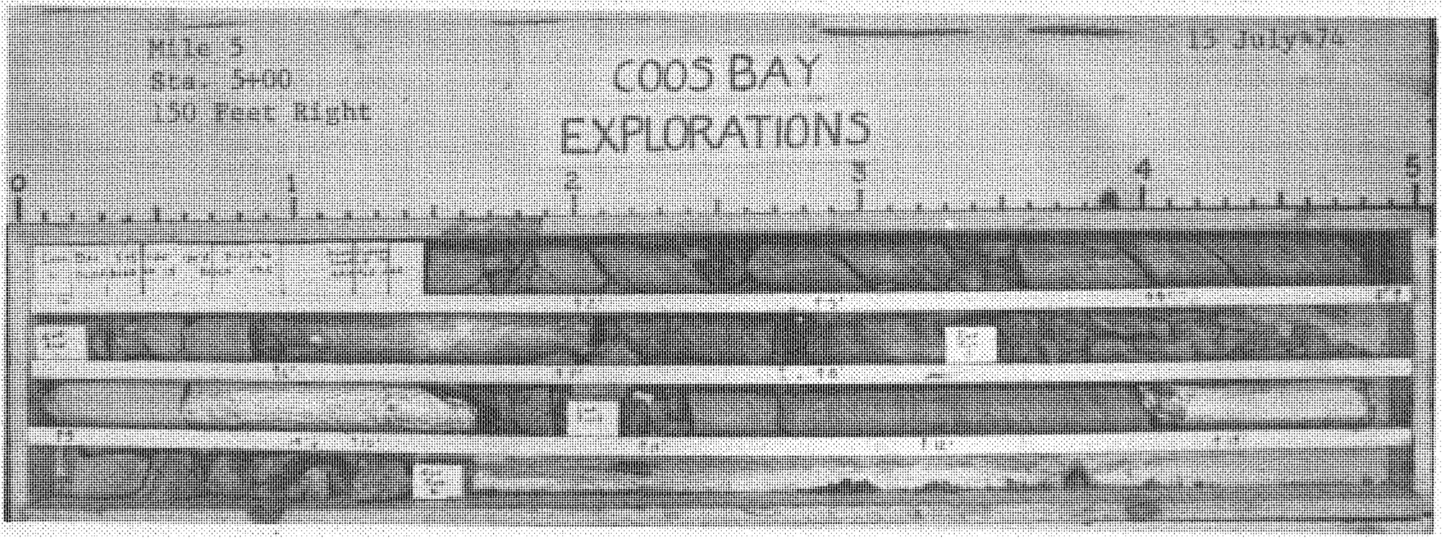
PLATE A-23



COOS BAY BORING MILE 4 STA. 10+00 150 FEET RIGHT. Claystone. Top of rock elevation: -34.2, bottom of hole elevation: -45.8. See Plate A-13 for log of core.



COOS BAY BORING MILE 4 STA. 20+50 100 FEET RIGHT. Claystone. Top of rock elevation: -34.7, bottom of hole elevation: -47.3. See Plate A-13 for log of core.

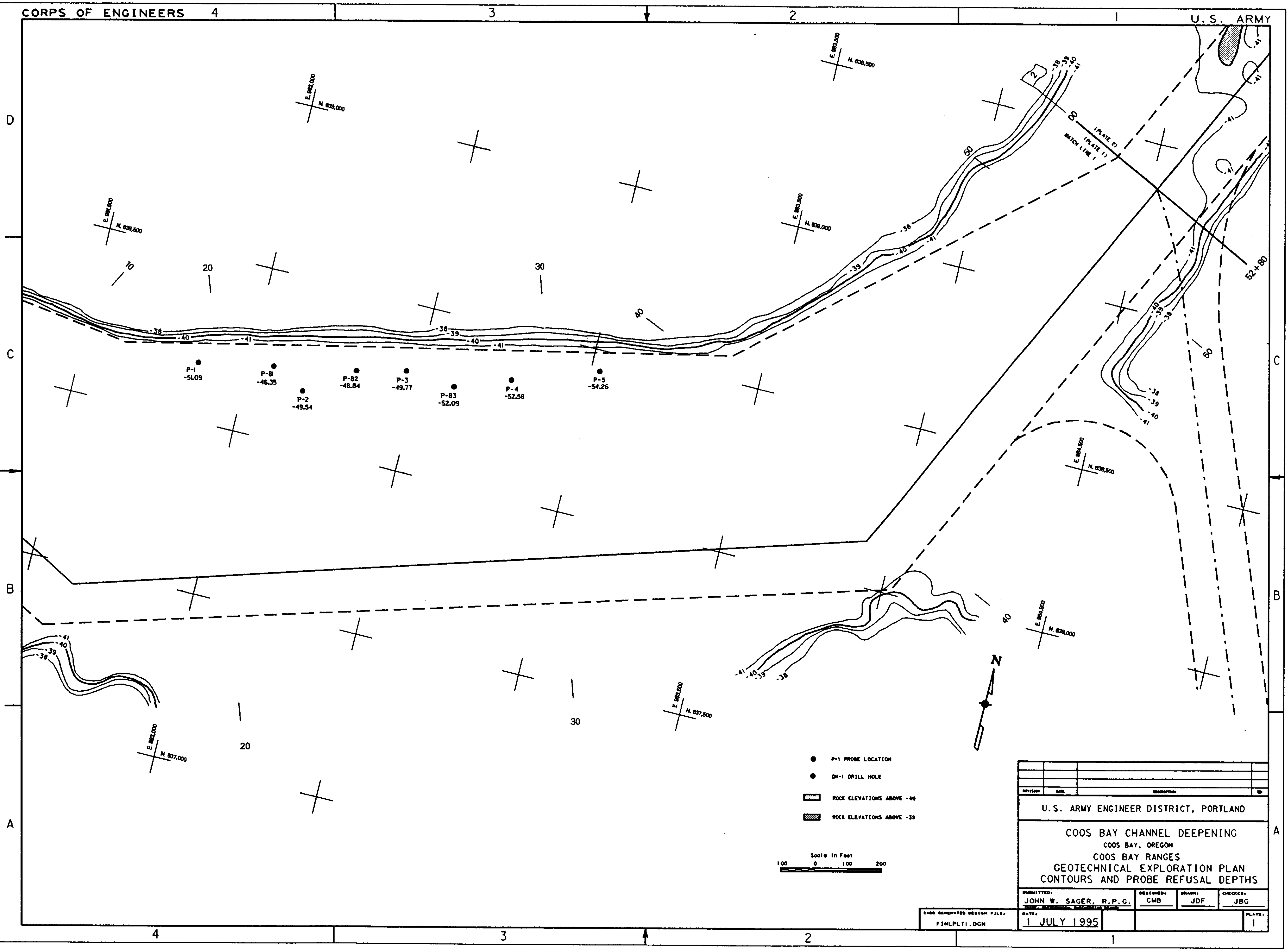


COOS BAY BORING MILE 5 STA. 5+00 150 FEET RIGHT. Sandstone. Top of rock elevation -32.1 to -33.2; Siltstone: elevation -33.2 to 39.4; Sandstone: elevation -39.4 to -41.8; Siltstone: -41.8 to bottom of hole elevation: -45.3. See Plate A-13 for log of core.

COOS BAY BORING MILE 5 STA. 29+00 300 FEET RIGHT. Claystone. Top of rock elevation: -38.1, bottom of hole elevation: -45.2. See Plate A-13 for log of core.

PLATE A-25

APPENDIX D – USACE 1994 Field Explorations and Laboratory Testing

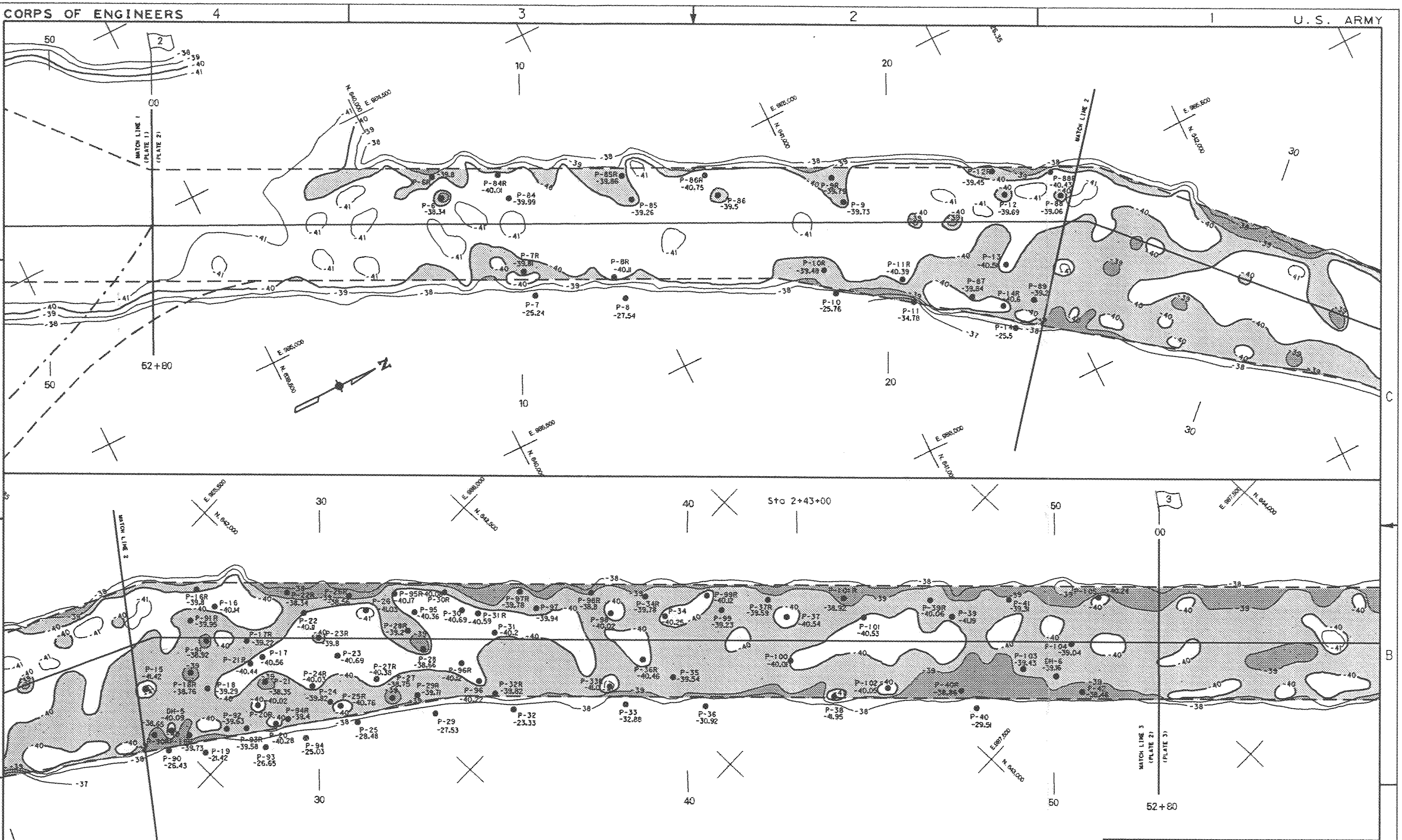


REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DISTRICT, PORTLAND

COOS BAY CHANNEL DEEPENING
COOS BAY, OREGON
COOS BAY RANGES
GEOTECHNICAL EXPLORATION PLAN
CONTOURS AND PROBE REFUSAL DEPTHS

SUBMITTED: JOHN W. SAGER, R.P.G.
DESIGNED: CMB
DRAWN: JDF
CHECKED: JBG
CADD GENERATED DESIGN FILE: FINLPLT1.DGN
DATE: 1 JULY 1995
PLATE: 1



U.S. ARMY ENGINEER DISTRICT, PORTLAND

REVISION	DATE	DESCRIPTION	BY

COOS BAY CHANNEL DEEPENING

COOS BAY, OREGON

COOS BAY RANGES
GEOTECHNICAL EXPLORATION PLAN
CONTOURS AND PROBE REFUSAL DEPTHS

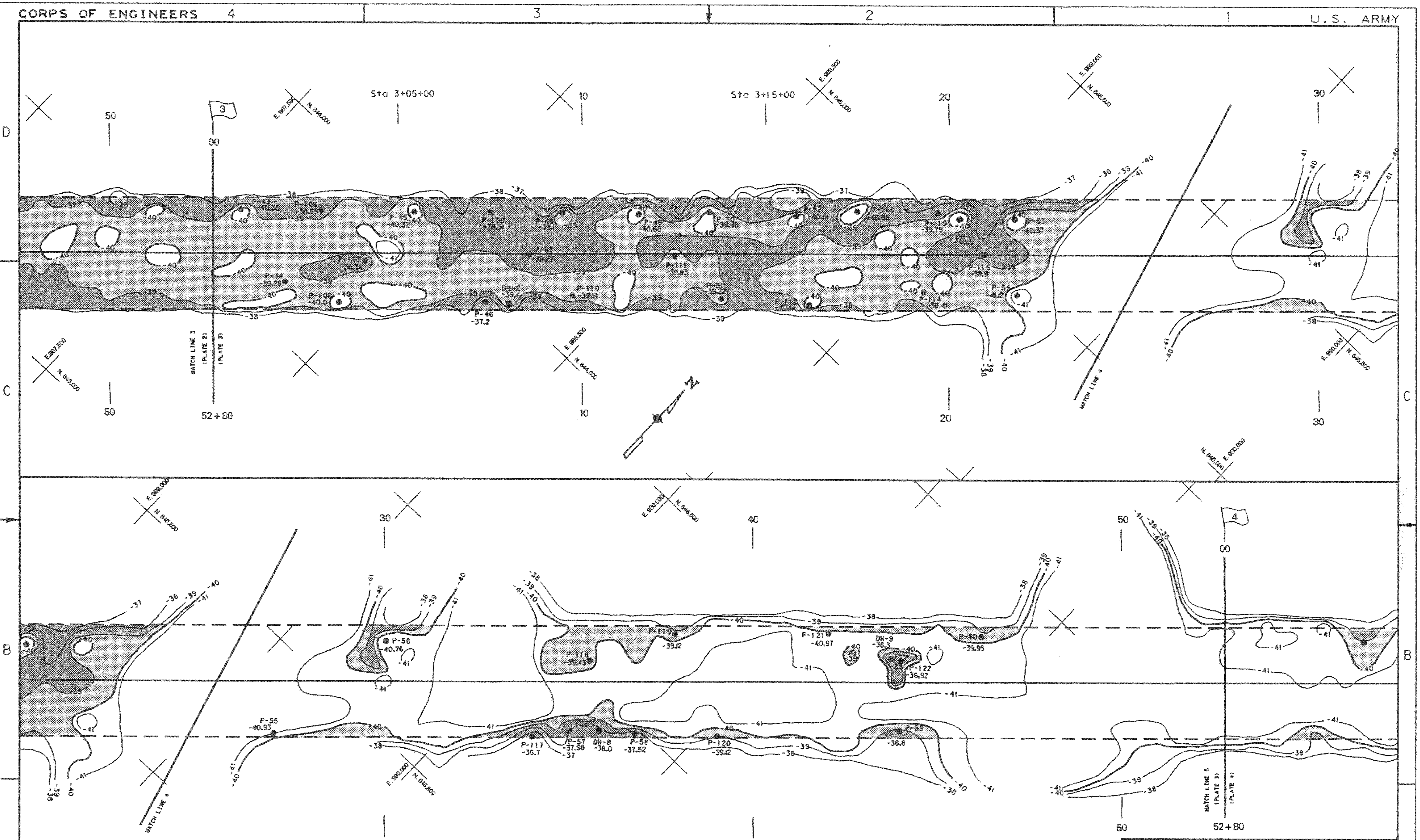
SUBMITTED:	DESIGNED:	DRAWN:	CHECKED:
JOHN W. SAGER, R.P.G. CHIEF, GEOTECHNICAL ENGINEERING BRANCH	CMB	JDF	JBG

CADD GENERATED DESIGN FILE: FINLPLT2.DGN

DATE: 1 JULY 1995

PLATE: 2

CORPS OF ENGINEERS U.S. ARMY



● P-1 PROBE LOCATION

● DH-1 DRILL HOLE

▨ ROCK ELEVATIONS ABOVE -40

▨ ROCK ELEVATIONS ABOVE -39

Scale in Feet
100 0 100 200

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DISTRICT, PORTLAND

COOS BAY CHANNEL DEEPENING
COOS BAY, OREGON
COOS BAY RANGES
GEOTECHNICAL EXPLORATION PLAN
CONTOURS AND PROBE REFUSAL DEPTHS

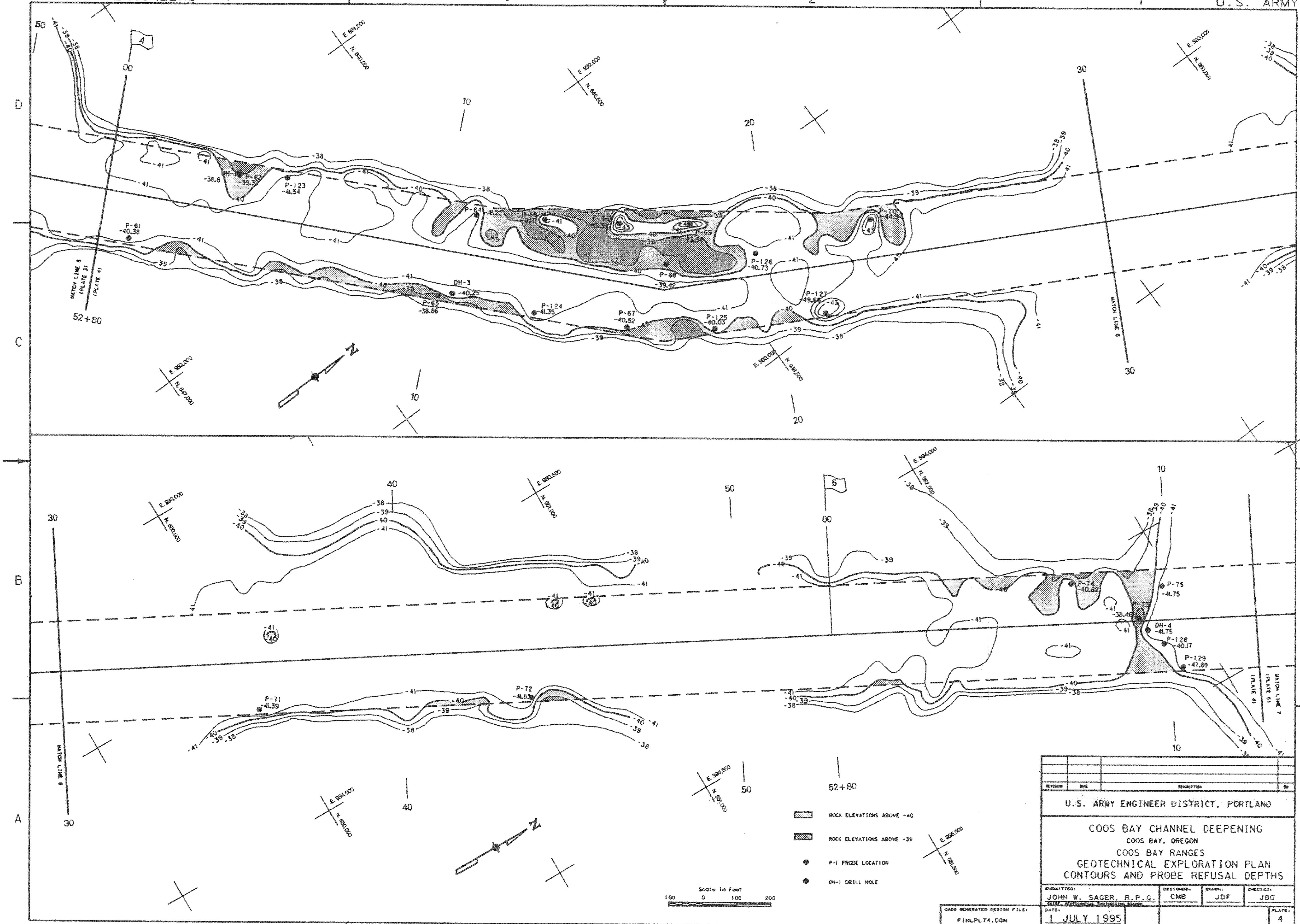
SUBMITTED:	DESIGNED:	DRAWN:	CHECKED:
JOHN W. SAGER, R.P.G. CHIEF, GEOTECHNICAL ENGINEERING BRANCH	CMB	JDF	JBG

CADD GENERATED DESIGN FILE: FINLPLT3.DGN

DATE: 1 JULY 1995

PLATE: 3

CORPS OF ENGINEERS U.S. ARMY



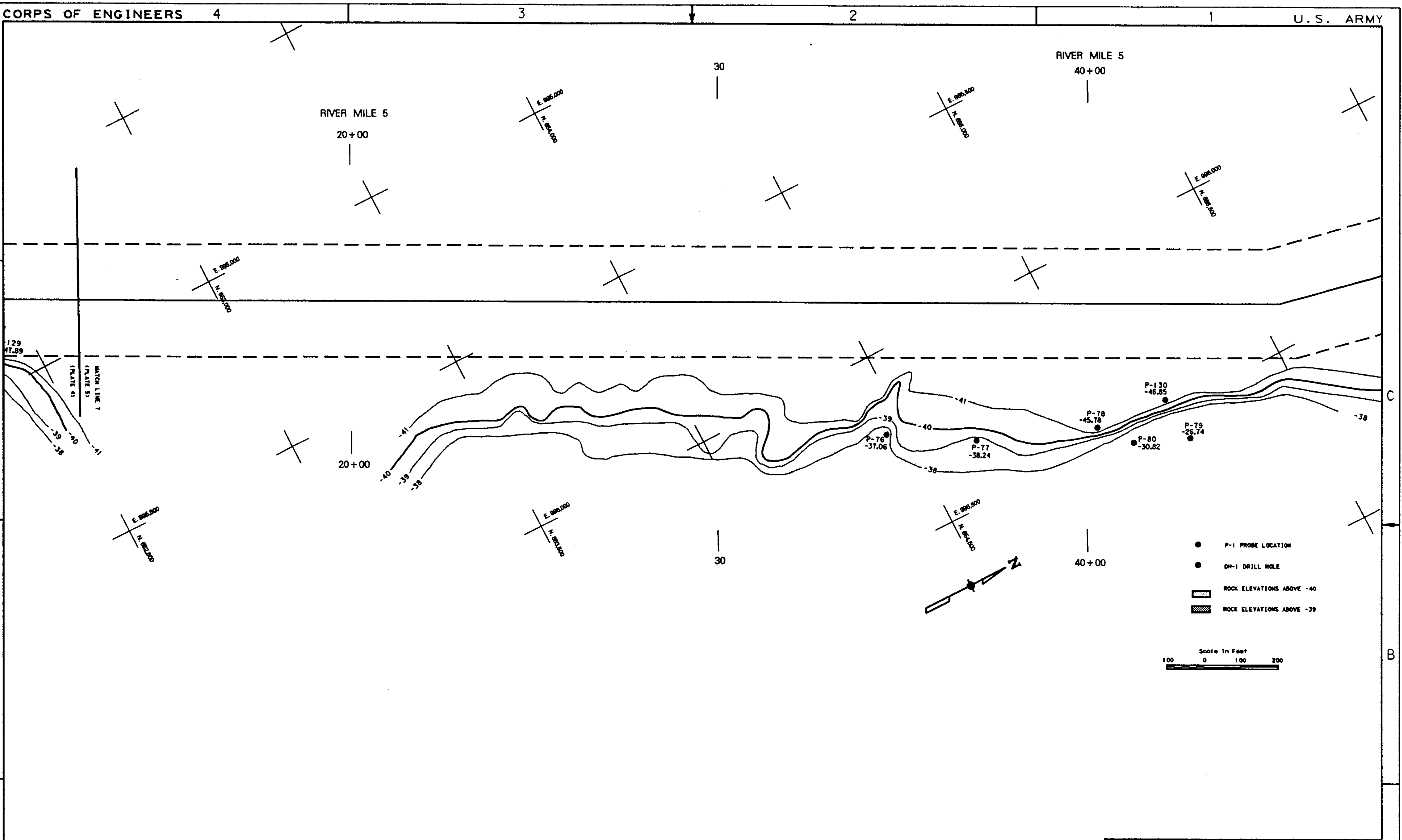
REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DISTRICT, PORTLAND

COOS BAY CHANNEL DEEPENING
COOS BAY, OREGON
COOS BAY RANGES
GEOTECHNICAL EXPLORATION PLAN
CONTOURS AND PROBE REFUSAL DEPTHS

SUBMITTED: JOHN W. SAGER, R.P.G.
CHIEF, GEOTECHNICAL ENGINEERING BRANCH
DESIGNED: CMB
DRAWN: JDF
CHECKED: JBG
CADD GENERATED DESIGN FILE: FINLPLT4.DGN
DATE: 1 JULY 1995
PLATE: 4

CORPS OF ENGINEERS U.S. ARMY



REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DISTRICT, PORTLAND

COOS BAY CHANNEL DEEPENING
COOS BAY, OREGON
COOS BAY RANGES
GEOTECHNICAL EXPLORATION PLAN
CONTOURS AND PROBE REFUSAL DEPTHS

SUBMITTED:	DESIGNED:	DRAWN:	CHECKED:
JOHN W. SAGER, R.P.G.	CMB	JDF	JBG

CADD GENERATED DESIGN FILE: FINLPLT5.DGN

DATE: 1 JULY 1995

PLATE: 5

Appendix A

Drill Logs
Core Photos

LEGEND FOR DRILL LOGS

N = Northing

E = Easting

m.l.l.w. = mean lower low water

DB = drill break

HB = hand break

DQ, CQ = Dent quality (dents upon hammer impact); crush quality (crushes upon hammer impact).

CSG = casing

CR = core recovery

Percent (%) Core Recovery, D,C,L

PLT = point load test

EOR = end of run

PD = partially decomposed

TOR = top of rock

MSV = massive

BOH = bottom of hole

V.F. = very fine

D = footage drilled

C = core recovered

L = core loss

S = sample

Med = medium

k = 35 pounds

U_L = ultimate load in pounds

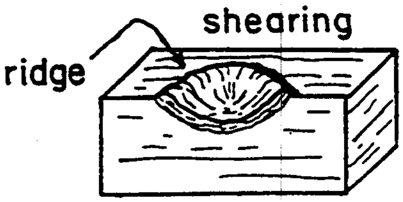
PLI = point load index in psi

LEGEND FOR DRILL LOGS

Field Compressive Strength

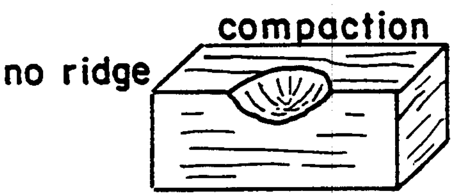
Field Compressive Strength or Impact Hardness is a measure of the intact strength of the rock mass independent of planar and linear elements. There are four distinct reactions to impact loading by means of a 1 pound ball-pean hammer (or a well rounded peck end of a G-pick). The reaction is independent of intensity of blow within the limitations of the tool used and the investigator's strength. Based on these reactions plus the moldability factor, five categories of field compressive strength are denoted:

1) MQ, <u>Moldable Quality</u> - The rock material is moldable, and therefore must be completely to partly decomposed (CD-PD).



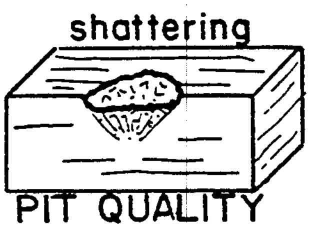
CRUSH QUALITY

2) CQ, <u>Crush Quality</u> - A reaction under the point of impact producing a shearing and upthrusting of adjacent mineral grains.



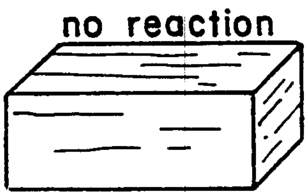
DENT QUALITY

3) DQ, <u>Dent Quality</u> - A reaction under the point of impact producing a dent or depression. It indicates the presence of "pore space" between the mineral grains.



PIT QUALITY

4) PQ, <u>Pit Quality</u> - A reaction under the point of impact producing a "Shatter Cone" and an explosive departure of mineral fragments. Results in a shallow, rough pit.



REBOUND QUALITY

5) RQ, <u>Rebound Quality</u> - A reaction under the point of impact in which there is no reaction by the rock.

DRILL CORE LEGEND COLUMN

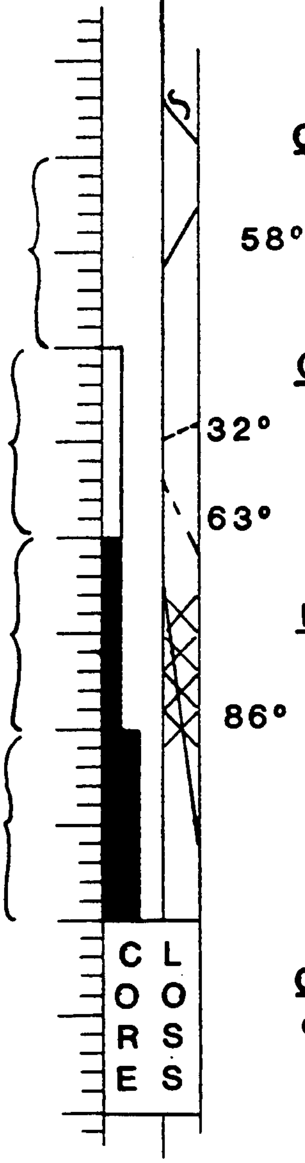
Weathering Column

Planar Features Column

Column width

1/12 x core dia.

Discontinuities are plotted on log not sketched



FRESH STATE

no symbol

STAINED STATE

open bar 1/10-inch wide

PARTLY DECOMPOSED

solid bar 1/10-inch wide

COMPLETELY DECOMPOSED

solid bar 2/10-inch wide

OPEN PLANES OF WEAKNESS

CLOSED PLANE OF WEAKNESS

FRAGMENTAL CORE

CORE LOSS zone as shown on core box

NOTE: Lines shown are representations of actual fractures or breaks in the recovered core samples.

Hole No. DH-1

DRILLING LOG

DIVISION North Pacific

INSTALLATION Portland District

SHEET 1 OF 2 SHEETS

1. PROJECT Lower Coos River Channel Expl.
2. LOCATION (Coordinates or Station) N. 647,528.7.9 E. 991,629 8.7
3. DRILLING AGENCY COE Contractor/ Sub-Pitcher Drilling Co.
4. HOLE NO. (As shown on drawing title and file number) Relocated DH-1
5. NAME OF DRILLER Ron Baker
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ______ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN (-38.24) 0.6' wash bore
8. DEPTH DRILLED INTO ROCK 3.3
9. TOTAL DEPTH OF HOLE 3.3
10. SIZE AND TYPE OF BIT NX Diamond Bit
11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MLLW
12. MANUFACTURER'S DESIGNATION OF DRILL Failing 1500
13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN DISTURBED 0 UNDISTURBED 0
14. TOTAL NUMBER CORE BOXES 1
15. ELEVATION GROUND WATER Tide
16. DATE HOLE STARTED 23 Aug 94 COMPLETED 23 Aug 94
17. ELEVATION TOP OF Rock -38.80
18. TOTAL CORE RECOVERY FOR BORING 97%
19. SIGNATURE OF INSPECTOR

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
-38.80	0		DB DB Claystone/ Mudstone Med. Grey, DQ, Fresh, Faintly Bedded, Fossiliferous DB MB Slakes v. fast. DB DB DBLOOR Blocked off	Run 1 D 1.4 C 1.4 L 0.0 100% CR. 1.4	Box No 1	0.0 Top of Rock
	1					Samples slacked before anything could be done
	2			Run 2 D 1.2 C 1.2 L 0.0 100% CR. 2.6		
			MB DBR	Run 3 D 0.7 C 0.6		L 0.1, 86% CR
-42.10	3		EL. EOR-BOH	3.3	3.3	
			Hole Bottomed 23 Aug 94 Strong current (7' in-coming tide) strong counter wind creating 2-2½ ft chop (16 knots - Cape Arago L.H.) shifted the barge and shifted the CSG.			
	4					
	5					
	6					
	7					
	8					
	9					
-48.80	10					

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT) 1/2

PROJECT Lower Coos River Channel Expl

HOLE NO. DH-1 (Reloc)

Hole No. DH-1 STUB

DRILLING LOG	**DIVISION** NORTH PACIFIC	**INSTALLATION** PORTLAND DISTRICT	**SHEET** 2 **OF** 2 **SHEETS**

1. PROJECT LOWER COOS RIVER CHANNEL EXPL.

2. LOCATION (Coordinates or Station) N. 647,528, E. 991,629

3. DRILLING AGENCY COE, CONTRACTOR / SUB - PITCHER DRILLING CO.

4. HOLE NO. (As shown on drawing title and file number) DH-1

5. NAME OF DRILLER RON BAKER RAHOR

6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ______ DEG. FROM VERT.

7. THICKNESS OF OVERBURDEN ~10.3

8. DEPTH DRILLED INTO ROCK

9. TOTAL DEPTH OF HOLE

10. SIZE AND TYPE OF BIT NX - DIAMOND BIT

11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MLLW

12. MANUFACTURER'S DESIGNATION OF DRILL FAILING 1500

13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN DISTURBED 0 UNDISTURBED 0

14. TOTAL NUMBER CORE BOXES 1

15. ELEVATION GROUND WATER TIDE

16. DATE HOLE STARTED 23 AUG '94 COMPLETED 23 AUG '94

17. ELEVATION TOP OF ROCK -38.80

18. TOTAL CORE RECOVERY FOR BORING 100% %

19. SIGNATURE OF INSPECTOR

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
-38.80	0	100% Core Loss Roller Bit	CLAYSTONE or MUDSTONE Med Grey, Claystone or mudstone, DR, CONCOIDAL FRACTURE, FOSSILIFEROUS			0.0 TOP OF ROCK
	1					
	2					HOLE ROLLER BITTED to ~ EL 42.10 THEN CORING STARTED.
	3	3.3		3.3	BOX No 1	
		S-1	DB EXCESSIVE BREAKAGE DUE TO HIGH TIDAL VELOCITY AND HIGH WATER CHOP (24"-30" WAVES).	Run 1 D 2.7 C 2.7 L 0.0 100% C.R.		
	4					
	5					
		f				P1, 5.8', 45p -K= 10p
	6		DBr - BLOCKED OFF	6.0		
-45.00		f	DB.	Run 2 D 1.1 C 1.1 L 0.0 100% C.R.		P2, 6.4, 57p -K=22p.
			DB-SOUND ABOVE.			
-45.90	7			7.1	7.1	
			HOLE BOTTOMED 23 AUG 93			PLT -K= ~35p P = POUNDS
	8					**PLT values represent uncorrected ultimate loads.**
	9					
-48.80	10					

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. 2/2 (TRANSLUCENT)

PROJECT LOWER COOS RIVER CHANNEL EXPL. **HOLE NO.** DH-1 STUB

Hole No. DH-2

DRILLING LOG

DIVISION: NORTH PACIFIC

INSTALLATION: PORTLAND DISTRICT

SHEET 1 OF 1 SHEETS

1. PROJECT: LOWER COOS RIVER CHANNEL EXPL
2. LOCATION (Coordinates or Station): N 643,999.3 E 988,286.2
3. DRILLING AGENCY: C.D.G. CONTRACTORS / SUB - BECHER DRILLING CO
4. HOLE NO. (As shown on drawing title and file number): DH-2
5. NAME OF DRILLER: RON BARKER
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED ______ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN: 0.0
8. DEPTH DRILLED INTO ROCK: 5.4
9. TOTAL DEPTH OF HOLE: 5.4
10. SIZE AND TYPE OF BIT: NX - DIAMOND BIT
11. DATUM FOR ELEVATION SHOWN (TBM or MSL): M. L. L. W.
12. MANUFACTURER'S DESIGNATION OF DRILL: FAILING 1500
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 0 UNDISTURBED 0
14. TOTAL NUMBER CORE BOXES: 1
15. ELEVATION GROUND WATER: TIDE
16. DATE HOLE: STARTED 19 Aug 94 COMPLETED 19 Aug 94
17. ELEVATION TOP OF ROCK: -39.60
18. TOTAL CORE RECOVERY FOR BORING: 100 %
19. SIGNATURE OF INSPECTOR: Clay

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
-39.60	0			Run 1		0.0 160p -K= 125p.
			DB	D 2.4		0.3 175p -K= 140p
		0.63	DB SANDSTONE	C 2.4		0.63
		S. 1	FINE GRAINED SANDSTONE,	L 0.0		
	1		LT TO MED GREY, DQ, FRESH,	100% C.R.		DEPTH 0.0 TOP OF ROCK
		1.45	DB W/ SCATTERED FOSSILS.			1.45 162p -K= 127p
		1.73	DB			1.73
	2	S. 2		2.4	BOX No 1	
				Run 2		2.26
		2.26	DB MDR	D 3.0		145p -K= 110p
		2.73		C 3.0		166p -K= 131p
			DB	L 0.0		2.73
	3	S. 3		100% C.R.		
		3.58	DB DRILL BREAKAGE DUE TO FAST TIDE BANGING CSG AGAINST RODS DB DB DB DB			
	4		DB DB DB DB			
		4.46	DB			
		S. 4				
	5					
-45.00		5.27	DB DB-MDR	5.4	5.4	
			HOLE BOTTOMED 20 AUG 94			* [f] BREAKAGE DUE TO POINT LOAD TEST
	6					
	7					PLT -K = -35~~00~~ lbs.
						UL: ULTIMATE LOAD IN POUNDS
	8					PLI = POINT LOAD INDEX, PSI
						P = POUNDS
	9					**PLT values represent uncorrected ultimate loads.**
-49.60	10					

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. 1/1 (TRANSLUCENT)

PROJECT: LOWER COOS RIVER CHANNEL EXPL HOLE NO. DH-2

Hole No. DH-3

DRILLING LOG

DIVISION North Pacific

INSTALLATION Portland District

SHEET 1 OF 1 SHEETS

1. PROJECT Lower Coos River Channel Expl
2. LOCATION (Coordinates or Station) N. 647,830.3 E. 992,2843.6
3. DRILLING AGENCY C.O.E Contractor/Sub - Pitcher Drilling
4. HOLE NO. (As shown on drawing title and file number) DH-3
5. NAME OF DRILLER Ron Barker
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ______ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN (1.28')
8. DEPTH DRILLED INTO ROCK 0.3 R.B & 5.1 Core.
9. TOTAL DEPTH OF HOLE 5.4
10. SIZE AND TYPE OF BIT NX - Diamond Bit
11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MLLW
12. MANUFACTURER'S DESIGNATION OF DRILL Failing 1500
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN — DISTURBED 0 — UNDISTURBED 0
14. TOTAL NUMBER CORE BOXES 1
15. ELEVATION GROUND WATER Tide
16. DATE HOLE — STARTED 17 Aug 1994 — COMPLETED 17 Aug 1994
17. ELEVATION TOP OF ROCK — 40.25
18. TOTAL CORE RECOVERY FOR BORING 100%
19. SIGNATURE OF INSPECTOR Clay

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
-40.25	0	C.L.				0.00 TO 0.30 Roller Bit Down to Seat Csg.
-40.55		R.B.	DB Siltstone/Mudstone	0.3		
			DB 0.3 to 0.5 Fine to Very Fine Grained Sandy Siltstone or Mudstone, Fresh, DR, Fossiliferous Lt Gray,	Run 1 D 3.2 C 3.2 L 0 100% C.R.		0.0 TOP OF ROCK
	1		0.5 to 5.			
			Fresh to PD Lt. Gray to Tannish Gray to Yellowish Gray, Partially Decomposed			
	2		Followed Old Joint or Fracture		Box No 1	
	3					
	Fract at					
			DB-EOR Slivers of Fresh Rock	3.5 Run 2 D 1.9 C 1.9 L 0 100% C.R.		
	4					
	5					
-45.65			DB-EOR	5.4	5.4	
			Hole Bottomed 17 Aug 94			
	6					
	7					
	8					
	9					
	10					

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT) 1/1

PROJECT Lower Coos River Channel

HOLE NO. DH-3

Hole No. DH-4

DRILLING LOG

DIVISION: NORTH PACIFIC

INSTALLATION: PORTLAND DISTRICT

SHEET 1 OF 1 SHEETS

1. PROJECT: LOWER COOS RIVER CHANNEL EXPL.
2. LOCATION (Coordinates or Station): N. 652,364.2 E. 994,757.1
3. DRILLING AGENCY: COE. CONTRACTOR/BOIS - PITCHER B.
4. HOLE NO. (As shown on drawing title and file number): DH-4
5. NAME OF DRILLER: RON BAKER
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED ______ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN: (2.67')*
8. DEPTH DRILLED INTO ROCK: 3.50'
9. TOTAL DEPTH OF HOLE: 3.50'
10. SIZE AND TYPE OF BIT: NX - DIAMOND BIT
11. DATUM FOR ELEVATION SHOWN (TBM or MSL): MLLW
12. MANUFACTURER'S DESIGNATION OF DRILL: FAILING 1500
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED Φ UNDISTURBED Φ
14. TOTAL NUMBER CORE BOXES: 1
15. ELEVATION GROUND WATER: TIDE
16. DATE HOLE: STARTED 16 AUG 94 COMPLETED 16 AUG 94
17. ELEVATION TOP OF ROCK: -41.75
18. TOTAL CORE RECOVERY FOR BORING: 100% %
19. SIGNATURE OF INSPECTOR:

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
~~39.08~~ 41.75	0	CORE LOSS R.B			BOX No 1	0.0 TO 0.5 ROLLER BIT DOWN TO SEAT CSG.
				0.5		0.0 TOP OF ROCK
	0.8 1	1.9	SILTSTONE/MUDSTONE MED GRAY LQ(DQ),	RUN 1 D 1.0 C 1.0 L 0 C.R. 100%		PLT
-43.00	1.3		DB	1.5		P.1, 1.4, 5.0 P
	2		DBBOE DRILL BREAKAGE DUE TO BLOCKING OF CORE CRUSHED.	RUN 2 D 2.0 C 2.0 L 0 C.R. 100%		
-44.00						
	3					
-45.00 -45.25			DB-EOR	3.5		
			HOLE BOTTOM 16 AUG 1994			
	4					
	5					
	6					
	7					*CSG WAS DRIVEN DOWN TO TOR THEN CLEANED OUT W/ ROLLER BIT
						R.B. - ROLLER BIT
	8					P = POUNDS
						PLT values represent uncorrected ultimate loads.
	9					
51.75 ~~40.08~~	10					

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT) 1/1

PROJECT: LOWER COOS RIVER CHANNEL EXPL

HOLE NO. DH-4

Hole No. DH-5

DRILLING LOG	DIVISION NORTH PACIFIC	INSTALLATION PORTLAND DIST.
		SHEET 1 OF 1 SHEETS

1. PROJECT LOWER COOS RIVER CHANNEL EXPL.
2. LOCATION (Coordinates or Station) N. 641,511.4, E. 985,842 1.9
3. DRILLING AGENCY COE CONTRACTOR/SUB - [illegible] DRILLING CO.
4. HOLE NO. (As shown on drawing title and file number) DH-5
5. NAME OF DRILLER RON BAKER
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ______ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN (-36.82) 3.27
8. DEPTH DRILLED INTO ROCK 5.0
9. TOTAL DEPTH OF HOLE 5.0 ROCK ONLY
10. SIZE AND TYPE OF BIT NX, DIAMOND BIT
11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MLLW
12. MANUFACTURER'S DESIGNATION OF DRILL FAILING 1500
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN | DISTURBED 0 | UNDISTURBED 0
14. TOTAL NUMBER CORE BOXES 1
15. ELEVATION GROUND WATER TIDE
16. DATE HOLE | STARTED 23 AUG 94 | COMPLETED 23 AUG 94
17. ELEVATION TOP OF ROCK -40.09
18. TOTAL CORE RECOVERY FOR BORING 89 % %
19. SIGNATURE OF INSPECTOR

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
-40.09	0		DB DB DB DB DB DB DB SANDSTONE MED TO FINE GRAINED SANDSTONE, DB, FRESH, LT. GRAY (DRY), MSV.	RUN 1 D 1.5 C 1.2 L 0.3 80% C.R.	BOX Nº 1	0.0 TOP OF ROCK
	1	P	HB			P1, 1.0, 115p -K=80p
		C 0.3	DB BLOCKED OFF GROUND AWAY? EOR	1.5		
			DB	RUN 2 D 2.5 C 2.35 L 0.15 94% C.R		
	2	P R				P-2, 2.00, 125-K=90P P-3, 2.15, 75-K=40p
			DB			
		2.7 3.0	DB DB DB			
	3	3.6				
		BL DDR	LDE	4.0		
	4	P	DS	RUN 3 D 1.0 C 0.9 L 0.1		P-4, 4.2, 141p -K=106p
		4.4 Sg 4.3	DB DB DB			P-5, 4.5, 42p -K=7p (C.R. 90%)
-45.09	5		DOU	5.0	5.0	
			HOLE BOTTOMED ~~23~~ 22 AUG 94			PLT -K= -35p P= POUNDS **PLT values represent uncorrected ultimate loads.**
	6					
	7					
	8					
	9					
-50.09	10					

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT) 1/1

PROJECT LOWER COOS R. CHANNEL EXPL | HOLE NO. DH-5

Hole No. DH-6

DRILLING LOG

DIVISION: NORTH PACIFIC
INSTALLATION: PORTLAND DISTRICT
SHEET 1 OF 1 SHEETS

1. PROJECT: LOWER COOS RIVER CHANNEL EXPL.
2. LOCATION (Coordinates or Station): N. 643,286.4, E. 987,476 5.8
3. DRILLING AGENCY: COE CONTRACTOR/SUBS - PETERSON DRILLING CO.
4. HOLE NO. (As shown on drawing title and file number): DH-6
5. NAME OF DRILLER: RON BAKER
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED ______ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN: ~~38.00~~ (-37.92) 1.24'
8. DEPTH DRILLED INTO ROCK: 5.80
9. TOTAL DEPTH OF HOLE: 5.80 (CORE ONLY)
10. SIZE AND TYPE OF BIT: NX, DIAMOND BIT
11. DATUM FOR ELEVATION SHOWN (TBM or MSL): MLLW
12. MANUFACTURER'S DESIGNATION OF DRILL: FAILING 1500
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 0 | UNDISTURBED 0
14. TOTAL NUMBER CORE BOXES: 1
15. ELEVATION GROUND WATER: TIDE
16. DATE HOLE: STARTED 20 AUG 94 | COMPLETED 20 AUG. 94
17. ELEVATION TOP OF ROCK: - 39.16
18. TOTAL CORE RECOVERY FOR BORING: 95%
19. SIGNATURE OF INSPECTOR:

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
-39.16	0	f f R 0.53	SANDSTONE/SILTSTONE	Run 1 D. 3.4	BOX No 1	PLT P1 0.15 216p -K 181p P-2 0.30 201p -K 186p P-3 0.95 187p, Side break =152p
		DB-Ground Smooth	V. FINE GRAINED SANDSTONE OR SILTSTONE W/ V.F. SAND, MED TO LT GREY, DQ, FRESH, MSU TO FAINTLY BEDDED.	C 3.4 L 0.0 100% C.R.		DEPTH 0.0 TOP OF ROCK
	1	1.18 DB				
	2					
		2.43 DB-Ground Smooth f f f f f				P4 2.58 - 207p -K=172p P-5 2.73 - 208p -K=175p P-6 2.88 - 192p -K=15[illegible] P-7 3.03 209p -K=[illegible] P-8 3.28 - 196p -K=[illegible] P-9 4.35 - 197p -K=[illegible] P-10 4.45 - 186p -K=151p
	3	OBEDR EOR DB REDRILL		3.4 Run 2 D 0.8 C 0.5 L 0.3 42		(C.R. 62.5%)
	4	DB		Run 3 D 1.6 C 1.6 L 0.0		HAD TO PULL OFF DRILL TO RIVER TRAFFIC. CORE LOSS DUE TO REDRILL PULLED OFF CORE
		4.53 DB				
	5	5.15 DB		100% C.R.		
- 44.96		5.75 EOR - BAN		5.8	5.8	
	6		HOLE BOTTOMED 20 AUG '94			-K = -35 p = POUNDS
	7					**PLT values represent uncorrected ultimate loads.**
	8					
	9					
-49.16	10					

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT) 1/1

PROJECT: LOWER COOS R. CHANNEL EXPL | HOLE NO. DH-6

Hole No. DH-7

DRILLING LOG

DIVISION North Pacific

INSTALLATION Portland District

SHEET 1 OF 1 SHEETS

1. PROJECT Lower Coos River Channel Expl
2. LOCATION (Coordinates or Station) N. 645,010.1 E.989,012.4
3. DRILLING AGENCY COE - Contractor/Sub Bitcher Drilling Co
4. HOLE NO. (As shown on drawing title and file number) DH-7
5. NAME OF DRILLER Ron Bauer
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ______ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN (2.4) *
8. DEPTH DRILLED INTO ROCK 4.3
9. TOTAL DEPTH OF HOLE 4.3
10. SIZE AND TYPE OF BIT NX - Diamond
11. DATUM FOR ELEVATION SHOWN (TBM or MSL) M.L.L.W.
12. MANUFACTURER'S DESIGNATION OF DRILL Failing 1500
13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN — DISTURBED 0 — UNDISTURBED 0
14. TOTAL NUMBER CORE BOXES 1
15. ELEVATION GROUND WATER Tide
16. DATE HOLE — STARTED 19 Aug 94 — COMPLETED 19 Aug 94
17. ELEVATION TOP OF Rock - 40.9
18. TOTAL CORE RECOVERY FOR BORING 100% %
19. SIGNATURE OF INSPECTOR

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
-40.90	0	S1 PC		Run No 1		P L T 0.0 TOP OF ROCK
		0.4 DB DB	SANDSTONE	D2.1		0.55 P-1 56p -K=21p 0.80
		0.8 DB	MED TO FINE GRAINED SANDSTONE, LT TO MED GREY, DQ, FRESH. W/ SCATTERED FOSSILS	C2.1		
	1	S2 1.2 DB DB		L0.0 100% %C.R.		1.38 P-2 55p -K=20p 1.72 P-3 62p -K=27p 1.97
	2	DB DB DBEOR DB DB DB		2.1	BOX No 1	
		2.7 DB		Run No 2 D2.2 C2.2 L0.0 100 %C.R.		2.43 P4 50p -K-15p 2.67
	3	S3 3.3 DB				3.35 P5 57p -K=22p P-6 47p -K=12p 3.75
		P4 3.8 DJ				
-45.20	4	S4 4.2 DB-EOR		4.3	4.3	
			Hole Bottomed 20Aug94			
	5					
	6					PLT -K= -35p P = Pounds
						PLT values represent uncorrected ultimate loads.
	7					
	8					
	9					
-50.90	10					

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. 1/1

(TRANSLUCENT)

PROJECT Lower Coos River Channel Expl

HOLE NO. DH-7

Hole No. DH-8

DRILLING LOG

DIVISION North Pacific

INSTALLATION Portland Dist

SHEET 1 OF 1 SHEETS

1. PROJECT Lower Coos River Channel Expl.
2. LOCATION (Coordinates or Station) N 645,918.1 E 990,296.9
3. DRILLING AGENCY C.O.E. Contractor/[illegible] Co
4. HOLE NO. (As shown on drawing title and file number) DH-8
5. NAME OF DRILLER Ron Baker
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ______ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN 0.0
8. DEPTH DRILLED INTO ROCK 92
9. TOTAL DEPTH OF HOLE 9.2
10. SIZE AND TYPE OF BIT NX - Diamond Bit
11. DATUM FOR ELEVATION SHOWN (TBM or MSL) H.L.L.W.
12. MANUFACTURER'S DESIGNATION OF DRILL Failing 1500
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN DISTURBED 0 UNDISTURBED 0
14. TOTAL NUMBER CORE BOXES 1
15. ELEVATION GROUND WATER Tides
16. DATE HOLE STARTED 18 Aug '94 COMPLETED 18 Aug 94
17. ELEVATION TOP OF ROCK -38.00
18. TOTAL CORE RECOVERY FOR BORING 100% %
19. SIGNATURE OF INSPECTOR

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
-38.00	0	1	SANDSTONE (MED) to FINE GRAINED DB SANDSTONE, DQ, FRESH, Lt to MED GREY, FOSSILIFEROUS, FAINTLY BEDDED	Run 1 D 5.0 C 5.0 L 0.0 100% % CR	Box No 1	PLT 0.0 TOP OF ROCK **PLT values represent uncorrected ultimate loads.**
	1		DB JAMMED DB CORE			
	2	2.0 2 2.5	SAND CUT			2.0 1 P-1 110 p -K= 75 p 2 P-2 106 p -K= 71 p 2.5
	3		DB-grinding DB JAMMED DB CORE			
	4	4.0 3	DB SAND CUT			3 P-3 108 p -K= 73 p 4 P-4 88 p -K= 53 p
	5		DB DBEOR JAMMED CORE BREAKAGE	5.0 Run 2 D 1.2 C 1.2 L 0.0 100% % C.R 6.2		
	6		DBEOR DB. DB DB	Run 3 D 3.0 C 3.0 L 0.0 100% % C.R.		5 P-5 37 p -K= 2 p 6 P-6 116 p -K= 81 p
-45.00	7		DB DB DB DB DB DB			7 P-7 120 p -K= 85 p 8 P-8 107 p -K= 72 p 9 P-9 95 p -K= 60 p 10 P-10 97 p -K= 62 p
	8		DB DB DB DB BREAKAGE DUE TO ROD [illegible] FROM CSG RATTLE.			11 P-11 117 -K= 82 p 12 P-12 100 p -K= 65 p 13 P-13 106 p -K= 71 p 14 P-14 96 p -K= 61 p
	9		DB DB DB DBEOR	9.2	9.2	
-47.20			HOLE BOTTOMED 18 Aug '94			PLT -K= ~35 psi P = pounds
-48.00	10					

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT) 1/1

PROJECT Lower Coos River Channel ~~Dep~~ Expl.

HOLE NO. DH-8

Hole No. DH-9

DRILLING LOG	DIVISION North Pacific	INSTALLATION Portland District	SHEET 1 OF 1 SHEETS

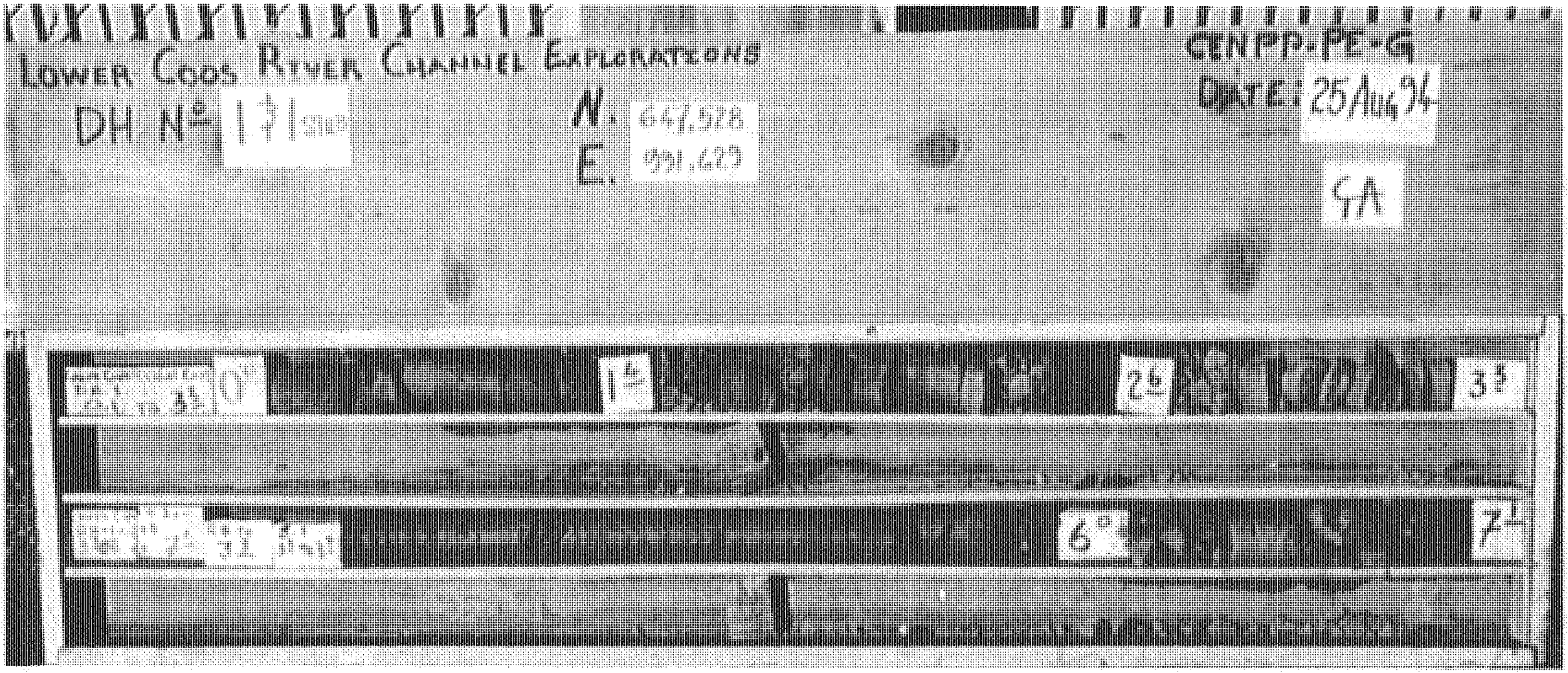
1. PROJECT Lower Coos River Channel Expl.
2. LOCATION (Coordinates or Station) N. 646,609.9 E. 990,735 9.8
3. DRILLING AGENCY COE-Contractor/Sub-Fischer Drilling Co
4. HOLE NO. (As shown on drawing title and file number) Relocated DH-9
5. NAME OF DRILLER Ron Bauer
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ______ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN (-37.10) 1.2
8. DEPTH DRILLED INTO ROCK 7.8
9. TOTAL DEPTH OF HOLE 7.8
10. SIZE AND TYPE OF BIT NX - Diamond Bit
11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MLLW
12. MANUFACTURER'S DESIGNATION OF DRILL Failing 1500
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN DISTURBED 0 UNDISTURBED 0
14. TOTAL NUMBER CORE BOXES 1
15. ELEVATION GROUND WATER Tide
16. DATE HOLE STARTED 24 Aug. 94 COMPLETED 24 Aug. 94
17. ELEVATION TOP OF ROCK -38.30
18. TOTAL CORE RECOVERY FOR BORING 99 % %
19. SIGNATURE OF INSPECTOR

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
-38.30	0	0.1 2A-1	DB Sandstone	Run 1		0.0 Top of Rock PLT
		0.5	DB Med to Fine Grained Sandstone, Grey, CQ (Somewhat Softer) Fresh, Mod to Fairly Bedded, numerous Fossils.	D3.5 C3.5 L0.0 100% C.R.		P-1, 0.70, 41p -K=6p P-2, 0.52, 52p -K=17p
	1	1.0 2A-2	DB			
-40.00						
	2	2.0	DB			P-3, 2.10, 41p -K=6p P-4 void P-5, 2.36, 40p K=5p P-6, 2.50, 39p K=4p P-7, 2.62, 41p K=6p
	3	2.75 2A-3	DS			
		3.40	DB -EOR	3.5	Box No 1	P-8, 3.55, 68p -K=33p Hard 5s P-9, 3.68, 36p -K=1p Soft 5s P-10, 3.80, 40p -K=5p P-11, 3.91, 35p -K=0p
	4		HB	Run 2 D2.1 C2.1 L0.0		P-12, 4.10, 35p -K=0p P-13, 4.31, 35p -K=0p P-14, 4.42, 37p -K=0p
		4.55 2A-4	DB	100% C.R.		
	5	5.0	DB			P-15, 5.12, 35p -K=0p
			DB Crushed DB -EOR-Blocked off	5.6		P-16, 5.65, 35p -K=0p
	6		DB DB DB DB DB DB	Run 3 D2.2 C2.1 L0.1		P-17, 6.13, 36p -K=1p P-18, 6.21, 36p -K=1p
-45.00		6.60 2A-5	DB DB	95% C.R.		
	7	6.90	HB			P-19, 7.07, 35p -K=0p P-20, 7.18, 38p -K=3p P-21, 7.29, 39p -K=4p P-22 void P-23, 7.45, 30p -K=4p P-24, 7.58, 36p -K=1p
-46.10			DB EOR - BH	7.8	7.8	P-25, 7.70, 37p -K=2p
	8		Hole Bottomed 24 Aug 94			PLT -K = -35psi P= Pounds
	9					**PLT values represent uncorrected ultimate loads**
-48.30	10					

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. *(TRANSLUCENT)*

1/1

PROJECT Lower Coos River Channel Expl. HOLE NO. DH-9 (Reloc.)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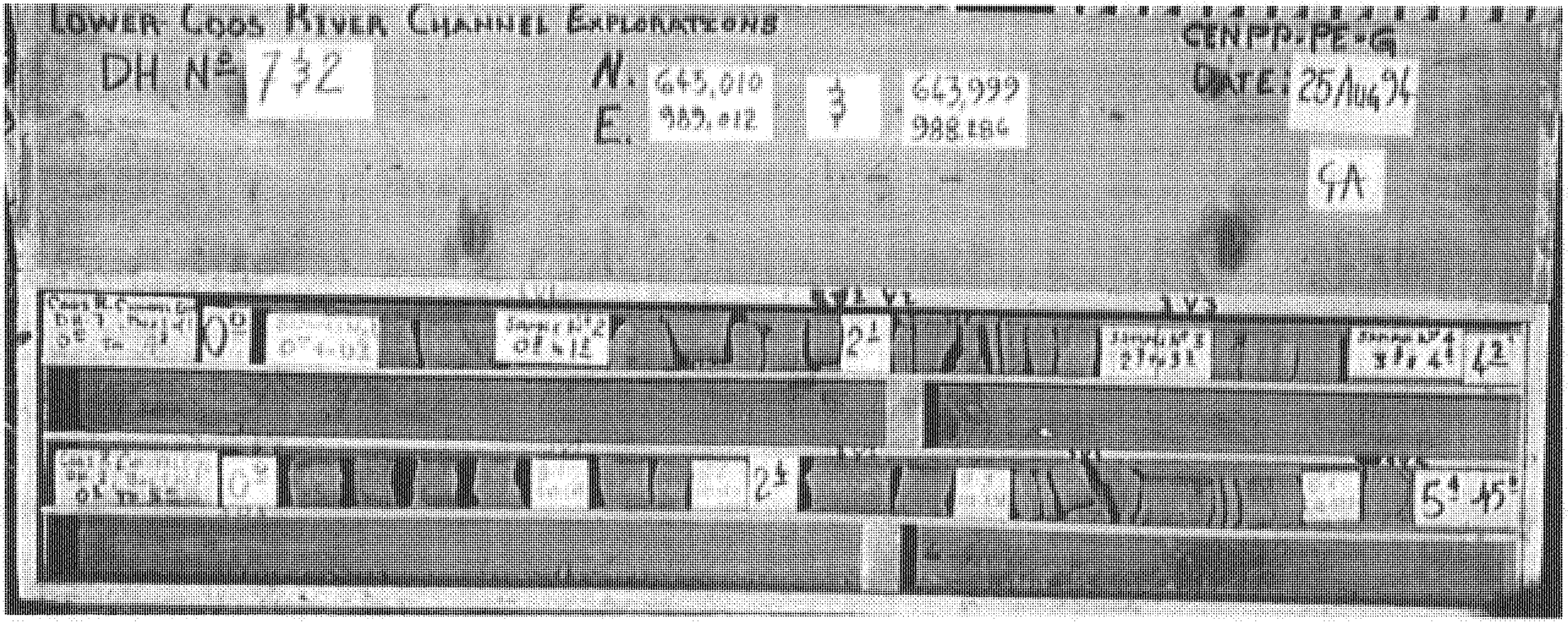
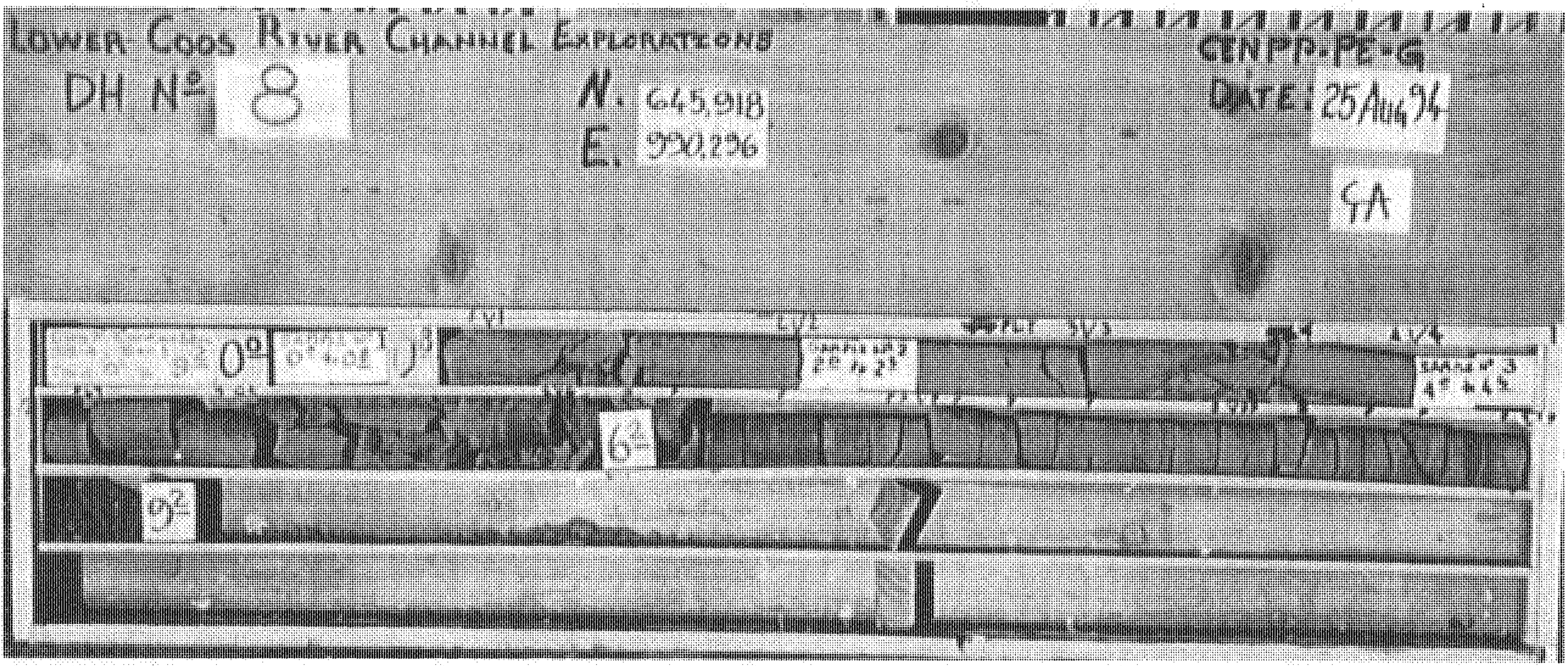
CENPP-PE-G
DH Nº 1 3/1
N. 647,578
E. 991,629
DATE: 25 Aug 94
9A
0°
1°
2°
3°
6°
7°


LOWER COOS RIVER CHANNEL EXPLORATIONS
CENPP-PE-G
DH Nº 7 3/2
N. 643,010
E. 989,012
643,999
988,186
DATE: 25 Aug 94
9A
0°
2°
4°
5°


LOWER COOS RIVER CHANNEL EXPLORATIONS
CENPP-PE-G
DH No 413
N. 692,364
E. 994,751
643,830
992,784
DATE: 25 Aug 94
GA
0'
3'


LOWER COOS RIVER CHANNEL EXPLORATIONS
CENPP-PE-G
DH No 615
N. 643,286
E. 987,476
641,511
985,842
DATE: 25 Aug 94
GA
3'
4'
5'
6'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N. 645,918
E. 990,296
CENPP-PE-G
DATE: 25 Aug 94
9A
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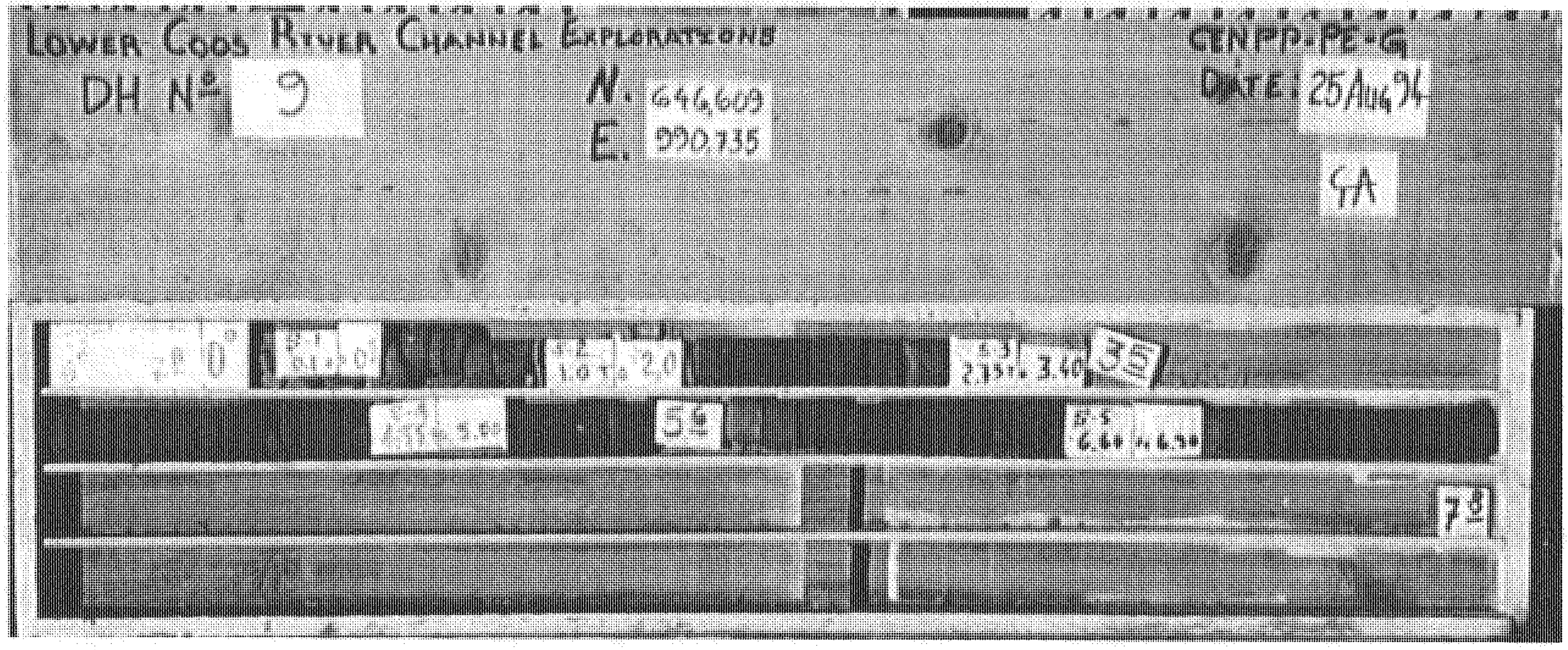
6'
9'


LOWER COOS RIVER CHANNEL EXPLORATIONS
DH Nº 9
N. 646,609
E. 990,735
CENPP-PE-G
DATE: 25 Aug 94
9A
0'
3.5'
5.9'
7.9'

Appendix B

Lab Test Reports

DEPARTMENT OF DEFENSE
UNITED STATES OF AMERICA

DEPARTMENT OF THE ARMY
NORTH PACIFIC DIVISION LABORATORY
CORPS OF ENGINEERS
1491 N.W. GRAHAM AVENUE
TROUTDALE, OREGON 97060-9503

19 Sep 94

CENPD - PE - GE - L (1110-1-8100c)

MEMORANDUM FOR Commander, Portland District ATTN: CENPP-PE-GG (Chris Budai/Jim Griffiths)

SUBJECT: W.O. # 94- 497 Report of Unconfined Compressive Strength and Point Load Tests on Rock Core Specimens

Project: Coos Bay Channel Explorations
Intended Use: Strength evaluation of dredge channel bottom material
Source of Material: Navigation Channel, Lower Coos River, Charleston, Oregon

Submitted by: CENPP-PE-GG
Date Sampled: --- Date Received: 19-26 Aug 94
Method of Test or Specification: CRD, ASTM, ROCK TESTING HANDBOOK
Reference: a) DD Form 448, MIPR No. E86-94-0087 dated 29 Jul 94
b) Telecons with Messrs. Phil Grubaugh, Clayton Amundson, and Chris Budai 26 Jul through 12 Sep 94, wherein test program and cost estimates were discussed.
c) NPD Forms 300, dated 17-26 Aug 94, covering transmittal of approximately 56 lineal feet of waxed rock core samples.

1. Attached is report of unconfined compressive strength and point load tests performed on nominal two-inch core samples to evaluate the strength of Lower Coos River channel material. Included are:

a) Enclosure 1, Table I, Report of Unconfined Compressive Strength Tests on Nominal 2-inch Diameter Rock Cores.

b) Enclosure 2, Table II, Report of Point Load Tests on Nominal 2-inch Diameter Rock Cores.

c) Enclosure 3, Calibration Curve for Point Load Test Apparatus with 600 psi Gauge.

2. Approximately 56 lineal feet of waxed rock core was received 19-26 August 1994 for unconfined compressive strength and point load tests. All of the core specimens were kept sealed and stored at 40 F (simulating in situ temperature) until time of test. Every effort was made to maintain as-received moisture content using moist toweling and plastic wrap until test. Test specimens for compressive strength were cut to length with a hacksaw and capped with sulfur capping compound. Unit weight tests were made based on the measured volume and weight of unconfined compressive strength specimens prior to capping and testing. Moisture content was determined on core remnants after test.

3. Point load tests were performed in the diametral orientation on all but four samples, which were with axial orientation, as noted on enclosure 2.

4. A series of calibration checks were made on the Portland District's (CENPP-PE-GG) Point Load Test Apparatus used in the current test program. Results indicated a variation of approximately 8 to 15 percent between successive runs using the 600-psi gauge. Reconditioning of the test apparatus is warranted. A recalibration is recommended after reconditioning or whenever changes to the equipment are made.

5. This completes all work requested.

Timothy J. Seeman

TIMOTHY J. SEEMAN
Director

Enclosures

Copy Furnished: CENPD-PE-GE

CENPD-PE-GE-L (94 - 497)

COOS BAY CHANNEL EXPLORATION
Charleston, Oregon

Table I

Report of Unconfined Compressive Strength Tests on Nominal 2-inch Diameter Rock Cores

						Unconfined Compressive Strength		
Drill Hole No.	Field Classification	Depth, Feet	Elevation, Feet	Moisture[1] Content, %	Unit [2] Weight, Lbs/cu. ft.	Ult. Load, Lbs.	psi	psi,[3] Corr.
1-1	Claystone	3.30/3.70	-42.10/-42.50	28.7	118.5	3480	1060	1060
2-1	F.Grained Sandstone	0.63/1.45	-40.23/-41.05	27.8	120.5	4520	1400	1410
2-2	F.Grained Sandstone	1.73/2.26	-41.33/-41.86	26.2	124.7	5140	1650	1620
2-3a	F.Grained Sandstone	2.73/3.58	-42.33/-43.18	31.6	119.2	5040	1570	1570
2-3b	F.Grained Sandstone	2.73/3.58	-42.33/-43.18	27.7	120.5	5130	1600	1590
2-4	F.Grained Sandstone	4.46/5.27	-44.06/-44.87	25.8	124.2	5240	1620	1620
3-1	Siltstone/Mudstone	0.30/0.60	-40.60/-40.80	24.3	123.3	1950	610	580
4-1	Siltstone/Mudstone	0.80/1.30	-42.20/-42.70	19.4	130.4	880	270	260
5-1	M-F Grained Sandstone	2.31/2.60	-42.40/-42.80	17.4	131.6	2560	820	820
5-2	M-F Grained Sandstone	3.00/3.60	-43.00/-43.60	18.3	133.6	2300	710	710
5-3	M-F Grained Sandstone	4.60/4.90	-44.70/-44.90	21.3	128.7	260	80	70
6-1	F.Grained Sandstone	0.53/1.18	-39.69/-40.34	23.2	125.1	5310	1620	1630
6-2a	F.Grained Sandstone	1.16/2.43	-40.34/-41.59	22.9	122.6	4700	1450	1450
6-2b	F.Grained Sandstone	1.16/2.43	-40.34/-41.59	23.2	126.2	4940	1530	1530
6-3	F.Grained Sandstone	4.53/5.15	-43.69/-44.31	24.9	124.9	5670	1750	1760
6-4	F.Grained Sandstone	5.15/5.75	-44.31/-44.91	21.0	130.7	5380	1650	1650
7-1	M-F Grained Sandstone	0.00/0.40	-40.90/-41.30	18.2	129.4	1370	430	440
7-2	M-F Grained Sandstone	0.80/1.20	-41.70/-42.00	17.8	127.9	1060	330	330
7-3	M-F Grained Sandstone	2.70/3.30	-43.60/-44.20	18.6	126.9	920	280	280
7-4	M-F Grained Sandstone	3.80/4.20	-44.70/-45.10	19.1	130.9	1520	470	460
8-1	V.F.Grained Sandstone	0.00/0.80	-38.00/-38.80	17.4	130.6	2380	760	760
8-2	V.F.Grained Sandstone	2.00/2.50	-40.00/-40.50	18.0	130.5	2640	820	820
8-3	V.F.Grained Sandstone	4.00/4.40	-42.00/-42.40	18.2	128.4	2200	680	680
9-1	M-F Grained Sandstone	0.10/0.50	-38.40/-38.80	14.5	136.5	1620	500	500
9-2a	M-F Grained Sandstone	1.20/1.50	-39.50/-39.80	16.2	137.7	770	230	230
9-2b	M-F Grained Sandstone	1.60/2.00	-40.00/-40.30	16.2	136.1	580	170	170
9-3	M-F Grained Sandstone	2.75/3.40	-41.05/-41.70	15.4	136.2	1060	320	320
9-4	M-F Grained Sandstone	4.55/5.00	-42.85/-43.30	16.6	136.1	570	180	180
9-5	M-F Grained Sandstone	6.60/6.90	-44.90/-45.20	19.2	133.5	70	20	20

Note: 1) Moisture content of sample at time of test.
2) Unit weight determined by measured volume/weight method.
3) Corrected for L/D ratio.

CENPDL No. 5022, Received 19-26 Aug 94

COOS BAY CHANNEL EXPLORATION
Charleston, Oregon

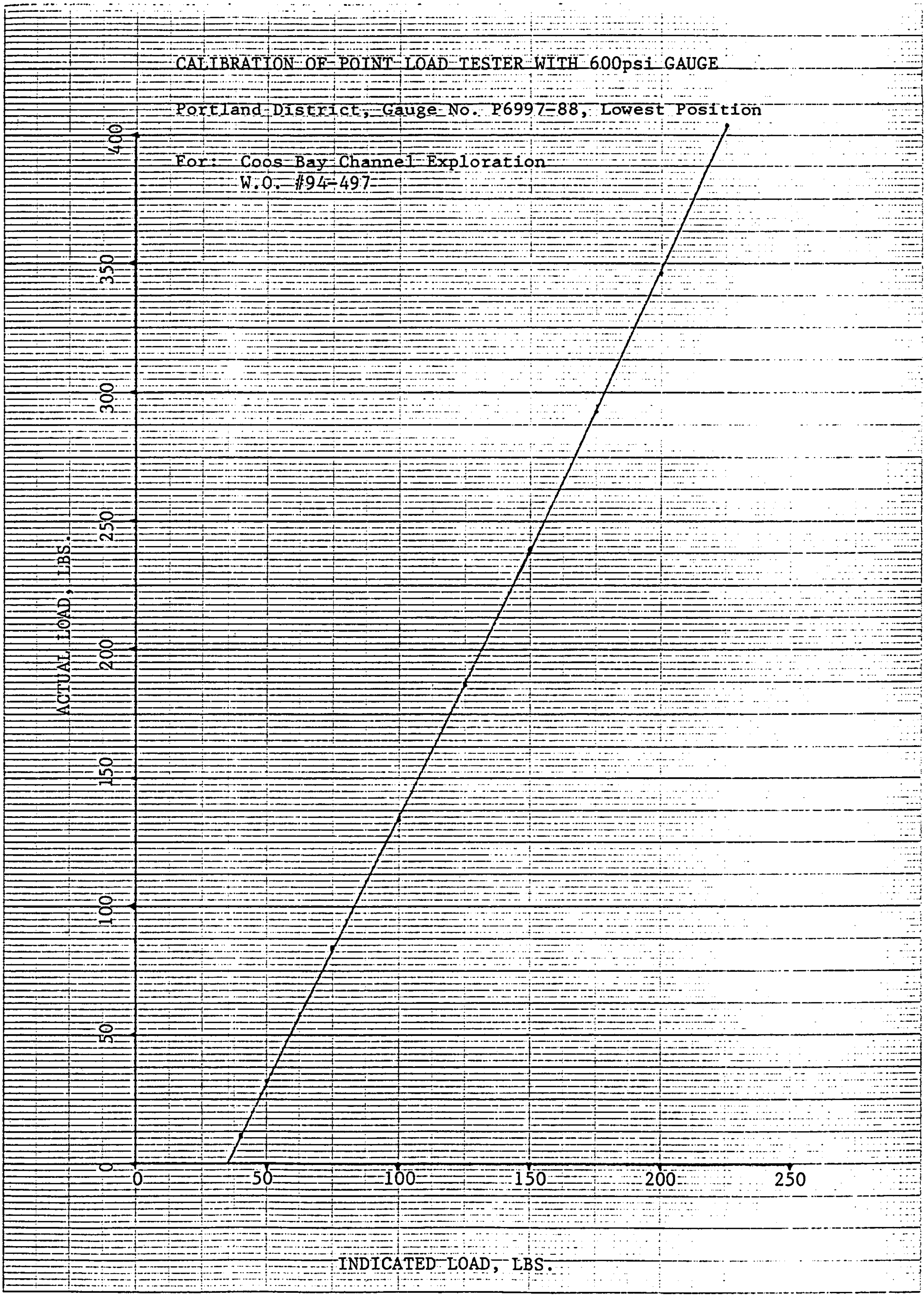
Table II

Report of Point Load Strength Tests on Nominal 2-Inch Diameter Rock Cores[1,2]

Drill Hole No.	Field Classification	Depth, feet	Elevation, feet	Diameter, inches	Length, inches	Ultimate Load, lbs	Point Load Index, psi
2-1a	F.Grained Sandstone	0.63/1.45	-40.23/-41.05	2.03	2.00	255	60
2-1b	F.Grained Sandstone	0.63/1.45	-40.23/-41.05	2.03	2.00	275	65
2-1c	F.Grained Sandstone	0.63/1.45	-40.23/-41.05	2.03	2.00	253	65
2-1d	F.Grained Sandstone	0.63/1.45	-40.23/-41.05	2.00	1.53	173[4]	75[4]
2-2	F.Grained Sandstone	1.73/2.26	-41.33/-41.86	1.99	2.30	341	60
2-3	F.Grained Sandstone	2.73/3.58	-42.33/-43.18	2.02	2.20	320	85
2-4a	F.Grained Sandstone	4.46/5.27	-44.06/-44.87	2.04	2.00	270	80
2-4b	F.Grained Sandstone	4.46/5.27	-44.06/-44.87	2.04	2.00	270	65
2-4c	F.Grained Sandstone	4.46/5.27	-44.06/-44.87	2.04	2.00	288	70
2-4d	F.Grained Sandstone	4.46/5.27	-44.06/-44.87	2.04	2.00	222	55
4-1	Siltstone/Mudstone	0.80/1.30	-42.20/-42.70	2.00	1.52	87[4]	20[4]
5-1	M-F Grained Sandstone	2.60	-42.40/-42.80	1.98	2.00	143	35
5-2a	M-F Grained Sandstone	3.10	-43.00/-43.60	2.04	2.00	30	5
5-2b	M-F Grained Sandstone	3.50	-43.00/-43.60	2.03	2.00	12	5
5-3	M-F Grained Sandstone	4.82	-44.70/-44.90	2.01	1.57	21[3,4]	5[3,4]
6-1a	F.Grained Sandstone	0.53/1.18	-39.69/-40.34	2.01	2.00	287	70
6-1b	F.Grained Sandstone	0.53/1.18	-39.69/-40.34	2.01	2.00	288	70
6-1c	F.Grained Sandstone	0.53/1.18	-39.69/-40.34	2.01	1.83	373[4]	80[4]
6-2a	F.Grained Sandstone	1.49	-40.34/-41.59	2.02	2.00	357	85
6-2b	F.Grained Sandstone	2.10	-40.34/-41.59	2.02	2.00	358	90
6-2c	F.Grained Sandstone	2.00	-40.34/-41.59	2.02	2.00	367[3]	90[3]
6-2d	F.Grained Sandstone	1.92	-40.34/-41.59	2.03	2.00	315	75
6-2e	F.Grained Sandstone	1.83	-40.34/-41.59	2.03	2.00	301	75
6-2f	F.Grained Sandstone	1.74	-40.34/-41.59	2.03	2.00	358	85
6-3a	F.Grained Sandstone	4.53/5.15	-43.69/-44.31	2.03	2.00	363	90
6-3b	F.Grained Sandstone	4.53/5.15	-43.69/-44.31	2.03	2.00	350	85
6-3c	F.Grained Sandstone	4.53/5.15	-43.69/-44.31	2.03	2.00	383	95
6-4a	F.Grained Sandstone	5.15/5.75	-44.31/-44.91	2.04	2.40	404	95
6-4b	F.Grained Sandstone	5.15/5.75	-44.31/-44.91	2.04	2.40	381	90
7-2	M-F Grained Sandstone	0.80/1.20	-41.70/-42.00	2.02	2.00	75[3]	20[3]
7-3a	M-F Grained Sandstone	2.70/3.30	-43.60/-44.20	2.04	2.00	70	15
7-3b	M-F Grained Sandstone	2.70/3.30	-43.60/-44.20	2.04	2.00	63	15
7-3c	M-F Grained Sandstone	2.70/3.30	-43.60/-44.20	2.03	2.00	17	5
7-3d	M-F Grained Sandstone	2.70/3.30	-43.60/-44.20	2.03	2.00	32	10
7-4	M-F Grained Sandstone	3.80/4.20	-44.70/-45.10	2.03	2.00	50	10
8-1a	V.F.Grained Sandstone	0.00/0.80	-38.00/-38.80	2.00	2.00	215	55
8-1b	V.F.Grained Sandstone	0.00/0.80	-38.00/-38.80	2.00	2.00	145	35
8-1c	V.F.Grained Sandstone	0.00/0.80	-38.00/-38.80	2.00	2.00	59	15
8-2	V.F.Grained Sandstone	2.00/2.50	-40.00/-40.50	2.03	2.00	134	35
8-3	V.F.Grained Sandstone	4.00/4.40	-42.00/-42.40	2.03	2.00	162	40
9-2	M-F Grained Sandstone	1.1	-39.30/-40.30	2.05	2.00	15	5
9-3a	M-F Grained Sandstone	2.75/3.40	-41.05/-41.70	2.05	2.00	17	5
9-3b	M-F Grained Sandstone	2.75/3.40	-41.05/-41.70	2.05	2.00	10	0
9-3c	M-F Grained Sandstone	2.75/3.40	-41.05/-41.70	2.05	2.00	32	10
9-4a	M-F Grained Sandstone	4.91	-42.85/-43.30	2.03	2.00	8	0
9-4b	M-F Grained Sandstone	4.82	-42.85/-43.30	2.03	2.00	9	0

Note: 1) Test made using Portland District's (CENPP-PE-GG) point load test apparatus
2) All tests made in diametral orientation unless otherwise noted.
3) Invalid test; specimen did not break through both points.
4) Axial test orientation.

CENPDL No. 5022, Received 19-26 Aug 94



CALIBRATION OF POINT LOAD TESTER WITH 600psi GAUGE

Portland District, Gauge No. P6997-88, Lowest Position

For: Coos Bay Channel Exploration
W.O. #94-497

Enclosure 3

Sep 94
G. Berg

DEPARTMENT OF THE ARMY
NORTH PACIFIC DIVISION LABORATORY
CORPS OF ENGINEERS
1491 N.W. GRAHAM AVENUE
TROUTDALE, OREGON 97060-9503

CENPD-ET-PL (1110-1-8100c) 26 Jan 95

MEMORANDUM FOR Commander, Portland District, ATTN: CENPP-PE-GG (Grubaugh/Budai)

SUBJECT: W.O. 94-497, Report of Correlation of Unconfined Compressive Strength and Point Load Index Results on Rock Core Specimens

Project: Coos Bay Channel Explorations
Intended Use: Strength evaluation of dredge channel bottom material
Source of Material: Navigation Channel, Lower Coos River, Charleston, Oregon
Submitted by: CENPP-PE-GG
Date Sampled: --- Date Received: 19-26 Aug 94
Method of Test or Specification: CRD, ASTM, Rock Testing Handbook
Reference: a) DD Form 448, MIPR No. E86-94-0087, dated 29 Jul 94
b) Telephone conversations with Messrs. Phil Grubaugh, Clayton Amundson, and Chris Budai 23 Oct 94 through 23 Jan 95; wherein , additional statistical results were discussed
c) Our report this subject, dated 19 Sep 94; wherein, results of Point Load Index and unconfined compressive strength test results were reported
d) Our facsimile report dated 22 Nov 94; wherein, preliminary correlation factors and other statistical data were reported
c) Our report, this subject, dated 17 Jan 95; wherein, statistical data was reported

1. Enclosed is report of point load strength tests made on nominal 2-inch diameter rock cores from the Coos Bay Channel Exploration project, revised to include correlation factors and statistical comparison data and revisions as requested by Christine Budai (CENPP-PE-GG). Included are.

a. Enclosure 1, Table I-F, Report of Point Load Strength Tests on Nominal 2-inch Diameter Rock Cores, Field Test Data, revised to include results of Field Tests made on Drill Hole No. DH-4.

b. Enclosure 2, Table II-L, Report of Point Load Strength Tests on Nominal 2-inch Diameter Rock Cores, Laboratory Test Data, (no revisions).

c. Enclosure 3, Table III-S, Summary of Field and Laboratory Point Load Strength Tests made on Nominal 2-inch Diameter Rock Cores, revised to include Field Tests made on Drill Hole No. DH-4 and additional clarification of notes.

2. This completes all work requested.

Enclosures

JAMES K. HINDS, PE
Deputy Director

Copy Furnished: CENPD-ET-P

COOS BAY CHANNEL EXPLORATION
TABLE I-F

Report of Point Load Strength Tests on Nominal 2-inch Diameter Rock Cores [1/]
Field Test Data

Drill Hole No.	Test No.	Compressive [2/] Strength, psi	Point Load Index, psi	Correlation [3/] Factor
DH-1 Stub	P-1	--	5	212.0
	P-2	--	10	106.0
	Average	1060	7.5	159.0
DH-2	P-1	--	45	34.7
	P-2	--	50	31.2
	P-3	--	45	34.7
	P-4	--	40	39.0
	P-5	--	50	31.2
	Average	1560	46.0	34.2
DH-4	P-1	--	0	-- [4/]
	Average	260	0.0	--
DH-5	P-1	--	25	21.2
	P-2	--	30	17.7
	P-3	--	10	53.0
	P-4	--	35	15.1
	P-5	--	10	53.0
	Average	530	22.0	32.0
DH-6	P-1	--	75	21.3
	P-2	--	65	24.6
	P-3	--	60	26.7
	P-4	--	70	22.9
	P-5	--	70	22.9
	P-6	--	65	24.6
	P-7	--	75	21.3
	P-8	--	85	18.8
	P-9	--	60	26.7
	Average	1600	69.4	23.3
DH-7	P-1	--	5	76.0
	P-2	--	5	76.0
	P-3	--	5	76.0
	P-4	--	5	76.0
	P-5	--	5	76.0
	P-6	--	5	76.0
	Average	380	5.0	76.0

CENPD-PE-GE-L (94-497)
Table I-F (cont)

Drill Hole No.	Test No.	Compressive[2/] Strength, psi	Point Load Index, psi	Correlation[3/] Factor
DH-8	P-1	--	20	37.5
	P-2	--	20	37.5
	P-3	--	20	37.5
	P-4	--	15	50.0
	P-5	--	10	75.0
	P-6	--	25	30.0
	P-7	--	25	30.0
	P-8	--	20	37.5
	P-9	--	15	50.0
	P-10	--	15	50.0
	P-11	--	25	30.0
	P-12	--	15	50.0
	P-13	--	20	37.5
	P-14	--	15	50.0
	Average	750	18.6	43.0
DH-9	P-1	--	10	24.0
	P-2	--	15	16.0
	P-3	--	10	24.0
	P-4	--	10	24.0
	P-5	--	10	24.0
	P-6	--	10	24.0
	P-7	--	15	16.0
	P-8	--	10	24.0
	P-9	--	10	24.0
	P-10	--	10	24.0
	P-11	--	10	24.0
	P-12	--	10	24.0
	P-13	--	10	24.0
	P-14	--	10	24.0
	P-15	--	10	24.0
	P-16	--	10	24.0
	P-17	--	10	24.0
	P-18	--	10	24.0
	P-19	--	10	24.0
	P-20	--	10	24.0
	P-22	--	10	24.0
	P-23	--	5	48.0
	P-24	--	10	24.0
	P-25	--	10	24.0
	Average	240	10.2	24.3

NOTES: [1] Field tests performed by Portland District staff (CENPP-PE-GG)

[2] Average laboratory unconfined compressive strength test data, reference report dated 19 Sep 94, Table I

[3] Correlation Factor is the ratio of average unconfined compressive strength to Point Load Index

[4] Point Load Index is zero; correlation factor is undefined. Result not included in average.

COOS BAY CHANNEL EXPLORATION

TABLE II-L

Report of Point Load Strength Tests on Nominal 2-inch Diameter Rock Cores [1][2]
Laboratory Test Data

Drill Hole No.	Test No.	Compressive [3] Strength, psi	Point [4] Load Index, psi	Correlation [5] Factor
DH-2	2-1a	--	60	26.0
	2-1b	--	65	24.0
	2-1c	--	65	24.0
	2-1d	--	75 [7]	20.8
	2-2	--	60	26.0
	2-3	--	85	18.4
	2-4a	--	80	19.5
	2-4b	--	65	24.0
	2-4c	--	70	22.3
	2-4d	--	55	28.4
	Average	1560	68.0	23.3
DH-4	4-1	--	20 [7]	13.0
	Average	260	20	13.0
DH-5	5-1	--	35	15.1
	5-2a	--	5	106.0
	5-2b	--	5	106.0
	5-3	--	5 [6][7]	106.0 [6]
	Average	530	15.0	75.7
DH-6	6-1a	--	70	22.9
	6-1b	--	70	22.9
	6-1c	--	80 [7]	20.0
	6-2a	--	85	18.8
	6-2b	--	90	17.8
	6-2c	--	90 [6]	17.8 [6]
	6-2d	--	75	21.3
	6-2e	--	75	21.3
	6-2f	--	85	18.8
	6-3a	--	90	17.8
	6-3b	--	85	18.8
	6-3c	--	95	16.8
	6-4a	--	95	16.8
	6-4b	--	90	17.8
	Average	1600	83.5	19.4

CENPD-PE-GE-L (94-497)
Table II-L (cont)

Drill Hole No.	Test No.	Compressive Strength, psi [3/]	Point Load Index, psi [4/]	Correlation Factor [5/]
DH-7	7-2	--	20 [6/]	19.0 [6/]
	7-3a	--	15	25.3
	7-3b	--	15	25.3
	7-3c	--	5	76.0
	7-3d	--	10	38.0
	7-4	--	10	38.0
	Average	380	11.0	40.5
DH-8	8-1a	--	55	13.6
	8-1b	--	35	21.4
	8-1c	--	15	50.0
	8-2	--	35	21.4
	8-3	--	40	18.8
	Average	750	36.0	25.0
DH-9	9-2	--	5	48.0
	9-3a	--	5	48.0
	9-3b	--	0	-- [8/]
	9-3c	--	10	24.0
	9-4a	--	0	-- [8/]
	9-4b	--	0	-- [8/]
	Average	240	3.3	40.0

NOTES: [1/] Laboratory tests performed by North Pacific Division Laboratory technicians (CENPD-PE-GE-L)

[2/] Tests made using Portland District (CENPP-PE-GG) point load test apparatus

[3/] Average laboratory unconfined compressive strength test data, reference report dated 19 Sep 94, Table I

[4/] All tests made in diametral orientation unless othewise ntoed

[5/] Correlation factor is the ratio of average unconfined compressive strength to Point Load Index

[6/] Invalid test; specimen did not break through both bearing points. Result not included in average

[7/] Axial orientation

[8/] Point Load Index is zero; correlation factor is undefined. Result not included in average

COOS BAY CHANNEL EXPLORATION

TABLE III-S

Summary of Field and Laboratory Point Load Strength Tests made on Nominal 2-inch Diameter Rock Cores [1]

		Field Data				Laboratory Data			
		Point Load Index		Correlation		Point Load Index		Correlation	
Drill Hole No.	Compressive [2] Strength, psi	psi[3]	No. of Tests	Factor [4]	Standard Deviation, Within Hole	psi[3]	No. of Tests	Factor [4]	Standard Deviation, Within Hole
DH-1 Stub	1060	7.5	2	159.0	75.0	--	--	--	--
DH-2	1560	46.0	5	34.2	3.2	68.0	10	23.3	3.1
DH-4	260	0.0	1	-- [5]	--	20.0	1	13.0	--
DH-5	530	22.0	5	32.0	19.3	15.0	3	75.7	52.5
DH-6	1600	69.4	9	23.3	2.6	83.5	13	19.4	2.1
DH-7	380	5.0	6	76.0	0.0	11.0	5	40.5	20.8
DH-8	750	18.6	14	43.0	12.2	36.0	5	25.0	14.3
DH-9	240	10.2	24	24.3	5.5	3.3	6	40.0	13.9
SUMMARY:									
Average:									
High:	800	25.5	--	56.0	--	33.8	--	33.8	--
Low:	1600	69.4	--	159.0	--	83.5	--	75.7	--
Standard	240	5.0	--	23.3	--	3.3	--	13.0	--
Deviation:									
	553	23.8	--	48.8	--	30.7	--	21.1	--

NOTES:

[1] Tests performed by Portland District Staff (field) and North Pacific Division Laboratory Technicians (laboratory)

[2] Average laboratory unconfined compressive strength test data, reference report dated 19 Sep 94, Table I

[3] Average Point Load Index as reported on Tables I-F and II-L.

[4] Average Correlation Factor as reported on Tables I-F and II-L.

[5] Point Load Index is zero, correlation factor is undefined.

APPENDIX E – Kenneth L. Finger, Ph.D., Consulting Paleontologist, Micropaleontological Examination

Kenneth L. Finger, Ph.D.
Consulting Paleontologist

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September 28, 2016

Kyle Wolfe
GRI
9750 SW Nimbus Avenue
Beaverton, OR 97008

Re: Micropaleontological Examination of 10 Coos Bay Core Samples

Dear Mr. Wolfe,

As per your request, I have processed and examined the 10 Coos Bay core samples for micropaleontological evidence that may help to differentiate the geologic units represented, as all of the samples are mudstones (silt + clay) that are dark brown when moist and a lighter buff when dry.

Geologic Units

The Tertiary sequence in the Coos Bay area consists of the Eocene Coaledo and Bastendorff formations, and the Miocene Empire formation. Diller (1899) named the Coaledo Formation for a series of predominantly nonmarine, coal-bearing, late Eocene strata exposed a few miles south of Coos Bay. Turner (1938) proposed a division of the Coaledo into lower and upper sandstone members separated by a middle unit of marine mudstone. The overlying Bastendorff Formation consists of thinly laminated dark-brown siltstones and mudstones that weather a light tan. It is unconformable with the Miocene Empire Formation, which consists of a basal conglomerate and sandstones (Addicott, 1983).

Previous Microfaunal Studies

The Eocene foraminiferal fauna of the Coaledo and Bastendorff formations at Coos Bay were first documented by Detling (1946). Her checklist reveals that the two units have similar assemblages. Although she recorded several species in only one of the two units, her study was not as comprehensive as that of Rooth (1974), who researched the microfauna from coastal outcrops of the two units just south of Coos Bay. Rooth also collected samples inland but they yielded molds and casts of foraminifers and radiolarians that, for the most part, were very difficult to identify. Rooth (1972) reported that foraminifers are very rare in the sandstones of the lower & upper Coaledo, but abundant in the middle Coaledo, which he interpreted as probably deposited at upper bathyal to outer neritic depths. In contrast, he also interpreted the high numbers of radiolarians and planktonic foraminifers in the Bastendorff Formation as evidence of deep-water deposition in a basin influenced by an open-ocean, mid-latitude water mass, rather than on the continental shelf or in a restricted embayment. Rau (1970) noted that there was no foraminiferal data from the Miocene Empire Formation.

Methodology

Samples were processed by first breaking the core samples into several pieces, immersion of the rocks in water with a deflocculent (Calgon) for a minimum of 24 hours with intermittent heating to near-boiling, and washing the disaggregated sediment over a 230-micron sieve. The remaining fraction was then filtered and oven-dried. Hydrogen peroxide was added to one sample (B-33) that was highly indurated (couldn't be broken with a rock hammer), but with little success. The dried residue was then sieved through a stack of 60, 100, and 200 micron screens. Each fraction was then sprinkled onto a micropaleontological picking tray and examined under the stereomicroscope. Specimens were picked onto micropaleontological slides for subsequent identification. For comparative study, I first perused approximately 200 specimen and assemblage slides from both the Coaledo and Bastendorff formations that are in the microfossil slide collection at the University of California Museum of Paleontology (UCMP).

Results

Disaggregation of the 10 core samples varied from nearly nothing to partial to extensive. Sufficient amounts of washed residue were obtained from nine of the core samples, the exception being B-33, which is so highly indurated that it cannot be fragmented with a rock hammer. As shown in the table below, foraminifers were common in only two of the core samples (B-21, B-23), but few specimens were preserved well enough for positive identification. Just a few specimens were found in four other samples, and none were recovered from the remaining four samples.

Sample	Forams	Paleodepth	Geologic unit
B-33	-	-	-
B-30	Rare	shallow	Empire
B-29	Few	deep	-
B-27	Few	deep	-
B-24	None	-	-
B-23	Common	deep	Bastendorff
B-22	None	-	-
B-21	Common	deep	Bastendorff
B-16	Few	deep	-
B-15	None	-	-

Conclusions

Four of the assemblages (B-21, B-23, B-27, B-29) have elements of a deep-water fauna characterized by *Plectofondicularia packardi, Stilostomella* spp., and radiolarians. The two richest assemblages also yielded multiple specimens of *Spiroloculina wilcoxensis*, a species that Detling found only in the Bastendorff Formation. In contrast, B-30 only yielded *Rosalina ornatissima* and *Nonion florense*, which suggests the shallow marine environment of the Empire Formation.

Sincerely,

Ken Finger

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