OREGON SHORES

CONSERVATION COALITION

October 14, 2019

Coos County Planning Department
c/o Planning Director Jill Rolfe
Coos County Courthouse
250 N. Baxter
Coquille, Oregon 97423

Via Email to: planning@co.coos.or.us

Re: Coos County File No. HBCU-19-003/FP-19-003
Concurrent Land Use Applications by Jordan Cove Energy Project L.P.
Multiple Proposals Related to Liquefied Natural Gas Terminal Facility
Supplemental Materials of Oregon Shores Conservation Coalition

Dear Planning Commission Members:

Please accept these additional comments and supplemental materials from the Oregon Shores Conservation Coalition and its members (collectively "Oregon Shores") to be included in the evidentiary record for File No. HBCU-19-003/FP-19-003 ("Omnibus II").[1] They are provided pursuant to the open record periods established at the public hearing for File No. HBCU-19-003/FP-19-003 held on Monday, Sept. 30, 2019 and ORS 197.763. The following comments and enclosed materials are relevant to the applicable standards for these multiple proposals, including those contained within the Oregon Statewide Planning Goals ("Goals"), Coos Bay Estuary Management Plan ("CBEMP") zoning district criteria, CBEMP Policies, the Coos County Comprehensive Plan ("CCCP"), and the Coos County Zoning and Land Development Ordinance ("CCZLDO"). We previously submitted comments for inclusion within the evidentiary record for the aforementioned public hearing. Oregon Shores hereby adopts in

[1] *See* Coos Cnty. Planning Dep't, *Notice of Land Use Hearing*, Coos Cnty. File No. HBCU-19-003, 1-3 (Sept. 10, 2019) [*hereinafter Omnibus II Pub. Notice*]; *See also See* Jordan Cove Energy Project L.P. ("JCEP"), *In the Matter of a Concurrent Request to Authorize Development of Uses and Activities in Conjunction with the Jordan Cove Energy Project on the North Spit*, Cnty. File Nos. HBCU-19-003/FP-19-003, 1 (Aug. 9, 2019) [*hereinafter JCEP Revised Omnibus II Appl.*].

full and incorporates by reference our previous comment in the record for File No. HBCU-19-003/FP-19-003. Please continue to notify us of any further decisions, reports, or notices issued in relation to this matter. Oregon Shores will continue to provide comments as appropriate within the established open record periods.

The below general comments and attached materials further underscore the apparent deficiencies of the various land use proposals in Omnibus II, and highlight key materials and concerns that should be considered by the County prior to any final decision in this matter. Of specific importance are the multiple concerns raised and data requests made by the Coos County Planning Department, the Oregon Department of Environmental Quality ("DEQ"), the State of Oregon's comments on the DEIS for this project, and a recent request by the U.S. Bureau of Land Management ("BLM") related to the IWWP. Many of the issues raised and information requested mirror those raised and requested by Oregon Shores, and should be addressed by the Applicant prior to any final decision on this matter.

I. General Comments

A. Deficiencies highlighted by Coos County Planning Department Staff Report

As stated by the Coos County Planning Department's Staff Report for Omnibus II ("Staff Report"), the Applicant has yet to address the following

- CCZLDO Art. 5.11, containing standards for Geologic Assessment Reports.[2]

- CBEMP Policy #30 (Restricting Actions in Beach and Dune Areas with "Limited Development Suitability" and Special Consideration for Sensitive Beach and Dune Resource), or explain why Policy #30 does not apply with respect to the proposed shoreline stabilization structure, pile dike rock apron, gas processing, and IWWP.[3]

- Impact assessment for proposed temporary dredge transport pipelines in order to demonstrate consistency Goal 16 (Estuaries), CBEMP Policy #4 (Resource Capability Consistency and Impact Assessment), and CBEMP Policy #5a (Temporary Alterations).

Oregon Shores' previous comment raised similar deficiencies with respect to Omnibus II. The Applicant should provide both the County and the public with the above requested evidence and analysis prior to the close for opportunity to comment and any final decision in this matter. Absent such information, the Hearings Officer should not recommend approval of the Application.

B. Industrial wastewater pipeline ("IWWP") as "Utility Facility – Service Lines" in the IND zone and as a "high-intensity utility" in the 7-D zone

[2] Coos Cnty. Planning Dep't, *Staff Report: HBCU-19-003*, 70, 102 (Sept. 23, 2019) [*hereinafter Staff Report*].
[3] *Staff Report*, 23, 32, 102.

The Applicant proposes to construct a new industrial wastewater pipeline ("IWWP") in the IND zone and the 7-D CBEMP zone.[4] Outside of the IND and 7-D zones, it appears that much of the proposed IWWP runs parallel to and within the vicinity of the Trans Pacific Parkway (i.e. public road right-of-way).[5] Oregon Shores previously highlighted several deficiencies in the Omnibus II Application materials with respect to the proposed IWWP. The issues raised within a recent additional environmental information request made by the U.S. Bureau of Land Management ("BLM") to the Applicant regarding the proposed IWWP serve to validate Oregon Shores' concerns, and are included as a part of the supplemental materials enclosed with this comment. Specifically, the letter includes requests for information required to address the BLM's concerns regarding the feasibility of installing and co-locating the IWWP along the Trans Pacific Parkway. The Applicant should address the concerns raised by BLM prior to any final decision in this matter, and any materials submitted by the Applicant in relation to the above concerns should be provided to the County and the public for review prior to the close of the opportunity for comment. Absent such information, the Applicant cannot demonstrate that the proposed IWWP in the IND zone is consistent with the requisite criteria, including CCZLDO 4.11.125.4 - Beaches and Dunes (Policy 5.10) and CBEMP Policy #30. As such, the County must deny the Application.

B. Corporate and administrative offices as an "accessory use" in the IND zone

According to the Application materials, JCEP proposes to develop an administration building as an "accessory development to industrial uses" in the IND zone, just south of the proposed SORSC.[6] The Application indicates that the administrative building will contain administrative and corporate offices, the purpose of which is to provide business, administrative, and information management support for the operations of the proposed LNG Terminal and related facilities.[7] Oregon Shores does not concede that the proposed corporate and administrative offices in the IND zone are an accessory use as that term is defined under CCZLDO 2.1.200 and as it is categorized under CCZLDO Sec. 4.3.210(1). The Application materials fail to provide sufficient information to meaningfully evaluate consistency with the applicable criteria. On the basis of the present record, the County cannot approve the proposed corporate and administrative offices in the IND zone.

Both the proposed administrative building and the proposed SORSC appear to be located just west of an identified wetland located on the boundary between the IND zone and 8-WD CBEMP zone. As discussed previously, Oregon Shores' was unable to locate any data sufficient to evaluate the potential impacts that the construction and operations of both the proposed SORSC and the proposed administrative building may have on this identified wetland. As stated in our previous comment, such data must be provided to the County and public for review prior to the close for opportunity for comment and any final decision in this matter. The concerns

[4] *JCEP Revised Omnibus II Appl. Narrative*, 5.
[5] *Id*, Ex. 3; *See also Omnibus II Pub. Notice*, 2.
[6] *See JCEP Revised Omnibus II Appl. Narrative*, 9-10; *See also* CCZLDO Section 4.3.200.66. Zoning Tables – Accessory Development to industrial uses; *See also* CCZLDO Sec. 4.3.210(1). Categories and review standards: Accessory structures and uses.
[7] *See JCEP Revised Omnibus II Appl. Narrative*, 9-10.

raised about Omnibus II's potential impacts to this wetland and other similar habitats on the North Spit are mirrored by the concerns raised within the State's comments on the proposed LNG Terminal and associated components within Jordan Cove's DEIS. The State's DEIS comments are enclosed within the supplemental materials for this comment. [8]

C. The proposals and associated components within Omnibus II are not in the public interest.

The Application materials indicate that the proposals and associated components within Omnibus II would serve to benefit the economy of the Coos Bay region. As discussed previously, the materials do not include sufficient information and analysis to support a robust evaluation of the accuracy of that claim against the applicable criteria. To the contrary, publicly available information suggests that the opposite conclusion is more likely to be true. A June 2019 memo by energy consulting firm McCullough Research found minimal likelihood that the Jordan Cove Energy Project would succeed economically. The memo was authored by Robert McCullough, who has twenty-five years of experience advising government, utilities and aboriginal groups on energy, metals and chemical issues. Mr. McCullough's recently issued memo is entitled "The Questionable Economics of Jordan Cove LNG Terminal." The report and Mr. McCullough's curriculum vitae are attached to this comment. The report makes the following conclusions:

- The terminal, if constructed as planned, would be at a 600-mile disadvantage compared to other west coast projects in transportation costs, the announced costs are high by market standards, and the proposed technology to be used will make JCEP less efficient than competitors in British Columbia and the Gulf Coast.

- JCEP will have a 25% cost disadvantage as compared to its competitors.

- Based on an economic model comparing all possible combinations of feed gas and Asian landed gas prices over the last decade, the chance of JCEP reaching operation is 33%.

As demonstrated by Mr. McCullough's report, the proposed project is unlikely to succeed or be economically viable. However, as discussed throughout Oregon Shores' comments and materials for the present Application, the construction, installation, and operation of the proposals and associated project components will likely have serious and irreparable adverse impacts on the Coos Bay region's waterways, natural resources, wetlands, fish and wildlife values, flood hazards, floodplain values, land use, navigation, shoreline erosion, aesthetic values, recreation, water quality, energy conservation, public safety, and public welfare. For these reasons, the proposed project is inconsistent with the public interest as well as the requisite criteria within CBEMP Policy #4. As such, the County should not authorize the proposals within Omnibus II.

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[8] *See* Or. Dep't of Justice, *Oregon State Agency Comments on Jordan Cove Energy and Pacific Connector Gas Pipeline Project Draft Environmental Impact Statement (Docket # CP17-494-000 and CP17-495-000)*, 65-93 (July 3, 2019) [*hereinafter OR DEIS Comments*].

D. State Agency Comments on the 2019 DEIS for the Jordan Cove Energy Project demonstrate that the proposals within Omnibus II

As discussed in our previous comment, for the past decade, Jordan Cove has failed to garner many of the required approvals, permits, and compliance determinations from local, state, and federal agencies. Most recently, the Oregon Department of Environmental Quality ("DEQ") issued a decision denying Clean Water Act Section 401 Certification for both the proposed Pacific Connector Pipeline and the Jordan Cove Energy Project LNG terminal.[9] DEQ concluded that it did "not have a reasonable assurance that the construction and operation of the Project will comply with applicable Oregon water quality standards[…]."[10] DEQ's denial is discussed in further detail in part I.E. below. In the State of Oregon's comments on Jordan Cove's Draft Environmental Impact Statement ("DEIS"), prepared by the Federal Energy Regulatory Commission ("FERC") in conjunction permitting requests for the proposed LNG Terminal and Pipeline, several state agencies concluded that federal environmental impact findings for the Jordan Cove LNG project were inadequate and frequently inaccurate.[11] Both the DEQ's denial and the State's DEIS Comments are relevant to standards and criteria for the CBEMP management units impacted by the Applicant's Omnibus II proposals and the requisite standards contained in CCZLDO Art. 4.11, as well as serve to validate the concerns raised by Oregon Shores. As such, both should be taken into consideration before any final decision in this matter. The State's comments on the DEIS for Jordan Cove are discussed in this section.

In their comments on the 2019 DEIS for Jordan Cove, several Oregon state agencies concluded that FERC's federal environmental impact findings for the Jordan Cove liquefied natural gas project were inadequate and frequently inaccurate, and indicated that Jordan Cove failed adequately describe the full extent of the proposed project's impacts on the Coos Bay region. The State's comments serve to validate the concerns raised in Oregon Shores' previous comment for Omnibus II, and are relevant to the applicable evaluation criteria for this matter. We strongly urge the County to consider the concerns raised by the State's DEIS comments as a whole when evaluating whether the proposals contained within Omnibus II are consistent with the requisite standards. Both the Oregon Department of Geology and Mineral Industries ("DOGAMI") and the Oregon Department of Fish and Wildlife ("ODFW") provided comments that mirror the many of the unresolved concerns raised by Oregon Shores' previous comment and the County staff report in this matter. This are discussed in further detail below.

1. DOGAMI DEIS Comments

Generally, DOGAMI found Jordan Cove's natural hazards mitigation inadequate due to the reliance on outdated information and technology within the Applicant's natural disaster analysis, which left unaddressed would lead to potential adverse consequences for public safety.[12] Further unresolved concerns include, but are not limited to:

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[9] *See* Or. Dep't of Envtl. Quality ("DEQ"), *Jordan Cove 401 Water Quality Certification Decision Cover Letter*, 1-3 (May 6, 2019) [hereinafter *DEQ Denial Letter*]; *See also* DEQ, *Evaluation and Findings Report: Section 401 Water Quality Certification for the Jordan Cove Energy Project*, 1 (May 2019) [hereinafter *DEQ Findings Report*].
[10] *DEQ Denial Letter*, 3.
[11] *Or. DEIS Comments*, 84-85 [*hereinafter OR DEIS Comments*].
[12] *See Or. DEIS Comments*, 157.

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2. Seismic hazards, including Cascadia earthquakes and identification, characterization and mitigation of quaternary faults and their hazards;

3. The long duration of shaking expected with a magnitude 9 earthquake;

4. Ground failure of the softer and looser soils, including earthquake-induced liquefaction and lateral spreading;

5. Landslide hazards, including earthquake-triggered landslides, require the use of lidar to identify as a first step in characterizing hazards and proposing mitigation;

6. Tsunami hazards analyses, including tsunami hazards with the proposed channel and estuarine modifications, and how currents, debris and ballistics may negatively impact the surrounding areas and safety of people;

7. Tsunami scour in the nearby area, including dynamic erosion of the North Spit dunes, and how the Maximum Considered Tsunami (MCT), that is, the design tsunami, may impact the local landforms, proposed facilities, nearby development and safety of people;

8. Tsunami design criteria. Will the design meet and/or exceed the minimum design requirements specified in the International Building Code's reference to the American Society of Civil Engineers 7 Minimum Design Loads and Associated Criteria for Buildings and Other Structures Chapter 6 on Tsunami Loads and Effects?;

9. Tsunami safety action plans, including tsunami evacuation plans and an evaluation of the response time to mobilize an LNG vessel during a distant tsunami;

10. Appropriate application of best management practices (BMP). For example, the best practice described in the DEIS using slope gradients to define where BMPs are implemented during construction is inadequate;

11. Instrument monitoring safety programs. For example, the landslide monitoring method described in the DEIS would not allow adequate time to mitigate landslide hazards during a Cascadia earthquake where many co-seismic landslides could be simultaneously triggered in direct response to the shaking; and,

12. Dependencies on existing infrastructure, such as roads and levees, which may fail during disasters causing safety concerns.[13]

[13] *See Or. DEIS Comments*, 157-158.

The unresolved concerns raised by DOGAMI mirror those raised by the County's Staff Report and Oregon Shores' previous comment with respect to the project's compliance with the requisite standards related to natural hazards contained within the CCZLDO, CCCP, CBEMP, and the Goals.[14] They serve to validate Oregon Shores' argument that, on the basis of the present record, the proposals contained in Omnibus II fail to demonstrate consistency with the applicable criteria. The Applicant should address the concerns raised by DOGAMI prior to any final decision in this matter, and any materials submitted by the Applicant in relation to the above concerns should be provided to the County and the public for review prior to the close of opportunity for comment. Absent such information, the County must deny the Application.

2. ODFW DEIS Comments

Generally, ODFW's unresolved concerns arise from Jordan Cove's failure to "demonstrate how serious depletion of Oregon's fish and wildlife resources will be avoided (ORS 496.012)."[15] These include, but are not limited to:

- The need for a Natural Resource Technical Advisory Group
- Economic Impact
- Connection to Port of Coos Bay Channel Modification Project and their Cumulative Effects
- JCEP LNG Terminal Impacts to the Coos Bay Estuary
- Dredging Impacts to Estuarine Habitats and Communities
- Impacts to Eelgrass
- Introduction of Non-indigenous Species through Ballast Discharge
- Disturbance to Marine Mammals
- Impacts to Wildlife in Freshwater Wetlands, Uplands, and Beaches on the North Spit
- Impacts of the LNG Terminal on Snowy Plover Nesting and Foraging Habitat
- Impacts to Coastal Marten Habitat
- Habitat Loss at the JCEP LNG Terminal Site
- Impacts from the PCGP Pipeline to Fish and Wildlife Habitat
- Impacts to Marbled Murrelet and Northern Spotted Owl Habitat
- Fish and Wildlife Habitat Mitigation
- Fish Passage
- In-Water Blasting, In-Water Work. [16]

The unresolved concerns raised by ODFW mirror those raised by the County's Staff Report and Oregon Shores' previous comment with respect to the project's compliance with the requisite standards within the CBEMP and the CCZLDO.[17] They serve to validate Oregon

[14] *See Or. DEIS Comments*, 157-158.
[15] *See Or. DEIS Comments*, 65.
[16] *Id.*, 65-93.
[17] *See Or. DEIS Comments*, 157-158.

Shores' argument that, on the basis of the present record, the proposals contained in Omnibus II fail to demonstrate consistency with the applicable criteria. The Applicant should address the concerns raised by ODFW prior to any final decision in this matter, and any materials submitted by the Applicant in relation to the above concerns should be provided to the County and the public for review prior to the close of opportunity for comment. Absent such information, the County cannot conclude that the proposals are consistent with the requisite criteria.

E. Oregon Department of Environmental Quality's May 6, 2019 denial of Jordan Cove's 401 Water Quality Certification Application.

Section 401 of the Clean Water Act ("CWA") bars federal agencies from issuing a license or permit for an action that may result in a discharge to Oregon's waters without first obtaining water quality certification from the Oregon Department of Environmental Quality ("DEQ"). JCEP's proposed dredging and filling activities in Coos Bay require a permit from the U.S. Army Corps of Engineers pursuant to Section 404 of the CWA.[18] As such, JCEP must obtain a Section 401 water quality certification ("WQC") prior to commencing the construction and operation of a number of the proposed uses and activities within its Omnibus II application. These include, but are not limited to, the proposed IWWP, wastewater treatment facility, temporary barge berth, temporary dredge material transport pipelines, and temporary construction laydown uses and activities.

In May 2019, the DEQ issued a decision denying CWA Section 401 Certification for both the Pacific Connector Gas Pipeline and the Jordan Cove Energy Project LNG terminal.[19] DEQ's review considered the potential adverse impacts arising from the Applicant's proposed new and maintenance dredging activities, dredge material transfer, dredge material disposal ("DMD"), and wastewater management in and around Coos Bay, and denied requested certification because it did not "have a reasonable assurance that the construction and operation of the Project would comply with applicable state water quality standards."[20] Findings relevant to the evaluation of the present proposal include, but are not limited to:

- JCEP has not demonstrated that its proposed LNG Export Terminal and associated facilities, uses, and activities will comply with Oregon's statewide narrative criteria, which supplement Oregon's numeric water quality standards and Oregon's antidegradation policies.[21] DEQ made this finding because:

    a. JCEP did not provide details for spill containment for Terminal.[22]

[18] The U.S. Army Corps of Engineers ("Corps") and the Oregon Department of State Lands ("DSL") use a joint permit application for proposed removal-fill activities. Each agency independently reviews the application and issues its own permit. Jordan Cove is presently seeking a removal-fill permit from both agencies.
[19] *See* Oregon Dep't of Envtl. Quality ("DEQ"), *Jordan Cove 401 Water Quality Certification Decision Cover Letter*, (May 6, 2019) [hereinafter *DEQ Denial Letter*]; *See also* DEQ, *Evaluation and Findings Report: Section 401 Water Quality Certification for the Jordan Cove Energy Project*, (May 2019) [hereinafter *DEQ Findings Report*].
[20] *See DEQ Denial Letter* at 3; *See also DEQ Findings Report*, 3.
[21] *See DEQ Findings Report*, 44; *See also id.*, 18.
[22] *See DEQ Findings Report*, 44.

b. JCEP did not provide details for infiltration controls for Construction Facility Areas.[23]

c. JCEP did not provide details for dredged material disposal controls.[24]

d. JCEP did not demonstrate that proposed construction stormwater controls are the highest and best treatment options to control pollution as required by OAR 340-041-0007(1).[25]

e. JCEP's proposed dredging activities do not employ the highest and best treatment options for preventing or minimizing turbidity as required by OAR 340-041-0007(1);[26] and,

f. JCEP's proposed dredging activities do not employ sufficient methods to keep organic or inorganic material out of public waters as required by OAR 340-041-0007(11).[27]

- Dredging at the Navigational Reliability Improvement locations, the Slip, and Access Channel would cause turbidity levels to increase above the allowable numeric limits established in Oregon's Turbidity water quality standard.[28]

- DEQ found that JCEP's Section 401 application materials failed to address procedures to minimize adverse effects arising from its proposed DMD activities upon estuarine water quality.[29]

As discussed in our previous comment, the Application materials for Omnibus II demonstrate a similar failure to adequately describe and address adverse effects to water quality, inconsistent with the requisite criteria for evaluation. At the very minimum, the Applicant must substantially address the above concerns raised by the DEQ's denial about its proposed LNG Terminal uses and activities prior to any final decision upon Omnibus II. Absent further information, the County cannot conclude that the Application materials are consistent with the requirements of the CCZLDO and the CBEMP.[30]

II. Conclusion

For the above reasons, the County should deny this Application. Thank you for considering this comment and the attached materials.

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[23] *Id.*
[24] *See DEQ Findings Report*, 45.
[25] *See DEQ Findings Report*, 45.
[26] *Id.*
[27] *Id.*
[28] *DEQ Findings Report*, 76.
[29] *DEQ Findings Report*, 43-44.
[30] *See* CBEMP Policy #47 – Environmental Quality (stating that "The Coos Bay Estuary Management Plan and Implementing Ordinance shall comply with the Department of Environmental Quality (DEQ) regulations regarding air, water quality and noise source standards that are established as law.")

Sincerely,

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Document	**Pages**
Sylvia Yamada, Potential Impact of Jordan Cove LNG Terminal Construction on the Nursery Habitat of Dungeness Crab, Jan. 2016.	4
Oregon DEQ 401 Certification Denial Letter and Findings Report, May 6, 2019. *These documents are combined for ease of reading.	213
Or. DOJ, Oregon State Agency Comments Jordan Cove Energy and Pacific Connector Gas Pipeline Project DEIS (Docket # CP17-494-000 and CP17-495-000), July 3, 2019.	248
Jes Burns, Jordan Cove LNG Plans Not Good Enough For People Or Environment, Oregon Says, (July 12, 2019). *Edited for relevance.	7
Robert F. McCullough, Jr., Principal – McCullough Research, The Questionable Economics of Jordan Cove LNG Terminal, (June 5, 2019).	10
Robert McCullough, Longform Curriculum Vitae, (June 5, 2019).	23
FERC, Environmental Information Request – Industrial Waste Water Pipeline, (Oct. 4, 2019). *This letter was sent by the FERC to the Applicant in order to address concerns raised by the BLM about the proposed IWWP.	2
SIGTTO Information Paper No. 14, Site Selection and Design for LNG Ports and Jetties, (1997).	27

Potential Impact of

Jordan Cove LNG Terminal construction on

the Nursery Habitat of Dungeness crab.

January 2016

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The **Dungeness crab** (***Cancer magister***) supports an important commercial and sport fishery from Alaska to California. Total annual landings in recent years exceeded 25,000 tons (55 million pounds) (FAO statistics, 2012). In Oregon, the 2014 Dungeness fishing season yielded 14.4 million pounds, $50 million to crabbers and an estimated $100 million to the Oregon economy (Oregon Dungeness Crab Commission in Fisherman's News On line). The Dungeness fishery is the most valuable commercial fishery in Oregon (Rasmusen 2013).

The life cycle of Dungeness crab is complex, depending on both estuarine and near-shore habitats. Typically, mating occurs in shallow water, and females migrate offshore to brood and hatch their eggs. The early larval stages feed and rear in the near-shore water column, after which the final larval stage rides tidal currents back to shore and settles out in shallow estuarine habitats. The final larval stage molts into a ~5 -7 mm wide first crab stage. The highest densities of juvenile Dungeness crabs are found in estuaries, which provide warm water, high biological productivity and protection from predators. Sand substrate and eelgrass beds are preferred habitat for these young crabs, which bury in the sand and hide in the eelgrass to escape predators. Size measurements of crabs trapped at Russell Point in Coos Bay (below the Highway 101 McCullough Bridge) show that Dungeness crabs in their first two years of life (100 mm carapace width and smaller) are extremely abundant in the mid-to low intertidal areas such as pools and eelgrass beds (Figure 1).

In my research documenting the status of the non-native European Green crab in Coos Bay, I encounter young Dungeness crabs in all my study sites. I selected a sub-set of my sites closest to the proposed Jordan Cove Energy Project: the north and south sides of Trans Pacific Lane and the beach adjacent to the Roseburg Forest Product watchman's booth. The results from over 600 trap-days, show that young Dungeness crabs are consistently abundant from 2002 to 2014 at all sites, with an average catch of 15 per trap (Table 1). These trapping results confirm the findings by Emmett and Durkin (1985) that estuaries are important nursery habitats for Dungeness crabs. These need to be kept in mind when a trench is dug In Haynes Inlet, the Trans Pacific Parkway is be expanded and an upland area is cut out to create a berth for ocean-going vessels. Not only will the turbidity during the construction phase be of concern to the ecological community, the on-going dredging to maintain the berth and shipping channels will continue to be a disturbance to the ecosystem. It will result in habitat loss for native species, including the valuable Dungeness crab. In one study between 45 to 85 % of the Dungeness crabs died during a simulated dredging operation (Chang and Levings, 1978). Marine habitat modification by construction of the Jordan Cove Energy Project could impact the important Oregon Dungeness fishery.

Sylvia Yamada is a marine ecologist who has studied native crabs and the European green crab in Oregon and Washington for over 20 years.

References:

Chang, B., Levings, C. 1978. Effects of burial on the heart cockle *Clinocardium nuttalii* and the Dungenes crab *Cancer magister*. *Estuarine, Coastal and Shelf Scie*nce. 7, 4009-412.

Emmett, R.L. and Durkin, J.T. 1985. The Columbia River Estuary: An Important Nursery for Dungeness Crabs, *Cancer magister*. *Marine Fisheries Review*. 47(3), 21-25.

Fisherman's News On line Sept 24, 2014 http://fnonlinenews.blogspot.com/2014/09/oregons-crabbers-riding-market-value.html

Rasmuson, L.K. 2013. The Biology, Ecology and Fishery of the Dungeness crab, *Cancer magister*. In Michael Lesser, editor: *Advances in Marine Biology*, Vol 65, Burlington: Academic Press, pp. 95-148. ISBN: 978-0-12-410498-3 Elsevier Ltd. Academic Press.

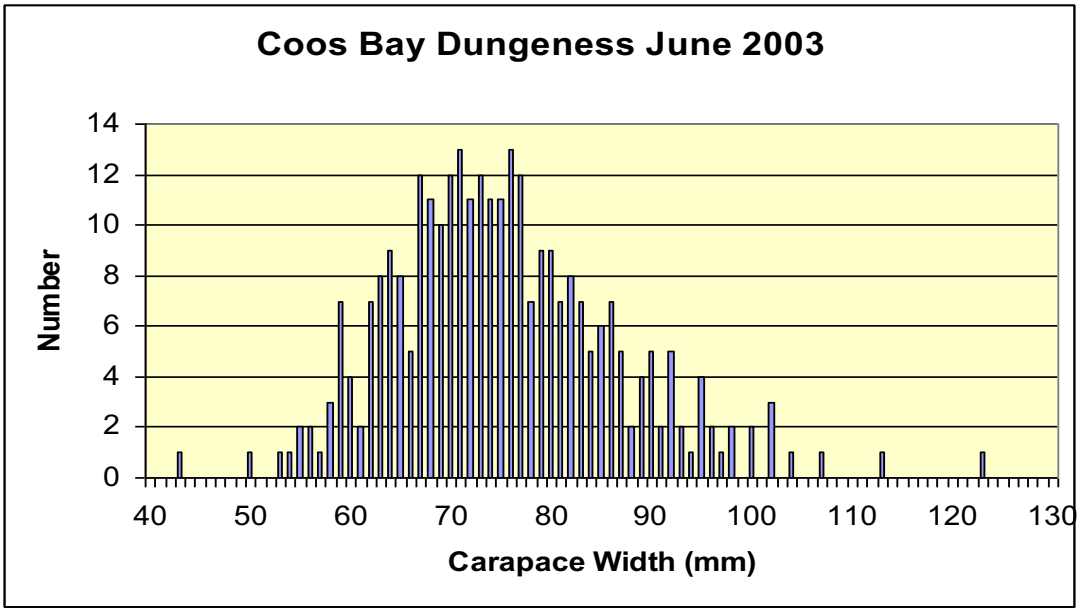

Figure 1. Size frequency distribution of Dungeness crabs trapped in pools and eelgrass at Russell Point, below the Highway 101 McCullough Bridge, in June 2003. Adult crabs are greater than 100 mm in carapace width. It is estimated that 2 year classes are represented.

Table 1. Trapping Data for study sites along Trans Pacific Lane and Roseburg Forest Product causeway from 2002-2014.

	Date	Trap Type	Zone	European green crab *Carcinus maenas*	Hairy shore crab *Hemigrapsus oregonensis*	Purple shore crab *Hemigrapsus nudus*	Dungeness crab *Cancer magister*	*Cancer magister* (Recruits <50mm)	Red rock crab *Cancer productus*	stag-horn sculpin	# Traps
Roseburg Lumber	6/25/2002	Fish	Site	0	0	0	45	0.5	0.1	0	10
Roseburg Lumber	6/16/2003	Fish	*low*	0	0	0	12.2	0	0.7	1.5	10
TransPacific S	7/10/2005	Fish	*low*	0	0	0	6.14	1.14	0	1.86	7
North	7/10/2005	Fish	*low*	0	0	0	0	5.7	0	1.1	10
South	3/25/2005	minnow	*Mid*	0	0	0	0	0	0	2.4	10
North	7/10/2005	minnow	*mid*	0	0.2	0	0	0.6	0	0.8	5
South	7/10/2005	minnow	*mid*	0	0	0	0	0.4	0	0.6	5
Trans-Pacific Bridge	9/1/2005	Fish	*Low*	0	0	0	6.6	0	3	1	5
	9/1/2005	Minnow	*high*	0	0	0	0.2	0	0	0.4	4
Trans-Pacific Ln.	6/8/2006	Fish	*Low*	0	0	0	4.9	0	0	2.6	10
	9/13/2006	Fish		0	0.4	0	0.2	0	0	0.2	5
	6/8/2006	Minnow	*high*	0	0	0	0.7	0	0	2.3	10
Trans Pacific Br.	9/13/2006	Minnow		0.2	0	0	0	0	0	0.2	5
TransPacific Ln. N	5/25/2007	Fish	Mid	0.5	0.2	0	1	0.1	0	0.8	10
	7/14/2007	Fish		0.4	1.47	0	23.53	0	0	0.2	15
	9/26/2007	Fish		0	0	0	4.75	0	0	0	8
TransPacific Ln. S	5/25/2007	Fish	Mid	0.09	0	0	0.82	0	0	0.36	11
	7/14/2007	Fish		0.27	0.07	0	9	0	0.07	1	15
	9/26/2007	Fish		0	0	0	2.71	0	0	0.14	7
TransPacific Bridge	5/25/2007	Fish	Mid	0	0	0	1.33	0	0	0	6
	9/25/2007	minnow	high	0	0	0	1.6	0	0	0.4	5
TransPacific Ln. N	6/18/2008	Fish	Mid	0.1	0.2	0	7.4	0	0	7.8	10
	6/19/2008	Fish		0	0	0	1.75	0	0	3.25	8
	9/18/2008	Fish		0	0.1	0	23.4	0	0	0.7	10
TransPacific Ln. S	6/18/2008	Fish	Mid	0.5	0	0	17.2	0	0	2.2	10
	6/19/2008	Fish		0.37	0	0	17.63	0	0	1.37	8
	9/18/2008	Fish		0.1	0	0	22.6	0	0	0.3	10
TransPacific Ln. N	7/8/2009	Fish	Mid	0.13	0	0	9.88	0	0	0.38	8

	7/9/2009	Fish		0.1	0.2	0	11.3	0	0	0.3	10
	07/0/09	Fish		0.1	0	0	11.7	0	0	0.5	10
TransPacific Ln. S	7/8/2009	Fish	Mid	0	0	0	24.38	0	0	0.25	8
	7/9/2009	Fish		0.1	0	0	30.2	0	0	0.9	10
	7/10/2009	Fish		0.4	0	0	16.6	0.1	0	0.5	10
	7/11/2009	Fish		0.4	0	0	13.1	0	0	2.7	10
TransPacific Ln. N	3/19/2010	Fish	Mid	0	0.4	0	0.7	0	0	0	10
	3/20/2010	Fish		0	0.1	0	0.1	0.2	0	0	10
	3/21/2010	Fish		0	0.3	0	0.3	0.4	0	0	10
	6/25/2010	Fish		0	0	0	35.7	0	0	1.1	9
	6/26/2010	Fish		0	0	0	75.9	0	0	0.4	10
TransPacific Ln. S	3/19/2010	Fish	Mid	0	0	0	1.9	0.9	0	0	10
	3/20/2010	Fish		0.1	0	0	1.7	0	0	0	10
	3/21/2010	Fish		0	0	0	2.5	0.1	0	0	10
	6/25/2010	Fish		0	0	0	90.6	0	0	0	10
	6/26/2010	Fish		0	0	0	69.9	0	0	1.6	20
TransPacific Ln. N	7/17/2011	Fish	Mid	0	0.6	0	4.73	0.27	0	0.73	15
	10/17/2011	Fish		0	0	0	5.3	0	0	0.2	10
TransPacific Ln. S	7/16/2011	Fish	Mid	0.03	0.09	0	1.5	0.06	0	1.53	34
	7/17/2011	Fish		0	0.13	0	2.07	0.47	0	1.2	15
TransPacific Ln. N	6/27/2012	Fish	Mid	0	0	0	89.2	0	0	0.4	5
TransPacific Ln. S	6/25/2012	Fish	Mid	0	0	0	9.75	0	0	0.75	12
	6/27/2012	Fish		0.11	0	0	5.2	0	0	0.67	9
TransPacific Ln. S	3/22/2013	Fish	Mid	0	0	0	1.75	0	0	0	20
	3/23/2013	Fish		0	0	0	6.79	0	0	0	19
	7/12/2013	Fish		0	0	0	7.37	0	0	1.6	30
	7/13/2013	Fish		0	0	0	5.24	0	0	1.48	25
TransPacific Ln N	7/12/2014	Fish		0	0	0	40.33	0	0	0.5	12
	7/13/2014	fish		0	0	0	24.9	0	0	0.4	12
TransPacific Ln. S	7/12/2014	Fish		0	0	0	47.27	0	0	0	15
	7/13/2014	fish		0	0	0	23.83	0	0	0	12
Average				0.068	0.075	0	14.955	0.067	0.065	0.874	
Total # Traps											649

Oregon

Kate Brown, Governor

Department of Environmental Quality
Western Region Eugene Office
165 East 7th Avenue, Suite 100
Eugene, OR 97401
(541) 686-7838
FAX (541) 686-7551
TTY 711

May 6, 2019

VIA EMAIL, CERTIFIED MAIL, AND U.S. FIRST CLASS MAIL

Derik Vowels
Jordan Cove LNG, LLC
Pacific Connector Gas Pipeline, LP
111 SW 5th Ave., Suite1100
Portland, OR 97204

and

Jordan Cove LNG, LLC
Pacific Connector Gas Pipeline, LP
5615 Kirby, Suite 500
Houston, TX 77005

Tyler Krug, Regulatory Project Manager
North Bend Field Office, Portland District
United States Army Corps of Engineers
2201 N. Broadway Suite C
North Bend, Oregon 97459

Ms. Kimberly D. Bose,
Secretary
Federal Energy Regulatory Commission
888 First St., N.E., Room 1A
Washington, D.C. 20426
FERC Dockets No. CP17-494, CP17-495

Dear Mr.Vowels, Mr. Krug and Ms. Bose:

On October 24, 2017, the U.S. Army Corps of Engineers (Corps) notified the Oregon Department of Environmental Quality (DEQ) that it had received an application from Jordan Cove LNG LLC and Pacific Connector Gas Pipeline LP, (herein collectively referred to as "Jordan Cove" or the "Applicant") for Section 404 (Clean Water Act, or CWA) and Section 10 and 14 (Rivers and Harbors Act) permits related to construction and operation of LNG facilities and an associated pipeline (collectively, the "Project"). Consistent with its regulations, the Corps

determined that the initial application of October 24, 2017 was incomplete on November 3, 2017. Consistent with Corps regulations, the Corps requested additional information from November 2017 through May 2018 before the Corps determined it had received a complete application and issued a public notice on May 22, 2018, which commenced DEQ's water quality certification (401 WQC) review pursuant to CWA Section 401.

The proposed Project consists of two interconnected parts. The 200-acre Jordan Cove LNG Export Terminal would be located in Coos County, Oregon on the North Spit of Coos Bay. The facility would include a slip and access channel, modifications to the federal navigational channel, a marine terminal, a natural gas conditioning and liquefaction facility, temporary workforce housing, security and safety buildings, and wetland mitigation sites. The Pacific Connector gas pipeline is the second part of the Project, consisting of a 229-mile 36-inch diameter pipeline and associated roadways and work areas, extending from the terminal to interconnections with existing pipelines near Malin, Oregon. The Jordan Cove terminal would receive up to 1.2 billion cubic feet per day of natural gas from the Pacific Connector gas pipeline.

DEQ has evaluated the Project application pursuant to Section 401 of the Clean Water Act, 33 USC §1341, ORS 468B.035 through 468B.047, and DEQ's certification rules found in Oregon Administrative Rules 340, Division 048. To certify the Project, DEQ must have reasonable assurance that the proposed activities will be conducted in a manner that will not violate the applicable provisions of Sections 301, 302, 303, 306, and 307 of the Clean Water Act, and Oregon water quality standards in Oregon Administrative Rules 340, Division 041, adopted to implement these sections.

Following a preliminary review of the Project, DEQ filed a request for additional information with Jordan Cove on September 7, 2018. Jordan Cove filed responses on October 8, 2018. However, because many of the responses were incomplete or inadequate, the Department filed a supplemental information request with Jordan Cove on December 20, 2018. That request included examples of the information sought. Jordan Cove responded, in part, on January 22, February 20, and April 16, 2019, and committed to filing complete responses by the end of April 2019. DEQ filed additional requests for project information on September 25, 2018, and March 11 and 13, 2019. Jordan Cove filed a response to these requests on April 30, 2019; however, the late date of Jordan Cove's filing prevented any significant review of the material for this decision. OAR 340-048-0020(3).

On March 29, 2019, DEQ reviewed the FAST-41 Coordinated Project Plan for the Project. DEQ notes that the Corps has indicated that JCEP is considering pipeline route changes, and that the Corps intends to issue a revised public notice once it receives sufficient information regarding the changes. DEQ has not yet received information from Jordan Cove regarding these changes to the proposed Project.

DEQ denies Jordan Cove's request for 401 WQC for the Project. DEQ does not have a reasonable assurance that the construction and operation of the Project will comply with applicable Oregon water quality standards, as described in the attached Evaluation and Findings Report, which is incorporated in its entirety by this reference. DEQ's decision, however, is made without prejudice. Jordan Cove may reapply for 401 WQC for the Project, and DEQ will consider additional information that is responsive to the bases for denial in this decision.

In accordance with the Oregon Administrative Procedures Act (Oregon Revised Statute, chapter 183) and OAR 340-048-0045(2), Jordan Cove may request a contested case hearing if dissatisfied with the certification decision. Your request for a hearing must be made in writing to and received by the Department of Environmental Quality within 20 days of the date of mailing of this certification decision, and such request must comply with OAR 340-011-0530(2) and OAR 340-048-0045(2).

A request for a hearing must be mailed to:

Oregon Department of Environmental Quality
Attn: Chris Stine
165 East Seventh Avenue, Suite 100
Eugene, Oregon 97401

If a request for hearing is not received within this 20-day period, your right to a hearing will be considered waived. If you request a hearing, you will be notified of the time and place of the hearing and provided information on the procedures by which contested cases are heard, your rights, the import and effect of such a hearing, and your rights and remedies.

Contested cases are governed by the rules of the Office of Administrative Hearings, specifically OAR 137-003-0501 through -0700. As a corporation, you must be represented by legal counsel at this hearing, if any.

In accordance with OAR 340-048-0045(3), this certification decision is effective upon issuance of this decision, notwithstanding a request for a contested case or other judicial review, if any.

As noted above, this decision is being made without prejudice. Jordan Cove may resubmit an application for 401 WQC with DEQ. If Jordan Cove does so, DEQ strongly recommends that Jordan Cove, the Corps and DEQ hold a pre-application conference to ensure a shared understanding of the information and actions required to complete a subsequent review of an application in a timely manner that would avoid delays in consideration of the application by DEQ, and that is coordinated with both the Corps and the FAST-41 Project Plan being managed by the Federal Energy Regulatory Commission. DEQ also requests that if it does resubmit an application, Jordan Cove clearly indicate in such a submittal whether the applicant is seeking certification for purposes of the permits and licenses for the Project pending before both FERC and the Corps.

If you have any questions, please contact Chris Stine at stine.chris@deq.state,or.us or at (541) 686-7810 or at the address on this letterhead.

Sincerely,

Richard Whitman
Director
Oregon Department of Environmental Quality

Attachment: Evaluation and Findings Report

cc: Ms. Natalie Eades, Jordan Cove LNG
Mr. Mike Koski, Jordan Cove LNG,
Ms. Rose Haddon, Jordan Cove LNG
Mr. Bill Abadie, US Army Corp of Engineers
Mr. Sean Mole, Oregon Department of Energy
Mr. Jim Rue, Oregon Department of Land Conservation and Development
Mr. Keith Andersen, DEQ
Mr. David Belyea, DEQ
Mr. Chris Stine, DEQ
FERC Dockets No. CP17-494, CP17-495
DEQ (file)

NOTICE TO ACTIVE DUTY SERVICEMEMBERS

Active duty Service members have a right to stay these proceedings under the federal Servicemembers Civil Relief Act. For more information contact the Oregon State Bar at 800-452-8260, the Oregon Military Department at 503-584-3571 or the nearest United States Armed Forces Legal Assistance Office through http://legalassistance.law.af.mil. The Oregon Military Department does not have a toll free telephone number.

Evaluation and Findings Report

Section 401 Water Quality Certification for the Jordan Cove Energy Project

May 2019

Water Quality Division
165 E. 7th Ave., Suite 700
Eugene, OR 97401
Phone: 503-229-5696
800-452-4011
Fax: 541-686-7551
Contact: Christopher Stine

www.oregon.gov/DEQ

DEQ is a leader in restoring, maintaining and enhancing the quality of Oregon's air, land and water.

State of Oregon
Department of Environmental Quality

This report prepared by:

Oregon Department of Environmental Quality
165 E. 7th Ave. Suite 100
Eugene, OR 97401
1-800-452-4011
www.oregon.gov/deq

Contact:
Christopher Stine
541-686-7810

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Attachments

1.0 Introduction

1.1 Background

On October 24, 2017, the U.S. Army Corps of Engineers (Corps) notified the Oregon Department of Environmental Quality (DEQ) that it had received an application from Jordan Cove LNG LLC and Pacific Connector Gas Pipeline LP, (herein referred to collectively as "JCEP" "Applicant" or "Jordan Cove")JCEP for Section 404 (Clean Water Act, or CWA) and Section 10 and 14 (Rivers and Harbors Act) permits related to construction and operation of LNG facilities and an associated pipeline (collectively, the "Project"). Consistent with its regulations, the Corps determined that the initial application of October 24, 2017, was incomplete on November 3, 2017. 33 CFRR 325.1. The Corps requested additional information from JCEP on November 2017 through May 2018.

JCEP submitted additional information to the Corps on May 8, 2018. Within 15 days of receiving such information from JCEP, the Corps determined it had received a complete application, and issued a public notice on May 22, 2018 (hereinafter referred to as "the Public Notice"). Per DEQ's usual procedure regarding Corps' permit applications, DEQ treated receipt of the Public Notice as receipt of a request for water quality certification under CWA Section 401 ("WQC") for the project pursuant to OAR 340-048-0032. The Public Notice included DEQ's notice of an application for WQC, and commenced the public comment period for the Corps' section 404/10-14 permits application and DEQ's WQC. Thus, DEQ's 401 WQC review process began on May 22, 2018. The Public Notice did not specify the applicable time period for DEQ's certification review; therefore, on June 22, 2018, DEQ sent a request to the Corps for additional time to complete its water quality certification review based upon the specific factual circumstances. 33 CFR 325.2(b)(1)(ii). The Corps responded to DEQ on July 3, 2018, and consistent with its regulations, indicated that DEQ had until May 7, 2019, to act on JCEP's certification request.[1]

1.2 Additional Information Requests

Pursuant to OAR 340-048-0032(2), DEQ made a number of formal additional information requests ("AIRs") to JCEP, see Attachment A. A brief chronology of DEQ requests and JCEP responses is described below, including the supplemental response to the 9/7/18 request that identifies where JCEP's responses were deemed insufficient.

AIR-1: September 7, 2018
Subject: Minimum 401 application and decision requirements per OAR 340-048-0020 & OAR 340-048-0042.

October 8, 2018: Jordan Cove files response.

December 20, 2018: DEQ files supplemental information request providing examples of deficiencies in October 8, 2018 response.

January 22, 2019: Jordan Cove asserted that DEQ's requests were overbroad and onerous, and requested meeting with senior management and legal representatives. During this meeting, DEQ explained that the

[1] Letter from Colonel Aaron Dorf, Corps, to Richard Whitman, DEQ (July 3, 2018). DEQ notes that it also communicated to JCEP its intent to deny water quality certification prior to October 22, 2018, due to the lack of reasonable assurance of the Project's compliance with water quality standards, noting deficiencies in the application and outstanding additional information requests. At that time, JCEP indicated that such responses were forthcoming and, of its own volition, withdrew its then pending request for 401 certification with DEQ on September 25, 2018, and resubmitted a new 401 certification request for the Corps permits that same day. See Letter from Tony Diocee, JCEP to Mary Camarata et. al, DEQ, at 1 (Sept. 25, 2018).

requested information is directly related to specific provisions of the agency's rules for water quality certifications, and that the requested information is consistent with information provided by other large pipeline developers including, most recently, the Ruby pipeline. OAR 340-048-0032, -0020. In many cases, the requested information is necessary for DEQ to determine whether proposed construction methods represent the highest and best practicable treatment and/or control of wastes, activities, and flows – a central narrative water quality criterion. In other cases, particularly where the affected waterbody is water quality limited, any new discharge may be allowed only if the proponent demonstrates that the discharge would not adversely affect the water quality impairment or is allowed under a TMDL implementation plan. This requires some level of site-specific evaluation corresponding to the specific activity proposed and the condition of the waterbody. The JCEP has continued to rely on standard FERC prescriptions and suggest that DEQ use its authority to condition a certification. The problem with this approach is that it presumes that conditions would always succeed in meeting standards. DEQ requires enough information to make an informed judgement before taking such a course JCEP.

February 20, 2019: Jordan Cove files partial response to September 7, 2018 request. Commits to filing remaining material within two months.

April 16, 2019: Jordan Cove files partial response to the December 20, 2018 request.

AIR-2: September 25, 2018
Subject: Post-construction stormwater plan for Jordan Cove Terminal.

October 25, 2018: Jordan Cove files partial response.

April 1, 2019: Jordan Cove files revised stormwater plan in response to September 25, 2018 information request.

AIR-3: March 11, 2019
Subject: Requests information on selection of particular waterbody crossing methods for particular crossings, and for baseline environmental conditions for site-specific stream restoration plans. The JCEP was not able to compile and submit the information requested in time for DEQ to evaluate it before making a 401 WQC decision.

AIR-4: **March 13, 2019**
Subject: Land Use Compatibility.

April 30, 2019: Jordan Cove files a response to prior DEQ requests for information. The JCEP did not submit the information requested with adequate time for DEQ to evaluate it before making a 401 WQC decision.

On March 29, 2019, DEQ reviewed the FAST-41 Coordinated Project Plan for the Project and notes that the Corps has indicated that JCEP has changed the project scope and that the Corps intends to revise the public notice once it receives information in sufficient detail. DEQ notes that if JCEP resubmits an application to DEQ for WQC, and the project scope has changed to include the Blue Ridge Variation,[2] it would need to provide the same information to DEQ for its review.

1.3 Public Comment Period

The Corps' and DEQ's public comment period for the Project were originally set to close on July 21, 2018. The agencies extended the public comment period with a new comment close date of August 20, 2018. DEQ

[2] The Blue Ridge Variation would increase the number of perennial waterbodies crossed by the pipeline by 27. FERC DEIS at 3-20.

received about 42,000 public comments electronically and by mail.

This Evaluation and Findings Report does not include responses to these public comments because DEQ is denying certification JCEP. Therefore, a response to public comments has not been prepared.

1.4 WQC Decision

DEQ has prepared this Evaluation and Findings Report supporting the attached 401 Water Quality Certification decision (the DEQ WQC Decision) for the Corps' issuance of CWA Section 404 and RHA Section 10 permits pursuant to Section 401 of the Clean Water Act (33 U.S.C. Section 1431), Oregon Revised Statutes (ORS) chapter 468B) and OAR 340 Division 48, other water quality related requirements of state law, and in consideration of all public comments received relevant to water quality and beneficial use concerns. As described in the DEQ WQC Decision, DEQ denies the requested certification because it does not have a reasonable assurance that the construction and operation of the Project would comply with applicable state water quality standards. DEQ's decision, however, is made without prejudice. Jordan Cove may reapply for 401 WQC for the Project, and DEQ would consider additional information that is responsive to the bases for denial in this decision.

DEQ notes that it has not received an application for WQC for issuance of a FERC permit or license associated with the Project. DEQ did receive information relevant to JCEP's applications to the Corps for Section 404/10 permits on February 6, 2018; May 21, 2018; November 21, 2018; March 19, 2019 and April 30, 2019. However, to the extent there was any ambiguity as to the nature of the materials received by DEQ on February 6, 2018 (specifically, whether that submittal constituted a separate request to DEQ for WQC for any FERC authorization or was a supplement to materials for the Corps' review) JCEP confirmed in correspondence on December 7, 2018, that the February 6, 2018 materials were supplements to its application to the Corps for Section 404 and Section 10 permits. Additionally, contrary to JCEP's assertion in its December 7, 2018, letter to DEQ that JCEP had submitted to DEQ a 401 WQC application on October 22, 2017, no record supports this assertion. The only materials DEQ received regarding the Project in October of 2017 were emailed notices from the Corps on October 23, 2017 and October 24, 2017 of the Corps' receipt of Section 404/10 permit application materials from JCEP. As described above, the Corps deemed that application incomplete (33 CFR 325.2(a)). As a result, in accordance with DEQ's rule (OAR 340-048-0032(1)) DEQ did not receive a 401 WQC application from JCEP for the Corps' permits until the Corps determined JCEP's application constituted a valid request for certification and issued the Public Notice on May 22, 2018, pursuant to Corps regulations. See 33 CFR 325.2(b)(1)(ii). In the event that JCEP resubmits an application to DEQ for certification, DEQ requests that JCEP expressly state whether the application is for certification for pending FERC authorizations under the Natural Gas Act as well as the pending Corps Section 404/10 permits.[3]

2.0 Summary of Application

Section 401(a) of the Clean Water Act, 33 U.S.C. § 1341(a), requires an applicant for "a Federal license or permit to conduct any activity which may result in a discharge into the navigable waters" to provide the federal licensing or permitting agency a certification from the relevant state that the discharge would comply with applicable provisions of sections 1311, 1312, 1313, 1316, and 1317 of the Clean Water Act.

[3] At this time, DEQ is not aware of any reason why review of a new certification request would require additional time as a result of including both the Corps permits and the proposed FERC authorizations.

2.1 Legal Name of Applicant

Jordan Cove LNG, LLC
Pacific Connector Gas Pipeline, LP
5615 Kirby, Suite 500
Houston, TX 77005

2.2 Description of Project Location

2.2.1 Jordan Cove LNG Export Terminal

The Jordan Cove LNG Export Terminal and associated facilities are proposed be located primarily on the bay side of the North Spit of Coos Bay in southwest Oregon in Section 5 of Township 25 South, Range 13 West at Latitude/Longitude: 43.432238°, -124.267136°. The primary site for the LNG Terminal is about 7.5 miles up the existing Coos Bay Federal Navigation Channel, approximately 1,000 feet north of the city limit of North Bend, in Coos County, Oregon, and more than one mile away from the nearest residence. Figure 1 presents a site plan of the proposed LNG Export Terminal.

2.2.2 Pacific Connector Gas Pipeline

The Pacific Connector gas pipeline would extend for about 229 miles across Klamath, Jackson, Douglas, and Coos Counties, Oregon and terminate at the proposed Jordan Cove LNG Export Terminal in Coos County. Figure 2illustrates the proposed alignment of the Pacific Connector gas pipeline. The pipeline would occupy 4,947.7 acres of land during construction and 1,398.57 acres of land as part of a permanent easement.

2.3 Adjacent Landowners

A list of landowners adjacent to the Jordan Cove LNG Export Facility is provided in Attachment K to the Section 404/10 application to the Corps and is incorporated here by reference.

Jordan Cove seeks to negotiate agreements with private, non-federal landowners to occupy lands necessary for temporary and permanent pipeline easements. Jordan Cove would also apply for Right-of-Way Grants with Federal land agencies to construct and operate the pipeline on federally owned lands.

2.4 Description of Activity

Jordan Cove Energy Project, LP is seeking to site, construct, and operate a natural gas liquefaction and liquefied natural gas export facility to be located on the bay side of the North Spit of Coos Bay, Oregon. To supply the LNG Terminal with natural gas, Pacific Connector Gas Pipeline, LP is proposing to construct and operate a new, approximately 229-mile-long natural gas transmission pipeline and compressor station from interconnections with the existing Ruby Pipeline LLC and Gas Transmission Northwest LLC ("GTN") systems to the LNG Terminal.

The Project is described more fully in section three of this report, and in the Section 404/10 Application to the Army Corps of Engineers (NWP-2017-041), which is incorporated into this section by reference.

Figure 1: Jordan Cove LNG Export Facility

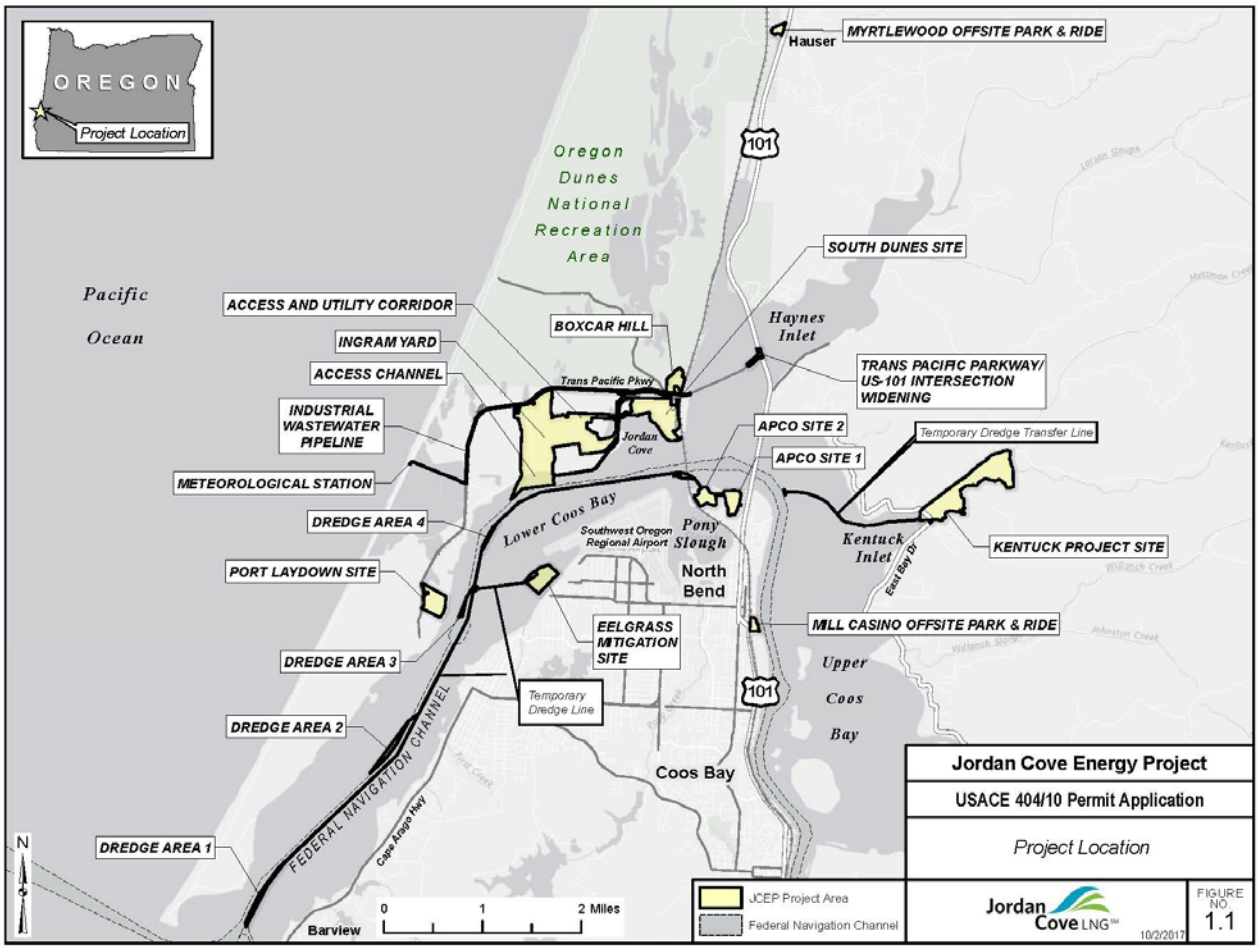
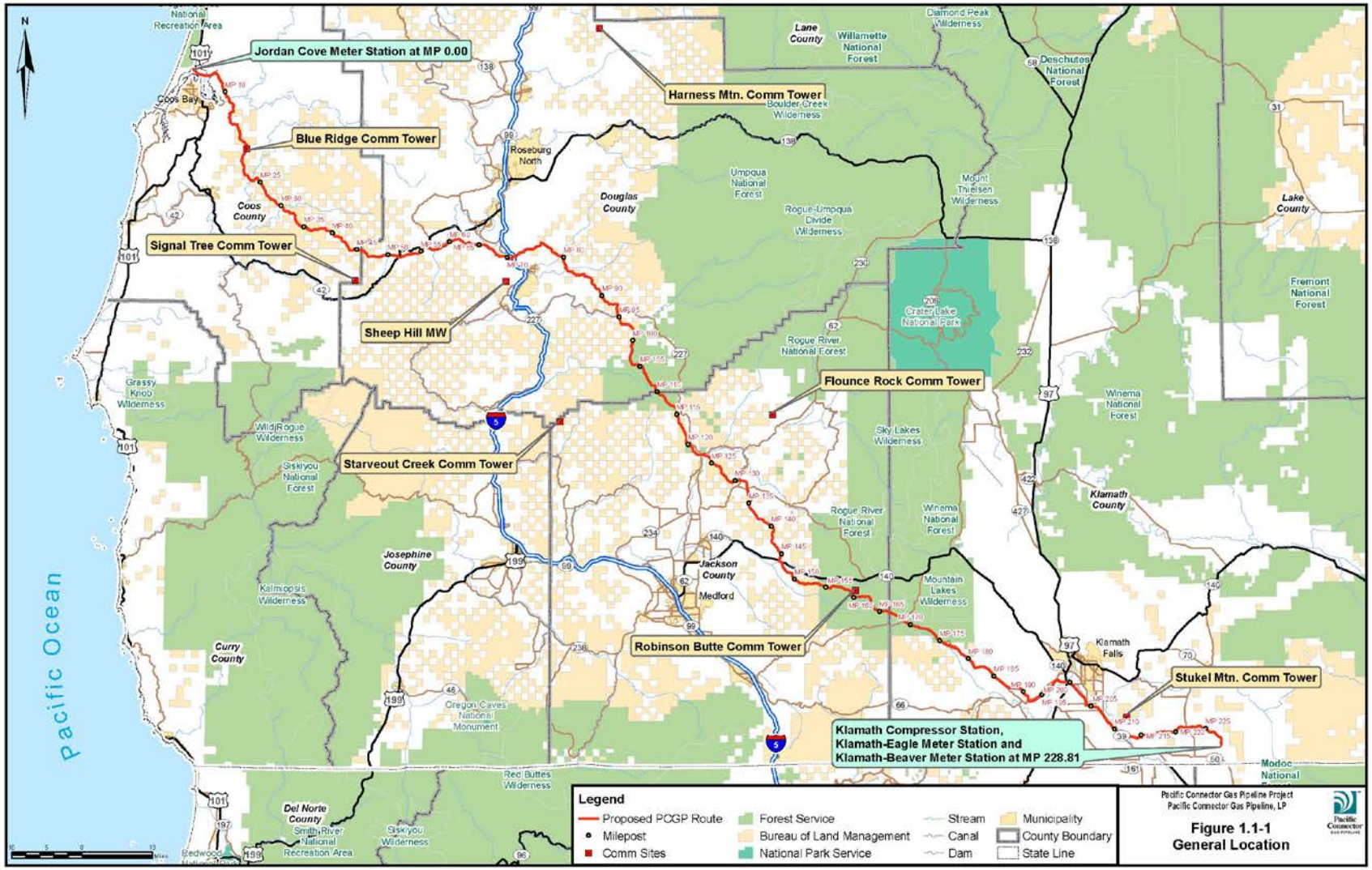


Figure 2: Pacific Connector Pipeline Alignment



2.5 Waters of the State Affected by the Project

2.5.1 Water Resources Affected by the Jordan Cove LNG Facility

Construction and operation of the Jordan Cove LNG Export Terminal would result in the temporary and permanent loss of estuarine and freshwater wetlands as well as alterations to those wetlands. In addition, the construction and operation of the Export Terminal would affect the Coos Bay estuary. A comprehensive accounting of wetland and water resources affected by the proposed action is presented in Section 6 of the Section 404/10 application to the US Army Corps of Engineers (NWP-2017-041).

2.5.2 Water Resources Affected by the Pacific Connector Gas Pipeline

Basins and watersheds affected by the proposed Pacific Connector gas pipeline are summarized in Table 1, below. The proposed pipeline would cross approximately 352 waterbodies (not including wetlands).

Table 1: Subbasins and Watersheds Crossed by the Proposed Gas Pipeline

Subbasins and Watersheds Crossed by Proposed Pacific Connector Pipeline

	Level 5 Watershed		
Subbasin	**Watershed Name**	**HUC a/**	**Miles Crossed b/**
Coos	Coos Bay- Frontal Pacific Ocean	1710030403	15.4
	South Fork Coos River c/	1710030401	2.0
Coquille	North Fork Coquille River	1710030504	11.5
	East Fork Coquille River	1710030503	9.7
	Middle Fork Coquille River	1710030501	15.8
South Umpqua	Olalla Creek-Lookingglass Creek	1710030212	8.8
	Clark Branch - South Umpqua River	1710030211	12.8
	Myrtle Creek	1710030210	8.9
	Days Creek - South Umpqua River	1710030205	19.2
	Elk Creek c/	1710030204	3.3
	Upper Cow Creek	1710030206	5.3
Upper Rogue	Trail Creek	1710030706	10.7
	Shady Cove - Rogue River	1710030707	8.1
	Big Butte Creek	1710030704	5.1
	Little Butte Creek	1710030708	32.9
Upper Klamath	Spencer Creek	1801020601	15.1
	John C. Boyle Reservoir - Klamath River-	1801020602	5.4
Lost River	Lake Ewauna-Upper Klamath River	1801020412	16.3
	Mills Creek - Lost River	1801020409	23.0
		Total	**229.1**

a/ Hydrologic Unit Code (USGS 1987).
b/ Total miles of watershed area crossed by the pipeline in each HUC, rounded to nearest tenth of a mile.
c/ There are no waterbodies crossed in these watersheds.

2.6 Documents Filed in Support of the JCEP Application

Jordan Cove submitted the following documents in support of their request for water quality certification:

May 22, 2018 – U.S. Army Corp Engineers Section 404/10 permit application (NWP-2017-014)

- US Army Corp Engineers Section 404/10 permit application materials (Oct. 23, 2017)
    - Additional Application Information to NWP-2017-041 (November 21, 2018)

- Section 401 Water Quality Package (February 6, 2018)
  Part 1: Jordan Cove Energy Project 401 Package
  Part 2: Pacific Connector Gas Pipeline 401 Package

- Additional Application Information to NWP-2017-041 (March 19, 2019).
- Responses to requests for additional information filed by DEQ on September 7, December 20, 2018, March 11 and March 13, 2019.

2.7 Public Notice(s) Issued by the Federal Licensing Authority

On May 22, 2018, the US Army Corps of Engineers publically noticed the receipt of a Section 404/10 application by the Jordan Cove LNG, LLC.[4] Corps' public notice also included a public notice of receipt of an application to DEQ for section 401 water quality certification pursuant to OAR 340-048-0032(1). The issuance date and public comment period for the applications were as follows:

Issue Date: May 22, 2018
Expiration Date: July 21, 2018
US Army Corps of Engineers No: NWP-2017-41

Following requests from the public, the Corps and DEQ extended the public comment period to August 20, 2019.

2.8 Land Use Determination by Local Planning Jurisdiction

An application for a 401 water quality certification is required to include land use compatibility findings for the activity prepared by the local planning jurisdiction (OAR 340-048-0020 (2)(i)(A)). The Project is located in the land use planning jurisdictions of Klamath County, Jackson County, Douglas County - noncoastal and coastal - sections, Coos County, City of Coos Bay, and the City of North Bend.

The JCEP supplied land use compatibility statements from Klamath County, Jackson County, Douglas County - coastal and non-coastal sections, Coos County, City of Coos Bay, and City of North Bend for the associated Pacific Connector pipeline and Jordan Cove Liquid Natural Gas Projects on January 28, 2019. DEQ found that the land use compatibility statements to be insufficient for various reasons (i.e., no determination of compatibility was made by the jurisdiction; land use approval had expired; and, in another case, an appeal was pending).

DEQ received additional information related to land use on April 30, 2019. This submission did not provide time for DEQ to evaluate it before making its 401 water quality certification decision.

Land use compatibility is addressed in more detail in Section 8 of this report.

2.9 Consistency with Other Requirements of State Law

Please refer to section 8 of this Evaluation and Findings Report.

[4] https://www.nwp.usace.army.mil/Missions/Regulatory/Notices/Article/1529167/nwp-2017-41/

3.0 Project Description

The Project consists of two distinct but interconnected parts: the Jordan Cove LNG Export Terminal, and the Pacific Connector Natural Gas Pipeline. Jordan Cove developed the Section 404/10 permit application in two sections to present each principle project component: Part 1 presents the Jordan Cove LNG Export Terminal; Part 2 presents the Pacific Connector Gas Pipeline. The following sections present descriptions of the proposed activities.

3.1 Jordan Cove LNG Export Terminal

The proposed Jordan Cove LNG export terminal would be located on the bay side of the North Spit of Coos Bay, Oregon. The export terminal and associated facilities (collectively, the "LNG Export Facilities") include the following components:

- LNG Export Terminal
- Slip and Access Channel
- Materials Offloading Facility
- Navigation Reliability Improvements
- Meteorological Station
- Industrial Wastewater Pipeline
- Trans Pacific Parkway / US 101 Widening
- APCO Sites 1 and 2
- Kentuck Site
- Eelgrass Mitigation Site
- Temporary Construction Areas

A complete description of the proposed action is presented in Section 6 of Part 1 of the Section 404/10 Permit Application filed by Jordan Cove with the Corps, and further described in Resource Report RR1 ("General Project Description") dated September 2017[5]. This report incorporates by reference the entirety of the proposed project as described in these documents and as summarized below:

LNG Terminal

The LNG Terminal includes all building infrastructure, machinery, utilities, and other project components associated with the receipt, liquefaction, storage, and loading of LNG onto ocean-going LNG carriers for export. The principle areas include the following:

- Ingram Yard – Includes LNG storage, loading, and export facilities.
- South Dunes Site – Includes temporary and permanent facilities including a Workforce Housing Facility, metering station, administrative building, and the Southwest Oregon Regional Safety Center.
- Access and Utility Corridor – A narrow corridor connects Ingram Yard with the Dunes site, which would provide temporary construction and permanent access roads and facilities, and would include the Fire Department Facility, underground utilities, and gas feed to the LNG Terminal.

Slip and Access Channel

Jordan Cove proposes a 38-acre marine slip for vessel loading. Jordan Cove proposes to excavate the marine slip from land that is currently upland area in the North Spit. To connect the Slip with the existing Coos Bay Federal Navigation Channel, Jordan Cove proposes to dredge about 22 acres of open water area. The Access Channel would be excavated to a depth of 45.21-feet MLLW with a 2-foot overdredge allowance and a 1.7-foot advance maintenance allowance (total depth of 48.91 feet MLLW, or 11.91-feet deeper than the authorized Federal

[5] Resource Report No. 1 General Project Description, Jordan Cove Energy Project September 2017. https://www.jordancovelng.com/pdf/FERC-Filing-Public-Only/JCEP/Volume-II-Public/RR1/2.1.1-JCEP-RR1.pdf

Navigational Channel depth at Channel Mile 7.3 near the proposed Project.[6]

Materials Off-Loading Facility
This area includes a permanent marine offloading facility for initial delivery of construction equipment, site construction, and future delivery of construction equipment related to facility maintenance.

Navigation Reliability Improvements
JCEP plans to excavate four submerged areas lying adjacent to the FNC to improve navigation efficiency and reliability for under broader weather conditions. The four NRI locations would require dredging approximately 700,000 cubic yards of sediment and the creation of disposal areas in the Coos Bay area.

Meteorological Station
Jordan Cove proposes to construct a new, permanent meteorological facility located on the west side of the lagoon on the North Spit. The facility would measure wind speed, direction, and other data to provide weather information to the LNG Terminal facility to support ship navigation.

Industrial Wastewater Pipeline
Relocation of an existing industrial wastewater discharge line near the Trans Pacific Parkway.

Trans Pacific Parkway and U.S. Highway 101Intersection Widening
Jordan Cove proposes to widen the intersection of the Trans Pacific Parkway and US-101 to provide safe ingress/egress during construction. The proposed widening would create a left-turn lane from Trans Pacific Parkway onto northbound US-101, and a right-turn lane from US-101 onto Trans Pacific Parkway.

APCO Sites 1 and 2
Jordan Cove proposes to utilize two land parcels on North Point, separated by a mudflat, for permanent placement of dredge material and temporary laydown of construction material.

Kentuck Project Mitigation Site
Jordan Cove proposes to mitigate for impacts to wetlands by restoring hydrologic and habitat function at the approximately 100-acre former golf course located adjacent to Kentuck Slough.

Eelgrass Mitigation Site
To mitigate for the permanent loss of eelgrass habitat due to dredging the Access Channel, Jordan Cove proposes to create a 9.3-acre eelgrass mitigation site near the offshore end of the North Bend Municipal Airport runway.

Temporary Construction Sites
Jordan Cove proposes to use additional sites outside of the immediate project construction footprint to provide space for construction staging, temporary equipment laydown, and employee park & rides. These areas include the Port Laydown site, Roseburg, Boxcar Hill, Myrtlewood and Ride and Mill Casino Park and Rides and APCO Site.

3.2 Pacific Connector Natural Gas Pipeline

Pacific Connector proposes to site, construct, and operate a 229-mile 36-inch diameter natural gas pipeline from interconnections with two existing interstate natural gas pipelines, the Ruby Pipeline and Gas Transmission Northwest LLC's GTN Pipeline, near Malin, Oregon, to the proposed Jordan Cove LNG Export Terminal near Coos Bay, Oregon. Part 2 of the Section 404/10 application filed with the Corps describes the proposed pipeline. The proposed action is further described in Resource Report RR1 ("General Project Description") provided as

[6] This depth would be consistent with the depth of the FNC that is proposed under the Port of Coos Bay Channel Modification, which is currently under consideration by the Corps. See, https://www.nwp.usace.army.mil/coast/coos-bay/channel-modification/ (last visited 5/3/2019).

Attachment A to the Corps' application. This report fully incorporates by reference the description of the proposed pipeline and associated facilities (collectively, the Applicant) presented in these two Corps' documents, which are briefly summarized below:

3.2.1 Pacific Connector Natural Gas Pipeline

Applicant is seeking to construct and operate a new 229-mile 36-inch diameter gas pipeline. The proposed pipeline would receive natural gas from interconnections near Malin, Oregon and deliver the gas to the Jordan Cove LNG Export Terminal near Coos Bay, Oregon. There, the natural gas would be liquefied, stored, and load onto vessels for transit to Pacific markets. The pipeline is expected to transport up to 1,200,000 decatherms per day (Dth/d) at 1600 psig and produce up to 7.8 million metric tons per annum (mtpa) LNG for export.

Over most of the alignment, the pipeline would occupy a 95-foot temporary easement during construction and a 50-foot permanent easement during operation. Applicant proposed exceptions to the width of both the operational and permanent easement to reduce impacts to areas such as wetlands and stream crossings. Applicant describes the proposed alignment of the Applicant gas pipeline in the Environmental Alignment Sheets, Appendix H.1 of Resource Report 1, which is incorporated herein by this reference.

3.2.2 Aboveground Facilities

Applicant proposes permanent infrastructure installations to support operation of the gas pipeline. Aboveground facilities proposed by Applicant are described in Section 1.1.2.3 of Resource Report 1, General Project Description, and summarized below.

Klamath Compressor Station

Applicant would locate the Klamath Compressor Station at MP 228.81 near the interconnection with the existing Ruby and Gas Transmission Northwest (GTN) pipelines. The compressor station includes two turbine-driven centrifugal compressor units providing 62,200 ISO[7] horsepower of compression and one similar 31,300 ISO horsepower compressor unit for backup compression operation.

Jordan Cove Meter Station

The Jordan Cove Meter Station would be located at the pipeline terminus on 1.72 acres of the Jordan Cove site adjacent to the LNG export terminal. A pig launcher/receiver and mainline block valve would be located within the meter station facility.

Launchers and Receivers

Pigging is the practice of using devices ("pigs") to conduct routing maintenance and inspection of pipeline interiors. Applicant would insert pigs at launching stations and transport these under pressure to a receiving station. Applicant proposes pig launching and receiving stations at each end of the pipeline. Applicant also proposes intermediate stations collocated with Block Valve Assemblies #6, #11 and #14 at MPs 71.51, 132.46 and 187.43.

Mainline Block-Valve Assemblies

Applicant proposes seven mainline block valves to isolate sections of the pipeline consistent with US Department of Transportation requirements and applicable guidance or rules by the Pipeline and Hazardous Materials Safety Administration. Applicant would automate five block-valves at intermediate locations along the alignment.

Communications Sites

Communications between the Klamath Compressor Station and the Jordan Cove Meter Station would require communication sites distributed along the pipeline alignment. Applicant expects fifteen communications locations are required including those located at the Klamath Compressor Station and the Jordan Cove Meter Station. Applicant is investigating leasing capacity from existing communications sites and building new facilities, as needed. Where feasible, new installations would be collocated with proposed aboveground facilities.

[7] International Organization for Standardization.

3.2.3 Land Requirements

Applicant describes the land required to construct and operate the proposed gas pipeline in Section 1.2 of Resource Report 1, General Project Description. DEQ incorporates this description by reference in this report. A summary of temporary and permanent land required for the project is presented in Table 2, below.

Table 2: Total Pipeline Land Requirements for Construction and Operation

Pipeline Component	Length (miles) or Number of Sites	Land Affected During Construction (acres)	Land Affected During Operation (acres)
Pipeline Facilities	229.09*	2,582.04	1,373.66[1] / 820.60
Temporary Extra Work Areas[2]	1,603	922.64	(44.80)[7]
Uncleared Storage Areas	320	676.44	0.00
Quarries & Disposal Sites	20	41.18	(41.18) [7]
Contractor and Pipe Storage Yards	36	674.17	0.00
Existing Roads Needing Improvements in Limited Locations [3]	32 Improvements (27 Roads)	22.52	(22.70)[9]
Temporary Access Roads	10	3.80	0.00
Permanent Access Roads	15	2.16[4]	2.16[4]
Aboveground Facilities	17	22.75[5]	22.75[6]
Total		**4,947.70**	**1,398.57[7, 8]**

* Because of changes in the centerline and associated MP equations, the ending MP no longer represents the actual centerline length.

[1] New permanent easement is 50-feet on private and federal lands.

[2] TEWAs are shown on the Environmental Alignment Sheets provided in Appendix H.1.

[3] Includes those existing roads requiring widening in specific locations; does not include limbing/brush clearing or blading/grading for potholes.

[4] Portions of the PARs are within the construction right-of-way and permanent easement.

[5] Construction impacts associated with the aboveground facilities are included in the construction impacts for the Pipeline facilities except the 8 potential communication tower sites and the Klamath Compressor Station, which are included here (1.61 acres and 17.14 acres, respectively).

[6] Portions of the operational impacts of the aboveground facilities are included within the permanent easement acreage.

[7] Represents TEWAs, existing quarries, and rock source and disposal sites provided in Table A.8-4 that may be used as permanent storage areas. The acreages are not included in the overall operational total because the storage areas will not be used during operation of the Pipeline.

[8] Although the improvements will not be reclaimed, these road improvements are not needed for operations, and the acres are not included in the total operational acreage.

Source: Pacific Connector Gas Pipeline Project, Resource Report 1

3.3 Port of Coos Bay Proposed Channel Deeping Project

The Oregon International Port of Coos Bay is proposing modifications to the lower Coos Bay Federal Navigation Channel to deepen, widen and lengthen the channel (the "Port Channel Deepening Project").[8] The Port Channel Deepening Project would expand the existing channel from -37' depth and 300' width to -45' depth and 450' width from the channel entrance to river mile 8.2, just beyond the Jordan Cove LNG Export Terminal. The Port Channel Deepening Project is not included in the activity under consideration for this 401 WQC sought by Jordan Cove. Jordan Cove did not request that DEQ consider the effects of the proposed deepening of the Federal Navigation Channel in the section 401 evaluation for the JCEP. According to Jordan Cove and the U.S. Coast Guard, the JCEP could function without the Port Channel Deepening Project, although the timing and (potentially) the overall volume of vessel traffic would likely be different.

[8] https://www.portofcoosbay.com/channel-deepening

Jordan Cove requires a depth of -45 feet to accommodate the expected class of LNG carriers with a minimum 10-percent under-keel clearance while ships are in dock. Because the draft of these vessels exceeds the present depth of the Federal Navigation Channel, these vessels cannot fully utilize the channel on all tides. Further, the Port Channel Deepening Project is largely dependent on JCEP as a source of financing for the proposed work. The Federal Energy Regulatory Commission is considering the cumulative effects of the Channel Deepening Project together with the effects of the proposed LNG Export Facilities.[9] In the event that Jordan Cove resubmits an application for certification, DEQ requests that the analysis being performed for FERC (or the Corps, or other similar information) be included in the submittal to DEQ given the likelihood that if the JCEP becomes operational, the Channel Deepening Project is also likely to occur. Information that DEQ currently holds shows that there could be cumulative effects on salinity and dissolved oxygen. The significance of these effects has not been fully analyzed at this time.

4.0 Water Quality Standards

Water quality standards are comprised of three elements. These include the beneficial uses that must be protected, the water quality criteria intended to protect those uses, and an antidegradation policy that is designed to prevent worsening existing water quality. To support all beneficial uses, DEQ applies numeric and narrative criteria to specific waterbodies and reaches within those waterbodies. OAR 340, Division 41 contains Oregon's water quality standards including beneficial uses, policies, and criteria. This section of the Evaluation and Findings Report identifies the beneficial uses designated within the area of the proposed Project and the narrative and numeric criteria established to protect those uses.

[9] FERC DEIS, at 4-793.

4.1 Beneficial Uses

Table 3 identifies designated beneficial uses within the area of the proposed Project.

Table 3: Designated Beneficial Uses

Beneficial Use	South Coast		Umpqua		Rogue			Klamath	
	Estuaries and Adjacent Marine Waters	All Streams and Tributaries Thereto	South Umpqua River Main Stem	All Other Tributaries to Umpqua, North and South Umpqua Rivers	Rogue River Main Stem From Estuary to Lost Creek Dam	Rogue River Main Stem above Lost Dam and Tributaries	All Other Tributaries to Rogue River and Bear Creek	Klamath River from Klamath Lake to Keno Dam	Lost River and Lost River Diversion Channel
Public Domestic Water Supply		X	X	X	X	X	X	X	X
Private Domestic Water Supply		X	X	X	X	X	X	X	X
Industrial Water Supply	X	X	X	X	X	X	X	X	X
Irrigation		X	X	X	X	X	X	X	X
Livestock Watering		X	X	X	X	X	X	X	X
Wildlife and Hunting	X	X	X	X	X	X	X	X	X
Fishing	X	X	X	X	X	X	X	X	X
Boating	X	X	X	X	X	X	X	X	X
Water Contact Recreation	X	X	X	X	X	X	X	X	X
Aesthetic Quality	X	X	X	X	X	X	X	X	X
Hydro Power		X	X	X		X	X	X	
Commercial Navigation and Transportation	X				X			X	
Fish and Aquatic Life	X	X	X	X	X	X	X	X	X

4.2 Numeric and Narrative Criteria

Oregon has adopted numeric and narrative criteria to support designated beneficial uses. DEQ's biologically based numeric criteria identify minimum conditions necessary to support life-stage histories of sensitive aquatic receptors such as salmonids. DEQ further implement numeric criteria through basin-specific rules that reflect regional water quality requirements. DEQ uses Oregon's narrative criteria to identify goals, practices and objectives to prevent degradation of water quality characteristics necessary to support all beneficial uses.

Section 305(b) of the Clean Water Act requires that states bi-annually assess the status of water quality. Water bodies that do not provide full support for designated beneficial uses are included on a list of impaired water bodies as required by Section 303(d) of the Clean Water Act. Impaired water bodies cannot assimilate additional pollution. DEQ is required to develop Total Maximum Daily Loads for impaired segments of water bodies to reduce pollution loading with the objective of attaining compliance with numeric and narrative criteria. In water bodies that are on the 303(d) list, where no TMDL has yet been adopted, new discharges may be allowed only if it is demonstrated that they would not increase the applicable pollutant load or that any such increase is mitigated.

4.3 Antidegradation Policy

Oregon's antidegradation policy (OAR 340-041-0004) applies to all surface waters. Oregon's antidegradation policy complements the use of water quality criteria. While numeric criteria provide the minimum conditions

needed to protect designated uses, antidegradation extends protection to waters whose characteristics meet or exceed minimum criteria. The policy prohibits degradation of water quality in some circumstances and provides for exceptions in others; however, the policy allows the lowering of water quality only after a systematic decision-making process considering many factors. These factors include the waterbody classification, consideration of alternative treatments, and a comparison of economic and social benefits with environmental costs. In addition, the antidegradation policy requires the involvement of the public through direct notice and through coordination with other government agencies. In this way, DEQ makes decisions to maintain or to change current water quality only after a deliberate and inclusive process. The goal of the antidegradation policy is to prevent unnecessary further degradation of water quality and to protect, maintain, and enhance the quality of existing surfaces waters to ensure the full protection of all existing beneficial uses

5.0 Proposed Actions Included in this 401 Analysis

Sections 3.1 and 3.2 of this Evaluations and Findings Report summarize the activities that are considered in this 401 WQC. These sections describe, in more detail, the methods and activities proposed by Jordan Cove and Pacific Connector to construct and operate the Jordan Cove Energy Project.

5.1 Pipeline Construction

Pipeline construction procedures are described in Section 1.3 of Pacific Connector's Resource Report 1 and are summarized below.

The 229-mile proposed pipeline alignment extends from the Jordan Cove LNG Export Terminal in Coos Bay to interconnections with existing pipelines near Malin, Oregon. Typical construction steps include surveying and staking the alignment, clearing and grading, trenching for pipe installation, pipe assembly, pipe placement and backfilling, hydrostatic testing, and site restoration. Because of the geographic scope of the project, Applicant anticipates performing pipeline construction in at least five construction spreads.

Applicant proposes to construct the pipeline generally within a 95-foot wide temporary construction right-of-way. To reduce impacts to water bodies or other sensitive areas the construction corridor, Applicant proposes to reduce the construction right-of-way width to 75 feet when it is sited through wetlands and waterbodies. Applicant anticipates pipeline construction would require an additional 922 acres of temporary extra work areas adjacent to the construction right-of-way to accommodate temporary storage of timber, slash, soil, rock, material and other construction-related equipment.

Applicant expects to exceed the minimum pipeline burial depths required by US Department of Transportation in 49 CFR 192.327. Where possible, JCEP would install the pipeline up to 36-inches deep in Class 1 areas with normal soils and 24-inches deep in Class 1 areas with consolidated rock. Applicant may consider deeper burial depths at stream crossings based on site conditions and concerns about erosion or scour potential.

Applicant proposes a significant portion of the alignment in rugged mountainous areas of Oregon's Coast Range and Cascade Range. A portion of the alignment traverses the Tyee Core Area with in the Coast Range. This area is characterized by steep slopes, erosive soils, rapidly moving landslides, and deep-seated landslide activity. During routing of the Pipeline, Applicant generally aligned the pipeline along ridgelines, where feasible, to minimize cut and fill requirements, traversing steep slopes, and conflicts with other potential geologic hazards. However, in numerous areas the pipeline must descend and ascend steep slopes to cross stream valleys.

5.2 Waterbody Crossings

The proposed 229-mile pipeline would affect approximately 352 waterbodies (not including wetlands). Of these, 69 have been identified as perennial streams and 270 as intermittent streams. The pipeline route would also affect some ponds and ditches, and the Coos Bay estuary. For intermittent streams that are not flowing at the time of construction, Applicant proposes standard overland construction techniques consistent with FERC national guidelines. Applicant expects to bury the top of the pipe to at least five feet below the streambed at all crossings.

For most streams that are flowing at the time of construction, Applicant proposes to use one of three dry open cut crossing methods. These methods temporarily divert the flowing stream around the crossing location to allow construction to proceed in a dewatered work area. Dry open-cut techniques include:

Diverted Open-Cut

Applicant proposes a diverted open-cut for the eastern (second) crossing of the South Umpqua River at about MP 94.7. This is the only crossing where a diverted open-cut is proposed. Applicant would achieve this crossing by diverting the river's flow into half of the channel while work is performed on the opposite half. Upon completion, flow would be routed to the opposite side of the channel to complete the installation. Applicant prepared a site-specific plan for crossing the South Umpqua River at MP 94.7.39. The river is approximately 125 wide at this location.

Fluming and Dam-and-Pump Techniques

Both fluming and dam-and-pump techniques rely on diverting upstream flow around the work area. Fluming systems use gravity flow through a series of pipes, while dam-and-pump techniques use mechanical pumps to transfer flow around the isolated work area. Both are generally used on crossings under 100 feet in width. These techniques require the temporary installation of an upstream and downstream dam to isolate the work area and create a pool of water to be diverted, as well as a dewatering system to remove water from the active work area. Details of the waterbody crossing techniques proposed by Applicant are described further in Section 2.2.5 of Resource Report 2.

Direct Pipe

Direct Pipe is a trenchless technology that provides a continuously supported hole during installation. Direct Pipe installations use an articulated, steerable micro-tunnel boring machine mounted to the leading end of the pipe or casing. Applicant would use bentonite slurry to increase lubrication and advance the micro-tunnel boring machine. Direct Pipe uses lower internal pressures and eliminates the reaming and pullback requirements of a horizontal directional drill. Applicant provides an overview of Direct Pipe technology in Appendix J.2 of Resource Report 2 including a report on the proposed direct pipe crossings beneath Interstate I-5, Dole Road, a railroad, and the South Umpqua River at MP 71.30.

Horizontal Directional Drill

Applicant proposes to install the pipeline using trenchless, horizontal directional drilling techniques beneath two sections of the Coos Bay Estuary (MP 0.3–1.0 and MP 1.5–3.0), three major waterbodies (Coos River at MP 11.1R; Rogue River at MP 122.7; and Klamath River at MP 199.4). HDD installations require establishing a pilot hole along the drill path and enlarging the hole with successive passes of a reaming tool until Applicant can install the pipe . During drilling and reaming operations, Applicant would advance high pressure drilling fluid consisting of bentonite slurry through the drill pipe. Return fluid flows back through the annular space to the maintain borehole and provide lubrication. Maintaining proper pressure within the borehole is critical. Low pressure can cause the installation to seize. However, internal drilling pressures exceeding the resistive overburden forces can cause escape of drilling fluids to the overlying waterway.

5.3 Construction and Maintenance of Roads

Access to the pipeline right-of-way during construction and operation would require the use of existing access roads, the construction of new temporary and permanent access roads, and transportation of equipment within the construction and permanent right-of-ways. Roads under heavy loads represent a significant potential source of sediment input to hydrologically connected streams.

Applicant has identified over 660 miles of existing access roads that it would use to access the pipeline during construction.[10] These include roads on federal, municipal and private lands. Applicant identifies numerous miles of these existing access roads as gravel, dirt, rock, and pit run surfaced roads. Applicant has not provided a field inventory of these roads to ensure a realistic understanding of upgrades and/or best management practices that would be needed to prevent sediment runoff to receiving streams.

Applicant is also proposing the new construction of approximately 25 segments of Temporary Access Roads and Permanent Access Roads to connect the construction right-of-way with existing access roads identified above. Lastly, Applicant would use a 229-mile construction access road in the construction right-of-way to allow construction equipment and vehicles to perform trenching and pipeline construction activities. Temporary Access Roads and Permanent Access Roads must be designed, built and maintained according to minimum design standards to prevent sediment discharge during pipeline construction.

5.4 Permanent Pipeline Right-of-Way

JCEP would maintain a permanent easement for the long-term operation and maintenance of the pipeline. The permanent easement would occupy approximately 1,374 acres based on the proposed 50-foot width. Applicant would control the vegetation in 30-feet of this 50-foot permanent easement as described below. To allow access along the right-of-way for inspections and maintenance, Applicant would maintain the permanent easement in an herbaceous state within a 10-foot corridor centered on the pipeline. In addition, Applicant would maintain vegetation in a small shrub and herbaceous state within 5 feet beyond the 10-foot corridor described above. Applicant would not alter the revegetated area beyond 15 feet of the pipeline centerline.

Development and maintenance of the permanent easement would alter surface hydrology within the permanent right-of-way. To manage post-construction stormwater and groundwater flow beneath the pipeline, Applicant proposes to install permanent erosion control devices including of trench breakers, slope breakers or waterbars, and perform revegetation measures to permanently stabilize disturbed areas. DEQ recognizes stormwater runoff from permanently maintained portions of the Project right-of-way as potential sources of pollution to hydrologically connected streams and waterways. This Evaluations and Findings Report evaluates the effectiveness of BMPs and controls proposed by the JCEP to reduce the impact on water quality of stormwater from the permanent right-of-way.

5.5 Terminal and Off-Site Project Area Stormwater

DEQ requires a post-construction stormwater management plan from applicants for section 401 water quality certifications if the project will add or reconstruct impervious surface areas.[11] On September 7, 2018, DEQ requested JCEP prepare and submit a post-construction stormwater management plan developed according to DEQ's March 2018 guidelines. The plan must address proper management of process chemicals, spill containment controls, best management practices, and a maintenance schedule for engineering controls.

Applicant must also address the discharge of stormwater from off-site areas. DEQ also recognizes that stormwater discharges from these areas may contact off-site placement of dredged material causing sediment discharge, turbid

[10] Table A.8-1 (Access Road Table), Part 2, Appendix B, Section 404 Permit Application

[11] Post-Construction Stormwater Management Plan Submission Guidelines. DEQ, March 2018.

flows, and decant water (i.e., leachate) to public waters. For freshwater wetlands, the discharge of saline decant water can alter aquatic species composition. This Evaluations and Findings Report evaluates the effectiveness of BMPs proposed by the JCEP to reduce the impact on water quality of stormwater from Terminal and Off-Site Project Area stormwater.

5.6 Jordan Cove LNG Terminal Dredging

JCEP proposes to dredge portions of the North Spit of Coos Bay to construct its LNG Export Terminal. The principle areas include the marine slip, and access channel connecting the slip to the existing Federal Navigation Channel, and four areas abutting the current boundary of the navigation channel between RM 2 to RM 7 (figure 2.1-1). Dredging would modify the physical morphology of the channel, by widening four turns along the channel, to allow for more efficient transit of LNG carriers. The proposed dredging would be sloped to an angle of three feet horizontal to one foot vertical (3:1). The access channel and slip would have a depth of 45 feet (deeper than the current navigation channel, which is currently maintained at 37 feet). The proposed dredging would generate approximately 6.32 million cubic years of material. Dredged material would be used to elevate the proposed LNG Terminal facilities, and disposed of at a combination of other sites including Roseburg Forest Products, the Al Pierce Company (APCO), and at Kentuck slough (a 140-acre wetlands mitigation site). The Project would require ongoing maintenance dredging as well as the initial dredge operations.

6.0 Water Quality Compliance Evaluation

6.1 Statewide Narrative Criteria

6.1.1 Applicable Standard

Oregon Administrative Rule 340-041-0007 contains Oregon's statewide narrative criteria, which supplement Oregon's numeric water quality standards and Oregon's antidegradation policies. In pertinent part, this rule provides that:

(1) Notwithstanding the water quality standards contained in this Division, the highest and best practicable treatment and/or control of wastes, activities, and flows must in every case be provided so as to maintain dissolved oxygen and overall water quality at the highest possible levels and water temperatures, coliform bacteria concentrations, dissolved chemical substances, toxic materials, radioactivity, turbidities, color, odor, and other deleterious factors at the lowest possible levels. * * *

(7) Road building and maintenance activities must be conducted in a manner so as to keep waste materials out of public waters and minimize erosion of cut banks, fills, and road surfaces. * * *

(11) The formation of appreciable bottom or sludge deposits or the formation of any organic or inorganic deposits deleterious to fish or other aquatic life or injurious to public health, recreation, or industry may not be allowed.

6.1.2 DEQ Evaluation

6.1.2.1 Pipeline construction

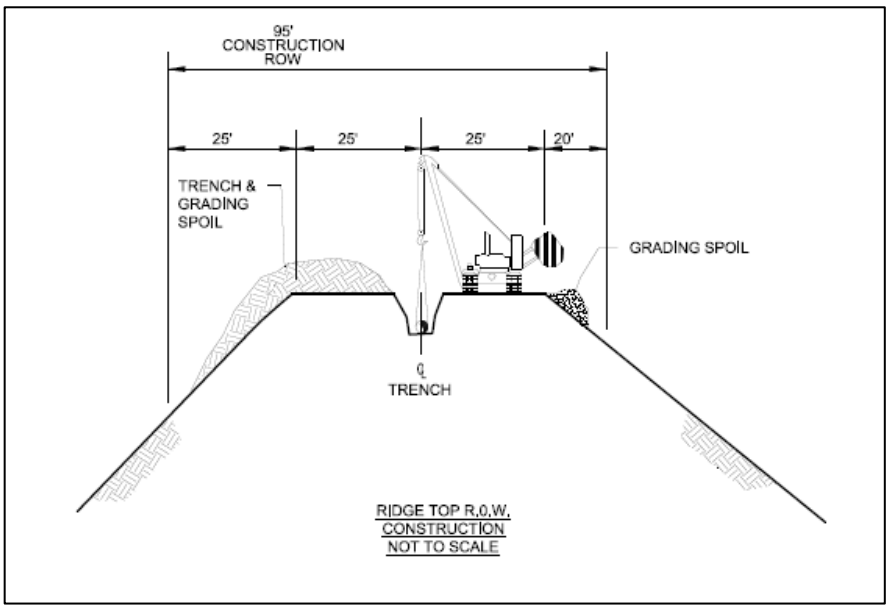
JCEP's proposed development of the construction right-of-way does not exhibit the highest and best controls and does not demonstrate that these improvements would minimize the erosion of and discharge of inorganic and organic debris, turbid flows, and sediment from cut banks, fills, and road surfaces. As noted above, pipeline construction necessitates the development of a construction right-of-way (ROW) including a construction access road for trenching and pipe laying equipment and Temporary Extra Work Areas (TEWAs) for construction staging and for storing equipment, material, and construction overburden. In developing the construction ROW, JCEP proposes to clear all trees and shrubs in this ROW. The width of this vegetation clearing would be 95 feet and

narrow down to 75 feet through wetlands and waterbody crossings. The development of TEWAs would increase the 95 foot width in upland areas and near streams and wetlands. In upland areas, JCEP would limit stump removal to the trench line and areas where grading is necessary to construct a safe, level working plane.[12] In the TEWAs, JCEP would store equipment and materials as well construction overburden (i.e., rock, soil, slash) for disposal or reuse.

The grading to level the surface in the ROW and TEWAs would include grading on steep slopes and ridgetops as depicted in Figure 3 below (Drawing Number 3430.34-X-0018).[13] This schematic is not drawn to scale as noted and does not reflect site-specific loads (trench/grading spoil and fill from leveling) placed on steep and potentially unstable slopes from the removal of rock and soil from ridgetops.

Although not delineated on JCEP's Environmental Alignment Sheets (Resource Report 1, Appendix H.1) or discussed in their Erosion Control and Revegetation Plan, typical drawings for right-of-way cross-sections in Resource Report 1 clearly show the use of a construction access road in the right-of-way. Without a durable surface, the soil in this corridor would experience compaction during the construction of the right-of-way, and during the trenching for pipe installation. The resulting soil compaction would increase runoff and, subsequently, erosion of native soils via rill and gully erosion without additional BMPs for the construction access road surface.

Figure 3: Schematic of Ridgetop Right-of-Way



JCEP has not provided BMPs for the 229-mile construction access roadway in the form design standards, specifications, and measures necessary to support the anticipated traffic load.[14] For example, design standards would inform the construction of the road surface based on estimated traffic load. Design manuals are available that provide BMPs for a stabilized construction roadway where displacement of soil occurs due to vehicle traffic.[15,]

[12] Pacific Connector Gas Pipeline. 2018. *Right-of-Way Clearing Plan for Federal Land*. Appendix E, Plan of Development Report U. Section 401 Water Quality Package

[13] Pacific Connector. 2017. *Erosion Control and Revegetation Plan*.

[14] Federal Highway Administration. 2000. *Gravel Roads – Maintenance and Design Manual*. U.S. Department of Transportation Local Transportation Assistance Program.

[15] State of California Department of Transportation. 2003, *Construction Site Best Management Practice Field Manual and Troubleshooting Guide*. CTSW-RT-02-007

[16] During a rain event, a durable unpaved road surface is essential to prevent fine soil particles from migrating to the road surface under truck traffic. Once on the road surface, stormwater entrains this soil during wet weather transporting it to swales (e.g., zero order streams), first order streams (e.g., bedrock hollows), and to streams. With the proposed pipeline alignment traversing 117 miles of steep slopes and 94 miles of severe erosion potential soils, careful selection of BMPs and the application of treatment methods are essential for water quality protection.

Construction access road design standards and specifications as well as design drawings should also guide construction of the 229-mile access road drainage system and the treatment controls for its discharge. These standards and specifications and their inclusion in design plans would influence the selection of discharge points that direct stormwater discharge to structural stormwater treatment controls or vegetated areas with permeable soils.

To avoid initiating a landslide on the extensive area of unstable slopes along the pipeline ROW, JCEP must identify the location of discharge points for concentrated stormwater flow from swales and channels collecting this runoff. In the sections below, DEQ documents the potential water quality impacts to streams that would likely result from discharges of stormwater to landslide prone slopes, as well as from the placement of fill or spoils on such slopes. JCEP has not provided specific designs for the construction access road stormwater management system adjacent to steep slopes (>30%) and landslide susceptibility zones. Rather, in Section 4.1 of the proposed ECRP, JCEP proposes a list of temporary erosion control BMPs for the construction ROW that DEQ evaluates below.

Construction Right-of-Way BMPs

JCEP would use temporary slope breakers (i.e., water bars) to prevent rill and gulley erosion when construction stormwater discharges from the ROW, the 229-mile construction access road, and the non-working side of the ROW. If properly spaced, slope breakers may effectively serve as a runoff control, preventing rill and gully erosion in the construction ROW and construction access road. However, JCEP has not provided information on how JCEP would ensure their proper function under anticipated traffic loads. Without additional design considerations, this traffic would compact the berm of the slope breaker and modify the excavated channel form, potentially modifying its flow path (see Resource Report 1, Drawing Number 3430.34-X-0008). Stormwater moving out of slope breaker and back onto the ROW would form rill and gully erosion and potentially affect the proper function of downstream temporary slope breakers.

Stormwater with suspended sediment from the construction ROW and construction access road would collect in the excavated channel in front of each slope breaker and would flow towards a discharge point. JCEP has not provided DEQ with specific information demonstrating that there are BMPs, for example, to prevent (1) rill and gully erosion from concentrated flow at discharge points and (2) sediment discharge from exposed soil to zero order streams. Zero order streams refer to swales such as bedrock hollows and are an integral part of stream networks serving as conduits to first order streams.[17] JCEP has not provided DEQ with information on the distance between the discharge point of slope breakers and other erosion control BMPs and zero order streams. Moreover, JCEP has not demonstrated that it would avoid stormwater discharge to areas of landslide susceptibility connected to zero order streams as discussed below in more detail. JCEP's proposed construction ROW would place grading spoils and, if needed, fill to level working surface. Construction of the pipeline appears likely to discharge stormwater to these landslide susceptibility zones commonly referred to convergent headwalls, as exhibited in Figure 4 below. As discussed in more detail and supported below, research and technical manuals indicate that adding water and weight to unstable slopes should be avoided during design of linear infrastructure projects.

In Section 4.1.4 of the ECRP, JCEP proposes to use mulch (i.e., effective ground cover). The application of mulch to exposed soil is an effective BMP presuming stormwater run-on controls are in place to prevent stormwater from

[16] Nevada Department of Transportation. 2004. *TC-2: Stabilized Construction Roadway*. Storm Water Quality Handbooks

[17] Gomi, Takashi, Roy C. Sidle, and John S. Richardson. 2002. *Understanding Processes and Downstream Linkages of Headwater Systems*. Bioscience, Volume 52(10): 905-916

mobilizing the mulch in runoff as discussed by Burroughs (1990). JCEP states that it would use this BMP when permanent stormwater controls such as reseeding and permanent slope breakers installed on the operational ROW are delayed beyond 20 days. During wet weather, exposed soil is subject to splash erosion initiating runoff and the potential for rill and gully erosion carrying sediment to streams. The criteria of a 20-day delay in installing permanent controls places water quality at risk. During wet weather, absent applying mulch to exposed soils within the construction ROW and control run-on to these mulched areas where construction activity is not occurring or planned in the immediate future, excessive sediment is likely to reach streams. Moreover, on its Environmental Alignment Sheets, JCEP has not delineated the travel ways into and within TEWAs or selected a durable surface for these travel way as a source control for these exposed soil surfaces. As discussed in construction stormwater manuals from California and Nevada cited above, durable surfacing for construction travel ways is a typical BMP that was not addressed in JCEP's erosion control planning.

To control sediment discharge from the 229-mile construction access road and construction right-of-way, JCEP proposes to use a silt fence parallel to the ROW. The construction ROW with its construction access road on ridgetops above steeps slopes has numerous adjacent areas with zero order streams that would serve as a channel carrying sediment from the ROW to first order streams. For areas of concentrated flow such as a swale, a silt fence is not designed to treat concentrated flow nor treat silt or clays deeper than sheet or overland flow.[18, 19] Additionally, according to the U.S. Environmental Protection Agency cited above, a silt fence has limits on the drainage area it can treat. In its submittal, JCEP provides no evaluation for the drainage area for silt fences, and does not identify alternative means of managing flow where a silt fence is inadequate. Sediment discharge overland within 200 feet of a waterbody *or a swale connected to a waterbody* has the potential to discharge sediment to this water body.[20, 21] JCEP appears to have limited its analysis to roadways and other land disturbances within 200 feet of a perennial or intermittent stream.[22]

[18] Minnesota Stormwater Manual. *Sediment Control Practices – Check Dams (Ditch Checks, Ditch Dikes)*

[19] Washington State Department of Ecology. 2017. BMP CW233: Silt Fence. Stormwater Management Manual for Western Washington

[20] Brake, D.M., Molnau, and J.G. King. 1997. *Sediment Transport Distances and Culvert Spacing on Logging Roads with the Oregon Coast Mountain Range*. Presented at the 1997 Annual Internationa ASAE Meeting Mineapolis, NM. Paper No. IM-975018

[21] Megahan, W.F. and G.L. Ketcheson. 1996. Prediction Downslope Travel of Granitic Sediments from Forest Roads in Idaho. Water Resources Bulletin Volume 32, No. 2, pages 371-382

[22] See, e.g., DEIS at 4-101.

Figure 4: Examples of Convergent Headwalls

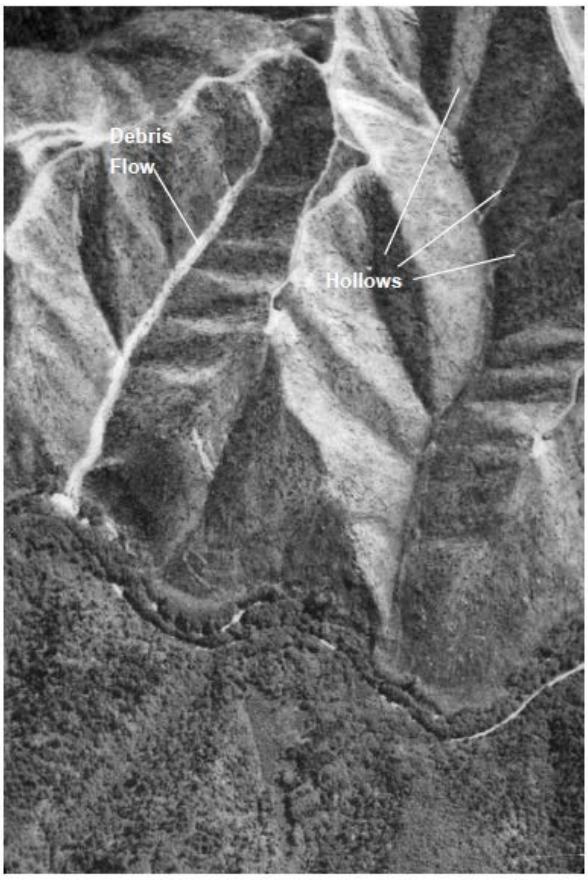


Figure 4a. Aerial View of a High Density of Bedrock Hollows in the Central Oregon Coast Range. This photo graph also shows a landslide in a bedrock hollow, triggered by a logging road, that transformed into a debris flow that deposited sediment into a larger stream. Source: Benda, Lee, Curt Veldhuisen, Dan Miller, Lynne Rodgers Miller. 1998. *Slope Instability and Forest Land Managers – A Primer and Field Guide*. Earth Systems Institute

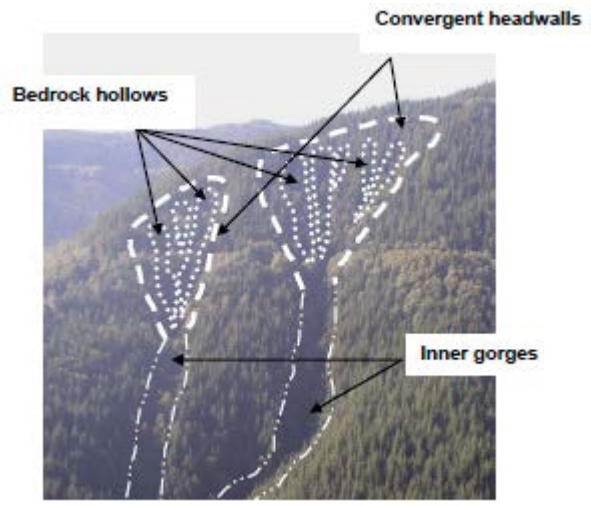


Figure 4b. Common hillslope relationship: bedrock hollows in convergent headwalls draining to inner gorges (photo and drawing by Jack Powell, DNR 2003). Source: Washington Department of Forestry. 2000. *Part 4. Characteristics of Unstable and Potentially Unstable Slopes and Landforms*. Forest Practices Board Manual

JCEP may also use biobags, straw wattles, and slash filter windrows to control sediment discharge from the construction ROW. According to the Minnesota and Washington manuals referenced above, check dams constructed of biobags and straw wattles are only moderately effective in trapping sediment and preventing channel erosion if properly spaced. Moreover, when used in a drainage swale according to the Minnesota manual, they provide only a secondary design benefit. Therefore, their application requires primary controls such as durable construction access road surfacing, stormwater management to avoid concentrated flows as well as other source controls. Additionally, JCEP would use slash filter windrows as a perimeter control for the construction right-of-way as indicated on JCEP's Environmental Alignment Sheets.

Slash filter windrows are typically placed on a contour at the toe of constructed road fill slopes to intercept sediment.[23] The research shows these windrows can reduce sediment leaving a fill slope by 75 to 85 percent

[23] Washington Department of Forestry. 2000. Forest Practices Board Manual

indicating that JCEP would need additional best management practices in a treatment train.[24] However, the literature does not indicate these controls are effective and designed for treating concentrated flows in rills, swales, and drainage channels arising from construction areas. JCEP has not provided information showing that forest slash when placed on soil surfaces dissected with rills, swales, and natural drainage channels would provide a continuous "seal" along the soil surface. Such a seal at the surface assures that a control measure for sheet runoff would trap suspended sediment. This seal at the soil surface may be achieved with a properly installed straw wattle countersunk into the soil. However, the rigid structure of forest slash would leave depressions from rills, swales, and channels below the windrow providing a path of least resistance for runoff and the sediment it carries.

In the Tyee Core Area, for example, JCEP proposes to place slash filter windrows below fill and spoils storage on headwalls. For example, in Drawing Number 3430.29-006 (Sheet 6 of 226) in the Environmental Alignment Sheets, JCEP proposes to use windrows on the border of the construction ROW where fill and/or grading spoils would be placed. JCEP would locate these windrows in a zero order stream below steep headwalls located along Pipeline Mileposts 8.56 to 8.75 (see Figure 5). These windrows and their construction stormwater discharged are directly connected to zero order streams (i.e., bedrock hollows) and, ultimately, first order streams. Absent supporting evidence demonstrating that the application of a slash filter windrow, by itself, is effective erosion control for these sensitive areas serving as conduits for first-order streams, DEQ finds this proposed method is insufficient to prevent violations of water quality. Additional information is required to demonstrate how construction stormwater would be managed above these sensitive areas.

As discussed above, JCEP proposes to use temporary slope breakers to concentrate and channel stormwater away from the construction ROW and construction access road. According to Burroughs (1990), research shows that rills and gullies resulting from concentrated road surface discharge reduces the effectiveness of mulch treatments on fill slopes and carries sediment long distances below these slopes. Burroughs (1990) also documents that uniform drainage from the road surface minimizes erosion on the fill slopes. In areas of steep slopes, JCEP is proposing to use temporary slope breakers (i.e., water bars) that – depending on its discharge point – would concentrate stormwater discharge onto fill slopes above slash filter windrows. These slash filter windrows are intended to manage sheet flow on fill slopes rather than concentrated flow from a temporary slope breaker.

In its December 20, 2018 supplemental information request, DEQ requested that JCEP use modeling to evaluate the efficacy of its proposed construction ROW BMPs to ensure JCEP is providing the highest and best treatment controls (see Page 1 – 2 of Attachment A). DEQ believes this modeling is essential to determining consistency with Oregon's statewide narrative water quality standard given the prevalence of steep slopes and zero order streams in close proximity to the construction ROW.[25] Models such as the Revised Universal Soil Loss Equation Version 2 (RUSLE2) are designed to evaluate the efficacy of BMPs proposed for concave, convex, and uniform slopes as well as cut and fill slope scenarios.[26] Practitioners of soil conservation have used versions of this model for decades. Moreover, Wisconsin requires comparable modeling for construction sites as a demonstration of compliance with a sediment performance standard.[27] JCEP has not performed an evaluation using RULSE2 or a comparable model to identify the most effective suite of BMPs given the site-specific conditions and constraints associated with its proposed activities.

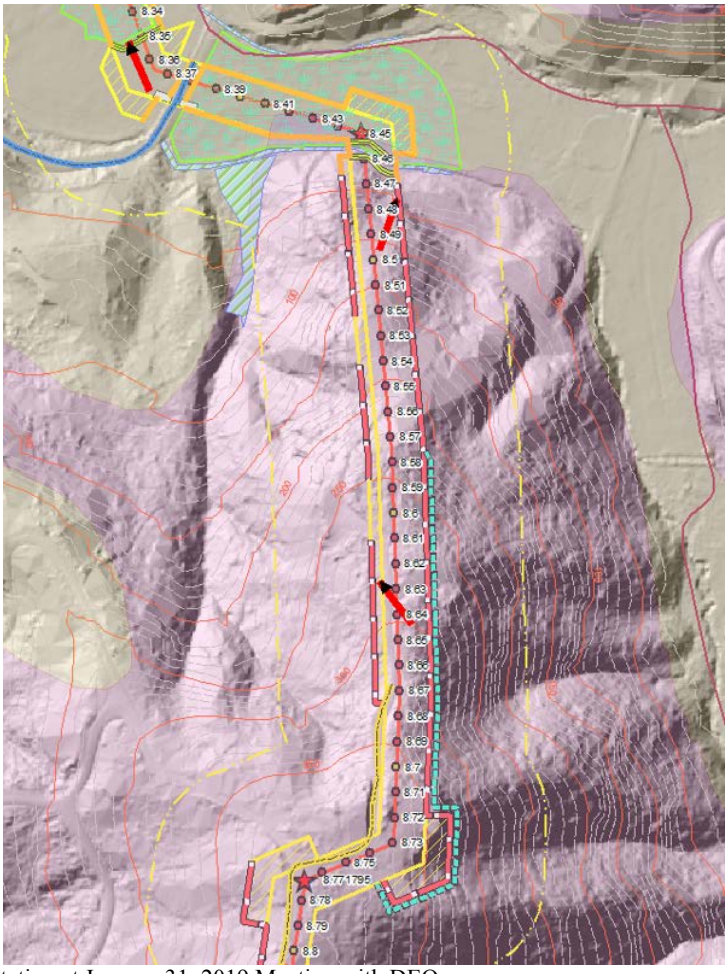
[24] Burroughs, E.R., Jr. 1990. *Predicting Onsite Sediment Yield from Forest Roads*. Proceeding of Conference XXI, International Erosion Control Association. Erosion Control: Technology in Transition. Washington, DC.

[25] See Attachment A, Page 1 and 2 of DEQ's December 20, 2018 Supplemental Information Request.

[26] USDA Natural Resource Conservation Service. Revised Universal Soil Loss Equation Version 2

[27] State of Wisconsin. 2017. *Construction Site Soil Loss and Sediment Discharge Calculation Guidance*. Bureau of Watershed Management Program Guidance, Wisconsin Department of Natural Resources. EGAD Number: 3800-2017-03

Figure 5: Spoil Placement on Headwalls for Construction ROW and TEWA 8.72-W between MP 8.56 – 8.75



Source: Pacific Connector Presentation at January 31, 2019 Meeting with DEQ.

Construction ROW Along Unstable Slopes

JCEP has not provided specific engineering drawings for its stormwater management system for the construction ROW and the 229-mile construction access road in areas of steep slopes and landslide susceptibility zones discussed below. JCEP is proposing to place grading spoils and, potentially, fill to level working surfaces, on geologically unstable slopes to support the 95-foot construction ROW including the Temporary Extra Work Areas (TEWAs). JCEP's Geologic Hazard Maps show geologically unstable slopes such as mapped landslides and rapidly moving landslide hazard areas in close proximity to the construction ROW.[28] The Oregon Department of Geology and Mineral Industries (DOGAMI) has documented landslide hazards in Oregon and, as discussed below, developed peer-reviewed procedures for identifying site-specific landslide hazards.[29] For example, the Tyee Core Area in Oregon's Coastal Range is an area of high landslide activity including both shallow and deep-seated landslides. The proposed pipeline traverses the Tyee Core Area from approximately Milepost 6 to 55. Research and technical references on slope stability are clear that land managers should avoid adding water or weight to unstable slopes and

[28] Appendix F, Geologic Hazards Maps for Pacific Connector Gas Pipeline. Part 2: Appendix C, Resource Report 6

[29] Oregon Department of Geology and Mineral Industries. Landslide Hazards in Oregon. State of Oregon

avoid cutting into unstable slopes without appropriate geotechnical engineering.[30, 31, 32, 33, 34] Oregon has seen other linear infrastructure development (i.e., roads, pipelines) initiate landslides, particularly in the Oregon coast range (State Highway 20, and Coos County Natural Gas Pipeline).[35]

Depending on the landslide type and proximity to streams, landslides can deposit substantial amounts of organic and inorganic debris into streams impacting the aquatic life dependent on these streams. Although landslides are a natural geomorphic process for streams in the Coast and Cascade Ranges, human-caused debris torrents affect water quality by changing the natural cycles of sediment delivery to stream systems.[36] For this reason as well as public safety, the Oregon Department of Forestry issued rules and technical guidance under the Oregon Forest Practice Act. The goal of these rules is to ensure forest operations such as road use and building do not initiate landslides.[37] As discussed in DEQ's December 20, 2018 supplemental information request (see Pages 13 and 19 of Attachment A), the Oregon Department of Forestry uses the Forest Practices Act rules to comply with Oregon water quality standards.[38] OAR 629-625-0200 provides that "operators shall avoid locating roads on steep slopes, slide areas, high landslide hazard locations, and in wetlands, riparian management areas, channels or floodplains where viable alternatives exist." OAR 629-625-0310(2)-(4) provides that "(2) operators shall end-haul excess material from steep slopes or high landslide hazard locations where needed to prevent landslides[;] (3) Operators shall design roads no wider than necessary to accommodate the anticipated use[;] (4) Operators shall design cut and fill slopes to minimize the risk of landslides[;] (5) Operators shall stabilize road fills as needed to prevent fill failure and subsequent damage to waters of the state using compaction, buttressing, subsurface drainage, rock facing or other effective means. Similarly, OAR 629-625-0330 includes other direction on management of drainage from forest land roads.

In the December 20, 2018 supplemental information request, DEQ provided JCEP with the basis for its concerns about slope stability along the ROW and the potential for pipeline ROW construction and ROW stormwater discharge to initiate landslides (see Pages 68 – 79 of Attachment A). DEQ also requested that JCEP use one of three slope stability models to objectively identify landslide risk areas and guide the siting of stormwater discharge points from slope breakers (i.e., water bars), the siting of grading and trench spoil storage, and design of fill on landslide susceptibility zones within or adjacent to the ROW. In preparation for a January meeting to discuss DEQ's comment, JCEP provided DEQ with several preliminary responses to DEQ's information request. These responses included a reference to a summary of JCEP's evaluation of slope stability in siting the pipeline alignment. DEQ's review of JCEP's landslide hazard assessment as presented in Resource Report 6 on Geologic Resources is summarized below.

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[30] Benda, L.E., Veldhuisen, C., Miller, D.J., and Rodgers-Miller, L. 2000. Slope instability and forest land managers: A primer and field guide. Seattle, Wash., Earth Systems Institute

[31] State of Washington. Forest Practices Board Manual. Section 16 Guidelines for Evaluating Potentially Unstable Slopes and Landforms

[32] Sidle, R.C. 1985. *Factors Influencing the Stability of Slopes*. Proceedings of a Workshop on Slope Stability: Problems and Solutions in Forest Management. USDA Forest Service. General Technical Report PN W-180

[33] Seaward, J.H. and T. Blackwood. 1998. Loading-induced Slope Failures on Bedding Planes in Sedimentary Geology of the Central Oregon Coast Range. In: Burns, S. (Editor), Environmental, Groundwater and Engineering Geology: Applications from Oregon. Belmont, California. Pages 497 – 506

[34] Hearn, G.J. 2011. Slope Engineering for Mountain Roads. Geological Society Engineering Geology Special Publication No. 24

[35] Hofmeister, R.J., D. J. Miller, K.A. Mills, J.C. Hinkle, A. Beier. 2002. Hazard Map of Potential Rapidly Moving Landslides in Western Oregon. GIS Layer for Local Governments in Implementation of Senate Bill 12. Interpretive Map Series IMS-22. Oregon Department of Geology and Mineral Industries

[36] Castro, Janine and Frank Reckendorf. 1995. Effects of Sediment on the Aquatic Environment: Potential NRCS Actions to Improve Aquatic Habitat. Working Paper No. 6. USDA Natural Resources Conservation Service

[37] Oregon Department of Forestry. 2003. *High Landslide Hazard Locations, Shallow, Rapidly Moving Landslides and Public Safety*: Screening and Practices. Forest Practice Technical Note Number 2

[38] Memorandum of Understanding between the Oregon State Department of Environmental Quality and the Oregon State Department of Forestry. April 16, 1998

Identification of Shallow Landslide Susceptibility

In Section 4.5.1 of Resource Report 6 (Geologic Resources), JCEP presents their three-phase methodology for a landslide hazard evaluation. Phase I involved an office review of geologic maps and publications, county and state hazard maps, Natural Resource Conservation Services soil surveys, topographic maps, LiDAR hillshade models, and stereo aerial photographs. Phase II involved an aerial reconnaissance, and Phase III involved a surface reconnaissance. In Section 4.5.2, JCEP clarifies its statements of risk in the landslide hazards evaluation report for Resource Report 6. For JCEP's hazard evaluation, risk only evaluated the potential for damage or failure of the pipeline from earth movements. JCEP's landslide hazard evaluation did not consider the risk of pipeline construction and operation initiating a landslide impacting water quality.

In Section 4.5.3.1, JCEP recognizes that rapidly moving landslides typically occur on steep slopes within zero order stream basins. In this section, JCEP notes that these landscape features can fail and generate a debris torrent that travels great distances along defined stream channels such a zero order streams and first order streams. DEQ provides examples of this type of unstable landscape feature in Figure 4 above.

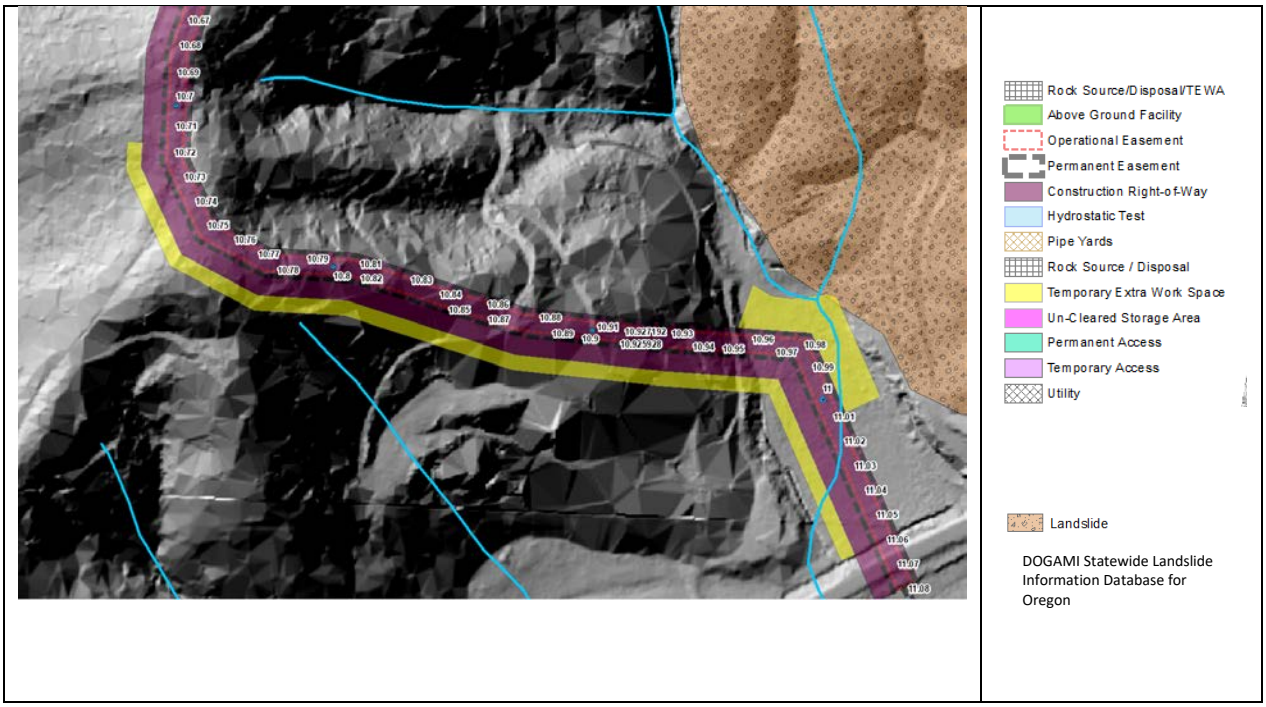
In the January 31, 2019 meeting to discuss the September 7, 2018 information request, JCEP presented a segment of the pipeline overlay on a Light Detection and Ranging Map (see Figure 5). This LiDAR map segment clearly shows the working side of the construction ROW with its construction access road and Temporary Extra Work Area above three headwalls (i.e., unstable slopes). As discussed above, these areas would support trenching and grading spoils and may require fill to level this working surface. The weight of the fill and/or trench and grading spoils, the anticipated traffic loads, and the stored material in combination with additional runoff due to the lack of a forest canopy present a substantial water quality risk to streams as well as a risk to worker and public safety.

Given its concern about slope stability above zero order streams, DEQ requested and received in February 2019 the LiDAR shapefiles used in their landslide hazard evaluation. DEQ performed a preliminary review of the LiDAR maps in a sample section of the Tyee Core Area and found many areas of concern. Two of these areas are illustrated below in Figures 6 and 7. DEQ searched for site-specific geo-engineering measures for fills and cuts on unstable slopes in information provided to-date by JCEP but found this information lacking as noted in DEQ's December 20, 2018 supplemental information request (see Page 70 – 73 and 75 to 79 of Attachment A).

Given the proposed placement of trench and grading spoils and, potentially, fill placed on the rapidly moving landslide risk area from Pipeline Milepost 8.56 to 8.75 (see Figure 5), DEQ reviewed Table B-3a in Resource Report 6 as a quality assurance check on JCEP's Phase I landslide hazard evaluation. Table B-3a summarizes the sites investigated in JCEP's Phase II field reconnaissance. In its review of this table, DEQ determined that JCEP did not include the area from between Milepost 8.56 to 8.75 in its field data collection and risk assessment. JCEP also did not conduct a surface reconnaissance for the areas of concern featured in Figures 6 and 7. Given this, DEQ referenced the methodology for identifying moderate and high rapidly moving landslide (RML) risks in Resource Report 6 as described below.

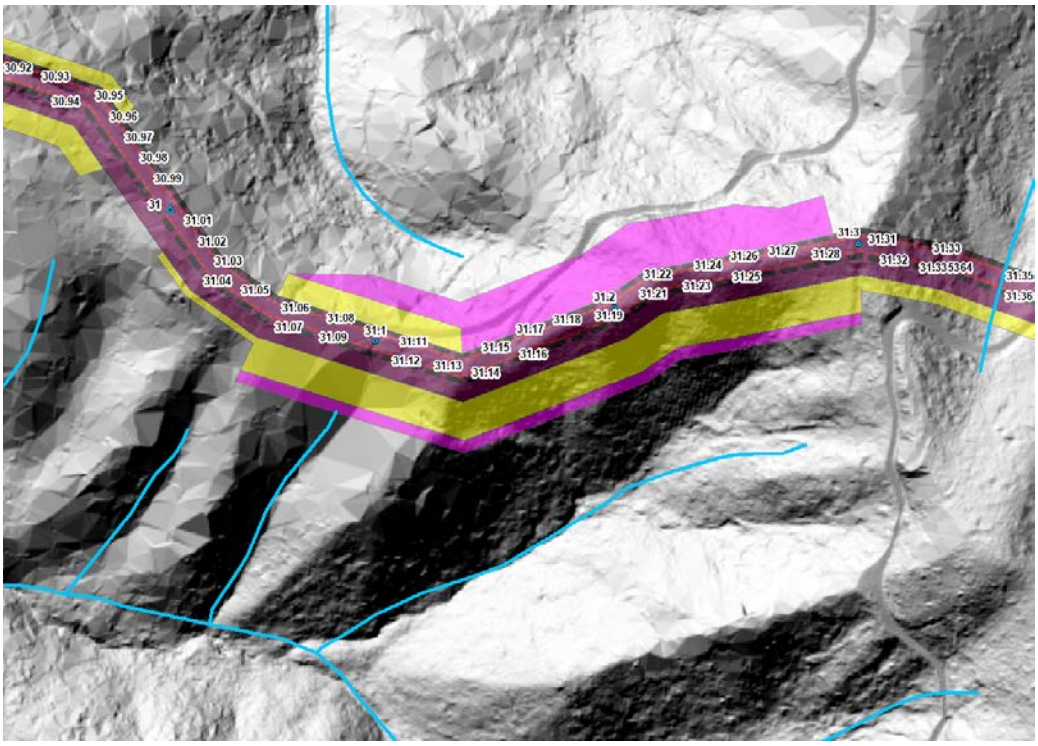
On Page 31 in Section 4.5.3.2 of Resource Report 5 (Geologic Resources), JCEP indicates it used LiDAR, 10-meter DEM, and aerial photography to identify moderate and high RML sites. This section provides the risk criteria JCEP used to identify the RML sites selected for surface reconnaissance and included in Table B-3a. JCEP's selection criteria was to identify the potential for a RML to induce strain on the pipeline and for RML erosion to expose a pipeline. These two selection criteria would not ensure the identification of RML sites posing a risk to streams and water quality. The above quality assurance check confirmed DEQ's concerns presented in the December 20, 2018 information request that JCEP's landslide hazard evaluation did not consider the landslide hazard risks to streams initiated by the construction and operational ROW.

Figure 6: Fill Placement on Headwalls for Construction Right-of-Way and TEWA 10.71-W MP 10.78 – 10.87



Source: LiDAR and pipeline ROW data from Pacific Connector

Figure 7: Fill Placement on Headwalls for Construction Right-of-Way and TEWA 31.06-W MP 31.07 – 31.28.


Source: LiDAR and pipeline ROW data from Pacific Connector

Landslide Hazard Evaluation

DEQ consulted with the Oregon Department of Geology and Mineral Industries (DOGAMI) to identify an accepted methodology for evaluating landslide susceptibility. DOGAMI provided DEQ with protocols for inventorying existing landslides, for mapping shallow landslide susceptibility, and for mapping deep-seated landslide susceptibility.[39] While regional studies of published landslide information such as DOGAMI's State Landslide Information Database for Oregon can be useful as a screening tool, in areas of high potential risk DOGAMI recommends a site-specific landslide evaluation.

For site-specific landslide hazard evaluations, DOGAMI considers the method in Special Paper 42 (SP-42) as state-of-the-practice.[40] To evaluate this protocol, DOGAMI compared remote sensing data for effectiveness in a pilot study.[41] Findings from this study indicate the use of LiDAR data resulted in 3 to 200 times the number of landslides identified compared to regional studies using already published information. A SP-42 landslide inventory results in an Arc-GIS format geodatabase of landslide data including landslide type, size, scarp height, estimated depth to failure plane, and confidence of identification. As noted below, the results from an inventory using this protocol support the identification of shallow-landslide and deep-seated landslide susceptibility zones to complete a landslide hazard assessment.

Using the SP-42 inventory, DOGAMI recommends following the procedure in Special Paper 45 (SP-45) to identify shallow landslide susceptibility maps.[42] DOGAMI is using this procedure to produce standardized shallow landslide maps for areas in Oregon. Use of a SP-45 map to identify shallow landslide susceptibility zones is necessary to reduce landslide risk through planning and engineering. For identifying deep-seated landslide susceptibility zones, DOGAMI recommends following the procedure in Special Paper 48 (SP-48).[43] Using the site-specific landslide inventory from SP-42, the procedure in SP-48 can assist in identifying and mitigating existing deep-seated landslides and slopes. The use of SP-42 in conjunction with SP-45 and SP-48 ensures identification of all the sites within and along the pipeline ROW where geo-engineering controls are needed to prevent spoil storage, cuts, and fills from pipeline construction and stormwater discharge from initiating landslides depositing organic and inorganic debris into streams.

BMPs to Mitigate Landslides

As discussed above and supported by references, JCEP's proposed activities create a significant risk of sediment transport to both perennial and intermittent streams. In Section 4.6.1 of Resource Report 6 (Geologic Resources), JCEP identifies two primary ways that pipeline construction methods would reduce slope stability and create a risk of sediment transport. Those are deep excavation perpendicular to the slope (i.e., creating a cut across a slope), and capturing and concentrating stormwater along the ROW and discharging this stormwater to potentially unstable slopes. Placing fill on a headwall is a third way that pipeline construction would reduce slope stability.

In Section 4.6.2 of Resource Report 6, JCEP states that it would engineer fill slopes constructed at gradients of 30 percent or greater to ensure long-term slope stability. JCEP states that it would identify side-slope ROW construction segments on steep slopes during the final design phase for this project. In its December 20, 2018 supplemental information request, DEQ reviewed and noted the deficiencies in the conceptual BMPs with regard to JCEP's Erosion Control and Revegetation Plan (see Pages 76 – 77 of Attachment A).

[39] Wang, Yumei. March 20, 2019. Email to Chris Bayham Regarding DOGAMI SLIDO Data.

[40] Burns, William, J and Ian P. Madin. 2009. *Protocol for Inventory Mapping of Landslide Deposits from LiDAR Imagery*. Special Paper 42. Department of Geology and Mineral Industries. State of Oregon

[41] Burns, W.J. 2007. Comparison of Remote Sensing Datasets for the Establishment of a Landslide Mapping Protocol in Oregon. AEG Special Publication 23: Vail, Colorado, Conference Presentations. First North American Landslide Conference

[42] Burns, W.J., Ian P. Madin, and Katherine A. Mickelson. 2012. *Protocol for Shallow-Landslide Susceptibility Mapping*. Special Paper 45. Department of Geology and Mineral Industries. State of Oregon

[43] Burns, William J and Katherin A.Mickelson. 2016. Protocol for Deep Landslide Susceptibility Mapping. Special Paper 48. Department of Geology and Mineral Industries. State of Oregon

In Section 4.6.2.1 of Resource Report 6, JCEP references its Erosion Control and Revegetation Plan for BMPs to manage surface water and groundwater near unstable slopes. For BMPs to address stormwater near steep slopes, JCEP identifies the use of temporary and permanent slope breakers (i.e., water bars). As discussed above in this Evaluation and Findings Report, slope breakers concentrate stormwater in an excavated channel in front of a berm (see Resource Report 1, Drawing Number 3430.34-X-0008). Runoff would substantially increase after JCEP removes the forest and shrub canopy and herbaceous vegetation. During construction and for several years post-construction, the drainage area for each temporary slope breaker is the 95-foot wide construction ROW and the 100 feet of ROW to the next temporary slope breaker based on FERC's spacing requirements. JCEP has not provided DEQ with the location of the discharge points for the concentrated flow in temporary slope breakers near unstable geologic features. Without additional BMPs near unstable slopes, temporary slope breakers increase the likelihood for this discharge to reduce slope stability identified by JCEP and highlighted above.

Without more developed information about the extent of areas of landslide risk and BMPs, DEQ is unable to determine what engineering controls for the design and construction of the pipeline are both feasible and reasonably likely to succeed in keeping waste materials out of public waters and minimizing erosion of cut banks, fills, and road surfaces. DEQ also is unable to determine whether JCEP can or would utilize the highest and best practicable treatment and/or control of wastes, activities, and flows so as to maintain dissolved oxygen and overall water quality at the highest possible levels and water temperatures, coliform bacteria concentrations, dissolved chemical substances, toxic materials, radioactivity, turbidities, color, odor, and other deleterious factors at the lowest possible levels. As a result, DEQ concludes that it is unable to determine that JCEP's proposed activities would be conducted in a manner that would not violate the statewide narrative criteria in OAR 340-041-0007.

6.1.2.2 Waterbody Crossings

JCEP's proposal to install a pipeline across streams does not exhibit the highest and best controls, does not demonstrate that these improvements would minimize the erosion of and discharge of inorganic and organic debris, turbid flows, and sediment from cut banks, fills, and road surfaces. Pipeline construction would affect about 352 waterbodies.[44] JCEP would install the pipeline below the stream bed of waterbodies using either trenchless methods (conventional bore, horizontal directional drill, or Direct Pipe® technique) or dry open–cut methods (diverted open cut, fluming, dam-and-pump) techniques. An evaluation of the potential water quality impacts of these waterbody crossing procedures is provided below.

Trenchless Waterbody Crossings – Horizontal Directional Drill

JCEP proposes to use the horizontal directional drill method for two crossings under the Coos Bay Estuary (MPs 0.3–1.0 and 1.5–3.0) and crossings of three major waterbodies (Coos River at MP 11.1R; Rogue River at MP 122.7; and Klamath River at MP 199.4). DEQ describes the horizontal directional drill method in section 5.2 of this report. JCEP prepared a HDD Feasibility Report that includes geotechnical engineering, recommendations, and HDD design criteria for the three proposed HDD river crossings. The report also includes a feasibility analysis of completing a HDD crossing beneath Coos Bay estuary. However, JCEP's consultant states that the "* * *feasibility evaluation of the proposed Coos Bay East HDD is based on limited subsurface data. Our conclusions should be considered preliminary pending completion of a subsurface exploration program. Resource Report 2, Appendix G.2. The feasibility analysis generally finds a low risk of drilling fluid releases. However, at the east end of the crossing approaching Kentuck Slough there is a high risk of hydraulic facture and drilling fluid surface release. Resource Report 2, Appendix G.2., at 9. The evaluation identifies potential mitigation for this risk, but it is unclear what specific mitigation measures JCEP is currently proposing.

On March 11, 2019, DEQ requested additional information to confirm the proposed HDD routes beneath the Coos

[44] There is some inconsistency between FERC's DEIS, DEIS at 2-60, which states that the pipeline would cross 352 waterbodies and Pacific Connector Gas Pipeline Resource Report 2, Appendix 2/A.2-2. September 2017, which provides that the number of crossings would be 326. DEQ has not, as this time, been able to determine the reason(s) for the discrepancy, and uses the more recent figure of 352 from the FERC DEIS here.

Bay estuary, the drilling fluid containment plans, the response procedures, and other information. As of the date of preparation of this report, DEQ had not received formal responses to this request. It is possible that some or all of this information was included in the materials submitted to DEQ on April 30, 2019. However, the timing of that submission did not provide any meaningful opportunity for DEQ review. Accordingly, because the available information evaluated to-date does not adequately characterize the proposed activities and mitigation measures, or the potential effects on water quality, DEQ cannot conclude there is a reasonable assurance that the proposed HDD crossings of the Coos Bay estuary would be conducted in a manner that would not violate the statewide narrative criteria in OAR 340-041-007.

Open Cut Waterbody Crossings

JCEP would perform dry open-cut crossing procedures at most waterbody crossings that are flowing at the time of construction (conventional trenching would be used to cross intermittent streams without flow). Both fluming and pumping methods rely on isolating a stream section with temporary dams, dewatering the work area, and bypassing flow around the isolated work area. Upon completion of pipeline installation activities JCEP proposes to restore waterways and embankments using the restoration and revegetation procedures discussed in the Erosion Control and Revegetation Plan.

The following proposed actions of the JCEP are evaluated for compliance with the Statewide Narrative Criteria:

Stream Crossings and Restoration:

To reduce impacts, JCEP proposes to complete these stream crossings in dewatered areas isolated from normal streamflow using temporary dams. JCEP's Stream Fluming Procedures and Dam and Pump Procedures describe the method for removing the flume upon completion. Upon removal, JCEP expects that short-term turbidity "could increase considerably" as the "streambed flushed clean of sediments left over from construction".[45, 46] DEQ has identified three waterbody crossings that are listed on the DEQ's 2012 303(d) list as impaired for sedimentation (S. Fork Little Butte Cr., MP 162.45; Spencer Cr. MP 171.07; Clover Cr. MP 177.76). In these particular areas, any increase in sediment loading is prohibited, at least until completion of a Total Maximum Daily Load that includes an allocation for the proposed activity, or until completion of an implementation plan that demonstrates that increased loading would be avoided. Under a Clean Water Act Section 404 Permit, DEQ would allow limited duration turbid discharges, but only if the project applies all practicable turbidity controls to minimize these discharges. JCEP's proposed methodologies include dewatering of construction areas, and dewatering and removal of temporary dams. JCEP has not presented how it would minimize sediment and turbid discharges during these activities.

DEQ's information request dated March 11, 2019, requested specific waterbody construction and restoration plans for stream crossings involving an open trench cut. These plans are necessary to demonstrate that JCEP has considered all construction concerns and constraints, restoration design alternatives, and selected the highest and best treatment alternatives to minimize pollution discharge in compliance with provisions of Oregon's Statewide Narrative Criteria. The importance of careful, detailed, site-specific planning for pipeline crossing construction and stream restoration is well-documented in the construction of the Ruby Pipeline. In the Ruby Pipeline project, a team of experts developed an approach to minimize impacts at 849 stream crossings.[47] DEQ's March 11, 2019 information request is consistent with the approach used in the Ruby Pipeline project.

Detailed construction planning is important for water quality protection. For example, on steep unstable slopes, a dewater structure can saturate the area round the structure creating a positive soil pore pressure. A positive soil pressure can destabilize a slope causing a small slope failure that discharges a debris flow into a stream. In addition, on steep slopes, spoils from trenching can discharge sediment to the stream if JCEP does not properly site

[45] September 2017. Stream Fluming Procedures. Pacific Connector Gas Pipeline. Appendix C.2 Resource Report 2

[46] September 2017. Dam and Pump Procedures. Pacific Connector Gas Pipeline. Appendix D.2 Resource Report 2

[47] Castro, J.M., A. MacDonald, E. Lynch, and R. Thorne. 2014 *Risk-based Approach to Designing and Reviewing Pipeline Stream Crossings to Minimize Impacts to Aquatic Habitats and Species*. River Research and Applications

these spoils and prevent the decant water with suspended sediment from discharging into the stream. In fact, on page 10 of JCEP's Stream Fluming Procedures, the drawing in Figure 8 of these procedures show turbid discharges of decant water from spoils placed on the construction access road and right-of-way discharging into the stream channel. This would constitute a violation of DEQ's NPDES 1200-C General Construction Stormwater Permit. Moreover, documenting and restoring the bankfull width and depth is important to avoid aggradation in front of the crossing or stream incision below the crossing.[48] DEQ has not yet received the requested plans. For this reason, DEQ cannot determine at this time that there is a reasonable assurance that the proposed action would be conducted in a manner that would not violate OAR 340-041-0007(1).

Dewatering Discharge:
JCEP describes general procedures for dewatering work areas during dry open-cut waterbody crossings. These methods rely on upland containment areas to promote sediment settling and infiltration of the turbid discharge. JCEP expects to site these structures in areas that can infiltrate the overflow from the dewatering structure into the surrounding area.

Discharging water to upland areas can locally saturate shallow soils causing slope failure and mass movement. DEQ identified several crossing locations where existing terrain and soil conditions may cause slope instability. For example, the pipeline alignment crosses Steinnon Creek at two locations, at MP 20.02BR, and 24.32BR. Steinnon Creek is a Level 0 stream and is upstream of spawning and rearing habitat for Endangered Species Act (ESA) listed Coho salmon. In Table B.3-4, JCEP notes steep topographic conditions for this reach near Milepost 20.20BR. Roering et al. (2005) and JCEP's Geologic Hazard Map (see Figure 5 of 47) identify contrasting steep and dissected terrain and a bench-like, low gradient form adjacent to this reach suggesting remnants of a deep-seated landslide and therefore an unstable slope. Steinnon Creek is crossed again at MP 24.32BR using a dry open cut procedure. The slopes adjacent to this crossing are landslides 126 and 127 identified from the Department of Geology and Mineral Industries Open File Report. JCEP has not provided DEQ with the proposed location of each dewater structure and the number of these structures for each crossing. JCEP has not presented the maintenance schedule for these dewater structure. DEQ noted additional crossing locations characterized by aquatic habitat value and steep, potentially unstable hillsides.[49]

The pipeline alignment is located in portions of the Tyee Core Area of the Oregon Coast Range characterized by steep hillsides and shallow rapidly moving landslides. To reduce the risk of landslides, the Oregon Department of Forestry recommends not discharging water or placing material on or near headwall areas. JCEP's general waterbody crossing procedures do not include site-specific information necessary to conclude that JCEP would would site and operate the dewatering structures to prevent turbid discharge, sediment discharge, and debris flows into streams. On March 11, 2019, DEQ requested information on dewatering procedures, spoil placement locations and monitoring procedures. DEQ requests this information to confirm that dewatering activities would not cause turbid discharge, sedimentation, or a discharge of organic or inorganic deposits to receiving waters as prohibited by Oregon's Statewide Narrative Criteria. DEQ has not received responses from JCEP. For this reason, DEQ also cannot find reasonable assurance that the proposed activities would be conducted in a manner that would not violate OAR 340-041-0007(1) and (11).

6.1.2.3 Road Construction and Maintenance

During pipeline construction, JCEP proposes to improve and maintain several hundred miles of existing access roads. Pipeline construction would also require the development of 25 segments of Temporary Access Roads and Permanent Access Roads. JCEP proposes to decommission the Temporary Access Roads after pipeline construction is complete, while the Permanent Access Roads would remain in use during pipeline operation. Oregon's Statewide Narrative Criteria include measures to prevent or minimize the discharge of pollutants from impacting waterbodies.

[48] Simon, Andrew, Sean J. Bennett, and Janine M. Castro. 2011. *Stream Restoration in Dynamic Fluvial System: Scientific Approaches, Analyses, and Tools*. Geophysical Monograph 194. American Geophysical Union, Washington, DC

[49] See waterbody crossings at mileposts 34.46, 44.21, 55.71, 55.90, 55.94, 56.28, 56.34, 57.11, and others.

DEQ's evaluation of the anticipated effects of JCEP's road maintenance and construction is presented below.

Existing Access Roads

JCEP proposes to use approximately 660 miles of existing access road to construct the pipeline. JCEP identifies numerous miles of these existing access roads as gravel, dirt, rock, and pit run surfaced roads. As presented on Drawing Number 3430.31-Y-Map 1 through 34 of the submittal, many of these access roads traverse steep slopes and landslide hazard areas that are in close proximity to zero order streams discussed above.

During wet weather, the existing roads would experience traffic loads moving heavy equipment, logs, and construction overburden (e.g., soil, rock, slash) during the preparation for and the construction of the pipeline. Unpaved roads require careful attention to the selection of construction design and maintenance standards to support their anticipated traffic loads. Proper selection of design standards for road surfaces prevent the failure of these surfaces under traffic loads. Heavy traffic on unstable road surfaces can result in sediment discharge to streams during wet weather. [50, 51]

JCEP would use both existing privately-owned and public access roads to clear trees from the construction right-of-way, Temporary Extra Work Areas, and other areas necessary for building and operating the pipeline. Tree harvesting on non-federal lands would require compliance with Oregon's Forest Practices Act (FPA) rules. Oregon Department of Forestry (ODF) administers these FPA rules. FPA rules regulate road construction and maintenance on privately owned roads during forest harvesting operations in wet weather. [52, 53, 54] ODF uses the FPA rules to ensure forest operations comply with water quality standards such as OAR 340-041-0007(1), (7), and (11). [55]

Maintenance Standards for Public and Private Roads

Tree harvesting and pipeline construction would also require compliance with road construction and maintenance standards for the U.S. Department of Agriculture Forest Service and U.S. Department of Interior Bureau of Land Management. These Forest Service and BLM standards include potential BMPs that could help assure compliance with the Statewide Narrative Criteria for road building and maintenance. These construction and maintenance standards would also help asssure compliance with the turbidity water quality standard discussed in Section 6.10 of this report. When DEQ lists waterbodies as water quality limited (not meeting standards) on the Clean Water Act 303(d) list, these two federal agencies develop Water Quality Restoration Plans (WQRP) to guide Forest Service and BLM actions to protect water quality standards. [56, 57, 58] In its December 20, 2018 supplemental information request, DEQ provided JCEP with an example WQRP for the South Umpqua. This WQRP identified roads as a source of sediment from erosion (see Page 43, Attachment A).

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[50] Grace III, J.M. and Clinton, B.D. 2007. Protecting Soil and Water in Forest Road Management. USDA Forest Service/University of Nebraska-Lincoln Faculty Publication Volume 50(5):1579-1584. 2007 American Society of Agricultural and Biological Engineers ISSN 0001-2351

[51] Furniss, M.J., T.D. Roelofs, and C.S. Yee. 1991. *Road Construction and Maintenance*. American Fisheries Society Special Publication 19:297-323

[52] Oregon Department of Forestry. 2003. *Wet Weather Road Use*. Forest Practice Technical Note Number 9

[53] Oregon Department of Forestry. 1999. *Road Maintenance*. Forest Practices Technical Note Number 4

[54] Oregon Department of Forestry. 2003. *Installation and Maintenance of Cross Drainage Systems on Forest Roads*. Forest Practice Technical Note Number 8

[55] Memorandum of Understanding between the Oregon State Department of Environmental Quality and the Oregon State Department of Forestry. April 16, 1998

[56] *Forest Service and Bureau of Land Management Protocol for Addressing Clean Water Act Section 303(d) Listed Waters* (May 1999, Version 2.0)

[57] Memorandum of Understanding Between United States Department of Interior Bureau of Land Management and the State or Oregon Department of Environmental Quality to Meet State and Federal Water Quality Rules and Regulations. BLM Agreement Number BLM-OR930-1702

[58] Memorandum of Understanding Between State of Oregon Department of Environmental Quality and the USDA, Forest Service Pacific Northwest Region. OMB 0596-0217, FS-1500-15

In addition, in this supplemental information request, DEQ provided JCEP with example requirements from the Forest Service regarding road maintenance (see Page 30 of Attachment A). These Forest Service requirements stem from the Forest Service Handbook and provide JCEP with water quality BMPs in the form of design and maintenance standards for unpaved roads on federal forestlands. In its October 25, 2018 response to DEQ's September 7, 2018 information request, JCEP referred DEQ to Table A.8-1 in Part 2 of Appendix B of it submittal. In DEQ's December 20, 2018 supplemental information request, DEQ reviewed Table A.8-1. In its review, DEQ highlighted the lack of information on maintenance treatments and needed road improvements in this table (see Page 41 – 42 of Attachment A).

Once tree harvesting is complete, JCEP proposes to grade a construction right-of-way including a construction access road for trenching and pipe laying equipment. This construction access road would require a durable surface to support heavy traffic loads. As discussed and referenced above in Section 6.1.2.1 on Pipeline Construction, a durable road surface prevents fine soil particles from being pushed to the road surface and carried by stormwater to drainage swales along the construction right-of-way. This durable surface as well as its stormwater management system would require monitoring and periodic maintenance to avoid erosion and subsequent sediment discharge to, for example, zero order and first order streams on ridge tops and along steep slopes. JCEP has not provided DEQ with information demonstrating that this monitoring would occur nor information on how JCEP would perform maintenance on this construction access road as well as existing access roads.

Planning for Erosion Control

JCEP proposes to use its Transportation Management Plan and Erosion Control and Revegetation Plan to identify BMPs for road construction and maintenance to minimize erosion of road cut slopes, fills, and surfaces. In reviewing these plans do not address, DEQ found no demonstration of compliance with the Oregon Forest Practice Act's road construction and maintenance requirements for non-federal, privately owned forest road segments. hydrologically connected to streams. Additionally, DEQ did not find County, Forest Service, BLM, and Bureau of Reclamation road construction and maintenance standards for unpaved road hydrologically connected to streams. In fact, a As noted in the December 20, 2018 information request (Pages 20-22 of, Attachment A) , DEQ found blank pages in the Appendices. JCEP referenced these pages in the Transportation Management Plan as containing information on JCEP's road operation and maintenance actions. Finally, DEQ did not find any discussion of the 229-mile construction access road and JCEP's maintenance plan to protect water quality while operating this road during pipeline construction.

Given this missing information, DEQ requested that JCEP provide a detailed maintenance and improvement plan for existing access roads in its September 7, 2018 information request (see Page 8 of 15 of Attachment B). DEQ also requested JCEP inventory the existing access roads to identify unpaved road segments needing improvements to support anticipated traffic loads and to ensure compliance with Forest Practices Act rules. DEQ requested that JCEP's road maintenance and improvement plan use road assessment protocols such as the Geomorphic Road Assessment and Inventory Package (GRAIP) to evaluate the potential for road surface erosion risk, gully risk, and landslide risks along the existing access roads.

In an October 25, 2018 response to these requests, JCEP indicated it would provide DEQ with a revised Table A.2-6 from Appendix A.2 of Resource Report 2 identifying BMPs for water bodies crossed by or within 100 feet of Temporary and Permanent Access Roads. In its December 20, 2018 supplemental information request, DEQ informed JCEP that lists of generic BMPs in a summary table were not responsive to DEQ's concerns regarding traffic loads on existing access roads (see Pages 40 – 41 of Attachment A). DEQ requested specific design and maintenance standards and specification by road ownership. DEQ also noted that JCEP's selection criteria for existing access roads in its inventory was not acceptable. More specifically, limiting the inventory to road segments that cross by or within 100 feet of a perennial or intermittent stream would not capture many existing access road segments that are hydrologically connected to streams. As one example, a road segment may be several hundred feet from a stream but still discharge sediment from its road surface if it has an in-slope drainage ditch with no cross drains. If its road surface is unstable during wet weather, a ditch with this design would discharge sediment

directly to a stream. Given these concerns, DEQ requested that JCEP use models such as GRAIP or the Washington Road Surface Erosion Model (WARSEM) to evaluate its proposed use of road segments. These models provide detailed protocols for determining which unpaved road segments are hydrologically connected to a stream.

In a January 2019 meeting and a February 20, 2019 response, JCEP proposed using WARSEM to perform the DEQ-requested inventory of unpaved roads to develop the DEQ-requested road maintenance and improvement plan.[59] During further discussions in conference calls, JCEP proposed to perform a Level I Inventory in WARSEM of existing access roads. A Level I Inventory is a desktop analysis using maps. In Section 4.3.2.2 of the Draft Environmental Impact Statement (DEIS) for this project activity (see Page 4-102), JCEP concludes that only 21 existing access roads could potentially deliver sediment to streams. As explained below, this conclusion is clearly erroneous given the numerous road-stream interactions in areas traversed by the construction right-of-way and given the procedures for determining hydrologic connectivity in a road system.

As a sample of road-stream intersections in the highly dissected drainage basins of the Coast and Cascade Ranges, Figure 8 shows the number of BLM road-stream crossings in just one of numerous subwatersheds where the construction ROW is located. This map does not include cross drains for roads that are also within 200 feet of a stream and, therefore, hydrologically connected to this stream. If a field inventory included cross drains, the number of road-stream interactions on this map would be greater than currently displayed in Figure 8. Many of the BLM roads depicted in the map below would serve as an existing access road for pipeline construction. Given this small area, JCEP's estimate of 21 existing access roads that could potentially deliver sediment is a significant underestimation.

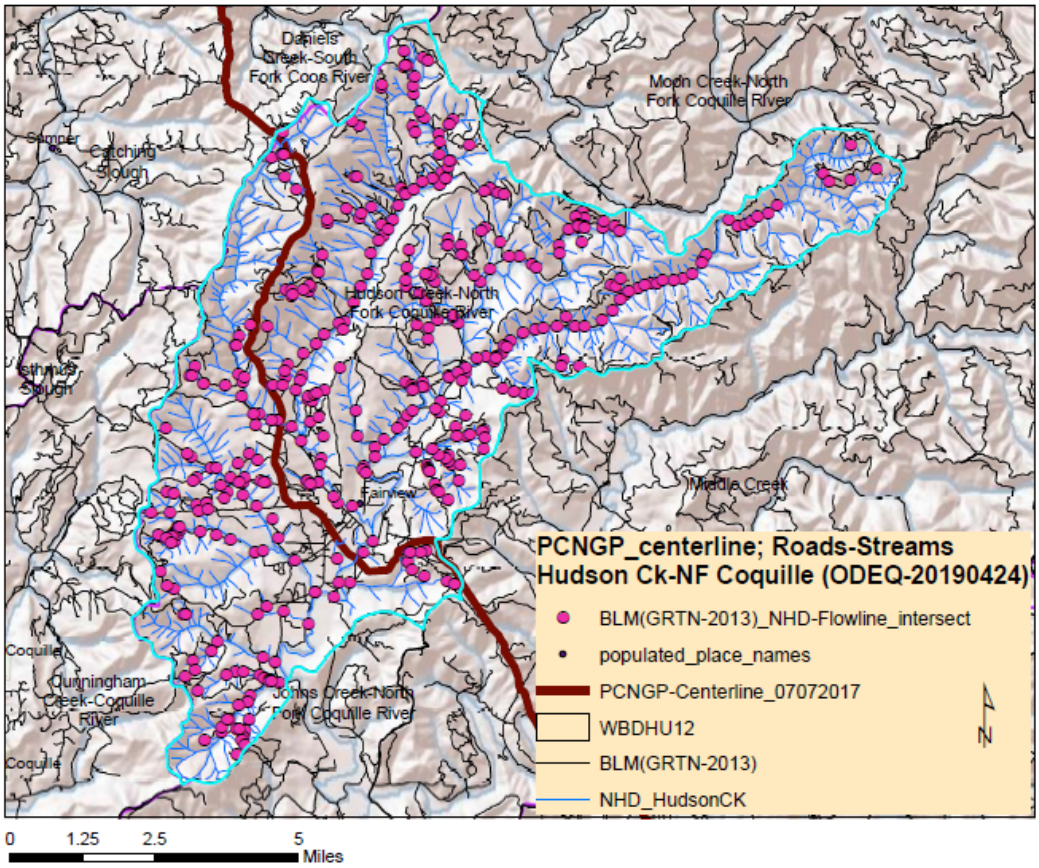
DEQ informed JCEP during the January 2019 meeting and subsequent conference calls that JCEP needed to perform an inventory of all roads segments to identify those hydrologically connected to streams. These road segments using maps during a desktop analysis. In Table 2 of the WARSEM Manual, the authors of this model clearly indicate that a determination of hydrologic connectivity requires field verification. As a result, DEQ requested a Level IV Inventory using WARSEM as this allows JCEP to document the erosion reduction from road surfaces using JCEP's maintenance and improvement plan. JCEP's conclusion that only 21 existing access roads have the potential to discharge sediment to streams is based upon road system surveys using aerial photos, maps, or other remote sensing tools. Remote sensing tools cannot serve as a substitute for a field inventory as explained below.

For example, JCEP cannot determine using maps if the surface of a road segment is out-sloping and, therefore, draining overland via the road's fill slope and undisturbed landscape. In addition, maps cannot indicate if the surface of a road segment is in-sloping and draining to a ditch carrying stormwater to a stream over several hundred feet or more downslope from this road segment. Moreover, maps cannot indicate if a road surface drains to an in-slope ditch that drains to a cross culvert (or drain) which discharges to a zero order stream connected to a first order stream. Given this, JCEP's desktop analysis of road segments is making significant assumptions that incorporate considerable error into its estimate of the number and location of road segments hydrologically connected to streams.

Such errors place surface water quality at risk from unpaved roads discharging sediment from their surface if JCEP does not maintain or improve these roads to support the anticipated traffic loads. To eliminate these errors, a WARSEM inventory protocol requiring field verification such as a Level IV Inventory or comparable analysis must be used. Further, development of a Transportation Management Plan for nonfederal roads is also required (the TMP in the 401 submittal did not discuss these roads).

[59] Dube, Kathy, Walt Megahan, and Marc McCalmon. 2004. *Washington Road Surface Erosion Model*. State of Washington Department of Natural Resources.

Figure 8: Map of Hudson Creek-North Fork Coquille Subwatershed



Road Construction

JCEP's proposed improvements of access roads include the widening of roads, the recommissioning of roads, the installation and removal of a temporary bridge, the development of turnouts, replacement of culverts at stream crossings, and the installation and removal of a temporary culvert at a stream crossing. JCEP would also build 25 segments of Temporary Access Roads and Permanent Access Roads. These proposed improvements and additions involve land disturbance that may lead to sediment and turbid discharges to streams and wetland depending on the site constraints at each improvement (Furniss et al. 1991). In Table 1.2-1 of Resource Report 1, JCEP estimates that road improvements would disturb 22.70 acres. On September 7, 2018, DEQ requested designs and specifications for these improvements and for the new roads. JCEP has not provided DEQ with the requested information regarding these improvements.

Road improvement designs and specifications as well as plan drawings showing constraints such as landslide susceptibility zones, sensitive receptors such as streams and wetlands, and BMPs are not available for DEQ to review and evaluate at this timeIn Section 1.3.4 of JCEP's Resource Report 1, JCEP notes that it would not conduct civil surveys to prepare engineering designs until the fourth quarter of 2019 for the road improvements. JCEP has only provided the general location of erosion controls proposed for the construction right-of-way on the Environmental Alignment Sheets submitted with JCEP's NPDES 1200-C Permit Application. These do not provide the engineering detail necessary to describe how JCEP would manage and treat stormwater from improved and new roads. The information submitted to date does not provide the engineering detail sufficient to describe how JCEP would stabilize road cut and fill slopes in landslide susceptibility zones.

Additionally, DEQ has not received the 1200-C required erosion control and sediment plan for these improvements to evaluate their compliance with Permit Schedule A.8.b on prevention of earth slides and A.10 on water quality

standards. In its December 20, 2018 supplemental information request (see Pages 46 – 50 and Page 80 of Attachment A), moreover, DEQ provided JCEP examples of new roads where JCEP did not provide design information, drawings, or site-specific BMPs. In providing these examples, DEQ identified its water quality concerns and the information DEQ needed to evaluate JCEP's actions to control road construction actions and road design elements that can lead to sediment and turbid discharges to streams.

As discussed in more detail above, when widening existing access roads, JCEP would cut into and the place fill on steep and/or unstable slopes. These proposed actions can initiate landslides discharging turbid flows and sediment with organic matter into zero order streams (i.e., bedrock hollows) as depicted in Figures 6 and 7. [60] DEQ detailed the potential water quality impacts of road construction and the deficiencies in JCEP's submittal in DEQ's December 20, 2018 supplemental information request (see Pages 18 – 25 of Attachment A). For example, while excavating a culvert from a stream crossing, sediment and fine soil particles generating turbid flows can discharge into streams and riverine wetlands. However, JCEP has not detailed how JCEP would address these discharges. JCEP's reliance on an Environmental Inspector to ensure effective sediment and turbidity controls during the construction process does not provide DEQ a reasonable assurance that the proposed activities will be conducted in a manner that will not violate the statewide narrative criteria.

In addition, JCEP must prepare for wet weather with an erosion and sediment control plan. Ten percent of the rain falls in the summer in Southwestern Oregon. [61] Although the probability is considerably lower, rain does occur during Oregon's in-water work period. Culvert replacements may involve the removal of substantial amounts of fill depending on the topography and road alignment relative to this topography. For its proposed culvert replacements projects, JCEP has not provided plans for locating and managing large stockpiles of excavated fill to avoid sediment and turbid discharges while JCEP installs a new culvert.

For culvert replacement projects, JCEP may clear riparian vegetation and grub their stumps from the soil adjacent to stream crossing approaches to create space for the crossing's footprint. These actions can discharge turbid flows and sediment to streams as well as increase thermal loading from the loss of riparian shade. JCEP has not documented these impacts or demonstrated what BMPs JCEP would deploy and where. Road recommissioning may involve the removal of water bars (i.e., slope breakers), reshaping the unpaved road surface to manage drainage, and reshaping drainage ditches. These land disturbing actions also can lead to sediment discharges and turbid flows into streams and wetlands during wet weather. If a decommissioned road was restored to approximate the natural contours, recommissioning may involve substantial regrading to create a travel way. This regrading may involve the development of cut and fill slopes on steep slopes and/or unstable slopes requiring geotechnical engineering to prevent landslides altering the roads' drainage system and leading to sediment and turbid discharges during wet weather.

JCEP presents it the Erosion Control and Revegetation Plan and Transportation Management Plan with their BMPs as its approach for managing water quality impacts from roads. DEQ reviewed these plans and identified their deficiencies in its December 20, 2018 supplemental information request (see Pages 10 – 25 of Attachment A). Based on DEQ's evaluation, JCEP's proposed access road improvements do not exhibit the highest and best controls, do not demonstrate that these proposed BMPs would minimize the erosion of and discharge of inorganic and organic debris, turbid flows, and sediment from cut banks, fills, and road surfaces.

6.1.2.4 Post-Construction Operation and Maintenance of Pipeline Right-of-Way

On steep slopes and near stream crossings, JCEP proposes to use permanent slope breakers to manage post-construction stormwater on the permanent ROW in compliance with 2013 FERC guidelines.[62] As discussed in Section 6.1.2.1 of this Evaluation and Findings Report, slope breakers (i.e., water bars) concentrate stormwater and

[60] Hearn, G.J. 2011. Slope Engineering for Mountain Roads. Geological Society Engineering Geology Special Publication No. 24

[61] National Climate Data Center. 2006. *Climate in Oregon*. National Oceanic and Atmospheric Administration

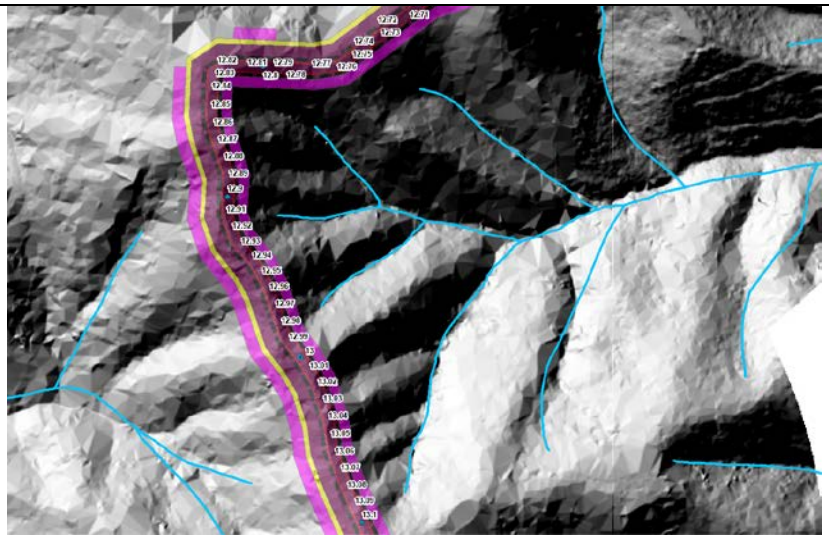
[62] Federal Energy Regulatory Commission. 2013. Upland Erosion Control, Revegetation and Maintenance Plan

discharge it outside the ROW. In the September 7, 2018 information request, DEQ requested JCEP evaluate the post-construction stormwater discharge from the 30-foot permanent ROW during the development of a post-construction stormwater management plan (see page 11 of 15 of Attachment B). For several years following the pipeline's construction, the drainage area for each permanent slope breaker on steep slopes would include 95-feet of the construction ROW width and the 100-feet of ROW to the next permanent slope breaker. This drainage area would decrease to 30 feet by 100 feet once a more mature canopy develops over several decades in the restored construction ROW. As referenced in preceding sections of this Evaluation and Findings Report, concentrating stormwater and discharging it to unstable slopes can produce positive soil pore pressures that initiate landslides.

Stormwater Discharge Relative to Unstable Slopes

To ensure compliance with statewide narrative criteria OAR 340-041-0007(1), DEQ developed the *Section 401 Water Quality Certification Post-Construction Stormwater Management Plan Submission Guidelines* (March 2018). In Section E.2.2 of these plan submission guidelines, DEQ requests that project proponents determine if infiltration of stormwater discharge should be avoided due to steep slopes or landslide risks (see Page 9). The proposed permanent ROW traverses over and along unstable slopes in numerous locations. For example, Figure 9 below shows sections of the permanent ROW above headwalls. JCEP has not provided DEQ with a post-construction stormwater plan for the permanent ROW demonstrating how JCEP would manage stormwater along the permanent ROW and, in particular, along landslide susceptibility zones. As discussed in Section 6.1.2.1 of this Evaluation and Findings Report, the stormwater discharge from slope breakers can reduce slope stability.

Figure 9: Construction Right-of-Way Above Headwall



Unknown stormwater management and discharge points between Pipeline Mileposts 12.65 – 12.86 and 12.86 – 13.1. There are two headwalls on each side of the permanent ROW between Mileposts 12.86 – 13.1 with two headwalls on each side of the permanent ROW. Source: LiDAR and pipeline ROW data from Pacific Connector

Stormwater Discharge Near Streams

In its December 20, 2018 supplemental information request, DEQ stressed that the permanent ROW is functioning as a primitive road (see Page 6 and 7 of Attachment A). Additionally, the permanent ROW would have soil compaction from pipe installation and post-construction maintenance, necessitating the need for a stormwater collection system in the form of slope breakers (i.e., water bars). Information from JCEP supports these concerns. For example, on Page 19 of JCEP's Erosion Control and Revegetation Plan (ECRP), JCEP states that it would not mitigate soil compaction over the pipeline's trench line. On page 24 of JCEP's Resource Report 6 (Geologic

Resources), JCEP notes that it would compact the fill over the pipeline after installation. In addition, on page 71 of Resource Report 1, JCEP states that – depending on trench settlement and its damage to slope breakers – sections of the pipeline would require additional fill. The compaction of this additional fill would also lead to soil compaction within the permanent right-of-way during regrading and repair of the permanent slope breakers. These activities as well as those noted below would increase runoff and sediment discharge into the permanent slope breakers.

In its Erosion Control and Revegetation Plan, JCEP references the 2013 FERC Upland Erosion Control, Revegetation and Maintenance Plan. On Page 17 of these guidelines, FERC requires pipeline operators to routinely mow or clear a corridor of 10-feet in width centered on the pipeline. This purpose of this corridor is to maintain this area in an herbaceous state. FERC also requires routine mowing and clearing at least every 3 years to maintain the remaining portion of the 30-foot right-of-way in an herbaceous and small shrub state. A pipeline industry survey indicates that more than 80% of the pipeline operators use mechanical mowing for post-construction ROW maintenance.[63] This mechanical mowing would also contribute to soil compaction. Grass surface roads discharge 50% of the sediment that discharges from a native soil surface road.[64] In fact, the authors of the Washington Road Surface Erosion Model (WARSEM) assign grass surface roads a higher erosion factor for road surfacing than gravel roads with ruts.

Figure 10 shows one of several examples of the permanent ROW crossing or paralleling streams on the 303(d) list for sediment or crossing streams discharging to these sediment-listed streams. Based on its proposed conceptual approach for operating the ROW, the permanent ROW has the potential to discharge sediment at stream crossings. Ongoing increases in sediment loading to a waterbody that is listed on the 303(d) list for sediment in not allowed without either a TMDL allocation, or an implementation plan showing that there will be no increase in loading. OAR 340-41-0004(7)("Water quality limited waters may not be further degraded except in accordance with paragraphs (9)(a)(B), (C) and (D) of this rule."[65]JCEP has not provided the analyses for the discharges that would

[63] Nowak, C., B. Ballard, P. Appelt, and D. Gartman. 2002. *Integrated Vegetation Management of Gas Pipeline Rights-of-Way*. Gas Technology Institute. GRI-01/0096

[64] Swift, L.W. 1984. Gravel and Grass Surfacing Reduces Soil Loass from Mountain Roads. Forestry Science Volume 30 Pages 657-670

[65] (9) Exceptions. The commission or department may grant exceptions to this rule so long as the following procedures are met:

(a) In allowing new or increased discharged loads, the commission or department must make the following findings:

(A) The new or increased discharged load will not cause water quality standards to be violated;

(B) The action is necessary and benefits of the lowered water quality outweigh the environmental costs of the reduced water quality. This evaluation will be conducted in accordance with DEQ's "Antidegradation Policy Implementation Internal Management Directive for NPDES Permits and section 401 water quality certifications," pages 27, and 33-39 (March 2001) incorporated herein by reference; and

(C) The new or increased discharged load will not unacceptably threaten or impair any recognized beneficial uses or adversely affect threatened or endangered species. In making this determination, the commission or department may rely on the presumption that, if the numeric criteria established to protect specific uses are met, the beneficial uses they were designed to protect are protected. In making this determination the commission or department may also evaluate other state and federal agency data that would provide information on potential impacts to beneficial uses for which the numeric criteria have not been set;

(D) The new or increased discharged load may not be granted if the receiving stream is classified as being water quality limited under sub-section (a) of the definition of "Water Quality Limited" in OAR 340-041-0002, unless:

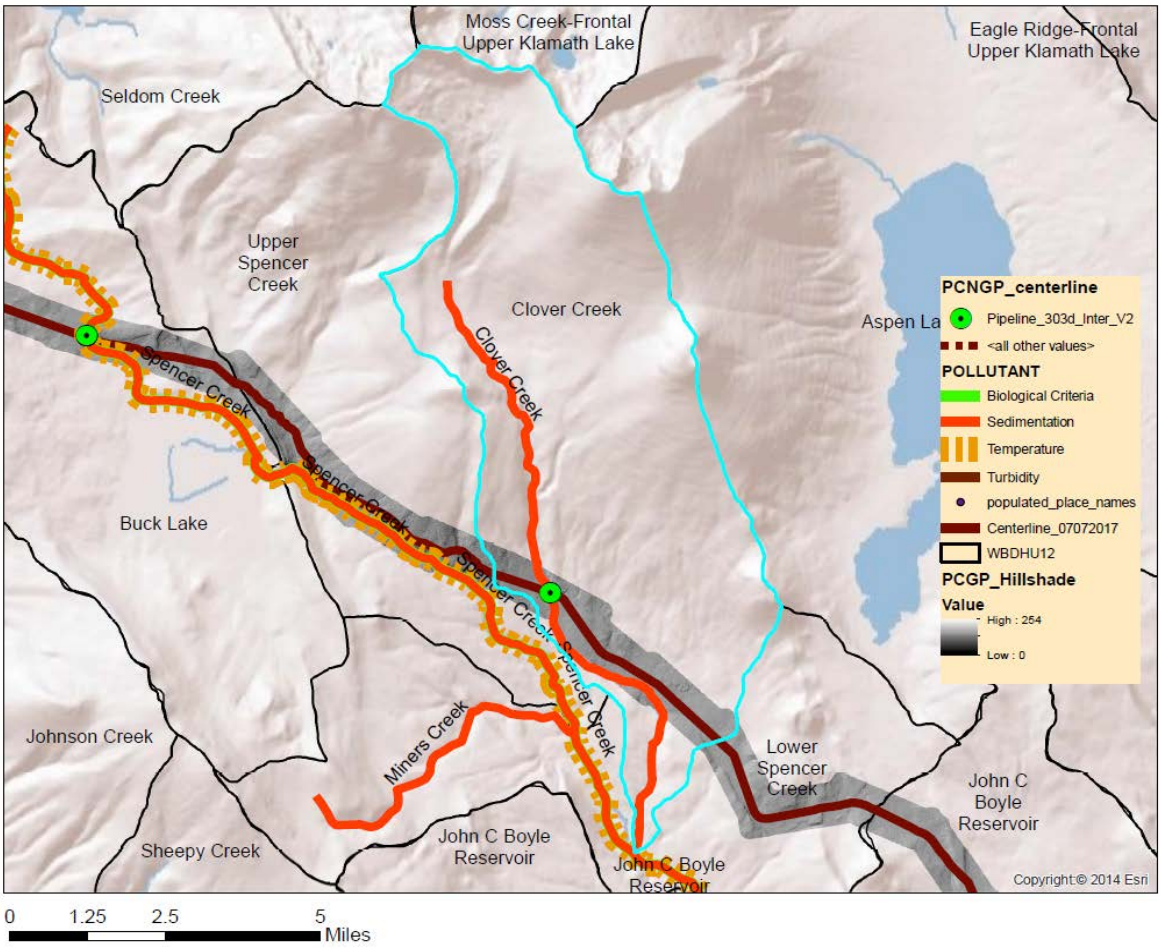
(i) The pollutant parameters associated with the proposed discharge are unrelated either directly or indirectly to the parameter(s) causing the receiving stream to violate water quality standards and being designated water quality limited; or

(ii) Total maximum daily loads (TMDLs), waste load allocations (WLAs) load allocations (LAs), and the reserve capacity have been established for the water quality limited receiving stream, compliance plans under which enforcement action can be taken have been established, and there will be sufficient reserve capacity to assimilate the increased load under the established TMDL at the time of discharge; or

(iii) Effective July 1, 1996, in water bodies designated water-quality limited for dissolved oxygen, when establishing WLAs under a TMDL for water bodies meeting the conditions defined in this rule, the department may at its discretion provide an allowance for WLAs calculated to result in no measurable reduction of dissolved oxygen (DO). For this purpose, "no measurable reduction" is defined as no more than 0.10 mg/L for a single source and no more than 0.20 mg/L for all anthropogenic activities that influence the water quality limited segment. The allowance applies for surface water DO criteria and for Intergravel dissolved oxygen (IGDO) if a determination is made that the conditions are natural. The allowance for WLAs applies only to surface water 30-day and seven-day means; or

occur at each slope breaker for each stream crossing. In addition, JCEP has not performed an analysis to demonstrate that the herbaceous area in the permanent ROW between the last slope breaker and stream is an effective BMP by itself and would not contribute to or cause a water quality standard violation, particularly near waterbodies that are not meeting standards for sediment. As noted in DEQ's September 7 (Page 11 of 15 of, Attachment B) and December 2018 (Page 66 – 68 of Attachment A) information requests, DEQ requested that JCEP evaluate the efficacy of these proposed BMPs using modeling. JCEP has not provided DEQ with this evaluation of the water quality impacts from this slope breaker discharge nor has it provided DEQ with the analysis of the proposed treatment for the discharge from slope breakers immediately upslope of a steam..

Figure 10: Pipeline Parallel to and Crossing Spencer Creek and crossing Clover Creek, near Milepost 177



(iv) Under extraordinary circumstances to solve an existing, immediate and critical environmental problem, the commission or department may, after completing a TMDL but before the water body has achieved compliance with standards, consider a waste load increase for an existing source on a receiving stream designated water quality limited under sub-section (a) of the definition of "Water Quality Limited" in OAR 340-041-0002. This action must be based on the following conditions:

(I) That TMDLs, WLAs and LAs have been set; and

(II) That a compliance plan under which enforcement actions can be taken has been established and is being implemented on schedule; and

(III) That an evaluation of the requested increased load shows that this increment of load will not have an unacceptable temporary or permanent adverse effect on beneficial uses or adversely affect threatened or endangered species; and

(IV) That any waste load increase granted under subparagraph (iv) of this paragraph is temporary and does not extend beyond the TMDL compliance deadline established for the water body. If this action will result in a permanent load increase, the action must comply with sub-paragraphs (i) or (ii) of this paragraph.

On page 63 to 68 (Attachment A) of the December 20, 2018 supplemental information request, DEQ provided JCEP with the basis for DEQ's request for the analyses described in Section E.3, E.6, and E.7 of DEQ's submission guidelines for post-construction stormwater management plans. On Page 78 to 80 of Attachment A in its December 20, 2018, supplemental information request, DEQ provided JCEP with an example of a landslide prone slope combined with erosive soils and stormwater to create soil slumping on a power line right-of-way intersecting JCEP's proposed pipeline right-of-way. These examples illustrate the site-specific challenges and need for effective BMPs to control sediment at stream crossings along the permanent right-of-way.

Based upon its evaluation, DEQ is unable to conclude that JCEP's proposed permanent pipeline right-of-way exhibits the highest and best controls, and demonstrates that proposed BMPs would minimize the erosion of and discharge of inorganic and organic debris, turbid flows, and sediment from cut banks, fills, and road surfaces. OAR 340-041-0007.

6.1.2.5 Terminal and Off-Site Project Area Stormwater

JCEP proposes to build and operate a LNG Export Terminal that would generate stormwater. JCEP proposes to use an oily waste collection system to collect and transport stormwater from drainage areas with various containment systems for tanks and bulk storage containers holding gas, diesel, and process chemicals such as amine and other chemicals yet to be identified. This oily waste system conveys stormwater to an oil/water separator that in turn discharges to an existing industrial wastewater pipeline that discharges to the Pacific Ocean. In its September 25, 2018 information request, DEQ requested JCEP identify the significant material transported within, stored, and used at the Terminal. JCEP has not identified the type of amine it would use or other process chemicals at the Terminal. This information is necessary to evaluate the water quality impacts of JCEP's proposed activities.

Additionally, the construction of the Terminal necessitates the excavation of uplands to create the Marine Slip for the Terminal and dredging to create the Access Channel and Material Offloading Facility. JCEP would use this excavated soil and dredged material as fill in the Terminal's Ingram Yard and South Dunes areas as well as in several Off-Site Project Areas such as the Roseburg Forest Products Property.[66] The leachate from dredged estuarine deposits would potentially drain to sensitive receptors such the freshwater wetlands.[67] To address during construction and post-construction stormwater discharges from the Terminal and the Off-Site Project Areas, JCEP proposed the November 2017 Storm Water Management Plan. For managing discharges transporting dredge material and the leachate from dredged material disposal, JCEP proposes to use specified Potential Dredge Disposal Locations featured in Enclosures 19 – 22 of Part 1, Appendix N-5. DEQ reviewed these documents and, based on this review, issued the information requests noted below.

In its review of the Terminal Stormwater Management Plan, DEQ used the March 2018 Section 401 Water Quality Certification Post-Construction Stormwater Management Plan Submission Guidelines. DEQ developed these guidelines to ensure project proponents used the highest and best practicable treatment control as required in Statewide Narrative Criteria OAR 340-041-0007(1). In its September 25, 2018 information request, DEQ provided JCEP with comments describing how the stormwater management plan did not address these guidelines. DEQ also requested that JCEP seek a National Pollutant Discharge Elimination System 1200-C Permit Application for the Terminal and the Off-Site Project Areas noted in its plan.

In an October 25, 2018 response to this information request, JCEP informed DEQ that it would address DEQ's comments in the first quarter of 2019. On April 1, 2019, DEQ received a revised plan entitled LNG Terminal Stormwater Management Plan. JCEP revisions partially addressed DEQ's information request. However, as noted below, JCEP has not yet demonstrated it would manage stormwater discharge with the highest and best practicable

[66] Drawing 21, Potential Dredge Disposal Locations Plan View. Section 401 Water Quality Submittal, U.S. Army Corps of Engineers Joint Permit Application. Jordan Cove Energy Project.

[67] Page 17, Table 4-1. Wetland and Estuarine Resources, LNG Terminal Stormwater Management Plan. March 2019

treatment controls, manage construction access road building and maintenance to reduce erosion, and prevent the deposit of organic and inorganic deposits deleterious to aquatic life. Moreover, JCEP has not yet demonstrated that the construction stormwater discharges would comply with applicable turbidity and biocriteria standards.

To manage construction stormwater, JCEP has not provided DEQ with a NPDES 1200-C General Permit Application(s) for construction stormwater in the Terminal, Off-Site Project Area as well as construction access roads proposed for these construction sites. The 1200-C permit application requires JCEP to submit an Erosion and Sediment Control Plan with the application. This ESCP must contain among other requirements areas of soil disturbance, drainage patterns, discharge points, sensitive receptors such as wetlands, and sediment and erosion controls including installation techniques (see Page 13 – 14 of 30, Schedule A.12, NPDES 1200-C Permit). DEQ does not have an ESCP to determine if the management of construction stormwater at these sites would violate OAR 340-041-0007(1), (7), and (11) as well as Schedule A.10 of the 1200-C permit. Schedule A.10 on In-stream Water Quality Standards states that compliance with this permit would result in stormwater discharges being controlled as necessary to meet water quality standards in the absence of information demonstrating otherwise. Without the information in the ESCP, DEQ cannot determine if the construction stormwater discharge would comply with the turbidity standard. Moreover, DEQ cannot reasonably determine that construction stormwater discharge would sufficiently protect aquatic life in wetlands and in Coos Bay.

For the revised LNG Storm Water Management Plan, DEQ's review noted significant progress in addressing DEQ's 401 plan submission guidelines. However, among the deficiencies in this revised plan, DEQ identified two proposed categories of action that do not demonstrate JCEP would meet OAR 340-041-0007(1) given the information provided in this plan. JCEP has provided incomplete information for spill containment within the Terminal. JCEP has not provided DEQ the design information for stormwater controls in the Terminal's abandoned Construction Facility Areas in the Terminal. These two deficiencies are detailed below.

In Section 5.5.2.1 of the JCEP's revised plan, JCEP proposes three categories of spill containment. In each category, JCEP provides qualitative information on proposed controls. In addition, in its April 1, 2019 response to DEQ's September 25, 2018 information request, JCEP directed DEQ to its proposed Spill Prevention, Control, and Countermeasure Plan for spill containment controls for the Terminal Stormwater Management Plan.[68] The cover of JCEP's SPCC Plan contains a note that this plan is a preliminary version. DEQ reviewed this plan and determined that it is not a complete or final plan. For example, in Table 1-1 of the SPCC Plan, the list of bulk storage containers and their secondary containment system is incomplete. JCEP does not provide information on the secondary containment for transformers. JCEP also notes that other oil storage systems and their containment controls are to be determined in the future. Additionally, Section 8 of this plan is preliminary information and JCEP notes that it would update this plan to reflect as-built controls.

In the final SPCC Plan, DEQ is seeking information on where exactly JCEP would locate on its stormwater site plan the proposed loading aprons, lined earthen berms, double walled tanks, and other containment structures designed to contain spills as well as information on the specific design features of these controls. For reasonable assurance, DEQ needs to know if JCEP would size the containment berms coupled with the containment capacity of the oil/water to capture the largest anticipated spill. Statements in the current draft SPCC Plan that JCEP would comply with federal regulations are not a demonstration that JCEP's proposed control concepts have the capacity to prevent a discharge to surface water. Site-specific information on proposed structural spill controls is essential for DEQ to evaluate their potential to control discharges to surface water. JCEP's containment controls must demonstrate consistency with the statewide narrative criteria for highest and best practicable controls to prevent the release of toxic substances to the Pacific Ocean. Site-specific design information is missing in the SPCC Plan and the revised Terminal Stormwater Management Plan.

For the abandoned Construction Facility Areas at the Terminal, JCEP did not provide DEQ with the drainage area

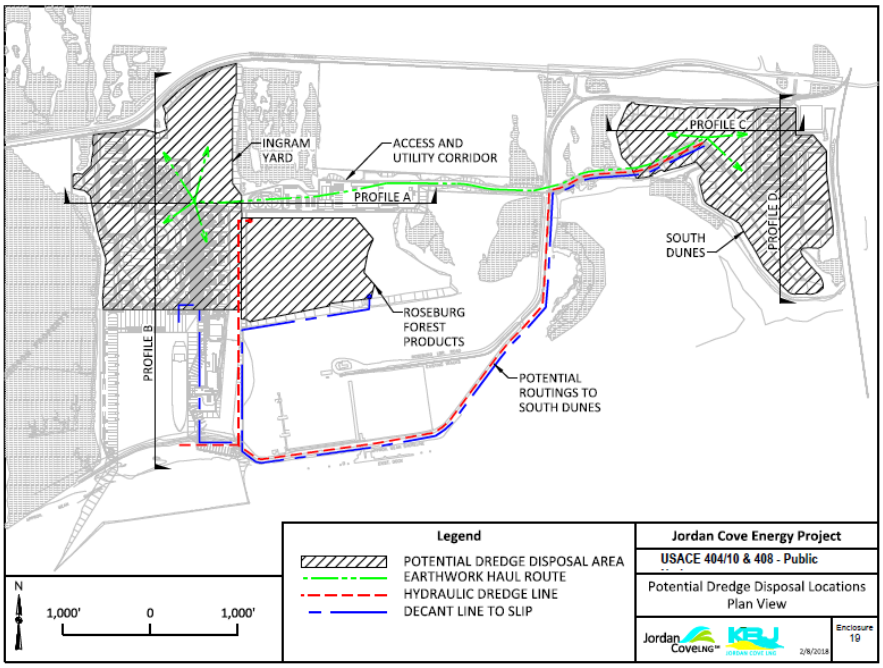
[68] Spill Prevention, Control, and Countermeasure Plan – Operation. August 29, 2017. Part 1: Appendix K, Section 401 Water Quality Package

for each infiltration control for these areas. JCEP did not provide the designs for each infiltration control that DEQ requests in Section E.7 of its 401 plan submission guidelines. Construction designs and specifications that DEQ requests in Section E.8 of these guidelines are necessary to demonstrate JCEP would prevent sediment inundation and erosion in all control prior to their operation (i.e., commissioning). Moreover, JCEP needs to provide design information to demonstrate that the infiltration controls can contain the volume of stormwater they receive without altering the hydrology of adjacent groundwater fed wetlands. Inundating these wetlands with surface water would convert them into stormwater detention ponds thus altering their resident aquatic biological communities by altering their values and functions. At present, JCEP's submittal does not demonstrate that the stormwater infiltration controls in the Construction Facility Areas provide the highest and best practicable controls of flows to meet OAR 340-041-0007(1).

For managing discharges transporting dredge material and the leachate from dredged material disposal, DEQ identified deficiencies in JCEP's proposed documents for managing dredging operations and dredge material to prevent discharges to wetlands and Coos Bay. Specifically, in its December 20, 2018 supplemental information request (see Pages 85 - 87, Attachment A), DEQ informed JCEP did not demonstrate in its submittal that the highest and best treatment controls were proposed to meet statewide narrative criteria OAR 340-041-0007(1) and (11). For example, DEQ noted that JCEP did not provide details on how JCEP would manage leachate from discharging to surround freshwater or estuarine wetlands altering their chemical composition and turbidity. Increasing turbidity in and inundating freshwater wetlands with saline leachate would alter their capacity to support the aquatic biological communities dependent on these wetlands.

In its October 8, 2018 response to DEQ's September 7, 2018 information request, JCEP referred DEQ to Potential Dredge Disposal Locations featured in Enclosures 19 – 22 of Part 1, Appendix N-5 of the 401 Water Quality Package. DEQ presents Enclosure 19 below to highlight the lack of detailed practices to manage the wetlands – shaded gray – adjacent to proposed dredging disposal areas:

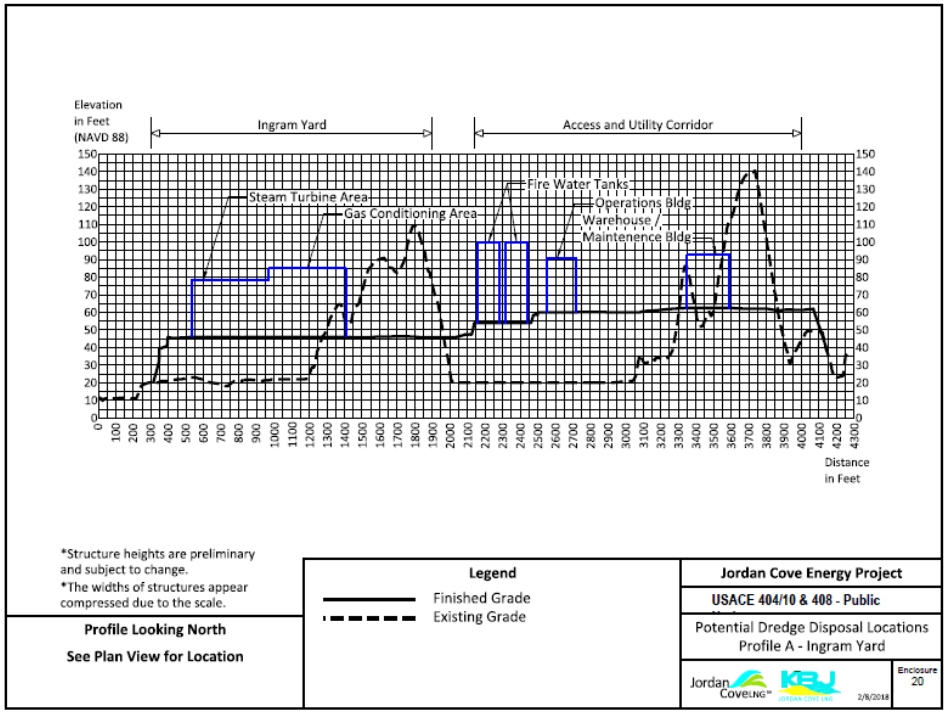
Figure 11: Potential Dredge Disposal Areas Relative to LNG Terminal and Adjacent Wetlands



Enclosure 19 does not show structural controls to demonstrate saline leachate or decant from dredged material would not discharge to adjacent freshwater wetlands. JCEP has not indicated how it would place containment

structures around the dredged material nor change the grade to direct decant to the dredge line, size a collection basin to capture the decant, operate a pump to transfer the decant to a discharge location, or propose a discharge location. Enclosures 20 – 22 only provide the elevation of dredge material as shown in Figure 12.

Figure 12: Proposed Finish Grade of Dredge Soil Locations



For upland confined dredge disposal facilities, the State of New Jersey requires project proponent to consider five factors in the placement of dredged material. These factors are illustrative on what DEQ would consider in evaluating a proposal with the required information. These factors are:

- Location of facility and site-specific condition including compatibility with adjacent and nearby land use.
- Characterization of the dredged material proposed for placement at the facility.
- Design and construction of the facility.
- Operation of the facility.
- Final closure of the facility.[69]

At present, JCEP's submittal does not demonstrate that controls for the disposal of dredged material provide the highest and best practicable controls of flows to meet OAR 340-041-0007(1) and prevent the deposit sediment deleterious to aquatic life to meet OAR 340-041-0007(11). Given this, DEQ cannot conclude that the JCEP's proposed disposal of dredge material would be conducted in a manner that would comply with the turbidity standard and biocriteria standard.

6.1.2.6 Dredging

JCEP's dredging in the North Spit of Coos Bay would reduce water quality by increasing turbidity above the numeric limits established in Oregon's Turbidity water quality standard.[70] JCEP provides an overview of dredging

[69] State of New Jersey. October 1997. Dredging Technical Manual, "The Management and Regulation of Dredging Activities and Dredge Material Disposal in New Jersey's Tidal Waters." Pages 73

[70] [70] Hydrodynamic Studies – Turbidity Analysis, Moffat and Nichol, November 2017.

procedures in the Dredge Material Management Plan and preferred locations for dredge material disposal but does not address procedures to minimize adverse effects of these actions on water quality. In particular, the plan does not specify methods to manage dredge spoil disposal in a manner that protects water quality. In one example, the plan recommends hydraulically transferring dredged material to the APCO sites and discharge of the slurry material to temporary containment berms. Hydraulic transfer requires large volumes of water to maintain dredge material in suspension during transfer. JCEP's Dredge Material Management Plan includes no proposal to manage and treat discharge from these containment areas to remove suspended material and reduce turbidity.

On September 7 and December 20, 2018, DEQ requested JCEP provide additional information, including a Dredging Pollution Prevention Plan, to describe specific dredging methods and procedures. In particular, DEQ requested the following information from JCEP to describe measures to reduce project effects on water quality:

- The type of pollution controls JCEP would use including its design and specifications.
- The specific applications for these controls.
- The specific location where JCEP would employ these controls relative to sensitive sites as well as other landscape features (e.g., drainage pattern, vegetation, etc.).
- The maintenance schedule for each control.
- A monitoring plan for evaluating the efficacy of all proposed controls and compliance with the turbidity standard.[71]

Oregon's Statewide Narrative Criteria requires applicants to demonstrate the activity includes the highest and best treatment controls and measures to prevent the discharge of organic and inorganic material into waterways. Absent a plan demonstrating JCEP has addressed these requirements, DEQ cannot confirm that JCEP has selected the highest and best treatment options to minimize anticipated project-effects in compliance with Oregon's Statewide Narrative Criteria.

6.1.3 DEQ Findings

Based on the preceding evaluation of Project effects, DEQ adopts the following findings related to OAR 340-041-0007 (Statewide Narrative Criteria):

1. JCEP has not demonstrated that the proposed pipeline construction, access road construction and maintenance, and pipeline right-of-way activities would employ the highest and best treatment to control pollution, as required by OAR 340-041-0007(1);
2. JCEP has not demonstrated that the proposed road construction and maintenance activities would be conducted in a manner to keep waste materials from cut banks, fills, and road surfaces out of public waters, as required by OAR 340-041-0007(7);
3. JCEP has not demonstrated that the proposed pipeline construction, access road construction and maintenance, and pipeline right-of-way activities would employ state-of-practice methods to identify landslide susceptibility zones and mitigate landslide risks to control discharge of organic or inorganic debris, as required by OAR 340-041-0007(11);
4. JCEP's failure to provide requested specific waterbody crossing and restoration plans, or plans that include descriptions of methods to construct and maintain roads in a manner to keep waste materials out of public waters and descriptions of methods to control discharge of organic or inorganic debris, prevented the department from being able to process the application within the time allowed by law. OAR 340-048-0020(3);and,
5. JCEP has not demonstrated that the proposed LNG Export Terminal and associated facilities will comply with Oregon's statewide narrative criteria. DEQ makes this finding because:
    a. JCEP did not provide details for spill containment for Terminal.
    b. JCEP did not provide details for infiltration controls for Construction Facility Areas.

[71] Supplemental Information Request. DEQ, December 20, 2018.

c. JCEP did not provide details for dredged material disposal controls.
d. JCEP did not demonstrate that proposed construction stormwater controls are the highest and best treatment options to control pollution as required by OAR 340-041-0007(1).
e. JCEP's proposed dredging activities do not employ the highest and best treatment options for preventing or minimizing turbidity as required by OAR 340-041-0007(1); and,
f. JCEP's proposed dredging activities do not employ sufficient methods to keep organic or inorganic material out of public waters as required by OAR 340-041-0007(11).

Based upon these findings, violations of the statewide narrative criteria are likely to occur and DEQ concludes that it does not have a reasonable assurance that the proposed activities will be conducted in a manner that will not violate the Statewide Narrative Criteria.

6.2 Biocriteria

6.2.1 Applicable Standard

Oregon Administrative Rules 340-041-0011:

Waters of the State must be of sufficient quality to support aquatic species without detrimental changes in the resident biological communities.

DEQ's Biocriteria narrative water quality standard is intended to avoid detrimental changes to biological communities caused by pollution. EPA guidance recommends using biological community assessments as an indicator for measuring support for aquatic life.[72] DEQ has developed procedures to characterize the existing condition of benthic communities as a means to assess whether detrimental changes affecting water quality are likely to occur.[73] DEQ's methods use information from reference sites throughout Oregon to assess existing and future conditions of biological communities resulting from anthropogenic activities.

This narrative criterion recognizes that compliance with individual criteria may not fully capture synergistic effects resulting from multiple stressors and cumulative impacts on aquatic species and resident biological communities. The biocriteria standard complements parameter-specific standards by extending broad protections to all designated beneficial uses with the implicit assumption that if the most sensitive beneficial use is protected, then all uses would be protected. Application of the biological criteria standard is intended to assess the overall impact to the aquatic community from water quality changes attributable to an anthropogenic activity.

Definitions applicable to the biocriteria standard include (OAR 340-041-0002):

(5) "Appropriate Reference Site or Region" means a site on the same waterbody, or within the same basin or ecoregion that has similar habitat conditions, and represents the water quality and biological community attainable within the areas of concern.

(6) "Aquatic Species" means plants or animals that live at least part of their life cycle in waters of the state.

(17) "Designated Beneficial Use" means the purpose or benefit to be derived from a water body, as designated by the Water Resources Department or the Water Resources Commission.

[72] US EPA, July 29, 205, Guidance for 2006 Assessment, Listing and Reporting Requirements Pursuant to Sections 303(d), 305(b) and 314 of the Clean Water Act, page 41.
[73] Methodology for Oregon's 2018 Water Quality Report and List of Water Quality Limited Waters, November 2018. Oregon Department of Environmental Quality: https://www.oregon.gov/deq/FilterDocs/ir2018assessMethod.pdf.

(19) "Ecological Integrity" means the summation of chemical, physical and biological integrity capable of supporting and maintaining a balanced, integrated, adaptive community of organisms having a species composition, diversity, and functional organization comparable to that of the natural habitat of the region.
(50) "Resident Biological Community" means aquatic life expected to exist in a particular habitat when water quality standards for a specific ecoregion, basin, or water body are met. This must be established by accepted biomonitoring techniques.

(75) "Without Detrimental Changes in the Resident Biological Community" means no loss of ecological integrity when compared to natural conditions at an appropriate reference site or region.

6.2.2 Evaluation of Biocriteria

6.2.2.1 Pipeline construction

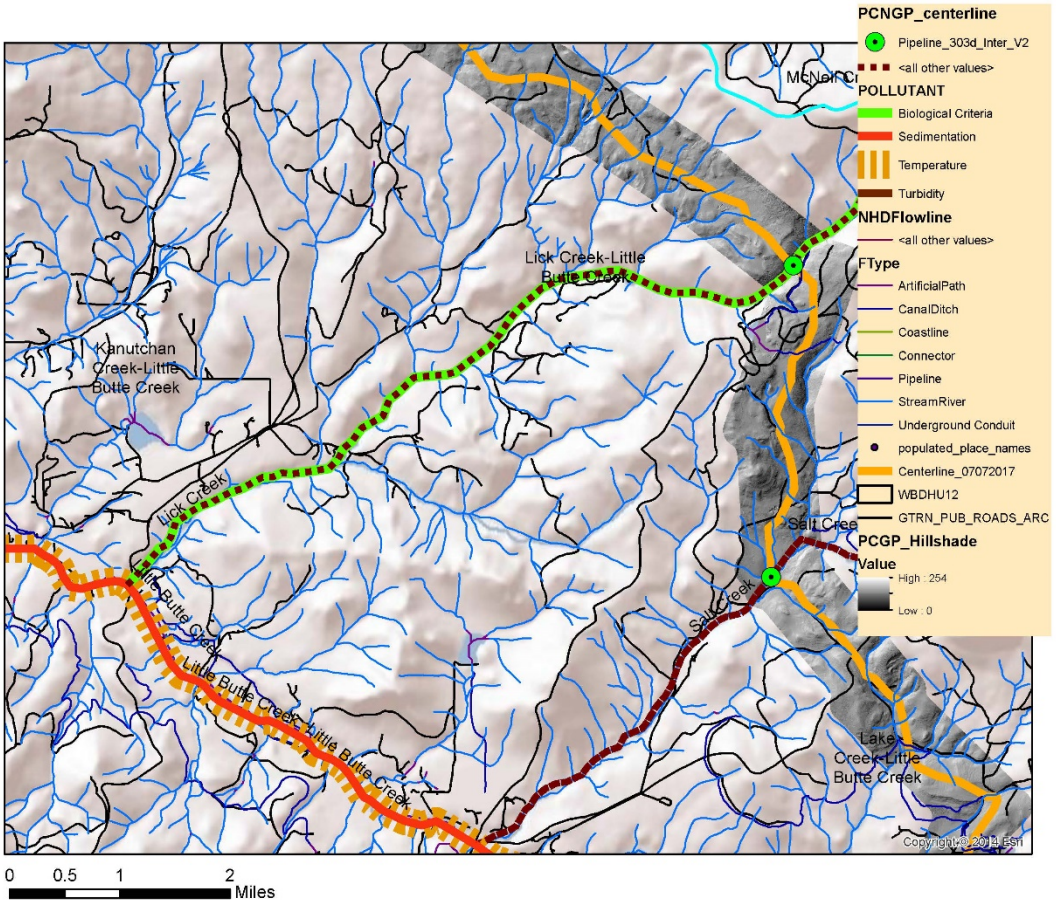
Section 6.1.2.1 of this report provides an evaluation of pipeline construction effects in areas of known or suspected landslide occurrence. In particular, portions of the Tyee Core Area in the Oregon Coast Range are characterized by historical land movement including rapidly moving landslides. Many of these areas form the upper drainages of headwater streams. Debris flows triggered by the placement of material and/or the management of stormwater can result increase landslide frequency that causes sediment discharge to receiving waters. Discharge of sediment and turbid flows to headwater (i.e., zero order) streams would commonly and adversely impact habitat and beneficial uses protected by the biocriteria standard. Information provided by JCEP does not demonstrate that pipeline construction would sufficiently avoid these impacts to provide reasonable assurance that the activities would not violate this standard by resulting in a loss of ecological integrity when compared to natural conditions.

DEQ refers the reader to Section 6.1.2.1 of this Report for DEQ's evaluation of JCEP's proposal to develop a construction right-of-way and a construction access road to install approximately 229 miles of pipeline. The evaluation in Section 6.1.2.1 is also relevant to DEQ's evaluation of JCEP's compliance with Oregon's biocriteria while developing the construction right-of-way (ROW) and the construction access road to build the pipeline. DEQ briefly summarizes this evaluation below.

In Section 6.1.2.1, DEQ summarizes JCEP's proposal to grade an access road and construct a 229-mile line pipeline. DEQ describes how this action would likely result in both the temporary and ongoing discharge of sediment without adequate BMPs.

Figure 13 shows the JCEP Gas Pipeline crossing tributaries to Lick Creek and crossing Lick Creek near Milepost 140.27. Lick Creek is listed on the 303(d) List for biocriteria. Sediment discharge from pipeline construction and debris flows from landslides initiated by the construction of the right-of-way could affect aquatic life in Lick Creek and the attainment of the biocriteria standard in this impaired waterbody. As noted earlier in this report, for a 303(d) listed waterbody, without a TMDL, no ongoing detrimental impact is authorized. Although natural landslides are an integral part of stream form and function, human-caused debris torrents and sedimentation impact water quality by changing the natural cycles of sediment delivery to systems, which impacts the aquatic environment; thus, affecting aquatic life (Castro and Reckendorf 1995).

Figure 13: Lick Creek and Little Butte Creek Vicinity



JCEP has not demonstrated that methods employed in pipeline construction, the development of the construction ROW, and the use of the construction access roads would sufficiently protect State waters to avoid detrimental changes in resident biological communities to comply with Oregon's biocriteria standard. The following information would be needed in order for DEQ to have a reasonable assurance that the biocriteria standard will be met:

- Modeling demonstrating that proposed right-of-way erosion controls are the most effective.
- A landslide hazard assessment following state-of-practice protocols, including both construction-induced risks and post-construction risks.
- Designs for stormwater management above unstable slopes in the right-of-way.
- Designs for fill, trenching spoils, and/or grading spoils placed on unstable slopes.

JCEP's identified siting, design and construction methods provide an inadequate analysis of Project hazards and inadequate measures to reduce potential impacts to streams and the aquatic life dependent upon these streams. DEQ cannot conclude from JCEP's proposed methods and available information that construction of the pipeline will comply with the biocriteria standard.

6.2.2.2 Waterbody Crossings

The JCEP gas pipeline would cross approximately 252 waterbodies, and in most cases, use dry open-cut crossing

techniques.[74] Dry open-cut crossings rely on diverting water around the work area to allow trenching and pipe placement to proceed across the temporarily dewatered stream. JCEP expects to backfill and restore the trench site according to the FERC's Wetland and Waterbody Procedures for most dry open-cut crossings. FERC's procedures call for one foot of clean gravel or native cobbles in all streams that contain coldwater fisheries. JCEP, however, has proposed to modify the approach where the existing substrate is not gravel or cobbles and site access is limited.[75] In these cases, JCEP would attempt to match the natural streambed material size, gradation, and composition as closely as possible.

Potential Effects on Biocriteria

Waterbody crossings can cause short- and long-term alterations of stream habitat and hydrology. The biocriteria standard extends protections to waterbodies to provide full support for beneficial uses affected by project-related actions. These actions include dry open-cut trenching, backfill placement, and restoration actions as discussed further below.

JCEP proposes a minimum of five-feet of cover above pipeline segments beneath stream crossings.
The resulting trenches would temporarily displace native soils that can alter in-situ characteristics including intrinsic permeability. Zones of higher permeability can cause local infiltration, partial stream capture, and create a fish passage barrier. Project-related actions that reduce streamflow may limit habitat availability, alter channel hydrology, and modify hyporheic exchange in riparian areas.

In addition, trenches installed in consolidated rock may require blasting, rock-sawing, or jackhammering to achieve excavation specifications. Open cut trenches in bedrock-dominated stream channels are susceptible to upstream propagation of knickpoints created by fractures and joints in the stream's bedrock created during the excavation process.[76] Knickpoint propagation in bedrock-dominated streams can alter stream geomorphology and potentially develop into barriers to fish migration.

Last, general construction practices related to flume installation and removal, site-restoration, and other Project-related activities can increase stream sediment releases. Sediment releases can have an adverse effect on substrate characteristics, oxygen availability, and habitat complexity.

Evaluation

Project-related activities including trenched waterbody crossings may affect stream habitat and reduce support for beneficial uses. JCEP must identify appropriate mitigation or restoration procedures that address the specific negative impacts to the biological communities present at each waterbody crossing to demonstrate compliance with this standard. While the biocriteria standard extends protections to all waterbodies, DEQ has identified that the pipeline would cross five stream segments listed as impaired for the biocriteria water quality standard. Two of these crossings, Olalla Creek (MP 58.78) and North Myrtle Creek (MP 79.12), include spawning and rearing habitat for Endangered Species Act-listed Oregon Coast ESU Coho salmon. JCEP has classified these crossings as Level 2 with a high potential for migration, avulsion and/or scour. In addition, JCEP proposes numerous waterbody crossings for headwater streams that are hydrologically connected with upper-watershed habitat networks. Maintaining protections at each affected waterbody crossing is critical to protecting state waters and designated beneficial uses to comply with the biocriteria water quality standard.

DEQ requested information on March 11, 2019, including specific field data to characterize the pre-development hydrology, geomorphic characteristics, and habitat features. DEQ based this request on protocol developed by the U.S. Fish and Wildlife Service in conjunction with Ruby Pipeline, LLC for assessing risks from pipeline stream

[74] Pacific Connector Gas Pipeline Resource Report RR2, Appendix 2/Table A.2-2.

[75] Pacific Connector Gas Pipeline, Erosion Control and Revegetation Plan. October 2017.

[76] Selander, Jacob. 2004. Processes of Knickpoint Propagation and Bedrock Incision in the Oregon Coast Range. Department of Geologic Sciences. University of Oregon.

crossings.[77] The site assessments DEQ requested for planning construction and restoration actions are necessary for DEQ to evaluate compliance with the biocriteria standard. Without this information DEQ is unable to find that the proposed waterbody crossing methods will comply with OAR 340-041-0011.

6.2.2.3 Road Construction and Maintenance

For pipeline construction, JCEP would need to improve and maintain several hundred miles of existing access roads. JCEP would also need to develop a 229-mile construction access road in the construction right-of-way. Moreover, JCEP would need to construction 25 segments of Temporary Access Roads and Permanent Access Roads. The improvement of existing access roads would involve resurfacing, widening of the travel way, culvert replacements, installation of temporary bridges, and other actions necessary to provide transportation access during construction. As documented in Section 6.1.2.3 of this report, road surfaces, fills, and cut slopes serve as a potential source of sediment input to streams. Sedimentation from road can significantly affect habitat function and availability.

DEQ refers the reader to Section 6.1.2.3 of this Report for DEQ's evaluation of JCEP's proposed road use and construction during pipeline construction. The evaluation in Section 6.1.2.3 is relevant to DEQ's evaluation of JCEP's compliance with the biocriteria standard while using existing access roads, improving existing roads, and constructing new roads. DEQ briefly summarizes this evaluation below.

In Section 6.1.2.3, DEQ describes how JCEP's use of existing access roads can cause sediment discharge to streams. DEQ also describes the lack of clear BMPs that JCEP would use to maintain and, if needed, improve these roads to prevent sediment discharge to streams during pipeline construction. In addition, DEQ evaluates the Erosion Control and Revegetation Plan and Transportation Management Plan that JCEP proposed to control sediment discharge from roads. The evaluation of these plans documents their deficiencies. Finally, DEQ evaluates JCEP's actions to conduct an inventory of unpaved existing access roads to develop a DEQ-requested maintenance and improvement for these roads. DEQ documents the incomplete inventory that JCEP conducted to identify hydrologically connected existing access road segments. This incomplete inventory provides a gross underestimate of the access road segments that have the potential to discharge sediment to streams.

In its December 20, 2018 supplemental information request, DEQ summarized the scientific literature and technical resources concerning the importance of nonpaved road design to protect water quality for aquatic life (see Page 18 - 19 of Attachment A). Notably, the National Marine Fisheries Service identified routine road maintenance as a needed action to assist in the recovery of salmonids listed under the Endangered Species Act (see Page 18 of Attachment A). Castro and Reckendorf (1995) summarize the impact of sediment in aquatic environments and its effect on aquatic life.

JCEP has not demonstrated that methods employed in pipeline construction and the design of the construction access road would avoid detrimental changes to resident biological communities as required by Oregon's biocriteria standard. Specifically, the application lacks the following information necessary to evaluate project effects on the biocriteria standard:

- Comprehensive inventory of hydrologically connected existing access road segments.
- Comprehensive maintenance and improvement plan for existing access roads.
- Information supporting proposed erosion controls on unstable cut and fill slopes on improved/new roads.
- Modeling demonstrating that the proposed erosion controls on roads are the most effective.
- A landslide hazard assessment including post-construction landslide hazards.

[77] Castro, J.M., A. MacDonald, E. Lynch, and R. Thorne. 2014 *Risk-based Approach to Designing and Reviewing Pipeline Stream Crossings to Minimize Impacts to Aquatic Habitats and Species*. River Research and Applications

Without this information, DEQ is unable to find that the proposed road construction and maintenance activities will comply with OAR 340-041-0011.

6.2.2.4 Pipeline Right-of-Way

JCEP proposes to manage the pipeline permanent easement in such a way to provide access and maintenance in perpetuity. Pipeline corridor management includes maintaining stormwater controls along the alignment. Sediment runoff is a potential source of pollutants to receiving streams. Proper runoff controls and management practices are necessary to avoid discharges that reduce support for aquatic receptors.

DEQ refers the reader to Section 6.1.2.4 of this report for DEQ's evaluation of the potential effects of JCEP's permanent pipeline right-of-way. DEQ's analysis in Section 6.1.2.4 is relevant to the potential effects of stormwater discharge and the management of cut and fill slope on the biocriteria standard. DEQ briefly summarizes this evaluation below.

In Section 6.1.2.4, DEQ evaluates the function of a permanent slope breaker (i.e., water bar) and describes how this stormwater collection system concentrates stormwater discharge along the permanent ROW. DEQ details the initial and final drainage area for permanent slope breakers on steep slopes. In addition, DEQ notes the potential for JCEP to discharge post-construction stormwater from the permanent ROW to landslide susceptibility zones. DEQ points out that JCEP did not provide DEQ with a post-construction stormwater management plan following DEQ's 2018 guidelines for post-construction stormwater plan submissions which request project proponents consider steep and landslide risks when siting discharge points.

In the evaluation in Section 6.1.2, DEQ evaluates the permanent slope breakers closest to pipeline stream crossings and their potential to discharge sediment and other pollutants to streams. DEQ explains how the permanent ROW is functioning as primitive road due soil compaction in the ROW during pipeline construction and during post-construction maintenance. DEQ finds that the permanent ROW may discharge sediment streams at a rate equivalent to a gravel road with ruts. Additionally, DEQ's finds that discharges from slope breakers within 200 feet of streams would likely deliver sediment to these streams. Moreover, DEQ notes that the area between the stream and permanent slope breaker upslope from the stream is a source of sediment delivery to streams. Given these sources of discharge, DEQ is unable to find that the proposed permanent operation and maintenance of the pipeline right-of-way will comply with OAR 340-041-0011.determine that the proposed activities will

In its December 20, 2018 supplemental information request (see Pages 66 - 68 of Attachment A), DEQ's explained its rationale for its request for modeling and engineering analysis for the permanent ROW stormwater discharges to stream described above. This evaluation further documents the potential sources of sediment discharge that can contribute to or cause a violation of Oregon's biocriteria standard.

6.2.2.5 Terminal and Off-Site Project Area Stormwater

Section 6.1.2.5 of this report provides an evaluation of Jordan Cove's proposed actions to manage stormwater in the construction and operation of the Terminal and Off-site Areas. DEQ refers the reader to Section 6.1.2.5 for DEQ's evaluation of these proposed actions. The evaluation in Section 6.1.2.5 is also relevant to DEQ's evaluation of Pacific Connector's compliance with Oregon's biocriteria while managing construction stormwater in the Terminal and Off-Site Project areas, managing stormwater and decant from dredge material disposal sites, and managing post-construction stormwater during the operation of the Terminal. DEQ notes particularly that the proposed stormwater discharge is via an existing ocean outfall. DEQ has not evaluated the effects of this aspect of the proposed activity on biological receptors in the vicinity of the outfall.

6.2.2.6 Dredge Material Management

JCEP proposes to dredge and excavate 6.32 million cubic yards to create the project's slip and access channel, as well as marine waterway modifications. JCEP proposes to dispose of this material at the LNG facility, the APCO sites, and at the Kentuck mitigation site. JCEP anticipates disposing much of the material at the Jordan Cove facility to increase the site elevation to a minimum of 34.5 feet NAVD88 consistent with design-level tsunami mitigation criteria.[78,79] Several upland wetland areas are known to exist in the immediate vicinity of developed portions of the LNG site. These are identified as Wetlands 2013-2, 2013-3, and 2013-4 on Figure 14 and include seasonally flooded Palustrine emergent wetlands whose hydrology is influenced by seasonally high groundwater conditions.

JCEP proposes to avoid site development that directly affects the wetland areas referenced above. However, placement of dredge material near these locations can permanently alter surface hydrology necessary to maintain hydrologic function of the wetland habitat. Further, runoff from marine dredged material may alter salinity and water quality characteristics of these areas. Hydrologic and chemical alteration of wetland habitats may reduce support for biological communities adapted to freshwater, seasonally flooded wetland environments. Oregon's biocriteria requires that water quality be preserved to provide support for aquatic species without detrimental changes in the resident biological communities. On December 20, 2018, DEQ requested JCEP provide information to demonstrate what measures JCEP would undertake to demonstrate protection of water quality given the proposed potential disposal of such materials in proximity to wetlands. Specifically, DEQ requested:

- How would JCEP manage the fresh and/or saline decant water if discharged from these sites to the surrounding landscape?
- How would the management of the decant water comply with Oregon's biocriteria (OAR 340-041-0011) if this decant water is discharged to waters of the state such as fresh or estuarine wetlands?[80]

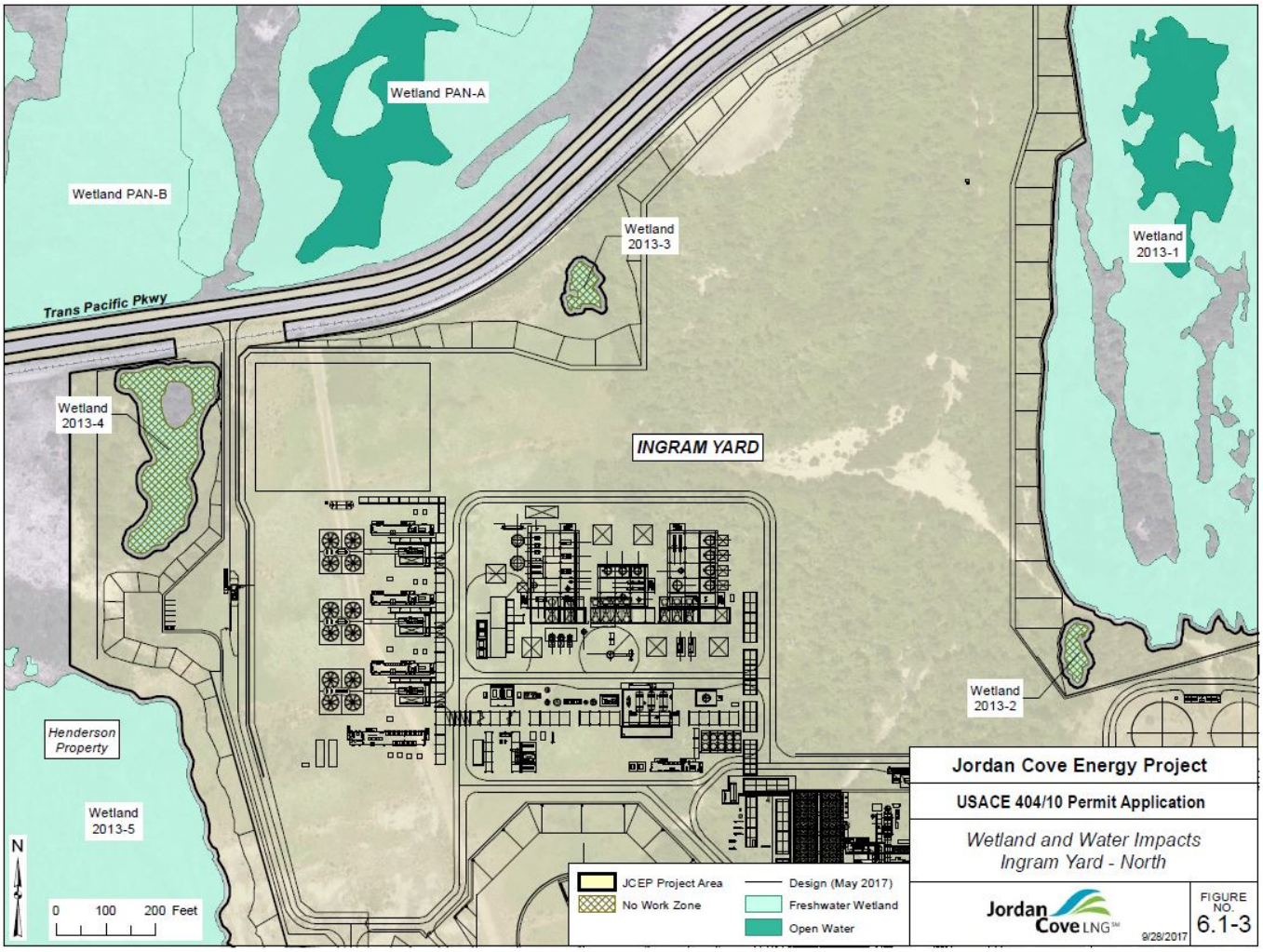
In correspondence dated February 20, 2019, JCEP proposed to address measures to demonstrate compliance with the biocriteria standard in a Dredging Pollution Prevention Plan. JCEP has not submitted a Dredging Pollution Prevention Plan that demonstrates how JCEP would minimize or mitigate the known likely violations of biocriteria standard. Accordingly, for the reasons discussed above, DEQ in unable to determine that JCEP's proposed management of dredged material will comply with OAR 340-041-0011.

[78] North American Vertical Datum of 1988.

[79] Jordan Cove Resource Report 1. September 2017.

[80] Supplemental Information Request. DEQ, December 20, 2018.

Figure 14: Wetland Areas Adjacent to LNG Terminal and Dredge Spoil Placement



6.2.3 DEQ Findings

Based on the preceding evaluation of Project effects, DEQ adopts the following findings related to OAR 340-041-0011 (Biocriteria):

1. JCEP has not demonstrated that the proposed pipeline construction, access road construction and maintenance, and pipeline right-of-way activities would avoid or mitigate detrimental changes in habitat structure and function, flow and resident biological communities;
2. JCEP has not demonstrated that the proposed road construction and maintenance activities would be conducted in a manner to avoid or mitigate detrimental changes in the resident biological communities;
3. JCEP has not demonstrated that the proposed pipeline construction, access road construction and maintenance, and pipeline right-of-way activities would identify and avoid or mitigate increases in landslide frequency that would result in detrimental changes in the resident biological communities;
4. JCEP's proposed management of stormwater in the Terminal and Off-Site Project Areas during construction and operation of the Project is likely to cause short and long-term alterations to wetland hydrology, turbidity, and form with sediment deposits, and these changes would result in detrimental alterations to the resident biological community dependent on these wetlands.
5. JCEP's management of stormwater and decant water during construction and operation of dredged material disposal sites is likely to cause short and long-term alterations to wetland hydrology, turbidity, and form with sediment deposits, and these alterations likely would result in detrimental changes to the resident biological community dependent on these wetlands.
6. JCEP proposes the permanent placement of marine sediments in upland locations that may alter the hydrologic and chemical characteristics of nearby wetland areas in a manner that would likely lead to violation of biocriteria, OAR 340-041-0011. Absent a plan to avoid or mitigate these effects, DEQ finds no reasonable assurance that these proposed activities would not violate the biocriteria standard. OAR 340-041-0011, OAR 340-048-0020(3).

6.3 Dissolved Oxygen

6.3.1 Applicable Standard

Oregon Administrative Rules 340-041-0016 set forth the state's water quality standards for dissolved oxygen. For spawning areas, the criteria range between 8.0 and 11.0 mg/l. For cold-water aquatic life, 8.0 mg/l is an absolute minimum. For cool water aquatic life, and for estuaries, dissolved oxygen may not be less than 6.5 mi/l: See, OAR 340-041-0016.

Dissolved oxygen is a principal parameter necessary to support of aquatic life. Adequate dissolved oxygen is vital to fish, invertebrates, and other aquatic life and can vary with life stages (egg, larvae, and adults). Maintaining adequate dissolved oxygen within gravels is particularly important during incubation of salmonid embryos.

Along the route of the proposed pipeline, the following waterbodies are listed as water quality limited for dissolved oxygen:

- North Fork of the Coquille River (all year)
- Middle Fork of the Coquille River (all year)
- South Umpqua River (all year)
- Bilger Creek (all year)
- North Myrtle Creek (May 15 – Oct 15)
- South Myrtle Creek (May 15 – Oct 15)
- Days Creek (May 15 – Oct 15)
- West Fork Trail Creek (Summer)
- Lick Creek (Summer)

- Klamath River (all year)
- Lost River (all year)

6.3.2 DEQ Evaluation: Dissolved Oxygen

6.3.2.1 Pipeline construction

Land disturbance during construction can cause organic and inorganic sediment discharge to streams as described above in section 6.1. Sediment loading directly impacts oxygen saturation potential and can reduce oxygen availability in spawning gravels.. In addition to sediment, the placement of slash and vegetation in waterbodies from land clearing activities can result in a reduction of dissolved oxygen, as can the introduction of runoff from lands that are fertilized for re-establishment of vegetation. Jordan Cove would need to manage these activities carefully in order to avoid adding pollutants that could reduce dissolved oxygen levels.

6.3.2.2 Waterbody Crossings

As discussed in Section 6.1.2.2 of this report, JCEP proposes to cross about 252 waterbodies (not including wetlands) using dry open-cut techniques. For the second South Umpqua River crossing (MP 94.73) JCEP proposes a diverted open cut crossing. For all other dry open-cut locations, JCEP proposes to temporarily dewater the work area using either fluming or dam-and-pump techniques.

Streamflow diversions can depress dissolved oxygen in several ways. First, bypassing streamflow through channelized diversions can alter natural stream function and reduce stream reaeration. Impoundments above the isolated work area may also reduce hydraulic energy that can further reduce saturation potential. In addition, solar gain and/or mechanical warming from transfer pumps may increase water temperature and reduce the dissolved oxygen saturation potential. Last, sediment releases following removal of the dam can increase oxygen demand below the work area.

JCEP states they intend to conduct stream crossings during seasonally low flow conditions. However, seasonally low flow conditions reduce the waterbody's capacity to assimilate pollutant loads without detrimental changes to water quality. According to DEQ's Antidegradation policy, up to a 0.1 mg/l decrease in dissolved oxygen from the upstream end of a stream reach to the downstream end of the reach is not considered a reduction in water quality so long as it has no adverse effects on threatened and endangered species.[81]

During pipeline construction, and as detailed above, JCEP proposes to cross 11 streams identified as impaired for dissolved oxygen. In these areas, no additional degredation of dissolved oxygen levels is allowed. These areas include the West Fork Trail Creek (MP 118.89), a perennial stream in a bedrock-dominated channel. This reach includes rearing and spawning habitat for ESA-listed Southern Oregon Northern California Coho salmon. JCEP proposes a dry open-cut crossing at this location, and JCEP provides no specific measures to mitigate water quality impacts. In addition, JCEP provides no water quality measures in the site specific restoration plan developed for this proposed crossing.[82]

The waterbody crossing at West Fork Trail Creek is impaired for dissolved oxygen and cannot assimilate additional pollutant loading without causing a violation of the standard. Because the actions proposed by JCEP are known to affect streamflow in ways that may decrease oxygen saturation potential, DEQ expects dry open-cut waterbody crossings would cause a violation of water quality standards. Furthermore, because smaller streams are more susceptible to water quality degradation from environmental stressors than streams with higher base flow, DEQ expects the JCEP's proposed actions would likely reduce oxygen saturation potential at other locations, as well.

[81] OAR 340-041-0004(3)(d).

[82] Stream Crossing Risk Analysis Addendum, Exhibit C-6. Pacific Connector Gas Pipeline, April 2018.

6.3.2.3 Road construction and Maintenance

Depending on the design, new road construction and the management of stormwater on existing roads can initiate debris flows into streams in landslides susceptibility zones. As noted in Sections 6.1.2.1 and 6.1.2.3, JCEP has not performed a comprehensive landslide hazard assessment to identify potential landslide risks associated with JCEP's proposed road use and construction. This assessment is necessary to mitigate landslide risks. Moreover, as noted in Section 6.1.2.3, JCEP has not conducted an inventory of existing access roads to identify road segments hydrologically connected to streams. This inventory is necessary for the development of a maintenance and improvement plan for existing access road to prevent and minimize sediment discharge to streams.

Debris flows initiated by roads can deposit substantial quantities of soil, coarse woody debris, and leaves into streams. Sediment discharge from road use also contains organic matter. The decomposition of this organic matter in streams can reduce dissolved oxygen. Given the lack of a comprehensive landslide hazard assessment and a road maintenance and improvement plan from JCEP, DEQ cannot conclude the proposed road use and construction would be conducted in a manner consistent with the dissolved oxygen standard.

6.3.2.4 Permanent Pipeline Right-of-Way

Depending on the design and operation of the pipeline right-of-way, the design cut and fill slopes and/or the stormwater management system can initiate debris flows into streams in landslides susceptibility zones. As noted in Sections 6.1.2.4, JCEP has not performed a comprehensive landslide hazard assessment to identify potential landslide risks associated with JCEP's pipeline right-of-way. This assessment is necessary to mitigate landslide risks. The design of the stormwater management system in the right-of-way can also discharge sediment containing organic matter into streams at crossings and near discharge points. The decomposition of organic debris in streams can reduce dissolved oxygen levels.

In a September 7, 2018 information request, DEQ requested that JCEP provide a post-construction stormwater management plan addressing DEQ's 401 plan submission guidelines as discussed in Section 6.1.2.4. JCEP has not provided DEQ with this post-construction stormwater management plan. DEQ does not have sufficient information from JCEP to evaluate whether minimization or mitigation measures would be sufficient to prevent or offset increases in dissolved oxygen levels caused by JCEP's proposed activities, including but not limited to its maintenance of the pipeline permanent right-of-way.

6.3.3 DEQ Findings: Dissolved Oxygen

Based on the preceding evaluation of Project effects, DEQ adopts the following findings related to OAR 340-041-0016 (Dissolved Oxygen):

1. JCEP has not demonstrated that the proposed pipeline construction, access road construction and maintenance, and pipeline right-of-way activities would avoid or mitigate adverse effects on dissolved oxygen, particularly in the 11 waterbody crossings where standards are not currently met and no additional loading is allowed. JCEP's proposed construction and use of temporary and permanent rights of way are land disturbance activities that would likely reduce oxygen availability in spawning gravels and likely result in organic and inorganic sediment discharge to streams in amounts inconsistent with dissolved oxygen standard.
2. JCEP's proposed activities do not include sufficient methods to minimize or mitigate for potential Project-related reductions in dissolved oxygen at proposed waterbody crossings or from the impacts of roads, including plans to avoid increases in the frequency of landslides from road construction and use.

Based upon these findings, DEQ concludes that it does not have a reasonable assurance that the proposed activities will be conducted in a manner that will not violate the Dissolved Oxygen water quality standard at OAR 340-41-0016.

6.4 Nuisance Phytoplankton Growth

6.4.1 Applicable Standard

The Nuisance Phytoplankton Growth standard is found in Oregon Administrative Rules 340-041-0019

The standard establishes average Chlorophyll-a values for water bodies where phytoplankton may impair the recognized beneficial uses.

6.4.2 DEQ Evaluation: Nuisance Phytoplankton Growth

Although several waterbodies are identified as water quality limited for Chlorophyll, DEQ does not expect the proposed Project to significantly affect conditions that would cause nuisance phytoplankton growth.

6.4.3 DEQ Findings

DEQ is reasonably assured the proposed Project will comply with the Nuisance Phytoplankton Growth water quality standard.

6.5 Hydrogen Ion Concentration (pH)

6.5.1 Applicable Standard

Oregon Administrative Rules 340-041-0021 provides that:

1) Unless otherwise specified in OAR 340-041-0101 through 340-041-0350, pH values (Hydrogen ion concentrations) may not fall outside the following ranges:

(a) Marine waters: 7.0-8.5;

(b) Estuarine and fresh waters: See basin specific criteria (OAR 340-041-0101 through 340-041-0350).

The applicable basin-specific criteria are presented in the table below.

Table 4: Basin-Specific Criteria: pH

	South Coast	Umpqua	Rogue	Klamath
Fresh (except Cascade lakes)	NA	NA	NA	6.5 – 9.0[a]
Estuarine & Fresh	6.5 – 8.5	6.5 – 8.5	6.5 – 8.5	NA
Marine	7.0 – 8.5	7.0 – 8.5	7.0 – 8.5	NA
Cascade lakes above 3,000 feet elev.	NA	6.0 – 8.5	6.0 – 8.5	NA
Cascade lakes above 5,000 feet elev.	NA	NA	NA	6.5 – 8.5

[a] When greater than 25 percent of ambient measurements taken between June and September are greater than pH 8.7, and as resources are available according to priorities set by the Department, the Department would determine whether the values higher than 8.7 are anthropogenic or natural in origin.

6.5.2 DEQ Evaluation: pH

Surface waters are susceptible to changes in pH caused by several factors including chemical releases, elevation, temperature, and biological processes such as photosynthesis and algal respiration. Surface water pH varies regionally throughout Oregon. External factors that cause aquatic pH to exceed regional ranges may stress biological functions of aquatic receptors. In addition, water column pH also determines the solubility and

biological availability of chemical constituents such as nutrients (e.g., phosphorus, nitrogen, and carbon) and heavy metals (e.g. lead and copper). In the case of certain heavy metals, water column pH also determines their toxicity.

The South Umpqua (Clark Branch) is water quality limited for pH. JCEP proposed to place the pipeline under the river bed via the direct pipe method.

Days Creek also is water quality limited for pH during the summer, as is the Rogue River. The Rogue River crossing is proposed as a HDD boring under the river bed. Butte Creek also is water quality limited for pH during the summer, as is the Klamath River (HDD bore).

6.5.2.1 Road Construction and Maintenance

Depending on the design, new road construction and the management of stormwater on existing roads can initiate debris flows into streams in landslides susceptibility zones. As noted in Sections 6.1.2.1 and 6.1.2.3, JCEP has not performed a comprehensive landslide hazard assessment to identify potential landslide risks associated with JCEP's proposed road use and construction. Debris flows initiated by roads can deposit substantial quantities of soil, coarse woody debris, and leaves into streams. The pH of the soil input, the pH the receiving water, the underlying bedrock geology, and the composition of the stream microbial community interact to influence the decomposition of this deposited organic matter. The decomposition of these organic matter inputs may alter stream pH. For example, over time, decaying leaves in streams can increase pH.[83] The decomposition of roots, wood, and bark release tannins such as tannic acid, which can lower stream pH. Without site-specific information on the source of debris flow, the chemistry of the receiving stream, and a comprehensive landslide hazard assessment, DEQ cannot conclude there is a reasonable assurance that the proposed road use and construction will be conducted in a manner that will not violate the pH standard.

6.5.2.2 Pipeline Right-of-Way

The pipeline's permanent easement would alter the surface hydrology and local stormwater runoff characteristics. Increased sediment loading to hydrologically connected streams may likely affect certain water quality characteristics including increasing pH in such waterbodies. On September 7, 2018, DEQ requested JCEP prepare and submit a post-construction stormwater management plan with procedures to manage the discharge of pollutants from the 1,373.66 acres of permanent right-of-way occupied by the pipeline. Because JCEP has not provided DEQ with the required management plan, DEQ cannot determine whether the proposed operation of the pipeline would meet the pH standard.

6.5.3 DEQ Findings

Based upon these findings, violations of the pH standard may occur in a few locations where the standard is not currently being met. JCEP has not identified methods to assure that no additional loading will occur in these areas whether the pipeline would cross a waterbody that is limited for pH. DEQ concludes that it does not have a reasonable assurance that the proposed activities will be conducted in a manner that will not violate the pH water quality standard at OAR 340-41-0021.

6.6 Temperature

Oregon's water quality standard for temperature is complex. Oregon Administrative Rules 340-041-0028. It include biologically based numeric criteria for waterbodies supporting salmonids, a numeric standard for the ocean and bays, a standard for waterbodies supporting cool water species, and a standard for protecting cold water in salmon, steelhead and bull trout waterbodies. In the numerous waterbodies that do not meet these standards, if there is a TMDL, the TMDL will contain allocations for non-point sources, and require implementation plans,

[83] Deano, Paula M. and J. W. Robinson. 1985. *The Effect of Decaying Leaves on pH and Buffer Capacity of Waters*. Journal of Environmental Science and Health. Volume 20: 903-911

including from the BLM and the USFS. Typically, these plans limit the increase in temperature from all anthropogenic sources to no more than 0.3 degrees C. If no TMDL has been adopted, a new source may be allowed only if it is demonstrated that the source will not add to temperature loads. This could be done through a temperature implementation plan, and could include mitigation, so long as the mitigation is in the same watershed.

Biologically based numeric temperature criteria applicable to the Project are determined by the Fish Use and Spawning Maps presented as Figures 340A and 340B of Oregon Administrative Rule 340, Division 041. Figure 340A designates the entire project as suitable habitat for bull trout. The seven-day-average maximum temperature of a stream identified as having bull trout spawning and juvenile rearing use is 12.0 degrees Celsius year round.

6.6.1 Applicable Standard

Oregon Administrative Rules 340-041-0028:

(1) Background. Water temperatures affect the biological cycles of aquatic species and are a critical factor in maintaining and restoring healthy salmonid populations throughout the State. Water temperatures are influenced by solar radiation, stream shade, ambient air temperatures, channel morphology, groundwater inflows, and stream velocity, volume, and flow. Surface water temperatures may also be warmed by anthropogenic activities such as discharging heated water, changing stream width or depth, reducing stream shading, and water withdrawals.

(2) Policy. It is the policy of the Commission to protect aquatic ecosystems from adverse warming and cooling caused by anthropogenic activities. The Commission intends to minimize the risk to cold-water aquatic ecosystems from anthropogenic warming, to encourage the restoration and protection of critical aquatic habitat, and to control extremes in temperature fluctuations due to anthropogenic activities. The Commission recognizes that some of the State's waters will, in their natural condition, not provide optimal thermal conditions at all places and at all times that salmonid use occurs. Therefore, it is especially important to minimize additional warming due to anthropogenic sources. In addition, the Commission acknowledges that control technologies, best management practices and other measures to reduce anthropogenic warming are evolving and that the implementation to meet these criteria will be an iterative process. Finally, the Commission notes that it will reconsider beneficial use designations in the event that man-made obstructions or barriers to anadromous fish passage are removed and may justify a change to the beneficial use for that water body.

(3) Purpose. The purpose of the temperature criteria in this rule is to protect designated temperature-sensitive, beneficial uses, including specific salmonid life cycle stages in waters of the State.

(4) Biologically Based Numeric Criteria. Unless superseded by the natural conditions criteria described in section (8) of this rule, or by subsequently adopted site-specific criteria approved by EPA, the temperature criteria for State waters supporting salmonid fishes are as follows:

(a) The seven-day-average maximum temperature of a stream identified as having salmon and steelhead spawning use on subbasin maps and tables set out in OAR 340-041-0101 to 340-041-0340: Tables 101B, and 121B, and Figures 130B, 151B, 160B, 170B, 220B, 230B, 271B, 286B, 300B, 310B, 320B, and 340B, may not exceed 13.0 degrees Celsius (55.4 degrees Fahrenheit) at the times indicated on these maps and tables;

(b) The seven-day-average maximum temperature of a stream identified as having core cold water habitat use on subbasin maps set out in OAR 340-041-101 to 340-041-340: Figures 130A, 151A, 160A, 170A, 180A, 201A, 220A, 230A, 271A, 286A, 300A, 310A, 320A, and 340A, may not exceed 16.0 degrees Celsius (60.8 degrees Fahrenheit);

(c) The seven-day-average maximum temperature of a stream identified as having salmon and trout rearing and migration use on subbasin maps set out at OAR 340-041-0101 to 340-041-0340: Figures 130A, 151A, 160A,

170A, 220A, 230A, 271A, 286A, 300A, 310A, 320A, and 340A, may not exceed 18.0 degrees Celsius (64.4 degrees Fahrenheit);

(d) The seven-day-average maximum temperature of a stream identified as having a migration corridor use on subbasin maps and tables OAR 340-041-0101 to 340-041-0340: Tables 101B, and 121B, and Figures 151A, 170A, 300A, and 340A, may not exceed 20.0 degrees Celsius (68.0 degrees Fahrenheit). In addition, these water bodies must have cold water refugia that are sufficiently distributed so as to allow salmon and steelhead migration without significant adverse effects from higher water temperatures elsewhere in the water body. Finally, the seasonal thermal pattern in Columbia and Snake Rivers must reflect the natural seasonal thermal pattern;

(e) The seven-day-average maximum temperature of a stream identified as having Lahontan cutthroat trout or redband trout use on subbasin maps and tables set out in OAR 340-041-0101 to 340-041-0340: Tables 121B, 140B, 190B, and 250B, and Figures 180A, 201A, 260A and 310A may not exceed 20.0 degrees Celsius (68.0 degrees Fahrenheit);

(f) The seven-day-average maximum temperature of a stream identified as having bull trout spawning and juvenile rearing use on subbasin maps set out at OAR 340-041-0101 to 340-041-0340: Figures 130B, 151B, 160B, 170B, 180A, 201A, 260A, 310B, and 340B, may not exceed 12.0 degrees Celsius (53.6 degrees Fahrenheit). From August 15 through May 15, in bull trout spawning waters below Clear Creek and Mehlhorn reservoirs on Upper Clear Creek (Pine Subbasin), below Laurance Lake on the Middle Fork Hood River, and below Carmen reservoir on the Upper McKenzie River, there may be no more than a 0.3 degrees Celsius (0.5 Fahrenheit) increase between the water temperature immediately upstream of the reservoir and the water temperature immediately downstream of the spillway when the ambient seven-day-average maximum stream temperature is 9.0 degrees Celsius (48 degrees Fahrenheit) or greater, and no more than a 1.0 degree Celsius (1.8 degrees Fahrenheit) increase when the seven-day-average stream temperature is less than 9 degrees Celsius.

(5) Unidentified Tributaries. For waters that are not identified on the "Fish Use Designations" maps referenced in section (4) of this rule, the applicable criteria for these waters are the same criteria as is applicable to the nearest downstream water body depicted on the applicable map. This section (5) does not apply to the "Salmon and Steelhead Spawning Use Designations" maps.

(6) Natural Lakes. Natural lakes may not be warmed by more than 0.3 degrees Celsius (0.5 degrees Fahrenheit) above the natural condition unless a greater increase would not reasonably be expected to adversely affect fish or other aquatic life. Absent a discharge or human modification that would reasonably be expected to increase temperature, DEQ will presume that the ambient temperature of a natural lake is the same as its natural thermal condition.

(7) Oceans and Bays. Except for the Columbia River above river mile 7, ocean and bay waters may not be warmed by more than 0.3 degrees Celsius (0.5 degrees Fahrenheit) above the natural condition unless a greater increase would not reasonably be expected to adversely affect fish or other aquatic life. Absent a discharge or human modification that would reasonably be expected to increase temperature, DEQ will presume that the ambient temperature of the ocean or bay is the same as its natural thermal condition.

(8) Natural Conditions Criteria. Where the department determines that the natural thermal potential of all or a portion of a water body exceeds the biologically-based criteria in section (4) of this rule, the natural thermal potential temperatures supersede the biologically-based criteria, and are deemed to be the applicable temperature criteria for that water body.

NOTE: On August 8, 2013, the Environmental Protection Agency disapproved rule section OAR 340-041-0028(8). Consequently, section (8) is no longer effective as a water quality criterion for purposes of CWA Section 303(c) and it cannot be used for issuing certifications under CWA Section 401, permits under CWA Section 402, or total maximum daily loads under CWA section 303(d).

(9) Cool Water Species.

(a) No increase in temperature is allowed that would reasonably be expected to impair cool water species. Waters of the State that support cool water species are identified on subbasin tables and figures set out in OAR 340-041-0101 to 340-041-0340; Tables 140B, 190B and 250B, and Figures 180A, 201A and 340A.

(b) See OAR 340-041-0185 for a basin specific criterion for the Klamath River.

(10) Borax Lake Chub. State waters in the Malheur Lake Basin supporting the Borax Lake chub may not be cooled more than 0.3 degrees Celsius (0.5 degrees Fahrenheit) below the natural condition.

(11) Protecting Cold Water.

(a) Except as described in subsection (c) of this rule, waters of the State that have summer seven-day-average maximum ambient temperatures that are colder than the biologically based criteria in section (4) of this rule, may not be warmed by more than 0.3 degrees Celsius (0.5 degrees Fahrenheit) above the colder water ambient temperature. This provision applies to all sources taken together at the point of maximum impact where salmon, steelhead or bull trout are present.

(b) A point source that discharges into or above salmon & steelhead spawning waters that are colder than the spawning criterion, may not cause the water temperature in the spawning reach where the physical habitat for spawning exists during the time spawning through emergence use occurs, to increase more than the following amounts after complete mixing of the effluent with the river:

(A) If the rolling 60 day average maximum ambient water temperature, between the dates of spawning use as designated under subsection (4)(a) of this rule, is 10 to 12.8 degrees Celsius, the allowable increase is 0.5 Celsius above the 60 day average; or

(B) If the rolling 60 day average maximum ambient water temperature, between the dates of spawning use as designated under subsection (4)(a) of this rule, is less than 10 degrees Celsius, the allowable increase is 1.0 Celsius above the 60 day average, unless the source provides analysis showing that a greater increase will not significantly impact the survival of salmon or steelhead eggs or the timing of salmon or steelhead fry emergence from the gravels in downstream spawning reach.

(c) The cold water protection narrative criteria in subsection (a) do not apply if:

(A) There are no threatened or endangered salmonids currently inhabiting the water body;

(B) The water body has not been designated as critical habitat; and

(C) The colder water is not necessary to ensure that downstream temperatures achieve and maintain compliance with the applicable temperature criteria.

(12) Implementation of the Temperature Criteria.

(a) Minimum Duties. There is no duty for anthropogenic sources to reduce heating of the waters of the State below their natural condition. Similarly, each anthropogenic point and nonpoint source is responsible only for controlling the thermal effects of its own discharge or activity in accordance with its overall heat contribution. In no case may a source cause more warming than that allowed by the human use allowance provided in subsection (b) of this rule.

(b) Human Use Allowance. Insignificant additions of heat are authorized in waters that exceed the applicable temperature criteria as follows:

(A) Prior to the completion of a temperature TMDL or other cumulative effects analysis, no single NPDES point source that discharges into a temperature water quality limited water may cause the temperature of the water body to increase more than 0.3 degrees Celsius (0.5 Fahrenheit) above the applicable criteria after mixing with either twenty five (25) percent of the stream flow, or the temperature mixing zone, whichever is more restrictive; or

(B) Following a temperature TMDL or other cumulative effects analysis, waste load and load allocations will restrict all NPDES point sources and nonpoint sources to a cumulative increase of no greater than 0.3 degrees Celsius (0.5 Fahrenheit) above the applicable criteria after complete mixing in the water body, and at the point of maximum impact.

(C) Point sources must be in compliance with the additional mixing zone requirements set out in OAR 340-041-0053(2)(d).

(D) A point source in compliance with the temperature conditions of its NPDES permit is deemed in compliance with the applicable criteria.

(c) Air Temperature Exclusion. A water body that only exceeds the criteria set out in this rule when the exceedance is attributed to daily maximum air temperatures that exceed the 90th percentile value of annual maximum seven-day average maximum air temperatures calculated using at least 10 years of air temperature data, will not be listed on the section 303(d) list of impaired waters and sources will not be considered in violation of this rule.

(d) Low Flow Conditions. An exceedance of the biologically-based numeric criteria in section (4) of this rule, or an exceedance of the natural condition criteria in section (8) of this rule will not be considered a permit violation during stream flows that are less than the 7Q10 low flow condition for that water body.

(e) Other Nonpoint Sources. The department may, on a case-by-case basis, require nonpoint sources (other than forestry and agriculture), including private hydropower facilities regulated by a 401 water quality certification, that may contribute to warming of State waters beyond 0.3 degrees Celsius (0.5 degrees Fahrenheit), and are therefore designated as water-quality limited, to develop and implement a temperature management plan to achieve compliance with applicable temperature criteria or an applicable load allocation in a TMDL pursuant to OAR 340-042-0080.

(A) Each plan must ensure that the nonpoint source controls its heat load contribution to water temperatures such that the water body experiences no more than a 0.3 degrees Celsius (0.5 degree Fahrenheit) increase above the applicable criteria from all sources taken together at the maximum point of impact.

(B) Each plan must include a description of best management practices, measures, effluent trading, and control technologies (including eliminating the heat impact on the stream) that the nonpoint source intends to use to reduce its temperature effect, a monitoring plan, and a compliance schedule for undertaking each measure.

(C) The Department may periodically require a nonpoint source to revise its temperature management plan to ensure that all practical steps have been taken to mitigate or eliminate the temperature effect of the source on the water body.

(f) Compliance Methods. Anthropogenic sources may engage in thermal water quality trading in whole or in part to offset its temperature discharge, so long as the trade results in at least a net thermal loading decrease in anthropogenic warming of the water body, and does not adversely affect a threatened or endangered species. Sources may also achieve compliance, in whole or in part, by flow augmentation, hyporheic exchange flows, outfall relocation, or other measures that reduce the temperature increase caused by the discharge.

(g) Release of Stored Water. Stored cold water may be released from reservoirs to cool downstream waters in order to achieve compliance with the applicable numeric criteria. However, there can be no significant adverse impact to downstream designated beneficial uses as a result of the releases of this cold water, and the release may not contribute to violations of other water quality criteria. Where the Department determines that the release of cold water is resulting in a significant adverse impact, the Department may require the elimination or mitigation of the adverse impact.

(13) Site-Specific Criteria. The Department may establish, by separate rulemaking, alternative site-specific criteria for all or a portion of a water body that fully protects the designated use.

(a) These site-specific criteria may be set on a seasonal basis as appropriate.

(b) The Department may use, but is not limited by the following considerations when calculating site-specific criteria:

(A) Stream flow;

(B) Riparian vegetation potential;

(C) Channel morphology modifications;

(D) Cold water tributaries and groundwater;

(E) Natural physical features and geology influencing stream temperatures; and

(F) Other relevant technical data.

(c) DEQ may consider the thermal benefit of increased flow when calculating the site-specific criteria.

(d) Once established and approved by EPA, the site-specific criteria will be the applicable criteria for the water bodies affected.

6.6.2 DEQ Evaluation

6.6.2.1 Pipeline construction

In developing the construction right-of-way and construction access roads for the pipeline, JCEP would clear all trees and shrubs. The width of this vegetation clearing would be 95 feet and, according to JCEP, would "neck down" (i.e., narrow) to 75 feet through wetlands and waterbody crossings. However, JCEP's Environmental Alignment Sheets do not show this narrowing of the construction ROW at any of the stream crossings as indicated in Section 1.2.1.1 of Resource Report 1 (see Figures 15 and 16). Further, it appears that JCEP's analysis fails to include consideration of the pipeline alignment when in runs parallel to waterbodies, as it does in the vicinity of Spencer Creek (discussed in more detail below). The analysis also fails to account for changes in vegetation and warming as a result of new roadways, widening of existing roadways and the development of Temporary Extra Work Areas (TEWAs). All of these activities would increase thermal loading to waterbodies unless they are adequately set back. The riparian protection rules adopted by the Oregon Department of Forestry to comply with Oregon's temperature standard require retention of all trees within specified distances of streams with salmon, steelhead or bull trout (typically 60 to 80 feet for small and medium-sized streams). OAR 629-642-0105.

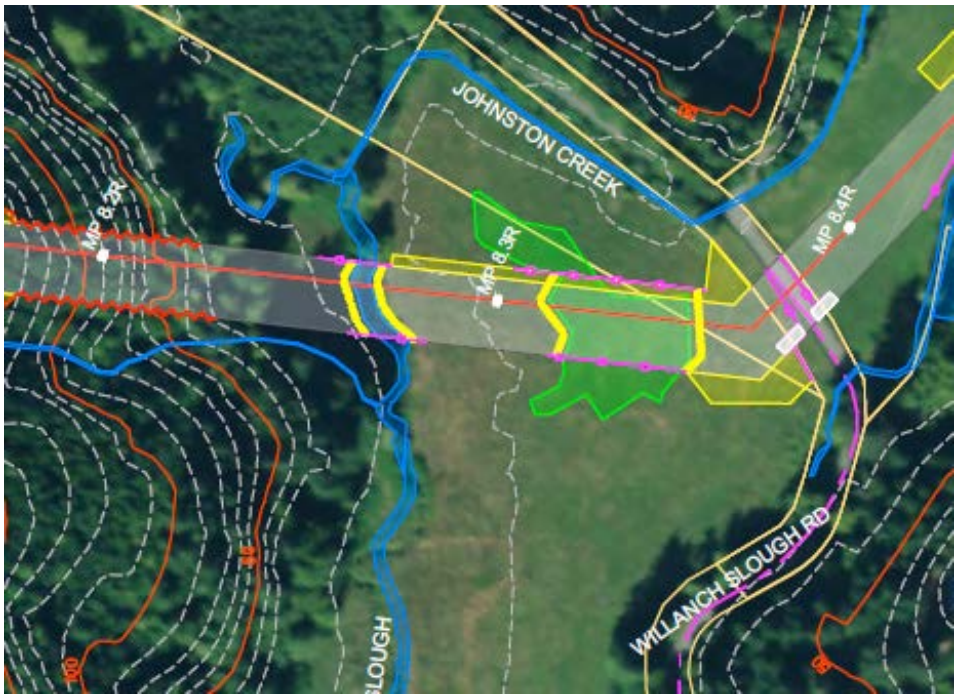
After the installation of the pipeline, JCEP would restore the vegetation removed during construction except within the 30-foot permanent right-of-way as discussed in Section 6.7.2.4 below. As a result, there would be a time lag between the removal of vegetation providing shade to waterbodies, and the reestablishment of that shade cover.

Based on FERC requirements its Wetland and Waterbody Procedures, JCEP can develop the construction right-of-way within 15 feet of streams when paralleling a stream. These procedures are significantly less protective than Oregon water quality requirements, and would allow increased thermal gain for these areas. On Forest Service and Bureau of Land Management administered public lands, JCEP proposes to site TEWAs 50 feet from streams, thereby providing somewhat more protection from increased thermal radiation to adjacent waterbodies. JCEP has not provided DEQ information regarding the setback for TEWAs at stream crossings on private land.

In its September 7, 2018 information request, DEQ requested that JCEP evaluate compliance with Total Maximum Daily Load allocations and with Designated Management Agencies' Total Maximum Daily Implementation Plans. DEQ has not received information on JCEP's compliance with TMDL allocations for temperature.

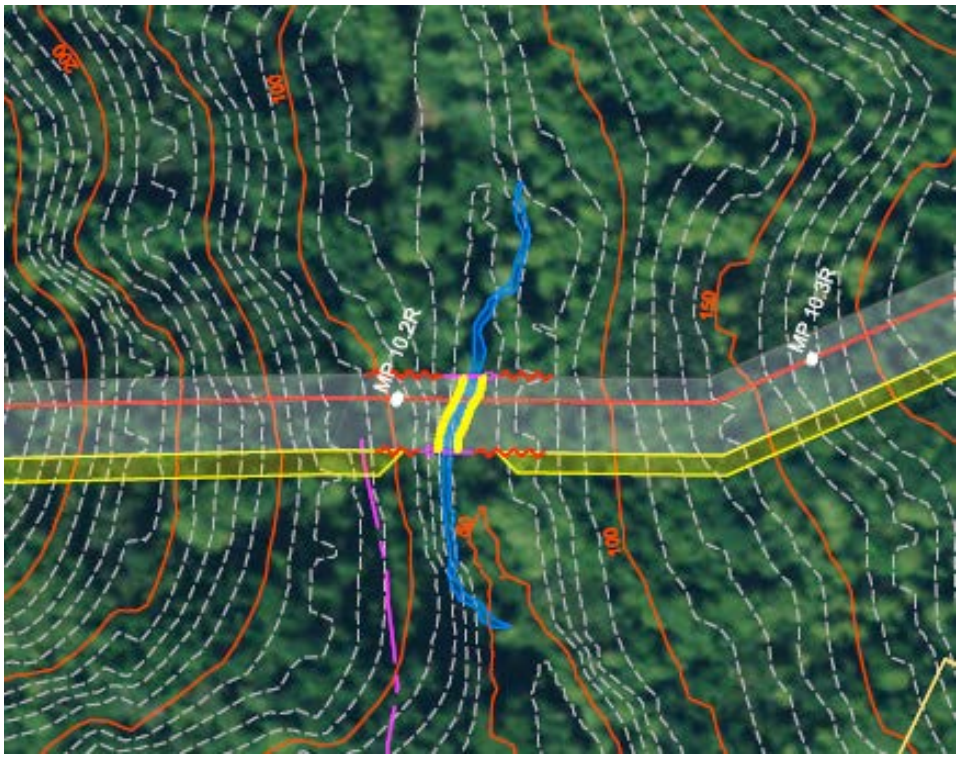
As an illustration of the reasons for DEQ's concerns about the temperature impacts of the proposed Project, at pipeline stream crossing at Milepost 58.78, Ollala Creek is limited for temperature year round and is under an approved TMDL. Similarly, DEQ has placed Rice Creek (Milepost 65.76), South Umpqua River (Milepost 71.27), North Myrtle Creek (Milepost 79.12), South Myrtle Creek (Milepost 81.19), and many others on the 303(d) list for temperature. These streams are under an approved temperature TMDL.

Figure 15: Pipeline Crossing at Wetland S1-04 (Willanch Slough) showing no "neckdown" of the ROW



Source: Environmental Alignment Sheet, Drawing Number 3430.29-006, Sheet 6 of 226.

Figure 16: Pipeline Crossing at Tributary to Cooston Channel showing no "neckdown" of ROW



Source: Environmental Alignment Sheet, Drawing Number 3430.29-008, Sheet 8 of 226.

For streams listed as impaired for temperature on the 303(d) list but not under temperature TMDL, Pacific Connector may not increase thermal loading leading to higher stream temperatures without effective mitigation. In Oregon's 2012 Integrated Report Assessment Database and 303(d) list, these streams are assigned an assessment category of five indicating a TMDL is needed to ensure these streams achieve the water quality standard. The lack of a temperature TMDL for Category 5 streams means DEQ has not established a human use allowance and reserve capacity for these streams. The reserve capacity in a TMDL ensures that loading capacity has been set aside for a safety margin and is otherwise unallocated.[84] Moreover, the human use allowance in the temperature standard does not permit a source to cause more warming than allowed under this allowance as stated in OAR 340-041-0028(12)(b).[85] Pacific Connector proposes to remove effective riparian shade on the following temperature limited Category 5 streams: North Fork Coquille River at Milepost 23.06, Middle Creek at Milepost 27.04, East Fork Coquille River at Milepost 29.85, Elk Creek at Milepost 32.40, Upper Rock Creek at Milepost 44.21, Middle Fork Coquille River at Milepost 50.28, Spencer Creek at Milepost 171.07, and Lost River at Milepost 212.07.

In evaluating compliance with TMDL Implementation Plans, DEQ's request was – in part – to determine if JCEP evaluated the thermal impact to streams from riparian vegetation removal during the development of the proposed 922.64 acres of TEWAs. DEQ was also seeking to determine JCEP's compliance with FERC's 15-foot buffer requirements noted above impacted riparian vegetation and if these impacts were evaluated in the 2017 Thermal Impact Assessment.

For example, given the proposed pipeline route, Figure 10 shows the potential for the loss of effective shade from the construction right-of-way as the pipeline parallels Spencer Creek near Milepost 177. Spencer Creek is listed as impaired for temperature. JCEP informed DEQ that the riparian impacts from TEWAs and impacts from FERC's 15-feet buffer requirement, noted above, were not included in the 2017 Thermal Impact Assessment. DEQ requested that JCEP include these impacts in a revised assessment. To-date, JCEP has not provided this revision.

Additionally, in the Draft Environmental Impact Statement for this proposed project (see Figure 3.4-2), JCEP is considering a pipeline route change referred to as the Blue Ridge Variation. This potential route change would also necessitate adjustments to the 2017 Thermal Impact Assessment. Moreover, in its September 7, 2018 information request (see Page 6 of 15, Attachment B), DEQ also requested information summarizing JCEP's action to first avoid riparian impacts then, if avoidance is not possible, minimize these impacts prior to siting TEWAs and the construction right-of-way parallel to streams. In DEQ's information request, DEQ noted it was seeking the location of these riparian impacts and the detailed rationale justifying these impacts. Specifically, DEQ was seeking information on the specific constraints and operational procedures at each site preventing avoidance or minimization.

In January 2019, DEQ received information from JCEP that the detailed justification for riparian impacts that DEQ was seeking was in Table A.1-1 of the Department of State Lands and Army Corps of Engineers Joint Permit Application. DEQ reviewed this information and found that it focuses primarily on wetland impacts associated with the siting of a TEWA rather than riparian impacts and temperature changes in streams. The modification rationale presented in this table provides no information regarding alternative locations for TEWAs that JCEP considered and provides no detailed explanation why these alternative locations were unsuitable. Moreover, DEQ cannot determine from the information in Table A.1-1 if riparian impacts from the construction ROW are a result of FERC's 15-foot buffer guidelines or some other factor, as the columns of information in this table present only information on the wetlands impacted, Cowardin Type for each wetland impacted, and TEWAs involved in the impact. From Table A.1-1, DEQ cannot find information on why JCEP could not avoid or minimize impacts to effective shade to streams when siting TWEAs and the construction ROW parallel to a stream.

In sum, DEQ cannot determine if JCEP avoided or minimized proposed impacts to riparian shade particularly for streams listed as impaired for temperature and currently under a TMDL such as Spencer Creek shown in Figure 10.

[84] Oregon Administrative Rule OAR 340-041-0002(49)

[85] Oregon Administrative Rule OAR 340-041-0028(12)(a)

Absent revision to the 2017 Thermal Impact Assessment, DEQ does not have a thermal impact assessment considering the riparian shade impacts described above (additional impacts from roadway alterations are addressed below).

In addition, DEQ has not received a detailed mitigation plan from JCEP identifying the following:

1. The mitigation site location.
2. The site-specific schedule for mitigation.
3. The site-specific riparian restoration plan including drawings.
4. Proposed planting density.
5. A proposed plant species composition.
6. A strategy to ensure seedling survival.
7. A maintenance schedule to ensure the trees are free to grow.
8. Performance standards for mitigation sites.
9. A mechanism for ensuring the mitigation persists in perpetuity.
10. Access for DEQ to evaluate the mitigation actions.

It appears from the FERC DEIS that JCEP is proposing some mitigation for losses to riparian areas on USFS and BLM lands. However, the proposed mitigation appears to be located in watersheds other than those where impacts would occur. In order for mitigation to be considered in relation to Oregon's temperature standard, it must occur in the same watershed.

Given the incomplete thermal impact assessment from pipeline construction (including TEWAs) and the lack of thermal mitigation plan to restore and protect effective shade, DEQ determines that it does not have a reasonable assurance that Pacific Connector's pipeline construction will comply with the applicable temperature standards.

6.6.2.2 Waterbody Crossings

The information JCEP provided to evaluate thermal loading from proposed water body crossings is incomplete and does not demonstrate JCEP would prevent stream temperature increases when constructing the pipeline through streams. Pipeline installations at the trenched open-cut waterbody crossings proposed by JCEP require the management of surface and groundwater resources in a manner that may negatively affect temperature. For waterbody crossings completed using dry open-cut methods, JCEP would isolate the work area using temporary upstream and downstream dams. The excavation through the work area would presumably capture shallow groundwater as well as seepage through the temporary flume dams. Water from the excavation would be pumped to dewater structures in upland areas where it would infiltrate into soil.

Many of the proposed dry open-cut crossings occur in headwater streams that are tributaries to fish-bearing streams lower in the watershed. Headwater streams provide a critical source of cold water particularly in summer months when flows decline and a higher fraction of base flow is derived from subsurface groundwater. In addition, JCEP proposes many waterbody crossings at streams listed as impaired for temperature on Oregon's 303(d) list of impaired waterbodies. Dewatering actions proposed by JCEP would reduce the volume of cold groundwater available for hyporheic exchange in the reach below each waterbody crossing. This reduction in groundwater exchange below crossings would reduce the assimilative capacity for thermal loading. JCEP proposes to alter groundwater flow at numerous stream to construct its pipeline. Many of these streams are currently impaired for temperature. For example, at pipeline stream crossing at Milepost 58.78, Ollala Creek is limited for temperature year round and is under an approved TMDL. Similarly, DEQ has placed Rice Creek (Milepost 65.76), South Umpqua River (Milepost 71.27), North Myrtle Creek (Milepost 79.12), South Myrtle Creek (Milepost 81.19), and many others on the 303(d) list for temperature. These streams are under an approved temperature TMDL.
In its September 7, 2018 information request, DEQ requested information on JCEP's Shallow Groundwater Study revised August 24, 2017. Under Oregon Administrative Rule 340-048-0042(2)(e), DEQ was seeking to determine if potential modifications of groundwater flows during pipeline construction would affect surface water quality

and, in particular, stream temperature from the alteration of groundwater flows into streams (see Page 14 of 15, Attachment B). In its October 8, 2018 response to DEQ's request, JCEP informed DEQ that the purpose of shallow groundwater study was to aid pipeline design to account for buoyancy in areas of shallow groundwater and referred DEQ to the Erosion Control Revegetation Plan for practices regarding trench dewatering to manage groundwater inflows. In DEQ's December 20, 2018 response to JCEP's response, DEQ again requested a completed shallow groundwater study, provided the rationale for this specific information request, and provided guidance on the specific information DEQ was seeking. DEQ has not received the information requested.

As noted, dry crossings accomplished by flumed or pumped diversions would rely on an impoundment above the crossing where pumps or gravity-operated flume pipes can bypass streamflow below the work area. Impoundments typically would increase temperature by exposing an increased wetted surface area to solar gain. Given this increase in thermal load as well as the reduction in groundwater flows into streams, proposed activities are likely to cause violations of the temperature standard.

DEQ expects that trenched open-cut waterbody crossings would increase thermal loading of streams below certain crossing locations. The potential for thermal loading is greatest in headwater streams with low seasonal baseflow. DEQ has requested additional information on the effect of these actions on shallow groundwater, but to date has not received the requested information. Based on the information currently available DEQ cannot determine that trenched open-cut waterbody crossings will not violate the temperature water quality standard. The FERC DEIS refers to the 2017 GeoEngineers report prepared for JCEP. That report identified average impacts for fifteen streams (0.03 degrees F) and a maximum increase of 0.3 degree F. However, as noted above this analysis did not consider the impacts of stream crossings together with TEWAs, new and altered roadways, or areas where the pipeline alignment (or roadways) parallel streams.

6.6.2.3 Road construction and Maintenance

JCEP's road improvements include replacing existing culverts in stream crossings, installing temporary bridges, and widening roads. JCEP may clear riparian vegetation adjacent to the approaches for road-stream crossings to create space for the increased crossing footprint. This increased crossing footprint may reduce effective shade at a reach. This reduction in effective shade may be permanent. JCEP has not provided information regarding these impacts for DEQ to evaluate the duration of impact. In addition, road widening that parallels a stream may reduce effective shade in the riparian areas between the access road and stream.

JCEP provided DEQ with a 2017 Thermal Impact Assessment (GeoEngineers 2017) addressing projected thermal impacts of the pipeline crossings of selected waterbodies, but it appears that riparian impacts from proposed improvements to existing and new access roads were not evaluated in this report.

Moreover, DEQ has not received a detailed mitigation plan from JCEP.

For these reasons, DEQ is unable to determine that JCEP's proposed roadway construction and maintenance associated with the Project will comply with Oregon's water quality standard for temperature, particularly with regard to the many water quality limited streams potentially affected by the Project.

6.6.2.4 Permanent Pipeline Right-of-Way

The information JCEP provided to evaluate thermal loading from pipeline operation is incomplete and does not demonstrate JCEP would be able to mitigate unavoidable permanent thermal loading consistent with applicable temperature standard. In developing the permanent rights-of-way, JCEP would clear all trees and shrubs. Initially, the width of this vegetation clearing would be 95 feet and, according to JCEP, "neck down" (i.e., narrow) to 75 feet through wetlands and waterbody crossings. After the construction ROW, JCEP would maintain a 30-foot permanent ROW in herbaceous and herbaceous/small shrub vegetative condition. Specifically, to protect the pipeline from tree roots, JCEP would maintain 10 feet of the permanent ROW in an herbaceous state centered on the pipeline. JCEP would maintain the remainder of the 30-foot permanent ROW in an herbaceous/small shrub

condition for the operational life of the pipeline. For riparian areas permanently impacted by the operational right-of-way, JCEP would propose sites it would use to mitigate the permanent loss of riparian shade at the pipeline's stream crossings. DEQ has received no details regarding the mitigation of riparian shade impacts.

Moreover, based on FERC requirements its Wetland and Waterbody Procedures, JCEP may develop the rights-of-way within 15 feet of streams when paralleling a stream. This proximity reduces effective shade on these streams. In its September 7, 2018 information request, DEQ requested that JCEP evaluate compliance with Total Maximum Daily Load allocations and with Designated Management Agencies' Total Maximum Daily Implementation Plans for temperature.

For streams listed as impaired for temperature on the 303(d) list but not under temperature TMDL, Pacific Connector may not increase thermal loading leading to higher stream temperatures. In Oregon's 2012 Integrated Report Assessment Database and 303(d) list, these streams are assigned an assessment category of five indicating a TMDL is needed to ensure these streams achieve the water quality standard. The lack of a temperature TMDL for Category 5 streams means DEQ has not established a human use allowance and reserve capacity for these streams. The reserve capacity in a TMDL ensures that loading capacity has been set aside for a safety margin and is otherwise unallocated.[86] Moreover, the human use allowance in the temperature standard does not permit a source to cause more warming than allowed under this allowance as stated in OAR 340-041-0028(12)(b).[87] Pacific Connector proposes to remove effective riparian shade permanently on the following temperature limited Category 5 streams: North Fork Coquille River at Milepost 23.06, Middle Creek at Milepost 27.04, East Fork Coquille River at Milepost 29.85, Elk Creek at Milepost 32.40, Upper Rock Creek at Milepost 44.21, Middle Fork Coquille River at Milepost 50.28, Spencer Creek at Milepost 171.07, and Lost River at Milepost 212.07.

Figure 10 shows the potential for the loss of effective shade from the permanent right-of-way as the pipeline parallels Spencer Creek near Milepost 177. DEQ listed Spencer Creek as impaired for temperature. JCEP informed DEQ that the riparian impacts from FERC's 15-feet buffer requirement, noted above, were not included in the 2017 Thermal Impact Assessment. DEQ requested that JCEP include these impacts in their assessment and provide a revised assessment.

Given the incomplete thermal impact assessment and the lack of thermal mitigation plan to restore effective shade DEQ is unable to determine that JCEP's operation of the pipeline will comply with Oregon's temperature standard.

6.6.3 DEQ Findings

Based upon the foregoing findings, DEQ determines that the proposed pipeline and associated work areas and roadways are likely to violate Oregon's water quality standard for temperature, particularly in areas that are not currently meeting numeric standards. JCEP has adequately identified methods to avoid or mitigate these impacts, particularly by providing for mitigation in the watersheds where the impacts will occur. DEQ concludes that it does not have a reasonable assurance that the proposed activities will be conducted in a manner that will not violate the temperature water quality standards at OAR 340-41-0028 and TMDLs adopted to meet those standards.

6.7 Total Dissolved Gas

6.7.1 Applicable Standard

Oregon Administrative Rule 340-041-0031:

> *(1) Waters would be free from dissolved gases, such as carbon dioxide hydrogen sulfide, or other gases, in sufficient quantities to cause objectionable odors or to be deleterious to fish or other aquatic life, navigation, recreation, or other reasonable uses made of such water.*

[86] Oregon Administrative Rule OAR 340-041-0002(49)

[87] Oregon Administrative Rule OAR 340-041-0028(12)(a)

(2) Except when stream flow exceeds the ten-year, seven-day average flood, the concentration of total dissolved gas relative to atmospheric pressure at the point of sample collection may not exceed 110 percent of saturation. However, in hatchery-receiving waters and other waters of less than two feet in depth, the concentration of total dissolved gas relative to atmospheric pressure at the point of sample collection may not exceed 105 percent of saturation.

6.7.2 DEQ Evaluation: Total Dissolved Gas

Water discharged to a receiving waterbody may entrain ambient atmospheric gases causing the concentration of dissolved gases to increase. Certain hydraulic conditions (e.g., deep laminar flow reaches or glides) prevent equilibration and can cause total dissolved gases concentrations to increase above levels deemed safe for aquatic life.

JCEP does not propose actions that may increase the concentration of total dissolved gas in Project waterways.

6.7.3 DEQ Findings

DEQ is reasonably assured the JCEP's specified proposed actions considered in this focused Evaluations and Findings Report would not violate the Total Dissolved Gas water quality standard.

6.8 Toxic Substances

6.8.1 Applicable Standard

Oregon Administrative Rule 340-041-0033:

(1) Toxic Substances Narrative. Toxic substances may not be introduced above natural background levels in waters of the state in amounts, concentrations, or combinations that may be harmful, may chemically change to harmful forms in the environment, or may accumulate in sediments or bioaccumulate in aquatic life or wildlife to levels that adversely affect public health, safety, or welfare or aquatic life, wildlife or other designated beneficial uses.

(2) Aquatic Life Numeric Criteria. Levels of toxic substances in waters of the state may not exceed the applicable aquatic life criteria as defined in Table 30 under OAR 340-041-8033.

(2) Human Health Numeric Criteria. The criteria for waters of the state listed in Table 40 under OAR 340-041-8033 are established to protect Oregonians from potential adverse health effects associated with long-term exposure to toxic substances associated with consumption of fish, shellfish and water.

6.8.1 DEQ Evaluation: Toxic Substances

6.8.2.1 Pipeline construction

Hazardous substances are known to exist at certain locations along the route of the proposed pipeline. These substances include high concentrations of naturally occurring minerals such as arsenic and mercury, post-process wastes from former mercury mining operations, and chemical contaminants from spills at current and former industrial sites. These substances may be present at concentrations that exceed applicable human health and/or aquatic life numeric criteria. DEQ evaluates the effects of ground-disturbing activities on toxic substances in the sections below.

Naturally Occurring Mineralization

A study in 2009 investigated naturally occurring mercury mineralization between MP 109 and the East Fork Cow Creek.[88] Local geology includes mercury mineralization at concentrations sufficient to support commercial mining

[88] Potential for natural-occurring mercury mineralization to enter the aquatic environment between M.P. 109 and East Fork

operations in the early to mid-1900s. [89] The study confirmed "very low concentrations of mercury mineralization" near the proposed pipeline route. The study also identified two intermittent streams that cross the final pipeline alignment. These studies noted that the streams "lack connectivity to the main stem East Fork Cow Creek. However, JCEP did not provide the methodology to evaluate hydrologic connectivity. Finally, the study concludes that JCEP may minimize the discharge of sediments containing mercury mineralization by implementing procedures in the Erosion Control and Revegetation Plan. In Sections 6.1.2.1, 6.1.2.3, and 6.1.2.4 of this report, DEQ identifies necessary information absent from in the JCEP's erosion control and landslide mitigation analysis and practices in both JCEP's Erosion Control and Revegetation Plan and its Transportation Management Plan. JCEP also proposes to use the Transportation Management Plan to control sediment discharge during road use and construction. DEQ summarizes the deficiencies in JCEP's proposed Transportation Management Plan in Section 6.1.2.3.

Metals

In response DEQ's March 2010 information request, JCEP provided information on the effects of Project-related activities on certain contaminants including turbidity, nutrients, and metals. [90] In particular, the study found the increase of suspended mercury due to expected sediment loading (0.017 ng/l) is far lower than the Human Health Numeric Criteria of 144 ng/l.

Existing Solid and Hazardous Waste Sites

The Draft Environmental Impact Statement (FERC, 2019) identified 116 sites with documented existing or historical soil and/or groundwater contamination within 0.25 mile of the pipeline route. The Draft Environmental Impact Statement further directs JCEP, before close of the public comment period, to consult with DEQ "regarding existing soil and groundwater contamination at the sites listed in appendix G. The DEIS further directs JCEP to file the results of this consultation along with any proposed site-specific soil or groundwater handling, management, and disposal procedures. DEQ anticipates JCEP would submit additional requested information to allow DEQ to evaluate the effects of pipeline construction.

6.8.2.2 Waterbody Crossings

Trenched crossings across waterbodies can increase the mobilization, solubility, and availability of soil contaminants. As discussed above, sources of soil contaminants include naturally occurring minerals, legacy wastes from mining operations, and chemical contaminants from industrial operations.

On March 11, 2019, DEQ requested JCEP develop site-specific water body crossing and restoration plans for each waterbody affected by the pipeline. The plans are necessary to address methods needed to restore hydrologic and habitat function to predevelopment conditions. At locations where toxic or hazardous substances may be present, DEQ would rely on these plans to determine that construction and site restoration is completed in a manner that prevents the mobilization of soil contaminants.

DEQ has not yet received the waterbody crossing plans from JCEP. Absent such plans, DEQ cannot conclude that project actions avoid or minimize activities that discharge toxic substances into waters of the state.

6.8.2.3 Road construction and Maintenance

DEQ recognizes that stormwater runoff from road surfaces represents a significant source of potential pollutants, including toxic substances present in soils. Referring to our evaluation in Section 6.1.2.3, additional information is

Cow Creek. Larry Broeker, November 18, 2009 (Revised February 3, 2010).

[89] Potential for natural-occurring mercury mineralization to enter the aquatic environment between M.P. 109 and East Fork Cow Creek. Larry Broeker, November 18, 2009 (Revised February 3, 2010).

[90] Turbidy Nutrients Metals Water Quality Impacts Analysis, GeoEngineers August 29, 2017.

needed to evaluate potential risks presented by potentially toxic substances. Absent such plans, DEQ cannot conclude that measures to prevent or minimize the discharge of toxic substances to waters of the state during road construction and maintenance would not cause an exceedance to the toxic substances water quality standard.

6.8.2.4 Pipeline Right-of-Way

JCEP would maintain portions of the permanent right-of-way in an herbaceous state to facilitate access for pipeline maintenance and inspection. Methods to control vegetation are described in the Erosion Control and Revegetation Plan and include the application of herbicides and pesticides. The plan references procedures in FERC's Waterbody and Wetland Construction and Mitigation Procedures that prohibit chemical applications within 100 feet of wetlands or waterbodies except as allowed by federal or state authorities.

To comply with the Toxic Substances water quality standard, applicants must comply with state regulations regarding the application of chemical herbicides and pesticides at locations that may directly or indirectly affect waters of the state.

6.8.2.5 Terminal and Off-Site Area Stormwater

Jordan Cove's LNG terminal would create that would cause stormwater discharging to Coos Bay, groundwater fed wetlands, and the Pacific Ocean.

In Section 5.5.2.1 of the revised Terminal Storm Water Management Plan (March 2019), Jordan Cove proposes three categories of spill containment. In each category, Jordan Cove provides qualitative information on proposed controls. In addition, in its April 1, 2019 response to DEQ's September 25, 2018 information request, Jordan Cove directed DEQ to its proposed Spill Prevention, Control, and Countermeasure Plan for spill containment controls for the Terminal Storm Water Management Plan.[91] The cover of Jordan Cove's SPCC Plan contains a note that this plan is a preliminary version. DEQ reviewed this plan and determined that it is not a complete or final plan. For example, in Table 1-1 of the SPCC Plan, the list of bulk storage containers and their secondary containment system is incomplete. Jordan Cove does not provide information on the secondary containment for transformers. Jordan Cove also notes that other oil storage systems and their containment controls are to be determined in the future. Additionally, Section 8 of this plan is preliminary information and Jordan Cove notes that it would update this plan to reflect as-built controls.

In the final SPCC Plan, DEQ is seeking information on where exactly Jordan Cove would locate on its stormwater site plan the proposed loading aprons, lined earthen berms, double walled tanks, and other containment structures designed to contain spills as well as information on the specific design features of these controls. For reasonable assurance, DEQ needs to know if Jordan Cove would size the containment berms coupled with the containment capacity of the oil/water to capture the largest anticipated spill. Statements in the current draft SPCC Plan that Jordan Cove would comply with federal regulations are not a demonstration that Jordan Cove's proposed control concepts have the capacity to prevent a discharge to surface water. Site-specific design information on all proposed structural spill controls is essential for DEQ to evaluate their potential to control discharges to surface water. This detailed information meets DEQ's need for reasonable assurance that Jordan Cove's containment controls would achieve the toxic substances standard by selecting and designing the highest and best practicable controls to prevent the release of toxic substances to the Pacific Ocean. This design information is missing in the SPCC Plan and the revised Terminal Stormwater Management Plan.

6.8.2 DEQ Findings

1. DEQ expects JCEP would consult with DEQ and provide additional information as directed by FERC to identify potential hazardous waste and cleanup sites within the project area. Absent this information,

[91] Spill Prevention, Control, and Countermeasure Plan – Operation. August 29, 2017. Part 1: Appendix K, Section 401 Water Quality Package

violations of toxicity water quality standards are likely, and wouldDEQ concludes there is no reasonable assurance that the proposed activities would be conducted in a manner that would not violate the Toxic Substances water quality standard. OAR 340-041-0033, OAR 340-048-0020(3).

2. JCEP proposes a stormwater management plan that does not demonstrate the spill containment controls are designed, for example, to capture a spill from the largest storage vessel in a drainage area.
   a. Without this demonstration, DEQ does not have reasonable assurance that Jordan Cove designed and located spill containment controls in manner to prevent a spill from causing a violation of the toxic substance standard. OAR 340-041-003.

6.9 Turbidity

6.9.1 Applicable Standard

Oregon Administrative Rule 340-041-0036

Oregon Administrative Rule 340-041-0036 provides, in pertinent part, that " No more than a ten percent cumulative increase in natural stream turbidities may be allowed, as measured relative to a control point immediately upstream of the turbidity causing activity. However, limited duration activities necessary to address an emergency or to accommodate essential dredging, construction or other legitimate activities and which cause the standard to be exceeded may be authorized provided all practicable turbidity control techniques have been applied * * *."

For activities authorized under a Clean Water Act Section 401 Water Quality Certification, CWA Section 404 Permit, and emergency activities coordinated with the Oregon Department of Fish and Wildlife, this standard may allow limited duration exceedances of the standard for dredging and construction activities. However, as set forth above, for a temporary exceedance, the project proponent must apply all practicable turbidity control techniques.

6.9.2 DEQ Evaluation: Turbidity

6.9.2.1 Pipeline construction

The information JCEP provided to DEQ does not demonstrate that pipeline construction and use of the construction access roads would avoid exceedances of the turbidity standard. DEQ refers the reader to Section 6.1.2.1 of this Report for DEQ's evaluation of JCEP's proposal to develop a construction right-of-way and a construction access road to install approximately 229 miles of pipeline. The evaluation in Section 6.1.2.1 is also relevant to DEQ's evaluation of JCEP's compliance with Oregon's turbidity standard while developing the construction right-of-way and the construction access road within it. DEQ briefly summarizes this evaluation below.

In Section 6.1.2.1, DEQ summarizes JCEP's proposal to grade and construct 229 miles construction access road to build the pipeline in the construction ROW. DEQ describes how this action would discharge sediment in stormwater without appropriate BMPs. DEQ evaluates JCEP's proposed erosion control BMPs for the construction ROW and the construction access road. DEQ highlights the lack of modeling in JCEP's submittal to evaluate the efficacy of its proposed BMPs for the construction ROW and its access road. DEQ considers the numerous landslide susceptibility zones in close proximity the ROW and, in many locations, beneath the fill of the ROW and the construction access road. DEQ notes the lack of engineering designs with support for construction ROW above and potentially discharging stormwater. Moreover, DEQ evaluates JCEP's methodology to identify landslide susceptibility zones and its criteria for addressing these zones during pipeline construction and operation. Finally, DEQ evaluates JCEP's BMPs to avoid pipeline construction initiating landslides.

In its December 20, 2018 supplemental information request, DEQ documents scientific literature concerning JCEP's proposed actions that can initiate a landslide (see Page 12 - 18 of Attachment A). In this supplemental request, DEQ also reviews JCEP's proposed BMPs relative to the information presented in literature to avoid

landslides initiated by linear infrastructure projects (see Page 71 – 77 of Attachment A). Human-caused debris torrents impact water quality by changing the natural cycles of sediment delivery to streams, which increases turbidity and this impacts the aquatic environment; thus, affecting aquatic life (Castro and Reckendorf 1995).

Given the following, JCEP has not demonstrated that pipeline construction and the use of the construction access road would avoid exceedances of the turbidity standard for the following reasons:

- Lack of technical support for erosion controls on unstable slopes.
- Lack of modeling demonstrating proposed erosion controls are the most effective.
- A landslide hazard assessment that does not follow state-of-practice protocols.
- A landslide hazard assessment that does not evaluate construction induced landslide hazards.
- Lack of engineering design and their support for mitigating landslide risk during pipeline construction.
- Lack of engineering designs for stormwater management above unstable slopes.

6.9.2.2 Waterbody Crossings

JCEP proposes pipeline installation using dry open-cut techniques at many minor waterbody crossings. This technique relies on temporary dams to isolate the work area thereby allowing the use of standard overland construction techniques to complete the waterbody crossing. JCEP provided general techniques and best management practices in their reports on dry open-cut waterbody crossings. The plans state, "For the first 10 to 30 minutes, turbidity downstream of the crossing area could increase considerably."[92]

Oregon's Turbidity water quality standard authorizes turbidity to increase more than ten percent above background levels *provided* all practicable turbidity control techniques have been applied. On March 11, 2019, DEQ requested JCEP to develop specific crossing plans for each waterbody crossed by the pipeline. DEQ would utilize this information to determine whether all practicable turbidity control techniques are employed to reduce Project-effects on turbidity. Because DEQ has not received the requested plans, DEQ cannot determine that pipeline installation would comply with the turbidity standard.

6.9.2.3 Road construction and Maintenance

The information JCEP provided to DEQ does not demonstrate that existing access road use and new road construction would avoid exceedances of the turbidity standard. The information provided for road improvements at stream crossings does not demonstrate that JCEP would apply all practicable turbidity controls during potential limited duration exceedances of the turbidity standard. DEQ refers the reader to Section 6.1.2.3 of this Report for DEQ's evaluation of JCEP's proposed use of existing access roads for pipeline construction. The evaluation in Section 6.9.2.1 is also relevant to DEQ's evaluation of JCEP's compliance with Oregon's turbidity while using existing access roads. DEQ briefly summarizes the evaluation in Section 6.1.2.3 here.

In Section 6.1.2.3, DEQ describes how JCEP's use of existing access roads can cause sediment and turbid discharges to streams. DEQ also describes the lack of clear BMPs that JCEP would use to maintain and, if needed, improve these roads to prevent sediment discharge to streams during pipeline construction. In addition, DEQ evaluates the Erosion Control and Revegetation Plan and Transportation Management Plan that JCEP proposed to control sediment discharge from roads. DEQ also evaluates JCEP's actions to conduct an inventory of unpaved existing access roads to develop a DEQ-requested maintenance and improvement for these roads. Finally, DEQ provides examples of proposed new roads where JCEP did not provide design information to demonstrate the cut and fills on these roads would prevent landslides from discharging to streams

[92] Stream Fluming Procedures, September 2017.

In its December 20, 2018 supplemental information request, DEQ summarizes the scientific literature and technical resources concerning the importance of non-paved road design to protect water quality for aquatic life (see Page 18 - 19, Attachment A). In this supplemental request, DEQ stresses to JCEP that the National Marine Fisheries Service identified routine road maintenance as a needed action to assist in the recovery of salmonids listed under the Endangered Species Act (see Page 18 of Attachment A). Castro and Reckendorf (1995) summarize the impact of sediment and turbid discharges in aquatic environments and its effect on aquatic life.

JCEP has not demonstrated that existing access road use and construction would avoid exceedances of the turbidity standard for the following reasons:

- Lack of a comprehensive inventory of unpaved roads hydrologically connected to streams.
- Lack of a comprehensive and complete maintenance and improvement plan for unpaved roads hydrologically connected to streams.
- A landslide hazard assessment that does not follow state-of-practice protocols.
- A landslide hazard assessment that does not evaluate construction induced landslide hazards.
- Lack of engineering designs with specifications demonstrating effective turbidity controls and landslide prevention measures for road construction.

6.9.2.4 Pipeline Right-of-Way

The information JCEP provided to DEQ does not demonstrate that pipeline operation would avoid violations of the turbidity standard. DEQ refers the reader to Section 6.1.2.4 of this Report for DEQ's evaluation of JCEP's proposal to maintain a permanent right-of-way (ROW) to operate the pipeline. The evaluation in Section 6.1.2.4 is also relevant to DEQ's evaluation of JCEP's compliance with Oregon's biocriteria while operating a permanent ROW. DEQ briefly summarizes the evaluation in Section 6.1.2.4 below.

In Section 6.1.2.4, DEQ evaluates the function of a permanent slope breaker (i.e., water bar) and describes how this stormwater collection system concentrates stormwater discharge along the permanent ROW. DEQ details the initial and final drainage area for permanent slope breakers on steep slopes. In addition, DEQ notes the potential for JCEP to discharge post-construction stormwater from the permanent ROW to landslide susceptibility zones. DEQ points out that JCEP did not provide DEQ with a post-construction stormwater management plan following DEQ's 2018 guidelines for post-construction stormwater plan submissions which request project proponents consider steep and landslide risks when siting discharge points.

In the evaluation in Section 6.1.2.4, DEQ evaluates the permanent slope breakers closest to pipeline stream crossings and their potential to discharge sediment and other pollutants to streams. DEQ explains how the permanent ROW is functioning as primitive road due soil compaction in the ROW during pipeline construction and during post-construction maintenance. Based on the information in JCEP's submittal, DEQ's demonstrates that the permanent ROW may discharge sediment streams at a rate equivalent to a gravel road with ruts. Moreover, DEQ notes that the area between the stream and permanent slope breaker upslope from the stream is a source of sediment delivery to streams. Given these sources of discharge, DEQ's requested that JCEP perform modeling; however, JCEP has not completed modeling and an engineering analysis of these discharges.

In its December 20, 2018 supplemental information request (see Pages 66 - 68, Attachment A), DEQ's evaluation provides the rationale for its request for modeling and engineering analysis for the permanent ROW stormwater discharges to stream described above. This rationale is also emphasized in the evaluation presented in Section 6.4.2.3. This evaluation documents the potential sources of sediment and turbid discharges that can contribute to or cause a violation of Oregon's turbidity standard.

JCEP has not demonstrated that pipeline operation would avoid violations of the turbidity standard for the following reasons:

- Lack of an engineering analysis and modeling for the right-of-way discharge at stream crossings.
- Lack of engineering designs and analysis for stormwater management above unstable slopes.
- Lack of post-construction stormwater management plan following DEQ guidelines.

6.9.2.5 Terminal and Off-Site Project Area Stormwater

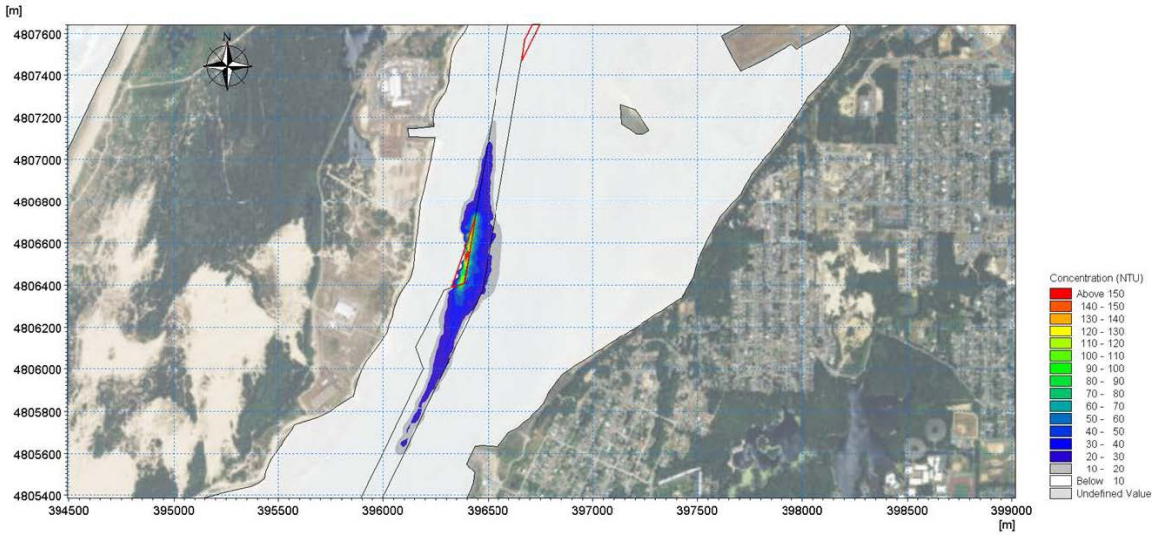
Section 6.1.2.5 of this report provides an evaluation of Jordan Cove's proposed actions to manage stormwater in the construction and operation of the Terminal and Off-site Areas. DEQ refers the reader to Section 6.1.2.5 for DEQ's evaluation of these proposed actions. The evaluation in Section 6.1.2.5 is also relevant to DEQ's evaluation of Pacific Connector's compliance with Oregon's turbidity standard while managing construction stormwater in the Terminal and Off-Site Project areas, managing stormwater and decant from dredge material disposal sites, and managing post-construction stormwater during the operation of the Terminal.

6.9.2.6 Dredging

Development of the proposed Slip and Access Channel would require the excavation and dredging of approximately 5.70 million cubic yards (mcy) of material. JCEP developed a Dredge Material Management Plan to guide dredging operations.[93] The DMMP describes three potential dredging methodologies, clamshell, hydraulic cutter-head, hydraulic hopper dredging, but acknowledges that the final dredging methods would depend on the equipment availability and the contractors' individual experience.

In addition, JCEP modeled the effects of turbidity at each of the proposed dredging locations using clamshell, hydraulic suction dredging, and excavation methods.[94] The modeling confirmed turbidity exceeding 10 NTU above background levels extending a total of more than one mile above and below the Navigational Reliability Improvement dredge locations. The modeling also confirmed elevated but comparatively localized turbidity plumes at the Slip, Access Channel, and eelgrass mitigation dredge locations. The report recommends that both capital and maintenance dredging operations incorporate construction BMPs, although the "nature and extent of BMPs should be determined through coordination with the regulatory agencies".

Figure 17: Modeled Turbidity from Capital and Maintenance Dredging at NRI-3



Oregon's Turbidity water quality standard allows DEQ to issue Section 401 water quality certifications that

[93] Dredge Material Management Plan. David Evans & Associates, Inc. October 2017.
[94] Hydrodynamic Studies – Turbidity Analysis, Moffat and Nichol, November 2017.

authorize actions to exceed numeric turbidity limits provided the applicant employ all practicable turbidity control techniques. On September 7, 2018, DEQ requested additional information related to JCEP's proposed dredging methods and measures to avoid or minimize turbidity. Specifically, DEQ requested a Dredging Pollution Control Plan. In particular, the request was for a "description of water pollution controls (operational controls, structural such as floating turbidity curtain etc.) that JCEP would use in dredging and transporting dredged material".

JCEP has not submitted a Dredging Pollution Prevention Plan. DEQ finds JCEP's proposed activities would cause turbidity to increase in excess of numeric limits, and absent any Dredging Pollution Prevention Plan, JCEP has failed to demonstrate its methods include sufficient controls to prevent exceedance of turbidity standard in OAR 340-041-0036.

6.9.3 DEQ Findings: Turbidity

DEQ's preceding evaluation of Project results in the following findings related to OAR 340-041-0036:

1. JCEP's proposed activities do not employ the highest and best treatment to control turbid discharges by failing to:
    a. Demonstrate the deployment of effective BMPs during pipeline construction and operation.
    b. Demonstrate the use of effective BMPs during road maintenance.
    c. Provide a site-specific waterbody crossing and restoration plans to minimize turbid discharges and restore stream form and function supporting water quality.
2. JCEP's proposed activities do not employ methods to construct and maintain roads in a manner to prevent turbid discharges to public waters by minimizing erosion of cut bank, fills, and roads.
3. JCEP's proposed activities do not employ methods to control turbid discharges generated by organic or inorganic debris from landslides during pipeline construction, pipeline operation, waterbody construction planning, and road maintenance, and road construction.
4. JCEP has not provided site-specific waterbody crossing and restoration plans that sufficiently describe required methods to avoid, minimize, and mitigate for turbidity. DEQ relies on the plans and information described above to confirm the project has considered the highest and best treatment techniques for minimizing turbidity during construction activities. Absent these plans and information, DEQ does not have a reasonable assurance that the JCEP's proposed activities will comply with the turbidity water quality standard. OAR 340-048-0020(3).
5. JCEP's proposed activity would likely violate the Turbidity water quality standard for the following reasons:
    a. JCEP has not provide an NDPDES 1200-C required Erosion and Sediment Control Plan demonstrating sediment and erosion controls with installation techniques have been properly deployed during the construction of the Terminal and Off-Site Project Areas to control turbidity from construction activities.
    b. JCEP proposes the disposal of dredged material producing turbid discharges from the leachate (i.e., decant flows), from this disposed material, and from exposed soils without demonstrating the deployment of site-specific controls to prevent exceedance of turbidity standard in OAR 340-041-0036.
6. JCEP's modeling conducted confirms that dredging at the Navigational Reliability Improvement locations, the Slip, and Access Channel would cause turbidity levels to increase above allowable numeric limits.
7. JCEP did not provide a Dredging Pollution Prevention Plan that sufficiently demonstrates JCEP considered and proposed all practicable turbidity control techniques to avoid, minimize, and mitigate these effects as required by OAR 340-041-0036.

Based upon these findings, violations of the turbidity water quality standard are likely to occur and DEQ concludes that it lacks a reasonable assurance that the proposed activities will be conducted in a manner that will not violate the Turbidity water quality standard.

6.10 Antidegradation

Oregon water quality standards have three main elements: beneficial uses; numeric and narrative criteria designed to protect those uses; and an antidegradation policy that is design to assure that water quality continues to improve. When the Department considers issuing a permit or a water quality certificate that would allow the existing water quality to be diminished in some way, the Department action must comply with the antidegradation provisions of the water quality standards.

6.10.1 Applicable Standard

Oregon's antidegradation policy provides a process to protect, maintain, and enhance water quality, support beneficial uses, and guide decision-making to prevent further degradation from new or increased point and nonpoint pollution sources. The antidegradation policy supplements other provisions of DEQ's water quality rules and is further implemented through guidance provided in Oregon's Antidegradation Internal Management Directive.

Oregon's antidegradation policy recommends a complete antidegradation review for new discharge sources requiring a Section 401 water quality certification. DEQ has established antidegradation review procedures for waterbodies classified as Outstanding Resource Waters, High Quality Waters, and Water Quality Limited Waters. The policy establishes a process in which DEQ may authorize actions that lower water quality in High Quality and Water Quality Limited Waters providing the action does not violate water quality standards, the action maintains support for beneficial uses, and feasible alternatives were implemented to reduce water quality impacts. If no feasible alternatives exist, the antidegradation policy may consider whether the action's social and economic benefits outweigh the environmental costs of reduced water quality.

The proposed Project does not affect any waterbodies classified as Outstanding Resource Waters.
Oregon Administrative Rule OAR 340-041-0004:

(1) Purpose. The purpose of the Antidegradation Policy is to guide decisions that affect water quality to prevent unnecessary further degradation from new or increased point and nonpoint sources of pollution, and to protect, maintain, and enhance existing surface water quality to ensure the full protection of all existing beneficial uses. The standards and policies set forth in OAR 340-041-0007 through 340-041-0350 supplement the Antidegradation Policy. * * *

(3) Nondegradation Discharges. The following new or increased discharges are subject to this division. However, because they are not considered degradation of water quality, they are not required to undergo an antidegradation review under this rule:

* * *

(c) Temperature. Insignificant temperature increases authorized under OAR 340-041-0028(11) and (12) are not considered a reduction in water quality.

(d) Dissolved Oxygen. Up to a 0.1 mg/l decrease in dissolved oxygen from the upstream end of a stream reach to the downstream end of the reach is not considered a reduction in water quality so long as it has no adverse effects on threatened and endangered species. * * *

(6) High Quality Waters Policy: Where the existing water quality meets or exceeds those levels necessary to support fish, shellfish, and wildlife propagation, recreation in and on the water, and other designated beneficial uses, that level of water quality must be maintained and protected. However, the commission, after full satisfaction of the intergovernmental coordination and public participation provisions of the continuing planning process, and with full consideration of sections (2) and (9) of this rule, and 340-041-0007(4), may allow a lowering of water quality in these high quality waters if it finds:

(a) No other reasonable alternatives exist except to lower water quality; and

(b) The action is necessary and benefits of the lowered water quality outweigh the environmental costs of the reduced water quality. This evaluation will be conducted in accordance with DEQ's "Antidegradation Policy Implementation Internal

Management Directive for NPDES Permits and section 401 water quality certifications," pages 27, and 33-39 (March 2001) incorporated herein by reference;

(c) All water quality standards will be met and beneficial uses protected; and

(d) Federal threatened and endangered aquatic species will not be adversely affected.

(7) Water Quality Limited Waters Policy: Water quality limited waters may not be further degraded except in accordance with paragraphs (9)(a)(B), (C) and (D) of this rule.

(8) Outstanding Resource Waters Policy. Where existing high quality waters constitute an outstanding State or national resource such as those waters designated as extraordinary resource waters, or as critical habitat areas, the existing water quality and water quality values must be maintained and protected, and classified as "Outstanding Resource Waters of Oregon." * * *

6.10.2 DEQ Evaluation

The preceding sections of this Evaluation and Findings report conclude that proposed activity would affect certain water quality standards and result in a lowering of water quality. Oregon's antidegradation policy requires DEQ to undertake a review of these actions in accordance with procedures established in the Antidegradation Internal Management Directive. The construction and operation of the Pacific Connector Pipeline would not meet the minimum requirements of Oregon's antidegradation policy because the applicant has not fully considered feasible alternatives to avoid, minimize, or mitigate for impacts to waters of the state. Absent an evaluation of feasible alternatives DEQ is prevented from considering the economic and social benefits of the proposed action against the environmental impacts of lowered water quality.

Temperature

Section 6.6 of this Evaluation and Findings Report finds that the temporary and permanent pipeline right-of-way would increase thermal impacts to waterbodies. JCEP has not provided a Source Specific Implementation Plan to propose methods to mitigate these impacts. Absent such a plan, DEQ finds the project does not meet the Antidegradation policy by failing to consider and implement alternative methods.

Turbidity and Sedimentation

Sections 6.1 and 6.9 of this Evaluation and Findings Report finds the proposed project would increase sedimentation and turbidity. JCEP has not submitted plans to address mitigation of project-related effects for road construction and maintenance, waterbody crossings, pipeline construction, and right-of-way maintenance. Information in plans is necessary to demonstrate JCEP proposed methods that would result in the least impact to water quality. Absent plans that support this requirement, DEQ finds the project does not meet the antidegradation policy by failing to consider and implement alternative methods.

Biocriteria

Section 6.2 of this Evaluation and Findings Report finds that trenched waterbody crossings would affect aquatic and riparian habitat and may cause detrimental changes to resident biological communities. JCEP has not submitted specific waterbody crossing and restoration plans for each proposed crossing. DEQ finds the project does not meet the Antidegradation policy's requirements by failing to demonstrate that alternative methods were considered.

6.10.3 DEQ Findings

DEQ's antidegradation policy requires a complete antidegradation review for projects subject to section 401 water quality evaluation. OAR 340-041-0004. Upon completion of such a review, DEQ may authorize projects that result in reduced water quality providing certain conditions are demonstrated. As discussed more fully in preceding

sections, JCEP failed to provide information necessary to complete such a review. Absent plans that demonstrate JCEP considered methods to avoid and minimize water quality impacts to temperature, turbidity, sedimentation, and biocriteria, DEQ finds the project does not meet the requirements of DEQ's antidegradation policy.

Based on the preceding evaluation, DEQ finds the proposed Project does not comply with Oregon's antidegradation policy.

7 Evaluation of Compliance with Sections 301, 302, 303, 306 and 307 of the Federal Clean Water Act

To certify a project pursuant to Section 401 of the federal Clean Water Act, DEQ must find that the project complies with applicable provisions of Sections 301, 302, 303, 306 and 307 of the Act and state laws and regulations adopted to implement these sections. Sections 301, 302, 306 and 307 of the federal Clean Water Act deal with effluent limitations, water quality related effluent limitations, national standards of performance for new sources and toxic and pretreatment standards. All of these requirements relate to point source discharges and are the foundation for conditions in National Pollutant Discharge Elimination System permits issued to the point sources.
Section 303 of the Clean Water Act relates to Water Quality Standards and Implementation Plans. EPA has adopted regulations to implement Section 303 of the act. The Environmental Quality Commission adopted water quality standards consistent with the requirements of Section 303 and the applicable EPA rules. The commission standards are in Oregon Administrative Rules Chapter 340, Division 41. EPA has approved the Oregon standards pursuant to the requirements of Section 303 of the act and has approved TMDLs that implement those standards in basins where standards are not currently being met. For the reasons set forth in the preceding sections of this report, DEQ finds that the proposed Project would not comply with Oregon Water Quality Standards and, in certain aspects, applicable TMDLs.

8.0 Evaluation Of Other Appropriate Requirements Of State Law

Pursuant to § 401(d) of the Clean Water Act, DEQ may condition a water quality certification to assure compliance with other appropriate requirements of state law. Such requirements are "appropriate" if they have any relation to water quality, Arnold Irrigation Dist. v. DEQ, 79 Or.App. 136 (1986), PUD No.1 of Jefferson Co. v. Washington Dept. of Ecology, 511 U.S. 700 (1994). Because DEQ is denying the requested water quality certification for the proposed Project for the reasons stated above in this report, DEQ has not fully evaluated what conditions would be necessary to comply with other appropriate requirements of Oregon law. However, DEQ lists below the requirements that it would consider should JCEP make a new request for certification.

Department of Land Conservation and Development

While the denial of certification may not be based on land use considerations, land use regulations protecting water quality and aquatic resources must be considered by DEQ. DEQ has determined that JCEP has not provided an adequate land use exhibit, as required by OAR 340-048-0020(i). This section of this report provides background for this determination and provides information that may be helpful should the application be resubmitted.

General Land Use Requirements under ORS 197.180

Unlike most states, Oregon has a system of statewide laws governing land use. The system includes 19 rules designated as statewide goals. The goals encompass a range of issues relating to land use, land development, and environmental protection, including goals and rules directly relating to water quality and to estuaries. OAR chapter 660, division 15. Local governments have the primary responsibility for implementing these statewide rules. Under ORS 197.180, however, state agencies also must comply with the statewide planning goals and act in a manner that is compatible with local comprehensive plans and land use regulations when taking actions in programs affecting land use.

A state agency generally complies with the statewide planning goals by acting compatibly with applicable comprehensive plans and local land regulations when such plans and regulations are acknowledged to comply with the statewide planning goals. OAR 660-030-0065(2); Schreiner's Gardens v. DEQ, 71 Or. App. 381(1984). Under the general rules adopted by the Land Conservation and Development Commission (LCDC) to implement ORS 197.180 and the specific rules governing DEQ, the agency may, and generally does, rely on determinations by local governments concerning whether a proposed use is compatible with acknowledged local plans and regulations. OAR 660-030-0070; OAR 340-018-0050. These determinations are known as "land use compatibility statements" or as a "LUCS". In situations where a local government cannot or does not provide a satisfactory LUCS, DEQ must determine for itself whether a proposed project or activity complies with the statewide goals, and is compatible with applicable acknowledged local plans and regulations.

Special Limitations Under CWA Section 401

The section 401 certification program is a program affecting land use for purposes of ORS 197.180. OAR 340-018-0030(4)(g). To the extent permitted by law, the DEQ certification decision must comply with the statewide planning goals and be consistent with acknowledged local land use plans and regulations as described above. Oregon case law, however, limits the application of ORS 197.180 in the context of certifications issued under CWA Section 401. Specifically, DEQ may apply applicable state and local land use regulations only to the extent that they relate to water quality, and then only for purposes of determining whether to impose conditions to assure compliance with those regulations (and not for purposes of approval or denial). Such provisions are "other appropriate requirement of State law" for purposes of CWA Section 401(d). Arnold Irrigation Dist. v. DEQ, 79 Or.App. 136 (1986).

Oregon's rule implementing the CWA, ORS 197.180 and the Arnold Irrigation Dist. decision requires:
(i) An exhibit that:
(A) Includes land use compatibility findings for the activity prepared by the local planning jurisdiction;
(B) If land use compatibility findings have not been obtained, identifies the specific provisions of the local land use plan and implementing regulations applicable to the activity and describes the relationship between the activity and each of the land use provisions identified in paragraph (A) of this subsection; and
(C) Discusses the potential direct and indirect relationship to water quality of each finding or land use provision.

OAR 340-048-0020.

On January 28, 2019, JCEP submitted to DEQ a land use exhibit pursuant to OAR 340-048-0020(2)(i). As discussed below, however, it is incomplete and otherwise inadequate to satisfy the rule.

JCEP has not supplied valid or complete LUCSs from the counties where the facility and pipeline would be located. Accordingly, before a certificate can issue, DEQ would be required to make its own determination regarding

whether the Project is compatible with water quality related requirements in the local comprehensive plans and land use regulations and complies with water quality related requirements in the statewide planning goals. (In the context of this application, DEQ has determined that elements of statewide Goals 5, 6, 12, and 16 (and their implementing regulations) are applicable.)

To the extent that a local government has applicable acknowledged local land use plans and regulations, and the Project components in the county would be compatible with those plans and regulations, DEQ generally would rely on the compatibility findings to determine goal compliance. To the extent a county does not have acknowledged plans and regulations addressing the project or DEQ cannot determined that the project is compatible with such provisions, DEQ would make its own finding regarding goal compliance and local compatibility. As noted above, however, in the context of Section 401 certifications, the findings would be limited to water quality related provisions. ORS 197.180(1)(b). The following subsections of this report describe DEQ's current evaluations of these issues.

Klamath County

Klamath County provided a LUCS dated January15, 2019, that covers both the proposed pipeline and compressor station. The LUCS states that both uses are compatible with the acknowledged comprehensive plan and allowed by conditional use permit. The County has issued a conditional use permit (CUP 5-15) for the proposed compressor station. The County has not issued a permit or approval from the pipeline, however, because it believes its authority to do so has been pre-empted by FERC. Although the LUCS acknowledges that approvals have not been issued for the pipeline, it incorporates proposed findings prepared by the JCEP for the LUCS previously issued in 2015 and a review of plan and regulation amendments that occurred after 2015. The proposed findings indicate that the pipeline would be approvable if the County were to exercise its land use jurisdiction.

Based on the County's findings and the supporting information provided by the JCEP to DEQ and the County, DEQ believes that the compressor station is compatible with the local acknowledge comprehensive plan and regulations and with the statewide goals. Based on the statements in the LUCS and proposed findings of the JCEP, DEQ has sufficient information at this time to determine the other elements of the Project within Klamath County are compatible with the County's comprehensive plan and land use regulations and would be approved or permitted if the County were to assert its land use jurisdiction. Because the pipeline use would be compatible with the County's acknowledged comprehensive plan and land use regulations, the Project elements in Klamath County could be deemed to comply with the statewide land use goals as well.

Jackson County

JCEP has provided an unsigned and undated LUCS from Jackson County. The LUCS states that the Project within Jackson County is allowed, but only because the Project is not subject to the County's comprehensive plan and land use regulations. The unsigned LUCS indicates that the County's refusal to assert jurisdiction arises from County policy number 17 relating to linear transmission facilities. The County does not take a position on whether the pipeline would be allowed outright or by conditional use permit if it were subject to the County's plan and land use regulations. JCEP provided proposed findings prepared in September 15, 2015, that purport to demonstrate that the Project would be compatible with the County's comprehensive plan and land use regulations if the County were to assert jurisdiction. JCEP has also provided evidence that there have been no relevant changes in the plan and land use regulations after 2015.

Without confirmation from the County that it concurs with the proposed findings, DEQ declines to determine at this time whether the pipeline is compatible with acknowledged comprehensive plan provisions and land use regulations for Jackson County. Some of the provisions in the comprehensive plan and land use regulations, including those relating to approval of conditional uses for linear facilities, appear to be water quality related. JCEP's land use exhibit, however, does not attempt to identify specifically which applicable plan provisions and implementing regulations are water quality related.

Douglas County, Non-Coastal Zone

JCEP provided a LUCS from Douglas County dated January 23, 2019, stating the pipeline use is allowed, but this is based on findings that County zoning authority over portions of the pipeline outside the coastal zone are pre-empted by the Natural Gas Act. JCEP has also provided proposed findings prepared in September 15, 2015, purporting to demonstrate that the project would be compatible with the County's comprehensive plan and land use regulations if the County were to assert jurisdiction.. JCEP has also supplied evidence that there have been no relevant changes to the plan and regulations after 2015. The LUCS acknowledges but does not incorporate or approve the proposed findings submitted by the JCEP.

Without confirmation from the County that it concurs with the proposed findings, DEQ declines to determine at this time whether the pipeline is compatible with acknowledged comprehensive plan provisions and land use regulations. Some in the plan and land use regulations, including those relating to approval of linear facilities, appear to be water quality related. JCEP's exhibit, however, does not attempt to identify specifically which applicable plan provisions and implementing regulations are water quality related.

Douglas County, Coastal Zone

The County provided a LUCS dated January 23, 2019, stating the pipeline use is allowed based on the prior issuance of conditional use permit and the findings supporting that permit. On this same day, however, the Douglas County Circuit Court determined that the conditional use permit issued by the County for construction of the pipeline on lands within the coastal zone is void based on the failure of the County to grant timely extension of the permit. McLaughlin et al. v. Douglas County, 17CV32687, 17CV41672 and 18CV04396. Under the provisions of OAR 340-018-0050(2)(a)(G), DEQ cannot base compatibility with acknowledge local plans and regulations and the applicable statewide planning goals on the basis of a LUCS that has been invalidated.

JCEP's land use exhibit is predicated on establishing compatibility with the comprehensive plan and land use regulations. Some of the provisions in the comprehensive plan and land use regulations, including those relating to approval of conditional uses for linear facilities, appear to be water quality related. JCEP's exhibit, however, does not attempt to identify specifically which applicable plan provisions and implementing regulations are water quality related.

The conditional use permit in question appears to be a requirement for the project under the regulations implementing the federal Coastal Zone Management Act. Consequently. DEQ anticipates that the JCEP would reapply for the CUP. If the permit is re-issued, DEQ would be able to determine the pipeline with in the Coastal Zone in Douglas County is compatible with the acknowledged plan and land use regulations.

Coos County

Coos County issued a LUCS dated December 17, 2018, that states the Project is not compatible with local comprehensive plan and land use regulations. This determination is based on several factors including necessary conditional use permits and plan amendments that have not yet been obtained for the pipeline and roadways, and the invalidation and remand of county decisions approving the LNG terminal itself. Ocean Shores Conservation Coalition v. Coos County, LUBA No. 2016-095 (2017). LUBA's decision was subsequently affirmed by the Oregon Court of Appeals.

With respect to the terminal, LUBA concluded that the County's findings were inadequate or improper. The remand involves, but is not limited to, the following water quality related issues:

- Findings relating to the need and substantial benefit required under Coos Bay Estuary Management Plan

policy 5(I) with respect to the dredging required in areas zoned 5-DA and 6-DA;
- Findings of no unreasonable interference with the public trust rights required under Coos Bay Estuary Management Plan policy 5(I) with respect to the dredging required in areas zoned 5-DA and 6-DA;
- Findings relating to whether the public need and gain from the project warrants the loss or modification to the estuarine system under Policy 4 and 4(a); and
- Mitigation findings with respect to its approval for filling a portion of the estuary in the 7-D zone.

Because key elements of the proposed Project are not currently allowed under the county's acknowledged comprehensive plan and land use regulations, DEQ cannot (at this time) determine that the Project is compatible with the acknowledged comprehensive plan and land use regulations. Some aspects of these decisions are clearly water quality related.

City of Coos Bay

As JCEP acknowledges, the Project requires a land use goal exception, comprehensive plan change, zoning map amendments, and a conditional use permit from the City of Coos Bay. These land use actions are needed at least in part to comply with water quality related requirements of the statewide land use goals as implemented through the city's comprehensive plan and land use regulations. As a result, DEQ cannot (at this time) determine that the Project is compatible with the acknowledge comprehensive plan and land use regulations.

City of North Bend

As JCEP acknowledges, conditional use permits from the City of North Bend are required in order for the Project to be compatible with the acknowledged comprehensive plan and land use regulations. These permits implement water quality related requirements of the statewide land use goals.

Laws Administered by the Oregon Department of State Lands
ORS 196.795 to 196.990 requires that permits be obtained from the Department of State Lands (DSL) prior to any fill or removal of material from the bed or banks of any stream.

Laws Administered by the Oregon Department of Fish and Wildlife
ORS 496.012 sets wildlife policy for prevention of depletion of indigenous species and toward wildlife resource decisions to be made in the best social, economical and recreational interests of all user groups

ORS 496.164 provides for cooperation and technical assistance to other agencies with regard to wildlife resource management

ORS 496.170 to 496.192 requires collection and analysis of scientific data to determine and inventory biological status of species, develop conservation strategies, and provide recommendations to other agencies regarding actions affecting threatened or endangered species

OAR 635-007-0502 et. seq. native fish conservation policy – protection of natural ecological communities and habitats tailored to individual watersheds and situations

OAR 635-059-0000 et. seq. aquatic invasive species control

OAR 635-100-0135 Survival Guidelines for Species Listed as Threatened or Endangered – lower Columbia coho

OAR 635-100-0150 requires consultation with ODFW on affects to endangered species OAR 635-410-0000 natural resource losses

OAR 635-412-0005 et. seq. addresses fish passage

OAR 635-413-0000 et. seq. fish habitat mitigation policy OAR 635-425-0000 et. seq. in-water blasting

OAR 635-500-0002 et. seq. addresses fish management plans

Laws Administered by the Oregon Department of Environmental Quality

ORS 459.005 – 418 Solid Waste Management Law

ORS 466.020, 075, 105, and 195 Hazardous Waste Management Law

ORS 468B.155 prevention of groundwater contamination

ORS 468B.160 (5) triggers action to prevent groundwater contamination or restore acceptable levels

OAR 340-040-0030 permitted operation (5) action requirements and (6) remedial action requirements

OAR 340-045 pertaining to NPDES and WPCF permits

OAR 340-143-0000 pertaining ballast water management

Laws Administered by the Oregon Department of Water Resources

OAR 690-009 groundwater interference with surface water OAR 690-010 appropriation and use of groundwater
OAR 690- 012 out-of-basin diversion OAR 690-020 dam safety

OAR 690-28 surface water registrations

OAR 690-033 standards for new appropriations

OAR 690-077 instream water rights
OAR 690-086 water management and conservation plans

Laws Administered by the Oregon Watershed Enhancement Board

ORS 541-351 et. seq. Oregon Plan for Salmon and Watersheds

9.0 Public Comment

The Corps' and DEQ's public comment period for the Project was originally from May 22, 2018 through July 21, 2018. The agencies extended the public comment period until August 20, 2018. DEQ received about 42,000 public comments electronically and by mail.

This document does not include responses to these public comments because DEQ is denying certification based, in part, upon the failure of the applicant to provide necessary information; therefore, a complete response to public comments has not been prepared.

10.0 Conclusion

For the reasons set forth in this report, DEQ denies Jordan Cove's request for 401 WQC for the Project. DEQ does not have a reasonable assurance that the construction and operation of the Project will comply with applicable state water quality standards, as described in this report. DEQ's decision, however, is made without prejudice. Jordan Cove may reapply for a 401 WQC for the Project, and DEQ will consider additional information that is responsive to the bases for denial in this decision.

Attachment A

Additional Information Requests

Oregon
Kate Brown, Governor

Department of Environmental Quality
Western Region Eugene Office
165 East 7th Avenue, Suite 100
Eugene, OR 97401
(541) 686-7838
FAX (541) 686-7551
OTRS 1-800-735-2900

September 7, 2018

Derik Vowels
Jordan Cove LNG, LLC
Consultant, Lead Environmental Advisor
111 SW 5th Ave., Suite 1100,
Portland OR 97204

Re: Additional Information Request
Jordan Cove Energy Project (FERC Project No. CP17-494)
Pacific Connector Gas Pipeline (FERC Project No. CP17-495)
U.S. Army Corps of Engineers (Project No. NWP-2017-41)

Dear Mr. Vowels:

The Oregon Department of Environmental Quality (DEQ) is currently reviewing an application from Jordan Cove LNG, LLC (Jordan Cove) for Clean Water Act section 401 water quality certification for a Section 404 permit from the U.S. Army Corps of Engineers necessary for construction of the Jordan Cove Energy Project and Pacific Connector Gas Pipeline (collectively, "the Project"). Jordan Cove proposes to construct a liquefied natural gas export facility near North Bend, Oregon, and a 232-mile natural gas pipeline connecting the terminal with existing pipelines near Malin, Oregon.

Section 401 of the Clean Water Act bars federal agencies from issuing a license or permit for an action that may result in a discharge to Oregon waters without first obtaining water quality certification from DEQ. DEQ anticipates Jordan Cove's construction and operation of the Project will require authorizations from multiple federal agencies, including but not limited to a Section 404 permit from the U.S. Army Corps of Engineers and authorizations from the Federal Energy Regulatory Commission (FERC) pursuant to the Natural Gas Act. DEQ is conducting a comprehensive section 401evaluation of the Project's direct, indirect, and cumulative effects on water quality. DEQ currently expects to develop a single certification decision based on this comprehensive evaluation of the Project that will be applicable to both the Corps and FERC decisions on the Project.

DEQ is processing the applications pursuant to Section 401 of the Clean Water Act, 33 USC §1341, ORS 468B.035 through 468B.047, and DEQ's certification rules found in Oregon Administrative Rules 340, Division 048. To certify the Project, DEQ must have a

reasonable assurance that the proposed Project, as conditioned, will comply with Sections 301, 302, 303, 306, and 307 of the Clean Water Act, Oregon water quality standards, and any other appropriate requirements of state law.

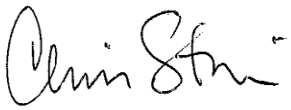
DEQ has conducted a preliminary review of the application package material submitted February 6, 2018, by David Evans and Associates, Inc. on behalf of Jordan Cove. The information described in the attachments to this correspondence is necessary to complete DEQ's analysis of the Project's compliance with applicable standards. Please file a complete response to this additional information request within 30 days of the date of this letter. Please forward your responses to:

Christopher Stine
Oregon Department of Environmental Quality
165 East 7th Avenue, Suite 100
Eugene, Oregon 97401

If Jordan Cove cannot provide certain information within the requested period, please indicate which items will be delayed and provide a projected filing date. You may reference previously submitted documents, in whole or in part, to support your responses to the requests in Attachments A through B

DEQ reserves the right to request additional information as necessary to complete its analysis and fulfill its obligations under state and federal law.

If you have any questions, please contact me directly at (541) 686-7810, or via email at stine.chris@deq.state.or.us.



Christopher Stine, PE
Water Quality Engineer

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Sean Mole, sean.mole@oregon.gov

ATTACHMENT A

Jordan Cove Energy Project / Pacific Connector Gas Pipeline
Additional Information Request

1. Application for Certification
   Oregon Administrative Rule (OAR) 340-048-0020(2) identifies the minimum requirements for applications to the Oregon Department of Environmental Quality for section 401 water quality certification. Please provide complete responses to the application requirements given in OAR 340-048-0020(2)(a-j). If Jordan Cove has previously submitted portions of this information, please reference the location and include any supplemental or clarifying information, as necessary, to provide complete responses.

2. Proposed Action
   Jordan Cove must provide and update DEQ with a complete and current description of the construction and operation of the proposed Project and the impacts of these actions on affected waterbodies. DEQ recognizes that Jordan Cove may revise project elements during the design process. Jordan Cove must provide DEQ with timely submissions describing changes to the proposed activity that may directly or indirectly affect water quality. Jordan Cove must also specify clearly that it is requesting that DEQ accept these submissions as changes to the proposed activity and consider the effects of the revised action in our section 401 water quality evaluation.

3. Submission of Application Information
   Jordan Cove's application to DEQ for section 401 water quality certification must provide DEQ with a comprehensive description of the proposed action including all resource reports, maps, electronic data files, and supporting documentation provided to federal agencies from whom Jordan Cove is seeking permits or authorizations. DEQ's certification rules require applicants to file information directly with the Department. For this reason, DEQ does not consider the availability of information on external websites or other sources as a submittal unless the applicant explicitly directs DEQ to obtain application materials from these sources.

4. Water Quality Standards
   Oregon's water quality standards consist of beneficial uses, numeric and narrative criteria developed to support these uses, and an antidegradation policy that prohibits an activity from further degrading water quality. Applicants for water quality certification must provide sufficient information to demonstrate the activity will comply with Oregon water quality standards (OAR 340-048-0020(g)).

   Provide information to demonstrate how the Project will comply with the water quality standards found in OAR 340 Division 041. For project activities that do not affect State waters, note how the Project will not violate applicable standards. For project activities that do impact State waters, note how Jordan Cove is proposing to mitigate, reduce, or prevent impacts so as to ensure the Project, as proposed, does not violate applicable water quality standards. Project impacts should be assessed in terms of direct, indirect, and cumulative effects of the activity on state water quality.

ATTACHMENT B

Jordan Cove Energy Project / Pacific Connector Gas Pipeline
Additional Information Request

Preliminary evaluation of the proposed activities to determine compliance with the requirements for a Certification Decision as described in Oregon Administrative Rules 340-048-0042(2):

Oregon Administrative Rule	Requirement	Information Requested
340-048-0042(2)	Compliance with Clean Water Act Sections 301 and 302	Please provide a NPDES 1200-C Permit Application demonstrating that land disturbing activities associated with the construction of Jordan Cove Energy Project's Liquefied Natural Gas Terminal as well as the following: • Land disturbing activities associated with the dry excavated portion of this terminal's Marine Slip, • Land disturbing activities associated with all offsite project areas associated with this terminal and its construction including those areas described in Section 5.3 of this terminal's stormwater management plan (Part 1, Attachment A3). • Land disturbing activities associated with roads used to access this terminal and offsite project areas. • Land disturbing activities associated with any other facilities (staging areas, refueling areas, employee parking etc.) that Jordan Cove Energy Project will use to construct of this terminal. DEQ will need to determine if these land disturbing activities will comply with the technology-based effluent limits of this permit. DEQ will also need an erosion and sediment control plan that, for example, addresses Schedule A.12.b.v and other conditions in this permit. For DEQ to evaluate the water quality impacts of the construction process on waters of the state, DEQ needs this information in an erosion and sediment control plan.
		Please provide a NPDES 1200-C Permit Application for land disturbing activities associated with the construction of Pacific Connector's gas pipeline and with the construction of all associated facilities such as communication towers, roads (existing and new), disposal sites, block valve facilities, and compressor stations. DEQ will need to determine if these land disturbing activities will comply with the technology-based effluent limits of this permit. DEQ will also need an erosion and sediment control plan that, for example, addresses Schedule A.12.b.v and other conditions in this permit. For DEQ to evaluate the water quality impacts of the construction process on waters of the state, DEQ needs this information in an erosion and sediment control plan.
		Please provide a NPDES 1200-A Permit Application demonstrating that the proposed 20 sites to obtain rock for Pacific Connector's gas pipeline construction and maintenance. DEQ will need to determine if these land disturbing activities will comply with the technology-based effluent limits of this permit.
		Please provide a NPDES 1200-A Permit Application demonstrating that the concrete batch plant proposed for the offsite project area referred to as Boxcar Hill in the LNG Terminal's stormwater management plan (Section 5.3,

		page 19). DEQ will need to determine if rock quarries will operate in compliance with the technology-based effluent limits of this permit.
		Please provide a NPDES Individual Permit Application for the LNG Terminal's two domestic wastewater facilities discharging to surface water. DEQ will use the information in this permit application to develop a discharge permit containing technology-based and water quality-based effluent limits associated with this permit.
		Please provide a NPDES Individual Permit Application for discharges of non-contact cooling wastewater discharged from Liquefied Natural Gas carriers using the Marine Slip at the LNG Terminal. DEQ will use this permit application to develop a discharge permit containing technology-based and water quality-based effluent limits.
		If the discharge from wastewater treatment plants proposed for the LNG Terminal has a design flow capacity of 1 million gallons per day or more or requires pretreatment under 40 CFR §403, please provide a NPDES 1200-Z Permit Application demonstrating that the Terminal's stormwater management plan will comply with the technology-based and water quality-based effluent limits in this permit.
		Please provide an application for a NPDES Individual Permit for the discharge of vehicle and equipment washwater to surface water during the operation of the LNG Terminal. DEQ will use this permit application to develop technology-based and water quality-based effluent limits for this permit if the operations.
		Please provide an application for a NPDES Individual Permit for the discharge of vehicle and equipment washwater to surface water during the construction and operation of the gas pipeline and all its associated facilities. DEQ will use this permit application to develop technology-based and water quality-based effluent limits for this permit.
	Compliance with Clean Water Act Section 302	DEQ will evaluate compliance with CWA Section 302 upon the receipt of information requested above.
	Compliance with CWA Section 303	In compliance with OAR 340-041-0007(8), please provide an assessment of Pacific Connector Gas Pipeline's compliance with all applicable DEQ-approved Total Maximum Daily Load Implementation Plans or compliance programs for the following: • United States Department of Agricultural Forest Service Water Quality Restoration Plans and the USDA National Best Management Practices for Water Quality Management on National Forest System Lands (Volume 1: National Core BMP Technical Guide) noted in DEQ's Memorandum of Understanding with the Forest Service. • US Department of Interior Bureau of Land Management's Water Quality Restoration Plans. • Oregon Department of Forestry's Forest Practices Act Program. • Oregon Department of Agriculture's Water Quality Plans. • Coos County Total Maximum Daily Load Implementation Plan. • Douglas County Total Maximum Daily Load Implementation Plan. • Jackson County TMDL Implementation Plan. • Klamath County TMDL Implementation Plan. In this compliance assessment, please also note all the support documents such as design manuals, guidance documents, road permits etc. that PCGP will follow when complying with these Implementation Plans. In addition, please identify all proposed amendments to federal land and resource management plans that would necessitate amendments to current Forest Service, Bureau of Land Management, or Bureau of Reclamation Total

		Maximum Daily Load Implementation Plans covering the pipeline's construction and operation. Federal Water Quality Restoration Plans represent the Forest Service's and BLM's plan for activities on these federal lands serving as a source of point and nonpoint source pollutants including pollutants addressed in a Total Maximum Daily Load. Finally, for determining compliance with TMDL allocations covering federal lands, please provide for DEQ's review and approval all proposed Forest Service, Bureau of Land Management, and Bureau of Reclamation road permits and access grants or right-of-way permits. For determining compliance with TMDL allocations on non-federal lands, please provide for DEQ's review and approval all proposed easements, agreements, and access or right-of-way permits. This compliance assessment must also include a summary of the steps taken to first avoid and then minimize impacts to the Designated Management Agency's riparian buffer protection areas prior to: • Siting Temporary Extra Work Areas for the pipeline construction • Siting of the construction and the permanent right-of-way for the pipeline. DEQ is requesting this information in response to Pacific Connector Gas Pipeline's proposal to locate TEWAs 50 feet from a waterbody and wetland boundary (see page 25 of Resource Report 1 for the gas pipeline). For example, this setback will not comply with the Forest Service's and Bureau of Land Management's riparian buffer protection requirements as presented in their Water Quality Restoration Plans which serve as their TMDL Implementation Plans. In Resource Report 1 noted above, PCGP notes that there are 922.64 acres of TEWAs. Please identify the location of each TEWA that PCGP will locate within one and two potential tree heights away to 50 feet from waters of the state. For streams, please indicate the distance of each TEWA from the ordinary high water mark of the stream or riverine wetland. Additionally, please note the land ownership where each TEWA is located. In addition, on page 58 of Resource Report 1 for the gas pipeline, PCGP indicates that the pipeline – in some places – will impact riparian vegetation while paralleling streams. Specifically, this report notes that the "proposed route will avoid paralleling a waterbody within 15 feet or less, where feasible." In this report, PCGP notes that this placement is consistent with the Section V.B.2.a of FERC's Wetland and Waterbody Procedures. However, 15 feet of riparian buffer would violate DMA riparian buffer protection requirements. Moreover, based on the literature, a 15-foot riparian buffer for thermal regulation of streams may result in thermal gain to the adjacent water body. As result, please identify each segment of the pipeline's construction right-of-way and permanent right-of-way that is parallel to waters of the state and within two site potential tree heights from waters of the state. Please provide the location and a detailed rationale for siting TEWAs closer to streams than authorized by a DMA's riparian buffer protection requirements and when siting sections of the construction and permanent right-of-way. For example, the PCGP's rationale in Resource Report 1 (page 58) for not proposing setbacks larger than 50 feet in Riparian Reserves is that larger setbacks "would render the TEWA useless for the stream crossing." PCGP should justify its proposal for non-standard riparian buffer protections by providing the following information:

		• A description of the specific constraints at each site preventing the use of a TEWA in an area. • The specific rationale why the TEWA must be closer to the stream crossing. Without this specific information, DEQ cannot determine that Pacific Connector Gas Pipeline attempted to first avoid and minimize riparian impacts to the maximum extent practicable before seeking to mitigate these impacts. This compliance assessment must also identify other locations where PCGP will not comply with Designated Management Agencies' riparian protection areas when siting the following: • Temporary and Permanent Access Roads, • Staging areas, • Material storage areas, and • Other components (e.g., compressor stations, metering stations) of the pipeline. Please include a detailed justification for seeking alternative riparian buffer protection requirements when siting these facilities within riparian areas. Pacific Connector Gas Pipeline must evaluate the thermal impacts from all noncompliance with DMA riparian protection requirements requested above where PCGP has provided and DEQ has approved the following information: • Detailed information demonstrating it considered all actions to first avoid or then minimize impacts to riparian areas to the maximum extent practicable. • Detail rationale for proposing nonstandard widths for riparian buffer protections. This evaluation must be included in PCGP's Thermal Impacts Assessment noted in the comments below on compliance with state water quality standards.
		There is no information presented in Pacific Connector Gas Pipeline's Appendices for Timber Removal and Construction in the Transportation Management Plan (Part 2, Appendix E-8). Please provide the location of the approximately 660 miles of existing public and private roads that PCGP proposes to use to construct the gas pipeline and/or support its operation. In this updated plan, please delineate these existing public and private roads by ownership as follows: • Private road on land zoned for forest use • Private road on land zoned for agricultural use • Private road on land zoned residential/commercial/industrial use by Coos/Douglas/Jackson/Klamath County • Public road owned and operated by Coos/Douglas/Jackson/Klamath County • Public road on the Umpqua/Rogue-Siskiyou/Winema-Fremont National Forest • Public road on land in the Bureau of Land Management Coos Bay District/Roseburg District/Medford District/Klamath Resource Area • Public road on Bureau of Reclamation land

		DEQ will use this information to evaluate compliance with the Section 303 of the Clean Water Act as noted above. There is also no information presented in PCGP's Appendices for Operations and Maintenance in the Transportation Management Plan. Please provide the documentation demonstrating that PCGP inventoried these existing roads to identify necessary maintenance actions and needed improvements to protect water quality prior to their use. This documentation should also include: • The results of the inventory for each road segment and the recommended maintenance prescription for each segment. • The road assessment protocols used (e.g., USDA Forest Service Water/Road Interaction Field Guide) and the evaluation tool (e.g. Geomorphic Road Analysis and Inventory Package) used to evaluate the surface erosion risk, gully risk, landslide risk, and stream crossing failure risk during road use. Please also provide a detailed maintenance and improvement plan for the approximately 660 miles of existing roads. This plan must demonstrate that PCGP will implement all maintenance actions and improvements necessary to protect water quality – identified during the road inventory – prior to road use for pipeline construction or operation. This maintenance and improvement plan must also: • Implement the Designated Management Agencies' DEQ-approved TMDL Implementation Plans. • Comply with maintenance standards, requirements, and/or other design standards developed and used by DMAs to implement these TMDL Implementation Plans. Additionally, please identify the location of all existing roads that PCGP will use to access the gas pipeline during its operation. Please provide a maintenance plan for these existing roads that includes: • A description of the level of use these roads will experience during the pipeline's operation. • A description of the maintenance practices to protect water quality and a schedule for performing these practices and supporting this level of use.
		Please provide the location of the propose 25 miles of new Temporary and Permanent Access Roads and the selection criteria used to site these new roads to avoid and minimize impacts to water quality. Please delineate these new roads by land ownership (e.g., private ownership on land zoned for forest use) consistent with the information request noted above. DEQ will need this delineation by land ownership to evaluate compliance with Section 303 of the Clean Water Act. To ensure these roads will not serve as a source of sediment to and hydromodification of waters of the state and as a source of debris flows into streams from road-related landslides, please include the design standards and specifications for constructing these roads including their drainage systems, cut-slopes, and fill-slopes. Please identify the proposed designs to stabilize fillslopes and cutslopes and manage stormwater on new temporary and permanent roads located on the steep slopes (i.e., slopes greater than 30%) and engineering support for these designs. This information is necessary for DEQ to evaluate compliance with the statewide water quality criteria for

		road building and maintenance (OAR 340-041-0007)(7) and for ensuring that PCGP uses the highest and best practicable treatment control (OAR 340-041-0007(1). Additionally, please provide detailed best management practices and design standards for DEQ review and approval for decommissioning the Temporary Access Roads.
	Compliance with Clean Water Act Section 306	DEQ will complete its review upon the receipt of information requested above.
	Compliance with Clean Water Act Section 307	DEQ will complete its review upon the receipt of information requested above.

	Compliance with other appropriate requirements of state law	DEQ has not completed this review at this time but will consult in the future with other DEQ programs and other state agencies concerning compliance with other state statutory requirements such as:
		
		• Oregon Revised Statute 468B.035 and 105 (Enabling Legislation for Implementing the Coastal Zone Amendments and Reauthorization Act)
		• ORS 783.620 through 640 and 783.990 through 992 (Ballast Water Management Law)
		• ORS 466.020, 075, 105, and 195 (Hazardous Waste Management Law)
		• ORS 196.795 through 990 (Removal-Fill Law)
		• ORS 496.172 – 496.192 (Oregon Threatened and Endangered Species Act)
		• ORS 496.012, 496.138, and ORS 506.109
		  ○ Fish and Wildlife Habitat Mitigation Policy
		  ○ In-water Timing and In-water Blasting Permits
		• ORS 509.585 (Fish Passage Requirements)
		• ORS 498 (Fish Screening)
		• ORS 497.298 (Scientific Taking Permit)
		• ORS 537 (Water Rights Law)
		• ORS 197 (Oregon Land Use Planning Law)
		• ORS 390.235 (Permits for Removal of Archaeological or Historical Material)
		• ORS 569 (Weed Control Law)
		• ORS 527 (Forest Practices Act)
		
		At this time, please provide applications for Construction and Demolition Landfill Permits required under Oregon Revised Statute 459.005 through 418 (Solid Waste Management Law) for the several proposed disposal sites associated with the construction or operation of the gas pipeline.

340-048-0042(2)(a)	Potential Alterations to Water quality standards in OAR 340 Division 41	DEQ is reviewing the Jordan Cove Energy Project's proposed stormwater management plan for the Liquefied Natural Gas Terminal. DEQ will provide comments in another information request.
		In compliance with OAR 340-041-0007(8), please provide for DEQ review and approval the resource and land management plans, guidance, design standards, design manuals, access permits or grants, and other programs from the U.S. Bureau of Reclamation that Pacific Connector Gas Pipeline will use to protect water quality during the following:

		• Siting Temporary and Permanent Access Roads and the construction/permanent right-of-way on U.S. Bureau of Reclamation land, over BOR water-bearing infrastructure (e.g., canals), or paralleling this infrastructure. • Maintaining both Temporary and Permanent Access Roads for pipeline construction and operation. • Siting other components to necessary to construct and operate such as staging areas, material storage areas, and other components (e.g., compressor stations, metering stations) of the pipeline. • Installing the construction and permanent right-of-way for the gas pipeline. • Operating the permanent right-of-way for the pipeline. Please identify any proposed amendments and changes to existing BOR resource and land management plans and other documents noted that are necessary to construct, use, or maintain access roads and the permanent right-of-way on BOR land.
		The scope of work in Pacific Connector Gas Pipeline's August 31, 2017 Thermal Impacts Assessment suggests that PCGP evaluated only stream crossings for their potential to influence or regulate thermal properties of streams. Please indicate if this Thermal Impacts Assessment of the gas pipeline's construction and operation includes the following: • An analysis of the impacts from the 50-foot setbacks from waterbodies in riparian areas currently proposed for the Temporary Extra Work Areas. • An analysis of the impacts from siting the pipeline alignment within riparian areas as close as 15 feet from streams as currently proposed when paralleling these waterbodies. • An analysis of the impacts from siting Temporary and Permanent Access Roads, Staging Areas, material storage area, and other pipeline components (e.g., compressor stations, metering stations) within riparian areas. DEQ is requesting this clarification because the scope of work from the Thermal Impacts Assessment suggests that the estimate of solar loading for stream crossings under both the construction (i.e., 75-95 foot wide) corridor and the permanent (i.e., 30-foot wide) corridor using the Shade-A-Lator tool did not consider the impact of these TEWAs. The use of TEWAs during pipeline construction extends the construction corridor beyond 75 and 95 feet. Currently, the Pacific Connector Gas Pipelines proposes to site TEWAs 50 feet from waterbodies as noted in the comment above. In addition, the scope of work in this assessment does not indicate PCGP evaluated the influence on stream thermal properties when the pipeline's construction and permanent corridor closely parallels streams and comes within 15 feet or less of these streams. For a comprehensive analysis of PCGP's compliance with the temperature standard, PCGP's Thermal Impact Assessment must also evaluate these impacts as well as other impacts (e.g., roads, staging areas etc.) as requested in the comments above on compliance with Section 303 of the Clean Water Act.
		In compliance with OAR 340-041-0007(1) and (7), please provide a post-construction stormwater management plan addressing DEQ's Section 401 Water Quality Certification Post-Construction Stormwater Management Plan Submission Guidelines for all the road stream crossings that Cove Energy Project and Pacific Connector Gas Pipeline will: • Replace or improve to construct and/or operate the gas pipeline and

		• Result in an increase in impervious surface area during the replacement/improvement process. This information is necessary (see OAR 340-048-0042(2)(a)) to determine whether the stormwater discharge from the pipeline's road stream crossings will contribute to or cause violations of water quality standards.
		In compliance with OAR 340-041-0007(1) and (7), please provide a post-construction stormwater management plan addressing DEQ's Section 401 Water Quality Certification Post-Construction Stormwater Management Plan Submission Guidelines for all stream crossings for the pipeline. The focus of this plan should be the drainage area for the right-of-way approaches that discharge stormwater into the stream crossing. To ensure compliance with OAR 340-048-0042(2)(a), please evaluate if the discharge from the pipeline's permanent 30 foot right-of-way at all stream crossings for the pipeline will contribute to or cause violations of water quality standards. In compliance with OAR 340-048-0042(2)(a), please propose the analytical model(s) (e.g., X-DRAIN) that Pacific Connector Gas Pipeline will use to evaluate if the stormwater discharge from the permanent 30 foot right-of-way with its 10 feet of compacted soil overlying the gas pipeline will contribute to or cause violations of water quality standards. In compliance with OAR 340-041-0002(1), this evaluation must also consider the impact of the change in stormwater volume discharged to receiving waters from the vegetation conversion (i.e., from forest canopy to herbaceous vegetation) during pipeline construction. The evaluation of this impact is necessary to determine if pipeline's permanent right-of-way will cause bed and bank erosion and, therefore, violate Oregon's biocriteria water quality standard (i.e., OAR 340-041-0011).
		In compliance with OAR 340-041-0007(1) and (7), please provide a post-construction stormwater management plan addressing DEQ's Section 401 Water Quality Certification Post-Construction Stormwater Management Plan Submission Guidelines for the 30-foot permanent right-of-way for the approximately 117 miles of the proposed pipeline right-of-way traversing steeps slopes (i.e., slopes greater than 30%). This information is necessary before Pacific Connector Gas Pipeline, in compliance with OAR 340-048-0042(2)(a), can determine whether the discharge from the pipeline right-of-way will contribute to or cause violations of water quality standards. The information provided in PCGP's documents (e.g., 401 Application Submittal, drafts of Resource Reports) – made available to DEQ – only provides generic diagrams and erosion controls practices. DEQ can find no information on PCGP's field investigations or remote sensing for these areas to evaluate slope stability when siting the pipeline alignment. DEQ can find no information on the specific designs and practices that PCGP will use on cutslopes and fillslopes located on these steep slopes. In developing this plan in compliance with OAR 340-041-0007(1) and (7), please provide information on the designs and engineering support for these designs for the permanent controls Pacific Connector Gas Pipeline proposes to stabilize cut-slopes and fill slopes for the right-of-way sited along the steep slopes. The purpose of these controls is to prevent sediment discharge in stormwater and debris flows from landslides discharging into streams. Please note these on the post-construction stormwater plan in the information request above. Additionally, please identify where the 117 miles of proposed pipeline noted above coincide with the 94 miles of the proposed pipeline that would be located in soils that PCGP has identified as having a high or severe erosion

		potential. Please provide the designs and engineering support for these designs for the permanent controls in these areas of high/severe erosion potential and steep slopes. In compliance with OAR 340-041-0007(1) and (7), the engineering support must indicate that these permanent controls are sufficient to: • Manage stormwater to prevent erosion on the permanent right-of-way, its cut-slope, and its fill-slope. • Prevent debris flows into streams from landslides from cut-slope and fill-slope failures. On the post-construction stormwater management plan requested above, please also provide the location for these controls along the 117 miles of pipeline on steep slopes (>30%).
		In compliance with OAR 340-041-0007(1) and (7), please provide post-construction stormwater management plans for the proposed 25 miles of new permanent and temporary roads addressing DEQ's Section 401 Water Quality Certification Post-Construction Stormwater Management Plan Submission Guidelines. This information is required before Pacific Connector Gas Pipeline can determine whether the discharge from these new roads will contribute to or cause violations of water quality standards. In compliance with OAR 340-048-0042(2)(a), please propose the analytical model(s) (e.g., X-DRAIN) that Pacific Connector Gas Pipeline will use to evaluate if the stormwater discharge from these 25 miles of proposed new roads will contribute to or cause violations of water quality standards.
		Please provide an evaluation of compliance with water quality standards if Jordan Cove Energy Project and Pacific Connector Gas Pipeline will use dredged material in the construction of facilities in uplands and drainage from this dredge material will discharge to waters of the state. This request is to expand upon the Portland Sediment Evaluation Team's assessment (PSET Letters, January 19, 2016) that considered these constructed upland facilities to be outside federal Clean Water Act jurisdiction for the dredged material suitability determination. However, upland constructed facilities using dredged material are not outside the effects considered in a 401 Water Quality Certification of a FERC application for the construction of a gas pipeline.
		Please provide a post-construction stormwater management plans addressing DEQ's Section 401 Water Quality Certification Post-Construction Stormwater Management Plan Submission Guidelines for North Point Workforce Housing Project noted in the Part 1, Section 404 Permit Application, Attachment F, Portland Sediment Evaluation Team Letters, Section 404 Permit Application. (If this site is not going to be used for the North Point Workforce Housing, please provide the post-construction stormwater plans for the proposed uses.) In addition, please provide the results of the Phase II environmental assessments evaluating the potential for contaminated soils summarized in the "FEIS, Section 4.3.1.3 (Soil Limitations) as noted in these PSET Letters.
		The 401 Water Quality Submittal package provides insufficient information concerning the dredging operations for the Marine Slip, Access Channel, and Material Offloading Facility. DEQ used a copy of Resource Report 1 (Section 1.5.5.2) for the development of an Environmental Impact Statement to obtain general information on the dredging operation. To direct the reader to additional information, this resource report references to the Dredge Material Management Plan and Resource Report 7 (Section 7.3.2.5). These two additional references provide few details regarding the water pollution control practices in the Marine Slip and Access Channel dredging operations. In compliance with OAR 340-041-0007(1) and -0036, please provide for DEQ review and approval a detailed pollution control plan for constructing the Access Channel and Marine Slip that provides at least the following information:

		• A detailed description of the sequencing of all construction dredging activities associated with the in-water Marine Slip construction, Access Channel construction, and Material Offloading Facility construction. • A site map of these construction actions and location of all structural controls to protect water quality. The site maps must include the following information: o A delineation of the areas in the Marine Slip that Jordan Cove will dry excavate and dredge. ▪ Please include the pollution controls for the dry excavation activities in response to the request above for an Erosion and Sediment Control Plan for a NPDES 1200-C Permit Application. o The location of the natural earthen berm separating the upland area of the Marine Slip that Jordan Cove will dry excavate from the remaining portion of the Marine Slip adjacent to the bay that Jordan Cove will dredge. o The location of the in-water dredging for the Access Channel and Material Offloading Facility. o The location of the slurry/hydraulic transport pipeline(s) for the transportation of the dredged material. o The location of all containment systems and/or spill response materials. • A construction dredging plan providing the following: o Dredging schedule for the Marine Slip, Access Channel, and Material Offloading Facility. o Type (e.g., cutter-suction dredging) and number of dredging plants that Jordan Cove will use during the dredging of the Marine Slip, Access Channel, and the Material Offloading Facility. o A description of water pollution controls (operational controls, structural such as floating turbidity curtain etc.) that Jordan Cove will use in dredging and transporting dredged material. o Detailed spill response procedures including all emergency shut-off procedures and procedures for a spill associated with the hydraulic transport pipeline. o A description of all operational and structural water pollution controls for breaching and removing the natural earthen berm noted in Section 1.5.5.4 of the Jordan Cove's Resource Report 1. o A dredging monitoring plan for DEQ review and approval to evaluate the effectiveness of all proposed controls. • A maintenance dredging plan providing the following: o A site map containing the following: ▪ The location of all areas Jordan Cove will dredge. ▪ The location of the slurry/hydraulic transport pipeline(s) for the transportation of the dredged material. ▪ The location of all containment systems and/or spill response materials. o Dredging schedule. o Type (e.g., cutter-suction dredging) and number of dredging plants that Jordan Cove will use during the maintenance dredging. o A description of water pollution controls (operational controls, structural controls such as floating turbidity curtain etc.) that Jordan Cove will use and the location of all structural controls to minimize the migration of turbid water from maintenance dredging activities, o Detailed spill response procedures including all emergency shut-off procedures and procedures for a spill associated with the hydraulic transport line. o A dredging monitoring plan for DEQ review and approval to evaluate the effectiveness of all proposed controls.
		In compliance with OAR 340-041-0007(1) and -0036, please provide for DEQ review and approval a detailed water pollution control plan presenting all practicable operational and structural control techniques that Jordan Cove

		Energy Project will employ when constructing the Material Offloading Facility east of the opening for the slip at the Liquefied Natural Gas Terminal. Please include in this plan a characterization of the fill material Jordan Cove will use to construct this facility that evaluates this fill material for contamination.
340-048-0042(2)(b)	Existing and potential designated beneficial uses of surface water or groundwater that might be affected by the activity	DEQ will perform this review upon the receipt of information requested elsewhere in this matrix.
340-048-0042(2)(c)	Potential water quality impacts from the use, generation, storage, or disposal of hazardous substances	DEQ will perform this review upon the receipt of information requested elsewhere in this matrix.
340-048-0042(2)(d)	Potential modifications of surface water quality or quantity affecting water quality	DEQ will perform this review upon the receipt of information requested above. In addition to these requests for information, please provide to DEQ an application for an Individual Industrial Water Pollution Control Facility Permit for the proposed discharges of the hydrostatic testing wastewater. Please provide the location of each point of discharge. If Jordan Cove Energy Project or Pacific Connector Gas Pipeline expects to discharge washwater to the ground from vehicle and equipment washing, please provide an application for a Water Pollution Control Facility Individual Permit for these discharges. Please provide the location of each point of discharge.
340-048-0042(2)(e)	Potential modifications of groundwater quality that might affect surface water quality.	DEQ will perform this review upon the receipt of information requested elsewhere in this matrix. In addition to these requests for information, please provide a copy of the results from the first phase (i.e., desktop data review with maps) of the Shallow Groundwater Study (Revised August 24, 2017 by GeoEngineers) showing suspected locations of shallow groundwater along the pipeline right-of-way. Please expand the maps proposed in this study to include suspected locations of shallow groundwater along the proposed route for the 25 miles of Temporary or Permanent Access Roads. When complete, please provide the results from the implementation of the subsurface exploration plan proposed for phase two of this study with an analysis of how the construction and permanent right-of-way will impact shallow groundwater as well as the construction of any proposed new roads. Moreover, please propose practices for how Pacific Connector Gas Pipeline will avoid, minimize, and, if necessary, mitigate the impacts identified in the Shallow Groundwater Study noted above.

340-048-0042(2)(f)	Potential water quality impacts from the construction of intake, outfall, or other structures associated with the activity.	DEQ will perform this review upon the receipt of information requested elsewhere in this matrix.
340-048-0042(2)(g)	Potential water quality impacts from wastewater discharges.	DEQ will perform this review upon the receipt of information requested elsewhere in this matrix.
340-048-0042(2)(h)	Potential water quality impacts from construction activities.	DEQ will perform this review upon the receipt of information requested elsewhere in this matrix.
340-048-0042(2)(i)	Compliance with plans applicable under Section 208 of the CWA.	Please provide signed Land Use Compatibility Statements from Coos, Douglas, Jackson, and Klamath Counties.

Oregon
Kate Brown, Governor

Department of Environmental Quality
Western Region Eugene Office
165 East 7th Avenue, Suite 100
Eugene, OR 97401
(541) 686-7838
FAX (541) 686-7551
TTY 711

December 20, 2018

Derik Vowels
Jordan Cove LNG, LLC
Consultant, Lead Environmental Advisor
111 SW 5th Ave., Suite 1100,
Portland OR 97204

Re: Supplemental Information Request
Response to October 8, 2018 Jordan Cove Correspondence

Jordan Cove Energy Project (FERC Project No. CP17-494)
Pacific Connector Gas Pipeline (FERC Project No. CP17-495)
U.S. Army Corps of Engineers (Project No. NWP-2017-41)

Dear Mr. Vowels:

The Oregon Department of Environmental Quality (DEQ) is currently reviewing an application from Jordan Cove LNG, LLC (Jordan Cove) for Clean Water Act section 401 water quality certification for a Section 404 permit from the U.S. Army Corps of Engineers necessary to construct the Jordan Cove Energy Project and Pacific Connector Gas Pipeline (collectively, "the Project").

On September 7, 2018, DEQ requested additional information from Jordan Cove to assist with our project analysis. Jordan Cove provided responses to the information request on October 8, 2018. In general, DEQ finds that many of Jordan Cove's responses do not fully address the information requests in our September 7, 2018, correspondence. Certain responses, for example, provide qualitative descriptions of best management practices or refer to previously submitted information. To be clear, measures proposed to reduce project-related water quality impacts must be supported by quantitative data, such as engineering specifications or output from appropriate numerical models, to demonstrate compliance with applicable water quality objectives.

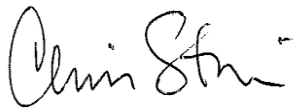
DEQ has supplemented its September 7, 2018, information request. The supplemental data request, provided as Attachment A, provides comments and clarifies, as needed, the information deemed necessary to meet certification requirements. For consistency, Attachment A retains the numbering format initiated by Jordan Cove in their October 8, 2018, response.

Please file a complete response to this supplemental information request by January 22, 2019, to:

Christopher Stine
Oregon Department of Environmental Quality
165 East 7th Avenue, Suite 100
Eugene, Oregon 97401

If Jordan Cove cannot provide certain information within the requested period, please indicate which items will be delayed and provide a projected filing date.

If you have any questions, please contact me directly at (541) 686-7810, or via email at stine.chris@deq.state.or.us.



Christopher Stine, PE

Water Quality Engineer

Attachment A: Response to Jordan Cove's October 8, 2018 Information Filing

ec: Mike Koski, mkoski@pembina.com
Natalie Eades, Neades@pembina.com
Tyler Krug, Tyler.J.Krug@usace.army.mil
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DEQ: Keith Andersen, Dave Belyea, Steve Mrazik, Chris Bayham, Mary Camarata, Sara Christensen
FERC Dockets: CP17-494-000, CP17-495-000

Comment No.	September 7, 2018 Information Request	Jordan Cove Response	DEQ's Review and Response to Jordon Cove's Response
1, 2	Must provide and timely update DEQ with complete description of construction/operation activities and specify clearly DEQ's acceptance of submissions as changes to proposed activities.	Jordan Cove will notify DEQ to update 401 application materials.	DEQ accepts response.
3	Must provide directly to DEQ a comprehensive description of the propose action including all resource reports, maps, electronic data files etc.	Jordan Cove will provide links to DEQ to access all information.	DEQ accepts response.
4, 5	Comment 4: Water Quality Standards Oregon's water quality standards consist of beneficial uses, numeric and narrative criteria developed to support these uses, and an antidegradation policy that prohibits an activity from further degrading water quality. Applicants for water quality certification must provide sufficient information to demonstrate the activity will comply with Oregon water quality standards (OAR 340-048-0020(g)). Comment 5: Provide information to demonstrate how the Project will comply with the water quality standards found in OAR 340 Division 041. For project activities that do not	The JCEP 401 Water Quality Memorandum (Part 1) and PCGP 401 Water Quality Summary Table (Part 2, Appendix A) in the application specifically address the Project's compliance with Oregon water quality standards.	**Summary Statement: Jordan Cove references previously submitted material that describes Best Management Practices to reduce project effects on water quality. Citing potential BMPs by themselves is insufficient. DEQ recognizes BMPs as one part of a broader strategy that must also consider existing water quality, local environmental conditions, the anticipated magnitude of project-related effects, and appropriate engineering controls to mitigate negative effects on water quality. Proposed BMPs must be well-supported using quantitative analyses such as modeling, manufacturer's technical specifications, results of pilot tests, or other quantitative data to support their site-specific use to effectively achieve water quality objectives. Please provide a plan that demonstrates how proposed BMPs or other engineering controls will protect water quality at each location where project actions may directly or indirectly affect waters of the state. The plan should provide a site-specific analysis of each proposed activity and technical justification for each proposed remedy as discussed more fully in the following section.** Jordan Cove's responses must provide a comprehensive analysis of potential project-related water quality impacts or the quantitative data necessary to evaluate proposed remedies. Jordan Cove's responses frequently refer to plans that rely on qualitative descriptions of BMPs with no site-specific reference to individual waterbodies, water quality conditions, or a discussion of proposed activities. Applications that propose BMPs to mitigate water quality impairment must identify the location, design details including engineering technical data, and a maintenance schedules to ensure adequate protection during use. In developing its response, Jordan Cove should refer to the information below. Jordan Cove must include quantitative and/or engineering support for the proposed controls or best management practices. For example, DEQ suggests using models such as Geomorphic Road Analysis and Inventory Package (GRAIP) and X-DRAIN to provide DEQ with the requested evaluation of potential water quality impacts from PCGP's proposal to use existing roads and to build new roads. Adequate quantitative analysis is necessary to demonstrate that current and future

	affect State waters, note how the Project will not violate applicable standards. For project activities that impact State waters, note how Jordan Cove is proposing to mitigate, reduce, or prevent impacts so as to ensure the Project, as proposed, does not violate applicable water quality standards. Project impacts should be assessed in terms of direct, indirect, and cumulative effects of the activity on state water quality.		erosion control planning will not "cause or contribute to a violation of in-stream water quality standards" as required in Schedule A.10.a of the NPDES 1200-C General Permit and OAR 340-048-0042(2)(a). Jordan Cove's response does not include estimates of sediment discharge from the construction and post-construction right-of-way. Models such as the Revised Universal Soil Loss Equation Version 2 (RULSE2), Watershed Assessment Tool for Environmental Risk (WATER), and/or Soil and Water Assessment Tool (SWAT) may be used to quantitatively estimate sediment control practices. PCGP can use GRAIP noted above to evaluate the need for BMPs on existing access roads for pipeline construction and operation.[1, 2, 3] Qualitative descriptions of proposed erosion and sediment control practices do not adequately demonstrate that measures will sufficiently mitigate risks to water quality. Jordan Cove must provide well-supported quantitative analyses of proposed engineering remedies based on site-specific understanding of water quality conditions. DEQ's comments on PCGP's response to Comment 15 provide additional examples of information required to demonstrate compliance with Oregon water quality standards.
6, 7	Comment 6: Please provide a NPDES 1200-C Permit Application demonstrating that land disturbing activities associated with the construction of Jordan Cove Energy Project's Liquefied Natural Gas Terminal as well as the following: • Land disturbing activities associated with the dry excavated portion of this terminal's Marine Slip, • Land disturbing activities associated with all offsite project areas associated	Jordan Cove's will submit its permit application for construction & land disturbing activities at the LNG Terminal to DEQ in Q4 2018.	**Summary Statement: DEQ will need detailed Site Map and Drawings for an NPDES 1200-C General Permit for:** • **Constructing the LNG Terminal and all its associated components.** • **Constructing the entire length of the pipeline and all associated components for constructing and operating this pipeline.** **The Site Maps and Drawings for these two construction projects must fully address Schedule A.12 of this permit as well as all the other applicable permit conditions. In developing these drawings, PCGP will need to provide geo-engineering analyses and the technical support for these analyses for the following concerns:** • **All cut and fill areas for the construction right-of-way and road improvements (Schedule A.12.b.v.3.b).** • **Construction stormwater discharge points for the construction right-of-way and road improvements (Schedule A.12.b.v.3.d).** • **Areas used for storage of logs, soils, or wastes (Schedule A.12.b.v.3.e).** **DEQ requests that PCGP use one of three modeling options noted in the section below to identify potential unstable slopes requiring further geotechnical analyses and engineering. Additionally, in the section below, DEQ provides**

[1] Natural Resource Conservation Service and USDA Agricultural Research Service. 2008. Revised Universal Soil Loss Equation, Version 2 (RULSE2)
[2] Wilson, Bruce N. Aleksey Sheshukov, and Reid Pulley. 2006. Erosion Risk Assessment Tool for Construction Sites (Final Report). Office of Research Administration. Minnesota Department of Transportation
[3] Gassman, P.W., M.R. Reyes, C.H. Green, and J.G. Arnold. 2007. The Soil and Water Assessment Tool: Historical Development, Applications, and Future Research Directions. American Society of Agricultural and Biological Engineers. Volume 50(4): 1211-1250

	with this terminal and its construction including those areas described in Section 5.3 of this terminal's stormwater management plan (Part 1, Attachment A3). • Land disturbing activities associated with roads used to access this terminal and offsite project areas. • Land disturbing activities associated with any other facilities (staging areas, refueling areas, employee parking etc.) that Jordan Cove Energy Project will use to construct of this terminal. Comment 7: DEQ will need to determine if these land disturbing activities will comply with the technology-based effluent limits of this permit. DEQ will also need an erosion and sediment control plan that, for example, addresses Schedule A.12.b.v and other conditions in this permit. For DEQ to evaluate the water quality impacts of the construction process on waters of the state, DEQ needs this information in an erosion and sediment control plan.		**examples of the level of detail DEQ is seeking from Jordan Cove and the data gaps in Jordan Cove's current planning documents. DEQ provides the rationale for this information request in the section below.** A complete NPDES 1200-C Permit Application is necessary for Jordan Cove to comply with the following: • NPDES 1200-C General Permit Conditions (Schedule A.1,10, and 12 in particular) • OAR 340-041-0007(1) and (7) • OAR 340-048-0042(2) Jordan Cove's response to Comment 6 only recognizes the need to address construction/land disturbing activities associated with the LNG Terminal. Jordan Cove's response does not address the need to develop a required erosion and sediment control plan for the approximately 229 miles of pipeline as noted in comments in AIR-1. As noted in the sources covered by the NPDES 1200-C General Permit, these include construction activities that are part of a common plan of development. For example, this includes land disturbing activities to widen an existing road, develop employee parking, lodging for workers, and develop communication towers. To comply with the technology-based effluent limits in this permit and, in particular, Schedule A.12 of this permit, Jordan Cove will need to demonstrate that the Site Map and Drawings for approximately 229 miles of pipeline construction right-of-way contains the following: *a. Preparation.* *i. The permit registrant must ensure that an ESCP is prepared and revised as necessary to reflect site conditions for the construction activity regulated by this permit, and submit revisions to DEQ or Agent in accordance with requirements of this permit. The design, installation, and maintenance of erosion and sediment controls must be adequate to address factors such as the amount, frequency, intensity, and duration of precipitation, the nature of resulting stormwater runoff, and soil characteristics, including the range of soil particle sizes expected to be present on the site.* *ii. Qualifications to Prepare ESCP.* *1. For construction activities disturbing 20 or more acres, the ESCP must be prepared and stamped by a Certified Professional in Erosion and Sediment Control, Certified Professional in Storm Water Quality, Oregon Registered Professional Engineer, Oregon Registered Landscape Architect, or Oregon Certified Engineering Geologist.* *2. If engineered facilities such as sedimentation basins or diversion structures for erosion and sediment control are required, the ESCP must be prepared and stamped by an Oregon Registered Professional Engineer.* *b. The ESCP must include the following elements:* *i. Name of the site.* *ii. Local Government Requirements. Include any procedures necessary to meet applicable local government erosion and sediment control or stormwater management requirements.*

	Please provide a NPDES 1200-C Permit Application for land disturbing activities associated with the construction of Pacific Connector's gas pipeline and with the construction of all associated facilities such as communication towers, roads (existing and new), disposal sites, block valve facilities, and compressor stations. DEQ will need to determine if these land disturbing activities will comply with the technology-based effluent limits of this permit. DEQ will also need an erosion and sediment control plan that, for example, addresses Schedule A.12.b.v and other conditions in this permit. For DEQ to evaluate the water quality impacts of the construction process on waters of the state, DEQ needs this information in an erosion and sediment control plan.		*iii. Erosion and Sediment Control Inspector.* *1. Inspections must be conducted by a person knowledgeable in the principles and practice of erosion and sediment controls who possesses the skills to assess conditions at the construction site that could impact stormwater quality, is knowledgeable in the correct installation of the erosion and sediment controls, and is able to assess the effectiveness of any sediment and erosion control measures selected to control the quality of stormwater discharges from the construction activity.* *2. Beginning January 1, 2017, for projects that are five or more acres, inspections must be conducted by a person certified in an erosion and sediment control program that has been approved by DEQ. DEQ has approved the following programs:* *a. Certified Professional in Erosion and Sediment Control,* *b. Certified Professional in Storm Water Quality,* *c. Washington State Certified Erosion and Sediment Control Lead, or* *d. Rogue Valley Sewer Services Erosion and Sediment Control Certification.* *3. Inspections must be conducted by the Erosion and Sediment Control Inspector identified in the ESCP.* *4. Provide the following for all personnel that will conduct inspections:* *a. Name and title;* *b. Contact phone number and, if available, e-mail address; and* *c. Description of experience and training.* *iv. Narrative Site Description.* *1. Description of the construction activity;* *2. Proposed timetable indicating when each erosion and sediment control BMP is to be installed and the duration that it is to remain in place;* *3. Estimates of the total area of the permitted site and the area of the site that is expected to undergo clearing, grading or excavation;* *4. Nature of the fill material to be used, and of the site soils prior to disturbance;* *5. Names of the receiving water(s) for stormwater runoff;* *6. The types of pollutants that could be found in stormwater and their likely sources;* *7. Any authorized non-stormwater discharges; and* *8. If a surface water of the state is within 50 feet of the permitted activities,* *a. Description of area within 50 feet of project site (including any natural buffer), and* *b. Description of approach to manage the natural buffer zone, if any (for example, maintain natural buffer, reduce natural buffer and increase BMPs, or eliminate flow through natural buffer).* *v. Site Map and Drawings.*

			1. *The site map and drawings must be kept on site and must represent the actual BMP controls being used onsite;* 2. *The site map must show sufficient roads and features for DEQ or Agent to locate and access the site;* 3. *The site map and drawings must include (but is not limited to) the following features (as applicable):* a. *Total property boundary including surface area of the development;* b. *Areas of soil disturbance (including, but not limited to, showing cut and fill areas and pre- and post-development elevation contours);* c. *Drainage patterns before and after finish grading;* d. *Discharge points;* e. *Areas used for the storage of soils or wastes;* f. *Areas where vegetative practices are to be implemented;* g. *All erosion and sediment control measures or structures;* h. *Impervious structures after construction is completed (including buildings, roads, parking lots and outdoor storage areas);* i. *Springs, wetlands and other surface waters on site or adjacent to the site;* j. *Temporary and permanent stormwater conveyance systems;* k. *Onsite water disposal locations (for example, for dewatering);* l. *Storm drain catch basins depicting inlet protection, and a description of the type of catch basins used (for example, field inlet, curb inlet, grated drain and combination);* m. *Septic drain fields;* n. *Existing or proposed drywells or other UICs;* o. *Drinking water wells on site or adjacent to the site;* p. *Planters;* q. *Sediment and erosion controls including installation techniques;* r. *Natural buffer zones and any associated BMPs for all areas within 50 feet of a water of the state; and* s. *Detention ponds, storm drain piping, inflow and outflow details.* The requirements noted above are critical for evaluating the potential efficacy of JCEP's/PCGP's erosion and sediment control program and proposed structural erosion and sediment controls as applied on the landscape along the entire pipeline alignment. This information is also critical for ensuring compliance with 1200-C permit requirements when construction is in progress. For example, in PCGP's Erosion Control and Revegetation Plan [Part 2, Appendix B, 404-10 JPA), Section 3.3.4] states:

			Temporary erosion control measures will be installed after vegetation clearing and immediately prior to/after initial soil disturbance…Section 4.0 of the ECRP describes in detail the temporary erosion control procedures or BMPs that will be implemented during construction to minimize impacts from erosion and sedimentation.. This information does not indicate to DEQ where, for example, PCGP will locate construction storage areas for soils, logs, boulders, and other construction debris. This information does not indicate where PCGP will locate stormwater discharge points as required in the NPDES 1200-C General Permit. PCGP does not indicate where PCGP will install erosion and sediment controls in the construction right-of-way and associated facilities during the construction phase. DEQ needs this information to determine if PCGP will store logs, rock, soil, and other construction debris from forest clearing operations and construction materials on or at the head mapped landslides or areas identified Potential Rapidly Moving Landslides Hazards. The Tyee Core Area is prevalent in the Oregon Coast Range where PCGP proposes to install the pipeline. The Tyee Core Area is commonly associated with thick sandstone beds that have few fractures. These beds allow water to concentrate in shallow soils overlying these beds creating positive soil pressure and the hazard of shallow, rapidly moving landslides. Human-caused landslides diminish water quality when they discharge into surface waters. Placement of additional weight and the discharge of construction or post-construction stormwater on to an unstable slope in the Tyee Core Area can initiate a landslide/debris torrent affecting water quality. In DEQ's desktop analysis of PCGP's proposed pipeline construction activities using maps provided by PCGP as well as aerial photos and datasets available to DEQ, DEQ has identified numerous potential constraints along the proposed pipeline alignment. If PCGP does not identify and address these in the construction and operation planning, these constraints have the potential to impact water quality. Constraints such as mapped landslide areas and convergent headwalls (see examples in the review, below) are numerous along the pipeline alignment. PCGP has provided limited analysis and recommendations and no site-specific engineering plans, specifications, and supporting technical analyses for how PCGP will construct and operate the pipeline among these constraints. As discussed in DEQ's comments below, the pipeline right-of-way with its area of soil compaction above the gas pipeline is essentially functioning as a permanent, primitive road alignment. Therefore, research and engineering evaluations such as those concerning roads on steep and/or unstable slopes are suitable technical references for identifying constraints that – if not addressed – may impact water quality. PCGP will need to formulate site-specific controls to prevent, for example, debris flows into streams initiated from pipeline construction and operation. DEQ will not accept the generic best management practices currently presented in PCGP's Erosion Control and Revegetation Plan as a substitute for the detailed information requested above and below in this review. During its desktop analysis, DEQ identified several landscape features or constraints discussed in more detail in the technical reference in *Slope Engineering for Mountain Roads* (Hearn 2011). In DEQ's review of PCGP's response to Comment 15, DEQ highlights below several examples of these constraints. These examples represent potential site-specific

			constraints that could impact water quality that PCGP did not address in its 401 Water Quality Certification submittal. In developing its Certification decision, DEQ must evaluate PCGP's efforts to identify and, if needed, develop engineering solutions to site-specific constraints encountered during its planning and field investigations for the following: (1) constructing and operating the pipeline, (2) using existing access roads, (3) improving/reconstructing existing access roads, and (4) building new roads. In reviewing the Section 4.0 of the PCGPs Erosion Control and Revegetation Plan for more detail, DEQ can find no information on where exactly PCGP will locate stormwater discharge from the construction right-of-way, the Temporary Extra Work Areas, and other areas cleared of vegetation. DEQ is seeking this information to determine how PCGP will manage construction stormwater discharge to streams, wetlands, Areas of Potential Rapidly Moving Landslide Hazards, and mapped landslides. Without this detailed information regarding how PCGP will address these significant constraints during the construction process, DEQ can only assume that PCGP will execute its erosion and sediment control program in an impromptu fashion consequently placing waters of the state at risk. DEQ requests PCGP employ one of the slope stability models noted below to identify potential unstable slopes. This information would guide the following: • Siting of log, construction debris, and/or equipment storage. • Design of the construction stormwater management and discharge system. • Design of the post-construction stormwater management and discharge system. • Design of cut and fill slopes for the pipeline alignment and access roads. To identify potential unstable slopes needing further geotechnical analyses and engineering, DEQ request the application of one of the following models: • Deterministic Level I Stability Analysis (DLISA) and Probabilistic Level I Stability Analysis (LISA).[4] • Shallow Landsliding Stability Model (SHALSTAB).[5] • Map-based Probabilistic Infinite Slope Analysis Program (PISA-m).[6] In DEQ's review of PCGP's response to Comment 15 below, DEQ highlights examples where PCGP is proposing to discharge construction/post-construction stormwater and store logs/construction spoils/etc. along concave-shaped slopes without providing DEQ with a slope stability analysis in its submittal. As discussed below, human actions initiate many debris flows within concave-shaped slopes and water plays a key role in destabilizing slopes.

[4] Koler, Thomas E. 1998. Evaluating Slope Stability in Forest Uplands with Deterministic and Probabilistic Models. Environmental & Engineering Geoscience, Volume IV, No. 2, pp. 185-194

[5] Montgomery, David R. Montgomery and William E. Dietrich. 1994. A Physically Based Model for the Topographic Control on Shallow Landsliding. Water Resources Research. Vol. 30, No. 4, pp. 1153-1171

[6] Haneberg, William C., William F. Cole, and Gyimah Kasali. 2009. High-Resolution Lidar-Based Landslide Hazard Mapping and Modeling. Bulletin of Engineering Geology and the Environment. 68:263-276

8	Please provide a NPDES 1200-A Permit Application demonstrating that the proposed 20 sites to obtain rock for Pacific Connector's gas pipeline construction and maintenance. DEQ will need to determine if these land disturbing activities will comply with the technology-based effluent limits of this permit.	PCGP will obtain rock commercially.	PCGP will not need coverage under NPDES 1200-A for rock material that is obtained commercially. PCGP will need to update the information in the 401Water Quality submittal package to reflect this revision to its proposal.
9	Please provide a NPDES 1200-A Permit Application demonstrating that the concrete batch plant proposed for the offsite project area referred to as Boxcar Hill in the LNG Terminal's stormwater management 9 plan (Section 5.3, page 19). DEQ will need to determine if rock quarries will operate in compliance with the technology-based effluent limits of this permit.	Jordon Cove's contractor KBJ will obtain a permit prior to operating.	DEQ understands Jordan Cove's contractor will apply for and receive coverage under NPDES 1200-A General Permit for the concrete batch plant at Boxcar Hill.
10, 11, 13	Comment 10: Please provide a NPDES Individual Permit Application for the LNG Terminal's two domestic wastewater facilities discharging to surface water. DEQ will use the information in this permit application to develop a discharge permit containing technology-based and water quality-based effluent limits associated with this permit.	JCEP is preparing an application for submittal in Q4 2018 to modify existing Permit No. 101499. JCEP provided a Discharge Characterization Memo to DEQ on May 25, 2018.	DEQ anticipates a response to this request in Q4 2018. The information provided in JCEP's Discharge Characterization Memo is insufficient for DEQ to draft a NPDES Individual Permit for the LNG Terminal's domestic wastewater discharge.

	Comment 11: Please provide a NPDES Individual Permit Application for discharges of non-contact cooling wastewater discharged from Liquefied Natural Gas carriers using the Marine Slip at the LNG Terminal. DEQ will use this permit application to develop a discharge permit containing technology-based and water quality-based effluent limits. Comment 13: Please provide an application for a NPDES Individual Permit for the discharge of vehicle and equipment washwater to surface water during the operation of the LNG Terminal. DEQ will use this permit application to develop technology-based and water quality-based effluent limits for this permit if the operations.		
12	If the discharge from wastewater treatment plants proposed for the LNG Terminal has a design flow capacity of 1 million gallons per day or more or requires pretreatment under 40 CFR §403, please provide a NPDES 1200-Z Permit Application demonstrating that the Terminal's stormwater	JCEP submitted a stormwater management plan to DEQ on February 6, 2018.	Information provided by JCEP indicates operation of these two small treatment plants would not require coverage under a NPDES 1200-Z General Permit. For this reason, JCEP will not need to submit an application to DEQ for a NPDES 1200-Z General Permit for the LNG Terminal.

	management plan will comply with the technology-based and water quality-based effluent limits in this permit.		
14	Please provide an application for a NPDES Individual Permit for the discharge of vehicle and equipment washwater to surface water during the construction and operation of the gas pipeline and all its associated facilities. DEQ will use this permit application to develop technology-based and water quality-based effluent limits for this permit.	JCEP and PCGP is preparing a NPDES 1200-C permit application and the ESCP in this application will describe how this wastewater will be treated before discharge under this 1200-C General Permit.	Schedule A.6.a-c of the NPDES 1200-C General Permit prohibits the discharge of wastewater from construction operations and vehicle/equipment washing operations. To comply with NPDES 1200-C General Permit requirements and OAR 340-045-0015(1)(a), PCGP must submit a separate NPDES and/or WPCF Individual Permit Application for the discharge of equipment and vehicle wash water to waters of the state.
15	In compliance with OAR 340-041-0007(8), please provide an assessment of Pacific Connector Gas Pipeline's compliance with all applicable DEQ-approved Total Maximum Daily Load Implementation Plans or compliance programs for the following: • United States Department of Agricultural Forest Service Water Quality Restoration Plans and the USDA National Best Management Practices for Water Quality Management on National Forest System Lands (Volume 1: National Core BMP Technical Guide) noted in DEQ's	PCGP provided DEQ Appendix A of Part 2 of the 401 Water Quality Package to DEQ demonstrating compliance with water quality standards and the plans used to meet water quality standards. The conditions in the Federal ROW grants will ensure compliance with applicable water quality plans.	**<u>Summary Statement</u>:** **PCGP's response does not fully address the requirements described in Comment 15. DEQ requires a comprehensive analysis using appropriate quantitative support to demonstrate compliance with water quality objectives, including TMDLs. As requested in Comment 15 and more fully described below, please describe how PCGP will comply with the Federal, State, and County plans/programs for complying with TMDLs. Please include or identify relevant supporting documents (e.g., design manuals, standards, and specifications) that each Designated Management Agency uses to implement their TMDL compliance programs. DEQ will need to review the conditions in all Federal access or right-of-way grants to ensure these conditions comply with OAR 340-048-0042(2).** Plans referenced by Jordan Cove provide a qualitative analysis of proposed BMPs. As discussed previously, DEQ requires BMPs to be supported by an evaluation of existing water quality, the impact of the proposed activity on water resources, and a quantitative assessment of mitigation provided by the proposed BMPs. For example, PCGP briefly describes BMPs in a table in Part 2 Attachment G that PCGP asserts will comply with water quality standards. In making this assertion, PCGP lists various plans developed to comply water quality standards. PCGP includes no analysis to demonstrate these BMPs will prevent a water quality violation for all pollutant discharges. Certain portions of the project that occur on state and federal lands are governed by existing TMDLs. PCGP has not demonstrated to DEQ that proposed activities such as right-of-way construction, road maintenance, and road construction will comply with USDA Forest Service, U.S. Department of Interior BLM, Bureau of Reclamation, Oregon Department of Forestry, and County Total Maximum Daily Load compliance plans and programs. DEQ developed these TMDL to achieve compliance with water quality standard in water bodies impaired by specific pollutants. For an example of this deficiency in PCGP's response to AIR-1, please refer to DEQ's review of PCGP's response to Comment 24 demonstrating that some

	Memorandum of Understanding with the Forest Service. • US Department of Interior Bureau of Land Management's Water Quality Restoration Plans. • Oregon Department of Forestry's Forest Practices Act Program. • Oregon Department of Agriculture's Water Quality Plans. • Coos County Total Maximum Daily Load Implementation Plan. • Douglas County Total Maximum Daily Load Implementation Plan. • Jackson County TMDL Implementation Plan. • Klamath County TMDL Implementation Plan. In this compliance assessment, please also note all the support documents such as design manuals, guidance documents, road permits etc. that PCGP will follow when complying with these Implementation Plans.		of PCGP's proposed activities will not comply with Forest Service, BLM, ODF, and County TMDL compliance programs without the submittal of additional information. Under state rules, TMDL compliance plans are enforceable when Designated Management Agencies such as the Forest Service, BLM, and ODF, for instance, fail to implement these plans. Right-of-way permits are not the only mechanism these Federal agencies will use to ensure compliance with their Water Quality Restoration Plans.[7, 8, 9] WQRPs can and do address road impacts on water quality. Federal agencies address these impacts in their efforts to comply with Clean Water Act requirements such as Section 303. DEQ provides PCGP an example of how federal agencies use WQRPs to address road impact on water quality in DEQ's review of PCGP's response to Comments 26 and 27 below. For this reason, DEQ will review all proposed road permits to cover all access roads Jordan Cove will use to construct and operate the terminal and gas pipeline. If acceptable, DEQ will use the conditions provided in Federal road permits when developing its Certification Decision. In Appendix A of Part 2 of the 401 Water Quality Package cited in PCGP's response to Comment 15, PCGP lists in a table the following: • Potential impairment parameters. • Sources and activities associated with these potential impairment parameters. • PCGP's proposed plans/BMPs developed to comply with water quality standards. In many of these plans and reports, PCGP provides only a qualitative description of actions or BMPs PCGP will use to avoid violations of water quality standards. DEQ highlights specific examples below. For example, PCGP provides no quantitative analysis or engineering designs with technical support demonstrating that the construction of the pipeline and operation of the pipeline right-of-way will prevent water quality impairments from landslides and sediment discharge resulting from the following: • Design and maintenance of roads. • Design of both the construction and permanent pipeline right-of-way. PCGP's qualitative analysis of compliance with water quality standards does not even list the more than 660 miles of access roads as a source of sediment. The scientific literatures clearly shows roads as a major source of sediment and soil erosion in forested watersheds. The scientific literature identifies road maintenance practices, road construction decisions,

[7] USDA Forest Service and DOI Bureau of Land. 1999. *Forest Service and Bureau of Land Management Protocol for Addressing Clean Water Act Section 303(d) Listed Waters*. USDA Forest Service, Pacific Northwest Region
[8] Memorandum of Understanding Between State of Oregon Department of Environmental Quality and the USDA, Forest Service Pacific Northwest Region. OMB 0596-0217, FS-1500-15
[9] Memorandum of Understanding Between United States Department of Interior Bureau of Land Management and the State or Oregon Department of Environmental Quality to Meet State and Federal Water Quality Rules and Regulations. BLM Agreement Number BLM-OR930-1702

			road construction and maintenance standards, road improvements, and decommissioning standards as key elements in protecting soil and water quality.[10] Among the proposed pollution control plans and reports in Appendix A of Part 2 that PCGP presents to avoid or minimize potential water quality impairments are: • Resource Report 6 (Geologic Resources) • Erosion Control and Revegetation Plan • Transportation Management Plan The information below demonstrates how these two plans and this report – with their current information – do not address how PCGP's proposed activities will comply with water quality standards. These two plans and this report lack either the quantitative analysis or engineering analysis and technical support to give DEQ reasonable assurance that PCGP's actions will not contribute to or cause a violation of water quality standards. **Examples of Inadequate Engineering Analysis and Support** **1. Unclear Drainage Management and Storage Activities Adjacent to Potentially Unstable Slopes** In areas where there is a potential for rapidly moving landslides such as the Tyee Core Area, PCGP should avoid certain activities. As recommended by authorities regulating forest management on unstable slopes, PCGP should avoid placing additional weight from (1) construction debris and logging and (2) water onto the upper or mid-scarp areas of unstable slopes such as those associated with: • Convergent headwalls/concave-shaped slopes • Bedrock hollows

[10] Grace III, J.M. and Clinton, B.D. 2007. Protecting Soil and Water in Forest Road Management. USDA Forest Service/University of Nebraska-Lincoln Faculty Publication Volume 50(5):1579-1584. 2007 American Society of Agricultural and Biological Engineers ISSN 0001-2351

			• Inner gorges with steep slopes.[11, 12, 13, 14, 15, 16, 17] In fact, the Oregon Department of Forestry issued rules under the Forest Practice Act that ODF uses to comply with the Clean Water Act requirements such as Total Maximum Daily Loads and to achieve Oregon's water quality standards.[18] Among these FPA rules is a rule OAR 629-625-0330 to ensure forest operations provide a stable forest roads that protect water quality when in use. As discussed in DEQ's review of PCGP's response to Comment 34, PCGP's pipeline right-of-way is functioning as a primitive road. Specifically, this forest road drainage rule for the FPA states: *(1) The purpose of this rule is to provide a drainage system on new and reconstructed roads that minimizes alteration of stream channels and the risk of sediment delivery to waters of the state. Drainage structures should be located based on the priority listed below. When there is a conflict between the requirements of sections (2) through (6) of this rule, the lowest numbered section takes precedence, and the later-numbered and conflicting section shall not be implemented.* *(2) Operators shall not concentrate road drainage water into headwalls, slide areas, high landslide hazard locations, or steep erodible fillslopes.* *(3) Operators shall not divert water from stream channels into roadside ditches.* *(4) Operators shall install dips, water bars, or cross drainage culverts above and away from stream crossings so that road drainage water may be filtered before entering waters of the state.* *(5) Operators shall provide drainage when roads cross or expose springs, seeps, or wet areas.*

[11] State of Washington. Forest Practices Board Manual. Section 16 Guidelines for Evaluating Potentially Unstable Slopes and Landforms
[12] State of Oregon. Landslide Hazards in Oregon. Oregon Department of Geology and Mineral Industries
[13] Jones & Stokes. 2008. Volume I: *Draft Environmental Impact Statement for Elliot State Forest Section 3.2.5 on Slope Stability*. Prepared for U.S. Fish & Wildlife Service and National Marine Fisheries Service.
[14] Report to the 70th Legislative Assembly. 1998. Joint Interim Task Force on Landslides and Public Safety.
[15] Hofmeister, R.J., D. J. Miller, K.A. Mills, J.C. Hinkle, A. Beier. 2002. Text to Accompany the Hazard Map of Potential Rapidly Moving Landslides in Western Oregon. GIS Layer for Local Governments in Implementation of Senate Bill 12. Interpretive Map Series IMS-22. Oregon Department of Geology and Mineral Industries
[16] Sidle, R.C. 1985. *Factors Influencing the Stability of Slopes*. Proceedings of a Workshop on Slope Stability: Problems and Solutions in Forest Management. USDA Forest Service. General Technical Report PN W-180,
[17] Benda, L.E., Veldhuisen, C., Miller, D.J., and Rodgers-Miller, L. 2000. Slope instability and forest land managers: A primer and field guide. Seattle, Wash., Earth Systems Institute, 74 p.
[18] Memorandum of Understanding between the Oregon State Department of Environmental Quality and the Oregon State Department of Forestry. April 16, 1998

(6) Operators shall provide a drainage system using grade reversals, surface sloping, ditches, culverts and/or waterbars as necessary to minimize development of gully erosion of the road prism or slopes below the road.

PCGP has not demonstrated in the Erosion Control and Revegetation Plan or Transportation Management Plan that PCGP will avoid discharging road drainage water into headwalls, slide areas, high landslide hazard locations, or steep erodible fill slopes. Moreover, PCGP has not addressed any of the ODF requirements noted below regarding forest road maintenance. ODF established FPA rule OAR 629-625-0600 to comply with water quality standards by timely maintenance of all active and inactive roads.

DEQ excerpted the following sketches and photographs from technical manuals designed to prevent landslides during forest operations. DEQ used these technical manuals during its desktop analysis of PCGP's proposed actions to identify potential unstable slopes that could initiate debris flows into water bodies. The examples depict convergent headwalls (i.e., concave-shaped slopes) and bedrock hollows. These landscape features can be found adjacent to the proposed PCGP pipeline alignment in numerous locations:

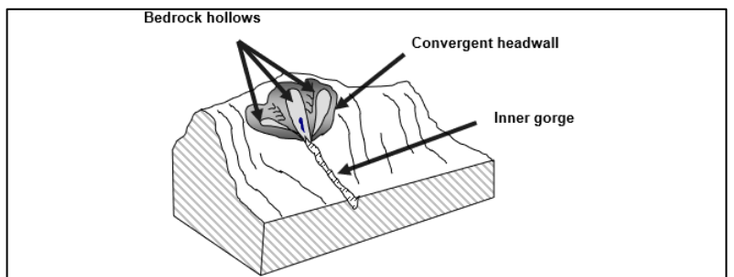


Figure 8. Typical hillslope relationships between bedrock hollows, convergent headwalls, and inner gorges (drawing by Jack Powell, DNR 2003).

Source: Text to Accompany the Hazard Map of Potential Rapidly Moving Landslides in Western Oregon (Hofmeister et al. 2002)

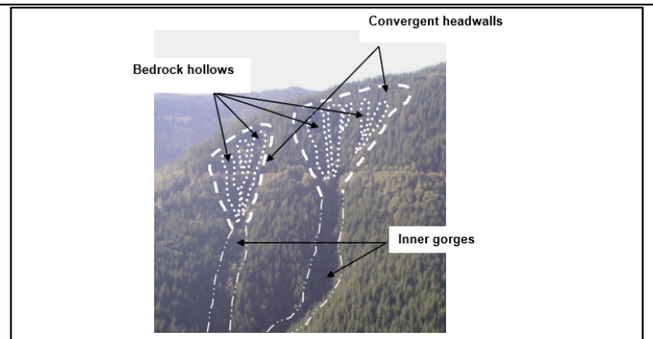


Figure 9. Common hillslope relationship: bedrock hollows in convergent headwalls draining to inner gorges (photo and drawing by Jack Powell, DNR 2003).

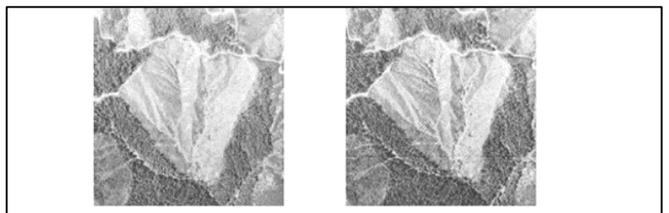
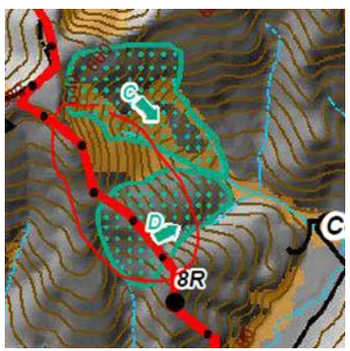


Figure 14a. Stereo pair of a clearcut convergent headwall in Pistol Creek basin, North Fork Calawah River, Washington.

Source: State of Washington Forest Practices Board Manual

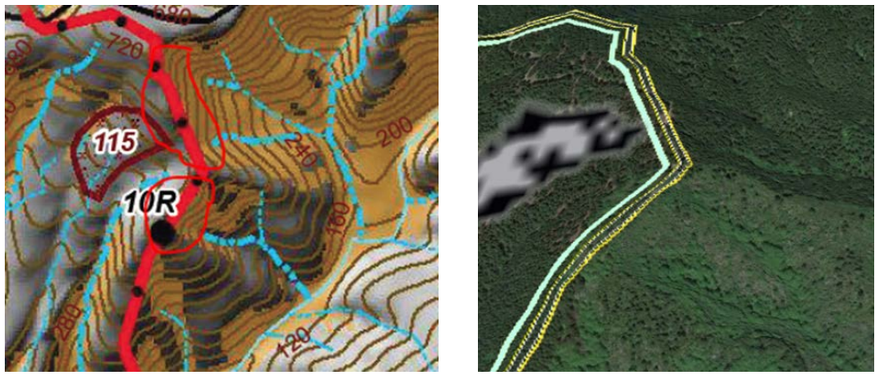
These three examples are among many that PCGP can identify when reviewing its Geologic Hazards Map in combination with aerial photos showing the pipeline's right-of-way and other components such as the Temporary Extra Work Areas relative to Areas of Rapidly Moving Landslide Hazard, convergent headwalls, and bedrock hollows. The light brown areas in the excerpt of PCGP's Geologic Hazards Maps are Potential Rapidly Moving Landslide Hazards. The accompanying excerpt of aerial photos show unstable slope features from the Statewide Landslide Information Database for Oregon (SLIDO). These excerpts from the aerial photos also show the pipeline right-of-way (in yellow) and Temporary Extra Work Areas (in light blue).

Figure 2 of 47 from PCGP's Geologic Hazards Maps (Northwest of Milepost 8R):



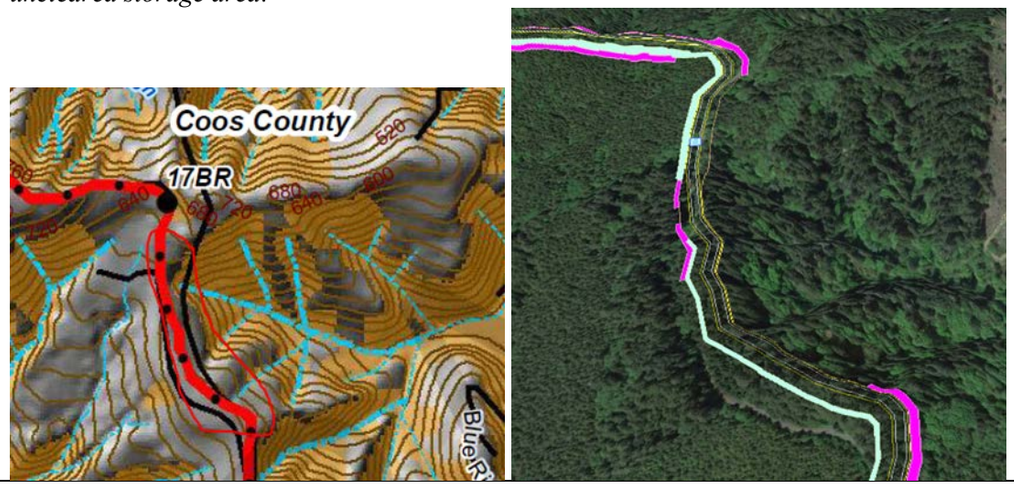
			PCGP's Erosion Control and Revegetation Plan does not indicate if the Temporary Work Area above the unstable slope feature will be used to store spoils (soil, boulders, root wads) and logs from forest clearing. However, PCGP's Resource Report 1 indicates that PCGP may use these work areas for these purposes. The ECRP does not detail how PCGP will manage construction stormwater above this unstable feature. Stormwater discharge at the top of convergent headwalls and bedrock hollow adds load to the top of this unstable slope. This stormwater discharge may create a positive soil pore pressure leading to a landslide. PCGP has not provided DEQ with an engineered post-construction stormwater management plan for the permanent pipeline right-of-way for this area and others indicating how PCGP will manage drainage above unstable slope features. On page 35 of Resource Report 6, PCGP discusses two primary ways in which pipeline construction has the potential to adversely impact slope stability. PCGP notes in Report 6 that routing drainage to potentially unstable slopes has the potential to adversely impact slope stability. However, PCGP does not provide DEQ with an analysis using the slope stability models to identify unstable slopes noted in DEQ's review of PCGP's response to Comments 6 and 7. Additionally, PCGP does not provide DEQ with a construction and post-construction stormwater management plan demonstrating how specifically PCGP will manage stormwater along these unstable landscape features. PCGP only identifies slope breakers along the construction and permanent right-of-way as the only technique to manage construction and post-construction stormwater. PCGP does not discuss, for example, or demonstrate the application of cutoff trenches presented in technical manuals on stabilizing slopes. PCGP does not detail the grade and placement of slope breakers on the ground in engineering plans for the construction and permanent right-of-way. Without this information as well as the drainage pattern, DEQ is unable to determine if the proposed use of slope breakers alone is sufficient to prevent the addition of weight from stormwater and an increase in soil pore pressure on an unstable slope. With the current submittal, DEQ cannot determine if the proposed slope breakers highlighted in the Erosion Control and Revegetation Plan will prevent landslides due to pipeline construction and operation. Additionally, in Resource Report 6 and the proposed ECRP, PCGP does not address site-specific constraints (i.e., roads, unstable landforms on each side of the right-of-way etc.) that may limit the application of slope breakers to route drainage away from unstable slopes. PCGP is proposing to remove trees and shrubs to install this gas pipeline. This loss of tree interception will increase the volume of runoff generated along pipeline's construction and permanent right-of-way. The discharge of this additional runoff among these unstable slope features has the potential to impact water quality. The following are two more examples highlighting similar concerns discussed in DEQ's review immediately above.

Figure 2 of 47 (Northwest and South of Milepost 10R) – Area No. 115 delineated in red is an identified landslide from the Department of Geology and Mineral Industries:



PCGP's ECRP does not show the engineering analysis and its technical support for how PCGP will manage the construction and post-construction stormwater above the Area of a Rapidly Moving Landslide Hazard and convergent headwall as well as the mapped landslide 115 identified by the Oregon Department of Geology and Mineral Industries..

Figure 4 of 47 (Southeast of Milepost 17 BR) – Blue square is a hydrostatic test location while the magenta polygon is an uncleared storage area:



			PCGP's ECRP does not show the engineering analysis and its technical support for how PCGP will manage the construction and post-construction stormwater above the Area of a Rapidly Moving Landslide Hazard and convergent headwall. **2. No Engineering Designs for Fill Slopes on Steep, Unstable Slopes and/or Steep Slopes with Erosive Soils** In Resource Report 6 (Geologic Resources), PCGP provides few specifics regarding controls to stabilize slopes to prevent landslides. Moreover, as noted in DEQ's review of PCGP's response to Comment 35 below, PCGP provides no engineering designs and the technical support for these designs for stabilizing fill slopes on steep, unstable slopes greater than 30% including slopes with highly erosive soils. PCGP identifies this deficiency on page 35 of Section 4.6.2 of Resource Report 6 by stating the following: *Steep side slope Pipeline construction segments will be identified during the final design phase of the Pipeline project. Fill slope construction details and specifications will be designed for the identified steep side slope Pipeline segments.* In Section 11.0 (Steep and Rugged Terrain), PCGP provides only a qualitative description of how it may approach fill slopes on steep, unstable slopes starting at the bottom of page 47. However, this mostly qualitative discussion does not consider terracing on erosive soils nor does it thoroughly address the management of stormwater on a terraced fill slope. The management of drainage on these steep slopes, the use of geotextiles or other engineering techniques to support terracing, and the need to reinforce the toe of slope are also not addressed in PCGP's submittal. These are issues typically addressed in technical references developed to construct linear infrastructure such as roads on steep slopes. However, PCGP does not discuss or addressed these issues in PCGP's submittal. **3. Unclear Design Standards/Specifications for Needed Road Improvements and Maintenance Standards/Specifications for Existing Access Roads** PCGP is proposing to use more than 660 miles of roads to construct this gas pipeline and its associated components. PCGP lists the Transportation Management Plan in Appendix A part 2 of the Water Quality Package as PCGP's approach to comply with water quality standards. As highlighted below, PCGP has not provided DEQ with specific road maintenance standards for access roads PCGP will use to construct and operate the pipeline. As highlighted below, PCGP has not provided DEQ with designs and specifications for any identified improvement to these existing access roads nor has PCGP demonstrated it conducted an inventory of the current condition of all access roads to determine their capacity to support the proposed level of use while minimizing the impact of these access roads on water quality.

			The scientific literature is replete with research documenting the importance of non-paved road design for protecting water quality. There are a number of references providing information on designing stable roads, including improving existing roads, and maintaining non-paved roads to protect water quality.[19, 20, 21, 22, 23] PCGP has not provided DEQ with engineering design details and their technical support for site-specific cut and fill slopes. PCGP has provided no information in the Transportation Management Plan on the improvements to protect water quality that PCGP proposes for existing access roads nor has PCGP presented for DEQ approval the methodology it will use to evaluate the potential water quality impact when using existing access roads given their current condition and design. Requesting that PCGP provide the engineering designs and specifications used to improve roads for pipeline construction and operation is essential for protecting water quality and, at minimum, assuring compliance with water quality standards and, in particular, OAR 340-041-0007(7). As noted in DEQ's review of PCGP's response to Comment 15, the scientific literature is replete with research documenting the importance of routine road maintenance for protecting water quality. For example, routine road maintenance for water quality is important to maintaining water quality necessary for the recovery of salmonids listed under the Endangered Species Act and found in streams receiving runoff from PCGP's proposed access roads. The National Marine Fisheries Service issued the Limit 10 Section 4(d) rule concerning routine road maintenance to protect water quality for ESA-listed salmon. For decades, the scientific community has established the harmful effects of roads on streams.[24] DEQ is requesting that PCGP provide the specific maintenance standards PCGP will apply to access roads while in use for pipeline construction. As discussed above, this is essential for protecting water quality and, at minimum, assuring compliance with water quality standards and, in particular, OAR 340-041-0007(7). Additionally, the Oregon Department of Forestry has rules for road maintenance and road building on private forest roads. ODF developed these rules to address public safety and water quality given the risk of landslides, road failure, and sediment discharge from road use and construction.[25, 26, 27, 28] ODF uses road maintenance and building requirements associated with the Forest Practices Act to comply with Clean Water Act requirements such as those associated with Total Maximum Daily Loads and water quality standards. However, PCGP does not provide DEQ with information on how

[19] Choctawatchee, Pea, and Yellow Rivers Watershed Management Authority. 2000. Recommended Practices Manual – A Guideline for Maintenance and Service of Unpaved Roads
[20] Berkshire Regional Planning Commission. 2001. The Massachusetts Unpaved Roads BMP Manual – A Guidebook on How to Improve Water Quality While Addressing Common Problems
[21] Gordon Keller and James Sherar. 2003. Low-Volume Roads Engineering – Best Management Practices Field Guide. US Agency for International Development and USDA Forest Service
[22] R. Jonathan Fanin and Joachim Lorbach. 2007. Guide to Forest Engineering in Mountainous Terrain. Forestry Harvesting and Engineering Working Paper 2. Food and Agricultural Organization of the U.N.
[23] Hearn, G.J. 2011. Slope Engineering for Mountain Roads. Geological Society Engineering Geology Special Publication No. 24
[24] Furniss, M.J., T.D. Roelofs, and C.S. Yee. 1991. Road Construction and Maintenance. American Fisheries Society Special Publication 19:297-323
[25] Oregon Department of Forestry. 2003. *Wet Weather Road Use*. Forest Practice Technical Note Number 9
[26] Oregon Department of Forestry. 1999. *Road Maintenance*. Forest Practices Technical Note Number 4
[27] Oregon Department of Forestry. 2003. *Installation and Maintenance of Cross Drainage Systems on Forest Roads*. Forest Practice Technical Note Number 8
[28] Oregon Department of Forestry. 2003. *High Landslide Hazard Locations, Shallow, Rapidly Moving Landslides and Public Safety*: Screening and Practices. Forest Practice Technical Note Number 2

			specifically PCGP will address OAR 629-625-0700 (Wet Weather Road Use). ODF's Wet Weather Road Use rule requires the following: *...durable surfacing or other effective measures to resist deep rutting or the development of a layer of mud on top of the road surface on road segments that drain directly to streams that will be used for log hauling and moving construction equipment during wet periods.* In its Forest Practices Technical Note 9, ODF provides a discussion of aggregate surfacing, road use, and turbidity in streams. DEQ can find no information in any of the plans included in PCGP's analysis of its compliance with water quality standards that addresses the issues raised in this ODF technical note and in Forest Practices Act rules. Moreover, for public safety, under OAR 629-623-0000 – 0800, a forest harvesting operator must submit to ODF a detailed road design for all new or reconstructed roads crossing high landslide hazard locations. For water quality protection and compliance with OAR 340-041-0007(7), DEQ is requesting in Comment 31 that PCGP provide detailed road designs for new or reconstructed roads in landslide hazard areas and other locations where these roads are hydrologically connected to waters of the state. PCGP must demonstrate in its plans and supporting documents where and when exactly PCGP is applying these designs on the proposed access roads for pipeline construction and operation. As with ODF's requirements for private forest roads, Counties have authority to establish road construction designs and specifications for County roads.[29] At minimum, these county requirements will ensure that an unpaved county road will support PCGP's proposed level of use while protecting the stability of the road surface and, consequently, water quality for roads hydrologically connected to waters of the state. In its proposed Transportation Management Plan, PCGP has not identified any maintenance standards as well as design and specifications for reconstructed County roads used as access roads. Additionally, PCGP has not provided DEQ with Forest Service, Bureau of Land Management, and Bureau of Reclamation road permits roads containing maintenance standards and design and specifications for reconstructed federal roads proposed by PCGP for use as access roads. These road permits must provide PCGP with clear and enforceable standards and specifications. The following is an example of the maintenance standards PCGP has proposed in its Transportation Management Plan in Section 2.2.2: *PCGP will perform or make commensurate share payment(s) for maintenance on existing Agency roads used during construction and any subsequent non-casual use in accordance with USDA-FS Manual Chapter 7730, the USDA-FS Handbook section 7709.59, Chapter 60, BLM Manual 9100 Series and the various BLM District Resource Management Plans and as shown*

[29] Association of Oregon Counties. 2014. Chapter 13: Design and Specification for Roads. County Road Manual

			in TMP Appendices C1, C2, C3, D, and D1. *Existing Agency-jurisdiction Roads will be maintained to ensure compliance with any applicable Road Use Permit, Reclamation standards for "Engineering and O&M Guidelines for Crossings" (Exhibit H of the Grant and TUP), the Grant and TUP, this TMP and in consultation with the Agencies regarding current standards for the maintenance level identified for the Road(s). Roads constructed by PCGP on Agency lands will be maintained to standards approved by the Agency.* *To facilitate consistency across the Pipeline Project, Agencies have agreed to utilize the most current USDA-FS, Pacific Northwest Region (Region 6), standard timber sale road maintenance specifications ("T-specs") and Pipeline Project specific supplemental specifications as appropriate. Agency Roads requiring PCGP maintenance and associated specifications are shown on maps in TMP Appendices B and B1 and in tables in TMP Appendices C, C1, C2, C3, D, and D1. Copies of the specifications are available from the Supervisor's Office of any National Forest in Region 6.* *Paved Roads will be kept free of mud and other debris that may be deposited by construction equipment. Track-driven equipment would cross paved Roads on tires or equipment pads to minimize Road damage. Any paved, gravel, or dirt roadways damaged by construction activities will be repaired to a condition equal to or better than the condition prior to damage. Agencies may require PCGP to provide selected pre-use Road and/or sign condition surveys, including photos or video, to aid in assessing use-induced changes.* Similarly, in Section 2.2.3, PCGP proposes road improvements to accommodate equipment for pipeline construction and roads slated for improvements are described in: *TMP Appendices B and B1 maps* *TMP Appendices C, C1, C2, C3, and D1 tables* However, PCGP has provided no information in Appendices B, B1, C1, C2, C3, D, and D1 as PCGP has left these pages in the Transportation Management Plan blank. PCGP indicates in the excerpt above that PCGP will maintain existing "Agency-jurisdiction Roads" to ensure compliance with any applicable road use permit and other standards. However, PCGP provides no road permits for DEQ to review nor any applicable road maintenance standards and specifications for all the access roads. In DEQ's Comment 15, DEQ requests that PCGP provide supporting documents such as design standards and road permits that PCGP will use when complying with TMDL Implementation Plans such as Federal Water Quality

			Restoration Plans. However, in PCGP's response to DEQ's Comment 15, PCGP indicates that Right-of-Way Grants will ensure compliance with water quality plans. DEQ disagrees with this assertion and provides the rationale for this disagreement in DEQ's review of PCGP's response to Comment 15. Moreover, the statement below from PCGP's Transportation Management Plan undermines this assertion regarding right-of-way grants. In the TMP, PCGP states that roads "will be maintained to ensure compliance with any applicable Road Use Permit." Although PCGP intends to use compliance with applicable road use permits to comply with water quality standards and, therefore, obtain a 401 Water Quality Certification, PCGP does not consider road use permits essential for demonstrating compliance with a Total Maximum Daily Load. Additionally, in the excerpts from PCGP's Transportation Management Plan above, PCGP does not provide the actions it will take to maintain Coos, Douglas, Jackson, and Klamath County and private forest roads that PCGP will use to access pipeline right-of-way for construction and operation. What are the County road maintenance standards that PCGP will follow? For private forest roads used to haul harvested trees, Oregon Department of Forestry has issued a road drainage rule to implement the Forest Practices Act.[30] As noted above, ODF uses the FPA and its administrative rules to regulate road maintenance for water quality and compliance with the Clean Water Act and, in particular, water quality standards. ODF requires the operator of private forest roads used for forest harvesting to install additional drainage such as cross drains where needed to filter stormwater from roads to protect water quality. In ODF's Technical Note Number 8 referenced above, ODF provides technical guidance to address ditch erosion and the sediment it produces. Specifically, ODF presents typical minimum culvert spacing for erosion control in a roadside ditch. As the grade of a road increases, this drainage becomes increasingly important. In OAR 629-625-600(9), ODF requires the following: *Where needed to protect water quality, as directed by the State Forester, operators shall place additional cross drainage structures on existing active roads within their ownership prior to hauling to meet the requirements of OAR 629-625-0330.* PCGP must determine in collaboration with ODF the need for additional cross drainage structures prior to using access roads for pipeline construction and operation. As discussed above, PCGP must include this determination as well as the evaluation of the current condition and design of existing access roads in its submittal for Water Quality Certification. DEQ will review this information when developing the Certification Decision. Additionally, in its Transportation Management Plan excerpted above, PCGP does not indicate specifically how PCGP will keep paved roads free of mud and other debris PCGP may deposit with its construction equipment. How specifically will PCGP keep paved roads free of mud and other debris? What BMPs will PCGP use to implement this stated goal? Will PCGP operate a wheel wash station at access road crossings with the construction right-of-way? DEQ cannot fully evaluate

[30] Oregon Department of Forestry. 2003. Installation and Maintenance of Cross Drainage System on Forest Roads. Forest Practices Technical Note Number 8 (Version 1.0)

			the efficacy of the proposed Transportation Management Plan on general statements unless PCGP follows these statements with specific practices applied to specific locations with a schedule identifying when PCGP will implement these practices. In PCGP's Transportation Management Plan excerpted above, PCGP has not provided road permits showing maintenance standards that DEQ can review. PCGP has not provided DEQ with proposed "T-specs" to review nor demonstrated that these "T-specs" will comply with County and ODF Forest Practice Act requirements developed to comply with Clean Water Act requirements. As requested in Comment 23 and 24, PCGP has not identified access requiring maintenance and improvements to protect water quality nor standards and specifications noted in the Transportation Management Plan excerpt above. Additionally, PCGP has not provided maintenance specifications for Forest Service roads. As noted in DEQ's Comment 15 and Comment 29, DEQ must ensure compliance with Section 303 of the CWA and other appropriate requirements of state law in developing its Certification Decision. To protect water quality and to comply with water quality standards such as OAR 340-041-007(7), PCGP must design needed access road improvements to ensure these improvements do not cause landslides. Moreover, PCGP must maintain access roads to prevent water quality impacts during logging truck and heavy equipment traffic. Regarding any proposed improvements to proposed access roads, PCGP provides few details that DEQ can use to evaluate the efficacy of proposed controls to prevent erosion and sedimentation. For DEQ's concerns regarding slope stability and the construction and operation of the pipeline, DEQ can find only the following information in Section 3.5 of the Transportation Management Plan: *Refer to Slope Stability Stipulation D.20 of the Grant and TUP.* PCGP has not provided the Grant (Right-of-Way Grant, Serial No. OR 63542-01) and the TUP (Temporary Use Permit, Serial No. OR 63542) for DEQ to review to determine if the grant and permit contain enforceable details regarding road maintenance and improvements. Our review of the "Grant and TUP" is essential for the development of the Certification Decision and determining PCGP's compliance rules for developing this decision as stated in OAR 340-048-0042. Given the above, DEQ is unable to determine what this "Slope Stability Stipulation" entails and how PCGP will respond to it. PCGP's Introduction in Section 1.0 of the Transportation Management Plan states that this plan: *...includes details regarding timber removal and construction access Road improvements, Road maintenance and management of use before, during, and after construction. A final TMP will be submitted by PCGP to the Agencies for approval prior to issuance of the TUP and Grant. This TMP applies to Agency-jurisdiction Roads located on Agency and privately-owned land.* To date, PCGP's Transportation Management Plan does not contain and PCGP has not provided DEQ with any detailed information in engineering plans on how and where exactly PCGP will perform road improvements to prepare the proposed

			access roads for their proposed use and to protect water quality. In the Transportation Management Plan, PCGP also states the following: *…where construction schedules require Road use outside the normal operating season, more substantial work such as surfacing or resurfacing of may be necessary.* The season of rainfall is typically from mid-October to mid-July. Timber and ridgetop removal as well as heavy equipment access for pipeline construction are levels of use that have the potential to generate sediment discharge to receiving waters if the non-paved roads are not reconstructed and maintained to support this proposed use during the season of rainfall. To date, PCGP has not provided DEQ with a road maintenance plan for all access roads to ensure that during the season of rainfall road use will not impact water quality. PCGP states in its Transportation Management Plan that: *All maintenance and improvements will be completed in accordance with Pipeline Project requirements and Agency, state, county and private landowner standards.* PCGP has not provided DEQ with any information on road maintenance standards and road improvement design standards in this Transportation Management Plan or any other document PCGP included in it 401 Water Quality Certification Submittal. In Section 2.2.1 of PCGP's Transportation Management Plan, DEQ states the following: *PCGP will be responsible for performing Road maintenance on all newly constructed Roads on Federal Lands and decommissioning of temporary Roads as specified in this plan.* PCGP has not presented in this plan any road decommissioning standards. Rather, PCGP only provides the following information and references to documents that are currently unavailable to DEQ: *TARs and previously decommissioned Roads that are constructed or reconstructed for use during the Pipeline Project will be reclaimed or decommissioned as specified by the Agency. In addition, as mitigation for impacts to various late-successional and riparian-dependent species as well as soil productivity losses, PCGP proposes to decommission off-site Roads in cooperation with the Agency in accordance with Agency specifications and the Compensatory Mitigation Plan (Exhibit G, Appendix CC to the Grant and TUP).*

			As noted in the USDA Forest Service's review of the science regarding road construction and maintenance, unmaintained roads are a substantial source of sediment delivery to streams in forest watersheds.[31] Given this and other research on water quality impacts from road design and maintenance, DEQ requested information in AIR-1 on road decommissioning to develop its Certification Decision. Although PCGP provides a definition of decommissioning in Appendix E of the Transportation Management Plan, PCGP does not indicate in this plan what roads PCGP will decommission nor provide detailed management practices and design standards that PCGP will employ at each decommissioned road segment. DEQ requested this information in Comment 28 of AIR-1. The definition of decommissioning used in PCGP's Transportation Management Plan indicates that treatments may include stabilizing slopes, pulling back road shoulder, removing unstable road fills, or installing water bars. How will PCGP carry out these treatments at each site to ensure roads on landslide prone, steep slopes are not destabilized further? Does stabilizing slopes refer to unstable cut slopes if the road prism is left in place? If so, what are PCGP's proposed designs for stabilizing unstable cut slopes? If PCGP uses slope breakers or water bars to manage stormwater on a decommissioned road surface, who will maintain this system for managing stormwater and are there financial resources to maintain this system for the operational life of this pipeline? PCGP has not demonstrated to DEQ that it has thought through the details of decommissioning road segments to protect water quality.
16	In addition, please identify all proposed amendments to federal land and resource management plans that would necessitate amendments to current Forest Service, Bureau of Land Management, or Bureau of Reclamation Total Maximum Daily Load Implementation Plans covering the pipeline's construction and operation. Federal Water Quality Restoration Plans represent the Forest Service's and BLM's plan for activities on these federal lands serving as a source of point and nonpoint source pollutants including	The Forest Service provided in a Notice of Intent a preliminary list of plan amendments required for the pipeline in Federal Register 27473 (June 15, 2017). In this notice of intent, BLM reviewed the proposed route and determined plan amendments required to accommodate the pipeline including changes to right-of-way Avoidance Areas where the pipeline would cross. BLM indicated that it will identify additional pathways via scoping or further analysis and that minor design modifications are needed for conformance with approved	**Summary Statement: DEQ requests that the Federal agencies not proceed with proposed amendments to land management plans until DEQ can determine how these changes may affect the Federal agencies' compliance with existing Total Maximum Daily Loads. DEQ makes this request so that DEQ can develop a Certification Decision in compliance with OAR 340-048-0042(2). In the section below, DEQ provides examples how these proposed plan amendments currently undermine Federal agency compliance with TMDLs.** **The proposed plan amendments to allow additional soil compaction suggest the surface of the proposed permanent right-of-way will have increased runoff similar to that of a primitive road. As such, DEQ requires PCGP to provide a quantitative assessment of the post-construction stormwater discharge from the permanent right-of-way at all stream crossings. This assessment should demonstrate this stormwater discharge complies with water quality standards. PCGP must also include design information for all stormwater treatment controls used at these stream crossings as requested in DEQ's submission guidelines for post-construction stormwater management. In Comment 34 of AIR-1, DEQ requested this information, but PCGP has not yet provided it.** **The BMPs and plans noted in PCGP's response do not fully address the Erosion and Sediment Control Plan requirements of a NPDES 1200-C General Permit. In the section below, DEQ details its concerns and the specific information DEQ is seeking in Comment 16 as well as the rationale for the information requested in this comment.** **1. Proposed Federal Land Use Plan Amendments**

[31] Furniss, M.J., T.D. Roelofs, and C.S. Yee. 1990. Road Construction and Maintenance. American Fisheries Society Special Publication 19:297-323

	pollutants addressed in a Total Maximum Daily Load.	plans. Four streams are proposed and presented for dry open cut crossings on Federal lands. Appendix A to Part 2 of the JPA details BMPs and plans PCGP to avoid and minimize effects to water quality when constructing waterbody crossings.	Federal Register 27473 (June 15, 2017) does not contain the information presented in JCEP's response to DEQ comments. Given this, DEQ cannot verify the information provided and requests that Jordan Cove provide the correct Federal Register citation. Although not referenced in JCEP's response to comments, Federal Register 28837 (June 26, 2017) presents proposed amendments to Federal land and resource management plans associated with PCGP's proposed gas pipeline construction. The proposed land and resource management amendments listed below may lead to amendments of the Forest Service's Total Maximum Daily Loads Implementation Plans referred to as Water Quality Restoration Plans. Changes to the Forest Service's Water Quality Restoration Plans may affect compliance with TMDLs. For example, proposed amendments entitled UNF-1, UNF-2, RRNF-5, and WNF-5 affecting effective shade and riparian areas may affect compliance with a temperature load allocation in a TMDL. For this reason, DEQ requests that proposed amendments to Forest Service land and resource management plans not proceed until PCGP has provided DEQ the information requested in Comment No. 19. In particular, DEQ request information on PCGP's effort to first avoid, then minimize and, if unavoidable, mitigate impacts to shade in riparian areas. DEQ also requests more information regarding BLM's proposed Resource Management Plan amendments to (1) make changes to land use allocations along the pipeline route and (2) make changes to right-of-way Avoidance Areas to determine if these areas contribute to the implementation of or alter BLM's Water Quality Restoration Plans. Water Quality Restoration Plans are the Forest Service's and BLM's TMDL Implementation Plans. **Umpqua National Forest** The following two proposed plan changes below are relevant to DEQ concerns regarding TMDL compliance: (1) effects of proposed amendments on Riparian Reserves and (2) detrimental soil conditions from the project. • Amendment (UNF-2) would allow the pipeline to run parallel to the East Fork of Cow Creek for .1 mile between MP 109.5 and 109.6 and will impact 1 acre of riparian vegetation. • Amendment (UNF-3) would remove for this proposed project established limits for soil compaction (i.e., no more than 20% allowed of the project area). This proposed amendment supports DEQ's concern and request in AIR-1 (see Comment 34) for a (1) post-construction stormwater management plan for the permanent right-of-way particularly as it discharges to streams and (2) for modeling to evaluate the impact of this discharge. The proposed amendment also supports DEQ's concern raised in AIR-1 regarding the impacts to riparian vegetation and the shade it provides streams with PCGP's proposal to use FERC guidelines that allow clearing for the pipeline alignment within 15 feet of a water body. This information in the proposed amendment supports the need for PCGP to address DEQ's Comment 32. **Rogue National Forest**

			Two of these proposed changes below are relevant to DEQ's concerns and both involve soil compaction. One area of soil compaction is in a restricted riparian area and the other is in all management areas. • Amendment (RRNF-5) potentially affects approximately 2.5 acres of the Restricted Riparian Management Strategy at one perennial stream crossing on South Fork of Little Butte Creek around MP 162.45. • Amendment (RRNF-6) would exempt PCGP from the requirement to limit soil compaction to 10% of the activity area (not including permanent roads or landings) upon completion and to limit soil compaction to no more than 20% from management practices. This proposed amendment supports DEQ's concern and request in AIR-1 (see Comment 34) for a (1) post-construction stormwater management plan for the permanent right-of-way particularly as it discharges to streams and (2) for the modeling of this impact of this discharge. **Winema National Forest** Two of these proposed changes below are relevant to concerns raised in DEQ's comments in AIR-1 and both involve soil compaction. This soil compaction is in all management areas and the other involves a specific riparian area. • Amendment (WNF-4) would exempt PCGP in all management areas from the requirement to limit soil compaction to 20% of the activity area. This proposed amendment supports DEQ's concern and request in AIR-1 (see Comment 35) for a (1) post-construction stormwater management plan for the Permanent ROW particularly as it discharges to streams and (2) for the modeling of this impact of this discharge. • Amendment (WNF-5) would exempt PCGP in Management Area 8. Management Area 8 is a riparian area where the pipeline affects approximately .5 mile or an estimated 9.6 acres of this particular management area and where the limit to soil compaction is 10% of the total riparian zone. Given the information in the Federal Register notice, DEQ cannot determine if the extent of potential water quality impacts are limited to soil compaction or riparian vegetation removal or both. DEQ requests that PCGP clarify the extent of potential water quality impacts associated with this proposed plan amendment for the Winema National Forest. Considering the proposed amendments above, DEQ has concerns with soil compaction's influence on the movement and volume of stormwater on the landscape and, ultimately, its erosive force over the landscape and potential to cause hydromodification in streams. Given the documentation in the Federal Register citation above, the operation of the gas pipeline will result in permanent soil compaction and this soil compaction will exceed the level permitted in the Forest Service's current land management plan. As a result, to evaluate compliance with OAR 340-041-0007(1), DEQ is

			requesting that PCGP submit for DEQ's review and approval a soil compaction monitoring plan clearly delineating the following: • Area of the right-of-way that PCGP will address soil compaction. • Area of the ROW where soil compaction will occur to support the operation of the pipeline. This monitoring plan must identify all the locations where PCGP will evaluate soil compaction from construction activities and include the methodology selected for soil compaction testing and quality assurance measures to support the accuracy and precision of soil compaction measurements. **2. BMPs and Plans to Avoid and Minimize Water Quality Impacts to Water Body Crossings** BMPs in Waterbody Crossing Plans and Figures in Resource Report 2 Appendix E.2 referenced in PCGP's response to DEQ's Comment 16 lack specific information required in, for example, the NPDES 1200-C General Permit's Schedule A.12.b.v. Compliance with this permit schedule will help demonstrate that PCGP will implement specific controls to avoid and minimize effects to water quality during the development of these water body crossings. The general description of BMPs excerpted below and referenced in PCGP's response when referring DEQ to PCGP's Wetland and Waterbody Crossing Plan will not comply with the NPDES 1200-C General Permit: *…Sediment barriers will be installed immediately after clearing and prior to initial ground disturbance (i.e., grading). Sediment barriers will be properly maintained throughout construction and reinstalled as necessary (such as after backfilling of the trench) until replaced by permanent erosion controls or restoration of adjacent upland areas is complete and revegetation has stabilized the disturbed areas…* To evaluate the efficacy of proposed BMPs to control pollutant discharge during the construction of all waterbody crossings, DEQ requests that PCGP include in its permit application for a NPDES 1200-C General Permit the information requested in Schedule A.12 including the Site Map and Drawings for all waterbody crossings. DEQ also requests that PCGP propose a model to demonstrate quantitatively that the application of these construction BMPs will not cause or contribute to a violation of in-stream water quality standards. This analysis is needed to comply with NPDES 1200-C General Permit Schedule A.10.a and OAR 340-048-0042(2)(a).
17	Finally, for determining compliance with TMDL allocations covering federal lands, please provide for DEQ's review and approval all proposed Forest Service,	PCGP submitted an application to BLM, Forest Service, and BOR for issuance of a right-way-grant across federal lands including a plan of development containing BMPs	**<u>Summary Statement</u>: The information provided in Federal agency road permits and access/right-of-way grants is critical to the process of developing a Certification Decision given its potential to protect water quality. DEQ is requesting that PCGP provide DEQ with drafts of all federal agency road permits and access/right-of-way grants to review and, if necessary, request modifications and/or additions to these permits/access grants/right-of-way grants. DEQ provides the rationale for this information request in the section below and the level detail it expects in a future response to Comment 17.**

	Bureau of Land Management, and Bureau of Reclamation road permits and access grants or right-of-way permits.	and PCGP commitments during and after construction. PCGP will provide a revised Table A.2-6 from Appendix A.2 of Resource Report 2. This revised table will identify BMPs for waterbodies crossed by or within 100 feet of the pipeline.	PCGP's response to Comment 17 did not address DEQ's request to review and approve road permits from Federal agencies that support or will support Federal agency compliance with Section 303 of the Clean Water Act. DEQ presents the rationale for requesting this information in DEQ's review of PCGP's response to Comment 15 provided above and to Comment 17 below. In summary, the intent of DEQ's information request in Comment 17 is to determine if the practices in these permits and right-of-way grants will protect water quality and, for example, comply with Total Maximum Daily Loads. As part of the 401 Certification process, DEQ will need to review and – if needed – request changes and/or additions to the conditions in road permits for Federal road and access/right-of-way grants to use Federal lands. This request supports DEQ's compliance with rules governing the development of a certification decision [OAR 340-048-0042(2)]. This request will also contribute to Federal agency compliance with the Presidential Order to coordinate environmental review and permitting.[32] To obtain an access or right-of-way grant from the Forest Service, PCGP must submit an application for a special-use authorization. In applying for this authorization, PCGP will submit with other information an environmental protection plan including actions to ensure environmental protection and rehabilitation during construction and maintenance of the gas pipeline.[33] The Forest Service uses the information in this required environmental protection plan to develop the right-of-way grant for PCGP. DEQ is seeking to review the environmental protections included in this grant to evaluate their efficacy in protecting water quality and complying with Federal agency programs for compliance with Total Maximum Daily Loads. PCGP's response to Comment 17 indicates that PCGP is providing Federal agencies with the same information PCGP provided DEQ in its submittal for a Section 401 Water Quality Certification. At this point in DEQ's review of PCGP's submittal, PCGP has not provided documents containing site-specific information such as plans with drawings and specifications identifying best management practices on the landscape designed to prevent water quality impacts. PCGP has provided some generic drawings and best management practices along with limited information in the narrative of plans included in its submittal as noted in elsewhere in this DEQ review. However, these generic drawings do not address site-specific landscape constraints such as fill and cut slopes on steep and, in many cases, unstable slopes (e.g., potential Areas of Rapidly Moving Landslide Hazards) and/or soils with a high erosion potential. These generic drawings do not provide the engineering designs and the technical support for these designs to demonstrate to DEQ that PCGP has considered these challenging landscape constraints and developed engineered solutions to protect water quality. Given the information provided in PCGP's Transportation Management Plan, DEQ anticipates PCGP will seek a road permit or similar authorizations to use Federal roads to build and operate the pipeline. These road permits or authorizations will contain conditions specifying how PCGP will use and maintain these existing roads. For example, Federal road permits may contain conditions specifying design standards for road improvements, road reconstruction, and/or road maintenance

[32] Presidential Executive Order. August 15, 2017. Establishing Discipline and Accountability in the Environmental Review and Permitting Process for Infrastructure

[33] USDA Forest Service. Obtaining a Special-Use Authorization with the Forest Service – The Application Process

			standards from handbooks, manuals, or other technical documents these Federal agencies use to implement their Water Quality Restoration Plans (Forest Service and BLM) or will use to implement their TMDL Implementation Plans (BOR). Federal agencies develop these plans to meet allocations for Total Maximum Daily Loads. Federal agencies may require in a road permit that PCGP address specific maintenance standards prior to, during, and after pipeline construction.[34] Many of these standards will protect water quality while preparing the road for its intended use as noted elsewhere in DEQ's review of PCGP's response to AIR-1. For example, the Forest Service provides the following direction in its Forest Service Handbook regarding the required road maintenance work prior to using National Forest road: *Prehaul work must be accomplished prior to commercial hauling to make a road suitable and safe for commercial use as well as any other anticipated traffic, such as recreation use. Prehaul maintenance includes such activities as surface blading, ditch and drainage maintenance, slide and slough removal, brush removal, and road opening. It does not include reconstruction work.*[35] Prehaul work that establishes, for instance, a durable surface on nonpaved roads will protect water quality and, therefore, are relevant to the development of DEQ's Certification Decision. This handbook also addresses road damage and extraordinary repairs as follows: *Commercial road users are responsible for repairing road damage caused by their operations or by their failure to perform proper or timely maintenance. The Forest Service is responsible to repair damage caused by noncommercial use, provided the commercial user has complied with contract or permit requirements for placement and operation of traffic control devices.* *Extraordinary repairs involve physical blockage or loss of the roadbed or its structures, damage that cannot be corrected by routine maintenance equipment (such as end loaders, graders, backhoes, and dump trucks) operating from the level of the roadbed. This is work that is outside the scope of maintenance specifications or that requires additional engineering drawings or design. To this, forests may add further definitions that fit their particular situations. Extraordinary repairs will generally be handled as reconstruction.* Such road repairs are critical to protect water quality as noted elsewhere in DEQ's review of PCGP's response to AIR-1. These road repairs will help ensure compliance with water quality standards while PCGP uses access roads for pipeline construction and operation. Consequently, in developing its Certification Decision, DEQ needs assurances that the road maintenance and reconstruction standards and specifications are required when PCGP uses a Federal access road. As a condition of using a federal road, DEQ also wants assurances in PCGP's submittal that PCGP will execute site-specific

[34] Ruiz, Leo. 2005. Guidelines for Road Maintenance Levels. USDA Forest Service. Technology & Development Program 7700-Transportation Management o577 1205-SDTDC

[35] USDA Forest Service. 2003. Chapter 10 – Maintenance of Forest Development Roads. Forest Service Handbook 7709.58 (Transportation System Maintenance Handbook. R6 Supplement FSH-7709.58-2003-1

			actions to prevent and, if necessary, quickly address road damage as it arises. Moreover, for example, the Forest Service Handbook in Section 12.42 (Region 6 Supplement) on Maintenance Standards references performance-based road maintenance specifications covering maintenance issue relevant to water quality protection such as: • Surface maintenance • Surface stabilization • Drainage Structure installation or removal • Roadway drainage system maintenance • Disturbed area treatment • Roadway vegetation maintenance[36] At minimum, such specifications provide verifiable indicators or measures of compliance with the Forest Service's road maintenance standards. As documented in this DEQ review of PCGP's response to AIR-1, road maintenance is critical for water quality protection. Consequently, DEQ is seeking these verifiable measures of compliance as it develops its Certification Decision. More importantly, these specifications provide DEQ assurance the Forest Service – a Designated Management Agency under a TMDL – can enforce compliance with maintenance standards and, if needed, suspend work until the permitted or authorized entity such as PCGP achieves compliance when using a Forest Service road. In its effort to ensure compliance with the conditions of a Certification Decision, for example, DEQ may request that the Forest Service use their authority to suspend work until PCGP restores the condition of the Federal road to protect water quality. As PCGP is revising its submittal to provide DEQ with more specific information regarding PCGP's practices on access road and in the pipeline right-of-way, DEQ is requesting the level of detail in PCGP's response provided in the examples above for all proposed maintenance and reconstruction actions on Federal, County, and private roads. If PCGP chooses to revise Table A.2-6 from Appendix A.2 of Resource Report 2 in response to Comment 17, then DEQ anticipates receiving from PCGP the level of detail highlighted in DEQ's review above regarding right-of-way or access grants and road permits. Moreover, as noted elsewhere in DEQ's review, DEQ will not accept PCGP's arbitrary decision to focus BMPs on waterbodies crossed by or within 100 feet of the pipeline. PCGP must apply all BMPs to protect water quality to all access roads and the pipeline's construction and permanent right-of-way hydrologically connected to water bodies. To determine objectively hydrologic connectivity of access roads and the right-of-way, PCGP can use Geomorphic Road Analysis and Inventory Package (GRAIP) or a comparable analytical tool approved by DEQ.
18	Provide for DEQ's review and approval all proposed easements, agreements, and access or right-of-way permits for non-federal lands.	PCGP is working with private stakeholders to secure proposed easement and access or right-of-way permits. PCGP will provide a revised Table	**Summary Statement: OAR 340-048-0020(3) authorizes DEQ to request and receive information necessary to review and evaluate applications for section 401 water quality certification. DEQ considers access to all locations of the proposed project both reasonable and necessary to fulfill our Clean Water Act obligations. For this reason and as more fully discussed in the following section, DEQ is requesting copies of all proposed easements, agreements, and access or right-of-way permits for non-federal lands.**

[36] USDA Forest Service. 2007. Performance Based Road Maintenance Specifications. Transportation System Operations and Maintenance. Pacific Northwest Region

		A.2-6 from Appendix A.2 of Resource Report 2 that will identify BMPs for waterbodies crossed by or within 100 feet of the pipeline. Private agreements are not prerequisites for issuing a 401 WQ Certification.	As discussed elsewhere, DEQ will require a site-specific analysis of existing water quality, project-related effects, and a technically supported analysis of proposed engineering measures to mitigate for project-related effects. Revisions to Table A.2-6 must provide site-specific support for these proposed measures. Moreover, DEQ questions PCGP's proposal to focus BMPs on water bodies crossed by or within 100 feet of the pipeline. BMPs are required to protect water quality from impervious surfaces throughout all portions of the construction and permanent right-of-way that are hydrologically connected to water bodies. To determine the hydrologic connectivity of access roads and the right-of-ways, PCGP can use Geomorphic Road Analysis and Inventory Package (GRAIP) or a comparable analytical tool approved by DEQ. DEQ requires review and approval of all private easement agreements to assess potential impacts to water quality. DEQ seeks information how PCGP will use and maintain non-federal access roads and manage stormwater as well as other sources of pollutant discharge during construction and operation of the pipeline under all easements, agreements, and access/right-of-way permits on non-federal lands. DEQ is making this information request Comment 18 to ensure that all proposed easements, agreements, and access or right-of-way permits for both non-Federal and Federal lands will implement PCGP's proposed BMPs included in its submittal comply – for example – with TMDLs. To date, PCGP has not provided DEQ with the conditions, engineering designs/specifications, and/or requirements attached to private agreements to secure access to private lands for pipeline construction and operation. To develop a Certification Decision, DEQ must review and – if needed – request changes/additions to these conditions, engineering designs/specifications, and/or requirements in its efforts to evaluate compliance with water quality standards.
19	This compliance assessment must also include a summary of the steps taken to first avoid and then minimize impacts to the Designated Management Agency's riparian buffer protection areas prior to: • Siting Temporary Extra Work Areas for the pipeline construction • Siting of the construction and the permanent right-of-way for the pipeline.	PCGP will provide a response to DEQ in Q4 of 2018.	DEQ anticipates PCGP's response in Q4 2018.

	DEQ is requesting this information in response to Pacific Connector Gas Pipeline's proposal to locate TEWAs 50 feet from a waterbody and wetland boundary (see page 25 of Resource Report 1 for the gas pipeline). For example, this setback will not comply with the Forest Service's and Bureau of Land Management's riparian buffer protection requirements as presented in their Water Quality Restoration Plans which serve as their TMDL Implementation Plans. In Resource Report 1 noted above, PCGP notes that there are 922.64 acres of TEWAs. Please identify the location of each TEWA that PCGP will locate within one and two potential tree heights away to 50 feet from waters of the state. For streams, please indicate the distance of each TEWA from the ordinary high water mark of the stream or riverine wetland. Additionally, please note the land ownership where each TEWA is located. In addition, on page 58 of Resource Report 1 for the gas		

	pipeline, PCGP indicates that the pipeline – in some places – will impact riparian vegetation while paralleling streams. Specifically, this report notes that the "proposed route will avoid paralleling a waterbody within 15 feet or less, where feasible." In this report, PCGP notes that this placement is consistent with the Section V.B.2.a of FERC's Wetland and Waterbody Procedures. However, 15 feet of riparian buffer would violate DMA riparian buffer protection requirements. Moreover, based on the literature, a 15-foot riparian buffer for thermal regulation of streams may result in thermal gain to the adjacent water body. As result, please identify each segment of the pipeline's construction right-of-way and permanent right-of-way that is parallel to waters of the state and within two site potential tree heights from waters of the state. Please provide the location and a detailed rationale for siting TEWAs closer to streams than authorized by a DMA's riparian buffer protection requirements and when siting sections of the construction and permanent		

	right-of-way. For example, the PCGP's rationale in Resource Report 1 (page 58) for not proposing setbacks larger than 50 feet in Riparian Reserves is that larger setbacks "would render the TEWA useless for the stream crossing." PCGP should justify its proposal for non-standard riparian buffer protections by providing the following information: • A description of the specific constraints at each site preventing the use of a TEWA in an area. • The specific rationale why the TEWA must be closer to the stream crossing. Without this specific information, DEQ cannot determine that Pacific Connector Gas Pipeline attempted to first avoid and minimize riparian impacts to the maximum extent practicable before seeking to mitigate these impacts.		
20	This compliance assessment must also identify other locations where PCGP will not comply with Designated Management Agencies' riparian protection areas when siting the following:	PCGP will provide a response to DEQ in Q4 of 2018.	DEQ anticipates PCGP's response in Q4 2018.

	• Temporary and Permanent Access Roads, • Staging areas, • Material storage areas, and • Other components (e.g., compressor stations, metering stations) of the pipeline.		
21a	Please include a detailed justification for seeking alternative riparian buffer protection requirements when siting these facilities within riparian areas.	PCGP will provide a response to DEQ in Q4 of 2018.	DEQ anticipates PCGP's response in Q4 2018.
21b	Pacific Connector Gas Pipeline must evaluate the thermal impacts from all noncompliance with DMA riparian protection requirements requested above where PCGP has provided and DEQ has approved the following information: • Detailed information demonstrating it considered all actions to first avoid or then minimize impacts to riparian areas to the maximum extent practicable. • Detail rationale for proposing nonstandard widths for riparian buffer protections.	PCGP will provide a response to DEQ in Q4 of 2018.	DEQ anticipates PCGP's response in Q4 2018.

	This evaluation must be included in PCGP's Thermal Impacts Assessment noted in the comments below on compliance with state water quality standards.		
22	There is no information presented in Pacific Connector Gas Pipeline's Appendices for Timber Removal and Construction in the Transportation Management Plan (Part 2, Appendix E-8). Please provide the location of the approximately 660 miles of existing public and private roads that PCGP proposes to use to construct the gas pipeline and/or support its operation. In this updated plan, please delineate these existing public and private roads by ownership as follows: • Private road on land zoned for forest use • Private road on land zoned for agricultural use • Private road on land zoned residential, commercial, and industrial use by Coos, Douglas, Jackson, and Klamath County • Public road owned and operated by Coos, Douglas, Jackson, Klamath County	Maps of access roads proposed for use for construction of the pipeline are included in Appendix B to Part 2 of the JPA (see pdf page 183 and 661 – please note that the same set of maps are provided twice, as their own attachment and as an appendix to the overall Project Description). A list of the roads is included in Table A.8-1 on pdf page 143. Table A.2-6 is in Appendix A.2 to Resource Report 2 (Attachment C of the PCGP JPA package) lists waterbodies crossed by or within 100 feet of temporary and permanent access roads or existing access roads where improvements will be required prior to use. PCGP will provide a revised table A.2-6 is in Appendix A.2 to Resource Report 2 (Attachment C of the PCGP JPA package) that will identify best management practices for waterbodies crossed by or within 100 feet of temporary and permanent access roads.	**<u>Statement Summary</u>: PCGP's response to Comment 22 did not identify the ownership of all the access roads PCGP proposes to use. In the section below, DEQ provides specific examples where ownership is unknown. DEQ requires site-specific, detailed information on road maintenance and road improvement actions PCGP will need to perform to protect water quality when using the more than 660 miles of access roads. DEQ provides the rationale for this information request in the section below as well as examples of the level of required detail. In particular, DEQ refers PCGP to a tool to identify roads that are hydrologically connected to water bodies. Please provide responses to Comment 22 using the examples and guidance provided below.** Information in submittal documents do not include all the information requested in Comment 22 of AIR-1. For example, on Sheet 1 of 55 of Drawing No. 3430.31-Y-Map 1, the specific ownership of the following roads as well as others is not identified: • Logging Spur 6.64R – 7.34R • Carlson Heights Road 7.34R – 7.44R • Willanch Slough 8.44R • Logging Spur 8.17R These are just a few examples among many on PCGP's drawings. Without information on the specific ownership of each road, DEQ cannot evaluate compliance with TMDL allocations as required in OAR 340-048-0042(2). As requested in AIR-1, please delineate these public and private roads by ownership where ownership is unclear. Additionally, PCGP provides only limited information in Table A.8-1 regarding the improvements needed for PCGP to use various access roads for pipeline construction and/or operation. For example, PCGP provides only the following information: requires pothole filling, blading/grading, brush limbing, widening and/or turnouts. As explained using an example in DEQ's review of PCGP's response to Comment 23 below, this information does not tell DEQ that PCGP evaluated these roads for their potential impact to water quality. DEQ is most interested in an assessment of the roads with dirt, gravel, bituminous, and rock surfaces for their potential impact to water quality under different levels of use noted in Table A.8-1. Moreover, given the information provided in PCGP's submittal, many of these road these access roads will experience loads from the following activities: • Haul heavy equipment for road building and improvements to support forest harvesting.

	• Public road on the Umpqua, Rogue-Siskiyou, and Winema-Fremont National Forest • Public road on land in the Bureau of Land Management Coos Bay District, Roseburg District, Medford District, Klamath Resource Area • Public road on Bureau of Reclamation land DEQ will use this information to evaluate compliance with the Section 303 of the Clean Water Act as noted above.	PCGP anticipates submitting the revised table to ODEQ in Q4 2018.	• Provide access to the approximately 300 miles of pipeline alignment for logging trucks and logging equipment to clear the construction right-of-way of vegetation. • Haul logs from the construction right-of-way. • Provide access for truck traffic for reforestation of the construction ROW. • Haul stumps as well as a portion of the slash that will not be left in the 30-foot swath of the 50-foot permanent right-of-way as this right-of-way needs to be clear for periodic vegetation management and future pipeline repairs. • Haul heavy equipment to construct a construction right-of-way that will require the removal of mountain ridgetops in the Coastal and Cascade Mountain Ranges. • Haul rock and soil to disposal sites that PCGP removed from ridgetops to create the permanent right-of-way. • Haul heavy equipment for laying the pipeline. • Haul heavy equipment to rip/subsoil or scarify compacted soil during the restoration of the construction right-of-way. To develop its Certification Decision, DEQ requested and must receive in response to Comment 22 the following: • An evaluation of each access road segment's current condition relative to applicable standards and specifications. • An evaluation of needed improvements to protect water quality as requested in Comment 23 below. This information is critical for DEQ to evaluate PCGP's compliance with Total Maximum Daily Load Implementation Plans of Designated Management Agencies as requested in Comments 15 and 16 noted above. In fact, the Oregon Department of Forestry – a Designated Management Agency – developed a Technical Note 8 to guide the implementation of Forest Practices Act rule that states: *Road drainage must be improved when there is the likelihood of substantial sediment delivery if the drainage system is not upgraded. Inspection of the road drainage on inactive roads prior to active road use is essential. Evidence of potential sediment delivery include the following conditions:* *ROAD USE CHANGING - LIKELY SEDIMENT DELIVERY* • *No cross drain structure (for filtering) within 200 feet of a stream crossing* • *Streams running in roadside ditches* *ROAD USE NOT CHANGING - LIKELY SEDIMENT DELIVERY ON ANY ROAD* • *When gullies (over 100 feet in length) exist in a ditch, or below a cross drain* • *Surface drainage waters flow into cracks on the outside edge of the road*

			• *When more than 30 percent of the road system draining directly to streams or into gullies (a goal for a superior road is 15 percent)* *REPAIRS FOR OLDER ROADS* *When repairing older roads, streams running down ditches need to be put back into the original channel. Other common repairs are adding cross drains for filtering above stream crossings, and installing new cross-drains where gullies have formed in the ditch or at culvert outlets. In general, the information on drainage of new roads as described earlier in this Technical Note are also appropriate for maintenance of older roads. Use any technique that efficiently fixes the problem.* As discussed in more detail in the review of PCGP's response to Comment 15, this information is necessary to ensure compliance Oregon Administrative Rule 629-625-0600. Oregon Department of Forestry uses this Forest Practices Act rule regarding road maintenance to protect water quality by requiring the timely maintenance of all active and inactive roads. ODF uses this rule to comply with Total Maximum Daily Loads and water quality standards as noted elsewhere in DEQ's review. The information request in Comment 22 is essential for evaluating PCGP's practices to protect water quality on PCGP's proposed private access roads as well as proposed public access roads. In Section 2.1.1 of the Transportation Management Plan, PCGP states only the following: *PCGP will obtain landowner agreements for any use of private roads. All conditions agreed to with the landowner must be met by the Contactor for continued use of the road. Where access is not available to Agency lands or Roads, and in cases of private roads of mutual interest, PCGP will coordinate with the appropriate Agency(ies) in the identification and acquisition of access rights related to the right-of-way locations for the Grant and TUP.* At minimum, to formulate a Certification Decision, DEQ must receive and review all private landowner agreements for use of private roads to ensure compliance with Forest Practices Act rules administered to comply with water quality standards as noted above and in DEQ's review of PCGP's response to Comment 15. To protect water quality, these private agreements must include: • PCGP's evaluation of the current conditions of these roads to protect water quality. • PCGP's reconstruction plan – if needed to protect water quality/comply with the Forest Practices Act – to prepare these private forest roads for their proposed use. • PCGP's maintenance plan for these roads once PCGP makes needed improvements to protect water quality.

			To develop the Certification Decision, DEQ requires PCGP to provide specific information on where PCGP will apply specific maintenance actions and when PCGP will apply these actions. This information is required for all the private and public access roads. In preparing AIR-1, DEQ reviewed Table A.2-6 in Appendix A.2 of Resource Report 2. The information in this table does not provide DEQ with a detailed maintenance and improvement plan for the approximately 660 miles of access roads to construct and/or operate this pipeline requested in Comment 24. As noted in the University of Nebraska's/USDA Forest Service's review of forest roads entitled Protecting Soil and Water in Forest Management, road maintenance is critical to protecting water quality. Given the research on roads and water quality, DEQ is most concerned with the dirt, gravel, bituminous, and rock surfaced access roads given their high potential to discharge sediment to waters of the state when under use for forest clearing and pipeline construction as documented elsewhere in DEQ's review of PCGP's response. Additionally, PCGP's table referenced in its response only identifies access road segments within 100 feet of waterbodies. Road conditions and their use beyond 100 feet of waterbodies can affect these waterbodies. PCGP must address all roads hydrologically connected to waterbodies in its pursuit of a Section 401 Water Quality Certification for its proposed activities. To identify objectively these hydrologically connected roads, PCGP may use Geomorphic Road Assessment and Inventory Package (GRAIP) or a comparable analytical tool approved by DEQ. DEQ is very skeptical that PCGP will provide the level of detail DEQ is requesting in AIR-1 in PCGP's update to the information presented in Table A.2-6. For an example of the detail that DEQ is expecting, please see DEQ's review of PCGP's response to Comments 23 and 24 below. This review provides examples of the level of detail DEQ is requesting and expecting to receive from PCGP to develop the Certification Decision.
23	Provide documentation demonstrating that PCGP inventoried these existing roads to identify necessary maintenance actions and needed improvement to protect water quality. The documentation should include (1) the results for the inventory for each road segment and recommended maintenance prescription and (2) the road assessment protocols used to perform this inventory, and (3) the evaluation tool used to assess the surface erosion risk, gully	PCGP will provide a revised Table A.2-6 from Appendix A.2 of Resource Report 2 that will identify best management practices for waterbodies crossed by or within 100 feet of temporary and permanent access roads.	**Summary Statement: Revising the table of proposed BMPs for waterbodies crossed or within 100 feet of temporary and permanent access roads does not address the central concerns expressed in Comment 23. Please refer to DEQ's Summary Statement for Comments 4 and 5. BMPs are a tool to reduce water quality impairment but do not represent a strategy to ensure water quality protection. DEQ requires a comprehensive inventory of temporary and permanent access roads, road inventory assessment protocols, and – most importantly – an analysis of surface erosion, gully formation, landslide potential, crossing failure, and other risks associated with predicted use of temporary and permanent roads. The section below describes a tool to identify roads hydrologically connected to water bodies and examples of detail required to adequately address project impacts. Please address the data request in Comment 23 based on the analysis and examples provided below.** DEQ does not believe PCGP's proposed additions to Table A.2-6 in Appendix A.2 of Resource Report 2 will provide DEQ with the level of detail regarding road maintenance prescriptions as well as road improvements needed to ensure the use of existing access roads will protect water quality. First, the road segments presented in the table reference in PCGP's response (i.e., Table A.2-6) includes only those segments within 100 feet of a waterbodies. DEQ is requesting PCGP's inventory evaluate all existing access roads hydrologically connected to waterbodies. To identify objectively these hydrologically connected roads, PCGP may use Geomorphic Road Assessment and Inventory Package (GRAIP) or a comparable analytical tool approved by DEQ.

	risk, landslide risk, and stream crossing failure risk.		Including these access roads will allow PCGP to assess all the potential impacts on receiving water quality. Secondly, in Comment 23, DEQ did not request that PCGP identify BMPs. DEQ is requesting documentation demonstrating that PCGP conducted an inventory of all existing access roads to evaluate their potential impact to water quality when used by heavy equipment and large truck traffic to construct and operate the gas pipeline. Please provide this information for all access roads hydrologically connected to water bodies. PCGP's evaluation of water bodies crossed by or within 100 feet of access roads is too narrow to protect water quality. To identify objectively these hydrologically connected roads, PCGP may use Geomorphic Road Assessment and Inventory Package (GRAIP) or a comparable analytical tool approved by DEQ To evaluate the effectiveness of PCGP's inventory of existing access roads for potential water quality impacts, DEQ requests the road assessment protocols and the evaluation tool used by PCGP to perform this inventory (e.g., USDA Forest Service Water/Road Interaction Field Guide and the Geomorphic Road Analysis and Inventory Package noted in DEQ's AIR-1). Currently, DEQ cannot evaluate the road assessment protocols and evaluation tool PCGP used to identify road maintenance treatment and road improvements needed for the approximately 660 miles of access roads. PCGP's Table A.8-1 in Part 2 of Appendix B in the Joint Permit Application provides only the following footnotes regarding maintenance needs along the approximately 660 miles of access roads: • Footnote 1: requires potholing filing • Footnote 2: blading/grading • Footnote 3: brush limbing • Footnote 4: widening and/or turnouts These footnotes do not indicate to DEQ that PCGP has inventoried all the access roads or evaluated their potential for water quality impacts. DEQ's goal with this information request is to determine if PCGP is taking proactive measures to protect water quality prior to using access roads. The scientific literature concerning the water quality impacts associated from forest roads is extensive as noted elsewhere in DEQ's review, and there are tools to evaluate the potential for water quality impacts from forest roads. DEQ requires assurance that roads conditions are fully evaluated to identify structural deficiencies that may lead to water quality impairment because of heavy industrial use. Non-paved roads will be a source of sediment delivery to stream unless, if needed, PCGP designs their construction and maintenance to support this proposed level of use.[37] For example, a footnote referring to potential potholes must also address the effect this maintenance action may have on water quality. PCGP must also describe information on the formation of potholes. Did the potholes form due to a soft

[37] Grace III, J.M. and B.D. Clinton. 2007. Protecting Soil and Water in Forest Road Management. USDA Forest Service/University of Nebraska-Lincoln. Faculty Publication Volume 50(5):1579-1584. 2007 American Society of Agricultural and Biological Engineers ISSN 0001-2351

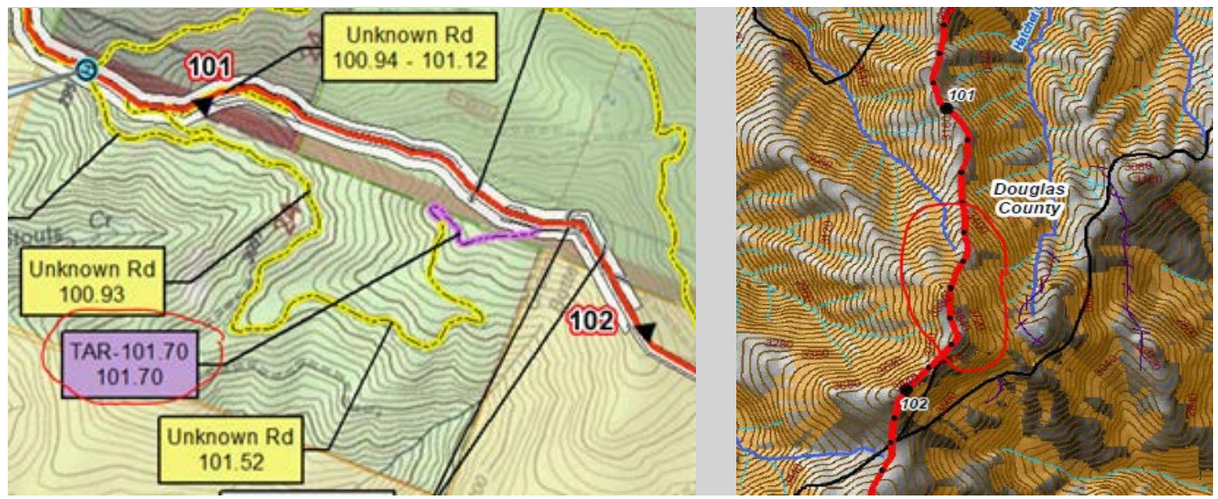
			subgrade and/or poor drainage from a non-paved road surface? Does the gravel road surface need replacement and geotextile fabric reinstalled to improve drainage from the road surface? Further, PCGP should include a strategy for monitoring road conditions, prioritizing maintenance actions, a decision matrix to identify and apply appropriate remedies, post-remedial monitoring, communication, and documentation. The information DEQ is requesting in Comment 23 is essential and necessary to protect water quality and to ensure the construction of this pipeline has the potential to comply with water quality standards. Given the limited budgets in the public and private sectors, deferred road maintenance is common. For example, in its submittal, PCGP notes that certain access roads will need improvements to move equipment into construction right-of-way. If PCGP inventories these access roads using evaluation criteria designed to protect water quality, this inventory will likely identify necessary improvements to achieve the following water quality protections: • Stabilize non-paved road surfaces to prevent sediment discharge into roadside ditches. • Improve stormwater management systems for roads to limit stormwater discharge into water bodies. • Design stable fill and cut slopes particularly for roads experiencing years of deferred maintenance. For example, in PCGP's General Location Map Drawing Number 3430.31-Map 12, Unknown Road 73.70 and Badger Creek Road (BLM 29-5-11) will experience widening in the Tyee Core Area. When these road improvements are evaluated in the context of PCGP's Geologic Hazard Maps (Figures 16 and 17 of 47), DEQ has concerns regarding PCGP's controls for maintaining slope stability when improving these roads. Hearn (2011) summarizes the issues and concerns for improving existing roads on slopes as follows: *Excavation into the hillside may reactivate landslides and trigger new slope failures: widening onto fill will invariably require additional retaining wall construction with considerations of bearing capacity and foundation stability. There may also be issues with stability of previous uncompacted construction spoil that has since become vegetated, giving the appearance of being in situ ground.* *On Balance, if suitable foundations and adequate compaction can be achieved it is preferable to widen onto fill, but each section of road will require its own assessment. If there is any uncertainty over the bearing capacity and foundation stability for walls or stability of natural slopes and fill slopes below the road, then it is preferable to widen into cut. A balance of cut and fill, either in cross-section or over relatively short alignment lengths, is the preferred solution if the cut material is suitable as fill (Section C2). On low-cost improvement schemes, the ease of excavation and the costs and difficulties associated with fill and retaining wall construction usually mean that widening takes place as cut to spoil, frequently to the detriment of slope stability. Engineering geological assessments and ground investigations will be required (Section B) before such important decisions are made.*

			The information PCGP provides in its submittal does not indicate to DEQ that PCGP has considered these complex issues. PCGP provided DEQ their proposed site-specific designs for these road segments in steep and potentially unstable slopes and the technical support for these designs. PCGP will need to provide DEQ information on where specifically (e.g., geo coordinates) PCGP will perform road maintenance actions and when PCGP will perform these actions. Once the inventory requested above is performed, PCGP will also need to provide DEQ with information on where specifically (e.g., geo coordinates) PCGP will improve access roads to protect water quality.
24	Provide a detailed maintenance and improvement plan for the approximately 660 miles of existing roads. This plan must demonstrate that PCGP will implement all maintenance actions and improvements necessary to protect water quality – identified during the road inventory – prior to road use for pipeline construction or operation. This plan must also (1) implement Designated Management Agencies' DEQ-approved TMDL Implementation Plans and (2) comply with maintenance standard, requirements, and/or other design standards developed and used by DMAs to implement these TMDL Implementation Plans.	PCGP is currently working with USFS, BLM, and BOR to provide the necessary information for the federal agencies to issue right-of-way grants for federal lands. An operations and maintenance plan will be prepared if required by the agencies during that process.	***Summary Statement:*** ***Notwithstanding information required for right-of-way grants on federal lands, DEQ requires PCGP to develop a maintenance and improvement plan to address, as authorized by OAR 340-041-0007(7) and OAR 340-048-0042(2), to address water quality impairments from access roads on all public and private lands. Please develop and submit a maintenance and improvement plan consistent with the data requested in Comment 24 and the examples provided in the following section.*** DEQ's request for a detailed maintenance and improvement plan is not contingent upon Federal agencies requiring PCGP to develop a plan. DEQ's authority under OAR 340-041-0007(7) and 340-048-0042(2) require PCGP to develop a maintenance and improvement plan for all public and private project-related roads. DEQ presents the scientific basis for this information request in the references included in DEQ's review of PCGP's response to DEQ's comments noted above. DEQ's administration of Section 303 of the Clean Water Act requires Designated Management Agencies operating under a Total Maximum Daily Load address road management activities including road maintenance. For example, DEQ's Memorandum of Understanding with the USDA Forest Service Pacific Northwest Region presents DEQ's and Forest Service's strategy for controlling point and nonpoint source water pollution and addressing Clean Water Act requirements such as TMDLs. This MOU establishes procedures to implement State and Federal water quality rules. These procedures reference a foundation for action for protecting water quality on U.S. Forest Service lands. This foundation is entitled the *National Best Management Practices for Water Quality Management*.[38] These practices include a section on road operations and maintenance. Moreover, Federal agency Water Quality Management Plans also serve as TMDL Implementation Plans as noted elsewhere in this DEQ review of PCGP's response to AIR-1. These plans may identify roads and their management as sources of nonpoint source pollution to be address in Federal agency actions to implement these plans. The Forest Service and BLM document this fact in the *Forest Service and Bureau of Land Management Protocol for Addressing Clean Water Act Section 303(d) Listed Waters* (May 1999, Version 2.0). For example, the BLM's Water Quality Restoration Plan for the South Umpqua (March 2, 2001) identifies sediment from roads and road encroachment as a key issue for protecting water quality on BLM lands. Similarly, the North Fork Coquille River WQRP (November 2001) identifies roads as creating water quality impacts from increasing peak flows in streams and sediment discharge into streams. This plan states the following as a management action for this WQRP:

[38] USDA Forest Service. 2012. National Best Management Practices for Water Quality Management. Volume I: National Core BMP Technical Guide. FS-990A

			...continuing to decommission, improve, or maintain federally administered roads will reduce the potential fine sediment supply and the potential increases in peak flows. Finally, as noted elsewhere in DEQ's review of PCGP's response to AIR-1, the scientific literature is replete with research documenting that road construction and maintenance has a substantial impact on water quality. With Comment 24, DEQ is exercising its authority to ensure compliance with water quality requirements and standards during the process of developing a Certification Decision. DEQ notes below examples of the level of detail DEQ is requesting in Comment 24. Specifically, DEQ is most interested in the current condition of dirt, gravel, bituminous, and rock surfaced access roads prior to use by PCGP for pipeline construction and operation. For the requested maintenance and improvement plans, DEQ is interested in receiving information on the specific location (i.e., delineated by GPS coordinates) for all the road maintenance treatments PCGP proposes to implement to protect water quality on all access roads that are currently hydrologically connected to waterbodies. This geographical information will allow DEQ to evaluate compliance and more effectively exercise its enforcement authority when ensuring compliance with a Certification Decision. Maintenance treatments could include, for example, the following: • Installation of geotextile fabric for soft and weak subgrades • Installation of a durable surface • Gravel road rehabilitation • Application of dust palliatives • Reshape surface and shoulder • Reshaping entire cross section • Re-establish the out-slope • Re-establish the in-slope and ditch • Removal of high shoulders (secondary ditches) • Reshape and vegetate ditch to prevent erosion • Rock ditches to prevent erosion • Installation of check dams in ditch to prevent erosion • Installation of cross drains to prevent gully formation and sediment discharge in ditches • Relocating road drainage discharge away from steep slopes, headwalls, bedrock hollows, active landslides areas, areas with high potential for rapidly moving landslide

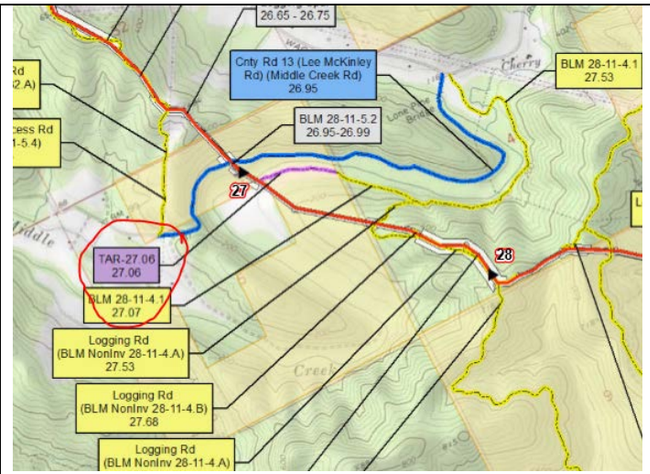
			In issuing treatment prescriptions based on PCGP's road inventory requested in DEQ's review of PCGP's response above, DEQ expects PCGP to provide the detailed maintenance standards and specifications that PCGP will use for all identified treatments.
25	Identify the location of all existing roads that PCGP will use to access the gas pipeline during its operation. Provide a maintenance plan for these existing roads that includes: • A description of the level of use these roads will experience during the pipeline's operation. • A description of the maintenance practices to protect water quality and a schedule for performing these practices and supporting this level of use.	Outside of federal lands, PCGP's use of public roads are not subject to federal licensing or permitting, and therefore no certification is required under Section 401. PCGP is not required under federal or state law to prepare operations and maintenance plans to use public roads. PCGP anticipate employing less than 15 operational staff. The operation traffic will be incidental to the existing traffic on existing road.	DEQ will review all proposed project-related activities that require a federal permit or permits and that may cause or contribute to a discharge to waters of the state. OAR 340-041-0007(7) and 340-048-0042(2) authorize DEQ to require maintenance plans to address discharge from temporary and permanent roadways. This includes permanently maintained access roads to service portions of the pipeline and its aboveground facilities. Given their potential to impact water quality through sediment discharge, DEQ is particularly concerned with the maintenance and operations planning for non-paved PARs when PCGPs uses these roads for pipeline repair and reconstruction given the heavy equipment traffic associated with these activities.
26, 27	Comment 26: Please provide the location of the proposed 25 miles of new Temporary and Permanent Access Roads and the selection criteria used to site these new roads to avoid minimize impacts to water quality. Please delineate these new roads by land ownership (e.g., private ownership on land zoned for forest use) so DEQ can evaluate compliance with Section 303 of the Clean Water Act. Comment 27:	Appendix B in Part 2 (Table 1.2-2 on pdf page 329) provides a table of the ten (10) temporary and 15 permanent access roads by milepost and landownership. There are not 25 miles of Temporary and Permanent access roads; the roads total approximately 2.2 miles (and 5.96 acres), not 25 miles as stated in the comment. They are shown on the maps included in the PCGP JPA (beginning on pdf page 660). Table 2.2-5 (pdf page 1104) lists those temporary and permanent access roads within 100 feet of waterbodies, all of which are located on private	**Summary Statement: DEQ requests that PCGP provide the selection criteria used to evaluate and choose road segments proposed in their application. In particular, DEQ wishes to review the decision-making criteria used to ensure road development would avoid conflicts with streams, wetlands, and waterbodies to the maximum extent practicable. DEQ further requests PCGP conduct an analysis to determine hydraulic connectivity of road surfaces and waters of the state using the analytical tools and the design standards addressed in the following section.** DEQ located the 25 (10 temporary and 15 permanent) segments of new road building proposed for the construction and operation of the pipeline in the maps included in PCGP's Joint Permit Application on pdf page 660. As discussed elsewhere in DEQ's review of PCGP's response to AIR-1, DEQ is requesting the level of detail provided in the examples below to evaluate the impacts of PCGP's proposed new roads to build and operate the pipeline. As noted elsewhere in DEQ's review of PCGP's response, new roads or existing roads do not have to be within 100 feet of a water body to have a potential impact on water quality. PCGP refers DEQ to Table A.2-6 in Appendix A.2 of Resource Report 2 for temporary and permanent access roads crossed by or within 100 feet waterbodies. This scope of analysis and the limited information provided in Table 2.2-5 is inadequate for DEQ to evaluate the potential impacts to water quality. PCGP must evaluate all Temporary and Permanent Access Roads hydrologically connected to water bodies. To evaluate objectively evaluate the impact of these Temporary and Permanent Access Roads on water quality, PCGP may use X-DRAIN or a comparable analytical tool approved by DEQ.

	To ensure these roads will not serve as a source of sediment to and hydromodification of waters of the state and as a source of debris flows into streams from road-related landslides, please include the design standards and specifications for constructing these roads including their drainage systems, cut-slopes, and fill-slopes. Please identify the proposed designs to stabilize fill slopes and cut slopes and manage stormwater on new temporary and permanent roads located on the steep slopes (i.e., slopes greater than 30%) and engineering support for these designs. This information is necessary for DEQ to evaluate compliance with the statewide water quality criteria for road building and maintenance (OAR 340-041-0007)(7) and for ensuring that PCGP uses the highest and best practicable treatment control (OAR 340-041-0007(1).	lands. Four waterbodies will be crossed by permanent access roads, and three of those waterbodies are ditches. Appendix A in Part 2 of the 401 Water Quality Package issued to DEQ on February 6, 2018 outlines PCGP's compliance with all applicable water quality standards and where plans have been developed for the Pipeline to ensure compliance with those standards, including compliance with requirement for TMDLs on federal and non-federal lands. Table A.2-6 is in Appendix A.2 to Resource Report 2 (Attachment C of the PCGP JPA package) lists waterbodies crossed by or within 100 feet of temporary and permanent access roads. PCGP will revise table A.2-6 (Appendix A.2 to Resource 2 – Attachment C of the PCGP JPA package) to identify best management practices for waterbodies crossed by or within 100 feet of temporary and permanent access roads. PCGP anticipates submitting	Without design details and their technical support, DEQ is unable to determine if PCGP is designing new permanent and temporary roads hydrologically disconnected to water bodies by the design of their drainage system. The Oregon Department of Forestry established rules to address drainage from forest roads as highlighted in DEQ's review of PCGP's response to Comment 15 above. ODF developed these rules to comply with water quality standards. The design of a road drainage system and a non-paved road surface, for example, influences the level of sediment delivery into water bodies as discussed elsewhere in DEQ's review of PCGP's response to AIR-1. Moreover, the location of cut and fill slopes and their design can destabilize slopes and lead to the failure of unstable, landslide prone slopes. As noted elsewhere in DEQ's review of PCGP's response, the literature is replete with information demonstrating that linear infrastructure such as roads can cause slope failures leading to landslides and sending debris flows into stream channels. Human-caused debris torrents impact water quality by changing the natural cycles of sediment delivery to stream systems.[39] PCGP has not provided DEQ with the selection criteria PCGP will use to site proposed new roads to avoid impacts to water quality. For example, PCGP directed DEQ to Table 1.2-2 (Temporary and Permanent Access Roads for the Pipeline). In this table, the Temporary Access Road labeled as TAR 101.70 appears to be on both Private and National Forest Land (Umpqua National Forest). This TAR provides an example of DEQ's concerns regarding the siting of these new roads. As shown in the following map excerpts below, PCGP has located TAR 101.70 in a Potential Rapidly Moving Landslide Hazard Area when DEQ compares PCGP's USGS Quad-Based General Location Maps with PCGP's Geologic Hazards Maps: 

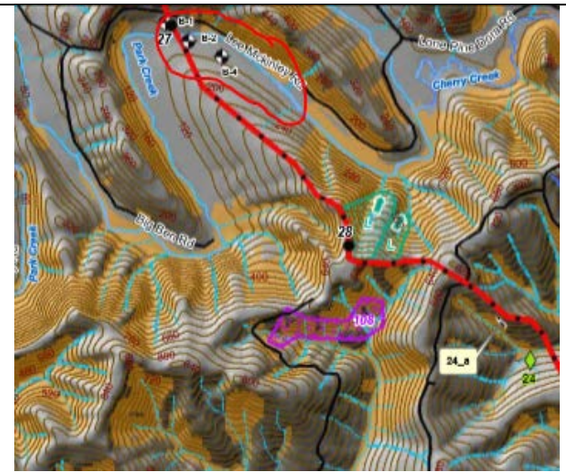
[39] Castro, Janine and Frank Reckendorf. 1995. Effects of Sediment on the Aquatic Environment: Potential NRCS Actions to Improve Aquatic Habitat. Working Paper No. 6. USDA Natural Resources Conservation Service

		the revised table to ODEQ in Q4 2018.	Location of TAR 101.70 near Milepost 102 in Part 2 JPA Appendix B, General Location Maps, Drawing No. 340.31-Y-Map 14, Sheet 27, 55 Area where TAR 101.70 will be located in Resource Report 6, Appendix F, Figure 22 of 47. **Note**: the light brown areas are Potential Rapidly Moving Landslide Hazard As noted in DEQ's review of PCGP's response to Comment 15, the Oregon Department of Forestry uses rules developed under the Oregon Forest Practices Act to comply with Total Maximum Daily Loads and with water quality standards. In ODF's memorandum of understanding with DEQ referenced in DEQ's review above, ODF states that it has adopted water protection rules in the form of BMPs for forest operations "including, but not limited to, OAR Chapter 629, Divisions 635-660." With the limited information that PCGP provides, DEQ is unable to determine if PCGP is complying with the following Forest Practices Act rule (OAR 629-625-0200): ***Road Location*** *(1) The purpose of this rule is to ensure roads are located where potential impacts to waters of the state are minimized.* *(2) When locating roads, operators shall designate road locations which minimize the risk of materials entering waters of the state and minimize disturbance to channels, lakes, wetlands and floodplains.* *(3) Operators shall avoid locating roads on steep slopes, slide areas, high landslide hazard locations, and in wetlands, riparian management areas, channels or floodplains where viable alternatives exist.* *(4) Operators shall minimize the number of stream crossings.* *(5) To reduce the duplication of road systems and associated ground disturbance, operators shall make use of existing roads where practical. Where roads traverse land in another ownership and will adequately serve the operation, investigate options for using those roads before constructing new roads.* Moreover, PCGP has not provided DEQ with any information indicating that it has investigated the constraints associated with the proposed site for TAR 101.70. PCGP has not developed engineering solutions – with associated technical support – to avoid debris flows into East Fork Stouts Creek or the intermittent streams below the fill slope of this proposed road sited in an area identified as hazard for Rapidly Moving Landslides. Hearn 2011 provides techniques for planning new road construction on steep mountainous terrain and include the following as stated in his book: *B1.2.1 New Road Construction* *The techniques listed in Table B1.3 are variously applicable to all project phases, but they offer the greatest application to new road construction projects as an aid to route corridor selection and*

			the development of the engineering design. The order in which the techniques are listed in the table, and described in Section B2-F5, is the approximate order in which they should be applied. *B1.2.4 Road Operation and Maintenance* *During road operation and maintenance, the focus of attention will be directed towards existing cut and fill slopes and the management of drainage. Systematic routine observation, slope monitoring and condition surveys will form the basis of the records necessary for ongoing assessment of slope stability. Field mapping, cross-section survey and ground investigation or monitoring at high-risk site may be required for the reinstatement and remedial works for slopes and section of road that have failed (Part D).* Hearn's recommendations for road construction, operation, and maintenance serve as one of several reasons for DEQ's request for additional information in Comment 26 and 27. Such recommendations and applicable regulatory requirements also serve as the basis for DEQ's information request in Comment 24. Hearn's recommendations provide examples of the information DEQ expects PCGP to provide DEQ when furnishing information on its maintenance plans for both Permanent Access Roads and existing access roads. Since PCGP needs access roads for PCGP's operation of the pipeline and the controlling authorities for these access roads cannot decommission these roads to avoid their associated water quality risks, these roads present potential impacts to water quality that PCGP must address in it 401 Water Quality Certification submittal. As a result, for access roads on steep and/or unstable slopes necessary for pipeline operation, PCGP must provide a maintenance plan that periodically evaluates the influence of these access roads on slope stability and evaluates the need to adjust the road design to help maintain the stability of the slope below and above the PAR. For another example of the lack of information provided by PCGP for proposed PARs and TARs, PCGP proposes to build Temporary Access Road labeled TAR 27.06. This TAR parallels the stream Park Creek and would extend a BLM road (BLM 29.11-4.1 27.53) when County Road 13 is also available to reach the temporary extra work area near Milepost 27. PCGP does not provide information detailing how PCGP will manage drainage from this proposed new access road and the extent, condition, or existence of a vegetated buffer between TAR 27.06 and Park Creek. PCGP does not provide information on the design of the cut slope for this TAR nor indicate with designs and technical support how PCGP will stabilize this cut slope to prevent small slides into the roadside stormwater conveyance system or perhaps prevent larger slides conveying debris flows into Park Creek directly. PCGP does not provide a discussion of the other alternatives to reach this TEWA. PCGP does not provide the rationale for building this new access road nor does PCGP provide the design details for DEQ to evaluate if this design has the potential to protect water quality.

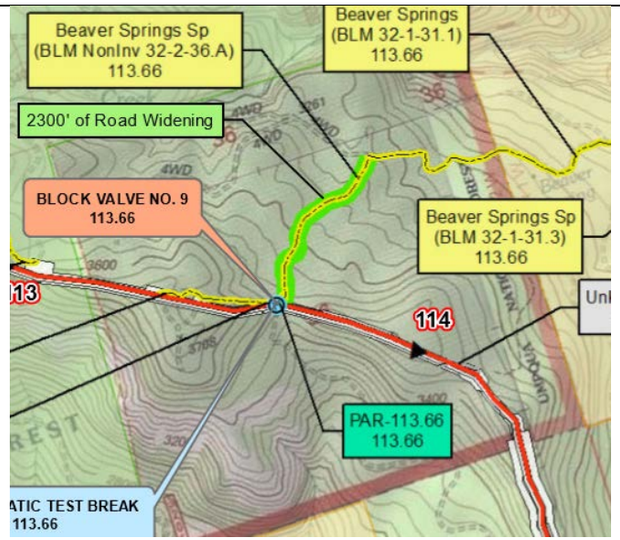


Location of TAR 27.06 near Milepost 27 on the General Location Maps. Drawing No. 3430.31-Y-Map 5, Sheet 6 of 55

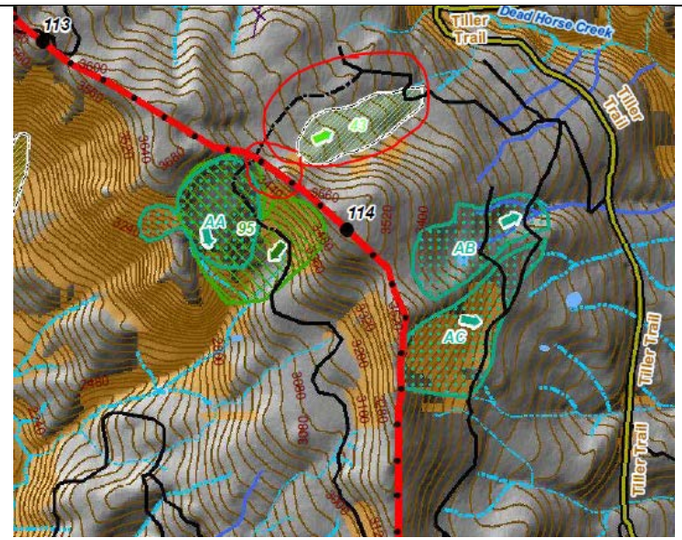


Location of TAR 27.06 near Milepost 27 on the Geologic Hazards Maps. Figure 8 of 47. **Note**: the light brown areas are Potential Rapidly Moving Landslide Hazard

PCGP is proposing to site another proposed new road labeled as PAR-132.66 and shown in the map excerpt below. PCGP proposes to locate this PAR in a Potential Rapidly Moving Landslide Hazard Area. This proposed PAR is also near landslides identified from Aerial Photos and from LiDAR. Moreover, PCGP is proposing to reconstruct BLM's Beaver Springs road (BLM Noninv 32-2-36.A) by widening it. According to PCGP's Geologic Hazard Map, this BLM road identified for widening is located above a landslide area that drains to intermittent stream discharging into Dead Horse Creek. PCGP has not provided DEQ with design information regarding the need for the creation of fill slopes for this proposed new road in an area with unstable slopes. PCGP has not provided DEQ with design information for the reconstruction of the BLM road above unstable slopes. Has PCGP conducted a geotechnical investigation of this road-widening project? If performed, does this geotechnical investigation indicate the need for reinforced fill for this road-widening project? Where will PCGP discharge the post-construction stormwater for this PAR? Given the lack of design details, these questions surface for DEQ while reviewing PCGP's submittal.



Location of PAR-113.66 and the reconstruction of BLM Noninv 32-2-36.A. Drawing No. 340.31-Y-Map 14, Sheet 32, 55



Location of PAR-113.66 and Proposed Road Reconstruction relative to landslide features. Figure 25 of 47. **Note**: the light brown areas are Potential Rapidly Moving Landslide Hazard

As discussed in DEQ's review of PCGP's response to Comment 15, the management of stormwater discharge and the design of cut and fill slopes are important engineering considerations when constructing roads on steep and unstable slopes. The intent of DEQ's request for information on PCGP's selection criteria is to evaluate PCGP's efforts to minimize impacts to water quality from debris flows during new road construction. As noted below, PCGP should analyze the various options for accessing sections of the pipeline alignment for construction and operation as part of its efforts to address the National Environmental Protection Act requirements and, based on this analysis required by NEPA, determine the need to build new roads such as TAR 101.70 discussed above. To evaluate PCGP's efforts to avoid and minimize impacts to water quality, DEQ is requesting that PCGP provide its selection criteria for determining the need and location of TARs and PARs that PCGP used in its alternative analyses to comply with NEPA.

DEQ is highlighting the information below to provide PCGP with an example of the level of detail DEQ is anticipating in PCGP's revision of Table A.2-6. DEQ requests this detailed information to evaluate PCGP's compliance with Clean Water Act requirements such as Total Maximum Daily Loads. For example, as noted above, the Forest Service and Bureau of Land Management use Water Quality Restoration Plans to comply with Clean Water Act requirements concerning nonpoint source pollution and Total Maximum Daily Loads. The BLM's Water Quality Restoration Plan for the Elk Creek

			Watershed applies to a portion of the pipeline where PCGP is proposing to place the pipeline alignment. Forest Service and BLM Roads are within the Elk Creek Watershed. In its WQRP, BLM identifies sediment input from roads as the primary human-caused sediment source from BLM-administered lands in the plan area and an influence on channel morphology with effects on stream temperature. BLM's restoration goals in this plan include: • Reduce road densities. • Maintain and improve road surfacing. • Minimize future slope failures through stability review and land reallocation if necessary. To achieve their restoration goals when roads are an element, BLM and the Forest Service have manuals and handbooks for locating new roads, engineering road construction/reconstruction, and conducting road maintenance. These technical manuals and references are the tools and strategies the Forest Service and BLM use to implement their WQRPs and, consequently, comply with TMDLs issued by DEQ. As noted elsewhere in this review, TMDLs are DEQ's plan to ensure a water body impaired by pollutant discharge ultimately achieves water quality standards. For example, the Forest Service Manual states: *Perform route or site selection, location, geotechnical investigation, survey, and design to a technical level sufficient for the intended use of the facility, the investment to be incurred, and the affected resource values.* *Ensure that road preconstruction activities receive peer reviews, and that the adequacy of road designs and cost estimates is attested to in writing by qualified engineers.*[40] In the Forest Service Handbook 7709.56 on Section 22.2 (Location Marking), the Forest Service provides the following directive for determining the location of a proposed road: *22.1 - Initial Field Examination* *Make an on-the-ground examination of the corridor in which the road is to be located.* *Verify the control points, critical areas, and resource and management direction identified in the applicable environmental, logging system, travel analysis, and transportation analysis documents and during the office location studies. Identify and document features within or adjacent to the corridor that would affect previous and subsequent decisions.*

[40] USDA Forest Service. 2014. Chapter 7720 – Transportation System Development. Forest Service Manual 7700 on Transportation Management

			If possible, document these features on maps and photos. Consult with appropriate specialists and land managers to resolve conflicts or address specific problems. *22.2 - Location Marking* *Using information from the office location studies and the initial field examination, mark road locations on the ground that conform to those identified on the maps and photos that are compatible with the design criteria and other management direction. It may be necessary to mark more than one location of a road or road segment, especially in the vicinity of critical areas such as topographic features affecting logging systems, landing locations, riparian areas, intersections, switchbacks, and private land. If a new NEPA document is being produced, these alternative locations will be analyzed for effects, according to FSH 1909.15, section 15.41* As noted in this reference, the National Environmental Policy Act influences the selection of the road location and this influence by NEPA is detailed in the Forest Service Handbook as follows: *15 - ESTIMATE EFFECTS OF EACH ALTERNATIVE* *Effects and impacts as used in these regulations are synonymous. Effects includes ecological (such as the effects on natural resources and on the components, structures, and functioning of affected ecosystems), aesthetic, historic, cultural, economic, social, or health, whether direct, indirect or cumulative. Effects may also include those resulting from actions which may have both beneficial and detrimental effects, even if on balance the agency believes that the effect will be beneficial. (40 CFR 1508.8(b))* *For each alternative considered in detail, analyze and document the environmental effects, including the effectiveness of the mitigation measures that would result from implementing each alternative, including the no-action alternative.*[42] This required analysis for locating a new road on National Forest Land would provide DEQ with specific BMPs and the level of detail DEQ is seeking to evaluate PCGP's selection a location for a TAR and PAR. DEQ is seeking this information to evaluate PCGP's efforts to protect water quality and comply with TMDL and other Clean Water Act requirements. This represents the level of detail DEQ is expecting from PCGP as they respond to Comment 26 and 27. DEQ's request for more detail on the practices PCGP will employ and engineering PCGP will use to protect water quality is consistent with and supportive of the NEPA process. PCGP should be supporting this NEPA process during its

[41] USDA Forest Service. 2011. Chapter 20 – Road Location. Forest Service Handbook 7709.56 on Road Preconstruction Handbook WO Amendment 7709.56-20111-1

[42] USDA Forest Service. 2012. Chapter 10 – Environmental Analysis. Forest Service Handbook 1909.15 on National Policy Act Handbook 1909.15-2012-3

			application to Federal Energy Regulatory Commission to construct and operate this gas pipeline. Given this NEPA requirement, PCGP should have developed selection criteria for choosing both the need for and the location of new access roads for pipeline construction and operation to minimize impacts to water quality among other concerns as discussed above in DEQ's review of PCGP's response to Comment 26.
28	Additionally, please provide detailed best management practices and design standards for decommissioning the Temporary Access Roads.	Best management practices for construction of temporary and permanent access roads are contained in the Erosion Control and Revegetation Plan in Attachment A, Appendix B.1 of the PCGP JPA package.	**<u>Summary Statement</u>:** The **Erosion Control and Revegetation Plan does not provide site-specific plans describing how PCGP will decommission temporary roads. PCGP should also address how road closures will comply with applicable TMDL Implementation Plans. Please provide site-specific plans for achieving these objectives as described more fully in the following section.** Unused and unmaintained roads are a source of sediment and debris flows into waterways.[43, 44, 45] For this reason, DEQ is requesting that PCGP provide DEQ with the specific road decommissioning treatments for each Temporary Access Road. DEQ reviewed PCGP's Erosion Control and Revegetation Plan and can find no design details and technical support these details in this plan. PCGP has not clearly detailed how PCGP will specifically decommission the 10 segments of Temporary Access Roads. Moreover, DEQ can find no discussion of how PCGP will treat closed Forest Service, BLM, Bureau of Reclamation, Private, and/or County roads that PCGP's project activated for the sole purpose of constructing the pipeline. The Forest Service, BLM, and ODF's Forest Practices Act Program have specific requirements concerning road decommissioning developed, in part, to address water quality impairments from nonpoint source pollution and comply with Total Maximum Daily Loads. In reviewing their requirements along with PCGP's Erosion Control and Revegetation Plan, PCGP has not clearly addressed the decommissioning or closing requirements of these TMDL Designated Management Agencies. To develop its Certification Decision, PCGP must provide DEQ the site-specific details for how it will decommission all Temporary Access Roads as well as close access roads that PCGP's project opened to build this pipeline. Evaluating compliance with Section 303 of the Clean Water Act is a requirement for developing DEQ's Certification Decision. PCGP must demonstrate that a road no longer in use for pipeline construction and/or operation will not become a source of sediment and debris flows into water bodies. As noted above in DEQ's review of PCGP's response to Comment 24, 26, and 27, road closures are often a goal of an agency Total Maximum Daily Load Implementation Plan. The Forest Service defines road decommissioning as "activities

[43] Swanston, D.N. and Frederick J. Swanson. 1976. *Timber Harvesting, Mass Erosion, and Steepland Forest Geomorphology in the Pacific Northwest*. In Geomorphology and Engineering. Dowden, Hutchinson and Ross Editors.

[44] Wolfe, Mitchell Dean. 1982. *The Relationship between Forest Management and Landsliding in the Klamath Mountains of Northwestern California*. Earth Resources Monograph 11, USDA Forest Service Region 5

[45] Elliot, William J. and Laurie M. Tysdal. 1999. *Understanding and Reducing Erosion from Insloping Roads*. Journal of Forestry. 97(8):30-34

			that result in the stabilization and restoration of unneeded roads to a more natural state.[46] As noted in DEQ's review above, the Forest Service uses the Forest Service Manual and Handbook to implement Water Quality Restoration Plans in its efforts to comply with TMDLs. According to this manual, the only road management option for temporary roads is decommissioning. The Forest Service Manual identifies the following five road decommissioning treatments that may be used in combination depending on the particular site: • Blocking entrance • Revegetation and water barring • Removing fills and culverts • Establish drainage ways and remove unstable road shoulders • Full obliteration by recontouring and restoring natural slopes[47] For private forest roads regulated under Forest Practices Act rules, the requirements for vacating these roads are as follows: ***Vacating Forest Roads*** *(1) The purpose of this rule is to ensure that when landowners choose to vacate roads under their control, the roads are left in a condition where road related damage to waters of the state is unlikely.* *(2) To vacate a forest road, landowners shall effectively block the road to prevent continued use by vehicular traffic, and shall take all reasonable actions to leave the road in a condition where road related damage to waters of the state is unlikely.* *(3) Reasonable actions to vacate a forest road may include removal of stream crossing fills, pullback of fills on steep slopes, frequent cross ditching, and/or vegetative stabilization.* *(4) Damage which may occur from a vacated road, consistent with Sections (2) and (3) of the rule, will not be subject to remedy under the provisions of the Oregon Forest Practices Act.*[48] As noted elsewhere in this DEQ review, the Oregon Department of Forestry uses the Forest Practices Act rules to comply with Total Maximum Daily Loads and water quality standards. Jordan Cove must provide DEQ with the site-specific designs and specification for each segment of road that Jordan Cove will decommission after terminal and pipeline construction.
29	DEQ has not completed this review at this time but will consult in the future with other	JCEP and PCGP are actively working with the respective agencies to obtain approvals	**<u>Summary Statement</u>: PCGP's Resource Report 1 describes excess material generated during development as "construction debris", which meets the definition of "demolition and construction materials" found in ORS 459.005(24).**

[46] 36 Code of Federal Regulations §212.1
[47] USDA Forest Service. 2001. 7712.11 – Exhibit 01, Chapter 7710 – Transportation Atlas, Records, and Analysis. Transportation System, FSM 7710-2001-3
[48] Oregon Administrative Rules 629-625-0650

	DEQ programs and other state agencies concerning compliance with other state statutory requirements such as: • Oregon Revised Statute 468B.035 and 105 (Enabling Legislation for Implementing the Coastal Zone Amendments and Reauthorization Act) • ORS 783.620 through 640 and 783.990 through 992 (Ballast Water Management Law) • ORS 466.020, 075, 105, and 195 (Hazardous Waste Management Law) • ORS 196.795 through 990 (Removal-Fill Law) • ORS 496.172 – 496.192 (Oregon Threatened and Endangered Species Act) • ORS 496.012, 496.138, and ORS 506.109 o Fish and Wildlife Habitat Mitigation Policy o In-water Timing and In-water Blasting Permits o ORS 509.585 (Fish Passage Requirements) o ORS 498 (Fish Screening)	outlined to the extent required by law. There are no landfills associated with the PCGP, therefore, ORS 459.005 is not applicable.	PCGP's submittal for a Section 401 Water Quality Certification references in several locations PCGP's plan to identify several disposal sites along the pipeline right-of-way. DEQ is providing PCGP excerpts below of these references to disposal sites. Please review your submittal and revise it to reflect PCGP's most current intent on managing the solid waste from the pipeline construction and operation. Without these revisions, DEQ will assume PCGP will develop and use disposal sites for construction debris. References to proposal sites in PCGP's submittal will require a Construction and Demolition Landfill Permit during the development of DEQ's Certification decision. **1. Overburden and Excess Material Disposal Plan, page 2 and Attachment A, Table 1** **2.3 PERMANENT DISPOSAL LOCATIONS** At permanent disposal sites, excess material will be deposited and treated in a manner that will be agreed upon with the corresponding federal land-managing agencies. PCGP will provide a Site Development and Reclamation Plan that will include surveyed drawings of the permanent disposal sites that identify the storage location of material based on material type and material size for agency approval. The disposal drawings will also show any temporary and/or permanent erosion control measures that may be required. Attachment B – Typical 1 shows the information that would be included in the sample quarry drawing for permanent disposal sites. **Attachment A** **Table 1** **Rock Source and Disposal Sites Identified for Construction of the Pipeline Project on Federal Lands**

Rock Source and/or Permanent Disposal Sites	Size (acres)	Pipeline MP location	Purpose	Jurisdiction	Land Use	Permanent/ Temporary Use	Vegetation	Access
Douglas County								
Signal Tree Road Quarry – Sec. 3 (3430.26-X-0004)	1.22	45.86	Rock source and overburden disposal; spoil storage, staging	BLM-Roseburg district	Quarries	Permanent or Temporary	Industrial, Douglas fir-W, Hemlock W., red cedar (regenerating)	Upper Signal Tree (BLM 28-9-35) 45.85 - 45.92 (3430-31-Y-008)
Signal Tree Road Quarry – Sec. 35 (3430.26-X-0002)	1.09	47	Rock source and overburden disposal	BLM-Coos Bay district	Quarries	Permanent or Temporary	Industrial, Douglas fir-W, Hemlock W., red cedar (regenerating)	Upper Signal Tree (BLM 28-9-35) 45.85 - 45.92 (3430-31-Y-008b)
Weaver Road Quarry Site 1 (3430.26-X-0003)	1.62	47	Rock source and overburden disposal	BLM-Coos Bay district	Quarries	Permanent or Temporary	Industrial, Douglas fir-W, Hemlock W., red cedar	Weaver Road (BLM 28-8-18) 42.03 – 42.50 (3430-31-Y-008b)
Weaver Road Quarry Site 2 (3430.26-X-0003)	1.30	47	Rock source and overburden disposal	BLM-Coos Bay district	Quarries	Permanent or Temporary	Industrial, Douglas fir-W, Hemlock W., red cedar	Weaver Road (BLM 28-8-18) 42.03 – 42.50 (3430-31-Y-008b)
Signal Tree Quarry Site – Sec. 15 (3430.26-X-0005)	1.75	47	Rock source and overburden disposal	BLM-Roseburg district	Quarries	Permanent or Temporary	Industrial, Douglas fir-W, Hemlock W., red cedar	Lower Signal Tree (BLM 29-9-36.0) 46.51 (3430-31-Y-008)
TEWA 79.85-N (BLM Quarry Site) [1]	3.61	79.85	Overburden disposal, PI, spoil storage, log landing, steep slope staging	BLM-Roseburg district	Transportation, communication, utilities corridors, regenerating evergreen forest land; quarries	Permanent or Temporary	Roads, corridors, Douglas fir dominant - mixed conifer	Pack Saddle Road (BLM 29-4-17) 79.89 - 80.42 & Construction Right-of-Way (3430-31-Y-013)
Hatchet Quarry MP 102.30 (3430.26-X-0018)	2.00	102.30	Log (mitigation) storage	FS-Umpqua	Strip mines, quarries, gravel pit and evergreen	Permanent	Industrial	FS 3220000 (3430-31-Y-016c)

	○ ORS 497.298 (Scientific Taking Permit) • ORS 537 (Water Rights Law) • ORS 197 (Oregon Land Use Planning Law) • ORS 390.235 (Permits for Removal of Archaeological or Historical Material) • ORS 569 (Weed Control Law) • ORS 527 (Forest Practices Act) At this time, please provide applications for Construction and Demolition Landfill Permits required under Oregon Revised Statute 459.005 through 418 (Solid Waste Management Law) for the several proposed disposal sites associated with the construction or operation of the gas pipeline.		**2. Sanitation and Waste Management Plan, page 4** **8.0 ROCK REMOVAL/EXCESS OVERBURDEN** FERC's Upland Plan requires the removal of excess rock from the top 12 inches of soil to the extent practicable in all rotated and permanent croplands, hayfields, pastures, residential areas, and other areas as agreed between landowner and PCGP. In these areas, PCGP will clean up excess rock to a condition similar to adjacent portions of the construction right-of-way (e.g., size, density, and distribution of rock) unless the landowner and PCGP negotiate different stipulations. Excess rock and spoil materials will be redistributed along the construction right-of-way in upland areas during restoration regrading in a manner that reflects the original contours and preconstruction drainage patterns. Excess materials will be disposed of in existing quarries and in permanent disposal sites that have been identified along the construction right-of-way. Appendix Q to the POD provides PCGP's Overburden and Excess Material Disposal Plan which describes how these materials will be stored and disposed of on federal lands. (Table A.8-4 in Appendix A.8 to Resource Report 8 of PCGP's Certificate application also identifies the permanent disposal areas that will be located on private lands.) Large rock may be provided to the federal land-managing agencies to be used for instream restoration projects and habitat features. Large rocks and boulders may also be used as OHV barriers along the right-of-way and at road crossings to block access at OHV points to restrict traffic on the right-of-way as described in the Recreation Management Plan (Appendix S to the POD). Additionally, large rocks and boulders may be piled in upland areas along the construction right-of-way to create habitat diversity features where approved by the EI or PCGP's authorized representative and the landowner or land-managing agency. The use of alternate disposal locations will be approved by FERC and, if on federal lands, the respective land-managing agency. **3. Resource Report 1, General Project Description, page 61**

			Excess Rock Removal. FERC's Upland Plan (see Section V.A.3) requires the removal of excess rock from the top 12 inches of soil in cultivated or rotated croplands, hayfields, pastures, residential areas, and other areas at the landowner's request. PCGP will comply with FERC's Upland Plan. In these areas, PCGP will clean up excess rock to a condition (size, density, and distribution) similar to adjacent portions of the construction right-of-way. In rangeland, forestlands, or other non-agricultural or residential lands where shallow bedrock is encountered and rock excavation is required, excess rock will be buried in cuts during restoration to reestablish approximate original contours and scattered across the right-of-way and TEWAs according to landowner agreements. Where excess rock requires disposal, PCGP will consider this material construction debris. The disposal sites have been identified in Resource Report 8, and PCGP will obtain the appropriate approvals prior to use. As noted above, excess rock may be incorporated into habitat diversity structures and stacked or piled along the right-of-way to provide wildlife habitat diversity features to benefit mammals, birds, reptiles, amphibians, and the prey base they depend upon. These habitat features would be created within the Pipeline's certificated construction limits where approved by the EI or PCGP's authorized representative and the landowner or land management agency. These features are also included in Section 10.14 of the ERCP (see Appendix B.1).
31	In compliance with OAR 340-041-0007(8), please provide for DEQ review and approval the resource and land management plans, guidance, design standards, design manuals, access permits or grants, and other programs from the U.S. Bureau of Reclamation that Pacific Connector Gas Pipeline will use to protect water quality during the following: • Siting Temporary and Permanent Access Roads and the construction/permanent right-of-way on U.S. Bureau of Reclamation land, over BOR water-bearing infrastructure (e.g.,	Please refer to the Response to #17. The Klamath Project Facilities Crossing Plan (Appendix E.3 to Part 2 of JPA), which is specific to BOR facilities, is under review as part of the POD and, once approved, would be implemented as part of the Right-of-Way Grant. PCGP is currently working with BOR to provide the necessary information for the federal agencies to issue right-of-way grants for federal lands. An operations and maintenance plan will be prepared if required by the agencies during that process. Proposed amendments and changes to existing BOR resource and land management plans are not	**<u>Summary Statement</u>: Amendments to federal plans that authorize new or modify existing discharge to waters of the state are considered federal authorizations and are, therefore, subject to review by states under Section 401(a) of the Clean Water Act. DEQ requests PCGP identify any proposed amendments and changes to existing BOR resource and land management plans as more fully described in the following section.** See also DEQ's response to Comment 18, above, for related responses to Comment 31. The U.S. EPA is currently reviewing DEQ's Upper Klamath and Lost River Total Maximum Daily Load first issued in May 2010. In this TMDL, DEQ address the impairment of a number of creeks segments by sedimentation and impairment of water bodies by nutrients including nutrient discharge via sediment as follows as follows: *DEQ is not developing a TMDL for a number of creek segments impaired by sedimentation or for biological criteria (Table 1-3). At the time of the writing of this TMDL, DEQ is in the process of developing a sedimentation assessment methodology that could be used for implementing the narrative sedimentation standard and possibly the biological criteria impairment, as well. When the methodology and associated guidance is completed, the agency will establish sedimentation TMDLs for those waterways on the 303(d) list. (page 11)* Given these pending TMDL actions, DEQ is requesting specific information from PCGP in the form of road design standards and specifications, road maintenance standards and specification, and – if appropriate – the technical support for these engineering designs. DEQ is requesting specific information from PCGP in the form of design standard and specification and engineering designs with their technical support for treating stormwater discharge from the pipeline's permanent right-of-way to BOR operated water conveyance structures connected to waters of the state.

	canals), or paralleling this infrastructure.
	• Maintaining both Temporary and Permanent Access Roads for pipeline construction and operation.
	• Siting other components necessary to construct and operate such as staging areas, material storage areas, and other components (e.g., compressor stations, metering stations) of the pipeline.
	• Installing the construction and permanent right-of-way for the gas pipeline.
	• Operating the permanent right-of-way for the pipeline.
	
	Please identify any proposed amendments and changes to existing BOR resource and land management plans and other documents noted that are necessary to construct, use, or maintain access roads and the permanent right-of-way on BOR land.
		prerequisites for issuing a 401 Water Quality Certification.	DEQ reviewed the Klamath Project Facilities Crossing Plan referenced in PCGP's response to Comment 31 and finds the following information gaps relevant to DEQ's Comment 31:
			
			• Information on how PCGP will manage all BOR access roads (including the 25 Permanent and Temporary Access Roads) while in use to construct and operate the pipeline such as the:
			  ○ Inventory method PCGP uses to evaluate the current condition of existing BOR roads and current capacity to protect water.
			  ○ Need for maintenance treatments prior to use by PCGP based on the inventory discussed above.
			  ○ Design standards and specifications for reconstruction that PCGP will use to ensure PCGP improves these access roads if the above inventory identifies needed improvements to protect water quality under the proposed use (e.g., durable surfacing for non-paved roads, cross drains etc.).
			  ○ If applicable, design standards and specifications that PCGP will use to ensure PCGP constructs proposed Permanent Access Roads and Temporary Access Roads to protect water quality.
			  ○ Standards and specifications for maintenance that PCGP will use to ensure existing and proposed new BOR.
			• Information on the selection criteria PCGP used to site the proposed PARs and TARs on BOR land if applicable.
			• Information provided to BOR in a Use Authorization Application and the Application for Transportation and Utility Systems and Facilities on Federal Lands as described in the directions for this application and highlighted below in DEQ's review of PCGP's response to Comment 31.[49, 50, 51]
			• Information referenced in Section 6.0 (Environmental Considerations) of the Crossing Plan that is relevant to Plans of Development (e.g., Transportation Management Plan, Erosion Control and Revegetation Plan) but lacking sufficient information for DEQ to use in its Certification decision as noted above in DEQ's review of PCGP's response to DEQ's comments in AIR-1 (e.g., Comment 15).
			• Information on the designs standards and specifications as well as engineering designs PCGP will use to construction stormwater treatment controls for the post-construction stormwater discharge to the BOR water conveyance structures connected to waters of the state.
			
			DEQ needs to review all easements, agreements, access/right-of-way grants, authorizations, and permits that are established to construct and operate this pipeline on all federal and nonfederal land. DEQ's receipt of this requested information and its evaluation by DEQ is required under OAR 340-048-0042(2) while developing a Certification Decision. DEQ will review and evaluate all final designs as well as standards and specifications – such as those referenced in the Klamath Project Facilities Crossing Plan and associated design package – as part of the required Certification Decision.

[49] Standard Form 7-2540 (09/30/2015). Bureau of Reclamation Use Authorization Application. OMB Control No.: 1006-0003

[50] Standard Form 299 (Revised 5/2009). Application for Transportation and Utility System and Facilities on Federal Lands. Prescribed by DOI/USDA/DOT under Public Law 96-487 and Federal Register Notice 5-22-95

[51] USDI Bureau of Reclamation Website. Last Updated 10/18/17. What do I have to do to apply?

			At minimum, DEQ anticipates receiving the information PCGP provides in response to the application requirements in BOR's use authorization application and the application for transportation and utility systems and facilities. DEQ provides examples below of the minimum level of detail DEQ is seeking from PCGP that BOR initially requires when an entity seeks to use BOR land, resources, and facilities. Depending on the potential level of impact to water quality, this minimum level of information may not be sufficient to develop a Certification Decision. However, the information provided in PCGP's submittal to date lacks the level of detail required for a BOR use authorization application and an application for transportation and utility system and facilities. For timber harvesting, removal of commercial forest products, and use of BOR roads, the BOR Use Authorization Application requests the following information: 4. *Location of the proposed use. Submit two copies of all maps or drawings and other information clearly demonstrating the location for the proposed use, including township, range, and section. Under 43 CFR 429.13(a), Reclamation may request additional information needed to process your application, such as legal land descriptions and detailed construction specifications.* 5. *Description of the proposed use. Examples of additional information to provide, depending upon the use, are as follows:* *• maximum number of anticipated participants/spectators/crew;* *• number and types of vehicles to be on site;* *• description of props, tents, tractors, trailers, and other equipment;* *• description of facilities you intend to provide, such as sanitation facilities, emergency personnel, food services or vendors, or other applicable information (attach plans); and* *• description of your intended use of Reclamation on-site roads or trails.* In its Application for Transportation and Utility System and Facilities on Federal Lands, for example, BOR will require or has required the following from PCGP for its proposed pipeline and roads: 7. *Project description (describe in detail): (a) Type of system or facility, (e.g., canal, pipeline, road); (b) related structures and facilities; (c) physical specifications (Length, width, grading, etc.); (d) term of years needed: (e) time of year of use or operation; (f) Volume or amount of product to be transported; (g) duration and timing of construction; and (h) temporary work areas needed for construction (Attach additional sheets, if additional space is needed.).* 13. *a. Describe the reasonable alternative routes and modes considered.* *b. Why were these alternatives not selected?*

			SPECIFIC INSTRUCTIONS (Items not listed are self-explanatory) *7. Attach preliminary site and facility construction plans. The responsible agency will provide instructions whenever specific plans are required.* *13. Providing information on alternate routes and modes in as much detail as possible, discussing why certain routes or modes were rejected and why it is necessary to cross Federal lands will assist the agency(ies) in processing your application and reaching a final decision. Include only reasonable alternate routes and modes as related to current technology and economics.* Consistent with DEQ's comments in AIR-1 and its review of PCGP's response to AIR-1, DEQ will need to know if PCGP inventoried/investigated the current condition of BOR roads for their proposed use. As noted elsewhere in this review, this inventory is important to evaluate potential impacts to water quality from this proposed use. PCGP can use the Geomorphic Road Inventory and Assessment Package (GRAIP) or a comparable analytical tool if approved by DEQ to perform this inventory. DEQ will also need to know that PCGP uses this inventory/investigation to identify maintenance treatments or road improvements necessary to protect water quality. Finally, DEQ anticipates that BOR will provide PCGP with the design standards and specifications applicable to BOR road maintenance, reconstruction, and construction projects. If DEQ provides these design standards and specifications, DEQ will review and – if needed – make modifications and addition to these during the development of a Certification Decision. If BOR does not provide these standards and specifications, DEQ expects PCGP to propose road maintenance, reconstruction, and construction standards and specification for DEQ review and approval.
32	The scope of work in Pacific Connector Gas Pipeline's August 31, 2017 Thermal Impacts Assessment suggests that PCGP evaluated only stream crossings for their potential to influence or regulate thermal properties of streams. • An analysis of the impacts from the 50-foot setbacks from waterbodies in riparian areas currently	The most recent version of the Draft Thermal Impact Assessment plan was provided to ODEQ as Attachment C / Appendix Q.2 of 404-10 JPA Part 2 provided as Appendix B of 2/6/18 401 WQ Package. PCGP is assessing all areas that may fall within riparian areas (one site potential tree height) that are outside the stream crossings listed in the Thermal Impact Assessment. Following receipt of ODEQ's comments on the Thermal	Please provide DEQ with an estimated schedule for the revision to the thermal analysis. PCGP should identify all the impacts to riparian vegetation that PCGP did not consider in its August 31, 2017 draft Thermal Impact Assessment. PCGP should also account for the effects of all cleared areas (e.g., TEWA, parallel stream-pipeline alignment, etc.) that were not previously included in the thermal load analysis.

	proposed for the Temporary Extra Work Areas. • An analysis of the impacts from siting the pipeline alignment within riparian areas as close as 15 feet from streams as currently proposed when paralleling these waterbodies. • An analysis of the impacts from siting Temporary and Permanent Access Roads, Staging Areas, material storage area, and other pipeline components (e.g., compressor stations, metering stations) within riparian areas. DEQ is requesting this clarification because the scope of work from the Thermal Impacts Assessment suggests that the estimate of solar loading for stream crossings under both the construction (i.e., 75-95 foot wide) corridor and the permanent (i.e., 30-foot wide) corridor using the Shade-A-Lator tool did not consider the impact of these TEWAs. The use of TEWAs during pipeline construction extends the construction corridor beyond 75 and 95 feet. Currently, the Pacific Connector Gas Pipelines	Impacts Assessment, updates or revisions to the assessment will be completed at that time.	

	proposes to site TEWAs 50 feet from waterbodies as noted in the comment above. In addition, the scope of work in this assessment does not indicate PCGP evaluated the influence on stream thermal properties when the pipeline's construction and permanent corridor closely parallels streams and comes within 15-feet or less of these streams. For a comprehensive analysis of PCGP's compliance with the temperature standard, PCGP's Thermal Impact Assessment must also evaluate these impacts as well as other impacts (e.g., roads, staging areas etc.) as requested in the comments above on compliance with Section 303 of the Clean Water Act.		
33, 34, 35, 36	Comment 33: In compliance with OAR 340-041-0007(1) and (7), please provide a post-construction stormwater management plan addressing DEQ's *Section 401 Water Quality Certification Post-Construction Stormwater Management Plan Submission Guidelines* for all the road	The JCEP 401 Water Quality Memorandum (Part 1) and PCGP 401 Water Quality Summary Table (Part 2, Appendix A) in the application specifically address project compliance with Oregon water quality standards.	**Summary Statement: The responses provided by PCGP do not fully address the information requested by DEQ. Please provide the information requested in Comments 33 through 36 and more fully described in the following section. See also DEQ's Summary Statements related to Comments 4, 5, and 15 for additional guidance.** **Comment 33 of DEQ's AIR-1 (Road Stream Crossings PCGP Will Improve)** In its response to Comment 33, PCGP has not address guidance materials found in DEQ's Section 401 Water Quality Certification Post-Construction Stormwater Management Plan Submission Guidelines. DEQ requested this information to evaluate fully PCGP's actions to treat the discharge from roads at stream crossings such as culverts and bridges. DEQ is requesting this information since these stream crossings serve as a discharge point for sediment arising from the travel ways, cut slopes, and in-slope ditches of non-paved roads.[52] The information regarding the

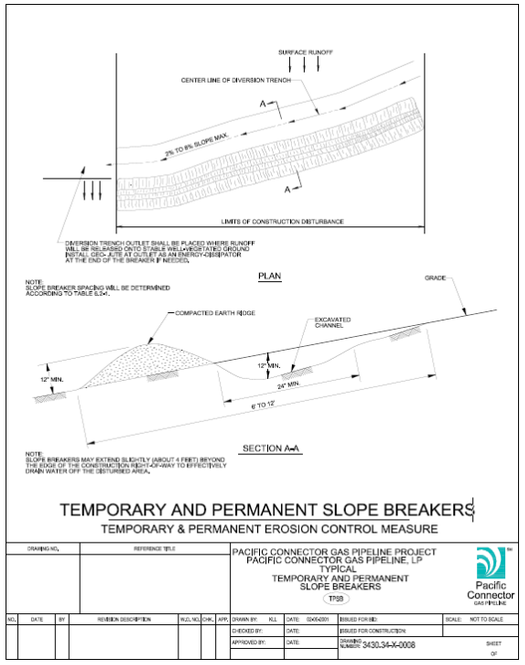
[52] Holley, A. Gordon, A. Gordon; Conner, Kristina F.; Haywood, James D., eds. 2015. *Sediment Deposition from Forest Roads at Stream Crossings as Influenced by Road Characteristics*. Proceedings of the 17th Biennial Southern Silvicultural Research Conference. General Technical Report. SRS-203. Asheville, NC: U.S. Department of Agricultural Forest Service, Southern Research Station. 551 p.

	stream crossings that Jordan Cove Energy Project and Pacific Connector Gas Pipeline will: • Replace or improve to construct and/or operate the gas pipeline and • Result in an increase in impervious surface area during the replacement/improvement process. This information is necessary [see OAR 340-048-0042(2)(a)] to determine whether the stormwater discharge from the pipeline's road stream crossings will contribute to or cause violations of water quality standards. Comment 34: In compliance with OAR 340-041-0007(1) and (7), please provide a post-construction stormwater management plan addressing DEQ's *Section 401 Water Quality Certification Post-Construction Stormwater Management Plan Submission Guidelines* for all stream crossings for the pipeline. The focus of this plan	Details pertaining to post-construction stormwater management for the pipeline are provided in the PCGP Erosion Control and Revegetation Plan (Part 2 Attachment A / Appendix B.1 of 404-10 JPA Part 2 provided as Appendix B of 2/6/18 401 WQ Package). The general location maps showing proposed access roads are referenced in Appendix G.1 to Resource Report 1 (Part 2 Attachment A of 404-10 JPA provided as Part 2 Appendix B of 2/6/18 401 WQ Package, see pdf pages 183 and 661). The waterbodies within 100 feet of existing roads needing improvement are detailed in Table A.2-6 in Appendix A.2 of Resource Report 2 (Part 2 Attachment C / Appendix A.2 of 404-10 JPA provided as Part 2 Appendix B of 2/6/18 401 WQ Package). Table A.2-6 will be updated to include the water quality BMPs for each crossing and provided to ODEQ in Q4 2018. Further, impacts associated with vegetation removal are detailed in the PCGP Revised	design of these stormwater treatment systems requested in these submission guidelines enables DEQ to evaluate the efficacy of PCGP's proposed stormwater treatment controls. Given the potential for pollutant discharge at stream crossings, DEQ is requesting the engineering designs and technical support for each water quality BMP proposed for each stream crossing that PCGP proposes to identify in a future update to Table A.2-6 in Q4 2018. DEQ will not accept a qualitative description of a treatment practice in lieu of these engineering designs and their technical support. Even for a simple stormwater treatment control such as a grass swale, several design variables influence the performance of a grass swale. For example, a simple statement that PCGP will use a grass swale to treat the roadside ditch runoff prior to discharge to a stream provides DEQ no information regarding the pollutant removal performance for this swale. As an illustration for PCGP's consideration in preparing to submit information to DEQ, Minton 2005 provides a brief discussion of these design variables for a grass swale in the following excerpt: *Although grass swales are commonly viewed as filters (biofiltration), they are properly classified as shallow basins or biosettlers. Flow-through grass swales function as treatment devices if vegetation remains erect. Erect grass reduces shear stress in the channel, reducing its capacity to carry sediment. Careful selection of the Manning's n is critical to proper sizing (Chapter 5).* *Length was first established at 200 feet (60 m) based on a study of a grass-lined freeway ditch. 60 percent of the TSS was removed in 100 feet and 80 percent in 200 feet. More recently, others have specified a minimum length of 100 feet combined with a minimum hydraulic residence time of 9 minutes. The specified residence time results in lengths considerably greater than 100 feet.* *...Swales and strips designed for treatment appear to give reasonable performance, on the order of 70 to 80 percent TSS removal if the hydraulic residence time is on the order of 10 minutes.*[53] A table of water quality BMPs employed at stream crossing without corresponding engineering analysis and its technical support will not allow DEQ to evaluate the potential water quality impacts from the stormwater discharge at these stream crossings. In developing the Certification Decision, DEQ must evaluate all proposed activities that would either contribute to or cause violations of water quality standards from road drainage discharged at stream crossings [OAR 340-048-0042(2)(a)]. To perform this evaluation, DEQ needs PCGP to submit a quantitative assessment using, for example, models and/or engineering designs and the technical support for these designs.

[53] Minton, Gary. 2005. *Stormwater Treatment – Biological, Chemical and Engineering Principles*. Sharidan Books, Inc.

	should be the drainage area for the right-of-way approaches that discharge stormwater into the stream crossing. To ensure compliance with OAR 340-048-0042(2)(a), please evaluate if the discharge from the pipeline's permanent 30-foot right-of-way at all stream crossings for the pipeline will contribute to or cause violations of water quality standards. In compliance with OAR 340-048-0042(2)(a), please propose the analytical model(s) (e.g., X-DRAIN) that Pacific Connector Gas Pipeline will use to evaluate if the stormwater discharge from the permanent 30 foot right-of-way with its 10 feet of compacted soil overlying the gas pipeline will contribute to or cause violations of water quality standards. In compliance with OAR 340-041-0002(1), this evaluation must also consider the impact of the change in stormwater volume discharged to receiving waters from the vegetation conversion (i.e., from forest canopy to herbaceous vegetation) during pipeline	Draft Thermal Impact Assessment (Part 2 Attachment C / Appendix Q.2 of 404-10 JPA provided as Part 2 Appendix B of 2/6/18 401 WQ Package).	**<u>Comment 34 of DEQ's AIR-1 (Permanent Right-of-Way Post-construction Discharge at Stream Crossings)</u>** In its response to Comment 34, PCGP did not provide DEQ with the information requested in DEQ's *Section 401 Water Quality Certification Post-Construction Stormwater Management Plan Submission Guidelines*. As discussed in DEQ's review of PCGP's response to DEQ's Comment 16 and again emphasized below, the permanent right-of-way for the pipeline will have areas of compacted soil particularly over the gas pipeline. Given this, the permanent right-of-way is essentially functioning as primitive road as the compacted soil above the pipeline is serving as a travel way. Compacted soil will limit stormwater infiltration and promote surface runoff. As a result, PCGP must treat the stormwater at the crossing of each pipeline right-of-way prior to its discharge into streams. As noted elsewhere in DEQ's review of PCGP's response to AIR-1, road stream crossings are a source of pollutant discharge. The proposed slope breakers or water bars noted below are serving as this primitive road system's cross drains for stormwater. Given this fact, DEQ draws upon the numerous studies on the impact of roads on receiving water quality to anticipate the potential water quality impacts from PCGP's proposed right-of-way. One of these studies, referenced elsewhere in DEQ's review of PCGP's proposal, summarizes DEQ's concerns as follows: > *If there is a moderate distance between the road and stream, then mitigation to reduce both road erosion and channel erosion may decrease sediment delivery. Channel treatment options include lining the channel with rock or similar materials, establishing vegetation, or installing control structures. These mitigation techniques are expensive and may be ineffective during severe runoffs.* (Elliot 1999). PCGP is proposing the use slope breakers discussed and presented below to manage stormwater on the permanent right-of-way for the gas pipeline. A slope breaker is essentially a stormwater ditch (see drawing below) with a berm to control the direction of stormwater flow. Slope breakers represent a potential hydrological connection between streams and the permanent right-of-way when these slope breakers are located near stream crossings. PCGP must propose to DEQ a defensible approach to treating any pollutants mobilized in the permanent right-of-way, transported in the ditches of slope breakers, and discharged near stream crossings. Unless PCGP can provide the engineering analysis to demonstrate otherwise, DEQ considers the proposed slope breakers near stream crossings to be stormwater conveyance systems rather than stormwater treatment systems. As noted above, compacted soil will limit the infiltration of stormwater. Raindrop splash erosion on bare soil and stormwater moving downslope will mobilize sediment where soil is exposed and/or compacted and vegetation is limited due to this compaction around the pipeline. Moreover, PCGP's proposed vegetation maintenance for pipeline right-of-way will limit the extent vegetation types allowed in the right-of-way particularly above and adjacent to the gas pipeline. PCGP's response to Comment 34 did not address DEQ's request to evaluate the discharge from this permanent 30-foot right-of-way with its 10-feet, at minimum, of compacted soil overlying the pipeline. During its

	construction. The evaluation of this impact is necessary to determine if pipeline's permanent right-of-way will cause bed and bank erosion and, therefore, violate Oregon's biocriteria water quality standard (i.e., OAR 340-041-0011).
	
	Comment 35: In compliance with OAR 340-041-0007(1) and (7), please provide a post-construction stormwater management plan addressing DEQ's Section 401 Water Quality Certification Post-Construction Stormwater Management Plan Submission Guidelines for the 30-foot permanent right-of-way for the approximately 117 miles of the proposed pipeline right-of-way traversing steeps slopes (i.e., slopes greater than 30%). This information is necessary before Pacific Connector Gas Pipeline, in compliance with OAR 340-048-0042(2)(a), can determine whether the discharge from the pipeline right-of-way will contribute to or cause violations of water quality standards.
	
	The information provided in PCGP's documents (e.g., 401 Application Submittal, drafts of
			review of proposed federal resource and land management plans, DEQ confirmed its concern regarding post-construction stormwater discharge from slope breakers at stream crossings carrying sediment from compacted soil. DEQ documents this concern in DEQ's review of PCGP's response to Comment 16 presented above. PCGP will need these amendments to federal soil compaction standards to build the gas pipeline.
			
			The application of a model such as X-DRAIN will help PCGP estimate the level of sediment discharge from the proposed permanent right-of-way. In AIR-1, DEQ requested from PCGP this quantitative evaluation to develop DEQ's Certification Decision. However, PCGP has not indicated in its response to AIR-1 that this evaluation is forthcoming. In formulating a Certification Decision, DEQ must determine if the potential alterations to water quality would either contribute to or cause violations of water quality standards [OAR 340-048-0042(2)(a)]. As noted above, a slope breaker installed near stream crossings is a stormwater conveyance component rather than a stormwater treatment component unless PCGP provides the engineering analysis to demonstrate otherwise. Moreover, DEQ does not see how PCGP's updating Table A.2-6 with brief, qualitative descriptions of water quality BMPs will provide the engineering design and its technical support that DEQ is requesting from PCGP.
			
			In PCGP's response to Comment 34, PCGP refers DEQ to PCGP's proposed Erosion Control and Revegetation Plan. In this plan, PCGP provides a description of its permanent post-construction stormwater control referred to a "permanent slope breakers (waterbars)." Below, DEQ provides an excerpt of this description as well as design details for slope breakers. This description and design details do not provide the information to answer the following questions:
			
			• Is PCGP proposing to install slope breakers/water bars in floodplains?
			  ○ Will these installations trigger local government floodplain regulations and, if yes, will these installations comply with these land use regulations or prevent the signing of a required Land Use Compatibility Statement.
			  ○ If PCGP does not intend to use slope breakers in floodplains, how is PCGP proposing to manage post-construction stormwater in floodplains.
			• What is PCCP's proposed setback from the Army Corps of Engineer's and Oregon Department of State Land's ordinary high water mark for permanent slope breakers?
			  ○ How will PCGP infiltrate (i.e., treat) the discharge from the slope breaker installed above this setback during periods of rainfall, high groundwater table, saturated soil conditions reducing infiltration of runoff, and a limited vegetation buffer to treat surface runoff?
			  ○ How will PCGP manage post-construction stormwater and provide treatment for this stormwater within this setback?
			  ▪ Is PCGP proposing to infiltrate (i.e., treat) the runoff within the setback during periods of high rainfall, high groundwater table, and saturated soil conditions or will this runoff discharge into streams untreated as surface runoff into streams?

	Resource Reports) – made available to DEQ – only provides generic diagrams and erosion controls practices. DEQ can find no information on PCGP's field investigations or remote sensing for these areas to evaluate slope stability when siting the pipeline alignment. DEQ can find no information on the specific designs and practices that PCGP will use on cut slopes and fill slopes located on these steep slopes. In developing this plan in compliance with OAR 340-041-0007(1) and (7), please provide information on the designs and engineering support for these designs for the permanent controls Pacific Connector Gas Pipeline proposes to stabilize cut-slopes and fill slopes for the right-of- way sited along the steep slopes. The purpose of these controls is to prevent sediment discharge in stormwater and debris flows from landslides discharging into streams. Please note these on the post-construction stormwater plan in the information request above. Additionally, please identify where the 117 miles of proposed pipeline noted above		• If PCGP will setback slope breakers from the ordinary high water mark to comply with Corps and DSL permit requirements, how will the discharge from these slope breakers prevent hydromodication of smaller streams and, therefore, bed and bank erosion in these streams with its effect on Oregon's biocriteria? **4.2.2 Permanent Slope Breakers** Permanent slope breakers (waterbars) will be installed across the right-of-way on slopes. The purpose of these structures is to minimize erosion by reducing runoff velocities by shortening slope lengths, preventing concentrated flow, and by diverting water off the right-of-way. Slope breakers are also intended to prevent sediment deposition into sensitive resources. Slope breakers will be constructed with a two to eight percent outslope so that water does not pool or erode behind the breaker. Outflow will be diverted to a stable area off the right-of-way consistent with FERC's Upland Plan. Slope breakers may extend slightly (about 4 feet) beyond the edge of the construction right-of-way to effectively drain water off the disturbed area. If a stable area is not present, a temporary energy-dissipating device will be installed at the end of the slope breaker. Slope breakers will be installed along the right-of-way based on slope gradient and soil characteristics (see Table 4.2-2). The frequency of slope breakers will be installed based on a combination of FERC's Upland Plan (see Attachment A) and input from the Forest Service and BLM. Because of the range in variation between agency recommendations and because of the complex landownership pattern, a single slope breaker spacing was developed based on slope gradient and soil type to ensure installation practicality across the various private and federal lands. The permanent slope breakers will be installed in all areas except agricultural fields, hayfields, pastures, and lawns. A typical drawing of a slope breaker is provided in Attachment C as Drawing 3430.34-X-0008. **Table 4.2-2** **Permanent Slope Breaker Spacing** **Spacing Based on Soil Characteristics[1]** **Slope Percent** / **Highly Erosive Granitic Soils[2] (feet)** / **Moderate/Low Erosion Soil Types (feet)** 0-5 / None Required / None Required >5-15 / 100 / 200 to 300 >15-30 / 50 to 75 / 75 to 100 >30 / 50 / 50 [1] Actual spacing will be determined at the time of installation based on site-specific topographic conditions on the right-of-way to ensure proper slope breaker construction and proper drainage to stable off-site areas. On the Umpqua National Forest between about MPs 109 and 110, where the alignment crosses the historic Thomason cinnabar claim group, waterbars are to be installed at 50-foot intervals as recommended by the Forest Service (see the Contaminated Substances Discovery Plan/Appendix E of the POD). [2] Granitic formations are crossed by the alignment between about: MPs 79.1 to 80.5; 81.6 to 82.2; 87 to 88.8; 97.0 to 101.2; 103.0 to 105.4; and 114.8 to 115. Section 4.2.2 on Slope Breakers from PCGP's Erosion Control and Revegetation Plan  Drawing Number 3430.34-X-0008 of Slope Breakers DEQ is seeking answers to the questions above because PCGP has provided limited information on its proposed post-construction stormwater controls at the stream crossings of the permanent right-of-way. In Comment 34, DEQ requested PCGP use DEQ's Section 401 Water Quality Certification Post-Construction Stormwater Management Plan Submission Guidelines. Using these guidelines would provide DEQ with information needed to evaluate the efficacy of PCGP's proposed use of slope breakers at stream crossings. For example, PCGP is proposing to discharge stormwater from slope breakers and, presumably, infiltrate this discharge into the surrounding soils for treatment. According to DEQ submission guidelines for a post-construction stormwater management plan, the PCGP should design structural controls for any conditions that warrant special water quality considerations such as:

	coincide with the 94 miles of the proposed pipeline that would be located in soils that PCGP has identified as having a high or severe erosion potential. Please provide the designs and engineering support for these designs for the permanent controls in these areas of high/severe erosion potential and steep slopes. In compliance with OAR 340-041-0007(1) and (7), the engineering support must indicate that these permanent controls are sufficient to: • Manage stormwater to prevent erosion on the permanent right-of-way, its cut-slope, and its fill-slope. • Prevent debris flows into streams from landslides from cut-slope and fill-slope failures. On the post-construction stormwater management plan requested above, please also provide the location for these controls along the 117 miles of pipeline on steep slopes (>30%).		• *Size infiltration structural stormwater controls such that there is sufficient depth to groundwater to facilitate drainage (e.g., soil pore storage volume ≥ volume of stormwater designed to infiltrate (Table 2, page 19).* • *The bottom of the structural stormwater control should be sufficiently above the highest anticipated seasonal groundwater to facilitate drainage. Generally, the volume of the post-construction stormwater runoff the structural control is designed to infiltrate should not exceed the storage volume within the soil pores of the subgrade (Section E.7.2.1, page 20).* PCGP's references the proposed Erosion Control and Revegetation Plan in its response to Comment 34. However, this plan does not provide any details regarding the natural area or structural controls PCGP intends to install to infiltrate stormwater discharged from slope breakers near stream crossings. PCGP does not provide any infiltration testing for the area receiving the slope breaker discharge as requested in Section E.3 of DEQ's submission guidelines. PCGP does not provide DEQ with any design criteria such as those suggested by Pazwash 2016. For example, Pazwash provides the following example criteria for a filtering system: *…the entire treatment system (including pretreatment) hold at least 75% of the WQ_v prior to infiltration. Minimum filter bed thickness is typically 18 in (45cm) for infiltration basins and 12 inches (30 cm) for sand filters. e. Swales: Swales are designed to treat the full WQ_v and may be dry swale or wet swale…Dry swale is basically a vegetated open channel, and wet swale has an expanded basin with wetland vegetation and constricted outlet. Figure 5.6 shows a schematic plan view of a wet swale. Design criteria for swales (open channel) area:* 1. *Swales shall be designed for the 10-year storm.* 2. *The peak flow velocity for the 10-year storm shall be nonerosive.* 3. *Channels will have moderate side slopes (flatter than 3:1) – in no case, steeper than 2:1.* 4. *A minimum ponding time of 30 minutes is recommended for WQv treatment. The maximum allowable ponding time shall be less than 48 hours. An underdrain system shall be provided in dry swales to meet the maximum ponding time requirement.*[54] PCGP provides none of the detailed information provided in the example above for how PCGP will manage and treat the stormwater discharge from slope breakers at stream crossings. Without additional information, PCGP is essentially asking DEQ to accept – without any engineering analysis or technical support – that the soils and vegetation in between the slope breaker's discharge point and the stream will treat this stormwater discharge. Additionally, when the permanent right-of-way is in operation, PCGP does not provide DEQ with the water quality

[54] Pazwash, Hormoz. 2016. *Urban Storm Water Managemen*t (Second Edition). CRC Press

	Comment 36: In compliance with OAR 340-041-0007(1) and (7), please provide post-construction stormwater management plans for the proposed 25 miles of new permanent and temporary roads addressing DEQ's Section 401 Water Quality Certification Post-Construction Stormwater Management Plan Submission Guidelines. This information is required before Pacific Connector Gas Pipeline can determine whether the discharge from these new roads will contribute to or cause violations of water quality standards. In compliance with OAR 340-048-0042(2)(a), please propose the analytical model(s) (e.g., X-DRAIN) that Pacific Connector Gas Pipeline will use to evaluate if the stormwater discharge from these 25 miles of proposed new roads will contribute to or cause violations of water quality standards.		design storm that the proposed slope breaker collection system and/or natural area will treat. Moreover, PCGP does not demonstrate that the natural area (i.e., buffer area) between stream and the slope breaker's discharge point is capable of adequately treating the discharge from the water bar. In the absence of this detailed information, DEQ can only assume that PCGP does not sufficiently treat the runoff from the permanent right-of-way at stream crossings once discharged from the slope breaker to the stream. In Comment 34, DEQ requested that PCGP evaluate the water quality impacts from this discharge by using a model such as X-DRAIN. PCGP has not provided this evaluation in its response nor indicated it will provide this information to DEQ in the near future. **Comment 35 of AIR-1 (Post-construction Stormwater Discharge from ROW to Steep/Unstable/Erosive Slopes** In PCGP's response to DEQ's Comment 35, PCGP refers DEQ to the Erosion Control and Revegetation Plan. As noted in DEQ's Comment 35, PCGP only provides generic diagrams for certain erosion control practices. This information does not provide site-specific information for how PCGP will avoid discharging post-construction stormwater to unstable slopes such as headwalls, Areas of Potential Rapidly Moving Landslide Hazards, and mapped landslides along the entire pipeline alignment. In DEQ's review of PCGP's response to Comment 15 noted above, DEQ provides the regulatory and technical basis for avoiding post-construction discharges to steep, unstable slopes from the pipeline's right-of-way. For example, in its Erosion Control and Revegetation Plan, PCGP indicates that it will use permanent slope breakers (i.e., water bars) across the right-of-way on slopes to: *...minimize erosion by reducing runoff velocities by shortening slope lengths, preventing concentrated flow, and by diverting water off the right-of-way. Slope breakers are also intended to prevent sediment deposition into sensitive resources*. DEQ addresses the deficiencies of this plan excerpt from the ECRP in DEQ's review of PCGP's response to Comment 34 above. This represents all the information PCGP provided to DEQ in its submittal. The information that PCGP has provided in its submittal, to date, lacks site-specific information regarding the discharge points for these slope breakers. Also, without additional information, DEQ is unable to determine if these discharge points will: • Add additional water to unstable slopes (e.g., headwalls, high Rapidly Moving Landslide Hazard Potential Areas, mapped landslides) • Produce positive soil pore pressures that may cause landslides that impact water quality. As noted PCGP's submittal, slope breakers are specialized drainage ditches to prevent stormwater from eroding the right-of-way and creating rills and gullies in this right-of-way. PCGP's response did not provide DEQ with a post-construction stormwater management plan for the management of stormwater for the approximately 117 miles of the proposed pipeline right-of-way traversing steeps slopes (i.e., slopes greater than 30%).

			Technical Basis for DEQ's Information Request In a discussion of slope stability and linear infrastructure such as roads, Benda et al. 2007 notes the following: *Surface runoff that is concentrated and diverted through ditches onto steep slopes can saturate soils or road fills much more than natural intense precipitation events (Megahan, 1972; Sidle et al., 1985), thus increasing the potential for landsliding and/or gully initiation (e.g., Montgomery, 1994; see Figure 31).* *Road drainage that is diverted onto hillslopes is a major factor in landslide initiation (Figure 32 and Table 2). Ditch water that is diverted into naturally landslide-prone bedrock hollows (such as is shown in Figure 1) can trigger shallow landslides and initiate debris flows.* *…Figure 34 illustrates how the design of road drainage can lead either to landsliding or reduce the likelihood of landsliding.* Moreover, drawing on geotechnical experts, research, and references, the USDA Forest Service stresses the role of water in the cause and mitigation of landslides as follows: *There are two categories of water with which we will be concerned: surface water and ground water. Concentrations of surface water, seeps, springs, and vegetation changes indicate topographic changes that can provide critical clues about what may be happening with the ground water.* *Water plays a very important role in the cause and mitigation of most landslides. It is important to learn as much as possible about surface water and ground water because changes in ground water levels and pore water pressures alter effective normal stress and, as a result, modify shear strength.* *It is therefore critical that the source of ground water, changes in ground water levels, and the relationships among surface water, ground water, and the local geology be understood if landslide activity is to be managed.*[55]

[55] Hall, David E., Michael T. Long, and Michael D. Remboldt (Editors). 1994. Slope Stability Reference Guide for National Forests in the United States Volume III. USDA Forest Service EM-7170-13. Washington, DC

			PCGP is proposing to clear ridgetops of trees and other vegetation in Tyee Core Area, other locations with mapped landslide features, steep slopes, and slopes with soil that has a high erosion potential. PCGP is also proposing to level these ridgetops to install a gas pipeline. These activities dramatically alter the interception of rainfall from trees and the movement of stormwater on these ridgetops. These alterations will result in a substantial increase in stormwater generated on these ridgetops relative to their undisturbed condition. However, PCGP has not provided DEQ with specific information for how PCGP will manage the stormwater generated on these ridgetops supporting the permanent right-of-way. As highlighted in references DEQ presented above, stormwater discharge has the potential to cause landslides. Landslides caused by stormwater discharge from pipeline construction activities and the operation of the permanent pipeline right-of-way have the potential to migrate into stream channels affecting water quality. As discussed in DEQ's review above, the permanent right-of-way for the pipeline is functioning as a primitive road. To ensure compliance with OAR 340-041-0007(1) and (7), DEQ is requesting additional information that PCGP would generate during the development of a post-construction stormwater management plan for its permanent right-of-way. DEQ provides guidelines for the development of a post-construction stormwater management plan. For example, in Section E.2.2 of DEQ's *Post-Construction Stormwater Management Plan Submission Guidelines*, DEQ requests that applicants seeking a 401 Water Quality Certification perform the following actions: *Check the topography and Oregon Department of Geology and Mineral Industries' Statewide Landslide Information Database (http://www.oregongeology.org/sub/slido/index.htm). Consult with an Oregon-registered geotechnical engineer or engineering geologist in areas with steep slopes or landslide risk to see if excavation and/or infiltration should be avoided.* Since stormwater discharge may cause a landslide as noted above, DEQ provides the above post-construction stormwater plan guidelines to project proponents in DEQ's effort to administer statewide narrative criteria OAR 340-041-0001(1). PCGP has not demonstrated to DEQ that it has selected appropriate discharge points for its slope breakers/water bars to avoid stormwater discharge to unstable slopes. In the limited field investigations for landslides that PCGP has performed (i.e., PCGP's Submittal, Part 2, Appendix C) and discussed in DEQ's review below, PCGP's focus was primarily on the potential risk to the pipeline and did not include a comprehensive evaluation of the risk to water quality. Moreover, the limited field investigations only evaluated the risk of deep-seated landslides and not shallow rapidly moving landslides. PCGP did not perform field investigations for landslide risks for constructing and operating this gas pipeline along the many miles of potential rapidly moving landslide hazards particularly in the Tyee Core Area. ***Examples of Information Lacking in PCGP's Erosion Control & Revegetation Plan***

			PCGP has not provided DEQ with a post-construction stormwater management plan as requested in Comment 35 addressing the plan submission guidelines noted above. PCGP has not demonstrated in its ECRP that it will strategically divert stormwater from the right-of-way to stable and non-convergent slopes. In DEQ's Comment 35, DEQ requested that PCGP develop a post-construction stormwater management plan by providing engineering designs and their technical support for permanent controls for cut and fill slopes. However, PCGP has not provided DEQ this information. In fact, PCGP notes the following in Resource Report 6 for Geologic Resources for BMPs on slopes steeper than 30%: *Steep side slope Pipeline construction segments will be identified during the final design phase of the Pipeline project. Fill slope construction details and specifications will be designed for the identified steep side slope Pipeline segments.* As indicated in DEQ's comments, the purpose of DEQ's request for engineered designs for these controls is to evaluate PCGP's efforts to prevent sediment discharge in stormwater and to prevent debris flows from landslides discharging into streams. Although PCGP refers DEQ to its Erosion Control and Revegetation Plan for this information, the ECRP does not provide this level of detail as noted elsewhere in DEQ's review. In the Erosion Control Revegetation Plan, PCGP provides DEQ with Section 11 on Seep and Rugged Terrain. This section provides no information regarding the discharge points for stormwater relative to unstable slope features. In this section, PCGP provides no information on how it will store construction spoils (e.g., root wads, soil, rock, slash) and logs to avoid adding additional weight to the top of unstable slopes (e.g., headwalls, rapidly moving landslide areas, mapped landslides). The following is what PCGP provides DEQ in its ECRP: *A significant portion of the Pipeline crosses rugged topography as it traverses the Coast and Cascade Mountain Ranges and foothills. Where the Pipeline passes through the dissected Coast Range and foothills between the Coos River and Myrtle Creek (MPs 9.00 to 81.00) most of the ridgelines run in the opposite direction of the proposed alignment. The orientation of the ridges requires the Pipeline, in numerous areas, to descend and ascend steep ridge slopes to cross stream drainages so that the alignment can proceed in a southeasterly direction toward Myrtle Creek and ultimately the terminus of the pipeline near Malin, Oregon. This similar condition also occurs between MPs 81.00 and 121.00 where the Pipeline traverses the Cascade Range and foothills. During routing, PCGP optimized the alignment along ridgelines, where feasible, to minimize crossing steep slopes and potential geologic hazards, to minimize waterbody crossings, and to minimize the amount of cuts and fill slopes that would be required which reduces the erosion hazard. Areas of steep side slopes (greater than 50% grade) were also avoided as much as practical during routing to minimize the complications associated with construction in these areas as well as potential long-term slope instability hazards.*

			The Geohazards and Mineral Resources Report (see Resource Report 6) provides a geotechnical hazards review that was conducted during routing and describes the avoidance mitigation measures that were implemented (i.e., minor reroutes) to avoid potential high risk geological hazards areas. Resource Report 7 of PCGP's FERC Certificate application also identifies the miles of soils crossed by the Pipeline which are associated with steep slopes and high erosion hazards. PCGP has noted areas where the proposed route traverses steep, narrow ridges and where it will be infeasible to return these ridges to their original preconstruction contours during final grading. Drawing 3430.34-X-0018 in Attachment C provides a typical construction right-of-way configuration in these sharp ridgeline areas. This drawing shows the construction techniques that will be utilized to ensure safe and feasible construction; minimize overall construction disturbance; and ensure the long-term safety, stability, and integrity of the pipeline. Avoidance of these areas is not feasible because stable alternate pipeline routes were not present along the alignment, except for other similar ridgeline features that would have the same conditions. *During construction across rugged topography, PCGP will utilize the same construction procedures outlined in this ECRP to minimize construction, geologic, and erosion hazards as well as to ensure the integrity of the pipeline. In summary these procedures include:* *• routing the pipeline to ensure safety and integrity of the pipeline;* *• identifying adequate work areas to safely construct the pipeline;* *• utilizing appropriate construction techniques to minimize disturbance and to provide a safe working plane during construction (i.e., two-tone construction; see Drawing 3430.34-X-0019 in Attachment C);* *• Spoil storage during trench operations on steep slopes (greater than the angle of repose) will be completed using appropriate BMPs to minimize loss of material outside the construction right-of-way and TEWAs. Examples of BMPs that may be used include the use of temporary cribbing to store material on the slope or temporarily end-hauling the material to a stable upslope area and then hauling and replacing the material during backfilling;* *• optimizing construction during the dry season, as much as practicable;* *• utilizing temporary erosion control measures during construction (i.e., slope breakers/waterbars);* *• installing trench breakers in the pipeline trench to minimize groundwater flow down the trench which can cause in-trench erosion;* *• backfilling the trench according to PCGP's construction specifications;*

			• restoring the right-of-way promptly to approximate original contours or to stable contours after pipe installation and backfilling; *• installing properly designed and spaced permanent waterbars;* *• revegetating the slope with appropriate and quickly germinating seed mixtures;* *• providing effective ground cover from redistributing slash materials, mulching, or installing erosion control fabric on slopes, as necessary; and* *• monitoring and maintaining right-of-way as necessary to ensure stability.* From the information PCGP provides above, the following - for example - is missing: • The design details for BMPs used to stabilize spoil storage on steep slopes to address the geotechnical concerns associated with adding additional weight to the head of unstable slopes. • The use of reinforced fill slopes on steep unstable slopes where PCGP notes that "the proposed route traverses steep, narrow ridges" as recommended in technical manuals for linear infrastructure projects. • The location of construction and post-construction stormwater discharge points relative to unstable landscape features/steep slopes/mapped landslides/Potential Rapidly Moving Landslide Hazards. • The location the discharge points for the hydrostatic test water, trench dewatering, and vehicle/equipment wash water relative to unstable landscape features/steep slopes/mapped landslides/Potential Rapidly Moving Landslide Hazards. • The stormwater management system for the construction right-of-way, for Temporary Extra Work Areas, and for other areas cleared of vegetation relative to unstable landscape features/steep slopes/mapped landslides/Potential Rapidly Moving Landslide Hazards. DEQ requests this additional information to determine if the location of construction and post-construction stormwater discharge, other discharge (i.e., hydrostatic, trench dewatering, and equipment wash water), and construction spoil/log storage have the potential to cause a landslide that flow into streams. DEQ also needs information from a geo-engineer's field investigations to identify suitable locations for discharging stormwater to minimize their potential to cause landslides. The limited filed investigations performed by PCGP and highlighted in DEQ's review below do not provide the information necessary to site the discharge of construction stormwater, post-construction stormwater, hydrostatic test water, trench water, and equipment washwater. PCGPs limited investigation of landslide risks focus only on deep-seated landslide risks for only mapped landslides. PCGPs *Potential Deep-Seated Landslide Evaluation Forms* did not include evaluations of risks associated with discharging stormwater to areas identified as rapidly moving landslides hazards and other unstable landscape features such as headwalls. As noted in the excerpt below, these filed investigation forms and their conclusions focused primarily on the potential risk to the pipeline. PCGP did not

evaluate the risks to water quality, for example, from rapidly moving landslides or deep-seated landslides from pipeline construction and operation.

Below is an excerpt from *Potential Deep-Seated Landslide Evaluation Form* for Landslide 34. Landslide 34 is an identified landslide from a published map. PCGP notes this landslide in Figure 24 of 47 in PCGP's Geologic Hazard Maps along Milepost 108.86 - 109.44 of the proposed gas pipeline.

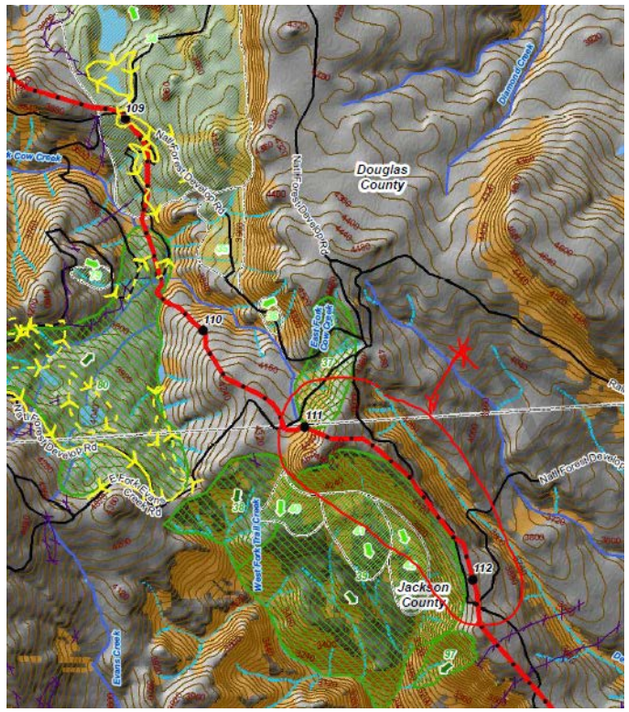
CONCLUSIONS BASED ON SURFACE OBSERVATIONS

Factors Contributing to Cause of Landslide (natural, anthropogenic):
Volcanic and tectonic activity.

Potential Risk to Pipeline: **Low**
We developed a geologic cross section through LS-34. Based on the location of the inferred slide plane and existing slope geometry, it is our interpretation that the failure plane for this very large landslide feature occurs approximately 100 feet below the ground surface at the location of the proposed pipeline. Excavation for pipeline construction will be typically less than 10 feet in depth and is not anticipated to encounter the inferred basal slide plane of LS-34. The volume of earthwork and depth of excavation required for the pipeline construction is small relative to the size of the landslide and likely depth of the slide plane. For this reason, it is our opinion that there is a low risk of construction adversely impacting the stability of this dormant-mature landslide.

The observations noted in the excerpt above do not address the additional stormwater discharge to this unstable landscape feature particularly above East Fork Cow Creek.

Moreover, PCGP's field investigation in this area as well as many other areas was limited in scope. For example, PCGP did not investigate the steep slopes surrounding the propose pipeline locations between Mile Posts 109 and 109.8 and between Mile Posts 111 and 112.2 (see the Geologic Hazard Map excerpt below). At these two sections of the proposed gas pipeline, PCGP has not indicated how PCGP will manage stormwater from the pipeline's construction and post-construction operations nor stabilize the fill slopes or the cut slopes. PCGP's proposed pipeline at Mile Post 109.4 and 109.5 is altering the toe of slope in areas identified as mapped Landslide 34 and as an Area of Rapidly Moving Landslide Hazard. However, PCGP does not provide DEQ with information regarding its design for loading the toe of this cut slope in these areas to prevent destabilizing it and causing a debris torrent to discharge into the East Fork Cow Creek.

			As documented in DEQ's review above, water plays a key role in the cause and mitigation of landslides. Referring to the map excerpt below, PCGP has not provided DEQ with information on how it will manage stormwater to avoid causing a debris flow below the pipeline in the rapidly moving landslide hazards on each side of the pipeline from Mile Post 111 to Mile Post 112.2. These Areas of RML also coincide with Landslides 37, 38, 42, and 80. Landslide 37, 38, 42, and 80. These are identified landslides from aerial photos. However, PCGP did not include them as part of its field evaluations of landslide risks. PCGP has not provided DEQ with engineering designs to stabilize the proposed pipeline's fill slopes for Landslides 37 and 42 as well as the cut and fill slopes for Landslide 38 and 80. There are numerous other areas of landslide risks where PCGP has provided no field evaluations or engineering analysis for protecting water quality from debris flows potentially precipitated by: • Loading additional stormwater at the top of unstable slopes when constructing and operating the gas pipeline. • Cutting into an unstable slope when constructing and operating the gas pipeline.  Geologic Hazard Map (Figure 24 of 47) from Resource Report 6 featuring several identified landslides including 34, 37, and 42 discussed

			In addition to PCGP's typical construction methods noted in the Erosion Control and Revegetation Plan excerpt above, PCGP identifies steep side slopes requiring restoration. PCGP provides the fill slope specifications below to ensure slope stability: *Fill slopes will be constructed in order to return the site to the approximate pre-construction topography. Fill slopes which exceed a gradient of 3H:1V (Horizontal:Vertical), will be constructed in accordance with the following specifications under the supervision of PCGP's qualified representative:* *<u>Materials</u>* *1. Fill materials used for constructing slopes exceeding 3H:1V will be considered structural fill.* *2. Materials used as structural fill should be free of roots, organic matter, and other deleterious materials.* *3. Fill materials will be at a moisture content suitable for compaction.* *4. If on-site soils are unsuitable for use as structural fill, imported structural fill will consist of pit or quarry run rock, crushed rock, crushed gravel and sand, or sand that is fairly well graded between coarse and fine, contains no clay balls, roots, organic matter or other deleterious materials, and has less than 5 percent passing the U.S. No. 200 Sieve.* *<u>Slope Preparation</u>* *1. Slopes to receive fills will be prepared by stripping the existing organic material and topsoil.* *2. Construct steps or benches on existing slopes to receive fills that exceed 3H:1V. The bench height to width ratio will be adjusted to match the existing slope gradient.* *<u>Fill Placement and Compaction</u>* *1. Fill soils will be compacted at a moisture content that is suitable for compaction. The maximum allowable moisture content varies with the soil gradation, and will be evaluated during construction. Silt and clay and other fine granular soils may be difficult or impossible to compact during persistent wet conditions.* *2. Fill material will be placed in uniform, horizontal lifts. Minimum lift thickness will vary based on material compacted and the type of compaction equipment used.* *3. Compact each lift by operating, hauling, and spreading equipment uniformly over the full*

			width of each layer until there is no visible deflection under the load of the hauling and spreading equipment. If each lift of fill cannot be accessed by the hauling and spreading equipment to achieve compaction, then other suitable compaction equipment will be used to obtain the required compaction. Alternative compaction equipment and methods may include tamping with a trackhoe bucket, vibratory plate compactors (hoe-pack) or rollers. Based on a review of available technical manuals for slope stabilization, PCGP's generic specifications presented above do not implement the recommendations in several technical guides on stabilizing slopes. PCGP does not provide need site-specific engineering analysis or technical support for the proposed fill slope specifications referenced above to demonstrate these practices are sufficient for each site where PCGP needs to stabilize fill slopes. As noted in PCGP's Resource Report 6 and 7, the alignment for the gas pipeline will traverse the Tyee Core Area an area known for its landslide activity as well as areas with steep slopes and highly erosive soils. The following information is missing from PCGP's specifications for the placement of the alignment on or above steep unstable slopes that are common along a substantial portion of the proposed alignment: • Information (i.e., engineering designs and their technical support) for the application of reinforced fill (embankments), retaining walls, buttresses or other techniques designed to stabilize unstable slopes along the gas pipeline alignment such as Areas of Rapidly Moving Landslide Hazards, Headwalls, and Mapped Landslides. • Information (i.e., engineering designs and technical support) on how PCGP will manage stormwater and groundwater on cut slopes into unstable slopes along the gas pipeline such as Areas of Rapidly Moving Landslide Hazards, Headwalls, and Mapped Landslides. • Information (i.e., engineering designs and technical support) on how PCGP will manage runoff onto fill slopes and manage stormwater on terraces constructed on unstable slopes such as Areas of Rapidly Moving Landslide Hazards, Headwalls, and Mapped Landslides.[56, 57] Moreover, for steep slopes with erosive soils and/or with landslide features, PCGP's proposed revegetation BMPs highlighted in the Erosion Control Revegetation Plan may not be sufficient practices. DEQ reviewed the information presented in PCGP's ECRP and found it lacking in engineering designs and their technical support. PCGP's proposed update to address DEQ's Comment 35 must contain engineering designs and their technical support. These engineering designs and technical support must address site-specific

[56] Hall, David E., Michael T. Long, and Michael D. Remboldt (Editors). 1994. *Slope Stability Reference Guide for National Forests in the United States Volume III*. USDA Forest Service EM-7170-13. Washington, DC

[57] Chatwin, S.C., D.E. Howes, J.W. Schwab, and D.N. Swanston. 1994. *A Guide for Management of Landslide-Prone Terrain in the Pacific Northwest* (2nd Edition). Research Branch of the Ministry of Forests. British Columbia.

constraints encountered as PCGP prepares the erosion and sediment control plan for a NPDES 1200-C Permit and the post-construction stormwater control plan for this proposed gas pipeline. In the development of the Certification Decision, DEQ will not accept qualitative descriptions of BMPs in an updated table as an adequate response to Comment 35.

DEQ photographed an Electrical Power Line right-of-way featured in the October 2, 2018 photo below that is close to the PCGP's proposed pipeline alignment. Within the right-of-way for this power line, two small slides developed after the operators established herbaceous and woody vegetation in the right-of-way. PCGP's BMPs for this area are simply to revegetate the slope with herbaceous vegetation following specifications designed for particular land ownership (i.e., Forest Service, BLM, etc.). This power line right-of-way is just east of the proposed gas pipeline alignment in the Tyee Core Area. The power line right-of-way featured in the photo below is on a slope in an area identified as a mapped landslide in the Statewide Landslide Information Database for Oregon. The power line right-of-way is also located in an area identified as an Area of Rapidly Moving Landslide Hazard in PCGP's Geologic Hazard Map Figure 2 of 27 (See Aerial Photo and Map Figure below). The area where this power line is exhibiting small slope failures and where the proposed gas pipeline alignment is proposed has the following soil types with the following erosion hazard rating:

Dominant soil type(s)

Soil Type	Erosion Hazard Rating	Hydric Rating	Percent Area
Salander silt loam, 50 to 75 percent slopes	Severe	No	32.07 %
Templeton silt loam, 30 to 50 percent slopes	Severe	No	17.97 %
Millicoma-Templeton complex, 50 to 75 percent slopes	Severe	No	9.94 %
Templeton silt loam, 50 to 70 percent slopes	Severe	No	7.96 %
Geisel silt loam, 12 to 30 percent slopes	Severe	No	7.27 %
Templeton-Millicoma complex, 12 to 50 percent slopes	Severe	No	7.00 %
Templeton silt loam, 30 to 50 percent slopes	Severe	No	6.73 %
Nestucca-Willanch complex	Slight	Yes	4.47 %
Geisel silt loam, 12 to 30 percent slopes	Severe	No	2.73 %
Templeton silt loam, 7 to 30 percent slopes	Severe	No	1.22 %

Results from Oregon Explorer's Oregon Rapid Wetland Assessment Protocol and Stream Function Assessment Method Map Viewer for soils in area containing the Electrical Power Line Right-of-Way and a section of PCGP's proposed gas pipeline west of the power line ROW.

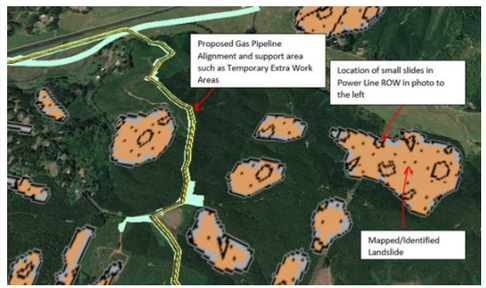


Photo to the left taken by DEQ on October 2, 2018 showing two small slides on a revegetated slope of an Electrical Power Line Right-of-Way. Aerial photo in the middle shows this power line right-of-way featured in the photo to the left relative to identified landslides. The topographical map to the right is PCGP's Geologic Hazard Map of this same area delineating the Areas of Rapidly Moving Landslide Hazards in light brown. This topographical map shows that the Electrical right of way moves down an unstable landscape feature referred to as a convergent headwall discussed in DEQ's review of PCGP's response to Comment 15. This unstable landscape feature also contains soils with a severe erosion potential as noted above.

PCGP is proposing to construct and operate a right-of-way for a gas pipeline at many locations with similar site constraints without providing DEQ with engineering designs developed to address site constraints presenting real risks to water quality over time. DEQ's request for the detailed information noted above is essential to demonstrate that PCGP will construct and operate this gas pipeline preventing sediment discharge in stormwater and preventing landslides discharging debris flows into streams.

Comment 36 of AIR-1 (Post-construction Stormwater Plan for Access Roads/Modeling WQ Impact)

For DEQ's review of PCGP's response to Comment 36, please see DEQ's review of PCGP's response to Comments 26 and 27 provided above. This review for Comment 26 and 27 is also applicable to PCGP's response to Comment 36. Additionally, DEQ does not believe that PCGP's additions to Table A.2-6 in Appendix A.2 of Resource Report 2 will provide DEQ with the level of detail regarding maintenance prescriptions as well as road improvements needed to ensure the use of existing access roads will protect water quality.

First, the road segments presented in the table PCGP references in its response (i.e., Table A.2-6) include only those segments within 100 feet of a water body. DEQ is requesting that PCGP's inventory evaluate all existing access roads hydrologically connected to water bodies. The use of an arbitrary distance of 100 feet

			does not provide DEQ reasonable assurance that PCGP's proposed measures will protect water quality. In AIR-1, DEQ requested the use of a model such as the Geomorphic Road Analysis and Inventory Package (GRAIP) to inventory roads for surface erosion, gully risk, and landslide risk. Using an analytical tool such as GRAIP is a more objective approach rooted in knowledge gained from evaluating the impact of roads on water quality. GRAIP can also identify road segments hydrologically connected to water bodies. To develop its Certification Decision, DEQ will not accept PCGP's focus on only roads within 100 feet of water bodies and a listing of qualitative BMPs in the proposed updated table without the following information: • Objective and quantitative support using a model (e.g., GRAIP or comparable model approved by DEQ) to identify the need for BMPs on road segments hydrologically connected to water bodies. • Engineering designs and their technical support addressing the concerns identified employing this model or analytical tool. • A plan requested in DEQ's *Section 401 Water Quality Certification Post-Construction Stormwater Management Plan Submission Guidelines* identifying where these BMPs are located on the landscape, their proposed design, and technical support accompanying this design. Finally, PCGP's response to Comment 36 does indicate that PCGP will propose and, once approved, use an analytical model such as X-DRAIN to evaluate siting alternatives for roads and their potential impact to water quality. This is particularly important for the construction of access roads of significant length in locations with steep slopes, unstable slopes, and erosive soils such as Temporary Access Road 101.70 between Mile Posts 101 and 102 discussed in more detail in DEQ's review of PCGP's response to Comment 26 and 27.
37	Please provide an evaluation of compliance with water quality standards if Jordan Cove Energy Project and Pacific Connector Gas Pipeline will use dredged material in the construction of facilities in uplands and drainage from this dredge material will discharge to waters of the state. This request is to expand upon the Portland Sediment Evaluation	The management of water quality during the construction of the LNG Terminal, APCO 2, and Kentuck, where dredge material characterized in the referenced 2016 PSET letters, will be addressed in respective 1200-C permits. As noted above, JCEP and PCGP are currently preparing respective 1200-C application materials and anticipate submitting	DEQ anticipates PCGP's response in Q4 2018.

	Team's assessment (PSET Letters, January 19, 2016) that considered these constructed upland facilities to be outside federal Clean Water Act jurisdiction for the dredged material suitability determination. However, upland constructed facilities using dredged material are not outside the effects considered in a 401 Water Quality Certification of a FERC application for the construction of a gas pipeline.	applications to DEQ in Q4 2018.	
38	Please provide a post-construction stormwater management plans addressing DEQ's *Section 401 Water Quality Certification Post-Construction Stormwater Management Plan Submission Guidelines* for North Point Workforce Housing Project noted in the Part 1, Section 404 Permit Application, Attachment F, Portland Sediment Evaluation Team Letters, Section 404 Permit Application. (If this site is not going to be used for the North Point Workforce Housing, please provide the post-construction stormwater plans for the proposed uses.) In addition, please provide the results of the Phase II	The location of workforce housing has changed from the North Spit (a.k.a. APCO Sites 1 and 2) to the South Dunes site to minimize overall project impacts. The nature of existing soil and groundwater conditions for South Dunes has been characterized in a report titled Data Gaps Investigation Report which was provided to ODEQ in August 2018. JCEP is currently preparing a 1200-Z permit application for the LNG terminal which will include South Dunes and anticipates submitting to ODEQ in Q4 2018.	DEQ anticipates PCGP's response in Q4 2018.

	environmental assessments evaluating the potential for contaminated soils summarized in the "FEIS, Section 4.3.1.3 (Soil Limitations) as noted in these PSET Letters.		
39, 40, 41, 43	Comment 39: The 401 Water Quality Submittal package provides insufficient information concerning the dredging operations for the Marine Slip, Access Channel, and Material Offloading Facility. DEQ used a copy of Resource Report 1 (Section 1.5.5.2) for the development of an environmental Impact Statement to obtain general information on the dredging operation. To direct the reader to additional information, this resource report references to the Dredge Material Management Plan and Resource Report 7 (Section 7.3.2.5). These two additional references provide few details regarding the water pollution control practices in the Marine Slip and Access Channel dredging operations. In compliance with OAR 340-041-0007(1) and -0036, please provide for DEQ review and approval a detailed pollution control plan for constructing the Access Channel and Marine	Additional details regarding the construction of the Marine Slip, Access Channel and Material Offloading Facility is provided in the following areas: • Construction Methodology: Part 1, Attachment A.1 of the 404-10 Application (included as Appendix M of the 401 Water Quality Package, issued to ODEQ on 2/6/18). • Dredge Disposal Location at Roseburg Forest Products: Enclosures 19 - 22 of Part 1, Appendix N-5 of the 401 Water Quality Package issued to ODEQ on 2/6/18. • Section 2.1.1.2, Dredging and Shore Protection at 2-21 - 2-26 of the Applicant Prepared Draft Biological Assessment (APDBA), Submitted 9/14/18. • Sections 3.5.1.3 and 3.5.4.3, Turbidity Effects from Dredging in Coos	**Summary Statement: DEQ anticipates JCEP will submit additional dredging information, including a pollution control plan, in Q1 2019. Please incorporate responses to the questions in the following section in JCEP's pollution control plan.** As JCEP is developing the advanced engineering details regarding dredging execution for Q1 2019, DEQ is providing JCEP with several examples of the questions that arose during DEQ's review of its Section 401 Water Quality submittal and the references JCEP provided in its response to Comments 39, 40, 41, and 43. The information provided in JCEP's response does not change DEQ's request in AIR-1 for a detailed pollution control plan for constructing the Access Channel and Marine Slip. Additionally, in JCEP's response to Comment 43, JCEP must provide information concerning the characterization of dredged material that JCEP proposes to use as fill in various locations. In developing additional information for Q1 2019. DEQ requests JCEP provide this information to ensure that dredged material used as fill does not contaminate the identified disposal sites and lead to pollutant discharge to waters of the state via decant water. In reviewing the recently provided references, DEQ is unable to locate Enclosures 19-22 of Part 1 (Appendix N-5 of the 401 Water Quality Package) that JCEP references in its response to Comment 39, 40, 41, and 43. The references JCEP provided in its response do not provide the detailed pollution control plan requested in AIR-1. To ensure compliance with Oregon's turbidity standard (OAR 340-041-0036), JCEP must demonstrate in the pollution control plan requested in Comment 39 that "all practicable turbidity controls have been applied" during JCEP's dredging activities. JCEP's information in the references noted in its response provide a conceptual approach to minimize turbidity and other pollutant discharges. JCEP has not fully developed the details of all its proposed controls and this creates uncertainty regarding their efficacy. For example, PCGP's proposed pollution control plan for dredging must clearly identify: • The type of pollution controls JCEP will use including its design and specifications. • The specific applications for these controls. • The specific location where JCEP will employ these controls relative to sensitive sites as well as other landscape features (e.g., drainage pattern, vegetation, etc.). • The maintenance schedule for each control. • A monitoring plan for evaluating the efficacy of all proposed controls and compliance with the turbidity standard.

	Slip that provides at least the following information: • A detailed description of the sequencing of all construction dredging activities associated with the in-water Marine Slip construction, Access Channel construction, and Material Offloading Facility construction. <u>Comment 40</u>: • A site map of these construction actions and location of all structural controls to protect water quality. The site maps must include the following information: o A delineation of the areas in the Marine Slip that Jordan Cove will dry excavate and dredge. o Please include the pollution controls for the dry excavation activities in response to the request above in an Erosion and Sediment Control Plan for a NPDES 1200-C Permit Application. o The location of the natural earthen berm	Bay on North American Green Sturgeon at 3-316 – 3-320) of the APDBA, Submitted 9/14/18. • Section 3.5.4.3, Turbidity Effects from Dredging in Coos Bay on Oregon Coast Coho Salmon at 3-522 – 3-525 of the APDBA, Submitted 9/14/18. Further advanced engineering details regarding dredging execution will be provided to ODEQ in Q1 2019.	For example, the Construction Methodology in Part 1 (Attachment A.1) of JCEP's submittal notes the following: *To the extent feasible, dredging of the access channel and slip will be performed with a CS dredge to minimize turbidity.* *The hydraulic dredge transport pipeline for hydraulic transportation of excavated materials (including the decant water return line) will follow the shoreline of the site of the Roseburg Forest Products chip loading facility and will not result in additional land disturbance.* *At all points along the pipeline route where the slurry pipeline could rupture and the contents could potentially enter the waters of Coos Bay, secondary containment will be provided around the slurry pipeline.* *Eelgrass and estuarine habitat disturbances resulting from the pipeline will be minimized by spanning these eelgrass areas or avoidance through the use of temporary structures or floats.* *Material removed by the hydraulic CS dredges will be sent via a submerged and/or floating pipeline to approved disposal sites, where dewatering would occur.* *Dredged or other excavated material will be placed on areas having stable slopes, and will be prevented from eroding back into waterways and estuarine wetlands.* This information raises the following questions for DEQ that must be addressed in a detailed pollution control plan as DEQ develops its Certification Decision: • When a Construction Suction (CS) dredge is not feasible, what other dredge will JCEP use as an alternative? • What control(s) will JCEP use to minimize pollutant discharge when using various dredging equipment? What are the designs and specifications for these controls? How and where will JCEP employ these controls? How will JCEP monitor their effectiveness for complying with the turbidity standard? • What controls – including designs and specifications – will JCEP use to prevent a spill from the hydraulic dredge transport pipeline? Where specifically will JCEP locate these controls on the landscape? What is their containment capacity? Is this capacity sufficient for anticipated spills? Does JCEP have contingency controls to protect sensitive resource should the proposed containment fail?

	separating the upland area of the Marine Slip that Jordan Cove will dry excavate from the remaining portion of the Marine Slip adjacent to the bay that Jordan Cove will dredge. o The location of the in-water dredging for the Access Channel and Material Offloading Facility. o The location of the slurry/hydraulic transport pipeline(s) for the transportation of the dredged material. o The location of all containment systems and/or spill response materials. <u>Comment 41</u>: • A construction dredging plan providing the following: o Dredging schedule for the Marine Slip, Access Channel, and Material Offloading Facility. o Type (e.g., cutter-suction dredging) and number of dredging plants that Jordan Cove		• What controls does JCEP propose as a contingency should the control for spanning the eelgrass and estuarine habitat fail? • If JCEP uses temporary structures or floats to minimize eelgrass and estuarine habitat disturbances, what are these structures/floats, what are their designs and specifications? Does JCEP have contingency controls should the temporary structures/floats fail? • What is the secondary containment including its designs and specifications for the submerged and/or floating pipeline for material removed by the hydraulic CS dredges? • Where is the specific location of the containment system for the placement of dredge material including information on key landscape features such as drainage patterns and the location of freshwater and estuarine wetlands, freshwater streams, salt-tolerant and non-salt tolerant vegetation? Where is the drainage system and the discharge points for decant water? Is the decant water saline or non-saline? What are the receptors for this decant water? For example, in JCEP's response, JCEP refers DEQ to Section 2.1.1.2 (Dredging and Shore Protection) from the Applicant Prepared Draft Biological Assessment for additional information. The draft Biological Assessment notes the following: *Dredging and Shore Protection* *For the capital dredging, about 5.7 million cubic yards (mcy) of material would be removed to create the slip basin and access channel. Of this, about 1.4 mcy would be dry excavated and about 4.3 mcy would be wet dredged. It is proposed that excavated and dredged material be distributed between Ingram Yard, the Roseburg site, the South Dunes site, and the Kentuck Project site.* *During the "fresh water" construction phase of the slip about 2.2 mcy of material would be dredged in the pocket behind a temporary construction berm. During the "salt water" construction phase of the slip, about 0.7 mcy (slip and berm) of material would be dredged during removal of the temporary construction berm and finish dredging of the marine slip, of which about 0.3 mcy may be used for the Kentuck Project. It is also possible that the 0.3 mcy required to facilitate the Kentuck Project could be sourced from the salt water dredge taken from the access channel between the FNC and the proposed LNG Terminal marine slip. A total of about 1.4 mcy of material would be dredged from the bay during construction of the access channel.*

	will use during the dredging of the Marine Slip, Access Channel, and the Material Offloading Facility. o A description of water pollution controls (operational controls, structural such as floating turbidity curtain etc.) that Jordan Cove will use in dredging and transporting dredged material. o Detailed spill response procedures including all emergency shut-off procedures and procedures for a spill associated with the hydraulic transport pipeline. o A description of all operational and structural water pollution controls for breaching and removing the natural earthen berm noted in Section 1.5.5.4 of the Jordan Cove's Resource Report 1. o A dredging monitoring plan for DEQ review and approval to evaluate the		*The northern slip face would be armored after the slip is dredged but before the earthen barrier berm is removed. The barrier berm would remain unarmored, because it would be removed during the later stages of slip construction.* *The estimated excavated and dredged material volumes and their proposed placement location are summarized in table 2.1.1-1 and further discussed in subsequent sections below.* This information raises the following questions for DEQ that must be addressed in a detailed pollution control plan as DEQ develops its Certification Decision: • Where specifically are the disposal sites for the dredged material deposited in the following locations: o Ingram Yard Site. o Roseburg Site. o South Dunes Site. o Kentuck Project Site. o And all other sites. • How will JCEP manage the fresh and/or saline decant water if discharged from these sites to the surrounding landscape? • How will the management of the decant water comply with Oregon's biocriteria (OAR 340-041-0011) if this decant water is discharged to waters of the state such as fresh or estuarine wetlands? • What specific controls will JCEP use to remove the temporary construction berm to ensure compliance with the Oregon's turbidity standard (OAR 340-041-0036) and how will JCEP monitor compliance with this standard? • What controls will JCEP use to prevent no more than a ten percent increase in turbidity when the temporary construction berm is removed and JCEP dredges the Access Channel? • Where specifically will JCEP locate the structural controls during the dredging of the Access Channel? In the development of AIR-1, DEQ reviewed the information related to the dredging of the Marine Slip, Access Channel, and Material Offloading Facility in the Dredge Material Management Plan. This information also does not provide DEQ with the level of detail to evaluate the efficacy of JCEPs proposed practices to ensure compliance with the turbidity standard. For example, this plan identifies the Ingram Yard as a disposal site for the dredge material as follows:

	effectiveness of all proposed controls. Comment 43: In compliance with OAR 340-041-0007(1) and -0036, please provide for DEQ review and approval a detailed water pollution control plan presenting all practicable operational and structural control techniques that Jordan Cove Energy Project will employ when constructing the Material Offloading Facility east of the opening for the slip at the Liquefied Natural Gas Terminal. Please include in this plan a characterization of the fill material Jordan Cove will use to construct this facility that evaluates this fill material for contamination.		*Section 4.4.4 Ingram Yard* *Disposal Methods* *Excavated and dredged material from the slip and access channel will be transported to the site in dump trucks. Material will be placed and compacted to meet project specifications. Additionally, hydraulically dredged material may be transported via pipeline and discharged within temporary containment berms, allowing material to settle and dewater. The berms will be constructed using existing on-site material initially, followed by incoming dredge material. The disposal methodology will be similar to that listed in Section 4.4.1 above. Decant water will be returned to the dredge as needed pending final design.* *Availability* *The Ingram Yard disposal site is within the JCEP project area and, therefore, availability of the site for dredged material disposal can be confirmed. JCEP also has access to the Roseburg Site and will manage the placement of material at this site.* The sampling of information in this plan raises the following questions for DEQ that JCEP must address in a detailed pollution control plan: • Will JCEP include the access roads for the dump trucks hauling dredged material and any needed erosion and sediment controls in the plan required for a NPDES 1200-C Permit? • Will JCEP place dredged material from a pipeline conveying dredged material to Ingram Yard and, if so, will JCEP provide secondary containment for this pipeline conveying dredged material? • Where will JCEP locate the containment berms for decanting water from dredged material? How will JCEP manage decant water from dredging to protect non-salt or salt tolerant vegetation in fresh and estuarine wetlands and water ways to comply with the Oregon's biocriteria (OAR 340-041-0011)? The above questions represent a sample of the detailed information DEQ is seeking from JCEP as it develops a detailed pollution control plan for DEQ's review and approval during the development of a Certification Decision.

42	• A maintenance dredging plan providing the following: o A site map containing the following: ▪ The location of all areas Jordan Cove will dredge. ▪ The location of the slurry/hydraulic transport pipeline(s) for the transportation of the dredged material. ▪ The location of all containment systems and/or spill response materials. o Dredging schedule. o Type (e.g., cutter-suction dredging) and number of dredging plants that Jordan Cove will use during the maintenance dredging. o A description of water pollution controls (operational controls, structural controls such as floating turbidity curtain etc.) that Jordan Cove will use and the location of all structural controls to minimize the migration	The JCEP Project detailed in the 404-10 application encompasses the dredging required for the Project (Appendix M of the 401 Water Quality Package, submitted to ODEQ on 2/6/18). Any future maintenance dredging activities will be requested under a separate 404-10/401 permit application and will be subject to a separate certification from ODEQ for compliance with section 401 of the CWA, if and when, such activities are required.	Maintenance dredging for the slip and access channel is estimated at 115,000 cy every three years for the first 10 years of operation and about 160,000 cy every five years thereafter. DEQ expects JCEP to apply for and receive authorization from the Army Corps of Engineers and section 401 water quality certification from DEQ prior to undertaking maintenance dredging activities.

	of turbid water from maintenance dredging activities, ○ Detailed spill response procedures including all emergency shut-off procedures and procedures for a spill associated with the hydraulic transport line. ○ A dredging monitoring plan for DEQ review and approval to evaluate the effectiveness of all proposed controls		
44	DEQ will perform this review upon the receipt of information requested above. In addition to these requests for information, please provide to DEQ an application for an Individual Industrial Water Pollution Control Facility Permit for the proposed discharges of the hydrostatic testing wastewater. Please provide the location of each point of discharge. If Jordan Cove Energy Project or Pacific Connector Gas Pipeline expects to discharge washwater to the ground from vehicle and equipment washing, please provide an application for a Water Pollution Control Facility Individual Permit for these	PCGP is currently preparing a Water Pollution Control Facility permit application for hydrostatic test water discharges during the construction of the pipeline and will submit to ODEQ in Q4 2018. PCGP is also preparing a 1200-C permit application for the construction of the pipeline. PCGP anticipates submitting the application to ODEQ in Q4 2018. The Erosion Control and Revegetation Plan (ECRP) provides details for equipment cleaning in Section 12.4 (pdf page 499 in Attachment A to Appendix B to Part 2 of the JPA) and a BMP typical for	**Summary Statement: PCGP cannot use an NPDES 1200-C General Permit and any plan associated with this stormwater permit to cover the discharge of wash water during pipeline construction. In the section below, DEQ includes a strategy for PCGP to manage wastewater discharges during pipeline construction in compliance with state rules. State rules for developing a Certification Decision require that PCGP's submittal demonstrate compliance with the effluent limitations of the NPDES 1200-C Permit. In the section below, DEQ identifies three potential wastewater discharges from PCGP's proposed actions that will require wastewater permit(s).** NPDES 1200-C Permit does not allow discharge of wastewater to waters of the state or to land. The NPDES 1200-C General Permit contains the following condition from Schedule A.6: *6. Prohibited Discharges* *Discharges of the following are not authorized by this permit:* *a. Wastewater from washout and cleanout of stucco, paint, form release oils, curing compounds and other construction materials;* *b. Fuels, oils, or other pollutants used in vehicle and equipment operation and maintenance;* *c. Soaps or solvents used in vehicle and equipment washing.* *d. Concrete truck wash-out, hydro-demolition water, and saw-cutting slurry.*

	discharges. Please provide the location of each point of discharge.	these types of operations as depicted and described in Drawing 3430.34-X-0020 in Attachment C to the ECRP). Note #8 in the drawing states, "Water used for cleaning shall not be allowed to flow into any waterbody, wetland or irrigation canal/ditch."	To manage the following discharges in compliance with state rules and permit requirements, PCGP must seek coverage for these discharges under a separate application for a Water Pollution Control Facility Individual Permit: • Hydrostatic test water • Vehicle and Equipment wash water • Trench dewatering DEQ is currently researching the feasibility of covering these three discharges under one WPCF Individual Permit.
45	DEQ will perform this review upon the receipt of information requested elsewhere in this matrix. In addition to these requests for information, please provide a copy of the results from the first phase (i.e., desktop data review with maps) of the Shallow Groundwater Study (Revised August 24, 2017 by GeoEngineers) showing suspected locations of shallow groundwater along the pipeline right-of-way. Please expand the maps proposed in this study to include suspected locations of shallow groundwater along the proposed route for the 25 miles of Temporary or Permanent Access Roads. When complete, please provide the results from the implementation of the subsurface exploration plan proposed for phase two of this study with an analysis of how the construction and permanent right-of-way will impact	The purpose of this plan was to aid pipeline design to account for buoyancy in areas of shallow groundwater. Please see the ECRP for how trench dewatering in shallow groundwater areas will be filtered and released for infiltration to minimize offsite sedimentation.	**<u>Summary Statement</u>: DEQ provides the rationale for the information requested below. As discussed in DEQ's review of PCGP's response to Comment 44, PCGP will need to submit a WPCF Permit Application to cover the trench dewatering discharge.** As noted in DEQ's review matrix from AIR-1, the intent of DEQ's Comment 45 is to determine compliance with OAR 340-048-0042(2)(e) when reviewing PCGP's proposed activities. The goal of DEQ's review is to determine if PCGP's proposed actions have the potential to modify groundwater quality and how these potential modifications affect surface water quality. Given the presence of Temperature Total Maximum Daily Loads and the influence of the pipeline's construction on compliance with these TMDLs, DEQ has concerns regarding PCGP's approach to mitigate the capture of shallow groundwater in the trench for the pipeline. DEQ will need this information to determine compliance with OAR 340-048-0042(2) (e.g., Section 303 of the Clean Water Act). In its response to Comment 45, PCGP indicates that the purpose of the Shallow Groundwater Study was to aid in pipeline design to account for buoyancy in areas of shallow groundwater. PCGP submitted this study in its 401 Water Quality Certification package to support the certification of the pipeline's construction and operation. When studies are included in a submittal, DEQ expects these studies to encompass water quality concerns in addition to, for example, pipeline stability concerns noted in PCGP's response. Both are important, and PCGP must address both in its submittal package. PCGP's referral to the submittal's Erosion Control and Revegetation Plan does not provide DEQ with sufficient detail to evaluate PCGP's effort to mitigate the capture of shallow groundwater during pipeline construction. DEQ requires the following information from PCGP: • Please provide a copy of the results from the first phase of the Shallow Groundwater Study showing suspected locations of shallow groundwater along the pipeline right-of-way. • Indicate if these areas of suspected shallow groundwater are in areas where PCGP proposes Temporary and Permanent Access Roads and, if so, propose mitigation measures to manage shallow groundwater.

	shallow groundwater as well as the construction of any proposed new roads. Moreover, please propose practices for how Pacific Connector Gas Pipeline will avoid, minimize, and, if necessary, mitigate the impacts identified in the Shallow Groundwater Study noted above.		• Provide an analysis demonstrating that the evapotranspiration losses from PCGP's two proposed mitigation approaches will not be significant to affect surface water quality (i.e., temperature) and will not require a third mitigation option such as discharging to an underground injection control device. • Identify PCGP's criteria for using the proposed mitigation measure of filter fabric/hay bales and the mitigation measure using a filter bag. • Provide the specific location for where PCGP will site all trench-dewatering measures. • Provide performance standards for mitigation measures to avoid overflow, prevent runoff, etc. In further reviewing PCGP's submittal, DEQ also has concerns about compliance with Oregon Water Rights Law and Division 33 rules (OAR 690-033) to administer this statute. As discussed above in DEQ's review of PCGP's response to AIR-1, DEQ is concerned that PCGP's proposed trench dewatering approach may cause landslides on unstable slopes by its effect on soil pore pressure depending on its location of discharge. To develop a Certification Decision, DEQ needs the following information from PCGP: • Please provide the geo-engineering analysis indicating that the discharge from the trench dewatering measure will not cause a landslide/debris flow when these measures are located above or on unstable landscape features such as headwalls, Areas of Potential Rapidly Moving Landslide Hazard, mapped landslides, steep slopes (greater than 30%), and highly erosive soils. Additionally, PCGP must submit a Water Pollution Control Facility Individual Permit Application to DEQ to cover the discharge from trench dewatering as required by OAR 340-045-0015(1)(a). DEQ considers this groundwater seepage into the pipeline's trench wastewater once it contacts one or more of the following: • Sediment from trench construction and potential pollutants (heavy metals such as arsenic, nutrients). • Pollutants arising from construction operations (e.g., oil and grease, welding slag, chemical coatings, etc.).
46	Please provide signed Land Use Compatibility Statements from Coos, Douglas, Jackson, and Klamath Counties.	Signed LUCS from Coos, Douglas, Jackson, and Klamath Counties will be provided in Q4 of 2018.	DEQ is awaiting PCGP's response.

Other References

Benda, L.E., Veldhuisen, C., Miller, D.J., and Rodgers-Miller, L. 2000. *Slope instability and forest land managers: A primer and field guide*. Seattle, Wash., Earth Systems Institute, 74 p.
Elliot, William J. and Laurie M. Tysdal. 1999. Understanding and Reducing Erosion from Insloping Roads. Journal of Forestry. 97(8):30-34
Hearn, G.J. 2011. Slope Engineering for Mountain Roads. Geological Society Engineering Geology Special Publication No. 24

Oregon
Kate Brown, Governor

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March 11, 2019

Derik Vowels
Jordan Cove LNG, LLC
Consultant, Lead Environmental Advisor
111 SW 5th Ave.,
Suite 1100,
Portland OR 97204

Re: Additional Information Request – Waterbody Crossings
Jordan Cove Energy Project (FERC Project No. CP17-494)
Pacific Connector Gas Pipeline (FERC Project No. CP17-495)
U.S. Army Corps of Engineers (Project No. NWP-2017-41)

Dear Mr. Vowels:

The Oregon Department of Environmental Quality is currently reviewing an application from Jordan Cove LNG, LLC for Clean Water Act Section 401 water quality certification for a Section 404 permit from the U.S. Army Corps of Engineers necessary for construction of the Jordan Cove Energy Project and Pacific Connector Gas Pipeline.

Section 401 of the Clean Water Act bars federal agencies from issuing a license or permit for an action that may result in a discharge to Oregon waters without first obtaining water quality certification from DEQ. DEQ anticipates Jordan Cove's construction and operation will require authorizations from multiple federal agencies, including but not limited to a Section 404 permit from the U.S. Army Corps of Engineers and authorizations from the Federal Energy Regulatory Commission pursuant to the Natural Gas Act. DEQ is conducting a comprehensive section 401evaluation of the project's direct, indirect and cumulative effects on water quality. DEQ expects to develop a single certification decision based on this comprehensive evaluation of the project that will apply to the Corps and FERC decisions on the project.

DEQ is processing the applications pursuant to Section 401 of the Clean Water Act, 33 United States Code §1341, Oregon Revised Statutes 468B.035 through 468B.047, and DEQ's certification rules found in Oregon Administrative Rules 340, Division 048. To certify the project, DEQ must have a reasonable assurance that the proposed project, as conditioned, will comply with Sections 301, 302, 303, 306 and 307 of the Clean Water Act, Oregon water quality standards, and any other appropriate requirements of state law.

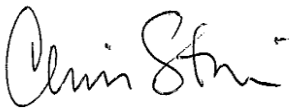
DEQ is reviewing the application submitted Feb. 6, 2018, by David Evans and Associates, Inc. on behalf of Jordan Cove. The information described in the attachments to this correspondence is necessary to complete DEQ's analysis of the project's compliance with applicable standards. Please provide a schedule for a complete response to this additional information request. Please forward your responses to:

Christopher Stine
Oregon Department of Environmental Quality 165
East 7th Avenue, Suite 100
Eugene, Oregon 97401

You may reference previously submitted documents to support your responses to the requests in Attachment A.

DEQ may request additional information as necessary to complete its analysis and fulfill its obligations under state and federal law.

If you have any questions, please contact me directly at 541-686-7810, or via email at stine.chris@deq.state.or.us.



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FERC Dockets: CP17-494-000, CP17-495-000

ATTACHMENT A

Jordan Cove Energy Project / Pacific Connector Gas Pipeline Additional Information Request

Horizontal Directional Drilling

1. In September 2017, Pacific Connector submitted Horizontal Directional Drilling Feasibility Analysis reports for the proposed Coos Bay East Crossing and Coos Bay West Crossing. According to the reports, the "conclusions should be considered preliminary pending completion of a subsurface exploration program." Please provide a status update on geotechnical drilling and a schedule for finalizing the reports.
2. Pacific Connector describes two options (i.e., single Horizontal Directional Drilling Option and a Dual Horizontal Directional Drilling Option) to accomplish the Coos Bay East Horizontal Directional Drilling crossing. DEQ expects the design criteria supporting the selected procedure will be presented in the final design report. DEQ requests Pacific Connector address the following considerations in determining their proposed methodology.

   Single Horizontal Directional Drilling Option

   a) The single option places the bottom tangent at elevation -190 feet mean sea level. Pacific Connector expects the underlying geology at this depth will consist of competent bedrock, which is deemed critical to the feasibility of the single option. Please describe whether alternate design measures would allow use of the single option if the geotechnical investigation concludes the underlying geology does not consist of competent bedrock.

   Dual Horizontal Directional Drilling Option

   A final Horizontal Directional Drilling design report that proposes the Dual Horizontal Directional Drilling Option should address the following issues.

   b) The dual option relies on a shared tie-in workspace located in a tidal flat area south of Glasgow Point. Describe how the workspace will be isolated from open water during Horizontal Directional Drilling installation.

   c) The likelihood of inadvertent surface returns of drilling fluid is highest near entry points where drilling pressures can exceed the shear strength and pressure from overburden soils. Describe what special contingency measures will be employed to contain drilling fluids in this inter-tidal environment.

   d) What is the proposed final depth below surface of the installation at the tie-in location? What measures, if any, are proposed to ensure the pipeline remains buried for the life of the project?

   e) Describe the scope of open-water activities such as inter-tidal dredging for barge access to the shared tie-in workspace.

   f) Describe what procedures Pacific Connector will employ to avoid, minimize, or

mitigate the effects of this option on water quality.

3. The Horizontal Directional Drilling Mud Contingency Plan states a berm may be built around the drilling site and hay bales or silt fences may be placed on the river side of the drilling area. Because inadvertent surface returns may reasonably be expected near entry locations, Pacific Connector should identify measures that will be employed and maintained to contain fluids during installation.
4. Inadvertent fluid returns to surface waters are unacceptable. Pacific Connector must develop and implement an Horizontal Directional Drilling plan to continuously monitor engineering conditions during installation and provide for a rapid response in the event fluid loss is confirmed or suspected. The plan should establish procedures to monitor drilling pressure, fluid circulation, pilot hole location, axial loads, visual monitoring or other parameters deemed appropriate to interpret formational or surface loss of drilling fluid.

Waterbody Crossing Plans

The effects of pipeline construction across waterbodies can affect the physical, biological and chemical integrity of the aquatic environment. Pacific Connector will utilize dry open cut methods (fluming, dam and pump, or diverted open cut) on most of the proposed 326 waterbody crossings. Open cutting of streambeds can have direct, indirect and cumulative effects on water quality, habitat and stream hydrology. Changes to channel geometry may cause streams to reestablish equilibrium. These actions can increase sedimentation, reduce water quality, decrease habitat complexity and modify channel hydrology. Because, the effects of open trench waterbody crossings can propagate upstream, downstream, and laterally these impacts, may not be confined to the project area.

Waterbody crossing plans must describe site-specific construction procedures that Pacific Connector will undertake at each proposed crossing. The plans should identify the proposed crossing methodology, dewatering procedures, dewatering discharge sites, spoils placement locations, mobilization and demobilization, and monitoring procedures. The plans should be developed in consideration of local characteristics such as anticipated flow, local, geology, gradient, sensitive environmental conditions, slope stability at dewatering discharge points or other environmental factors that may influence the design and implementation of waterbody crossings. Pacific Connector should describe procedures for crossings that may require unique or challenging procedures (e.g., blasting consolidated rock). Last, site-specific crossing plans must address the removal of dams, dewatering locations, temporary bridges, or other temporary construction elements and include procedures to avoid or minimize sediment mobilization or turbidity

Waterbody crossing plans must also describe site-specific plans to restore each of the proposed waterbody crossings. Each plan must include sufficient local-scale information to provide an accurate baseline assessment of pre-construction environmental and ecological conditions to guide the design of the post-construction restoration. Each stream restoration plan must contain

site-specific designs and specifications to ensure PCGP fully mitigates the impact of open cut trenching in each stream and protects the beneficial uses. The data generated from the information requested below will support the development of site-specific waterbody crossing plans.

To develop a waterbody crossing plan for each open trench cut stream crossing, Pacific Connector must document and use the site-specific field data described below.

Hydraulic Assessment

Pacific Connector must conduct a hydraulic analysis on each proposed waterbody crossing. Site-specific information of local discharge is required to demonstrate that proposed pumping and fluming designs can adequately bypass anticipated flows. Pre-development local hydrology must also be characterized to inform stream restoration actions.

Pacific Connector should conduct the analysis using one of the following methods:

- Rational Method (for drainages up to 200 acres)
- NRCS Peak Flow Method using HydroCAD (for drainages larger than 200 acres)
- USGS StreamStats for Oregon

The hydraulic analysis should provide the following information:

- Drainage area above each proposed crossing
- Peak flow estimate at the time of construction
- Bankfull width, stage, and corresponding discharge
- Average gradient within the temporary crossing easement
- Mean two-year, five-year and 10-year discharge and velocity at the proposed crossing

Based on the hydraulic conditions at each crossing, Pacific Connector should confirm the design pumping capacity of the proposed fluming or pumping bypass system can sufficiently transfer maximum anticipated flows around the work area. Pacific Connector should further describe alternate or contingency methods in the event field conditions prevent successful dewatering. Waterbody crossing plans must include engineering data to support design criteria of proposed conveyance structures based on gradient, bypass length and anticipated flow.

Pacific Connector must also measure bankfull width, stage, and corresponding discharge at each crossing. Recognizing the bankfull width at each crossing is critical in designing and implementing restoration plans that maintain the geomorphological function of the stream segment.

Topographic Survey of Stream Channel

Restoring a stream's natural form and function requires a topographic survey of the pre-construction stream channel and floodplain form.[1] Pacific Connector provided this information for the South Umpqua Number 2 River crossing. However, this information is lacking for other crossings involving open trench cutting. This survey information will assist in the reconstruction of the natural stream channel. At minimum, Pacific Connector should include in each topographic survey a longitudinal survey of the stream profile, top and bottom of banks, and the top and bottom floodplain slopes. This topographic information should also include geometric data downstream and upstream of the pipeline crossing to assist the restoration design and to identify potential interactions with adjacent reaches.

Stream Function Assessment

Trenched waterbody crossings can alter stream function in ways that negatively affect aquatic habitats and ecosystems. Potential effects may include modified stream channel geometry, reduced habitat complexity, reduced streambank stability, impaired benthic production and increased sedimentation.

Pacific Connector must conduct a pre-construction ecological assessment of each waterbody crossing using the methodology presented in Stream Function Assessment Method for Oregon Version 1.0.[2] SFAM was developed jointly by EPA and Oregon Department of State Lands. The method provides a scientifically supported rapid assessment tool for gathering information on the functions and values associated with wadeable streams that may be subject to regulatory jurisdiction under Section 404 of the Clean Water Act and Oregon's Removal-Fill Law.

The assessment is needed to establish a pre-development ecological baseline and to inform site-specific practices necessary to mitigate the environmental effects of the action. Pacific Connector can also use this assessment method for post-construction monitoring of Pacific Connector's stream restoration actions over time.

More information can be found at:
https://www.oregon.gov/dsl/WW/Pages/Resources.aspx#assessment.

Biological Assessment

Oregon water quality rules prevent discharges to waters of the state that may reduce support for beneficial uses or cause changes in residential biological communities. To establish pre-construction conditions, Pacific Connector must conduct a benthic macroinvertebrate assessment to comply with the Biocriteria water quality standard (Oregon Administrative Rule 340-0410-0011). Benthic communities form the basis for food webs that support aquatic life and are susceptible to changes in sedimentation. Oregon DEQ has developed procedures to characterize

[1] Yokum, S.E. 2018. Guidance for Stream Restoration. Technical Note TN-102.4. National Stream Aquatic Ecology Center. USDA Forest Service

[2] Stream Function Assessment Method for Oregon Version 1.0. June 2018. U.S. Environmental Protection Agency and Oregon Department of State Lands. EPA 910-D-18-001.

the health of benthic communities to comply with this standard. Using procedures found in Methodology for Oregon's 2018 Water Quality Report and List of Water Quality Limited Waters,[3] Pacific Connector must perform pre-development benthic surveys using to the PREDictive Assessment Tool for Oregon (PREDATOR). The results of the PREDATOR surveys will enable DEQ to evaluate the direct, indirect, and cumulative effects of the action caused by stream channel modification, habitat loss, sedimentation or other potential project effects.

Streambed Material Assessment

Pacific Connector must characterize bed material composition at each trenched waterbody crossing. Substrate composition is critical to stream hydrology and provides interstitial refuge for egg incubation. Characteristics can vary considerably based on gradient, stream channel geometry, watershed hydrology and other factors. For this reason, site-specific knowledge of local bed material characteristics are necessary to inform restoration and mitigation actions following construction.

For streambeds characterized by unconsolidated substrates, Pacific Connector must conduct a pre-construction quantitative assessment of substrate material. The assessment should address the particle size, sorting, vertical variability and distribution of material.

Open cut trenches in bedrock-dominated stream channels are susceptible to upstream propagation of knickpoints created by joints in the stream's bedrock.[4] Knickpoint propagation in bedrock-dominated streams can cause changes in stream geomorphology and, potentially, barriers to fish migration. Pacific Connector should describe in detail how bedrock-dominated stream channels will be restored to prevent the creation of a joint in the bedrock that leads to the formation and propagation of a knickpoint in these channels.

Habitat Assessment

Naturally occurring material such as large wood and boulders provide gravel recruitment, cover for juvenile fish, thermal refugia, and hydraulic control. Pacific Connector must conduct a detail inventory of aquatic habitat features within the project area of each proposed crossing. Habitat features identified during this predevelopment inventory should be used to ensure restoration efforts result in no net loss of habitat function or complexity. In its Stream Crossing Risk Analysis document, Pacific Connector provides only general descriptions to address, for example, the reinstallation of boulders to maintain an existing bed profile and cascade/pool morphology during the stream restoration process. However, Pacific Connector's habitat assessments must capture such habitat features as noted above in sufficient design detail so that the construction contractor has clear direction in site-specific drawings to restore these habitat

[3] Methodology for Oregon's 2018 Water Quality Report and List of Water Quality Limited Waters, November 2018. Oregon Department of Environmental Quality: https://www.oregon.gov/deq/FilterDocs/ir2018assessMethod.pdf.
[4] Selander, Jacob. 2004. Processes of Knickpoint Propagation and Bedrock Incision in the Oregon Coast Range. Department of Geologic Sciences. University of Oregon

features during the stream restoration process.

Water Quality

Site-specific water body crossing plans should address the following water quality issues at each crossing proposed:

- Oregon DEQ may issue a section 401 water quality certification that allows the numeric turbidity criteria to be exceeded provided all practicable turbidity control techniques have been applied. Please identify what engineering controls (e.g., settling, filtration, flocculation, etc.) are proposed to reduce turbidity in streams during mobilization and removal of construction equipment.

- Describe procedures to backfill trenches in a manner that maintains predevelopment streambed material and habitat function. For example, backfilling procedures must clearly address how Pacific Connector will prevent the restored stream flow from moving completely into the subsurface of restored streambed material and creating a fish passage barrier. Additionally, crossing plans should clearly describe how fill material will be placed to prevent streambed and bank scour, sedimentation, and channel modification.

- For trench dewatering structures, please identify how sediment and fines removed from the isolated work area will be permanently managed following work completion.

Comments

1. Appendices C.2 and D.2 (Stream Fluming Procedures, Dam and Pump Procedures) of Resource Report 2 state, "Turbidity sampling will be conducted during all . . . crossings in accordance with the Stormwater Pollution Prevention Plan." DEQ cannot find the Stormwater Pollution Prevention Plan in Pacific Connector's application submittal to evaluate the proposed turbidity sampling.
2. Fluming and dam and pump procedures rely on upstream and downstream dams to isolate temporarily work areas during construction activities. Oregon's fish passage requirements found in Oregon Revised Statute 509.585 prevent activities that impede the volitional movement of fish. Pacific Connector should describe how proposed fluming and dam and pump procedures will comply with Oregon fish passage law.
3. Stream Classifications in Table A.2-2 in Resource Report 2 reference methods established by Oregon Department of Forestry and the Northwest Forest Plan. DEQ's biologically based numeric criteria are based on fish distribution maps developed by Oregon Department of Fish and Wildlife. Please consult with ODFW to identify fish use and classifications at the proposed waterbody crossing locations.
4. Appendix C.2 of Resource Report 2 (Fluming Procedures) indicates that scrap metal pipe may be used to construct flumes and that pipes may be steam-cleaned to remove oil and grease. Please identify on the crossing plans where Pacific Connector will discharge this wash water. DEQ expects that Pacific Connector will apply for and obtain coverage under the appropriate permit (i.e., either Water Pollution Control Facility or National

Pollutant Discharge Elimination System) based on the proposed activity.

5. Figure 8 of Appendix C.2 of Resource Report 2 (Fluming Procedures) illustrates procedures to divert stormwater runoff from the construction easement into the isolated stream section. Please note that NPDES 1200-C General Permit does not authorize the discharge of stormwater to waterways. Pacific Connector must control runoff from upland work areas to prevent discharge to stream channels.

Oregon
Kate Brown, Governor

Department of Environmental Quality
Western Region Eugene Office
165 East 7th Avenue, Suite 100
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TTY 711

March 13, 2019

Derik Vowels
Jordan Cove LNG, LLC
Consultant, Lead Environmental Advisor
111 SW 5th Ave., Suite 1100,
Portland OR 97204

Re: Additional Information Request #4
Jordan Cove Energy Project (FERC Project No. CP17-494)
Pacific Connector Gas Pipeline (FERC Project No. CP17-495)
U.S. Army Corps of Engineers (Project No. NWP-2017-41)

Dear Mr. Vowels:

The Oregon Department of Environmental Quality is currently reviewing an application from Jordan Cove LNG, LLC for Clean Water Act section 401 water quality certification for a Section 404 permit from the U.S. Army Corps of Engineers necessary to construct the Jordan Cove Energy Project and Pacific Connector Gas Pipeline (collectively, "the Project"). DEQ is evaluating the land use compatibility statements and application materials related to land use to determine if they meet state law requirements.

DEQ requests the following supplemental information on land use.

1. Provide a map of the Pacific Connector Project showing zoning designations and overlays applicable to the project.
2. In Resource 8, Jordan Cove provided maps with zoning designations. Have these maps been update to reflect any changes to land use and to include supplemental project updates (i.e., worker park and ride locations, rock apron to arrest channel mitigation, eelgrass donor and embayment areas, and mitigation sites)? See Jordan Cove Energy Project, Resource 8, Figures 8.1-3a and -3b.
3. Provide an exhibit that identifies the specific provisions of the local land use plans and implementing regulations applicable to the activity and a discussion of the potential direct or indirect relationship to water quality of each finding or land use provision per OAR 340-048-0020(2)(i).
4. Provide updated analyses for capability determinations that date back to 2015. Pacific Connector provided analyses in 2015 with updates in the Jan. 2019 LUCs submission for Klamath, Jackson, and Douglas County for the non-coastal zone. No updates were provided for Douglas County coastal zone or Coos County. The updated analyses need to affirmatively review whether any project changes since 2015 would affect those prior analyses.
5. Provide analyses for capability determinations for Coos County for Jordan Cove.

Please provide a schedule for a complete response to this supplemental information to:

Mary Camarata
Oregon Department of Environmental Quality
165 East 7th Avenue, Suite 100
Eugene, Oregon 97401

If you have any questions, please contact me directly at (541) 687-7435, or via email at camarata.mary@deq.state.or.us.

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FERC Dockets: CP17-494-000, CP17-495-000

Oregon State Agency Comments
Jordan Cove Energy and Pacific Connector Gas Pipeline Project
Draft Environmental Impact Statement
(Docket # CP17-494-000 and CP17-495-000)
July 3, 2019

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Oregon State Agency Comments
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Introduction

The State of Oregon reviewed and analyzed the draft Environmental Impact Statement ("draft EIS") to ensure it provides a full and fair disclosure of the significant environmental impacts that may result from the siting and operation of the Jordan Cove LNG export terminal facility and the Pacific Connector Pipeline project (hereinafter collectively referred to as, the "Project") as well as the comparative impacts resulting from a reasonable range of alternatives to the proposed action. *See* 40 C.F.R. § 1502.1; *see also* 40 C.F.R. § 1502.1 ("An environmental impact statement is more than a disclosure document. It shall be used by federal officials in conjunction with other relevant material to plan actions and make decisions."). Accordingly, Oregon provides the following general comments as well as specific comments and recommendations from each state agency with technical expertise in its respective program area to assist the Federal Energy Regulatory Commission ("Commission") refine this draft EIS to meet the National Environmental Protection Act's ("NEPA's") requirements.

1. ***The Commission and Other Agencies May Not Rely Upon Insufficiently Detailed and Unenforceable Mitigation in this Draft EIS to Justify its Conclusion the Proposed Action Will Result in "Less-Than-Significant" Impacts***

Agencies relying upon this draft EIS to support their decisions must ensure that mitigation measures alleged to be reducing impacts to less-than-significant levels, see Section 5.1 ¶1, are mandatory, specifically described, and fairly evaluated. *See* 40 C.F.R. §§ 1502.14(f) (requiring discussion of possible mitigation measures in alternatives), 1502.16(h) (requiring discussion of mitigation in addressing environmental consequences of proposed action). The U.S. Supreme Court has stated that "omission of a reasonably complete discussion of possible mitigation measures [] undermine[s] the 'action-forcing' function of NEPA. Without such a discussion, neither the agency nor other interested groups and individuals can properly evaluate the severity of the adverse effects." *Robertson v. Methow Valley Citizens Council*, 490 U.S. 332, 352 (1989). If proposed mitigation measures are unenforceable, or lack monitoring commitments or sufficient resources to assure performance, the Commission has no reasonable basis to conclude that such measures will effectively reduce environmental impacts. *See* 40 C.F.R. §§ 1505.2(c), 1508.25(b). Here, the Commission has represented to decision-makers and the public in this draft EIS that mitigation measures will effectively reduce environmental impacts to less-than-significant levels. As identified in the specific state agency comments that follow, the Commission has not sufficiently identified or analyzed possible mitigation measures to support that conclusion in the draft EIS, and must address the agencies' recommended mitigation measures in the final EIS.

Significantly, the draft EIS states at various points that the Commission's staff finds that adverse environmental impacts would be reduced to less-than-significant levels with the implementation of the applicants' proposed mitigation measures and additional measures recommended by Commission staff. *See* draft EIS, section 5.1. Thus, the Commission is *relying upon* the applicant's proposed mitigation to conclude that the disclosed significant environmental impacts will be reduced to less-than-significant levels. But the Commission staff only recommends a generic condition requiring the applicants to "follow the…mitigation measures described in its applications and supplemental filings (including responses to staff data requests)." *See* draft EIS, section 5.2.1. This generic condition, without any further identification as to what those mitigation measures might be, is insufficient to establish that relied upon mitigation are mandatory, specifically described, and fairly evaluated. Any mitigation that support's the Commission's conclusion that significant environmental impacts have been reduced to less-than-significant levels should be specifically listed as required measures in Section 5.2. This omission is misleading to the public and decision-makers, who would have no recourse to require the applicant to comply with its *proposed* mitigation measures disclosed and analyzed in this draft EIS if such measures are not incorporated as required conditions in the Commission's authorizations.

Further, Council on Environmental Quality ("CEQ") regulations clarify that mitigation includes "[r]ectifying the impact by repairing, rehabilitating, or restoring the affected environment." 40 C.F.R. § 1508.20(c). However, the draft EIS does not disclose whether sufficient resources are available to ensure that if an accident were to occur involving a LNG vessel that there would be sufficient funds available to carry out the necessary environmental clean-up. At present, a law may limit the liability of vessel owners to the amount of its cargo. *See* Owner's Liability Act, 46 U.S.C. 181, *et seq*. To appropriately mitigate the potential significant environmental impacts, the State urges the Commission to ensure additional resources are available to correct any resulting environmental damage from a vessel accident. We recommend FERC require the applicant to enter an agreement with each LNG vessel owner intending to berth at the terminal in which such vessel owner waives its right to (or attempt to) limit its liability under that law and to require the vessel owner provide the applicant at all times sufficient evidence that the vessel's protection and indemnity association has agreed to cover the vessel as a member of the association against the liabilities pertaining to such an accident. This is a common method in the industry of helping to ensure sufficient funds are available to respond and correct environmental disasters, and we urge the Commission to require this reasonable mitigation measure.

2. The Commission and Other Agencies Relying Upon this Draft EIS Must Correct the Deficiencies Related to Missing or Inaccurate Data and Scientific Analysis, as well as Unconsidered Environmental Impacts of the Proposed Action and Alternatives

NEPA requires that the Commission utilize "high quality" information and accurate scientific analysis," see 40 C.F.R. § 1500.1(b), and ensure "professional integrity, including scientific integrity, of the discussions and analyses" within an EIS. 40 C.F.R. § 1502.24. Oregon state agencies have identified numerous errors and deficient analysis in the draft EIS, as specifically set forth below, which the Commission must address to appropriately disclose and analyze potential significant environmental impacts to comply with that mandate.

In addition, NEPA requires disclosure and analysis of *all* direct, indirect, and cumulative environmental impacts of the proposed action. *See* 40 C.F.R. §§ 1508.7, 1508.25(c), 1502.16. Further, NEPA specifically defines "indirect effects" as those that are "caused by the action and are later in time or farther removed in distance,

but are still reasonably foreseeable." 40 C.F.R. § 1508.8(b). Accordingly, the State urges the Commission to resolve the following deficiencies in this draft EIS relative to undisclosed and unconsidered environmental impacts of the proposed action. First, the draft EIS fails to describe and assess the potential impacts on Oregon's lands and state waters due to air contaminant emissions, including greenhouse gas ("GHG") emissions, from the transportation of LNG during natural gas exploration, collection, distribution, and export to markets outside the United States. The draft EIS refers to these impacts as "'life-cycle' cumulative environmental impacts associated with the entire LNG process," but nonetheless states such impacts are "outside the scope" of the draft EIS. See draft EIS, Section 1.4. This conclusion is legally incorrect. For example, as the Ninth Circuit Court of Appeals has explained relevant to the U.S. Army Corps' similar error in construing NEPA, "while it is the development's impact on jurisdictional waters that determines the scope of [that federal agency's] *permitting authority*, it is the impact of the permit on the environment at large that determines [a federal agency's] NEPA responsibility." *See Save Our Sonoran v. Flowers,* 408 F.3d 1113, 1122 (9th Cir. 2005) (emphasis added).

Notably, the U.S. Supreme Court held that when "an agency has no ability to prevent a certain effect due to its limited statutory authority over the relevant actions, the agency cannot be considered a legally relevant 'cause' of the effect" so as to require that agency to disclose such effects in its EIS. *Dep't of Transp. v. Pub. Citizen,* 541 U.S. 752, 770 (2004). Here though, in contrast, there is no doubt that if FERC did not approve the siting of the Project the "life-cycle" emissions associated with this Project would not be emitted into the atmosphere – no Presidential authorization allows for LNG to be extracted, sent to Coos Bay, and then shipped overseas. *See id.* at 769. Further, this is not a case where the effect is a "risk" as opposed to an effect on the physical environment. Instead, there is a direct (not attenuated) causal connection between FERC's approval of the LNG export facility and the impact on the physical environment (e.g., emissions) resulting from transportation, for example, of that LNG from where it is extracted, to Oregon, and then overseas. *See Metro. Edison Co. v. People Against Nuclear Energy*, 460 U.S. 766, 774-75 (1983). Moreover, the State is not asking for more than a "reasonably thorough discussion" and disclosure of the air contaminant emissions that may result as a consequence of this approval – even if the extent of such emissions are uncertain. *See S. Coast Air Quality Mgmt. Dist. v. FERC*, 621 F.3d 1085, 1094-95 (9th Cir. 2010) (holding that an EIS's reasonable, even though limited, disclosure and analysis of emissions resulting from burning of natural gas supplied by a pipeline subject to FERC's approval "contain[ed] a reasonably thorough discussion of the environmental impact of its actions, based on information then available to it."); 40 C.F.R. § 1502.22 (addressing how an agency should handle incomplete or unavailable information in an EIS). We urge the Commission to adhere to the CEQ guidance released on December 18, 2014, which describes how the Commission should consider the effects of GHG emissions and climate change in their NEPA reviews.

The State also notes that even with respect to the proposed project's direct emissions, the DEIS only quantifies such emissions. It does not attempt to assess their significance, despite readily available tools to do so. Draft EIS, pages 4-804 through 4-807. This approach violates NEPA (*See* 40 C.F.R. §§ 1508.7, 1508.25(c), 1502.16), as two of FERC's Commissioners have acknowledged. Commissioners Glick and LaFleur have each described the inadequacies in FERC's approach to greenhouse gas emission analysis under NEPA in recent decisions on LNG terminal and natural gas pipelines pursuant to Sections 3 and 7 of the Natural Gas Act. *See*, *e.g.*, Concurrence of Commissioner Cheryl A. LaFleur on Port Arthur LNG, LLC and PALNG Common Facilities Company, LCC, dated April 18, 2019; Commissioner Richard Glick Dissent Regarding Freeport LNG Development, L.P. and FLNG Liquefaction 4, LLC, dated May 16, 2019. Commissioner Glick writes in his dissent:

> As an initial matter, identifying the consequences that those emissions will have for climate change is essential if NEPA is to play the disclosure and good government roles for which it was

> designed. By contrast, the Commission's approach in this order, where it states the volume of emissions as a share of national emissions and then describes climate change generally, tells us nothing about the "'incremental impact' that these emissions will have on climate change." It is hard to fathom how hiding the ball on a project's climate impacts is consistent with NEPA's purpose.

(Internal citations omitted). The State agrees, and urges the Commission to fully analyze the significance of GHG emissions resulting from the proposing project, as required by NEPA.

Secondly, with respect to natural gas price increases, this indirect effect will likely result in socioeconomic impacts on the State and beyond; therefore, this EIS should disclose and analyze such impacts to inform decision-makers and the public that these consequences have been considered. Although CEQ regulations state that "economic or social effects are not intended by themselves to require preparation of an environmental impact statement," in this instance the economic and social effects are interrelated with the impacts on the physical environment such that this EIS should address all such impacts. *See* 40 C.F.R. § 1508.14. This draft EIS should, therefore, disclose the potential increase in domestic natural gas prices and resulting socioeconomic impacts, including the number of affected landowners and land values reduced due to the pipeline or terminal's location. Further, since the applicant has made several claims regarding the positive potential economic effects of its planned terminal and pipeline, the Commission should assure itself that no potentially adverse economic effects negate those claims if it will rely upon this draft EIS to justify its conclusion as to whether this terminal is in the public interest or whether the construction and operation of the pipeline is required by the present or future public convenience or necessity. *See* Natural Gas Act, 15 U.S.C. §§ 717b(a), 717f(e); *see also* Certification of New Interstate Natural Gas Pipeline Facilities, 88 FERC ¶ 61,227, at 27 (Sept. 15, 1999) ("The strength of the benefit showing will need to be proportional to the applicant's proposed exercise of eminent domain procedures."). *See generally* 40 C.F.R. § 1500.1(b).

3. The Commission and Other Agencies Relying Upon this Draft EIS Must Not Foreclose Consideration of Reasonable Alternatives to the Proposed Action

The State of Oregon recommends that the Commission abandon its practice of issuing conditional orders before receiving authorizations delegated to the State under the Clean Water Act (CWA), the Coastal Zone Management Act (CZMA), and the Clean Air Act (CAA). The State urges the Commission to await such authorizations to avoid violating NEPA's procedural provisions, see 40 C.F.R. 1502.14[1], as well as the substantive provisions of the above-listed federal laws. *See* 33 U.S.C. § 1341(a); 16 U.S.C. § 1456(c)(3)(A); 42 U.S.C. § 7416; 16 U.S.C. § 1536(d); *see also* 40 C.F.R. § 402.09. NEPA mandates that federal agencies "[r]igorously explore and objectively evaluate all reasonable alternatives" as well as to "[i]nclude appropriate mitigation measures not already in the proposed action or alternatives." 40 C.F.R. § 1502.14(a),(f). However, if the Commission issues a conditional approval (after completion of this NEPA process and) before completion of necessary state authorizations under the CWA, CAA, and CZMA, see 5 U.S.C. § 717b(d), this practice will foreclose the formulation of an alternative that an Oregon state agency may deem necessary when carrying out its delegated authority under those laws. It is unwarranted to assume that the Oregon Department of Environmental Quality's ("ODEQ's") review in accordance with CWA section 401, for example, will lead to a determination that the proposed Project will not violate state water quality standards (or alternatively to assume that any

[1] Or alternatively, requiring FERC to issue a supplemental EIS, see 40 C.F.R. 1502.9(c)(1).

exceedance may be effectively mitigated) without potentially necessitating a change in routing of the pipeline. We urge the Commission not to circumvent ODEQ's review that may disclose a potentially significant environmental impact that this draft EIS did not disclose and consider. In short, the Commission's completion of its NEPA process before issuance of the state's necessary authorizations under the CWA, CAA, and CZMA will foreclose the consideration of reasonable alternatives to the proposed action raised as part of, for example, the Department of Land Conservation and Development's consistency review under the CZMA. We urge the Commission to negate the necessity of supplementing its EIS or otherwise violating NEPA by conditionally approving this Project before the relevant state agencies complete their on-going authorization processes.

In light of the Commission's NEPA obligations, the State of Oregon urges the Commission to consider carefully each of Oregon's comments and recommendations and to modify specified sections of the draft EIS to address cited concerns, and where appropriate, to incorporate agency recommendations as required conditions in the Commission's authorizations to support the Commission's conclusion that significant environmental impacts have been reduced to "less-than-significant levels."

Oregon Department of Energy

Siting Division

Contact: Sean Mole, 503-934-4005, sean.mole@oregon.gov

The Oregon Department of Energy expects FERC and the applicant to meet Oregon siting standards found in Oregon Revised Statute and Administrative Rules. These include Oregon's CO2 emissions standards, the provision of a legally enforceable retirement bond for the project, and a comprehensive discussion of, and preparation for, emergency situations that could endanger humans and the environment from construction and operation activities.

Citation	Issue Identification	Recommended Solution
1.5.2.3 p. 1-31	Oregon Energy Facility Siting Council Site Certificate is not listed as a required State permit, prior to construction of the terminal. The applicant had applied for an exemption to Site Certificate as a jurisdictional energy facility, on June 14, 2018.	Include Energy Facility Siting Council Site Certificate as a necessary State Agency Permit and Approval under Oregon Department of Energy, should the applicant propose designed electrical generation components which are EFSC jurisdictional.
2.1.1.5 p. 2-7 Supplemental Resource Report 13 p. 5	Electrical Systems design changes are not addressed in the dEIS. According to Jordan Cove's supplemental Resource Report 13, the facility will reduce its on-site power production by more than 50% (down to 24.4 MW from 50.4 MW). This change is not detailed in the dEIS. Without the detailed engineering description of the power production components, in this case the 3 Steam Turbine Generators, there is uncertainty about whether or not Jordan Cove will require an Oregon Department of Energy Site Certificate. Should the engineering design require components which are subject to Oregon Energy Facility Siting	Include condition requiring the applicant to obtain an EFSC Site Certificate should the final electrical design incorporate jurisdictional components.

	Council jurisdiction, the facility may find itself in violation of ORS 469.320(1) concerning the construction and operation of energy facilities.	
Appendix F.10, 1.6 Termination and Abandonment p. 22	The dEIS describes terms for termination and abandonment of the Pacific Connector Gas Pipeline, but not for the Jordan Cove terminal. The described terms for termination and abandonment do not contemplate involuntary abandonment on the part of the applicant and/or subsequent owners.	Require abandonment planning for the LNG terminal as well as the pipeline. Previous iterations of this project have addressed this issue by entering into an MOU with Oregon Department of Energy which requires the procurement of financial bonds in the amount commensurate with the needs to return the site to its useful, non-hazardous condition, which existed prior to construction. These requirements ensure that taxpayers are not "footing the bill" to acceptably retire these facilities in the event that Pembina is fiscally incapable or otherwise disinclined to do so.

Emergency Preparedness

Contact: Deanna Henry – 503-032-4429 – deanna.henry@oregon.gov

EPAct – Section 311: According to the EPAct, the Governor of a state in which an LNG terminal is proposed is to designate an appropriate state agency to consult with the Commission. The state agency should provide the FERC with an advisory report on state and local safety concerns, within 30 days of the FERC's notice of an application for an LNG terminal, for the Commission to consider prior to making a decision.

Designated Authority: In January 2006, Governor Ted Kulongoski designated the Oregon Department of Energy (ODOE) as the lead state agency to: 1) ensure Oregon's interests are protected in the federal siting process of LNG terminals in Oregon, 2) develop LNG emergency preparedness program to protect Oregonians from an LNG incident, and 3) provide safety and security oversight throughout the life of an LNG terminal sited in Oregon.

State Established LNG Emergency Preparedness Standards - Memorandum of Understanding: In 2006, there were five proposed LNG terminals in Oregon. Four terminals were proposed along the Columbia River along with the Jordan Cove Terminal near Coos Bay. Each developer had a different interpretation of what was "adequate" LNG emergency preparedness and the appropriate approach to coordinating with state and local agencies. As a result, ODOE worked with the Governor's Office, Oregon Department of Justice, and the Oregon State Fire Marshall's Office to develop minimum requirements for LNG safety, security, and emergency preparedness and coordination in Oregon. Each LNG developer is required to enter into a Memorandum of Understanding (MOU) with ODOE demonstrating the company's commitment to meet state established standards for LNG security and emergency preparedness at their proposed facility.

Fort Chicago entered into the MOU with ODOE for the Jordan Cove LNG Terminal in February 2009. The MOU was updated under Veresen ownership in June 2014. ODOE is currently working with Pembina to update the MOU for the Jordan Cove LNG Terminal, associated waterway, and pipeline system in 2019.

History of Jordan Cove Safety, Security, and Reliability Coordination: Beginning in April 2006, ODOE began working with Fort Chicago to address the safety, security, and reliability issues involving the proposed Jordan Cove LNG Terminal. Fort Chicago conducted quarterly meetings workshops, training, tabletops, and exercises with federal, state, and local agencies that would be affected by the construction and operation of the Jordan Cove LNG Terminal. This included the U.S. Coast Guard (USCG), ODOE, Oregon State Fire Marshall's Office (OSFM), Oregon State Police (OSP), Port of Coos Bay, Coos County Emergency Management, Coos County Sheriff's Office, Coos County Public Health, city of Coos Bay, city of North Bend, and various local volunteer fire districts.

Fort Chicago conducted quarterly meetings, workshops, training, tabletops, and exercises to identify and vet risks, response measures, resource needs, and coordination protocols among the agencies and Fort Chicago in response to LNG incident scenarios at the proposed Jordan Cove LNG Terminal. After three years of coordination and collaboration, the December 2009 Jordan Cove Emergency Response Plan (ERP) and Resource List identifying gaps required to implement the ERP were developed. The Jordan Cove ERP and Resource List were approved unanimously in concept by the state, local emergency response organizations, and USCG on the condition that the 2009 draft ERP and Resource List would be working documents and updated as needed. An approved Jordan Cove ERP and the Resource List are essential to the development of a Cost Share Agreement between Jordan Cove and impacted state and local agencies as required by FERC.
Developers Fort Chicago and then Veresen continued to work collaboratively with federal, state and local agencies to revise and refine the Jordan Cove ERP and Resource List.

Current Evaluation of Jordan Cove Safety, Security and Reliability Coordination: Safety, security, and reliability coordination for the Jordan Cove LNG Terminal stalled significantly in May 2017 under new Jordan Cove owner Pembina. Pembina proposed a new Jordan Cove ERP, which resembled a template oil spill response plan, without consultation with key federal, state, and local agencies dismissing more than 10 years of work collaboration amongst all entities. This ERP was unanimously rejected by federal, state, and local agencies, which Pembina rescinded.

After a rough start and staff re-organization, Pembina reset its approach and are taking initial steps to get back on track. This includes working with ODOE to: 1) update the original Jordan Cove ERP for review by all agencies; 2) update the Jordan Cove MOU on LNG safety, security, and emergency preparedness for the terminal and waterway; and 3) develop a MOU on safety, security, and emergency preparedness along the pipeline. In addition, Pembina provided ODOE an assurance letter committing to work with all key federal, state, and local agencies on safety, security and emergency preparedness planning and coordination involving the terminal, waterway, and pipeline.

However, much work remains for Pembina to regain the momentum lost over the last two years. Pembina must reinstate the quarterly planning and coordination meetings and re-engage with key federal, state, and local emergency response agencies that have been a part of the project safety, security, and emergency response planning process for over a decade. In addition to ODOE, this includes the U.S. Coast Guard (USCG) Sector Columbia River, USCG Sector North Bend, Oregon State Fire Marshal's Office, Oregon State Police (OSP), Oregon State Marine Board, Port of Coos Bay, Coos Bay Sheriff's Office, Coos County Emergency Management, Coos County Public Health, Bay Area Hospital, Southwestern Oregon Community College, City of Coos Bay Police and Fire, City of North Bend Police and Fire, Charleston Fire, North Bay Fire, and Hauser Fire. This team of agencies

have been meeting quarterly on Jordan Cove safety, security, and emergency preparedness planning and coordination since April 2006.

Pembina will also need to re-engage and re-establish planning and coordination meetings with key agencies along the pipeline route. This includes, but is not limited to Bureau of Land Management, U.S. Forest Service, ODOE, OSP, Oregon Department of Forestry, and local emergency management agencies and sheriff offices in Coos, Douglas, Jackson, and Klamath counties.

State Advisory Report and DEIS Safety, Security, and Reliability Concerns: The following comments address ODOE's safety and security issues for the State Advisory Report and specific DEIS comments on ODOE's safety, security, and reliability concerns for the Jordan Cove LNG terminal, waterway, and pipeline.

Overarching Concerns:

- Issue 1 – Pembina has not provided a construction phase emergency response plan or security plan for the terminal, waterway, and pipeline. This includes strategies to address the workforce population and housing. Project construction activities directly impact federal, state, and local emergency management and law enforcement agencies tasked with ensuring public safety and security in Coos, Douglas, Jackson, and Klamath counties.

  Recommended Resolution – As a condition of the certificate, require the applicant to provide federal, state, and local agencies a construction ERP and security plan for review, approval, and coordination prior to initial site preparation. Also as a condition of the certificate, require Pembina to enter into a Cost-Sharing Plan that contains a description of any direct cost reimbursements to each state and local agency with responsibility for security and safety during the construction of the LNG terminal, associated waterway, and pipeline system.

- Issue 2 – To protect public health and safety and ensure the safe and secure construction and operation of the Jordan Cove LNG terminal, waterway, and pipeline requires the full participation and coordination of federal, state, and local law enforcement, fire service, and emergency managements agencies with legal jurisdiction (USCG NVIC 01-2011). Pembina recently suspended funding to the Coos County Sheriff's Office (SO) preventing the SO from participating in Jordan Cove emergency planning activities. ODOE strongly encouraged Pembina to re-engage the Coos County SO. There is currently no resolution. The SO is the key local law enforcement agency with legal jurisdiction over the proposed Jordan Cove terminal, waterway, and the 46 mile section of the pipeline in Coos County. As a result, the participation of the Coos County SO is required to complete the development and implementation of the following documents: 1) Jordan Cove Emergency Response Plan (ERP), 2) Facility Security Plan, 3) LNG Carrier Transit Management Plan, and 4) Pipeline ERP and Security Plan.

  Recommended Resolution – As a condition of the certificate, require the applicant to enter into a Cost-Sharing Plan that contains a description of any direct cost reimbursements to each state and local agency with responsibility for security and safety at the LNG terminal and in proximity to LNG marine vessels that serve the facility as required by the natural gas act.

Specific Concerns:

Citation	Issue Identification	Recommended Resolution
Executive Summary, Conclusions, 1st Paragraph, Page ES-5	The DEIS concludes that constructing the Project would temporarily but significantly impact housing in Coos Bay. Issue: Impact to housing from construction would not only significantly impact house in Coos Bay, but North Bend, Charleston, and other nearby communities as well as the housing and campgrounds in Coos County.	Include language in the DEIS that accurately reflects the housing impacts. The DEIS should state that "constructing the Project would temporarily but significantly impact housing in Coos Bay, North Bend, Charleston, and surrounding cities. This includes housing and campgrounds in Coos County.
1.0 Introduction, 1.5 Permits, Approvals, and Consultations, Table 1.5.1-1, Page 1-23	Table 1.5.1-1 references ODOE's authority to furnish an advisory report on state safety and security issues to FERC regarding the Jordan Cove LNG terminal proposal and conduct safe operational safety inspections if the facility is approved and built. Issue: Table 1.5.1-1 does not include the state's minimum standards established for LNG safety, security, and emergency preparedness in Oregon at proposed LNG terminals, associated waterways, and pipeline systems. The state established standards were established by ODOE in consultation with the Governor's Office, the Oregon Department of Justice, and the Oregon State Fire Marshal's Office. As lead state agency designated by the Governor to oversee the safety, security, and emergency preparedness of the Jordan Cove LNG Terminal, associated waterway, and pipeline system throughout the operational life of the project, ODOE requires all applicants to enter into an Memorandum of Understanding (MOU) to meet the state established minimum standards for LNG safety, security, and emergency preparedness.	Include the following language to Table 1.5.1-1: - State established minimum standards for LNG safety, security, and emergency preparedness to "Authority/Regulation/Permit." - ODOE requires all applicants to enter into an MOU to meet state established minimum standards for LNG safety, security, and emergency preparedness to "Agency Action." - Pending to "Initiation of Consultations and Permit Status As a condition of the certificate, require the applicant to enter into an MOU with ODOE to meet state established minimum standards for safety, security and emergency preparedness for the Jordan Cove LNG Terminal, associated waterway, and pipeline system.
1.0 Introduction, 1.5.2.3 Oregon Department of Energy, Pages 1-31	The DEIS states that ODOE has been designated by the Governor of Oregon as the lead state agency to coordinate the review of proposed LNG projects by other state agencies and consult with FERC. Issue: The DEIS does not include ODOE's authority as lead state agency to provide oversight on all aspects of the development and implementation	Include language in section 1.5.2.3 that states "As lead state agency, ODOE provides oversight on all aspects of the development and implementation of safety, security, and emergency response plans and strategies of the proposed projects throughout the federal application process to the end of the

	of safety, security, and emergency response plans and strategies throughout the federal application process to the end of the operational life of the LNG terminal should FERC authorize the project. The DEIS does not include the state's minimum standards established for LNG safety, security, and emergency preparedness in Oregon at proposed LNG terminals, associated waterways, and pipeline systems. The state established standards were established by ODE in consultation with the Governor's Office, the Oregon Department of Justice, and the Oregon State Fire Marshal's Office. As lead state agency designated by the Governor to oversee the safety, security, and emergency preparedness of the Jordan Cove LNG Terminal, associated waterway, and pipeline system throughout the operational life of the project, ODOE requires all applicants to enter into an Memorandum of Understanding (MOU) to meet the state established minimum standards for LNG safety, security, and emergency preparedness.	operational life of the LNG terminal should FERC authorize the project." As a condition of the certificate, require the applicant to enter into an MOU with ODOE to meet state established minimum standards for safety, security and emergency preparedness for the Jordan Cove LNG Terminal, associated waterway, and pipeline system.
2.0 Description of the Proposed Action, 2.1.1.7 Marine Access Facilities, Materials Offloading Facility, Page 2-12	The DEIS states that the Marine Offloading Facility (MOF) would be constructed to receive components of the LNG terminal that are too large or heavy to be delivered by road or rail. The MOF would cover about 3 acres on the southeast side of the slip. Following construction, the MOF would be retained as a permanent feature of the LNG terminal to support maintenance and replacement of large equipment components. Issue: All construction activities, including the transportation of materials and personnel to Jordan Cove, directly impact the safety and security of the public. Jordan Cove has not provided an ERP or security plan for the construction phase for federal, state, and local emergency response agencies review and approval. The ERP and security plan for the construction phase must be validated by and coordinated with federal, state, and local emergency management, law enforcement, fire service, public health, and other key stakeholders tasked with ensuring public health and safety.	As a condition of the certificate, require the applicant to provide an ERP and a security plan for the construction phase prior to initial site preparation. The construction phase ERP and security plan must be coordinated with and approved by federal, state, and local agencies tasked with ensuring public health and safety. This includes a Cost-Sharing Plan identifying federal, state, county, and local resources needed to implement the construction ERP and security plan.
2.0 Description of the Proposed	The DEIS states that Jordan Cove proposes to construct a temporary workforce housing facility	As a condition of the certificate, require the applicant to provide a

Action, 2.1.1.10 Workforce Housing, Page 2-18	within the South Dunes portion of the LNG terminal site that could accommodate common facilities and 200 to 700 beds. Parking would be provided onsite, and shuttle buses would be provided to and from local communities to reduce traffic on the road network after working hours. After completion of construction and commissioning activities the entire facility would be decommissioned and removed from the site. Inadequate to address all of the construction workers required for the project. Issue: The DEIS concludes that constructing the Project would temporarily but significantly impact housing in Coos Bay. (Page ES-5). The workforce housing plan Jordan Cove proposed in this DEIS is inadequate to support the anticipated thousands of construction workers anticipated on site during the height of construction. Jordan Cove needs to provide a comprehensive housing plan that addresses the peak construction workforce and impacts on housing in Coos Bay, North Bend, Charleston, and other nearby communities as well as housing and camp ground in Coos County as a part of the construction phase ERP and security plans. The workforce housing plan and must be reviewed and approved by federal, state, and local agencies tasked with ensuring public health and safety.	comprehensive workforce housing plan that addresses the peak construction workforce and impacts on housing in Coos Bay, North Bend, Charleston, and other nearby communities as well as housing and camp ground in Coos County. The workforce housing plan will be part of ERP and security plans for the construction plan and must be reviewed and approved by federal, state, and local agencies tasked with ensuring public health and safety prior to initial site preparation.
2.0 Description of the Proposed Action, 2.4.1.2 Material Deliveries, Page 2-46	The DEIS states that the transportation of materials, supplies, and staff to the LNG terminal site would be accomplished via a combination of road, marine transport, and rail. Issue: All construction activities including the transportation of materials and personnel to Jordan Cove directly impacts the safety and security of the public. Jordan Cove has not provided an ERP or security plan for the construction phase for federal, state, and local emergency response agencies review and approval. The ERP and security plan for the construction phase must be validated by and coordinated with federal, state, and local emergency management, law enforcement, fire service, public health, and other key stakeholders tasked with ensuring public health and safety.	As a condition of the certificate, require the applicant to provide an ERP and a security plan for the construction phase prior to initial site preparation. The construction phase ERP and security plan must be coordinated with and approved by federal, state, and local agencies tasked with ensuring public health and safety. This includes a Cost-Sharing Plan identifying federal, state, county, and local resources needed to implement the construction ERP and security plan.

Table 2.6.3-1 Pacific Connector's Plan of Development, Appendix C: Blasting Plan, Page 2-68	Table 2.6.3-1 details Pacific Connector's Plan of Development. Appendix C states that the purpose of the Blasting Plan is intended to help ensure the safety of construction personnel, the public, nearby facilities and sensitive resources. Issue: Pacific Connector has not provided a Blasting Plan for federal, state, and local agency review and approval. Blasting hazards directly impact federal, state, and local agencies tasked to ensure public safety and security during the construction of the pipeline. As a result, blasting hazards should be included in the Emergency Response Plan for the pipeline for the construction phase.	As a condition of the certificate, require Pacific Connector to provide an ERP identifying blasting hazards and response measures to ensure the safety of construction personnel, the public, nearby facilities and sensitive resources. The pipeline construction ERP must be completed and provided to federal, state, and local agencies tasked with ensuring public safety and security along the pipeline route for review, approval, and coordination prior to the initial site preparation.
Table 2.6.3-1 Pacific Connector's Plan of Development, Appendix H: Emergency Response Plan, Page 2-69	Table 2.6.3-1 details Pacific Connector's Plan of Development. Appendix H states that the purpose of the Emergency Response Plan is to identify the standards and criteria that Pacific Connector would follow to minimize the hazards during pipeline operation resulting from a gas pipeline emergency in accordance with the Pipeline and Hazardous Materials Safety Administration's regulations in 49 CFR 192.615 and 192.617. Issue: Appendix H does not include an ERP that identifies standards and criteria that Pacific Connector would follow to minimize the hazards during pipeline construction. This includes hazards from blasting, landslides, fires, injuries, safety and security threats to construction workers and the public, and other emergencies threatening public safety and security along the pipeline route. Pacific Connector has not provided a pipeline ERP for construction or operation. Pipeline construction activities directly impact public safety and security. As a result, a comprehensive ERP for construction and operation must be developed and maintained throughout the life of the project in coordination with federal, state, and local agencies tasked with ensuring public safety and security along the pipeline route.	As a condition of the certificate, require Pacific Connector to provide a comprehensive ERP for pipeline construction and operation that identifies all potential hazards and response measures to federal, state, and local agencies tasked with ensuring public safety and security along the pipeline route for review, approval, and coordination prior to the initial site preparation.
Table 2.6.3-1 Pacific Connector's Plan of	Table 2.6.3-1 details Pacific Connector's Plan of Development. Appendix K states that the Fire Prevention and Suppression Plan describes the	As a condition of the certificate, require Pacific Connector to provide an ERP identifying fire hazards and

Development, Appendix K: Fire Prevention and Suppression Plan, Page 2-69	measure to be used by Pacific connector and its contractors to ensure that fire prevention and suppression techniques are carried out in accordance with federal, state, and local regulations. Issue: Pacific Connector has not provided a Fire Prevention and Suppression Plan for federal, state, and local agency review and approval. Fire hazards directly impact federal, state, and local agencies tasked to ensure public safety and security during the construction and operation of the pipeline. As a result, fire hazards should be included in the Emergency Response Plan for the pipeline for construction and operation.	response measures to ensure the safety of construction personnel, the public, nearby facilities and sensitive resources. The pipeline construction ERP must be completed and provided to federal, state, and local agencies tasked with ensuring public safety and security along the pipeline route for review and approval prior to the initial site preparation.
Table 2.6.3-1 Pacific Connector's Plan of Development, Appendix V: Safety and Security Plan, Page 2-70	Table 2.6.3-1 details Pacific Connector's Plan of Development. Appendix V states that the purpose of the Safety and Security Plan is to describe safety standards and practices that would be implemented to minimize health and safety concerns related to the construction of the pipeline project. Issue: Pacific Connector has not provided a Safety and Security Plan for the construction phase for federal, state, and local agency review, approval and coordination.	As a condition of the certificate, require Pacific Connector to provide an ERP identifying fire hazards and response measures to ensure the safety of construction personnel, the public, nearby facilities and sensitive resources. The pipeline construction ERP must be completed and provided to federal, state, and local agencies tasked with ensuring public safety and security along the pipeline route for review and approval prior to the initial site preparation. This includes a Cost-Sharing Plan that contains a description of any direct cost reimbursements to each state and local agency with responsibility for security and safety along the pipeline route.
4.13 Reliability and Safety, 4.13.1 Jordan Cove LNG Project, 4.13.1.1 LNG Facility Reliability, Safety, and Security Regulatory Oversight, Paragraph 3, Pages 4-698 – 4-702	The DEIS states that USDOT has the authority to enforce the federal safety standards for the location, design, installation, construction, inspection, testing, operation, and maintenance of onshore LNG facilities under the Natural Gas Pipeline Safety Act. In an MOU signed with FERC on August 31, 2018, USDOT agreed to issue a Letter of Determination (LOD) stating whether a proposed LNG facility would be capable of complying with location criteria and design standards contained in subpart B of Part 193. The LOD serves as one of the considerations for the	FERC should postpone its decision on whether to authorize or deny Jordan Cove a permit to proceed with construction until USDOT completes and issues its LOD. Upon completion of the LOD, FERC should allow adequate time for federal, state, and local agencies tasked with ensuring public health and safety to review and comment on the LOD prior to issuing the FEIS

	Commission to deliberate in its decision to authorize or deny an application *(Page 4-702, 1st paragraph, last sentence).* Issue: USDOT has yet to issue a LOD. Without USDOT's LOD, crucial reliability and safety information on the potential impacts of the facility design and operation on public health and welfare is unavailable to assist FERC in making a knowledgeable and accountable decision to authorize or deny Jordan Cove's application. In addition, without USDOT's LOD, federal, state and local agencies tasked with ensuring public health and safety are unable to complete a thorough assessment of whether the applicant accurately evaluated the potential incidents and safety measures incorporated in the design or operation of the facility that have direct impact on the safety of plant personnel and the surrounding public. As a result, safety and security strategies identified in the Jordan Cove ERP may not be sufficient	and issuing its decision on whether to authorize or deny a permit on this project. In addition, the incidents and safety measures incorporated in the design or operation of the facility directly impact the safety and security of facility personnel and the surrounding public. As a condition of the certificate, require the applicant to take into account LOD incident scenarios and safety measures in the development and implementation of the ERP and security plans for the Jordan Cove terminal, waterway, and pipeline.
4.13 Reliability and Safety, 4.13.1 Jordan Cove LNG Project, 4.13.1.4 LNG Facility Security Regulatory Requirements, Pages 4-710 – 4-711	The DEIS states that the security requirements for the proposed project are governed by 33 CFR 105, 33 CFR 127, and 49 CFR 193 Subpart J – Security, Title 33 CFR 105, as authorized by the MTSA, requires all terminal owners and operators to submit a Facility Security Assessment (FSA) and a Facility Security Plan (FSP) to the Coast Guard for review and approval before commencement of operations of the proposed Project facilities (page 4-710, first paragraph). Title 49 CFR 193 Subpart J also specific security requirements for the onshore components of LNG terminals, including requirements for conducting security inspections and patrols and liaison with local law enforcement officials (page 4-711, second paragraph). Issue: The DEIS does not include state security requirements identified in the ODOE MOU that the applicant must comply with if the project is authorized and constructed. The applicants FSA and FSP must also be reviewed, approved, and coordinated with federal, state and local law enforcement tasked with ensuring public safety and security for the LNG terminal, waterway, and pipeline.	Include language in section 4.13.1.4 that states the applicant must also comply with state established security requirements for the LNG terminal, waterway, and pipeline for construction and operation. As a condition of the certificate, require the applicant to comply with state established security requirements in the ODOE MOU for the LNG terminal, waterway, and pipeline for construction and operation. As a condition of the certificate, require the applicant to provide a FSA and FSP to federal, state and local law enforcement tasked with ensuring public safety and security for the LNG terminal, waterway, and pipeline. The FSA and FSP must be completed for review, approval, and coordination with law enforcement agencies prior to initial site preparation.

4.13 Reliability and Safety, 4.13.1 Jordan Cove LNG Project, 4.13.1.5 FERC Engineering and Technical Review of the Preliminary Engineering Design, Onsite and Offsite Emergency Response Plan, Page 4-753 – 4 -755	The DEIS states that as part of its application, Jordan Cove indicated that the Project would develop a comprehensive ERP with local, state, and federal agencies and emergency response officials to discuss the Facilities. Jordan Cove would continue these collaborative efforts during the development, design, and construction of the Project (Page 4-753, first paragraph, Onsite and Offsite Emergency Response Plan). The emergency procedures would provide for the protection of personnel and the public as well as the prevention of property damage that may occur as a result of incidents at the Project facilities. Issue: The DEIS only discusses Jordan Cove's intention to continue collaborative efforts with local, state, and federal agencies and emergency response officials during the development, design, and construction of the Project. However, the DEIS does not discuss the ongoing collaboration required with local, state, and federal agencies tasked with ensuring public safety and security during facility operation. The need for safety, security, and emergency response to incidents at the Jordan Cove terminal do not stop at the end of construction, but continues into operation and throughout the life of the project.	Include language in section 4.13.1.5 on the first paragraph under Onsite and Offsite Emergency Response Plan to state "Jordan Cove would continue these collaborative efforts during the development, design, construction, and throughout operations of the Project." As a condition of the certificate, require the applicant to develop and maintain a comprehensive ERP with local, state, and federal agencies tasked with ensuring public safety and security through the life of the project. This includes a Cost-Sharing Plan that contains a description of any direct cost reimbursements to each state and local agency with responsibility for security and safety at the LNG terminal and in proximity to LNG marine vessels that serve the facility, and along the pipeline route.
4.0 Environmental Analysis, 4.1 Geological Resources, 4.1.1 Jordan Cove LNG Project, 4.1.2.3 Seismic and Related Hazards, Page 4-1 – 4-30 November 6, 2017 DOGAMI Letter	ODOE shares the Oregon Department of Geology and Mineral Industries' (DOGAMI) concern regarding the possible deficiencies in the scientific and engineering analyses relating to geologic hazards in the DEIS. With the proposed Jordan Cove LNG Terminal located in the Cascadia tsunami inundation zone, ODOE strongly agrees with DOGAMI that it is critical that all geologic hazards are identified and mitigation measures approved before design and construction to ensure the protection of public health and safety. Issue: Jordan Cove has yet to address the scientific and engineering analyses deficiencies relating to geologic hazards raised in DOGAMI's November 6, 2017 letter. Additional site-specific geologic hazard evaluations to identify accurate risks and proper mitigation measures for the hazards are required to ensure public safety. This	As a condition of the certificate, require the applicant to meet with DOGAMI and ODOE to address and resolve issues raised in the November 6, 2017 letter prior to the end of this draft EIS comment period. As a condition of the certificate, require the applicant to provide the following assessments and hazards analysis prepared by a qualified licensed professional to DOGAMI for review and approval prior to initial site preparation: 1) Probabilistic seismic hazard assessment, which includes the ground motions and duration of

	information is critical for federal, state, and local agencies tasked with protecting public health and safety for the LNG terminal, waterway, and pipeline. The results and findings of these hazards analyses directly impact the planning, development and implementation of response and recovery strategies in the Jordan Cove Emergency Response Plan under development.	shaking for the terminal facilities and entire pipeline route using accurate and up-to-date date methods and data. 2) Comprehensive tsunami hazard analyses for the facility and surrounding areas. 3) Comprehensive liquefaction hazard analysis and mitigation design with supporting data. Comprehensive landslide hazards analysis, which includes co-seismic landslides and lateral spreads for the proposed facilities (including the pipeline) and surroundings.
2.11.1 JCEP-Final Resource Report 11, Page 56	Resource Report 11 (RR11) states that a distant earthquake in Alaska or Japan could result in a tsunami with a relatively long lead-time (12 to 24 hours). RR11 also states that all ships in Coos Bay, including an LNG carrier, would be directed to depart the harbor by the USCG Captain of the Port (COTP). LNG carriers at the LNG Terminal will be facing the basin entrance and Coos Bay and would be adequately manned, as required by the USCG, with the ability to get underway in a short time period while berthed. Therefore, the LNG carriers would be able to depart relatively quickly from the LNG Terminal and head out to sea in the event of a distant tsunami, in response to notice and instructions from the USCG COPT. This amount of time would be adequate for the terminal to stop loading operations and disconnect from the LNG vessel and use two tug boats already in the slip to counteract the forces placed on the LNG carrier hull by the arriving tsunami. If the LNG carrier is traversing in the channel during the tsunami, the tugs would also provide assistance against the force of the tsunami wave coming up the channel. Issue: Both the RR11 or the DEIS fails to sufficiently and accurately identify and mitigate tsunami impacts to the LNG terminal, navigational channel (other vessels and waterway traffic), LNG carrier, and the LNG berth from a Cascadia earthquake. The USCG Waterway Suitability Assessment (WSA) Validation Committee did not address tsunami impacts to	4) As a condition of the certificate, require the applicant to provide for DOGAMI review and approval a comprehensive tsunami hazard analysis, which includes Cascadia tsunami arrival times and distant tsunami hazards. This assessment must address tsunami impacts to the estuarine area surrounding the proposed modifications (e.g., dredged channel, construction modifications), document the analyses, data, assumptions, results, and proposed mitigations. The tsunami analysis is to be prepared by a qualified licensed professional.

	the LNG terminal, navigational channel, LNG carrier, or the LNG berth because it was beyond the scope of the WSA. DOGAMI established that it would take approximately 25-30 minutes for a large tsunami generated from the Cascadia earthquake to reach Coos Bay following the 3-5 minute shake. Additional site-specific tsunami evaluations to accurately identify risks and proper mitigation measures for tsunamis are required to ensure public safety. This information is critical for federal, state, and local agencies tasked with protecting public health and safety for the LNG terminal, waterway, and pipeline. The results and findings of these hazards analyses directly impact the planning, development and implementation of response and recovery strategies in the Jordan Cove Emergency Response Plan, LNG Carrier Transit Management Plan, and the LNG Carrier Emergency Response Plan under development.	

Oregon Department of Environmental Quality

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Citation	Issue Identification	Recommended Resolution
Section 1.5.1.6, P. 1-28	DEQ has the authority to approve or deny water quality certifications under section 401 of the CWA.	DEIS Section 5.1.3.2 states "the Project would not result in significant impacts on surface water resources." This conclusion is inaccurate and inconsistent with DEQ's recent review of the proposed project's impacts on state water quality. On May 6, 2019, DEQ denied without prejudice Jordan Cove's request for section 401 water quality certification for the U.S. Army Corps of Engineers' issuance of Clean Water Act Section 404 and RHA Section 10 permits. DEQ found that Jordan Cove failed to provide reasonable assurance that construction and operation of the Project would comply with applicable Oregon water quality standards, as described in the May 6, 2019, Evaluation and Findings Report, which DEQ incorporates in these comments in their entirety by this reference. (See Appendices C and D.) This EIS should be amended to include an accurate representation, analysis and conclusion regarding the direct, indirect, and cumulative impacts of the proposed project, and all similar, connected and cumulative actions, on the water quality of affected State waters.
Section 1.5.1.6	Section 401 of the Clean Water Act bars federal agencies from issuing a license or permit for an action that may result in a discharge to Oregon waters without first obtaining water quality certification from DEQ. DEQ anticipates Jordan Cove's construction and operation of the Project will require authorizations from multiple federal agencies, including but not limited to a Section 404 permit from the U.S. Army Corps of Engineers and authorizations from the Federal Energy Regulatory Commission (FERC) pursuant to the Natural Gas Act.	FERC requires Jordan Cove to apply for and DEQ to approve water quality certification under Section 401 of that Act that the proposed project will comply with Oregon's federally-approved water quality standards.

Citation	Issue Identification	Recommended Resolution
4.14.1.2	The DEIS considers the cumulative effects of the Project with other, reasonably foreseeable actions including the Port of Coos Bay's proposed Channel Deepening project. The projects, though proposed separately, are connected and must, therefore, be considered and analyzed as connected actions. The Port of Coos Bay proposes to increase the depth of the channel to -45 feet, the same depth as Jordan Cove's proposed Slip, from the channel entrance to river mile 8.2, just beyond the Jordan Cove LNG Export Terminal. Jordan Cove requires a depth of -45 feet to accommodate the expected class of LNG carriers with a minimum 10-percent under-keel clearance while ships are in dock. Because the draft of these vessels exceeds the present depth of the Federal Navigation Channel, these vessels cannot fully utilize the current channel on all tides.	FERC's EIS must analyze all related actions in this EIS, meaning the cumulative impacts of the proposed project (including alterations to the federal navigation channel), together with the effects of a deepened navigational channel, as connected, similar, and cumulative actions. DEQ understands that the proposed navigational improvements, together with the proposed deepening of the channel will permanently affect water quality parameters including salinity, dissolved oxygen, turbidity, and total dissolved solids. The EIS must analyze the cumulative effects on water quality of changes to the navigation channel resulting from both the Jordan Cove and the Port of Coos Bay Channel Deepening projects.
Executive Summary, p. ES-3	The DEIS states that the pipeline would be located across steep terrain through the Cascade Mountains and planned accordingly. However, the pipeline also crosses the Coast Range with its deep-seated and shallow-seated landslide-prone Tyee Core Area. In its evaluation of Jordan Cove's application for 401 water quality certification, ODEQ presents several concerns with Jordan Cove's landslide hazard assessment in preparation for constructing the pipeline. For example, Jordan Cove did not evaluate the landslide risk associated with the pipeline's construction and operation particularly near headwalls (head scarps) and other unstable slopes. Right-of-way initiated landslides at headwalls connected to bedrock	FERC must address the water quality concerns raised in ODEQ's May 6, 2019 denial without prejudice of Jordan Cove's application for 401 water quality certification. ODEQ evaluated Jordan Cove's landslide hazard assessment in Sections 6.1.2.1, 6.1.2.3, 6.1.2.4, 6.2.2.1, 6.2.2.3, 6.2.2.4, 6.9.2.1, 6.9.2.3, and 6.9.2.4 of Evaluation and Findings Report for ODEQ's 401 water quality certification denial decision. ODEQ's evaluation presented the procedures for a landslide hazard assessment that Jordan Cove should use in the future. Jordan Cove should use Department of Geology and Mineral Industries' protocols to: 1) Identify landslide risks. 2) Identify areas in need of mitigation measures for these risks. To resolve this lack of evaluation criteria and determine the need for mitigation measures, FERC should request that Pacific Connector use the following protocols for landslides developed by

Citation	Issue Identification	Recommended Resolution
	hollows and first order streams will violate Oregon sediment and turbidity standards. Given the proposed placement of trench and grading spoils and, potentially, fill placed on the rapidly moving landslide risk area from Pipeline Milepost 8.56 to 8.75, ODEQ reviewed Table B-3a in Resource Report 6 as a quality assurance check on Jordan Cove's Phase I landslide hazard evaluation. Table B-3a summarizes the sites investigated in Jordan Cove's Phase II field reconnaissance. In its review of this table, ODEQ determined that Jordan Cove did not include the area from between Milepost 8.56 to 8.75 in its field data collection and risk assessment. Jordan Cove also did not conduct a surface reconnaissance for the areas of concern featured in Figures 6 and 7. Given this, ODEQ referenced the methodology for identifying moderate and high rapidly moving landslide risks in Resource Report 6 as described below. On Page 31 in Section 4.5.3.2 of Resource Report 6 (Geologic Resources), Jordan Cove indicates it used LiDAR, 10-meter DEM, and aerial photography to identify moderate and high RML sites. This section in Resource Report 6 provides the risk criteria Jordan Cove used to identify the RML sites selected for surface reconnaissance and included in Table B-3a. Jordan Cove's selection criteria were to identify the potential for a RML to induce strain on the pipeline and for RML erosion to expose a pipeline. These two selection criteria would not ensure the identification of RML sites posing a risk to streams and water quality. The above quality assurance check confirmed ODEQ's concerns	DOGAMI: 1. Special Paper 42 (2009) – Protocol for Inventory Mapping of Landslide Deposits from Light Detection and Ranging (LiDAR) Imagery (https://www.oregongeology.org/pubs/sp/p-SP-42.htm) 2. Special Paper 45 (2012) – Protocol for Shallow-Landslide Susceptibility Mapping (https://www.oregongeology.org/pubs/sp/p-SP-45.htm) 3. Special Paper 48 (2016) – Protocol for Deep Landslide Susceptibility Mapping (https://www.oregongeology.org/pubs/sp/p-SP-48.htm) DOGAMI considers the method outlined in Special Paper 42 as the state-of-practice method. Special Paper's 45 and 48 present methods for determining shallow and deep landslide susceptibility, respectively. Jordan Cove's states that it used DOGAMI's state-of-practice method citing DOGAMI's 2002 "Text to Accompany Hazard Map of Potential Rapidly Moving Landslides in Western Oregon" by Hofmeister, Miller, Mills, and Beier. This 2002 document is an introduction to the risks of rapidly moving landslide hazards in Oregon and not a substitute for DOGAMI's SP-42 (2009), SP-45 (2012), and SP-48 (2016) noted above.

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	presented in the December 20, 2018 Supplemental Information Request that Pacific Connector's landslide hazard evaluation did not consider the landslide hazard risks to streams initiated by the construction and operational right-of-way.	
Section 2.3.2.1, Access Roads, P. 2-41 Section 4.3.2.2, Page 4-103	The DEIS erroneously concludes that only 21 existing road segments related to the pipeline project could potentially deliver sediment to streams. In its evaluation of Jordan Cove's application for 401 water quality certification, ODEQ presented several issues with Jordan Cove's analysis of road segments with the potential to deliver sediment to streams. Jordan Cove's assessment grossly underestimates the expected sediment discharge from the use of several hundred miles of unpaved existing access roads. For example, Jordan Cove proposes to use the Washington Road Surface Erosion Model to identify roads hydrologically connected to streams. However, in its analysis, Jordan Cove uses WARSEM incorrectly. ODEQ informed Jordan Cove that it needed to perform a field inventory not a desktop inventory of all roads segments to identify those hydrologically connected to streams. Jordan Cove attempted to identify road segments hydrologically connected to streams using maps during its desktop analysis. In Table 2 of the WARSEM Manual, the authors of this model clearly indicate that a determination of hydrologic connectivity requires field verification. As a result, ODEQ requested a Level IV Inventory using WARSEM as this allows Jordan Cove to document the erosion reduction from road surfaces using Jordan Cove's maintenance and	FERC must ensure that Jordan Cove's methods used to identify unpaved road segments that are likely to be hydrologically connected to streams are reasonably accurate. Please refer to ODEQ's May 6, 2019 denial without prejudice of Jordan Cove's application for 401 water quality certification. ODEQ evaluated Jordan Cove's assessment of existing access roads and their potential to discharge sediment to streams in Sections 6.1.2.3, 6.2.2.3, and 6.9.2.3 of the Evaluation and Findings Report for its decision on the 401 certification. In its evaluation, ODEQ identifies several deficiencies in Jordan Cove's application of the Washington Road Surface Evaluation Model that contribute to Jordan Cove's gross underestimation of road segment hydrologic connectivity and the need for existing access road improvements and maintenance to protect water quality.

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	improvement plan. Jordan Cove's conclusion that only 21 existing access roads have the potential to discharge sediment to streams is based upon road system surveys using aerial photos, maps, or other remote sensing Tools and generalized assumptions about distance and hydrologic connectivity. Remote sensing tools cannot serve as a substitute for a field inventory as explained below. For example, Pacific Connector cannot determine using maps if the surface of a road segment is out-sloping and, therefore, draining overland via the road's fill slope and undisturbed landscape. In addition, maps do not indicate if the surface of a road segment is in-sloping and draining to a ditch carrying stormwater to a stream over several hundred feet or more downslope from this road segment. Moreover, maps do not indicate if a road surface drains to an in-slope ditch that drains to a cross culvert (or drain) which discharges to a zero order stream connected to a first order stream. Given this, Pacific Connector's desktop analysis of road segments is making significant assumptions that incorporate considerable error into its estimate of the number and location of road segments hydrologically connected to streams.	
Section 2.0, P. 2-1	The DEIS fails to identify actions necessary to fully characterize the scope of the proposed project. 40 CFR 1508.25 requires lead agencies to consider actions that may be connected, cumulative, and/or similar to the proposed activity. This deficiency has direct consequences on the ability of the DEIS to fully consider project alternatives and/or develop appropriate controls to minimize water	FERC must include all actions in the project scope to determine project impacts and identify needed mitigation, including but not limited to: 1) Post-construction stormwater discharge to streams from the permanent pipeline right-of-way carrying sediment discharging to streams (See Section 6.1.2.4 of ODEQ's Evaluation and Findings Report for Jordan Cove's 401 WQC application). 2) Post-construction stormwater discharge at new

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	quality impacts. In its 12/20/18 supplemental request in the Evaluation and Findings Report, ODEQ identifies several actions proposed by Jordan Cove requiring full consideration of project alternatives and/or appropriate controls. ODEQ considered many of these proposed actions in its May 6, 2019 denial without prejudice of Jordan Cove's 401 water quality certification application. For example, ODEQ's evaluation for this denial consider the proposed actions in Sections 6.1.2, 6.2.2, 6.6.2, and 6.9.2. Example actions are briefly highlighted in the column to the right. In its September 7, 2018 Additional Information Request (see Page 6 of 15, Attachment B in the Evaluation and Findings Report), ODEQ also requested information summarizing Jordan Cove's actions relating to Temporary to first avoid riparian impacts. Only if avoidance is not possible, is it appropriate to consider minimization and mitigation of these impacts prior to siting TEWAs and the construction right-of-way parallel to streams. In ODEQ's information request, ODEQ noted it was seeking the location of these riparian impacts and the detailed rationale justifying these impacts. Specifically, ODEQ was seeking information on the specific constraints and operational procedures at each site preventing avoidance or minimization. In January 2019, ODEQ received information from Jordan Cove that the detailed justification for riparian impacts that ODEQ was seeking was in Table A.1-1 of the Department of State Lands and Army Corps of Engineers Joint Permit Application. ODEQ reviewed this information and found that it focuses primarily on wetland	and altered road stream crossings (See Section 6.1.2.4 of ODEQ's Evaluation and Findings Report for Jordan Cove's 401 WQC application). 3) Sediment discharge from the use of hundreds of unpaved segments of existing road surfaces and roadside ditches during pipeline construction. These segments are hydrologically connected to streams (See Section 6.1.2.4 of ODEQ's Evaluation and Findings Report for Jordan Cove's 401 WQC application). 4) Placement of fill to develop the construction right-of-way and TEWAs on headwalls/unstable slopes such as headwalls along Pipeline Milepost 8.56 to 8.75 as well as numerous other locations (See Section 6.1.2.1 of ODEQ's Evaluation and Findings Report for Jordan Cove's 401 WQC application). 5) Placement of construction overburden (i.e., rock, soil, tree root wads, slash etc.) on TEWA supported by fill placed on headwalls/unstable slope such as headwalls along 8.72 to 8.75 (See Section 6.1.2.1 of ODEQ's Evaluation and Findings Report for Jordan Cove's 401 WQC application). 6) Constructing a 229-mile construction access road to build the pipeline (See Section 6.1.2.1 of ODEQ's Evaluation and Findings Report for Jordan Cove's 401 WQC application). 7) Siting the construction and permanent right-of-way parallel to streams thus reducing effective riparian shade necessary for thermal regulation of streams (See Section 6.6.2.4 of ODEQ's Evaluation and Findings Report for Jordan Cove's 401 WQC application). 8) Construction of a new Temporary Access Road on steep slopes that are a hazard area for rapidly moving landslides such as TAR 101.70 identified in Jordan Cove 401 water quality certification application (see Drawing No. 340.31-Y-Map 14, Sheet 27 and Geologic Hazard Map Figure 22 of 47 and see Section 6.1.2.3 of ODEQ's Evaluation and Findings Report for Jordan Cove's 401 WQC application). 9) Placement of fill above identified landslides (e.g., Landslide 43) when widening Beaver Springs Sp (BLM NonInv 32-2-36.A) 113.66 (see Drawing No. 340.31-Y-Map 14, Sheet 27 and Geologic Hazard Map Figure 25 of 47 and see Section 6.1.2.3 of

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	impacts associated with the siting of a Temporary Extra Work Area rather than riparian impacts and temperature changes in streams. The modification rationale presented in this Table A.1-1 provides no information regarding alternative locations for TEWAs that Jordan Cove considered and provides no detailed explanation why these alternative locations were unsuitable. Moreover, ODEQ cannot determine from the information in Table A.1-1 if riparian impacts from the construction right-of-way are a result of FERC's 15-foot buffer guidelines or some other factor, as the columns of information in this table present only information on the wetlands impacted, Cowardin Type for each wetland impacted, and TEWAs involved in the impact. From Table A.1-1, ODEQ cannot find information on why Pacific Connector could not avoid or minimize impacts to effective shade to streams when siting TEWAs and the construction right-of-way parallel to a stream. Use of FERC's standard 15-foot buffer guidelines conflicts with Oregon's water quality standards in the significant number of areas for the pipeline route where the state's temperature standard is not met. In these areas, Pacific Connector must demonstrate consistency with the surrogate measures for effective stream shade adopted by DEQ in the Rogue TMDL. Moreover, in a late response to an ODEQ information request, Jordan Cove provided information regarding its rationale for not avoiding impacts to effective riparian shade. As a rationale for not avoiding impacts, Jordan Cove uses "emergent pasture vegetation" as a justification for proposing to remove	ODEQ's Evaluation and Findings Report for Jordan Cove's 401 WQC application).

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	effective riparian shade while paralleling a stream. Emergent pasture vegetation is essentially wetlands impacted by agricultural practices. Jordan Cove's goal to avoid causing a loss of wetlands substantially altered by agricultural production is not a lawful basis for instead removing effective riparian shade that is required by Oregon water quality standards during pipeline construction and operation. Wetlands altered by agricultural activity does not take precedence over effective riparian shade in Jordan Cove's alternatives analysis. Moreover, FERC must assure that Jordan Cove does not use a perpendicular approach to a stream crossing as a rationale for reducing effective riparian shade. Jordan Cove can design bends in the pipeline to avoid impacting riparian areas and to ensure a perpendicular stream approach. These two desirable water quality objectives are not mutually exclusive.	
Table 1.5.1-1, P. 1-23 (ODEQ)	The DEIS fails to include the need for Jordan Cove to obtain Oregon's Water Quality Pollution Control Facility (WPCF) Permit for wastewater discharges to land during pipeline construction. The DEIS also fails to indicate that Jordan Cove will need to use an ODEQ-approved septic tank for the guardhouse at the LNG Terminal. Jordan Cove fails to identify the locations where it will dispose putrescible waste (tree stumps, slash, and roots) from construction overburden and seek a permit for this disposal. ODEQ provides the basis for seeking a solid waste disposal permit in 12/20/18 supplemental request (See Pages 54 – 57 of Attachment A in the	FERC must include the following under ODEQ in Table 1.5.1-1: 1) ODEQ has not issued a NPDES 1200-C permit for the terminal or pipeline construction in regards to FERC's description of permit status. 2) Before ODEQ can review 1200-C permit applications, ODEQ needs Jordan Cove to submit complete NPDES 1200-C permit applications for: a. Pipeline construction and associated structures b. Existing access road improvements c. LNG Terminal d. All Off-Site Project Areas associated with Terminal construction and dredging e. Kentuck mitigation site 3) WPCF permit for vehicle and equipment wastewater during pipeline construction. 4) WPCF permit for the hydrostatic test water discharge. 5) WPCF permit for the trench dewatering

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	Evaluation and Findings Report).	discharge. 6) Use an approved septic tank for the LNG Terminal. 7) Construction and Demolition Landfill Permits for several Jordan Cove proposed disposal sites as required Oregon Revised Statute 459.005 through 418.
Section 4.1.3.5, Pages 4-435 to 4-436	Completion of the pipeline project will require amendments to Rogue, Umpqua, and Winema National Forest Land and Resource Management Plans (LRMPs). Jordan Cove seeks amendments to these plans to allow work in restricted riparian corridors, removal of effective shade on perennial streams, and the creation of detrimental soil conditions in riparian areas. Some amendments require reductions in riparian buffer protections. Specifically, Jordan Cove proposes 50-foot setbacks from streams for Temporary Extra Work Areas (P. 28, Section 1.2.1.1 of Resource Report 1, Construction Right-of-Way). Additionally, FERC guidance allows right-of-way riparian impacts within 15-feet of streams. Such limited riparian setbacks result in thermal loading from the loss of riparian shade from Jordan Cove's proposed actions for pipeline construction and operation, and are in conflict with surrogate measures implementing Oregon temperature TMDLs in the Rogue basin. The proposed TEWA and ROW impacts also conflict with key Aquatic Conservation Strategy (ACS) and CWA Section 303 objectives (i.e., temperature standard, Temperature Total Maximum Daily Loads) related to water quality. There are 922.64 acres of TEWAs and, presumably, a portion of these acres will result in the loss of effective riparian shade. At ODEQ's request,	The Northwest Forest Plan (NWFP) Standard and Guideline WR-3 stipulates that Forest Service cannot use mitigation as a substitute for preventing habitat degradation. Moreover, before impacting riparian buffers for TMDLs, ODEQ requires 401 water quality certification applicants to first avoid riparian impacts and, if avoidance is not technically infeasible, then minimize these before moving to mitigation. ODEQ discusses this in Section 6.6.2 of Evaluation and Findings Report for ODEQ's denial without prejudice of Jordan Cove's application for 401 water quality certification. FERC must ensure the EIS considers all reasonable alternatives which eliminate or reduce riparian impacts before considering amendments to existing land and resource management plans to avoid conflicts with Aquatic Conservation Strategy objectives and TMDLs. To avoid these conflicts, FERC must require Jordan Cove to incorporate detailed justifications in Table A.1-1 that identify all physical and/or technical constraints preventing Jordan Cove from locating TEWAs beyond 50 feet from streams for TEWAs and the construction right-of-way beyond 15 feet from streams when paralleling these streams. Moreover, as a rationale for not avoiding impacts, FERC cannot accept Jordan Cove's use of "emergent pasture vegetation" as a justification for proposing to remove effective riparian shade. Emergent pasture vegetation is essentially wetlands impacted by agricultural practices. Jordan Cove's goal to avoid a loss of wetland functions and values substantially altered by agricultural production cannot serve as a legitimate reason for removing effective riparian shade during pipeline construction and operation. Protecting diminished wetland functions and values legally altered by agricultural activity cannot take precedence over protecting effective riparian shade

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	Jordan Cove is currently compiling the proposed impacts from TEWAs and right-of-way construction parallel to streams. In responding to ODEQ's information requests during the review of Jordan Cove's 401 water quality certification application, Jordan Cove states that site-specific justifications for amendments to riparian buffers are in Table A.1-1 of Appendix B to Part 2 of the USACE Joint Permit Application (P. 399). This table lacks the information needed to evaluate Jordan Cove's requests to amend the Forest Service's Land and Resource Management Plans rather than avoid impacting riparian shade in establishing TEWA set-backs. Moreover, as noted in ODEQ's September 7, 2018 Additional Information Request (AIR) and December 20, 2018 Supplemental Request in the Evaluation and Findings Report, amendments to Land and Resource Management Plans will necessitate changes to BLM and Forest Service Water Quality Restoration Plans. BLM and the Forest Service use Water Quality Restoration Plans (WQRPs) to meet TMDLs. ODEQ approves WQRPs for this purpose. Amendments to Land and Resource Management Plans without ODEQ's review and input undermine ODEQ's actions to ensure compliance with TMDLs.	in Jordan Cove's alternatives analysis. Moreover, FERC must assure that Jordan Cove does not use a perpendicular approach to a stream crossing as a rationale for reducing effective riparian shade. Jordan Cove can design bends in its pipeline to avoid removing effective riparian shade when paralleling streams and to ensure a perpendicular stream approach when crossing streams. These two desirable water quality objectives are not mutually exclusive.
Section 2.1.6, Pages 2-35 and 2-36	The DEIS states that Jordan Cove must secure a Right-of-Way (ROW) Grant from the Bureau of Land Management to cross BLM, USDA Forest Service, and Bureau of Reclamation Lands. In its May 6, 2019 denial without prejudice of Jordan Cove's 401 water quality certification, ODEQ evaluated both pipeline construction (see Sections	FERC must ensure that ODEQ evaluates Right-of-Way Grants for Jordan Cove's proposed pipeline construction and operation activities. This evaluation will ensure these grants incorporate the information presented in Section 2.1.6 of the DEIS such as "stipulations, project design features and mitigation." ODEQ's evaluation will ensure compliance with applicable water quality standards.

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	6.1.2.1, 6.2.2.1, 6.6.2.1, and 6.9.2.1) and the permanent pipeline right-of-way (see Sections 6.1.2.4, 6.2.2.4, 6.6.2.4, and 6.9.2.4) in its Evaluation and Finding Report for this denial decision. In this evaluation, ODEQ detailed the deficiencies in Jordan Cove's proposed plans and best management practices for pipeline construction and operation. For example, in the December 20, 2018 supplemental request in the Evaluation and Findings Report, ODEQ provided Jordan Cove with the basis for ODEQ's concerns about slope stability along the construction and operational right-of-way. ODEQ's concerns included the potential for pipeline ROW construction and ROW stormwater discharge to initiate landslides (see Pages 68 – 79 of Attachment A). Given its concern about slope stability above zero order streams, ODEQ requested and received in February 2019 the LiDAR shapefiles used in their landslide hazard evaluation. ODEQ performed a preliminary review of the LiDAR maps in a sample section of the Tyee Core Area and found many headwalls in close proximity to the construction and permanent ROW. During this review, ODEQ searched for site-specific geo-engineering measures for fills and cuts on unstable slopes in information provided to-date by Jordan Cove but found this information lacking as noted in ODEQ's December 20, 2018 supplemental information request (see Page 70 – 73 and 75 to 79 of Attachment A in the Evaluation and Findings Report).	Jordan Cove's 401 water quality certification application to ODEQ lacked key project design features to demonstrate Jordan Cove will comply with water quality standards as detailed, for example, in Sections 6.1.2.1 and 6.1.2.4 of ODEQ's Evaluation and Finding Report for the denial decision on Jordan Cove's application. Moreover, Jordan Cove's application lacked a mitigation plan for offsetting the loss of effective riparian shade during construction and operation of the pipeline and associated roadways and work areas as discussed in Sections 6.6.2.1 and 6.6.2.4 of ODEQ's Evaluation and Finding Report.
P. 4-114 & 4-115, Table 4.3.2.2-9	In ODEQ's September 7, 2018 Additional Information Request (AIR), ODEQ determined that Pacific	FERC must direct Pacific Connector to submit a revised Thermal Impact Assessment that includes an evaluation of all the impacts from vegetation removal

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and Section 4.7.3.5, Watersheds Crossed by the Pacific Connector Pipeline Project, P. 4-495 and P. 4-503 (federal lands)	Connector did not consider the following impacts: 1) Development of the construction and operational right-of-way removing riparian vegetation up to 15 feet from stream based on FERC national guidance. 2) The location of Temporary Extra Work Areas (TEWAs) 50 feet from stream crossings. 3) The location of vegetation clearing associated with new and improved roadways. Pacific Connector has not demonstrated that it first avoided then minimized these impacts before moving to mitigation. Pacific Connector did not provide a detailed justification identifying all the constraints necessitating a move to mitigation of riparian impacts. Pacific Connector only references Table A.1-1 of Appendix B to Part 2 of the USACE Joint Permit Application (P. 399). This table lacks the detailed justification to evaluate the need to amend the Forest Service land management plan rather than avoid riparian impacts when establishing TEWA set-backs. Pacific Connector has not provided a mitigation plan for addressing the loss of riparian shade from ***all aspects of*** pipeline construction and operation. In Sections 6.6.2.1 and 6.6.2.4 of its Evaluation and Findings Report for its denial decision, ODEQ noted Pacific Connector did not provide plans for mitigating the loss of riparian shade and identified the components that Pacific Connector's mitigation plans should contain. Finally, this analysis is not sufficient to determine compliance with Oregon's temperature standard and	from the pipeline right-of-way, associated roadways, and TEWAs and providing a revised mitigation plan addressing unavoidable impacts to riparian shade. As noted above in ODEQ's comment above, FERC must ensure Pacific Connector provides detailed justification for each action to mitigate rather than avoid or minimize the riparian impacts from the development of the construction and operation of roadways, pipeline right-of-way and TEWAs. FERC must consider in the EIS the cumulative thermal impact resulting from shade loss at all stream crossings within each watershed. FERC must consider the proposed loss of effective riparian shade on streams impaired for temperature but not under a TMDL and those subject to OAR 340-041-0028(11). As noted on Pages 65 and 68 of Section 6.6.2 of DEQ's Evaluation and Findings Report for its denial decision without prejudice, the human use allowance in Oregon's temperature standard does not permit a pollution source to cause more warming of a Category 5 stream than allowed under this allowance as stated OAR 340-041-0028(12)(b). Category 5 streams are **impaired** water bodies on the 303(d) list that are not under a Total Maximum Daily Load (TMDL) and therefore have no allocation with a reserve capacity. FERC must analyze and disclose and analyze cumulative effects from all aspects of Jordan Cove's proposed pipeline, and require avoidance, minimization and for any remaining impacts full mitigation within the same subbasin where the thermal impacts would occur.

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	implementing TMDLs. The DEIS does not consider the cumulative thermal impact resulting from shade loss at all stream crossings within each watershed. The DEIS does not disclose and analyze this cumulative effect analysis.	
Section 2.4.2.1, Cleanup and Permanent Erosion Control, P. 2-57	Jordan Cove proposes to use open trench cutting to create stream crossings for its pipeline. At ODEQ's request, Jordan Cove's 401 WQ certification application proposed an approach to designing and reviewing stream crossings based on: • Castro, J.M., A. MacDonald, L. Lynch, and R. Thorne. 2014. *Risk-Based Approach to Designing and Reviewing Pipeline Stream Crossings to Minimize Impacts to Aquatic Habitats and Species*. River Research and Applications. In its 3/11/19 Additional Information Request in the Evaluation and Findings Report, ODEQ requested that Jordan Cove collect field assessment data that is also consistent with Castro et al. (2014). ODEQ requested that Jordan Cove use the risk based approach presented in Castro et al. (2014). This assessment data is necessary to develop site-specific restoration plans. These field assessments include the documentation and quantification of aquatic habitat units that Jordan Cove's open trench cutting will impact. Jordan Cove's 401 water quality certification application does not contain this information for each stream crossed by open trench cut method. Moreover, Jordan Cove has not developed site-specific restoration plans for all these crossings that use site-specific assessment data.	FERC must request that Jordan Cove collect the field data recommended by Castro et. al. (2014) (see Table 1, Basic Data Needs) during pre-construction surveys of all stream crossings where Jordan Cove will use the open trench cut method. FERC must request that Jordan Cove use the basic data needs noted above to develop site-specific stream restoration plans for ODEQ and other Oregon natural resource agencies to review.
Section 2.4.2.1,	The DEIS states that Jordan Cove will	FERC must correct the discrepancy concerning the

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Cleanup and Permanent Erosion Control, P. 2-57 and Table 2.4.2.1-1	install permanent erosion control devices consistent with the requirements of Section V.B of FERC's "Plan" as described in Jordan Cove's Erosion Control and Revegetation Plan. Table 2.4.2.1-1 of the DEIS presents spacing requirements that conflict with Section V.B of the FERC's "Plan." In its ECRP, Jordan Cove identifies this "Plan" as FERC's 2013 Upland Erosion Control, Revegetation, and Maintenance Plan. On page 14 of Section V.B, FERC presents slope breaker spacing that conflicts with the spacing in Table 2.4.2.1-1. FERC's requirements specify a spacing of 100 feet on slopes greater than 30%. This spacing will create a larger drainage area for each slope breaker than presented in the DEIS. FERC's required spacing and its drainage area has implications for slope stability as noted in the comments above. FERC's requirements in its 2013 Upland Erosion Control, Revegetation, and Maintenance Plan are part of Jordan Cove's 401 water quality certification application to ODEQ. In Section 6.1.2.4 of the Evaluation and Findings Report for ODEQ's denial decision without prejudice (See Pages 36 and 37), ODEQ evaluated Jordan Cove's slope breakers using FERC's spacing requirements in landslide susceptibility zones. ODEQ's evaluation raised concerns regarding these slope breakers and their potential to initiate landslides in these zones.	permanent slope breaker spacing in the DEIS Table 2.4.2.1-1 and FERC's spacing requirements in Section V.B of the 2013 Upland Erosion Control, revegetation, and Maintenance Plan. FERC must request Jordan Cove propose alternatives to slope breakers for managing stormwater in the construction and operational right-of-way in landslide susceptibility zones given the literature recommending that land managers avoid the discharge of additional water to unstable slopes.
Section 2.1.1.5, Other Terminal Support Systems, Page 2-8 Section 4.3.2.1, Jordan Cove	The DEIS states that Jordan Cove will manage runoff from impervious surfaces within the Terminal and this runoff will be directed to designated areas for disposal. The collection systems for rain in the Terminal are the storm water system and the oily waste system. In its 9/25/18 information	FERC must ensure the design of Jordan Cove's stormwater controls for the Terminal's Construction Facility Areas and the spill containment areas is complete and available for ODEQ's 401 Water Quality Certification Program to review and evaluate if these proposed controls will comply with Oregon's water quality standards.

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LNG Project, Page 4-83 Section 4.3.2.1, Spills or Leaks of Hazardous Materials, Page 4-87 and 4-88	request in the Evaluation and Findings Report, ODEQ requested changes to and information on the Storm Water Management Plan provided in the Jordan Cove's 401 water quality certification application. Jordan Cove addressed some of ODEQ's concerns. However, ODEQ still has concerns with this plan and detailed information is still lacking, for example, on managing the discharge from Construction Facilities Areas and managing spills from discharging to the oily waste system. These deficiencies were evaluated in Section 6.1.2.5 of the Evaluation and Findings Report for ODEQ's denial without prejudice decision for Jordan Cove's 401 water quality certification application.	
Section 4.3.2.1, Jordan Cove LNG Project, Page 4-83 and 4-84	The DEIS states that dredging activity associated with the Marine Slip, Access Channel, temporary material barge berth, Material Offloading Facility, and marine waterway modifications will create turbidity and sedimentation. In its September 7, 2018 Additional Information Request and December 20, 2018 Supplemental Request in the Evaluation and Findings Report, ODEQ requested a detailed pollution control plan for its dredging activities. As noted in Section 6.1.2.6 of the Evaluation and Findings Reports for ODEQ's denial without prejudice decision, ODEQ did not receive this information prior to the development of the denial decision.	FERC must require Jordan Cove to submit to ODEQ;s 401 Water Quality Certification Program a dredging pollution control plan to determine if these proposed controls will comply with Oregon's water quality standards.
Section 4.2.1.2 Project Specific Soil Limitations P 4-47	The DEIS indicates ODEQ "recommended" a No Further Action determination in 1996 for the Ingram Yard (Terminal Site) and the former Weyerhaeuser Containerboard Mill. ODEQ issued a No Further Action determination in 2006 for both of these cleanup sites.	Change the text to state, that based on the findings of previous environmental investigations, the ODEQ <u>issued</u> a "No Further Action" determination for the former Weyerhaeuser mill site and the LNG terminal site (aka Ingram Yard site).

Table 4.2.1.2-1	Metals natural background concentrations for the Cascade Range Physiographic Province appear to have been incorrectly listed in the table. The cleanup sites that are the focus of this section and table are located in the Coast Range province, and the Coast Range background concentrations should be used.	Revise the table using Coast Range background metals concentrations from ODEQ's Development of Background Metals Concentrations in Soil technical report dated March 2013.
Section 4.2.1.2 Project Specific Soil Limitations Potentially Contaminated Soils and Groundwater 2018 Data Gap Investigation P 4-48	Jordan Cove conducted a Data Gap Investigation on the Containerboard Mill Site in 2018. The DEIS indicates residual contamination remains at levels above ODEQ risk based concentrations (RBCs). However, in ODEQ's review of the Data Gap Investigation, it was pointed out that much of the contamination is deep and not accessible to occupational workers. Only deep excavation work could expose workers to these residual levels of contamination. ODEQ's No Further Action remains in place for this site with the understanding that future deep excavation activities would require extra care to protect workers.	Change the text to state that ODEQ approved the Data Gap Investigation in its letter dated February 12, 2019. If deep excavation work (deeper than 10 feet) is planned, a health and safety plan should be prepared to limit worker exposures and ensure workers are aware of the presence or possible presence of contamination, and steps to take if contamination is encountered.
Section 4.2.2.3 Soil Limitations Jordan Cove Meter Station (MP 0.0) P 4-65	The DEIS references ODEQ No Further Action letter (1996, footnote 62) when describing how clean backfill should be used when filling excavations on this site. The No Further Action letter for the two North Spit sites generally describes how contaminated media should be handled (in accordance with ODEQ rules). The letter does not describe what kind of fill should be used.	The EIS should remove references to ODEQ's Cleanup Program advising or requiring the use of clean backfill when excavations are completed on the site.
Table 1.5.1-1, P. 1-23	The DEIS states that a Title V Acid Rain Permit will be issued.	An Acid Rain Permit is not required for Jordan Cove LNG and will not be issued by ODEQ.
Section 1.5.2.4	The DEIS says that Jordan Cove will be part of the acid rain program.	The Jordan Cove's LNG facility is not subject to ODEQ's acid rain program.

P. 1-31		
Section 4.12.1.1 P. 4-657	The DEIS lists the emissions from the emission units that were in the permit application. The emission units listed includes five combustion turbines, a thermal oxidizer, a boiler, two flares, seven engines, two storage tanks, and fugitive emissions. These emission units could change.	If any of the emission units or number of emission units change, ODEQ' Air Quality Program would need to be notified to update Jordan Cove's application.
Section 4.12.1.1 P. 4-658	Second to last paragraph. The Pacific Connector Pipeline Project, Klamath Compressor Station will not be subject to Prevention of Significant Deterioration (PSD) requirements contained in OAR 340-224-0070.	Correct error. The Pacific Connector Pipeline Project, Klamath Compressor Station will be subject Type B State NSR. [OAR 340-224-0010(2)(d)(B)]
Section 4.12.1.2 P. 4-667	First paragraph. The compressor station location.	Clarify by stating, The compressor station is to be located in an unclassified area, approximately 14 miles to the southeast of the southeast corner of the non-attainment area.
2.1.1.5 Water Systems 4.3.1.1 Groundwater	The Coos Bay-North Bend Water Board (CBNBWB) has 18 groundwater wells located within the Oregon Dunes National Recreation Area (ODNRA) to the north of the LNG terminal. There is a possibility that the water withdrawn from these wells for this project could dry up wetlands or lower water levels in nearby wetlands shallow dunal lakes. The bulk of the water use if related to building the project in the Jordan Cove area.	Correct Reference: Sand Dune Aquifer Groundwater Availability Study. Referenced in Livesay, D., 2006, Jordan Cove Energy Project, Groundwater Review, Groundwater Solutions, Inc., Portland, attached as Appendix E.2 to Resource Report 2 filed with Jordan Cove's May 2013 application to the FERC.
4.1.3.3 Rock sources and disposal sites	Note that "clean fill" as defined in ORS 340-093-030 may be disposed in upland areas without ODEQ approval. However wood waste is putrescible and must be disposed of in a manner consistent with ODEQ solid waste rules	Dispose of all wastes within ODEQ Solid Waste Rules.
4.2.1.2 Potentially Contaminated	"Soils and/or sediments containing residual contamination must be managed and/or disposed in	Any other contaminated soils encountered shall either remain in place under supervision of ODEQ's Cleanup Program or be properly disposed of in

Soils and Groundwater	accordance with ODEQ rules. Per guidance from the ODEQ, Jordan Cove would provide prior notice to the ODEQ when grading or ground disturbance activities are planned to occur on the LNG terminal site."	accordance with ODEQ's solid waste rules. Note – this applies to both the pipeline and the LNG sites.
4.2.1.2 Potentially Contaminated Soils and Groundwater	Similar to the above comment, in the same section of the document. Any wastewater treatment sludges that require removal for structural reasons must be managed in accordance with ODEQ's Solid Waste Rules.	Any wastewater treatment sludges that are removed from the Ingram Yard Site must be properly disposed of in accordance with ODEQ's Solid Waste Rules.
4.2.1.2 Potentially Contaminated Soils and Groundwater	This section discusses removal of boiler ash from the Ingram Yard area.	Per solid waste rules, ODEQ expects industrial derived boiler ash material to be disposed of in a properly designed landfill. Either in a cell of the current permitted landfill on site or an appropriately permitted off-site landfill.
Section 2.4.1.2, p. 2-46 And Section 4.10.1.1, p. 4-622	Operation of the temporary barge berth and storage materials area may require 1200-Z NPDES industrial stormwater general permit coverage, with a Primary Standard Industry Classification (SIC) Code of 44 – Water transportation marine cargo handling.	The EIS should reference the requirement for applicant to apply for and obtain 1200-Z NPDES industrial stormwater general permit coverage with ODEQ.
Section 2.1.1.5, pp. 2-7,8 And Section 4.10.1.1, p. 4-622	The LNG Terminal operation is subject to 1200-Z NPDES industrial stormwater general permit coverage. At a minimum, stormwater exposed to the steam electric power generation activities (Sector O) will require 1200-Z permit coverage. In addition, the primary standard industry classification (SIC) code for the LNG terminal appears to be 44 – water transportation, which also requires 1200-Z permit coverage, as well as any co-located industrial activities at the LNG Terminal site.	The EIS should reference the requirement for applicant to apply for and obtain 1200-Z NPDES industrial stormwater general permit coverage with ODEQ.
Section 2.4.1.1, p. 2-46	A concrete batch plant in a location with the ability to discharge stormwater to surface waters will require 1200-A NPDES stormwater	The EIS should reference the requirement for the concrete batch plant to operate under an ODEQ 1200-A NPDES mining stormwater general permit.

	mining general permit coverage.	
Section 2.1.1.5, p. 2-8 And Section 2.4.1.8, p. 2-51 And Section 2.4.2.1, p. 2-56-57 And Section 4.3.4.2, p. 4-138 Section 4.5.2.2, p. 4-255	Wastewater generated from hydrostatic testing is not an authorized non-stormwater discharge under a 1200-series stormwater permit. The inclusion of a plan to discharge this wastewater to surface waters within an internal management plan, such as the Hydrostatic Test Plan referenced on p. 4-138 is not authorization to discharge this wastewater by Oregon ODEQ.	Ensure all future 1200-series stormwater permit applications and associated stormwater plans clearly describe how this wastewater will be managed and disposed, which may not include discharging to surface waters under a 1200-series stormwater permit.
Section 2.4, p. 2-45	All activities conducted under an ODEQ 1200-series NPDES general stormwater permit must create and implement an acceptable stormwater plan. The 1200-C (construction) must implement an Erosion and Sediment Control Plan (ESCP), and the 1200-Z (industrial) must implement a Stormwater Pollution Control Plan (SWPCP). The DEIS does not reference the requirements of either of these plans, and only references the requirement of a 1200-C permit on p. 4-87 for the construction of the LNG Terminal facility. The existence of other permits or stormwater management plans will not exempt projects from ODEQ's 1200-series NPDES general stormwater permitting requirements.	Apply for and obtain all required 1200-series NPDES general stormwater permits with ODEQ. Complete applications must include complete Erosion and Sediment Control Plans (ESCPs for 1200-C permits) or Stormwater Pollution Control Plans (SWPCPs for 1200-Z permits) that will be reviewed by ODEQ prior to permit assignment.
Section 4.2.2.3, Table 4.2.2.3-2, p. 4-66 And Section	The DEIS only mentions the need for an ODEQ 1200-C NPDES construction stormwater permit for the construction of the LNG Terminal facility on p. 4-87. However, all construction related land	Apply for and obtain all required 1200-C NPDES construction stormwater permit coverage with ODEQ. Complete applications must include complete Erosion and Sediment Control Plans (ESCPs) that will be reviewed by ODEQ prior to permit assignment.

4.3.2.2, p. 4-103, 4-107 And Section 2.4.2.2, p. 2-60 And 2.6.1, p. 2-66 And Section 4.2.2.3, Table 4.2.2.3-2, p. 4-68 And Section 4.5.2.2, p. 4-254 And Table 4.5.1.1-2, p. 4-185 And Section 4.10.2.1, p. 4-627	disturbance, including materials or equipment staging and stockpiling areas that exceeds one acre with the potential for stormwater runoff to enter waters of the state, or that is less than one acre but part of a common plan of development that will exceed one acre (such as the new and expanded access roads), must be conducted under 1200-C permit coverage. The following projects will likely need to be covered by the 1200-C permit: • The 36 potential temporary storage yards (p. 4-66). It is not clear if the staging and spoils storage areas referenced on page 4-107 are considered TEWAs or temporary storage yards, but are also subject to 1200-C coverage. • Access Roads - for all new roads, expansion of roads, anything beyond maintenance of existing road footprint. • The pipeline project. • The LNG Terminal facility. All other project areas identified in Figure 2.1-1 as needed, such as the Park & Ride and housing facility.	
Section 2.6.1, p. 2-66	The 1200-C permit specifies the specific monitoring and inspection frequency of erosion and sediment controls and written documentation requirements. The DEIS indicates monitoring will be at the discretion of contracted environmental inspectors and internal management plans, but does not specify the monitoring requirements of the 1200-C construction stormwater permit or the required erosion control certifications required of inspectors for sites greater than 5 acres.	Apply for and obtain 1200-C permit coverage for all projects as discussed in the above comment.

P. 4-298 - 4-300	Total water used for hydrostatic testing would be about 39 million gallons. Pacific Connector would obtain its hydrostatic test water from commercial or municipal sources or surface water rights owners to lakes, impoundments, and streams from possibly 12 different locations. About half of the water would be from impoundments or lakes, and the rest may come from up to nine streams, including Coos River, East and Middle Fork Coquille Rivers, Olalla Creek, South Umpqua River, Rogue River, Lost River, and Klamath River. Table 4.5.2.3-6 Shows a 35% Flow reduction for the Middle Fork Coquille River during October at the start of coho salmon migration and spawning. ODEQ has concerns that such flow reduction will have impacts to ESA listed salmonid beneficial uses and further limit dissolved oxygen levels in a 303(d) listed MF Coquille River.	Correct deficiency: If dewatering is likely to or is resulting in adverse impacts to waters of the state, the EIS should identify and calculate flow reduction impacts and clearly discuss mitigation efforts to prevent a water quality violation as per the numeric dissolved oxygen standard (OAR 340-041-0016). The dewatering process should be re-evaluated prior to commencement. ODEQ Recommendation: FERC **not** issue license to Pacific Connector until this deficiency is corrected.
	ODEQ has concerns about the temperature impacts that may occur due to water withdrawals during low flow periods. ODEQ does not know enough about where these withdrawals will occur to evaluate these potential impacts. Three Oregon Administrative Rules state that no single activity is allowed to increase water temperature by more than 0.3 degrees Celsius (0.5 degree Fahrenheit) above the applicable criteria prior to the development of a Total Maximum Daily Load (TMDL). The Oregon Administrative Rules which place this limit on allowable stream warming are: Anti-degradation rules and policy, 340-041-0004(3)(c),	Correct deficiency: the Appendix M: Hydrostatic Test Plan does not provide enough detail to safeguard that the cumulative impacts of surface withdrawals will not increase water temperature by more than 0.3 degrees Celsius (or lesser amount specified in any applicable TMDL load allocation) above the applicable criteria prior to the development of a Total Maximum Daily Load (TMDL) for the South Coast Basin. Potential temperature impacts must be represented as changes in percent effective shade or actual thermal loads in Kcals/day. Near and long-term impacts must be quantified as requested in ODEQ's September 2011 and September 7, 2018 Additional Information Request which identified deficiencies in the scope of Project activities that could impact effective shade and associated thermal load on streams. ODEQ Recommendation: FERC **not** issue license to

	Protecting Cold Water OAR340-41-0028 (11)(a), Implementation of the Temperature Criteria OAR340-41-0028 (12)(e). Following adoption of a TMDL, particularly temperature TMDLs, the amount of allowable impact may be lower (0.04 degrees Celsius in the Rogue basin, for instance). The DEIS indicates thermal impacts of riparian clearing that are likely to exceed this level in several locations.	Pacific Connector until this deficiency is corrected
P. 4-119, 4-425	"Pacific Connector would prepare and submit to the ODF State Forester for approval a written plan describing how the pipeline would be in compliance with the Forest Practices Act (FPA) (OAR 629-605-0170), prior to harvesting activities."	Correct error: The EIS should identify the specific Oregon FPA stream protection requirements that Pacific Connector must comply with, as these laws implement federal Clean Water Act requirements on non-federal forest lands. Any plans that waive Oregon FPA water quality protections require ODEQ approval.
P. 4-246,	The statement about "typical" Total Suspended Solids (TSS) is unsupported. TSS was calculated based upon a formula derived from a turbidity TSS statistical regression equation based on data from Washington State. ODEQ's has TSS measurements which do not support this statement.	Correct error: TSS modeling was not calibrated upon TSS data. The model calibration might be tested using TSS data. In addition, the TSS turbidity relationship should be derived from paired TSS turbidity data from Coos Bay. The TSS modeling is not applicable as presented in the DEIS. "Background" TSS and turbidities vary based upon precipitation whereas "elevated" TSS and turbidity are "typically" related to rainfall and runoff events or disturbance of bed or banks. ODEQ will base compliance determinations on direct measurements of turbidity rather than through surrogate measures such as TSS. If the applicant resubmits its request for 401 certification, ODEQ will develop conditions to ensure that temporary increases in turbidity do not impair beneficial uses and the EIS should reflect that requirement. If the Commission authorizes the Project, ODEQ is recommending that the following measure be included as specific condition in the Commission's Order. Jordan Cove shall not begin construction until the TSS

		- turbidity statistical relationship is derived from paired TSS turbidity data from Coos Bay. ODEQ Recommendation: FERC **not** issue license to Pacific Connector until this deficiency is corrected.
P. 2-58, P. 4-117 P. 4-117	"Pacific Connector would use a standard fertilization rate of 200 pounds per acre bulk triple-16 fertilizer on disturbed areas to be seeded." "Fertilizer would not be used in wetlands unless required by the land-managing agencies and would not be applied within at least 100 feet of flowing streams that have domestic use or support fisheries and would not be applied during heavy rains or high wind conditions." "No application would occur within 100 feet of flowing water and would be avoided during heavy rain and windy conditions. Aerial broadcast spreaders would only occur with federal land-managing agency approval. Fertilizer would be added directly to hydroseeding slurry." Fertilizer should be applied at agronomic rates according to environmental conditions. The reference to refraining from application during heavy rains (0.3"/hour or greater) does not account for accumulative rainfall, saturation of soils, and the potential for runoff.	Correct deficiency: A rainfall index accounting for previous and predicted rainfall should be developed to guide the application of fertilizer and identified in the DEIS. The EIS should require that fertilizing near intermittent stream channel should be prohibited and identify specific setbacks. Identify conditions that will trigger the evaluation of a site specific buffers to protect water quality (e.g. steep slopes, etc) when applying fertilizers. ODEQ Recommendation: if FERC issues license to Pacific Connector include conditions responding to this issue.
P. 2-71, 4-170, 4-211, 4-303	"Vegetation at aboveground facilities would be periodically maintained using mowing, cutting, trimming and the selective use of herbicides." Pesticide applicators must be in compliance with Oregon Department of Agriculture licensing requirements and	The EIS should identify, discuss and require that Jordan Cove and Pacific Connector secure required licensing and permits for these actions. ODEQ Recommendation: if FERC issues license to Pacific Connector include conditions responding to this issue.

	ODEQ's Pesticide General Permit 2300A (http://www.deq.state.or.us/wq/wqpermit/genpermits.htm) should be secured if permit eligible activities are proposed.	
P. 4-114 P. 4-115	The DEIS does not address the cumulative thermal impacts resulting from shade loss at all stream crossings, adjacent work areas, and temporary and permanent ROW maintenance within each watershed. The DEIS does not disclose and analyze the Project's cumulative thermal load analysis. The DEIS only reports results of temperature modeling using SSTEMP at a subset of stream crossings. The applicant performed a shade assessment and associated cumulative thermal impacts analysis by basin. The results are documented in the Thermal Impacts Assessment Resource Report Appendix Q.2 (August 31, 2017). In ODEQ's September 7, 2018 Additional Information Request, ODEQ identified deficiencies in the scope of Project activities that could impact effective shade and associated thermal load on streams. Table 4.3.2.2-9 while informative for predicted modeled temperatures, does not align with Oregon's water quality standards and TMDLs implementing those standards in areas that are not in attainment. DEQ has adopted TMDLs in the basins impacted by the project that include effective shade as a surrogate measure as provided under EPA regulations (40 CFR 130.2(i)) to address heat loading. Pacific Connector must demonstrate compliance with these measures.	Correct error: The Project's thermal impacts must be represented as changes in percent effective shade or actual thermal loads in Kcals/day. Construction and operational (near and long-term) impacts must be quantified as requested in ODEQ's September 2011 letter. If the Commission authorizes the Project, ODEQ is recommending that the following measure be included as specific condition in the Commission's Order. Jordan Cove and Pacific Connector shall not begin riparian vegetation removal, construction of facilities and/or any staging, storage, or temporary work areas and new or to-be-improved access roads until site-specific riparian management area prescriptions are developed for all Project activities that comply with applicable local, state or federal regulations and are consistent with established natural resource management plans. Those site specific plans will include assessment of effective shade reduction due to short-term and long-term reductions in effective shade at the stream surface. Those estimates will be used in developing riparian shade mitigation plans. ODEQ Recommendation: FERC **not** issue license to Pacific Connector until addressing thermal impacts from shade loss is corrected.

	Potential temperature impacts must be represented as changes in percent effective shade or actual thermal loads in Kcals/day. Near and long-term impacts must be quantified as requested in ODEQ's September 2011 letter and consistent with the information requests in the WQ 401 certification review and evaluation documentation.	
P. 4-21 - 4-22	The DEIS does not clearly identify the mechanism or methods to be used for determining whether a slope failure in proximity to a pipeline construction area is related to the pipeline. The DEIS does not clearly identify how slope failures and/or mass wasting events triggered by pipeline construction will be assessed and mitigated.	Correct deficiency: EIS needs to identify the mechanism and methods for the determination of pipeline related slope failures. Explain how slope failures and/or mass wasting events triggered by pipeline construction will be assessed, avoided, minimized and mitigated to prevent water quality impacts. ODEQ Recommendation: FERC **not** issue license to Pacific Connector until this deficiency is corrected.
P. 4-245	"Disturbance to 17 acres of other estuarine habitats (non-eelgrass) would be mitigated with reestablishment of estuarine habitat on about 91 acres of unvegetated mudflats at the Kentuck project site. This mitigation site would re-establish 67 acres of tideland habitat and additional wetland acreage." Both Isthmus and Kentuck Sloughs are water quality limited for dissolved oxygen. Disturbance and Mitigation activities in these areas that have the potential to increase total organic carbon (TOC) or biochemical oxygen demand (BOD) will need to determine the effects of this increased load on water column dissolved oxygen conditions. Dike breeching that allows marine waters to come in contact with high organic matter environment (pasture land) can result in increased loads of oxygen demanding substances.	Correct deficiency: The DEIS indicates that applicant will be opening up an area that was previously diked. The EIS should evaluate and disclose the potential impacts to the environment that would likely result from such an action and recommend appropriate mitigation measures that are enforceable and sufficiently detailed. For example, the paper Biogeochemical Effects of Seawater Restoration to Dike Salt Marshes (1997) indicates that tidal restoration should be conducted gradually and be carefully monitored to prevent large releases of nutrients. FERC should disclose and evaluate whether the proposed mitigation actions in these sloughs will result in negative impacts to water column dissolved oxygen levels, and if so, FERC should recommend controls that will reduce such impacts. ODEQ Recommendation: FERC **not** issue license to Pacific Connector until this deficiency is corrected

P. 4-73, Table 4.2.3.2-1 and P. 4-74	Identifies areas with erodible soils and steep slopes	Correct Deficiency: These areas represent high risk areas for soil erosion and as such will require frequent monitoring of erosion controls. The EIS should identify and discuss a separate monitoring plan specifically for these erosion high risk areas. Erosion controls are expected to need more inspection and maintenance in these areas than controls in other areas. If the Commission authorizes the Project, ODEQ is recommending that the following measure be included as specific condition in the Commission's Order. Jordan Cove and Pacific Connector shall not begin riparian vegetation removal, construction of facilities and/or any staging, storage, or temporary work areas and new or to-be-improved access roads until a statistically valid monitoring plan is developed for a representative range of locations , including ongoing assessment of water quality impacts to ensure project impacts are identified and understood at multiple scales (site and cumulative). The monitoring plan should (a) establish baseline (pre-project) conditions and (b) monitor and report construction and post-project conditions and indicators. ODEQ Recommendation: if FERC issues license to Pacific Connector include response to this issue.
P. 4-246 – 4-247	"Model results for the access channel and slip construction indicate that elevated TSS above background would extend about 0.2 to 0.3 mile beyond the dredge sites during a full tidal cycle with any method considered and would exceed about 500 mg/l for about 0.1 mile. Maximum concentrations outside of the specific dredge location would only occur for about 2 hours or less over the tidal cycle with the plume moving upstream or downstream of the dredge site on flood or ebb tide, respectively." Fecal indicator bacteria can adhere to suspended particles in water which	Correct Deficiency: The potential to increase water column bacteria concentrations in Coos Bay should be evaluated. Shellfish harvesting is especially sensitive to increases in bacteria and potential pathogens. Impacts to commercial, recreational and subsistence shellfish harvesting should be identified along with closure plans if monitoring indicates that elevated bacteria levels are present in the bay during construction activities. ODEQ Recommendation: FERC **not** issue license to Pacific Connector until this deficiency is corrected

	then settle causing an accumulation of bacteria in the bottom sediment (Davies et al., 1995). Numerous studies have found fecal indicator bacteria at greater concentrations in the sediment than in the overlying water in rivers, estuaries and beaches (Stephenson and Rychert, 1982, Struck 1988, Obiri-Danso and Jones, 1999, Byappanahalli, et al. 2003, Whitman and Nevers, 2003). Concentrations in the sediment can range from 10 to 100 times greater than in the overlying water. Resuspension of bottom sediment has been shown to increase in fecal indicator bacteria concentrations in the water column. (Sherer et. al., 1988 and Le Fever and Lewis, 2003).	
P. 2-59 4-114, 4-138, 4-115-116 4-291	In riparian areas, shrubs and trees would be replanted across the right-of-way for a width of 25 feet from the waterbody bank. Within Riparian Reserves, Pacific Connector would replant shrubs and trees to within 100 feet of the ordinary high-water mark (OHWM). A riparian strip at least 25 feet wide on private lands, including widths ranging from 50 to 100 feet on fish-bearing streams as designated for Oregon State Riparian Management Areas, and 100 feet wide on federally managed lands, as measured from the edge of the waterbody, would be permanently revegetated. For private lands, vegetative buffers should be restored to widths equal to or above pre disturbance conditions at each site. Re-vegetation scenarios should be compliant with applicable regulatory mechanisms including the Oregon Forest Practices Act, Oregon Department of Agriculture rules	Correct Deficiency: The EIS should identify and recommend that Pacific Connector comply with current regulatory mechanisms for all Project activities (work areas and rights of way), not just stream crossings, consistent with applicable land use and Designative Management Agency requirements (where TMDLs are issued) unless variance, waiver, or exemption has been granted to appropriately mitigate environmental impacts to an alternate level. In areas with temperature TMDLs, this will normally require replacement of equivalent effective shade losses via replanting. That mitigation needs to occur in physical proximity to the location of impacts. Site-specific riparian management area prescriptions must be developed for all Project activities, not just stream crossings that comply with applicable local, state or federal regulations and are consistent with established natural resource management plans. Those site specific plans must include assessment of effective shade reduction due to short-term and long-term reductions in effective shade at the stream surface. Those estimates must then be used in developing riparian shade mitigation plans. ODEQ Recommendation: FERC **not** issue license to

	relating to agricultural lands, as well as those ordinances implemented by local jurisdictions. For federal lands, The NWFP identifies the riparian management areas as two mature tree heights. The USFS document, Northwest Forest Plan Temperature TMDL Implementation Strategies, 2004, determined that harvest in the secondary tree zone (the second tree height) could result in increases in stream temperatures primarily from the loss of angular canopy density. Impacts to riparian vegetation on federal and non-federal lands should include an assessment of the impacts of riparian removal to a distance of two tree heights.	Pacific Connector until these deficiency are corrected.
General Comment	As per the State's Anti-degradation Rule (Oregon Administrative Rule (OAR) 340-041-0004(7): "Water quality limited waters may not be further degraded except in accordance with section (9)(a)(B), (C) and (D) of this rule." In allowing new or increased discharged loads, the Commission or Department must make the following findings as per rule: (A) The new or increased discharged load will not cause water quality standards to be violated; (B) The action is necessary and benefits of the lowered water quality outweigh the environmental costs of the reduced water quality. (C) The new or increased discharged load will not unacceptably threaten or impair any recognized beneficial uses or adversely affect threatened or endangered species. (D) The new or increased discharged	Correct deficiency: The EIS should fully analyze whether the project can comply with applicable Clean Water Act Antidegradation requirements as set out in 40 CFR 122.4(i), 40 CFR 131.12, OAR 340-041-0004, ODEQ's Antidegradation Policy, Implementation Internal Management Directive for NPDES Permits and Section 401 Water Quality Certifications (March 2001), and EPA's August 8, 2013, Review of Oregon's Antidegradation Internal Management Directive. These antidegradation regulations, rules, and policies require, *inter alia,* maintaining and protecting existing instream uses, protecting and maintaining existing high quality waters unless certain state findings are made, and prohibitions on certain new point source discharges to water quality limited water bodies. The only reference to anti-degradation is provided on page 4-94 in the DEIS and lacks substance or evaluation using the above rules and other guidelines. ODEQ Recommendation: FERC **not** issue license to Pacific Connector until this deficiency is corrected.

	load may not be granted if the receiving stream is classified as being water quality limited under sub-section (a) of the definition of "Water Quality Limited" in OAR 340-041-0002. The applicant must demonstrate that these findings are supported in the DEIS.	
General – Table 1.5.1-1 and TABLE 4.4.2-1	The DEIS does not adequately describe the role of Oregon Dept of Agriculture (ODA) and its authority under Oregon Revised Statute 568: Water Quality Management or Agricultural Water Quality Management Area Rules and Plans; see OAR 603 Division 90 & Division 95 pertaining to the regulatory role of the Oregon Dept of Agriculture and implementing OARs to areas affected by the pipeline. ORS 568.900 to 568.933 authorizes the Oregon Department of Agriculture to develop and carry out an agricultural water quality management area plan for agricultural and rural lands where a water quality management plan is required by state or federal law. Under this program, ODA has responsibility for protection of impacts to water quality from for "Agricultural activities" but does not regulate WQ impacts for other activities (commercial ventures, forestry, rural residential, etc.) even if occurring on land zoned for agriculture. These Agricultural Area Rules and Plans have been developed under OAR 603 Divisions 90 & 95 for all of the counties in the pipeline path, including those without TMDLs in place. Therefore, it is important that pipeline construction and operation not negatively impact	The EIS should clearly identify the authority and role of Oregon Department of Agriculture's (ODA) Agricultural Water Quality Management Area Rules and Plans. These Area rules and plans provide the framework for how lands and activities under the jurisdiction of ODA will meet the total maximum daily load (TMDL) requirements. There is brief reference to ODA's regulatory authority in Table 1.5.1-1; however there is no mention of evaluating or managing impacts to water quality associated with agricultural lands. ODEQ Recommendation: if FERC issues license to Pacific Connector include response to this issue.

	implementation of the Area Rules and Plans. The proposed pipeline waterbody crossings and riparian activities would reduce stream-side shade thereby negatively affecting the potential to reach TMDL identified shade targets on private lands supporting agricultural activities. See individual Agricultural Water Quality Management Area Rules and Plans for riparian management goals and requirements at the Oregon Department of Agriculture Water Quality Plans web page: https://www.oregon.gov/ODA/programs/NaturalResources/AgWQ/Pages/AgWQPlans.aspx	
Page 4-114 Table 4.3.2.2-9	The DEIS does not explicitly consider the cumulative thermal impact resulting from shade loss at all stream crossings, adjacent work areas, and permanent ROW maintenance within each watershed. The DEIS does not disclose and analyze the Project's cumulative thermal load analysis. The DEIS only reports results of temperature modeling using SSTEMP at a subset of stream crossings. The applicant performed a shade assessment and associated cumulative thermal impacts analysis by Basin. The results are documented in the Resource report Appendix Q.2 In 9/7/18 Information Request, ODEQ identified deficiencies in the scope of Project activities that could impact effective shade and associated thermal load on streams. Associated with these disturbances to the streams and wetlands themselves, are significant impacts to riparian and	Correct deficiency. The DEIS isolates impacts from the pipeline alone to draw the conclusion that there will be minimal impacts to water quality benefits of shading, etc. The EIS must address the cumulative thermal effects occurring in the areas that will be impacted by pipeline construction and long-term operation. Site-specific riparian management area prescriptions must be developed for all Project activities that comply with applicable local, state or federal regulations and are consistent with established natural resource management plans. Those site specific plans must include assessment of effective shade reduction due to short-term and long-term reductions in effective shade at the stream surface. Those estimates must then be used in developing riparian shade mitigation plans. ODEQ Recommendation: FERC **not** issue license to Pacific Connector until this deficiency is corrected.

	wetland vegetation. For instance, most existing riparian trees along the pipeline route will be removed. The DEIS states: "9 linear stream miles of streambank could be affected along the whole Project route (GeoEngineers 2017)." These activities will result in a significant removal of riparian shade. Completed TMDLs identify riparian shade surrogates to meet the thermal load allocations required in the TMDL. Selective replanting is proposed except for areas within 15 feet over the center of the pipeline. Even so, temporal losses of wetland and water quality function will be experienced for 1-3 years for wetland shrubs and up to several decades for trees in forested wetland areas and riparian areas. This riparian vegetation, and in particular trees, is essential to providing water quality and habitat functions. Riparian ecological services - shade to reduce stream temperature, nutrient and pollutant uptake, stormwater treatment and infiltration, and bank stabilization through root structure - will be lost in the impacted areas for years to decades. Although mitigation through replanting lengths are proposed for Riparian Reserve areas, the sensitivity of all riparian areas is not accurately described in the DEIS.	
Page 4-96 Mercury in eroded soils. Page 4-289	The Rogue River has been identified as impaired for mercury based on fish tissue analysis (2012 303(d) list: Category 5 – water quality limited). A TMDL for mercury in the Rogue River will be developed in the future. The Willamette basin TMDLs provided estimates that up to 47% of the mercury entering the Willamette River mainstem is coming from the erosion of	Correct error: Mercury impairments in the Rogue River (River Mile 0-216.8) must be acknowledged in the EIS. FERC should require that all necessary steps be taken to prevent erosion during and after construction are implemented including soils testing and implementing the measures outlined in the Contaminated Substances Discovery Plan where warranted.

	native soils. Willamette Basin Mercury TMDL, 2006 https://www.oregon.gov/deq/wq/tmdls/Pages/TMDLs-Willamette-Basin.aspx The DEIS addresses mercury in isolated areas of East Fork of Cow Creek and in the vicinity of legacy mercury mines only (Page 4-96). Given the high potential for mercury in soils within the Rogue Basin, mercury should be addressed across the proposed pipeline route in the context of erosion prevention/sediment control in the ECRP. The DEIS (page 4-289) states, "With adjacent upland disturbance following the standard ECRP and supplemental erosion control actions, additional site-specific ground cover actions would be taken at this crossing, and upslope potential sediment entry into the stream would be controlled and minimized. Overall, adverse effects on fish from mercury would not occur from Pacific Connector Pipeline" Project actions and construction sites must be stabilized following construction to ensure no erosion occurs with wet weather as per the ECRP. If soils containing high levels of mercury are encountered in the Rogue Basin or other mercury containing areas including the East Fork Cow Creek drainage during Project construction, Pacific Connector must implement the measures outlined in its *Contaminated Substances Discovery Plan*.	ODEQ Recommendation: FERC **not** issue license to Pacific Connector until this deficiency is corrected
4-27, 4-31-32, 4-297, Table 4.1.2.6-1	As per the DEIS the blasting potential was classified as high for about 100 miles of the proposed pipeline route (4-27). All blasting would be done by	Correct deficiency: The EIS should identify the water quality impacts caused by blasting. The EIS should also disclose that permits from Oregon Department of Fish and Wildlife and coordination

Blasting	licensed contractors under the terms of applicable regulatory requirements. Although there is a discussion of minimizing impacts to wetlands and water wells and springs in the text (pages 4-31-32), there is no discussion of minimizing the impacts to streambeds and stream water quality as a result of blasting. Blasting should be a last resort option which must be thoroughly analyzed regarding potential impacts and damage minimization options. Permits from ODFW and coordination with ODEQ are required for blasting in waters of the state.	with ODEQ are required for blasting in waters of the state. The EIS should discuss measures that will be applied to minimize and mitigate adverse impacts when blasting is determined to be the only option. ODEQ Recommendation: FERC **not** issue license to Pacific Connector until this deficiency is corrected.
Section 4.1.2.6. Page 4-32. Impacts to private and public water wells.	The DEIS states "Pacific Connector would request authorization from landowners to test and document the baseline condition, yield, and water quality of any private wells located within 200 feet of the pipeline construction right-of-way. This testing would occur before the pipeline construction starts in the nearby area, and the testing results would be shared with the property owner, if requested. Similar information would be gathered for any public water wells located within 400 feet of the pipeline construction right-of-way. Based on testing results, if it is determined after construction that there has been an impact on groundwater supply (either yield or quality), Pacific Connector would work with the landowner to ensure a temporary supply of water, and, if determined necessary by the landowner, Pacific Connector would provide a permanent water supply." ODEQ recommends that if surface and/or groundwater connectivity extends beyond 400 feet or 2-yr time of travel, whichever is larger, that these	Correct deficiency: ODEQ recommends that if source water impacts have the potential to extend beyond the distances specified in the DEIS that these private and public wells are monitored as well. ODEQ Recommendation: if FERC issues license to Pacific Connector include response to this issue.

	private and public wells are also monitored for impacts.	
P. 4-795 and Table 4.14-2 Cumulative Effects: Water Resources.	P. 4-795 states, "However, based on available information (see table 4.14.-2) and the temporary and localized impacts of the Project on surface waters as described in the preceding environmental analyses, Pacific Connector's use of HDDs to cross major waterbodies, and its implementation of erosion and sediment control measures as well as other impact minimization measures, we conclude that these impacts and the potential impacts of the other projects would result in a cumulative impact; but, this impact would not be significant."	Correct omission: Erosion and sedimentation potential and the associated impacts associated with specific activities are examined on a site-by-site basis, and the EIS must include such an analysis. Oregon's numeric turbidity standard OAR 340-041-0036 and Statewide Narrative Criteria OAR 340-041-0007(11) (see also Prohibited activities in ORS 468B.025(1)(a)) are not to be exceeded at any project site along the pipeline route. No individual actions can exceed water quality standards for sediment or turbidity except where authorized by permit. https://secure.sos.state.or.us/oard/displayDivisionRules.action?selectedDivision=1458 https://secure.sos.state.or.us/oard/viewSingleRule.action?ruleVrsnRsn=68690 ODEQ Recommendation: FERC **not** issue license to Pacific Connector until this deficiency is corrected.
P. 2-42, 2-60 Temporary Extra Work Areas	Page 2-42 of the DEIS states that Pacific Connector has identified approximately 920 acres of TEWAs that would be disturbed during construction of the pipeline. All of these areas are considered temporary disturbance and would be restored upon completion of construction. All TEWAs that were forested prior to construction would be replanted with trees. Page 2-60 of the DEIS states that "TEWAs would be located more than 50 feet away from the edge of waterbodies where possible, and Pacific Connector has identified locations where site-specific conditions or other constraints prevent a 50-foot setback (see appendix E)."	Correct error: Eventual re-vegetation and restoration does not obviate the requirement to quantify the cumulative thermal impacts. Since TEWAs will result in the additional disturbance and overstory removal in riparian, the EIS should include an analysis of the thermal impacts of this activity, and quantify those impacts. Those impacts must avoided and minimized to the extent possible, and mitigated where they are unavoidable. Subsequent increases in solar radiation should be included in the solar loading assessment and include these thermal units in thermal mitigation calculations. TEWAs will result in the additional removal of riparian vegetation at pipeline waterbody crossings. FERC must include a requirement that TEWA thermal impacts be quantified and mitigated. ODEQ Recommendation: FERC **not** issue license to Pacific Connector until this deficiency is corrected.
P. 4-116	DEIS text on page 4-116 states "To	Correct error: Cumulative thermal impacts need to be

Thermal impact from riparian vegetation removal	minimize the potential effects of pipeline construction on stream temperatures by the removal of riparian vegetation, Pacific Connector has incorporated the following measures into its Project design: narrowing the construction right-of-way at waterbody crossings to 75 feet where feasible based on site-specific topographic conditions; locating TEWAs 50 feet back from waterbody crossings to minimize impacts on riparian vegetation, where feasible; replanting the streambanks after construction to stabilize banks and to re-establish a riparian strip across the right-of-way for a minimum width of 25 feet back from the streambanks; and replanting riparian areas equal to 1:1 ratio to temporary riparian shading vegetation losses and 2:1 ratio for permanent riparian losses from the 30-foot operational easement clearing. Based on these measures and the studies summarized above, we conclude that the construction and operation of the pipeline would have no discernible effect on stream temperature."	assessed as changes in percent effective shade or thermal load. Mitigation will be based upon the increase in thermal units not discernable changes in stream temperature. ODEQ Recommendation: FERC **not** issue license to Pacific Connector until this deficiency is corrected.
P. 4-114 & 4-115, Table 4.3.2.2-9 Temperature Impacts Nonpoint Source Load Allocations - Site Specific Effective	The DEIS does not consider the cumulative thermal impact resulting from shade loss at all stream crossings, adjacent work areas, and permanent ROW maintenance within each watershed. The DEIS does not disclose and analyze the Project's cumulative thermal load analysis. The applicant performed a shade assessment and associated cumulative thermal impacts analysis by basin. The results are documented in the Thermal	Correct error: Potential temperature impacts must be represented as calculated changes in percent effective shade or thermal loads in Kcals/day. near and long-term impacts must be quantified as requested in ODEQ's September 2011 letter. If the Commission authorizes the Project, ODEQ is recommending that the following measure be included as specific condition in the Commission's Order. Jordan Cove and Pacific Connector shall not begin riparian vegetation removal, construction of facilities

Shade	Impacts Assessment Resource Report Appendix Q.2 (August 31, 2017). ODEQ's September 2011 letter provided Pacific Connector guidance on using shade as a surrogate for temperature and using methods to estimate long term impacts to shade and subsequently thermal loading to be consistent with the TMDLs approach. In this section, the DEIS only summarizes results of temperature modeling using a model SSTEMP at a subset of stream crossings. While the assessment of measurable temperature impacts to stream segments as a result of specific crossing or action is informative it does not align with Oregon's water quality standard or TMDLs implementing that standard. TMDLs in the basins impacted by the Project use "*other appropriate measures*" (or surrogate measures as provided under EPA regulations (40 CFR 130.2(i))) in the form of percent effective shade to address heat load. Potential impacts to waters of the state by the removal of riparian vegetation should be quantified as loss of effective shade as measured on the streams' surface. As per the temperature TMDLs, attainment of the effective shade surrogate measure is equivalent to attainment of the nonpoint source heat load allocations. System potential vegetation is the typical shade target for streams with no assimilative capacity. System potential vegetation represents the maximum possible effective shade for a given location, assuming the vegetation is fully mature. **Note:** In general the Rogue and Klamath, and Umpqua Basins,	and/or any staging, storage, or temporary work areas and new or to-be-improved access roads until site-specific riparian management area prescriptions are developed for from all Project activities, not just stream crossing that comply with applicable local, state or federal regulations and are consistent with established natural resource management plans. Those site specific plans will include assessment of effective shade reduction due to short-term and long-term reductions in effective shade at the stream surface. Those estimates will be used in developing riparian shade mitigation plans. ODEQ Recommendation: FERC **not** issue license to Pacific Connector until this deficiency is corrected

	temperature TMDLs and associated shade targets apply to all perennial and intermittent streams within the project area. Solar gain and thermal loading are not limited only to 303d listed segments, but are an issue for all perennial and intermittent streams in a TMDL basin. See individual TMDLs for more information: https://www.oregon.gov/deq/wq/tmdls/Pages/TMDLS-Basin-List.aspx	
P. 4-140 Stream Temperature Assessment See also comment 61 P. 4-114 & 4-115, Table 4.3.2.2-9 Temperature Impacts	The DEIS summarizes results of temperature modeling using SSTEMP at a subset of stream crossings. Project-specific temperature modeling that was conducted on federal lands stream crossings using Stream Segment Temperature Model (SSTEMP) (Bartholow 2002), was conducted at the perennial stream crossings on BLM lands at Middle Creek Deep Creek and Big Creek, and NFS lands at multiple crossing on the East Fork Cow Creek in 2009 and again in 2013 to reflect new pipeline alignment and lower flow conditions (NSR 2009, 2015b,c). ODEQs' TMDLs are based on achieving and maintaining site potential vegetation, recognizing that natural disturbance will occur that prevents full potential from being achieved at any given time & location.	Correct deficiency in DEIS: Anthropogenic heating and stream temperature increases above natural rates of heating are a violation of state water quality standards in TMDL basins. Effective shade is the surrogate measure for compliance in these basins. The EIS should clarify that impacts to riparian vegetation must be fully mitigated by offsetting increases in thermal loading by ratios of 1:1 and 2:1. See ODEQ's September 2011 letter to Jordan Cove and Pacific Connector. These mitigation ratios are consistent with ODEQs 2009 Water Quality Trading Internal Management Directive. ODEQ Recommendation: FERC **not** issue license to Pacific Connector until this deficiency is corrected
4-411	Section provides incomplete and inadequate description or analysis of Oregon CZMA/CZARA status. Oregon developed a Coastal Nonpoint Pollution Management Plan (CNPCP) that was finally disapproved by EPA and NOAA in 2015. The primary basis for disapproval is failure to resolve the outstanding management measures for private forestry. Specifically, three areas have	In order to demonstrate that the Project will be consistent with Oregon's existing CNPCP and address outstanding management measures: The EIS will need to address how the Project will ensure that BMPs are implemented to address CNPCP outstanding management measures when conducting operations on private lands. At a minimum, the Project should fully implement practices consistent with those developed under the Oregon Plan (see

	been identified as not met associated with operations on private forest lands (and so-called legacy roads).	Private Forest Landowners and the Oregon Plan (February 2012): https://www.oregon.gov/ODF/Documents/WorkingForests/Oregon_Plan_PFguide.pdf
4.3.1.2 Pacific Connector Pipeline Project p. 4-100: Impacts and Mitigation pp. 4-104 to 4-108: Turbidity and Sedimentation 4-273 to 4-284:	Sources of turbidity and sedimentation and waterbody impacts of these potential characteristics or pollutants are addressed in multiple sections of the DEIS. The DEIS (p 4-273) states "Pipeline crossings of surface waterbodies would cause some downstream turbidity and sedimentation." The DEIS summarizes the evaluation performed by the Project on construction phase impacts of crossings and concludes: "Overall cumulative effects [of sedimentation on aquatic resources] would be unsubstantial based on the dispersed distribution of crossings and magnitude of effects at each and lengths of stream channel potentially affected". ODEQ disagrees with the DEIS' principal conclusion regarding sedimentation. The reasons are that Oregon's Statewide Narrative Criteria In OARs 340-041-0007(7), (8), and (11) and OAR 340-041-0011. **Biocriteria** set forth performance standards that the Project (due to its multiple waterbody intersections in a variety of geographies) cannot demonstrate will be met without site-specific & project-specific monitoring activities that evaluate pre- and post-project conditions of the "Resident Biological Community" (OAR 340-041-0002(50)). Assessing whether there are aquatic life	The EIS must include an analysis of target turbidity values or fine sediment (e.g. TSS) levels and require monitoring to assure that those levels are not exceeded. This must include an assessment of post-construction, operational phase total suspended sediment or turbidity levels in waterbodies hydrologically connected to drainages along the pipeline. The EIS must be based on a statistically valid monitoring plan developed for a representative range of locations, including ongoing assessment of water quality indicators and macroinvertebrate condition, to ensure project impacts are identified and understood at multiple scales (site and cumulative). The monitoring plan must (a) establish baseline (pre-project) conditions & (b) monitor and report construction and post-project conditions and indicators. ODEQ Recommendation: FERC **not** issue license to Pacific Connector until this deficiency is corrected

	impacts from anthropogenic sources of fine sediment is normally based on macroinvertebrate condition (compared to reference or pre- & post-activity). Physical survey methods could be employed to assess whether the standard in OAR 340-041-0007 (11) is met. The discussion of Project effects on sedimentation and turbidity levels are linked to a range of monitoring approaches and their respective effectiveness. Turbidity levels upstream of an activity are generally used to establish the target turbidity value (downstream from an activity) and assess compliance with Oregon's turbidity standard (OAR 340-041-0036). For disturbance associated with construction of stream crossings, assume turbidity is associated primarily with generation and suspension and transport of fine sediment rather than organic matter. Establishing the target turbidity level and assessing compliance with that target depends on the water body conditions at the time of the activity. These levels should be explicitly identified in the joint permit conditions (JPA). For the post-construction, operational phase, no specific estimates of total suspended sediment or turbidity levels was provided. The DEIS largely assumes that full site stabilization will occur in disturbed areas. Follow-up with federal agencies for areas not meeting the ECRP is included, but no post-construction monitoring plan on private	

	lands was identified. In contrast, a channel condition monitoring plan is explained (p. 4-102)	
P. 4-104 Turbidity and Sedimentation	The DEIS discusses several impacts of fine sediment suspension and subsequent deposition. The DEIS does not explicitly address whether the pipeline construction activities and operation will achieve compliance with OAR 340-041-0011-Biocriteria and OAR 340-041-0007 Statewide Narrative Criteria (11) Oregon's sedimentation and biocriteria standards are not explicitly linked to highly variable in-stream turbidity levels but rather are associated with impacts on stream bottom habitat or aquatic life, respectively.	Correct deficiency: The EIS should more effectively address whether the pipeline construction and operation can meet narrative state water quality standards, and if so, what mitigation measures will be needed to meet these standards and monitoring to demonstrate that standards are, in fact, being met as a result of Project activities. See preceding comment above. ODEQ Recommendation: FERC **not** issue license to Pacific Connector until this deficiency is corrected
Stream Temperature pp. 4-114 to 116 p. 4-291;	The DEIS summarizes the riparian setbacks for Project and concludes (p. 4-116): "Based on these measures and the studies summarized above, we conclude that the construction and operation of the pipeline would have no discernible effect on stream temperature." As stated in other comments, ODEQ does not agree with this conclusion for several reasons. First, the DEIS fails to address the primary thermal load surrogate (effective shade) and fails to address thermal load. Second, thermal impacts that exceed OAR 340-041-0028(11) Protecting Cold Water (PCW) criterion have been documented by ODF from harvest using FPA private forest RMAs for small and medium fish-bearing streams (Groom et al 2011; see Board of Forestry Rules analysis).	The EIS should recommend that state forest Riparian standards (for RMAs) be followed. See Forest Management Plans (FMP) [ODF, 2010]) riparian buffers https://www.oregon.gov/ODF/Working/Pages/StateForests.aspx Revise ECRP and other documents accordingly to reflect level of RMA protection needed to meet shade targets and protect cold water on waterbodies where riparian management is conducted on private lands. ODEQ Recommendation: FERC **not** issue license to Pacific Connector until this deficiency is corrected.

	The minimum 25-foot riparian management area (RMA) is not adequate to ensure thermal load reduction and meet TMDL shade targets on small perennial streams or meet OAR 340-041-0028(11). The DEIS also does not describe Oregon's Riparian Protection Rule in sufficient detail to evaluate whether the Project will be in compliance with the FPA where applicable. It can be complex to determine RMA requirements under "alternate practices" likely to be employed for pipeline construction. See Oregon's Forest Protection Laws : An Illustrated Manual -Chapter 2: Planning a timber harvest https://oregonforests.org/pub/oregons-forest-protection-laws-illustrated-manual Finally, in its 9/7/18 information request, ODEQ identified deficiencies in the scope of Project activities that could impact effective shade and associated thermal load on streams.	
p. 4-105 Major Waterbody Crossings	DEIS (4-105) states: "The South Umpqua River diverted open-cut crossing would have similar effects on downstream sediment and turbidity, in the short term, to those from other dry crossings." The DEIS evaluation concluded that turbidity generated during construction may exceed the Oregon water quality standard for short distances and short durations downstream from each crossing. *Further*, "There would be short-term turbidity increases for several hours during portions of the installation and removal of the diversion structures for	The EIS should reflect the need to provide a more robust evaluation of: (a) the amount and characteristics of fine sediment that is expected to be generated, and (b) fate of fine sediment and impacts to aquatic habitat and aquatic life expected to be produced by the pipeline Project under a normal range of environmental scenarios, including discharge and precipitation events. FERC should develop license conditions that would better ensure protection of water quality and aquatic resources If the Commission authorizes the Project, ODEQ is recommending that the following measure be included as specific condition in the Commission's Order.

	the proposed diverted open-cut crossing of the South Umpqua River." ODEQ concludes that the Project expects that turbidity standards will be exceeded for unknown periods of. These exceedences are not authorized. In the South Umpqua sub-basin, there are 22 segments that are Category 5: Water quality limited, 303(d) list, TMDL needed for Biological Criteria. For many of these segments fine sediment has been identified as a significant stressor. The DEIS minimizes adverse downstream impacts of fine sediment deposition on aquatic habitat and aquatic life. Major waterbody crossings are risky. If construction is planned for an unanticipated period of wet flows or heavy precipitation occurs, the Project's response isn't clear. These low frequency - high impact scenarios are not adequately addressed.	Jordan Cove and Pacific Connector shall not begin construction of diverted open-cut crossings until project provides a more robust evaluation of: (a) the amount and characteristics of fine sediment that is expected to be generated, and (b) fate of fine sediment and impacts to aquatic habitat and aquatic life expected to be produced by the pipeline Project under a normal range of environmental scenarios, including discharge and precipitation events. ODEQ Recommendation: FERC **not** issue license to Pacific Connector until this deficiency is corrected
Mitigation on Non-Federal Lands P. 2-36	The DEIS provides a short description on how impacts on non-federal lands will be mitigated. It provides information on plans that are currently being drafted.	Complete plans on mitigation measures on non-federal lands must be included in the EIS.
Environmental Analysis Pipeline: P. 4-71	The Pacific Connector Pipeline Project would likely result in a degraded soil condition on an estimated 30 to 70 percent project right-of-way on NFS lands in the Winema National Forest (all in the Spencer Creek Watershed) due to displacement and compaction (Orton 2009). Compaction can largely be addressed by subsoil ripping, but displacement would be unavoidable because of the nature of the project.	The DEIS provides information on streamside vegetation mitigation. However, due to the unprecedented amount of disturbed land and degraded soil, mitigation measures must be included to minimize sedimentation in the watershed as a result of the degraded soil conditions. Furthermore, efforts will need to be made to revegetate these areas.
Klamath River	Table 4.7.3.5-10 outlines specifics in the	Spencer Creek is the main tributary in the Upper

Basin, Spencer Creek Fifth Field Watershed, HUC 180102206, Winema National Forest P 4-512 to 4-516	Spencer Creek watershed. However, there is no analysis of the sediment listing for Spencer Creek as it pertains to the Clean Water Act. In addition, there is no analysis of impacts to spawning grounds for Redband Trout and no analysis of protections for anadromy.	Klamath River watershed and will host salmonids upon dam removal for spawning purposes. Include protections for sediment loading that will impact both water quality in the watershed and potentially impact spawning habitat for Redband Trout and Salmonids.
Measures That Would Mitigate Effects on Aquatic Resources on Federal Land P. 4-307- 4-308	Mitigation has been mentioned throughout the document in regards to the various impacts related to stream crossings. However, there is little detail on mitigation on non-federal lands.	In areas where the pipeline crosses sensitive streams such as the Spencer Creek, alternative methods for stream crossings must be used to reduce significant impacts to environment. These alternative methods could include horizontal boring or changing the route of the pipeline. Otherwise, the EIS should identify and discuss other specific mitigation measures for water quality improvement projects that will appropriately protect water quality in these sensitive streams. In addition, other areas outside of the federal nexus need to be evaluated. Private lands should have an additional section on how the mitigation practices will work to protect them as well.

Oregon Department of Fish and Wildlife

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The Oregon Department of Fish and Wildlife (ODFW) provides the following comments on the Federal Energy Regulatory Commission's (FERC) 2019 Draft Environmental Impact Statement (DEIS) for the Jordan Cove LNG Terminal and Pacific Connector Pipeline Projects (JCEP/PCGP) in the state of Oregon (FERC Docket No. CP17-494-000 and CP17-495-000). The DEIS was published in March 2019 by FERC and its Cooperating Agencies (US Bureau of Land Management – BLM, US Forest Service – USFS, US Fish and Wildlife Service – USFWS, US Army Corps of Engineers – USACE, National Oceanic and Atmospheric Administration's National Marine Fisheries Service – NMFS, US Coast Guard, Coquille Indian Tribe, and the Pipeline and Hazardous Material Safety Administration).

These comments are a compilation of ODFW comments over the 11-year history of the JCEP/PCGP project, including ODFW comments on the FERC Notices of Intent (NOI; 2008, 2012, 2017), Draft Environmental Impact Statements (DEIS 2015, 2019), as well as comments submitted to USACE and state permitting agencies over the years. All comments reflect careful long-term refinement and assessment by ODFW, but are lengthy due to the extended history of the proposed project and its widespread impacts. ODFW has reviewed and updated previous comments that remained fully relevant. Where the project actions have changed or new information was available, ODFW has modified or added comments that reflect these aspects.

ODFW provides the following comments aimed at the sufficiency of the DEIS in its consideration of impacts to fish, wildlife, and their habitats, as guided by the implementing regulations for NEPA documents at 40 C.F.R Part 1502 and 18 C.F.R. Part 380. ODFW comments are also submitted under provisions of the Fish and Wildlife Coordination Act (FWCA) (16 U.S.C. 661-667e; the Act of March 10, 1934; Ch. 55; 48 Stat. 401) which, as amended in 1946, requires consultation with the Fish and Wildlife Service and the fish and wildlife agencies of States where the "*waters of any stream or other body of water are proposed or authorized, permitted or licensed to be impounded, diverted . . . or otherwise controlled or modified*" by any agency under a Federal permit or license. Consultation is to be undertaken for the purpose of "preventing loss of and damage to wildlife resources" and to allow FERC and its Cooperating Agencies to consider state fish and wildlife agencies concerns.

Relevant ODFW Authorities:

ODFW recommendations on the JCEP/PCGP project are guided by the following statutes, rules, and plans. *(An asterisk (*) indicates those authorities also listed as Enforceable Policies for the Jordan Cove Energy Project by ODFW of Land Conservation and Development Oregon Coastal Management Program for their Federal Consistency determination, pursuant to Section 307(c)(3)(A) of the Coastal Zone Management Act.)*

- Wildlife Policy (ORS 496.012*): Establishes wildlife management policy to prevent serious depletion of any indigenous species and maintain all species of fish and wildlife at optimum levels for future generations.
- Threatened or Endangered Wildlife Species Protection and Conservation Programs (ORS 496.171-182*): Authorizes ODFW to develop conservation and recovery plans for listed wildlife species, including guidelines that it considers necessary to ensure the survival of individual members of the species. These guidelines may include take avoidance and protecting resources sites such as spawning beds, nest sites, nesting colonies, or other sites critical to the survival of individual members of the species (496.182(2)(a). Directs state land management agencies to work with ODFW to determine their agency's role in conservation of endangered and threatened species. At ORS 498.026(1), prohibits "taking" of any listed species. Illegal take is a violation of the wildlife laws, subject to criminal prosecution as a Class A misdemeanor or violation pursuant to ORS 496.992.
- Prohibition of harassment, etc. of wildlife (ORS 498.006): Prohibits chasing, harassment, molestation, worrying or disturbing any wildlife, except as the Fish and Wildlife Commission may allow by rule.
- Criminal penalties for wildlife violations (ORS 496.992): Makes violation of any wildlife statute or Fish and Wildlife Commission rule subject to prosecution as a Class A misdemeanor or violation.
- Food Fish Management Policy (ORS 506.109*): Establishes production, utilization, and conservation goals for food fish to provide optimum economic, commercial, recreational, and aesthetic benefits for present and future generation for the citizens of this state.
- In-Water Blasting (ORS 509.140*): Any entity that desires to use explosives or any substances deleterious to fish for the construction of a dam, bridge, or other structure shall make application to the State Fish and Wildlife Commission for a permit to use explosives in such waters. This statute also creates the authority for ODFW designation of in-water work windows (time periods appropriate for working within fish-bearing waters).
- ODFW Fish Passage Law (ORS 509.580 - 509.645*): Requires upstream and downstream passage at all artificial obstructions in those Oregon waters in which migratory native fish are currently or have historically been present.
- ODFW Fish Screening Policy (ORS 498.301*): Prevents appreciable damage to game and nongame fish populations as a result of the diversion of water for nonhydroelectric purposes from any body of water in this state.
- Fish and Wildlife Habitat Mitigation Rule (OAR 635-415-0000-0025): Governs ODFW's provision of biological advice and recommendations concerning mitigation for losses of fish and wildlife habitat caused by development actions. Follows a mitigation hierarchy of avoid, minimize, and mitigate impacts to fish and wildlife habitat. Goals of the policy include no loss, no net loss, and net benefit depending on the category of habitat impacted. This rule is the framework ODFW uses to implement ORS 496.012, 506.109, 496.182, 509.140, and 509.180, among other statutes.
- General Fish Management Goals (OAR 635-007-0510): Establishes the goals that fish be managed to take full advantage of the productive capacity of natural habitats, and that ODFW address losses in fish productivity due to habitat degradation through habitat restoration.

General Comments and High Priority Issues

This narrative section highlights ODFW's primary concerns with the JCEP/PCGP project, and focuses on the key areas of the DEIS that did not sufficiently demonstrate how serious depletion of Oregon's fish and wildlife resources will be avoided (ORS 496.012). By way of summary, those key areas of insufficiency include:

- The need for a Natural Resource Technical Advisory Group
- Economic Impact
- Connection to Port of Coos Bay Channel Modification Project and their Cumulative Effects
- JCEP LNG Terminal Impacts to the Coos Bay Estuary
- Dredging Impacts to Estuarine Habitats and Communities
- Impacts to Eelgrass
- Introduction of Non-indigenous Species through Ballast Discharge
- Disturbance to Marine Mammals
- Impacts to Wildlife in Freshwater Wetlands, Uplands, and Beaches on the North Spit
- Impacts of the LNG Terminal on Snowy Plover Nesting and Foraging Habitat
- Impacts to Coastal Marten Habitat
- Habitat Loss at the JCEP LNG Terminal Site
- Impacts from the PCGP Pipeline to Fish and Wildlife Habitat
- Impacts to Marbled Murrelet and Northern Spotted Owl Habitat
- Fish and Wildlife Habitat Mitigation
- Fish Passage
- In-Water Blasting, In-Water Work.

Each of these bulleted issues is discussed in detail below.

Natural Resource Technical Advisory Group – ODFW recommends FERC and/or JCEP/PCGP create a Natural Resource Technical Advisory Group (NRTAG) to serve as a technical team to minimize environmental impacts and oversee the comprehensive mitigation plan (mentioned in Section 4.5.1.1 on Page 4-186). A Natural Resource Technical Advisory Group could include the Applicant, and natural resource knowledgeable professionals. ODFW recommends the NRTAG be comprised of members from federal agencies, tribes, state agencies, science-based organizations, and other stakeholders. The role of the NRTAG would be to assist project managers with project planning, adaptive management, and implementation assuming FERC authorization. The NRTAG could interact with FERC and JCEP/PCGP to provide specific guidance/feedback, evaluation of potential ecological impacts risks, needed monitoring/studies, and post-study ecological assessment relating to:

- Direct and indirect construction impacts of the project.
- Post-construction legacy impacts to fish and wildlife production.
- Precise methods of study to determine/measure the magnitude of both project impacts and restoration/mitigation effectiveness.
- Mitigation strategies, and monitoring of mitigation to ensure effectiveness.

Economic Impact - ODFW recognizes the project is anticipated to provide immediate economic benefits to the local communities of Coos County and other counties within the range of the pipeline portion of the project. However, this benefit should be evaluated in the context of both the potential adverse environmental effects and negative impacts to the long-standing current and future economically important industries (e.g. commercial fishing, recreational fishing and hunting, aesthetics, wildlife viewing, and aquaculture) that depend on healthy and abundant fish, wildlife, and habitats. Section 4.9 of the DEIS briefly discusses the potential impacts to commercial and recreational fishing and its contribution to the economy. However, ODFW contends the DEIS's discussion grossly underestimates the impact. Fish and wildlife recreational expenditures in 2008 accounted for $2.5 billion in income for the state of Oregon (Runyan and Associates 2009). In Oregon, the commercial crabbing fishery is a tremendous economic engine with potential to be impacted by this project. For example, the 2017-2018 Dungeness crab season (December to August) generated $74 million in ex-vessel value (see https://www.dfw.state.or.us/MRP/shellfish/commercial/crab/docs/Crab%20Newsletter_2018_final.pdf, and https://www.dfw.state.or.us/MRP/shellfish/commercial/crab/news_publications.asp). Like many other important fisheries, Dungeness crab use Coos Bay and the surrounding nearshore area for nursery habitat that may be affected by this project's proposed dredging activity, and the Coos Bay fishing fleet relies heavily on crab for its profits.

Connection to Port of Coos Bay Channel Modification Project, Cumulative Effects - The JCEP terminal will dredge a combined total of 5.7 million cubic yards (CY) from North Spit and Coos Bay in order to create the slip for ships to load liquefied natural gas (LNG) and navigate along the Coos Bay channel to the ocean. The Port of Coos Bay has also proposed a navigation channel modification project (US Army Corps of Engineers – USACE Environmental Impact Statement, see Federal Register 82 FR 39417) that will also highly benefit the JCEP/PCGP project. ODFW recognizes that the Port of Coos Bay channel modification project will convey benefit to the JCEP/PCGP project both in terms of financial savings and through increased transport efficiency. Accordingly, ODFW recommends that the FERC jointly consider the impacts of the USACE Port of Coos Bay Channel Modification Project, because they are connected, similar, and cumulative actions. Some of the impacts of the combined projects include:

- Deepening and widening of the existing Coos Bay navigational channel to 37' deep and 300' wide
- Expansion of the Coos Bay navigational channel to 45' deep and 450' wide from the channel entrance to River Mile 8.2
- Alteration of the hydrodynamic characteristics of the Coos Bay estuarine tidal basin in response to deepening and widening, including:
    - Physical changes in the intrusion of marine waters, coupled with alteration of the salinity regime, conductivity, exchange volume, tidal prism, tidal currents, and other parameters
    - Shifts in the location, configuration, and spatial extent of marine-dominated, estuarine, and freshwater-tidal habitats
    - Changes in the composition of ecological communities that reside within the water column, marine-dominated, estuarine, and freshwater-tidal habitats
    - Changes in the location and potential for rearing of juvenile fish
- Disposal of 18 million CY of dredge material at upland sites on the JCEP project lands

located southwest of the OR Highway 101 bridge at the APCO Sites, and disposal of dredged material at the Kentuck Project Site;

- Impacts to the ocean floor outside the mouth of Coos Bay where a large quantity of dredged material (estimated at 18-25 million CY) will be deposited at an ocean disposal site, or multiple sites, that have not been fully identified, including:
    - Deposition of dredged materials on the ocean floor will alter the physical characteristics of the benthic habitat due to both the substantial modification of the bottom topography and the anticipated characteristics of the dredged material (e.g. estimated 8.5 million CY of sandstone and siltstone debris);
    - Deposition of dredged materials on the ocean floor will impact the benthic communities of resident marine fish and invertebrates, as well as transient species of concern including green sturgeon (*Acipenser medirostris*);
    - Dredged materials transported away from the deposition sites have the potential to negatively affect important nearby rocky reef habitats;
    - Disposal of dredged materials may occur in areas of heavy Dungeness crab commercial fishing activity, potentially interfering with crab habitat and fishing vessels; and
    - Excessive mounding of sediments can alter the wave climate, creating enhanced risk to commercial fishing vessels that navigate nearshore waters during stormy conditions.
- Installation of a large rock apron at the toe of the North Jetty at the entrance to Coos Bay;
- Excavation of a new vessel turning basin with a length of 1400 feet, width 1100 feet at -37 feet deep (constructed approximately between River Miles 7.3 to 7.8);
- Disposal of 700,000 CY of dredged material through mechanical or hydraulic methods (24 inch pipeline laid on bottom of Coos Bay 8.3 miles) then distributed between the APCO 1 and 2 disposal sites between River Mile 2 to 7;
    - Dredge Area #1, RM 2: 150-feet wide and 550-feet long, 15.1 acres, 350,020 CY
    - Dredge Area #2, RM 4.5: 200 ft wide and 2500 ft long, 13.4 acres, 184,000 CY
    - Dredge Area #3, RM 6: 150 ft wide, 1150 ft long, 2.9 acres, 25,200 CY
    - Dredge Area #4, RM 6.8: 100 ft wide, 625 ft long, 4.0 acres, 24,000 CY
- Dredging will affect 35.4 acres of subtidal habitat within Coos Bay that is important for production of species such as Dungeness crab (*Cancer magister*), white sturgeon (*Acipenser transmontanus*), and California halibut (*Paralichthys californicus*);
- 300,000 CY of dredge material from the JCEP project will be disposed of at the Kentuck Mitigation Site.

Marked change will occur to the productivity of the dredged portion of the bay and little recovery is expected over time due to the continual need for maintenance dredging. In the DEIS (Section 2.1.1.8), JCEP proposes to conduct maintenance dredging every 3 years with about 115,000 cy of material removed per dredging interval for the first 12 years of operation. The DEIS states that maintenance dredging could be done every 5 years with up to 160,000 cy of materials removed during each dredging event. In the marine waterway, dredging would also be conducted about every 3 years with roughly 27,900 cy of materials removed during each dredging event. Dredging operations of this magnitude will result in a continually disturbed condition preventing development of any reliable estuarine production in the affected areas. Additionally, the Port of Coos Bay project will likely dredge substantially more on an annual basis.

To not consider the combined impacts of the Port's channel modification project and the JCEP project will effectively underestimate the biological and economic impacts to the State's fish and wildlife habitat resources in the Coos Bay estuary, due to these connected, similar, and cumulative actions.

JCEP LNG Terminal Impacts to the Coos Bay Estuary - The proposed project is large in scope, will likely incur deleterious ecological impacts, and have legacy implications for aquatic habitats of Coos Bay and upland habitats on the North Spit. The North Spit is one of the only ocean peninsula land features in the state with estuarine, ocean, wetland, and upland habitats available for fish and wildlife within a very small geographical area. This unique landform and bay provide a number of strategic benefits for production of fish and wildlife. Coos Bay is the largest estuary located entirely in Oregon and supports populations of fish and shellfish that contribute to large commercial and recreational fisheries. The aquatic and upland habitats encompassed by the JCEP terminal and associated facilities have been subjected historically to a number of landscape and waterway alterations including: dredging, riprap installation, leveling, and removal of native coastal pine forest, filling of wetlands, and other development related impacts. These habitats historically would have been primarily characterized as Category 2 or 3 habitats, (providing essential, important, and/or limited habitat function for fish and wildlife) under the ODFW Fish and Wildlife Habitat Mitigation Policy. Although negatively impacted historically, much of the tidal, subtidal, and upland habitats at the proposed project site have received only minimal disturbance in the past two decades and substantial recovery of ecological function has occurred.

The subtidal, tidal, intertidal, and shoreline features of the Coos Bay estuary tidal basin provide critical habitat for a number of culturally and economically important game and non-game species including, but not limited to: Dungeness crab (*Metacarcinus magister*), red rock crab *(Cancer productus*), cockles (*Clinocardium nuttallii*), gaper clams (*Tresus capax)*, butter clams (*Saxidomus giganteus)*, littleneck clams (*Protothaca staminea*), rockfish (*Sebastes spp.*), lingcod (*Ophiodon elongates*), greenling (*Hexagrammos decagrammus*), California halibut (*Paralichthys californicus*), English sole (*Parophrys vetulus*), Pacific sand dabs (*Citharichthys sordidus*), ghost shrimp (*Neotrypaea californiensis*), mud shrimp (*Upogebia pugettensis*), starry flounder *(Platichthys stellatus)*, smelts (Osmeridae family), (Engraulidae family), sardines (Clupeidae family), fall run Chinook salmon *(Oncorhynchus tshawytscha)*, green sturgeon *(Acipenser medirostris)*, white sturgeon *(A. transmontanus)*, (OC) ESA threatened coho salmon *(Orncorhunchus kisutch)*, and possibly Pacific lamprey (*Entosphenus tridentata*). There is some potential that Pacific smelt (eulachon) (*Thaleichthys pacificus)* may also occur in the JCEP area of Coos Bay. Additionally, the tideflats and subtidal regions of the lower Coos estuary are sites for the commercial harvest of bay clams (gaper clams, butter clams, cockles) and the mudflats in the JCEP area support a commercial fishery for ghost shrimp (*Neotrypaea californiensis*).

Scattered populations of the native Olympia oyster (*Ostrea lurida*) have recently become re-established within the marine and polyhaline regions of the Coos Bay estuary where they typically occur as individuals or small clusters attached to rip-rap, rock, shell, or other hard substrata. The recovering populations of *O. lurida* are considered as a Strategy Species by the Oregon Department of Fish and Wildlife / Nearshore Conservation Plan (www.oregonconservationstrategy.org). Section 4.5.2.2 (page 427) of the DEIS states that suspended sediments from the dredging will not significantly affect oysters in Coos Bay. ODFW does not agree with FERC's determination. These at-risk populations of Olympia oysters are particularly sensitive to smothering and burial by silt and other suspended materials, and it is likely that they will be exposed to heavy loads of suspended sediment and excessive siltation during dredging activities associated with excavation of the new JCEP Terminal. ODFW recommends further evaluation and development of mitigation strategies for impacts to Olympia oysters.

The proposed slip will create a new deepwater alcove backwater likely resulting in a number of significant biological effects (e.g. change to water flow patterns in the vicinity, salinity patterns, turbidity associated with initial and repeated dredging, and shallow water conversion to deepwater). While hydrodynamic models provide some insight into the physical changes that the site and bay may undergo, biological changes should be studied in situ to accommodate unknown variables. The actual JCEP longer-term, indirect impacts to the larger estuary may not be accurately predicted prior to construction.

Dredging Impacts to Estuarine Habitats and Communities – The JCEP DEIS describes the location and extent of dredging and removal of unconsolidated sediment from the intertidal and subtidal zones of the Coos estuary, but only superficially considers the potential effects of dredging on aquatic habitat and species that are expected to occur in response to construction of the different components of the JCEP terminal (Section 4.5.2.2). Direct impacts to estuarine habitats associated with construction of the vessel slip, access channel, temporary material barge berth, the material offloading facility, and rock pile apron (Table 4.5.2.2-2; page 4-241) are expected to be long-lasting and substantial. In particular, the estuarine portion of the Jordan Cove LNG Facilities would include direct impacts to 37 acres of estuarine habitat, including 2 acres of eelgrass habitat, 13 acres of intertidal habitat, 4 acres of shallow subtidal habitat, and 18 acres of deep subtidal habitat. The JCEP also includes extensive dredging and excavation of four submerged areas of the sub-tidal zone in Coos Bay (total 40 acres) along the Federal Navigational Channel and vessel access route to improve navigation reliability for the LNG carriers.

Unconsolidated soft-sediment habitat is widespread in the Coos Bay estuary tidal basin where it occurs extensively throughout the intertidal zone and sub-tidal zone along the bottoms, sides, and margins of primary and secondary tidal channels (Cortright *et al*., 1987). Soft-sediment habitats provide a series of diverse, productive, and dynamic ecological functions in the estuary, including provision of habitat and forage areas for invertebrates, fish, birds, and marine mammals, as well as serving as an important source of detritus. Soft-sediments also play an important role in the microbial and biogeochemical transformations of organic materials and nutrient cycling, and they typically serve as a sink or reservoir for the deposition of water-borne particles. Diverse communities of motile, epifaunal, and infaunal invertebrates inhabit the soft-sediments, and the communities of crabs, shrimp, amphipods, polychaete worms, copepods, hydroids, anemones, clams, and other invertebrates are specifically adapted to survive, feed, grow, and reproduce themselves in the unconsolidated sediments (Simenstad 1983; Emmett *et al*., 2000). Microbial activity and deposition of organic matter associated with fine-grained sediments together support a complex food web that includes multiple resident (infaunal, epifaunal, motile) and transitory (seasonal, migratory) species.

The JCEP DEIS incorrectly illustrates the major known oyster and shrimp habitat and clamming and crabbing areas in the bay relative to the Project activities (Figure 4.5-2). In particular, mixed communities of bay clams (*i.e.*, gaper clams, butter clams, cockles, and other species) are known to occur throughout the intertidal zone in the area immediately west and north-west of the airport runway (ODFW 2009; area AP). These areas are illustrated only as “Shrimp Habitat” and “Oyster Habitat” in Figure 4.5-2. It is not clear why the known clam beds located nearest the JCEP project area were omitted from Figure 4.5-2, when the map incorporates spatial information about the other clam beds throughout the intertidal zone of the Coos Bay estuary tidal basin further distances away from the JCEP project area. The known clam beds within ODFW area AP (Airport Runway) are

located within 50 m of the Temporary Dredge Line for the Federal Navigation Channel and within about 500 m of the proposed JCEP Access Channel, as illustrated in Figure 4.5-3 of the JCEP DEIS. In addition, it is also unclear what species of oyster is intended to be represented by the broad polygon that extends throughout the intertidal zone as "Oyster Habitat" in Figure 4.5-2. Commercial mariculture of Pacific oysters (*Crassostrea gigas*) does not occur anywhere in the intertidal zone near the airport runway, and patchy clusters of Olympia oysters (*Ostrea lurida*) only occur on the rocky rip-rap that extends around the periphery of the airport runway. The spatial distribution for major clam beds and shrimp beds should be corrected and updated with relevant information generated by ODFW for Coos Bay (2009).

Mixed communities of shellfish, such as Dungeness crab, red rock crab, bay shrimp, gaper clams, butter clams, littleneck clams, softshell clams, cockles, and many other species are year-round residents of the intertidal and sub-tidal areas of the Coos Bay estuary. Some of these shellfish are motile (*i.e.*, crabs and shrimp) and periodically move to different locations or migrate through the intertidal and sub-tidal zones, while others are stationary (*i.e.*, bivalves) and remain largely in place over the duration of their adult lives. The mixed communities of living bivalves and the beds of their non-living shells (*e.g.*, shell rubble or shell hash) are particularly important because they function to stabilize unconsolidated sediments and provide heterogeneous habitat for numerous species of adult and juvenile fishes, crabs, shrimp, amphipods, worms, and other estuarine organisms. Moreover, filter-feeding by dense populations of living clams can sometimes play an important role in the removal of phytoplankton and smaller particulate materials, thereby decreasing turbidity and increasing light penetration through the estuarine water column. Consequently, maintenance of suitable soft-sediment habitat is essential for survival of the moderately long-lived (life-span 10-15 years or longer) gaper, butter, and cockle clams, particularly in the sub-tidal zone. When soft-sediment habitat is chronically disturbed and altered by dredging of the subtidal zone, there may be a permanent loss and impact to benthic invertebrate populations and a decline in the biodiversity of benthic communities. Loss of some or all of these sub-tidal populations of bay clams has implications for both the ecological functioning of sub-tidal habitats and the ability of the bay clams to serve as broodstock to support the recreational and commercial shellfish fisheries in Coos Bay (D'Andrea 2012).

It is expected that dredging and removal of the soft-sediments will likely have substantial and immediate local impacts on the sub-tidal populations of benthic invertebrates and shellfish, such as gaper clams, butter clams, and cockles. This may include the physical removal of the clams and their surrounding sediments, as well as a disruption of the mixed ecological communities of shellfish, mobile and infaunal invertebrates, and fish that make use of the sub-tidal habitats. The JCEP DEIS states that dredging would directly remove benthic organisms (e.g., worms, clams, benthic shrimp, starfish, and vegetation) from the bay bottom within the access channel and navigation channel modifications. Mobile organisms such as crabs, many shrimp, and fish could move away from the region during the process, although some will be entrained during dredging so that direct mortally or injury could occur (Effects on Aquatic Habitat and Aquatic Species from Construction of the Jordan Cove LNG Facilities; 4-247).

The JCEP DEIS acknowledges that dredging, removal, and disturbance of the soft-sediment habitats will directly remove benthic organisms from the bay bottom, and the DEIS also states that it is likely that recovery would

occur in about one year for benthic resources particularly in the area of navigation channel modifications (4-248). This estimate of the rapid rate of community recovery is problematic, however, because the technical references cited by the JCEP DEIS (4-248) are drawn from earlier investigations of dredging impacts that generally used a group small-bodied, rapidly-growing invertebrates (including amphipods, polychaete worms, small bivalves, etc. that have life-spans on the scale of months to a few years) as the focal species to provide metrics for the estimates of species and habitat recovery. These small opportunistic species are not representative of the large-bodied, long-lived bay clams that typically exhibit episodic recruitment and have life-spans on the scale of 10-20 years in the Oregon estuaries. Moreover, large-scale dredging modifications that include subsequent maintenance dredging every 5-10 years may not provide the opportunity for bay clams and other shellfish to recruit successfully and fully re-colonize after the repeated disturbance events. It is also likely that benthic food resources may also be impaired or lost for other estuarine species (*i.e.*, forage fish, salmonids, crab) as a result of dredging actions. Consequently, dredging activities that significantly disturb and/or remove the mixed communities of long-lived bay clams from soft-sediment habitat in the sub-tidal zones of Coos Bay are expected to have longer-term impacts that extend well beyond a time period of many years.

As proposed, the JCEP also includes extensive dredging and excavation of four submerged areas of the sub-tidal zone in Coos Bay along the Federal Navigational Channel and vessel access route to improve navigation reliability for the LNG carriers. These actions include dredging of 27 acres of deep subtidal habitat at bend areas along the Federal Navigation Channel, and the dredge lines for this additional activity would include disturbance and modification of another 13 acres of mostly deep subtidal habitat. The JCEP DEIS points out that these additional dredging activities and follow-up maintenance dredging would disturb the 40 acres of subtidal habitat and result in a short-term reduction in the ecological function of these areas by disturbance of the benthic and epibenthic organisms.

Impacts to Eelgrass - The proposed JCEP project includes construction of a marine terminal slip and dredging of an access channel. These activities will permanently destroy about 1.9 acres of established native eelgrass (*Zostera marina*).

Dredging in the intertidal and shallow subtidal zones within the JCEP project area is expected to have significant deleterious effects on native eelgrass habitats and the species found therein. Beds of eelgrass occur at several locations throughout the Coos Bay tidal basin where they provide numerous ecological functions, including heterogeneous habitat for a number of fish and wildlife species, nursery habitat for invertebrates and fish, forage areas for shorebirds and waterfowl, primary production and a source of organic-rich detritus, stabilization of unconsolidated sediments, trapping of suspended sediments, and contribute to improvements to estuarine water quality (Thom et al. 2003; Kentula and DeWitt 2003). In particular, the emergent blades and rhizomes of eelgrass beds provide complex and heterogeneous multi-dimensional habitat within the unconsolidated soft-sediments in the intertidal and shallow subtidal zones. In many cases, the abundance and species composition of macroinvertebrate, shellfish, and fish communities differ within eelgrass beds in comparison with un-vegetated areas where eelgrass is absent. Eelgrass beds are known to provide habitat for numerous species of invertebrates, including polychaete worms, cockles, gaper clams, butter clams, littleneck clams, Dungeness crab, grass shrimp and epibenthic invertebrates such as harpacticoid copepods, isopods, and gammerid amphipods, In addition, eelgrass beds also provide habitat for a diverse community of fishes, including juvenile salmonids, sculpin, English sole, shiner perch, lingcod, rockfish, pipefish, and herring.

Long-term efforts to remove root wads, large woody debris, and other natural structures embedded in the un-vegetated soft sediment of Coos Bay in order to facilitate commercial shipping and recreational boating have greatly exacerbated the lack of structural complexity along the shoreline and further increase the ecological importance of eelgrass beds. The heterogeneous canopies of eelgrass beds provide both primary complexity and an ecological edge effect that presents an important biophysical transition zone for fish and invertebrates that forage in adjacent un-vegetated habitats.

Introduction of Non-indigenous Species through Ballast Discharge – Movement and translocation of ballast water associated with vessels is widely considered as the most significant transfer mechanism for non-indigenous species in the marine environment. Filling of LNG carriers at the JCEP Terminal will be coupled with concurrent discharge of ballast water that will exit the terminal area and mix with the tidal waters of the Coos Bay estuary. Consequently, it is expected that the Coos estuary will receive a very large volume of estuarine / ballast water that originated in foreign ports, as well as seawater that was pumped into the vessel at sea during transit. This ballast water typically contains a taxonomically diverse and reproductively viable community of estuarine and marine organisms that have potential to establish themselves as non-indigenous species within the estuarine tidal basin.

The DEIS (Section 4.3 Water Resources and Wetlands; and 4.5.2 Aquatic Resources) states that while berthed the LNG carriers would release ballast water and engine cooling water into the marine slip. It is estimated that each LNG carrier would discharge approximately 9.2 million gallons of ballast water during the loading cycle to compensate for 50 percent of the mass of LNG cargo loaded, and that the ballast water discharge rate would be approximately 20,250 gallons per minute (gpm). The DEIS states that the newer LNG carriers are expected to conform to the "D-2" standards that require ships to utilize on-board ballast water treatment systems. In contrast, existing LNG carriers that do not currently have on-board ballast water treatment systems must continue to, at a minimum, conduct open-sea exchanges of ballast water in conformity with the "D-1" standard. The DEIS concludes that the effects of ballast water exchange and the measures that will be implemented to minimize or avoid effects from ballast water introductions are adequate to ensure that operation of the JCEP would not significantly affect marine resources. However, the DEIS does not contain any information about the timing of ballast water discharge events to coincide with flood or ebb periods of the semi-diurnal tidal cycle, nor any estimate of the retention time for the ballast water discharged from the individual LNG carriers. The conclusion reached by the DEIS is further is flawed because earlier research conducted by the Smithsonian Environmental Research Center (Ruiz et al., 2005) demonstrated that flow-through ballast water exchange (or the open-sea exchange; D-1 standard) is not an effective deterrent to ensure that organisms are not entrained, transported, and discharged from ballast tanks. Furthermore, the ballast water discharge standard (33 CFR 151.2030(a)) requires all vessels calling at U.S. ports to be equipped with a Coast Guard-approved Ballast Water Management (BWM) system. The DEIS, however, does not provide details about the BWM systems that will be used within the fleet of bulk carriers and LNG carriers that are expected to discharge about 6.8 million cubic meters of ballast water each year into the tidal waters of the Coos estuary. Discharge of this large volume of saline water that originated in foreign ports into the Coos estuary has a very high potential to introduce non-indigenous species into the estuarine waters in the vicinity of the JCEP Terminal. Consequently, the conclusion reached by the DEIS that ballast water discharged from the LNG carriers and other vessels associated with the JCEP Terminal will not provide a vector for introduction of new non-

indigenous species is not fully supported, and ODFW recommends this issue be re-analyzed and impacts fully addressed through appropriate minimization and mitigation measures.

Disturbance to Marine Mammals – Numerous species of marine mammals routinely occur in the nearshore marine waters immediately outside the mouth of Coos Bay, and several species temporarily or permanently reside within the Coos estuary tidal basin (Rumrill, 2003). The JCEP – DEIS properly recognizes that many species of marine mammals species are common in the waterway leading to the Jordan Cove LNG Terminal, including eight species of whales and one species of sea lion (Appendix I, Table I-1). However, the DEIS does not point out that California sea lions (*Zalophus californianus*) are common near the docks and marinas immediately inside the mouth of Coos Bay, and that Steller sea lions (*Eumetopias jubatus*) sometimes forage in the estuary from haul out sites at nearby Cape Arago. In addition, juvenile northern elephant seals (*Mirounga angustirostris*), orca (*Orcinus orca*), harbor porpoise (*Phocoena phocoena*), and gray whales (*Eschrichtius robustus*) are occasional visitors to the tidal waters of the Coos estuary.

In contrast to the temporary use of the estuary by the species of marine mammals described above, the tidal waters and submerged/submersible lands within the Coos estuary are inhabited year-round by populations of Pacific harbor seals (*Phoca vitulina*). Pacific harbor seals haul out in large numbers on the exposed tideflats at multiple sites located in the lower region of the Coos estuary and in South Slough, and they forage in the estuary where they prey upon numerous species of resident and transitory estuarine fish. Breeding activities typically occur between February and May, and the harbor seal pups are born and weaned in the estuary from March to June. The Oregon populations of *P. vitulina* are considered as a Strategy Species by the Oregon Department of Fish and Wildlife / Nearshore Conservation Plan, and priority conservation actions have been identified to limit anthropogenic disturbance, adhere to the federal protections developed by NMFS, and capitalize on opportunities to generate new information and fill data gaps.

Construction and operation of the JCEP and the subsequent increase vessel traffic by large LNG carriers to 140 trips per year raises primary concerns about disturbance to the Pacific harbor seal populations that reside year-round within the Coos estuary tidal basin. In particular, it is expected that harbor seals will be susceptible to immediate and acute disturbance by noise associated with construction of the JCEP Terminal as well as longer-term chronic disturbance from vessel wakes and noise generated by passage of the LNG carriers through the Coos Navigational Channel. The DEIS includes recommendations that JCEP prepare a Marine Mammal Monitoring Plan that identifies specific measures that would be implemented to reduce noise impacts and to ensure compliance with NMFS underwater noise criteria pertaining to ESA-listed species of whales. To the extent possible, the department urges that the scope of the Marine Mammal Monitoring Plan prepared by JCEP be expanded to also include consideration of the effects of noise on resident populations of adult and juvenile harbor seals and to minimize potential disturbance to early season harbor seal breeding and pupping activities. In addition, the DEIS and Marine Mammal Monitoring Plan should also acknowledge the potential for chronic disturbance to the harbor seal haul out sites associated with vessel wakes generated by the passage of the LNG carriers. Hauled out harbor seals are known to exhibit an increased likelihood of entering the water when they are disturbed by the presence of large vessels (2X increase in disturbance), and when the vessels are within 100 m of the haul out site (3.7X increase in disturbance; Mathews et al., 2016). Moreover, adult harbor

seals also exhibit an increased likelihood of entering the water in response to vessels whenever a pup is present (1.3X increase in disturbance). These observations made in Alaska indicate that harbor seal haul-outs are disturbed by the passage of large vessels, and they suggest that local fitness of the resident population of harbor seals may be reduced by vessel disturbances particularly when they occur during breeding and pupping seasons (Mathews et al., 2016).

The department is in agreement with the DEIS recommendation that construction of the JCEP Terminal should not occur until consultation with USFWS, NMFS and ODFW regarding potential disturbance and impacts to marine mammals is complete. Accordingly, it is premature at this time for the DEIS to conclude that constructing and operating the JCEP would not significantly affect the species of marine mammals within the project area.

Impacts to Wildlife in Freshwater Wetlands, Uplands, and Beaches on the North Spit – ODFW considered the impacts of this project to all relevant wildlife in its review of the DEIS, but the purpose of this section is to highlight some of the priority issues ODFW found within the DEIS.

Freshwater wetland habitats on the North Spit provide functionally important ecological features as they contribute to nutrient cycling where the sandy soil types are very limited in primary nutrients, and they provide freshwater refugia within a short distance of saline habitats. The wetlands and open water ponds are important for production of a number of amphibians including rough skinned newts (*Taricha granulosa*), red-legged frogs (Rana aurora), as well as several species of tree frog (i.e. Pacific tree frog *Pseudacris regilla*). Three-spined stickleback (*Gasterosteus aculeatus*) occupy a number of the ponds and deeper wetlands. Numerous waterfowl species transition through these ponds including mallards (*Anas platyrhynchos*), bluebills (*Aythya marila*), wood ducks *(Aix sponsa*), and Canada geese (*Branta Canadensis*). ODFW recommends that FERC condition the project such that these impacts be avoided, minimized, and mitigated to the maximum extent practicable.

It is ODFW's understanding that unavoidable impacts to freshwater wetlands will be mitigated for at the Kentuck Mitigation Site (comments on Kentuck provided below). ODFW uses the Fish and Wildlife Habitat Mitigation Policy (OAR 635 Division 415, described more fully below) to determine necessary mitigation offsets depending on the functions and values of the habitat being impacted (what the policy refers to as habitat categories). In previous iterations of this project, the applicant's consultant (David Evans and Associates; DEA) provided ODFW with preliminary categorizations of impacted habitats according to this ODFW Mitigation Policy. From 2011-2014, ODFW and DEA determined that within the project area for the JCEP liquefaction and workforce housing there is an approximate total of 33.9 acres of Category 2 habitat as follows: 16.7 estuarine/intertidal habitat; 0.3 acres of low salt marsh; 5.8 acres of intertidal unvegetated sand; 4.7 acres of algae/mud/sand; 3.4 acres of shallow subtidal; and 3.0 acres of eelgrass habitat within the project location where estuarine dredging is proposed. There is 15.4 acres of deep subtidal Category 3 habitat that is proposed for dredging as well. ODFW has requested updated Habitat Categorization, per the ODFW Fish and Wildlife Habitat Mitigation Policy, and acreages from the Applicant but has not received this information at the time of these comments. In addition, the DEIS does not make it clear whether this mitigation is addressing temporal loss for those impacts lasting longer than 2 years but something less than permanent. As per the ODFW Fish and Wildlife Habitat Mitigation Policy (described below), offsets should be provided for those temporarily impacted areas that may be unavailable to fish and wildlife while vegetation is recovering. It is difficult for ODFW to determine from the existing information in the DEIS whether or not the State of Oregon's fish and wildlife resources are being

adequately addressed in freshwater wetlands impacted by the JCEP project.

ODFW also considered the wildlife resources in the uplands that will be displaced by this complete conversion of upland habitat to a new deepwater terminal/zone, construction of facilities, deposition of dredge materials, and long-term daily disturbance factors attributable to project activities. The North Spit is used by a variety of important wildlife such as the snowy plover (*Charadrius nivosus nivosus*), coastal marten (*Martes caurina*), pacific fisher (*Pakania pennantii*), bald eagle (*Haliaeetus leucocephalus*), rookeries for great blue heron (*Ardea herodius*), black-tailed deer (*Odocoileus hemionus*), American beaver (Castor Canadensis), mountain lion (Puma concolor), Roosevelt elk (*Cervus elaphus rooseveltii*), porcupine (*Erethizon dorsatum*), various bat species, and black bear (*Ursus americanus*). There are also 11 species of amphibians (8 salamanders, 3 frogs) and at least 10 species of reptiles that have been found to occur on the North Spit. It is ODFW's understanding that three potential mitigation sites have been identified to address upland habitat impacts on the North Spit, however it is not clear based on information provided in the DEIS if or how those sites offset the functions and values being lost through this project (more discussion below).

ODFW also found the DEIS provided insufficient information and assessment for the following key wildlife species and their habitats.

Impacts of the LNG Terminal on Snowy Plover Nesting and Foraging Habitat – ODFW is particularly concerned about the JCEP project's impacts to western snowy plover (hereafter, snowy plover) nesting and foraging habitat. This species is federally listed, but is also listed as Threatened on the Oregon Endangered Species Act (ORS 496.171-192, also see OAR 635-100-0105). ODFW's understanding from reading the DEIS is that FERC and its Cooperating Agencies have not yet developed a biological assessment (BA) or begun consultation with the USFWS, which has federal jurisdiction per the federal ESA. ODFW understands that consultation will fall under Section 7 for the federal action and for the federal lands within the project, but that Section 10 of the federal ESA will also apply to the non-federal portion of the project. The DEIS does not discuss how this consultation will occur on the non-federal portion of the project, or how this relates to FERC's authority and decision making for a project that crosses multiple land ownerships, and ODFW recommends this information be provided.

Snowy plovers populations have declined on the Pacific coast over the past century, but recent nest monitoring has shown stable to increasing populations. The reason for the recent increase is the intensive and coordinated management by state (ODFW, OPRD) and federal agencies (USFWS, USACE, USFS, BLM) to address the threats to the plover including 1) habitat destruction caused by development and recreation, 2) resource extraction, 3) invasion of non-native beachgrass (*Ammophila* spp.), and 3) increased predation by corvids (ravens and crows) and other predators (gulls, coyotes, skunks, etc..) (USFWS 2007). The North Spit is a particularly important component of snowy plover habitat along the Oregon coast, with the highest numbers of nesting plovers and the highest nest success rates among all plover sites (Lauten et al. 2018, M. Nugent ODFW personal communication). One of the primary reasons for the North Spit's success is the multi-agency maintenance of grass-free sandy beaches within snowy plover habitat restoration areas (HRA) as well as recreation management by OPRD and predator control by US APHIS Wildlife Services. Significant funding and resources have gone into snowy plover recovery on the North Spit. Without this constant management, it is without question that snowy plover abundance and productivity at the North Spit would decline and the species would be at risk of serious depletion.

Despite these constant and expensive management efforts, there are additional threats which cannot be managed locally. With climate change, the North Spit is experiencing an increased frequency and intensity of storm events. Overwash from high tide events during these storms destroy nests, and prevailing winds during these storm events can cause blowing sand to bury nests. With the predicted rise in sea levels associated with climate change, this only increases the risk of loss of beach habitat for snowy plovers.

Any additional threat puts the snowy plover at risk of declining again. Impacts to plover nesting and foraging areas may come from the noise associated with construction and operation, but more likely from the increased recreational pressure and subsequent increase in predators on the North Spit. On page 4-322 of the DEIS, FERC states *"Jordan Cove terminal construction and operations personnel would likely use the North Spit for recreational purposes and increased recreational use could result in increased plover disturbance including destruction of nests by dogs, off-road vehicle traffic, inadvertent trampling, or increased predation if scavengers and predators (corvids, coyotes, striped skunk, feral cats) are attracted to nesting areas due to the presence of trash and food remains".* ODFW contends that given the other threats this plover colony is facing on the North Spit, these new threats would likely tip the scales toward declining performance and abandonment of the colony. ODFW expects the BA and consultation with USFWS to give adequate attention to the additive threats posed by the JCEP project to the snowy plover, and would appreciate consultation with ODFW to identify appropriate avoidance, minimization, and mitigation measures (further discussed below in the mitigation section of this letter).

Impacts to Coastal Marten Habitat – Adjacent to the slip is a large dune occupied by a mature shore pine vegetation community that is potential habitat for the coastal marten (*Martes caurina*). Coastal martens have a limited range and occur in coastal shore pine as well as late-successional mixed conifer forests. Coastal martens have an apparently low survival rate in fragmented forests elsewhere in the United States, and habitat connectivity has been identified as one of the key conservation strategies for this species. Abundance and distribution of the coastal marten in Oregon is still largely unknown at this time, though ongoing research by ODFW, universities, and federal partners is underway. Coastal martens have been documented on trail cameras in close proximity to the site in 2018, easily within range of the JCEP project site and in identical shore pine habitat.

Conservation concern for the coastal marten is on the rise. Currently ODFW considers the coastal marten a State Sensitive Species and an Oregon Conservation Strategy Species for the reasons described above. Coastal martens were recently petitioned for listing on the federal Endangered Species Act list (80 FR 18741) and the USFWS has not yet issued its decision as of the writing of this letter. Conservation organizations also recently petitioned the Oregon Fish and Wildlife Commission to consider listing the coastal marten on the Oregon ESA, however the Commission decided not to consider a petition to list due to a lack of substantial scientific information (see OFWC Sept 2018 Staff Report Exhibit H and Meeting Minutes). Additionally, the OFWC was petitioned in 2018 to close fur-trapping of coastal martens west of Interstate 5, as well as all furbearer and unprotected mammal trapping in the Oregon Dunes National Recreation Area (see OFWC Aug 2018 Staff Report Exhibit D and Meeting Minutes). The OFWC will make its decision on this petition in 2019.

Habitat Loss at the JCEP LNG Terminal Site - ODFW recognizes that a substantial proportion of the upland habitats at the JCEP sites adjacent to the bay are not in pristine condition. However, they have been in a relative state of quiescence for more than a decade and are predominantly considered Category 3, 4, and 5 habitats (per OAR 635-415-0000 through 0025). A substantial component of forested dune habitat remains in Category 3 condition at the site. These lands will be altered from their current condition through several pathways including:

- Conversion of terrestrial lands into submerged lands.
- Elimination of the viability of remaining dune and forested dune habitats (largely due to encroachment, removal, disturbance, etc.) and reduction in the viability of immediately adjacent habitat as a result of construction of the LNG storage tanks and pipeline network, installation of road networks to support the site, and direct forest clearing of at least 90.0 acres.
- Impacts to the uplands and wetlands at the JCEP sites will essentially render much of the affected habitats area incapable of supporting the native plant and wildlife species that currently occupy the site due to a number of factors including, but not limited to:
    - Direct removal and disturbance (e.g. disturbance factors such as ship moorage/loading activities and road traffic, machinery and compressor noise). The DEIS notes that during construction sound levels will be similar to the city of North Bend. The DEIS states, "We predict that operational noise from the LNG terminal would have an equivalent sound level (Leq) of 49 dBA and day-night sound level (Ldn) of 55 dBA when measured about 0.7 miles away".
    - Alteration of the surfaces through paving, placement of gravel, removal of the organic layer on the sandy soils, etc. that eliminate capacity of the habitats to support fish and wildlife
    - Invasion of competitive plants and non-native or native plant and animal colonists such as crows, starlings, and Scotch broom (*Sarothamnus scoparius*) that result in a loss of habitat capacity and function due to competitive interactions.
- Institution of daily human disturbance that will likely occur post-construction during the operations at the site.
- Creation of the slip/berth and associated LNG facility will further fragment the North Spit peninsula. Peninsula type habitats are uniquely rare on the Oregon Coast.

Impacts from the PCGP Pipeline to Fish and Wildlife Habitat - The FERC DEIS description for the PCGP (pipeline) portion of the project outlines proposed construction of a 36" steel gas pipeline from the North Spit of Coos Bay, Oregon (229 miles) to Malin, OR in order to connect the JCEP export facility to the Ruby LNG pipeline carrying gas primarily from the Rocky Mountain region. The pipeline will cause significant direct and indirect impacts to fish and wildlife habitat, as well as the indirect impacts to water quality associated with an increase in watershed runoff caused by this project, particularly in areas where the pipeline is proposed on slopes exceeding 50%, and where vegetation will be removed from riparian corridors. Impacts are likely within the Coos, Coquille, South Umpqua, Upper Rogue, Upper Klamath, and Lost River watersheds. According to the DEIS, the pipeline would affect 352 waterbodies, including 69 perennial streams, 270 intermittent streams, 9 perennial ponds, and 4 estuaries (Page 4-93). This is significant because all of these waterbodies provide habitat for fish and wildlife.

The applicant proposes to utilize horizontal directional drilling (HDD) for the crossing of the Coos Bay estuary, Coos River, Rogue River, and Klamath River. The applicant would use dry open-cut crossing methods where HDD methods are not planned. These actions will have temporary and permanent impacts to fish and wildlife

habitats, which ODFW recommends be addressed consistent with the ODFW Fish and Wildlife Habitat Mitigation Policy, be performed consistent with ODFW recommended In-Water Work Windows, and be permitted where applicable via ODFW In- Water Blasting and Fish Passage authorizations.

ODFW acknowledges that some of the aquatic habitats in Coos Bay have been impacted historically from dredging, rip-rap installation, upland and tidal mudflat leveling, filling of tidal wetlands/saltmarsh, and other development/utilization impacts, However, substantial recovery of ecological potential has occurred due to improvements in forest management (reducing sediment inputs) and regulations conserving wetlands and waterways. The current and desired future condition of the waterbodies that will be affected by the pipeline is predominantly linked to management actions in the riparian habitats and adjacent uplands. Many of the streams that will be impacted by the pipeline have been ecologically degraded historically by a number of human impacts including: removal of native coastal riparian forest, road construction with subsequent chronic sediment contribution, and debris torrent/mass-wasting events related to forestry activities. The majority of these streams, many of which are critical for native salmon, trout, sculpin, lamprey, and other aquatic species production, are in a gradual trend of recovery following management guidelines and Best Management Practices implemented through agency and private ownership coordinated efforts (Oregon Coast Coho Conservation Plan; ODFW 2007). Actions such as pipeline construction and maintenance with associated long-term disturbance introduce an added burden inhibiting ecological recovery. Pipeline stream crossings have the potential to negatively affect watercourse ecosystems through alteration of channel beds and banks, increasing total suspended solids (TSS), alteration of substrate size and quantity in the reach and changes to the immediate area benthic community. These impacts can result in deleterious impacts for fish due to decreased food availability, changes in foraging range increasing predation, aquatic habitat simplification, and decrease in overall health.

ODFW recommends robust emergency preparedness plans be developed for the long-distance HDD across Coos Bay (along with other waterway crossings) to prepare for catastrophic failures, and that these plans be developed in coordination with State of Oregon agencies including ODFW.

There are numerous critical concerns with placement of the pipeline on steep slopes and direct routing parallel to the slope. Coastal sandstone soils are highly susceptible to mass-wasting when undercut and generally disturbed. A relatively extensive access road network will be created to access the pipeline installation and facilitate pipeline maintenance, which will further create potential for mass-wasting slope failures and general sediment production over the current condition. Stream health related to anadromous fish production has largely been assessed to be predominantly “Poor” (Scale: “Very Poor”; “Poor; Fair”; “Good”; “Excellent”) in the Coos and Coquille River basins, with similar stream health conditions in the South Umpqua River basin. This “Poor” condition rating is largely related to upland disturbance increasing sediment loading and loss of riparian forest since 1900. Additionally, the proposed access road networks will likely have long-term chronic effects to fish and wildlife unless seeded, mulched, and closed. Sediment transport to streams is considered a substantial factor currently suppressing recovery of OC Endangered Species Act (ESA) threatened Coho salmon. Extensive research has documented the impacts of sediments to salmonids. Work to reduce sediment input into coastal and inland streams that will be impacted by the pipeline is foundationally critical for enhancing spawning and rearing habitat for fall Chinook salmon, Oregon Coast (OC) threatened Coho salmon, Pacific lamprey (Entosphenus tridentata), winter steelhead (O. mykiss irrideus) and coastal cutthroat trout (O. clarki clarki) as water quality is directly linked to hatch rates and food available for these species. Sediment loading above natural background levels contributes to embedding of substrates, which often results in reduced hatch rates for eggs in redds, inability of fry to emerge from redds, inhibited production of macroinvertebrates (invertebrates

largely live in the interstitial spaces of gravels), and impacts on the ability of fish to obtain food due to the nature of salmonids to feed predominantly by using their sight (Burns 1970; Hall and Lanz 1969; Weiser and Wright 1988; Suttle et al. 2004; Tripp and Poulin 1992; Waters 1995). For these reasons, ODFW recommends FERC and the Cooperating Agencies include ODFW in coordination discussions with NMFS to identify appropriate take mitigation strategies.

FERC should also be aware that Oregon Department of Forestry (ODF) fish presence/absence surveys represent "present conditions", and although highly useful, do not comprehensively represent historical fish usage as some watersheds have culvert barriers, man-made dams, etc. that are as of yet undocumented. For this reason, ODFW recommends coordination with ODFW to identify streams that should be surveyed, and where appropriate avoidance, minimization, and mitigation measures should be designed prior to construction.

Impacts to Marbled Murrelet and Northern Spotted Owl Habitat - ODFW is particularly concerned about the PCGP project's impacts to late-successional forest wildlife such as the marbled murrelet (MAMU) and the northern spotted owl (NSO). Both of these species are also listed as Threatened on the Oregon Endangered Species Act (ORS 496.171-192, also see OAR 635-100-0105). Both species are experiencing declines in higher-suitability habitat in Oregon. For example with regard to MAMU habitat, Raphael et al. (2016) estimated that higher-suitability habitat in Oregon declined from 853,400 acres in 1993 to 774,800 acres in 2012, a net loss of 78,600 acres (-9.2%). On federal lands, losses were mostly due to wildfire, whereas those on nonfederal lands were largely the result of timber harvest.

The DEIS does not acknowledge the state's authority (Section 1.5.2.5) and ODFW recommends this be rectified. The Oregon ESA's primary authority is related to state agency actions on state-owned or managed lands; and in so doing prohibits 'take' (killing or obtaining possession or control) without an incidental take permit. Where approval for take is given by USFWS, then this is taken as a waiver under Oregon ESA. ODFW defers to USFWS take permit determinations for species that are listed both at the state level and federally per the Endangered Species Act (ESA, 1973 as amended). ODFW can be more restrictive than the USFWS in its protection of listed species, but cannot be less restrictive. Moreover, ODFW can address habitat mitigation needs for listed species per the Oregon Wildlife Policy (ORS 496.12) and the ODFW Fish and Wildlife Habitat Mitigation Policy (OAR 435 Division 415), on both federal and non-federal lands (see *California Coastal Commission v. Granite Rock Co.*, 480 U.S. 572 (1987); 43 CFR 24.3(a) ("In general the States possess broad trustee and police powers over fish and wildlife within their borders, including fish and wildlife found on Federal lands within a State.")).

ODFW's understanding from reading the DEIS is that FERC and its Cooperating Agencies have not yet developed a biological assessment (BA) or begun consultation with the USFWS who has federal jurisdiction per the federal ESA. ODFW understands that consultation will fall under Section 7 for the federal action and for the federal lands within the project, but that Section 9 and Section 10 of the federal ESA will also apply to the non-federal portion of the project. The DEIS does not discuss how this consultation will occur on the non-federal portion of the project, or how this relates to FERC's authority and decision making for a project that crosses multiple land ownerships, and ODFW recommends this information be provided.

Based on the projected impacts to MAMU and NSO owl habitats, and the lack of inclusion of the USFWS Jordan Cove Conservation Framework (USFWS 2014, included in the FERC 2014 DEIS but absent from the 2019 DEIS), ODFW does not see how this project will avoid a determination of jeopardy and 'take'. According to the DEIS (Page ES-4), the pipeline would impact over 2,000 acres of forest including over 750 acres of late-stage old-growth forest that provides habitat to marbled murrelet, northern spotted owl, and other federally-listed and state-listed (ORS 496.171-182) threatened and endangered species. The federal ESA mandates that any project authorized by a federal agency should "not jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat of such species which is determined…to be critical". The DEIS Section 4.6 (page 4-323-330) details the potential impacts to both MAMU and NSO, including clearance of large trees and understory essential for nesting habitat to create the pipeline right-of-way and for temporary work areas, as well as impacts from ambient noise and human disturbance. Furthermore, for the MAMU, which forages at sea, LNG carrier traffic and their associated impacts (ballast water, dredging, risk of fuel and lubricant spills, etc.) creates additional risk for the species. The DEIS describes the minimization measure proposed by the applicant to mitigate for these risks, which simply involves a timing restriction for tree removal within the breeding season. ODFW finds this measure to be inadequate, and looks to the suite of minimization and mitigation measures identified in the 2014 *Revised Conservation Framework for the Northern Spotted Owl and Marbled Murrelet: Jordan Cove Energy and Pacific Connector Gas Pipeline Project* (USFWS 2014) as essential to addressing the take and jeopardy anticipated with this project. Furthermore, ODFW contends that the amount of habitat removal for MAMU and NSO suitable or occupied habitat is not lawful without an incidental take permit developed under a federal Habitat Conservation Plan. ODFW recommends consultation with USFWS as soon as possible, and that the 2014 USFWS Conservation Framework be fully re-incorporated into the applicant's plans and into the FERC and Cooperating Agencies' NEPA process.

It is not clear to ODFW whether all of the MAMU habitat and NSO habitat has been surveyed throughout the project. ODFW understands that the applicant does not have access to some lands where the project is proposed. However, surveys are essential prior to disturbance in order to establish appropriate avoidance, minimization, and mitigation measures. ODFW recommends FERC require that MAMU surveys be conducted on all lands (federal and non-federal) according to the Pacific Seabird Group Protocol (Mack et al. 2003, revision pending), which requires at least two years of survey prior to construction. ODFW recommends full NSO surveys also be conducted according to protocol (USFWS 2012). Given ODFW's jurisdiction per the Oregon ESA, ODFW also recommends that the data resulting from those surveys be provided to ODFW as well as access to all information in the upcoming BA.

Fish and Wildlife Habitat Mitigation – ODFW recommends that aquatic and upland impacts to fish and wildlife habitats be addressed consistent with the Oregon Wildlife Policy (ORS 496.012) and implemented through the ODFW Fish and Wildlife Habitat Mitigation Policy (OAR 635-415-0000 through 0025). This rule governs ODFW's provision of biological advice and recommendations concerning mitigation for losses of fish and wildlife habitat caused by development actions. Based on standards in the rule, the applicant seeks ODFW concurrence on the appropriate category to apply to land or water where a development action is proposed. If the habitat is Category 1, ODFW must recommend that impacts to the habitat be avoided. If impacts cannot be avoided, ODFW must recommend against the development action. If ODFW determines that such habitat is Category 2, ODFW must recommend that impacts to the habitat be avoided and if impacts cannot be avoided, ODFW must recommend a high level of mitigation (as specified in more detail in the rule). If such mitigation is not required,

ODFW must recommend against the development action. Subsequent specific mitigation goals follow for habitats determined to be Category-3, 4, 5 and 6, and for which impacts cannot be avoided.

In previous versions of the JCEP/PCGP project, the applicant was working cooperatively with ODFW to develop habitat mitigation plans for the LNG terminal area and for the pipeline. Draft plans included habitat categorization for areas of direct impact, and lists of potential mitigation options were in development. In the current DEIS, the habitat categorization is provided for the LNG terminal but not for the pipeline and is not taken further to identify mitigation obligations for those habitat categories that will be impacted. On Page 4-186 the DEIS states "*More details on these upland mitigation sites will be provided in a Wildlife Habitat Mitigation Plan that will be provided by the applicant as an appendix to their Comprehensive Mitigation Plan*". However the DEIS does not include any conditions of approval requiring completion of this work and mitigation that offsets the impacts. ODFW deems a mitigation plan essential to avoiding serious depletion of - and significant adverse impacts to - the fish and wildlife resources of the State of Oregon. Fish and wildlife habitat mitigation is also essential per the Oregon Wildlife Policy (ORS 496.12), and ODFW contends that this mitigation should pertain to both federal and non-federal lands. ODFW recommends that FERC include a condition requiring development of a fish and wildlife habitat mitigation plan in consultation with ODFW, and that mitigation commence concurrent with construction.

Since the inception of the JCEP/PCGP project, ODFW has been calling for a comprehensive mitigation plan that provides the public and the reviewing agencies with 'one-stop shopping' for all of the various mitigation pieces. The primary purpose of this comprehensive mitigation plan would be to ensure that all natural resource impacts are adequately addressed in a seamless fashion both geographically and jurisdictionally, in part to avoid duplication, but also in part to ensure nothing slips through the cracks. To date, a comprehensive mitigation plan has not been developed by the applicant and does not appear in the DEIS. ODFW recommends FERC, the Cooperating Agencies, and the USFWS work with the applicant and the State of Oregon natural resources agencies to develop a comprehensive mitigation plan. A comprehensive mitigation plan should follow the mitigation hierarchy of avoid, minimize, and mitigate and include at least the following components of mitigation to address:

- ESA listed species per USFWS and NFMS consultation in Section 7 and Section 10 processes,
- Migratory Bird Treaty Act species including golden and bald eagles,
- Marine mammals per the Marine Mammal Protection Act,
- Fish and wildlife habitat loss (on all land ownerships) per the ODFW Fish and Wildlife Habitat Mitigation Policy,
- Fish passage mitigation,
- In-water blasting impacts,
- Water quality/quantity mitigation per DEQ 401 Water Quality Permitting and through WRD Limited License Approvals,
- Wetland/waterway mitigation per DSL removal fill and US Army Corps of Engineers 404/408 permits,
- USFS, BLM, BOR, and USACE mitigation.

Oversight for implementation of this comprehensive mitigation plan could become part of the role for the NRTAG, see above.

ODFW acknowledges that some mitigation for fish and wildlife impacts has been identified in the DEIS, and

views this work as a good start. However, many habitats and the impacts to the State's fish and wildlife resources remain unaddressed through these measures. In particular, ODFW notes that mitigation for upland wildlife habitat impacts along the PCGP pipeline have not been addressed at all in the DEIS.

The DEIS identifies five mitigation areas, which ODFW addresses more specifically below.

1 – Compensatory Wetland Mitigation Plan and the Kentuck Slough Wetland Mitigation Project (information found at Chapter 2.1.1.9; Chapter 4.5.2.2; pgs 4-245 to 248; TABLE 4.11.3.1-1 (continued) Chapter 5.1.3.3 within the DEIS)

It should be noted that the numbers for waterbody crossings vary across documents. ODFW found differing numbers in the applicant's Compensatory Wetland Mitigation Plan (CWMP) as compared to the Applicant Prepared Biological Assessment. Those numbers differed again from the numbers reported in the FERC Resource Reports and those were again different from the DEIS. Recognizing that project design shifts over time while documents remain static depending on time of publication, it does make it difficult to assess impacts without consistent numbers as well as inconsistent definitions of waterbody (as opposed to the normal terminology used by the state for 'waterway' and 'wetland') and FERC's usage of the terms "coldwater" and "coolwater" which are not defined in the DEIS and which have no definition in State of Oregon regulations. ODFW recommends state definitions be used for the aquatic resources of the state (ORS 196.800 and OAR 141-085).

With regard to avoidance and minimization measures discussed in the plan, ODFW appreciates the applicant's efforts to co-locate facility components with existing infrastructure and previously disturbed areas where possible. ODFW supports the minimization measures and best management practices identified in the CWMP, but also directs FERC and the applicant's attention to the comments provided throughout this letter that would further help to minimize impacts to fish and wildlife habitats.

ODFW believes wetland impacts were underestimated for this project because the applicant did not consider temporary impacts in its calculations. Per OAR 141-085-0510(99), the Oregon Department of State Lands (DSL) treats temporary impacts as adverse impacts to waters of the state that are rectified within 24 months from the date of the initiation of the impact. DSL considers any impact duration longer than two-years as permanent, even though the US Army Corps of Engineers does not define temporary. The CWMP states that for the sake of consistency, the plan only addresses 'actual' permanent impacts and temporary impacts will be addressed in a separate site restoration plan. ODFW interprets this to mean that the applicant is considering anything less than a permanent impact to be temporary and therefore not requiring a mitigation offset. This interpretation does not meet the ODFW Fish and Wildlife Habitat Mitigation Policy which directs ODFW to consider the nature, extent, and ***duration*** of impacts and that offsets should persist for the life of the impact. Because of the 'duration' language in the mitigation policy, ODFW bases its recommendations not only on the physical loss of habitat, but also the length of time for which that habitat is unavailable to fish and wildlife (referred to as temporal loss of habitat). Impacts that the applicant might consider temporary in nature might actually result in temporal loss of habitat that should be mitigated in order to prevent depletion of a species with short generational turnover, and to meet the mitigation policy's goal of 'no net loss'. ODFW contends that unavoidable impacts (i.e., greater than two years) should be addressed in the CWMP.

ODFW notes that mitigation for the unavoidable impacts to freshwater wetlands along the 229-mile pipeline will be consolidated into the uppermost 10 acres of the Kentuck Mitigation Site in Coos Bay. ODFW reviewed the

section of the CWMP that discussed the reasoning for consolidation (page 2). The ODFW Fish and Wildlife Habitat Mitigation Policy recommends in-proximity mitigation for impacts to Habitat Categories 2 and 3. Since the CWMP did not provide a categorization of habitats for the pipeline, ODFW is not clear whether and/or how in-proximity mitigation options were considered and found to be untenable, or that the Kentuck option provided greatest overall net benefit to Oregon's wetland resources.

ODFW notes that the Kentuck Wetland Mitigation Project forms the basis of mitigation in the CWMP for all estuarine and freshwater wetland mitigation impacts associated with the LNG facility and the pipeline. Overall, ODFW supports the Applicant's proposal for restoration at Kentuck Slough because, if successful, the project will improve the quality and diversity of rare estuarine habitats as well as freshwater habitats.

The Kentuck mitigation site is approximately 100 acres in size. The current mitigation plan proposes a network of tidal channels and removal of a segment of East Bay Drive in order to connect these channels to Coos Bay tidal inflow/outflow. Additionally a portion of Kentuck Creek streamflow will be guided through the new channel network using a modestly complex configuration of culverts and tidegates. The habitats at the Kentuck site have been diked, drained, tidegated, cultivated, grazed, and stream networks channelized since the late 1800's resulting in substantial degradation of the ecological productivity. Historically the site would have been defined as Habitat Category-2 intertidal Algae/Mud/Sand habitats, under ODFW Fish and Wildlife Habitat Mitigation Policy. However, currently the function for native fish and wildlife species is considered Category-4 and 5 in some locations.

Mitigation restoration will reestablish natural hydrologic regimes to a substantial degree at the site, although the entrance of tidal flow will be truncated partially due to the limited opening through East Bay Drive and partial reintroduction of Kentuck Creek flow. Historically, full volume flood flows from Kentuck Creek would have been able to support a broader range of euryhaline conditions for native fish and wildlife. Additionally, tidal flows would have been a combination of sheetflow and channel flow prior to installation of East Bay Drive. The mitigation restoration proposes to establish tidal channel flow. However, without full removal of the length of East Bay Drive (which ODFW is not suggesting as an option), sheetflow will not be reestablished. As a result, full hydrologic connectivity will remain limited.

Algae-mud-sand habitats, as well as saltmarsh habitats are considered Habitat Category 2 per the ODFW Fish and Wildlife Habitat Mitigation Policy. The JCEP project impacts to intertidal habitats include primarily: Habitat Category 2 Intertidal Unvegetated Sand; Habitat Category 2 Shallow Subtidal; Algae/Mud/Sand; Habitat Category 2 eelgrass; and Habitat Category 3 Deep Subtidal. The majority (very roughly 82 acres; based on LiDAR evaluation) of the Kentuck Slough within the proposed mitigation area is currently below elevation 5.0ft MLLW. Excavation of a tidal channel through East Bay Drive with the current elevations within the mitigation area would allow nearly all lands within the site to be inundated with the majority of tides. The JCEP project proposes using the Kentuck Mitigation site for dredge material disposal (300,000 CY) that would elevate a substantial proportion of the project area above elevation 5.0ft MLLW, which decreases the land area that will be inundated regularly and prevents inundsation with the majority of tides. However, ODFW recognizes the potential for the higher elevation areas as a result of the fill to eventually vegetate to saltmarsh ecotype, which is considered high in value and limited in Coos Bay.

While there may be sufficient acreage at this site to meet the Oregon DSL's standard for a 3:1 restoration ratio as a result of the dredging impacts at the JCEP site, a number of potential impacts (e.g. salinity gradient issues, changes in bay turbidity, creation of a deepwater zone) that will occur due to construction of the JCEP will not be compensated in-kind as the salinity gradients are out of the range that is present at the project location.

Public access is currently not allowed at the Kentuck Mitigation site, however, it is allowed on the water at the North Spit and South Dunes portions of the bay. Recreational access to the estuary and shoreline habitats of the bay is an important component of the local economy. It is expected that the security zone in the JCEP project area following construction will significantly reduce public use of the bay and adjacent uplands, and the Kentuck Slough will likely see increased public recreation interest for clamming and birding. JCEP will need to work with ODFW and other relevant state agencies to determine appropriate recreation management strategies that address the lost recreation opportunity while sustaining the likelihood of success of the mitigation efforts.

Saline waters will move upstream into the Kentuck mitigation site via restoration actions allowing more viability of mariculture (i.e. Pacific oyster farming). The effective area available for expansion of mariculture will not only be within the new mitigation site, but there will also be an increase in the particle range (i.e. drift of Oyster spat) of these operations up bay. The spread of the footprint of mariculture operations just down Bay (defined as within ¼ mile) from the mitigation site may retard the creation of this restored estuarine habitat in Kentuck Slough. These types of mitigation may not be effective in the context of future expansion of mariculture which would likely defeat mitigation goals. Although it will likely be practical for oyster cultivation on the mitigation site, this would be counter-productive to the intended goals of mitigating for fish and wildlife. ODFW recommends careful consideration of restricting commercial oyster cultivation from the Kentuck mitigation site as a condition of the FERC approval.

ODFW also requests that FERC require coordination between JCEP/PCGP and ODFW during the development/construction of the Kentuck Mitigation site, so that ODFW will be able to provide JCEP/PCGP with recommendations for the planning, construction, and long-term monitoring of the ecological functions.

2) Eelgrass Mitigation Plan (DEIS Section 4.3.2.1, and see *Jordan Cove Energy Project Compensatory Wetland Mitigation Plan* filed with the FERC in May 2018)

Native eelgrass is recognized by ODFW as a Habitat Category 2, and the ODFW goal is no net loss of either habitat quantity or quality and to provide a net benefit of habitat quantity or quality (OAR 635-415-0025). To achieve the mitigation goal, ODFW recommends avoidance of the impacts through alternatives to the proposed development action, or mitigation of the impacts (if unavoidable) through reliable in-kind, in proximity habitat mitigation to achieve no net loss of either pre-development habitat quantity or quality.

In order to offset the loss of 1.9 acres of eelgrass, the JCEP includes a proposed eelgrass mitigation plan that relies on the “best case scenario” for full success by creating 6.03 acres of eelgrass (3:1 ratio) within a 9.34 acre site in the intertidal zone near the impact area. ODFW has noted a number of potential issues associated with the proposed JCEP mitigation plan that have not been considered/addressed fully by the applicant.

The DEIS does not demonstrate that serious consideration has been given to avoidance of the impacts to eelgrass beds. In this regard, the JCEP Mitigation Plan should describe the alternative sites that were considered, characterize the location, species composition, and abundance of the eelgrass and other submerged aquatic vegetation at the alternative sites, and provide the rationale for rejection of the alternative sites and preference for the proposed site. The existing JCEP Mitigation Plan is incomplete because it does not provide a full description of the steps that were taken to avoid adverse impacts to existing eelgrass beds in Coos Bay.

The proposed eelgrass mitigation plan does not give serious consideration to the difference in habitat quality that is anticipated between the eelgrass impact area and the eelgrass mitigation site. The plan proposes to excavate 9.34 acres of existing algae/mud-sand algae habitat located in the intertidal zone near the North Bend Airport to an elevation of -2.00 ft NAVD, and to convert the algae/mud- sand habitat into 6.03 acres of eelgrass. The proposed conversion of algae/mud-sand habitat to eelgrass habitat is problematic, because eelgrass and algae-mud-sand is also recognized as Habitat Category 2 value habitat under ODFW Fish and Wildlife Habitat Mitigation Policy. While these habitats are both considered as Habitat Category 2, they provide different functions and values. Accordingly, diminishing the quantity and quality of algae/mud-sand habitat in order to offset the loss of eelgrass habitat is not 'in kind' and does not create a 'net benefit', and therefore does not meet the ODFW Fish and Wildlife Mitigation Policy goals for Habitat Category 2.

Earlier attempts to mitigate for the damage or loss of eelgrass beds have met with limited success in Pacific Northwest estuaries. For example, Thom et al. (2008) conducted a review of 14 eelgrass mitigation and transplant projects, and they concluded that it is sometimes possible to restore eelgrass under favorable site conditions when the reason for the initial loss of eelgrass is understood and corrected. The authors also noted, however, that eelgrass restoration science is hampered by knowledge gaps which reduce restoration success. The underlying mechanisms for recent eelgrass loss in the Pacific Northwest region are not obvious, which suggests that the scientific understanding of eelgrass biology and ecosystem conditions is currently inadequate to fully support environmental management actions (Thom et al. 2008).

There are often hydrologic flow regime complexities that affect potential for success in eelgrass restoration:

- Habitat conditions created through excavation or filling are often ephemeral and subject to subsequent deposition/erosion that results in movement of conditions outside of the range of preferred variability for eelgrass.
- Flow regimes including severity of wave action and current speed contribute to the potential success of a site for eelgrass establishment and growth. Sites that are created through excavation or fill are an artificial modification of conditions that have formed through the geomorphological features that drive flow regimes. Factors such as water depth reflect deposition/erosion rates from water transported sediments. Excavation or filling to a specific elevation is attempting to alter the natural elevation conditions in relation to hydrologic conditions for many sites that might serve as potential mitigation. Resultantly there is limited potential for success of projects that modify water depth/elevation of the substrates for creating conditions appropriate for eelgrass mitigation unless the site chosen has substrate elevation that has been artificially created from previous disturbance or the conditions are dominated by factors other than hydrology.
- Use of eelgrass sites immediately adjacent to or within the mitigation area for obtaining plants/shoots results in impacts to these locations, potentially weakening the vigor of eelgrass at these locations which is counter to goals.
- Excavation of locations adjacent to existing eelgrass beds can result in hydrologic changes such as erosion of surrounding substrates resulting in impacts to currently productive stands.
- The monitoring plan should include more robust methods such as diver or low tide visual count surveys with established known planting densities at time-0 and subsequent measurable surveys with quantifiable methods.
- Due to the potential for minimal success the eelgrass mitigation ratio is likely insufficient to offset impacts at the JCEP project impact location.

For all of the reasons listed in the discussion above, ODFW recommends the eelgrass mitigation strategies be re-evaluated to favor avoidance.

3, 4, and 5) Panhandle, Lagoon, and North Bank Mitigation Sites (Section 2.1.1.9 in the DEIS)

The DEIS reports three upland habitat mitigation sites. The Panhandle site is approximately 133 acres and is located north of Trans-Pacific Parkway. The Lagoon site is approximately 320 acres and is located adjacent to the meteorological station. The North Bank site is approximately 156 acres and is located on the north bank of the Coquille River adjacent to the Bandon Marsh National Wildlife Refuge (NWR). ODFW is aware of these locations and acknowledges that these sites have been part of preliminary discussions with JCEP/PCGP about potential mitigation sites. During those discussions, ODFW expressed reluctance to accept those sites as appropriate mitigation because much of the habitat types were out-of-kind. For example, ODFW expressed reluctance over the North Bank land purchase as complete mitigation for the loss of forested dune habitat (coastal marten Category 2 shore pine habitat), because the North Bank site is largely Douglas fir forest and not shore pine forest. Without a habitat mitigation plan that details categories of habitat impacts by the LNG facility and how these mitigation sites offset the functions and values being lost, it is difficult for ODFW to determine if these sites will meet the criteria outlined in the ODFW Fish and Wildlife Habitat Mitigation Policy. ODFW recommends these sites be evaluated in coordination with ODFW as part of a larger habitat mitigation planning effort.

Additional Mitigation Recommendations

- **MAMU and NSO Habitat and the ODFW Fish and Wildlife Mitigation Policy**

The DEIS identifies seasonal restrictions for tree removal and construction activity as the only mitigation measure to address impacts to MAMU and NSO habitat. ODFW finds this wholly inadequate for avoiding take and jeopardy of both species given the significance of predicted impact (see comments above) and federal ESA obligations. The proposed seasonal restrictions are a minimization measure that does not address the net loss in habitat. ODFW had expected these species to be foremost in a comprehensive mitigation plan for the JCEP/PCGP project. However, that plan has not been included in the DEIS. ODFW recommends a comprehensive mitigation plan be developed that includes adequate measures to achieve the goals of avoidance, as well as no net loss and net benefit. In addition, the mitigation plan should be developed for all land ownerships, consistent with the recommendations provided below and with the guidance provided by the USFWS in the 2014 Conservation Framework.

In the 2014 version of the PCGP project, a habitat categorization effort was underway with the PCGP's biological consultants. In the current project, PCGP has stated verbally their plan is to continue using that previous work to develop a wildlife habitat mitigation plan for the pipeline. However the DEIS does not provide any indication that this effort or evaluation has been initiated or developed. PCGP has also met with ODFW in early 2019 to discuss potential revisions to the categorization of Category 1 habitat for MAMU. ODFW requested additional information prior to providing feedback to PCGP. That data request included access to Appendix Z from the Applicant Prepared Draft Biological Assessment (provided to the FERC docket in September 2018), as well as greater detail on the definitions and methods used to delineate potential MAMU habitat, and spatially-explicit information on survey areas and results. At this time, the applicant has provided ODFW with a qualitative description of methods and results but has not provided ODFW with the previously requested information (Appendix Z, the spatially-explicit information). Until that information is provided and reviewed by ODFW, ODFW continues to provide the following recommendations.

In the ODFW Fish and Wildlife Habitat Mitigation Policy, Habitat Category 1 is irreplaceable, essential habitat for a fish or wildlife species, population, or a unique assemblage of species and is limited on either a physiographic province or site-specific basis, depending on the individual species, population or unique

assemblage. The mitigation goal for Category 1 habitat is no loss of either habitat quantity or quality. For Category 1 habitat, ODFW recommends avoidance of impacts through alternatives to the proposed development action; or no authorization of the proposed development action if impacts cannot be avoided (OAR 635-415-0025(1)(b)).

For the NSO, the nesting habitat for the owl is extremely limited on a physiographic basis, and the structural characteristics of their nesting sites (old growth trees, complex understory, available prey base, connectivity of habitat) are irreplaceable within the life of this project. . Therefore, ODFW deems the 70-acre nest patch as Habitat Category 1 (consistent with the Oregon Forest Practices Act ORS 197.277 and OAR 629 Division 665, as well as the federal ESA). ODFW recommends avoidance of any habitat loss within presumed-occupied and occupied nest patches (as per protocol-level survey – see above) for the NSO. This recommendation applies to any season, not just the active breeding season, especially given the NSO's strong nest site fidelity.

The DEIS states "*The Project would affect habitat within 97 NSO home ranges and 9 nest patches. About 37 miles of pipeline route would cross 7 designated critical habitat sub-units. Project construction would remove a total of about 517 acres of nesting, roosting, or foraging (NRF) habitat for NSO, of which 134 acres would be permanently lost within the 30-foot-wide corridor maintained in an herbaceous state. Additionally, 214 acres of NRF habitat for NSO would be modified and used as UCSAs. Approximately 1,158 acres of dispersal habitat (high NRF, NRF, and dispersal only habitat) would be removed by the Project. Approximately 919 acres of NSO capable habitat would be removed by construction of the proposed Project, of which 216 acres would remain in a permanent herbaceous/shrub state within the 30-foot operational ROW. Approximately 13,294 acres of NSO habitat (1,307 acres of high NRF/NRF habitat, 4,147 acres of dispersal only habitat, and 5,690 acres of capable habitat) occur within 100 meters (328 feet) of habitat removal, of which 4,326 acres (or 32.5 percent of NSO habitat within 100 meters of habitat removal) of interior NSO habitat would be indirectly affected (1,586 acres of high NRF/NRF habitat, 1,388 acres of dispersal only habitat, and 1,352 acres of capable habitat). The Pacific Connector Pipeline Project would remove 442 acres from LSRs , of which 379 acres is NSO habitat or capable of becoming NSO habitat (approximately 69 acres of high NRF, 93 acres of NRF [includes about 9 acres of "post-fire" NRF], 71 acres of dispersal only habitat, and 146 acres of capable habitat)".*

ODFW does not support any impact within the 70-acre nest patch and believes allowance of such activities will result in net loss of habitat and 'take' per the federal ESA and potentially per the Oregon ESA if NSO are physically harmed in the process. Therefore, ODFW recommends the PCGP project explore alternatives that avoid direct impacts and habitat loss within NSO nest patches, as those impacts are not mitigatable.

Beyond the NSO nest patch, ODFW defines the remainder of Nesting Roosting Foraging Habitat (as defined in the USFWS 2014 Conservation Framework) as Category 2 habitat. While avoidance and minimization is prioritized, impacts to Category 2 habitat are mitigatable at the high standard of 'no net loss of either quantity or quality and to provide a net benefit in habitat quantity or quality'. To meet that mitigation goal, ODFW recommends those acres in Nesting Roosting and Foraging Habitat (beyond the 70-acre nest patch) be identified as Category 2 habitat and that mitigation strategies be developed consistent with the guidance provided by the USFWS in the 2014 Conservation Framework.

Similar to the NSO, nesting habitat for the MAMU is extremely limited on a physiographic basis, and the structural characteristics of their nesting sites (primarily mature and old growth trees, the presence of nesting platforms, complex understory, and connectivity of habitat) are irreplaceable within the life of this project. For this reason, ODFW considers occupied MAMU sites (as defined by Mack et. al. 2003) Category 1

habitat in the context of an impact such as the PCGP project. According to Mack et al. 2003 an occupied site would be where protocol level surveys were performed for a minimum of two years in suitable habitat, and where a sub-canopy detection of a MAMU was made. The extent of the occupied habitat is based on all suitable habitat encountered until interrupted by a 100-meter break in habitat continuity. ODFW recommends avoidance of any habitat loss within occupied MAMU habitat. This recommendation applies to any season, not just the active breeding season, especially given the MAMU's strong nest site fidelity. These recommendations should apply to all land ownerships, as they match what ODFW would recommend to state agencies per OAR 635-100-0137.

The DEIS states "*Construction of the Project would remove a total of about 806 acres of MAMU habitat (suitable, recruitment, capable), including about 78 acres of suitable habitat removed from 37 stands (18 occupied MAMU stands and 19 presumed occupied stands). There is the potential that effects could extend over a total of about 7,145 acres of suitable nesting habitat in the terrestrial nesting analysis area (i.e., the extent of disturbance/disruption of MAMU during the breeding season; FWS 2014c), where Project-related noise, primarily use of access roads, may affect MAMU behavior, including breeding activities. HDD and DP activities are not anticipated to disturb nesting MAMU as noise associated with this work would attenuate to ambient levels before reaching MAMU stands. Ten occupied and 24 presumed occupied MAMU stands occur within CHU OR-06 (b, c, and d) within the proposed terrestrial nesting analysis area. Overall, construction of the Pacific Connector Pipeline Project would remove about 4 acres of suitable MAMU nesting habitat (PBF- 1) and about 12 acres of recruitment habitat and 15 acres of capable habitat (both of which make up PBF-2) within CHU OR-06-d*". Impacts would occur in the form of tree removal, trenching, ROW maintenance, noise disturbance, by the PCGP project. However, it is not clear whether PCGP had access to all potentially suitable habitat for surveys. ODFW believes allowance of any impacts in MAMU occupied nesting habitat will result in net loss of habitat and 'take' per the federal ESA and potentially per the Oregon ESA if MAMU are physically harmed in the process. Therefore, ODFW recommends the PCGP project explore alternatives that avoid direct impacts and habitat loss within occupied MAMU nesting habitat, as those impacts are not mitigatable.

Beyond the Category 1 occupied MAMU nesting habitat, ODFW considers suitable MAMU nesting habitat (where structural characteristics exist but sub-canopy detections were not made) to be Category 2 habitat given its essential and important role as potential MAMU nesting habitat (and to account for missed detections of elusive birds). While avoidance and minimization is prioritized, impacts to Category 2 habitat are mitigatable at the high standard of 'no net loss of either quantity or quality and to provide a net benefit in habitat quantity or quality'. To meet that mitigation goal, ODFW recommends those acres in suitable MAMU nesting habitat be identified as Category 2 habitat and that mitigation strategies be developed consistent with the guidance provided by the USFWS in the 2014 Conservation Framework.

- **Snowy Plover Habitat**

ODFW defines snowy plover nesting and foraging habitat as Category 2 per the ODFW Fish and Wildlife Habitat Mitigation Policy (essential and limited, but can be replaced and enhanced). At a minimum, an area of beach/dune habitat, from 1-2 km in length north of the current nesting area (Oregon Dunes National Recreation Area) would be an appropriate set-aside to be managed for nesting snowy plovers). Habitat preparation and management (dune sculpting, physical removal and disposal of non-native beach grasses, predator management, and public outreach and control) would all be appropriate forms of mitigation uplift. These mitigation options are an opportunity to create a success story for snowy plover recovery and community engagement. ODFW recommends FERC require JCEP to coordinate with ODFW to develop

mitigation strategies to offset the direct and indirect impacts expected from this project, so that take/jeopardy determinations can be avoided in the Section 7 and Section 10 (if applicable) consultations.

- **Coastal Martens**

The JCEP LNG terminal would remove shore pine habitat that is important and limited for the coastal marten. The shore pine forest habitat that would be impacted by the JCEP is limited in abundance on the Oregon coast. While information on patterns of habitat use and distribution is still somewhat limited, it appears to ODFW that what is known about coastal marten distribution in the Coos Bay area seems to be based on the existence of this shore pine habitat type. Given the close proximity of known detections of coastal martens relative to the project area, the limited extent and importance of the habitat type, and the desire to keep martens off the endangered species lists, ODFW considers the forested dune in the JCEP project area to be Category 2 habitat. ODFW recommends FERC and JCEP/PCGP work cooperatively with ODFW to incorporate coastal martens into a fish and wildlife habitat mitigation plan.

- **Big Game Winter Range**

The PCGP project bisects a significant amount of big game winter range, which ODFW prioritizes given its importance to sustaining big game populations and its limited extent. ODFW has digitized biological winter habitats for mule deer, Rocky Mountain elk, and bighorn sheep in both eastern and western Oregon and has provided this information to PCGP previously (ODFW 2013, and 2017). ODFW recommends PCGP work with ODFW to ensure the best available science is used to assess and mitigate for impacts to big game. ODFW recommends that a comprehensive mitigation plan be developed for this project to ensure impacts are offset and serious depletion (see ORS 496.012) does not occur for Oregon's big game species. Examples of possible mitigation may include purchasing degraded properties within designated winter range and performing habitat improvement projects to mitigate for damage to winter range through likely noxious weed establishment and increased OHV activity. See Appendix A Table 3 for a list of possible improvement projects, and Figure 4 and Table 4 for a list of possible mitigation properties.

- **Other Sensitive Wildlife Habitats**

Oak woodlands are a unique and highly productive habitat that is limited in quantity. Oak Woodlands have been classified by ODFW under the agency Habitat Mitigation Policy (OAR 635-415-0000-00025) as Category 2. Many of these woodlands have critical function as winter range for big-game and meet life history needs for a variety of migratory birds (e.g. Acorn woodpeckers), forest herps and small mammals. Oak woodlands require a long-time (100+ years) to reach full productivity and function as habitat, and are a limited habitat type in Oregon. For these reasons ODFW recommends oak woodlands receive particular attention in the DEIS and that the Applicant work with ODFW to develop avoidance, minimization, and/or mitigation plans for this important habitat type.

Vernal pools are also a unique and highly productive habitat that is limited in quantity. Vernal pools, when functional, provide essential habitat for vernal pool fairy shrimp which are listed as Threatened on the federal ESA and which are an Oregon Conservation Strategy Species. Vernal pool fairy shrimp require vernal pools or similar, ephemeral pools to complete their life cycle. They prefer small pools with cold water. Prior to seasonal drying of the pools, females produce eggs ("cysts"). These cysts can dry out and lie dormant until pool re-filling occurs, at which time the eggs will hatch. There is little genetic variability within vernal pool fairy shrimp populations. Many vernal pools have been drained or have modified hydrology unsuitable for

fairy shrimp. Remaining pool habitat is increasingly isolated. Stormwater run-off containing pesticides, chemical residues, and other contaminants are also harmful to vernal pool fairy shrimp. For these reasons ODFW considers vernal pool habitat to be Category 2 and recommends they receive attention in the DEIS and that the applicant work with ODFW to develop avoidance, minimization, and/or mitigation plans for this important habitat type.

- **General Inequity of Mitigation between federal and non-federal lands in the DEIS**

ODFW notes that the DEIS identifies that non-federal lands make up approximately 70+% of the area affected by this pipeline. Yet most or nearly all the mitigation recommended through the document is on federal lands. ODFW recognizes the federal agencies were Cooperating Agencies, and that many of the projects outlined on federal land had previous planning from internal agency effort. However, ODFW recommends the DEIS recognize the ecological gap created by impacted habitats at a location and conducting mitigation that may be out-of-kind or out-of-proximity. These types of issues create complications for ecological function in relation to compensating for impacts. ODFW finds that much of the federal land mitigation discussed in the DEIS for would not meet the goals of the ODFW Fish and Wildlife Mitigation Policy, and notes that the DEIS refers to the 'POD' which ODFW was unable to locate.

In Section 2.1.5 the DEIS discusses how USFS mitigation plans are programmatic, and may include projects where NEPA is not complete. Completion of additional NEPA for these mitigation options could take years beyond the construction of the JCEP/PCGP project. ODFW recommends that mitigation occur prior to or concurrent with the development action (OAR 635-415-0025).

Table 2.1.5-1 lists mitigation actions for USFS lands. These actions were identified by USFS to address the Aquatic Conservation Strategy, habitat for federally listed species, Late Successional Reserves, compliance with the various Forest Plans, as well as specific resource issues by watershed. Given these criteria for identifying mitigation, not all projects listed in the DEIS for USFS lands are designed to offset the losses of fish and wildlife habitat and therefore do not achieve the goals of no net loss and net benefit as set forth in the ODFW Fish and Wildlife Habitat Mitigation Policy. To remedy this issue, again ODFW recommends FERC condition their approval such that JCEP/PCGP works with ODFW, the federal agencies, tribes, and other relevant state natural resource agencies to develop a comprehensive mitigation plan that aligns with the ODFW Fish and Wildlife Habitat Mitigation Policy.

Fish Passage - It is the policy in the State of Oregon to provide upstream and downstream passage for native migratory fish (see ORS 509.580 through 509.910 and corresponding Administrative Rules OAR 635-412-005 through 0040). Fish passage is required in all waters of Oregon in which native migratory fish are currently or were historically present. With some exceptions defined in ORS 509.585, a person owning or operating an artificial obstruction may not construct or maintain any artificial obstruction across any waters of this state that are inhabited, or historically inhabited, by native migratory fish without providing passage for these fish. Projects that construct, install, replace, extend, repair or maintain, and remove or abandon dams, dikes, levees, culverts, roads, water diversion structures, bridges, tide gates or other hydraulic facilities can be "triggers" to Oregon's fish passage rules and regulations. Specific information relating to Oregon Fish Passage Law can be viewed on our website at the flowing location: http://www.dfw.state.or.us/fish/passage/

At this time, ODFW has received Fish Passage Plans for the portion of the project located within the Coastal Zone Management Area (CZMA). ODFW has not received detailed fish passage design plans for the rest of the pipeline and its associated infrastructure.

In April 2019, ODFW received the PCGP fish passage plan for pipeline and stream crossings within the CZMA. This fish passage plan submittal included approximately fifty eight (58) locations where the proposed 229-mile long, 36-inch diameter natural gas pipeline would intersect waterways in Coos and Douglas Counties. As proposed, four (4) of the 58 waterway crossings would be Horizontally Directionally Drilled (HDD) and the remaining would be open trench installations. Open trench natural gas pipeline installations generally consists of either a flume or a dam and pump water management installation method. Additionally, at each pipeline crossing except the HDD installations, temporary water crossing structures (bridges) would be necessary at all locations to facilitate project construction and pipeline installation.

ODFW also received a Fish Passage Plan for a road-stream crossing for a temporary bridge installation at MP 44.29 (Upper Rock Creek). This submittal package was for a temporary bridge structure to provide construction equipment access to the proposed pipeline route where access is presently inaccessible.

Finally, ODFW also received a JCEP fish passage plan for the Kentuck-APCO estuarine habitat restoration at the Kentuck mitigation site in Coos County on March 2019. This packet addressed five (5) primary compensatory restoration actions as a result of impacts associated with the JCEP export liquefied natural gas terminal. These five actions include fish passage plans for:

- East Bay Drive Bridge,
- Golf Course Lane Culvert,
- Kentuck Tide Gate,
- Kentuck Creek Restoration, and
- APCO Bridge

Based on the materials received to date (described above), ODFW does not have sufficient data, information and design details necessary to process and authorize the state's fish passage approvals for the various project components where ODFW has fish passage authority.

General areas where insufficient information, data and design details exists include:

- Streambed and stream bank restoration best management practices at high risk pipeline sites
    - Limited to no fish passage engineering design details exist for these high risk sites
- Short and long term post project monitoring, evaluation and reporting for all project sites associated with pipeline and restoration actions
- Temporary water management and fish passage during pipeline installation at sites determined "high risk" by ODFW
    - Presently at sites where dam and pumping water management strategies will be implemented, no fish passage is proposed during construction. Further discussion is necessary for some of the sites determined by ODFW to be high risk for passage of native migratory fish species.

Downstream fish passage during project implementation for high-risk sites determined by ODFW will be required.

- As identified in the pipeline installation plans, no in-water blasting is proposed. There are conflicts with some of the design detail notes where it appears in-water blasting may be necessary and "at the direction of the engineer and to be determined during project construction". Any and all in-water blasting requires a blasting plan to be submitted to ODFW (as per ORS 509.140). Additional discussions and design details are necessary with the project design team regarding in-water blasting plans associated with pipeline installation.
- Kentuck – APCO Project Site – numerous design details continue to be developed by the design team associated with the proposed tide gate structure and other restoration components of this proposed action. These include:
    - Ownership, long-term operational and maintenance responsibilities, water management plans, final engineering design details of East Bay Drive Bridge and tide gage, temporary water management, work area isolation, fish salvage and removal and fish passage during project implementation

Just as the ODFW fish passage application is not yet sufficient, the FERC DEIS also does not elaborate on this necessary fish passage information. Without consideration for the details enumerated above, the project does not demonstrate its ability to provide adequate fish passage, and therefore ODFW contends the JCEP/PCGP project has the potential for significant impact on native fish who rely on fish passage for population maintenance. Given the insufficient information for fish passage in the DEIS, ODFW questions FERC's determination of no significant adverse impact.

ODFW recommends the JCEP/PCGP applicant work with ODFW to provide the additional necessary data and information for the fish passage plans received to date. Furthermore, ODFW recommends JCEP/PCGP submit the fish passage plans for the remainder of the project assuming there are a number of stream crossings beyond the CZMA that will trigger Oregon's fish passage rules.

ODFW recommends FERC condition the project certificate such that the Applicant is required to complete consultation with ODFW and receive approvals under Oregon Fish Passage Fish Passage Law (ORS 509.585) for each individual stream crossing which triggers this policy prior to authorization of project construction.

In-Water Work/In-Water Blasting – The JCEP/PCGP project will involve construction work within waters of the state inhabited by fish and aquatic wildlife. ODFW has guidelines for appropriate timing of in-water work which can be found at http://www.dfw.state.or.us/lands/inwater/. These guidelines provide a way of planning in-water work during periods of time that would have the least impact on important fish, wildlife, and habitat resources. Specific recommendations related to in-water timing are also briefly discussed in the comment tables below, however ODFW recommends FERC require the Applicant to work with ODFW to identify appropriate in-water timing windows on a site-specific basis and according to the above guidelines and pursuant to ORS 509.140 and implemented through OAR 635 Division 425.

As required by OAR 635-425-0000 through 0050 (In-water Blasting Permits) the project shall apply for in-water blasting permits at any stream crossing locations where the use of explosives is desired in the course of removing any obstruction in any waters of this state, in constructing any foundations for dams, bridges, or other structures, or in carrying on any trade or business (OAR-635-425-0005). Further, it is the policy of the Oregon Fish and Wildlife Commission to discourage in-water blasting unless it is the only practicable method to accomplish project goals. ODFW may issue in-water blasting permits only if they contain conditions for preventing injury to fish and wildlife and their habitat (OAR 635-425-0015).

The applicant has engaged ODFW in discussions regarding the need for and intent to apply for in-water blasting permits before construction begins, however specific locations and details had not been discussed nor has ODFW received any in-water blasting applications. In those discussions the applicant informed ODFW that in-water blasting would not be undertaken with the Coastal Zone. However, the DEIS and the applicant's fish passage applications submitted to ODFW in April 2019 indicate that in-water blasting may be performed at sites to be determined during construction at the discretion of the project engineer. In fact the DEIS Section 4.6.1.3 discusses the potential for 13 blasting sites within the Southern Oregon Northern California Coho (SONCC) Essential Salmonid Unit (ESU), and another 22 blasting sites within the Oregon Coast coho ESU, both of which are in the coastal zone.

In-water blasting has the potential to injure fish and aquatic wildlife due to percussive shock waves produced by the energy associated with the explosion. This percussion can cause direct injury and stressors including bursting of swim bladder, hemorrhage, damage to sensory organs, and trigger displacement behavior in fish species. Given the significance of the impact, ODFW only issues blasting permits when the applicant demonstrates that all alternatives to blasting have been considered, and that this method is the least impactful to fish, wildlife, and their habitats. If blasting is unavoidable, ODFW expects applicants to identify appropriate mitigation offsets pursuant to the ODFW Fish and Wildlife Habitat Mitigation Policy (OAR 635 Division 415).

ODFW understands the applicant has not been able to physically access all stream crossing locations preventing the collection of necessary site-specific geotechnical information necessary to determine if in-water blasting is the only practicable method. However, the DEIS lacks an assessment of alternatives to blasting and lacks a thorough description of the significance of the blasting effect. The DEIS states that fish salvage prior to blasting will offset the impact but goes on to acknowledge that coho are particularly sensitive to electroshocking and handling without providing any comparative analysis of this minimization measure. Furthermore, the DEIS does not identify any compensatory mitigation options when avoidance and minimization cannot be achieved.

ODFW recommends this issue receive further consideration and analysis, given the high potential for significant adverse impact, between the draft and the final EIS. ODFW also recommends that FERC condition any approval such that the JCEP/PCGP applicant will have applied for and received any in-water blasting approvals from ODFW prior to beginning construction.

Specific Comments

In addition to the comments provided above, ODFW offers the following more site-specific comments in tabular form. These comments are a compilation of input from ODFW Fish and Wildlife Districts over the last 11 years that the JCEP/PCGP project has been proposed, in its various iterations. Table 1 includes ODFW comments and recommendations specific to the JCEP LNG Terminal and the Coos Bay Estuary. Table 2 includes ODFW comments and recommendations specific to the PCGP Pipeline. ODFW has attempted to update page and section numbers, and new information is added as necessary throughout both tables.

JCEP LNG TERMINAL SPECIFIC COMMENTS:

Citation	Issue Identification	Recommended Resolution
Table 1.5.1-1	**US Army Corps of Engineers Consultations:** In Table 1.5.1-1 the DEIS does not make mention of the US Army Corps of Engineers' jurisdiction and management authority on a parcel of land on the North Spit at Coos Bay. This has implications for snowy plover protection and management.	**US Army Corps of Engineers Consultations:** ODFW recommends Table 1.5.1-1 be corrected to include the US Army Corps of Engineers management authority for the parcel of land on the North Spit, specifically with regard to Section 7 ESA consultation for snowy plovers.
	US Fish and Wildlife Service Jurisdiction per the Endangered Species Act: Table 1.5.1-1's treatment of USFWS jurisdiction per Section 7 of the ESA does not describe their authority adequately. Take of listed species is always prohibited unless it is specifically permitted.	**US Fish and Wildlife Service Jurisdiction per the Endangered Species Act**: ODFW recommends Table 1.5.1-1 be corrected to more adequately describe the authority and Agency Action associated with Section 7 of the ESA. Furthermore, there is no mention of Section 10 authority regarding federally listed species and incidental take on non-federal lands. ODFW recommends this also be discussed in the table.
	Oregon Endangered Species Act (ORS 496.171-192) is omitted from Table 1.5.1-1: The table does not list the Oregon Endangered Species Act. The OESA's primary authority is related to state agency actions on state-owned or managed lands; and in so doing prohibits 'take' (killing or obstaining possession or control)	**Oregon Endangered Species Act (ORS 496.171-192) is omitted from Table 1.5.1-1:** To ensure that any state agency actions associated with this project do not overlook their obligations per the OESA, ODFW recommends Table 1.5.1-1 be updated to include reference to this statute.

	without an incidental take permit. Where approval for take is given by USFWS, then this is taken as a waiver under OESA.	
Section 1.5.2.5	**Omission of reference to Oregon Endangered Species Act (ORS 496.171-192):** This section does not describe ODFW authority for state-listed species. Furthermore, this section refers to the state's Wildlife Diversity Plan. Although the plan still exists, the Oregon Conservation Strategy is the wildlife conservation blueprint for ODFW and the State of Oregon as a whole.	**Omission of reference to Oregon Endangered Species Act (ORS 496.171-192):** ODFW recommends this section be updated to include reference to OESA. Please replace reference to the Wildlife Diversity Plan with Oregon Conservation Strategy. www.oregonconservationstrategy.org.
Chapter 2.1.1.6; pgs 2-10-17	**Maintenance of the slip:** It is unclear if the Port of Coos Bay will maintain access channel depth into Slip. Will this become part of the Port's Unified Dredging Permit, which maintains the depth of several access channels and vessel berths connected to, but outside of, the navigational channel? Port has recently been granted extensions outside of the ODFW-recommended in-water work windows for the Unified Permit, despite ODFW's request to dredge only within the window to protect estuarine resources.	**Maintenance of the slip:** ODFW recommends clarification of whether or not the access channel dredging and maintenance dredging will be part of Port of Coos Bay's Unified Dredging Permit. ODFW recommends all dredging of the portions of the project outside of the footprint of the current federal navigation channel or within the current upland be fully isolated from the bay by the proposed soil berm, and occur only with in the ODFW' in-water work window: http://www.dfw.state.or.us/lands/inwater/
Chapter 2.1.1.6; pgs 2-10-17; Chapter 4.6.1.3; pgs 4-330 to 4-441	**Direct Construction and Maintenance Dredging Impacts:** Lethal and non-lethal impacts to marine fish, crab, shrimp, bivalves, juvenile Chinook salmon, white sturgeon; ESA listed coho salmon, green sturgeon, and Pacific eulachon; as well as non-listed Pacific lamprey, and other species may occur:	**Direct Construction and Maintenance Dredging Impacts:** ODFW recommends: • During the initial dredging and excavation, monitoring of the dredge output at the storage site, ODFW recommends the Applicant access/estimate the magnitude (quantification of organisms in the dredge spoils) of impact to shellfish and non-game/game fishes.

	• Through entrainment in the hydraulic dredge at the time of the initial construction. • Be impacted by entrainment during future maintenance dredging required to keep the berth and access to the berth serviceable. • Become attracted to the alcove and away from natural habitats, introducing risk of industrial impacts to these species (e.g. metabolic expenditure from disturbance; entrainment into cooling intakes, entrainment into ship ballast water intakes). • The access channel from navigational channel to terminal is approx. 30 acres; will dredge 1.4 MCY; turbidity will likely last for 4-6 months; "localized". Four to six months could affect the life history of several estuarine species (fish and invertebrates), depending on timing. ODFW in-water work window is shorter than six months long.	• ODFW recommends a biological assessment of the JCEP deepwater access and slips be completed following construction to determine the degree that production of shellfish/gamefish will recover and stabilize. ODFW recommends this recovery assessment be scaled based on productivity in undisturbed regions in the Bay (reference sites). • ODFW recommends this information be provided to ODFW, NRTAG (see above), local tribes, and other interested parties within one calendar year after construction of the slip and berth is completed and annually thereafter for a period of 10 years. • The direct impacts of initial construction are clearly identifiable. However, post-project indirect impacts are likely not. ODFW recommends appropriate monitoring/study plans for the project area and mitigation sites be developed by and formally agreed upon by the Applicant and pertinent stakeholders. • The expected hydrological changes at the site due to the project development will potentially result in a number of changes to the biological communities at those locations (e.g. densities, species composition, predatory interactions, etc.). • These changes may occur in areas adjacent to or a considerable distance from the project area where there is little or no construction activity (see Deepwater Zone recommendations below). • Long-term monitoring/study (i.e. majority of the FERC certificate duration) is appropriate to understand/mitigate for ecological and biological changes associated with the project. • Clarify whether or not extension of IN-WATER WORK WINDOW would be requested. Issue is similar to Port's Unified Dredging Permit extension request, which ended with DSL issuing extension despite ODFW's recommendation of dredging only within the recommended IN-WATER WORK WINDOW. • ODFW recommends costs for monitoring/studies and mitigation are borne by the Applicant.
Chapter 2.1.1	**Omissions:**	**Omissions:**

pgs 2-1-4; 2-9 to 2-16; Chapter 4.5.1	• ODFW should be identified as an "appropriate agency" with regard to consultation on the Wetland Mitigation Plan. • ODFW should be identified as an "appropriate agency" with regard to consultation on the Aquatic Species Nuisance Treatment Plan. The JCEP project needs to report to FERC any abnormal operating incidents that result in harassment or mortality of fish and wildlife species.	• Clarify ODFW's role/authorities for wetland habitat mitigation. Confirm ODFW is an "appropriate agency" with this regard. • Clarify ODFW's role/authorities for Aquatic Nuisance Species prevention/mitigation. Confirm ODFW is an "appropriate agency" with this regard. • ODFW recommends the DEIS add, "…mortality or sub-lethal injury to fish or wildlife species," as information that needs reported to ODFW.
Chapter 2.1.1.6; pgs 2-10-17	**Hydrological/Water Quality Changes:** ODFW points to three anticipated changes in the hydrology/water quality of the site that will impact fish and wildlife due to the JCEP/ PCGP Coos Bay development: A) Turbidity; B) Salinity intrusion; and C) Water temperature changes. **Turbidity:** Mobilization of substrates will occur during the initial dredging and with continued regular disturbance associated with maintenance dredging (estimated 115,000 CY every three yrs.; ~383,000 CY in the first 10yrs) within the project area. Turbidity will increase over an unknown portion of the Coos Bay during construction and when maintenance dredging is conducted. The 2019 DEIS relating to the Easement permit application indicates that dredging will occur on the regular three year interval.	**Hydrological/Water Quality Changes:** The 2019 DEIS has addressed ballast water temperature exchange suggesting pg 4-91 that ballast and bay waters will likely be similar. ODFW questions FERC's assumption. Further information is needed to determine if increased salinity intrusion has the potential to change the ecological conditions in Coos Bay to a notable degree. Turbidity can reduce primary and secondary productivity, while salinity intrusion can have a myriad of effects (e.g. change in species distribution, invasive species colonization ability, reproduction changes). ODFW recommends that all three factors A) Turbidity; B) Salinity intrusion; and C) Water temperature changes are monitored and addressed in the following ways: Predictive Hydrologic Model: ODFW recommends the Applicant(s) consultant(s) develop of a predictive hydrologic model to estimate how creation of the slip and maintenance dredging of the main Coos River channel will affect salinity intrusion into the bay *(ODFW recognizes the efforts of the Applicant that have been completed to date, however, these focus primarily on hydraulic flow rather than salinity patterns).* This model should be developed and distributed for review to the NRTAG and department prior to initiation of construction at the site.

	However, the slip and berth represent additional acreage that will be impacted over current levels and may require an increased dredging frequency. Additionally, the hydrodynamic modeling indicates the slip will become an alcove, likely collecting sediments at a greater rate than the main shipping channel. Increased turbidity levels in the open water column can result in suppression of primary production, affecting a number of ecological factors: • Survival and growth of estuarine plankton (Cloern 1987; Irwin and Claffey 1966). • Potential effects to feeding capability and subsequent reduction in planktivorous organisms (Carter et al. 2009; Horppila et al. 2004; Bash et al. 2001). • Survival and growth of species such as eelgrass are affected by factors that decrease total solar input and depth to which light penetrates into the water column. • Potential reduction in production of mollusks, Dungeness crab, juvenile coho, Chinook salmon and other species. • Comments received from DEA on 01/07/11 have been considered. **Salinity Intrusion:** The current 2019 DEIS does not note the *Oregon International Port of Coos Bay Section 204(f)/408 Channel Modification Project*, which ODFW	Inclusion of Hydrologic Factors in the Monitoring Plan: ODFW recommends the Applicant develop a monitoring plan (in combination with the biological monitoring plan as described above) in collaboration with ODFW/NRTAG to study/quantify/qualify: Turbidity effects; • Salinity intrusion effects; • Water temperature issues at the site. ODFW recommends this monitoring/study plan be developed in collaboration with the NRTAG/Department. Studies outlined in the plan should be completed for a time period necessary to meet the goals, which should be determined in collaboration with the NRTAG/department. Data Sonde Network: As part of the monitoring plan, ODFW recommends: • A network of data sondes be deployed to collect data on A) Turbidity; B) Salinities; C) Water temperature both at the surface and depth. • If salinity intrusion, thermal changes, or turbidity are determined to impact fish and wildlife resources, mitigation should be appropriately identified by the JCEP, department and NRTAG as consistent with OAR 635-415-0000 through 0025. ODFW recommends a monitoring/study plan be developed in collaboration with the NRTAG and department. This plan should include: • Biological information (e.g. abundance, species composition, behavior; for both native and invasive species) project in the bay. • Hydrological information (turbidity, salinity intrusion, water temperature changes) and specifically address ecological impacts related to the deepening of the JCEP site due to dredge activities. • Modeling that has been conducted by the Applicant to date has been informative. However, it may not accurately and precisely predict what actual post-construction hydrologic and ecological condition will be. The study should use an experimental design that includes before and After Controlled Impact

	suggests is linked to the JCEP project. The Applicant noted that hydrologic modeling has indicated sediments will likely accumulate at an accelerated rate in the berth area. To date, the Applicant has not modeled the potential that actions of the JCEP will increase the distance to which highly saline waters intrude due to the above noted Port project; into Coos Bay and the effects to residence time of highly saline waters. Increased salinity intrusion likely would affect Category 2 habitats in the JCEP area, but also in an unknown portion of the remainder of the bay. Effects may include: • Ecotone boundary changes altering aquatic plant growth patterns and distribution. • Distribution changes for plant and animal organisms vulnerable to salinity levels. • Changes to the available zones for reproductive success (e.g. Dungeness crab, striped bass Morone saxatilis). • Phytoplankton community productivity change related to nutrient regime shifts (i.e. the time of year freshwater dominates for a given reach of the Bay). Saline intrusion associated with increased dredging in the 1980's was thought to have had a notable negative impact on several fin fish species in the Bay including striped bass and American shad (*Alosa sapidissima*), although study results	techniques aimed at elucidating changes in shallow and deepwater communities, correlations between biological indices, and hydrological changes.

	were inconclusive. The impacts that this intrusion would have on native shellfish and finfish species such as fall Chinook, coho salmon, Dungeness crab, and native oysters cannot be modeled and would only be detectable through real-time monitoring. Salinity ecotones are known to highly affect the zones habitable for shellfish. Productive commercial oyster farms, which occur in euryhaline waters upstream of the project site, are currently protected from many fouling organisms and predators that occur in more stable salinities. Further intrusion of salt water will contribute to more stenohaline waters thus presenting new risk to a currently economically viable industry. Effects of the dredging may be detectable over the entire bay. Mitigation at the Kentuck site is not In-Kind when considering salinity intrusion. Ecological benefits at the Kentuck site would not be able to compensate for impacts that increased salinity could have throughout the Bay. Some understanding and determination of changes in salinity pattern (e.g. results from a salinity study), could guide adaptive management/mitigation.	

	Water Temperature: Ships loading at the facility will discharge heated engine cooling water that may be as much as 3°C warmer than the surrounding water. Fish that come in direct contact with this plume will experience stress. ODFW recognizes that significant cooling of this water will occur soon after it is released from the vessel and sees this issue as less concerning, however, remains interested in potential for deleterious effects.	
Chapter 2.1.1.6; pgs 2-10-17	**Deepwater Zone Biological Communities:** Construction of the JCEP LNG slip and offloading site will create a new deepwater zone that is 25+ft in depth: This new deepwater zone will be constructed at 90° to the axis of the river channel forming a type of alcove morphologic feature that currently does not exist in Coos Bay. Deepwater zones that exist in Coos Bay tend to attract specific species compositions (e.g. white sturgeon, Dungeness crab, California halibut). However, these deepwater zones are in line with the main flow of the channel. Due to the location and hydrologic patterns associated with this new alcove, there needs to be monitoring to determine the species benefitted and or detrimental effects. The slip area will be highly disturbed during dredging and recover slowly, with re-disturbance at regular	**Deepwater Zone Biological Communities:** It is critically important to understand what impacts the development of a large "alcove" deepwater zone at the JCEP site will have on finfish and shellfish populations. Changes may occur to life-history patterns, movements, concentrations, overall abundance, and perhaps reproductive aspects of affected organisms in the Bay. Identifying these changes will be essential to development of a mitigation plan to compensate for negative impacts as they occur and are detected. ODFW recommends that specific studies be designed through coordination with ODFW and NRTAG to determine these changes or lack thereof. As described above long-term monitoring is critical to define the effects of this substantial proposed change to habitats in Coos Bay. ODFW recommends study of the effects of creating deepwater zones be conducted on an on-going basis through the majority of the JCEP/PCGP FERC license period. ODFW recommends this study attempt to document

	intervals associated with maintenance dredging. Installation of rip-rap and sheet-pile in the berth are expected to maximize the simplicity of the zone inhibiting the productive capacity for fish and wildlife. Consequently, there is concern with how construction of this site will affect life cycle patterns, population concentrations, overall abundance, and movements of certain affected species in Coos Bay. Specifically, e.g. will additional deepwater zone in this region of the bay affect the following: • Finfish/shellfish species densities in the JCEP area and other regions of the bay. If change occurs, how will this affect production of affected species in relation to current levels (e.g. predator-prey relationships with avian predation of salmonids, seal and sea lion predation to salmonids; avian predation to finfish)? • Competitive interactions associated with the habitat value or lack of value of the slip. Additionally, it is of concern if the slip will become a zone of higher density of predatory fishes. • Recreational opportunities related to current finfish/shellfish distributions (e.g. alteration of the distribution of Dungeness crab; salmon movement changes; influx of larger rockfish; etc.).	changes to populations including, but not limited to: change in species diversity, abundance, behavior, distribution, and species composition caused by the project. ODFW recommends Before and After Control Impact (BACI) study methods be used to provide before, after, and control structure for the investigations. ODFW recommends the Applicant receive guidance from ODFW/NRTAG for methods and timing (beginning, sampling frequency, and ending) for these studies. Study results should be distributed annually to ODFW/NRTAG, other interested agencies/parties. ODFW recommends a biological assessment of the JCEP deepwater access and slips be completed following construction to determine the degree that production of shellfish/finfish will recover and stabilize. This recovery assessment should be scaled on a percentage basis compared to productivity in undisturbed regions in the Bay. ODFW recommends reports be completed annually and information provided to ODFW, NRTAG, local tribes, and other interested parties within one calendar year after construction of the slip and berth is completed and annually thereafter for a period of 10 years. The DEIS needs to fully acknowledge the potential for use of the slip by juvenile salmonids and other fish or invertebrate species and monitor, and mitigate for use of terminal slip impacts to these species.
Chapter	**Recreational Users:**	**Recreational Users:**

4.13.1.3 Table 4.13-2; 4.14.1.6 pg 4-799, 80	It is ODFWs understanding that the U.S. Coast Guard typically requires exclusion zones of up to 500 meters surrounding LNG tankers transiting the bay and potentially while at dock for safety and national security purposes. The 2019 DEIS does not address this very serious potential impact to recreational and commercial boat and/or bank use of Jordan Cove and the surrounding bay areas. Any such actions by the US Coast Guard would likely result in a notable impact to public recreation for fishing, shellfish, or hunting which should be analyzed as part of the cumulative impacts of the project and fully mitigated for should they occur: The DEIS states that LNG ship traffic would not significantly impact recreational users because the # of vessels would equal the historic # of deep-draft ships that once called on Coos Bay. This does not take into account that: • Recreational use of the Bay has increased, with greater numbers of crabbers, clammers, and anglers participating. • The Bay area from the jetties to Jordan Cove is a high-use area for crabbing and salmon angling from boats. • It is uncertain whether or not USCG security/safety measures will require boats to completely leave the area, or simply require boats to clear the navigational channel to allow the ship to pass.	ODFW recommends FERC clarify safety/security requirements for recreational boaters when LNG ships are in transit within the K Buoy to terminal zone, specifically including any such future safety or national security exclusion zones likely to be implemented by the U.S. Coast Guard or any other state of federal enforcement agency. ODFW recommends that FERC and/or the applicant conduct a more thorough economic analysis of the shellfish (crabbing/clamming) and finfish (rockfish, salmon, steelhead) fisheries in Coos Bay, their contribution to the economics of Coos County and Southwest Oregon and address the potential impacts of the JCEP. The economic impact to these recreational opportunities and the local businesses that depend on them is directly related to this environmental concern. ODFW recommends FERC more carefully weigh the impact that any such loss of recreational access and fisheries revenue would have for local business and the State of Oregon's economy.
Chapter 4.5.2.2; pgs 4-	**Aquatic Resources:**	**Aquatic Resources:** Should use most up-to-date species status, which has

245-248; TABLE 4.11.3.1-1 (continued)	Omissions: • ODFW should be identified as an "appropriate agency" with regard to consultation on the Wetland Mitigation Plan. • ODFW should be identified as an "appropriate agency" with regard to consultation on the Aquatic Species Nuisance Treatment Plan.	changed for some species since 2005 report. ODFW Recommends: • Clarify ODFW's role/authorities for wetland habitat mitigation. Confirm ODFW is an "appropriate agency" with this regard. • Clarify ODFW's role/authorities for Aquatic Nuisance Species prevention/mitigation. Confirm ODFW is an "appropriate agency" with this regard. • ODFW recommends the JCEP project report to FERC any abnormal operating incidents that result in harassment or mortality of fish and wildlife species.
Chapter 2.4.1.5 pg 2-48	**In-Water Dredging/Work:** The DEIS outlines that dredging of the bay, placement of sheet pile, etc. will occur**.** At the JCEP project site there is some potential that Pacific smelt (eulachon) may be in this reach of the bay from January 15 until April annually. Although the presence of eulachon is considered highly unlikely.	**In-Water Dredging/Work:** The DEIS outlines the project's intent to complete work below the high tide zone. For work that will occur below the high tide watermark, ODFW recommends that these actions coincide with the In-Water Work window for the Coos Bay estuary (October 1 to February 15). At this particular site there is some potential that Pacific smelt (eulachon) may be in this reach of the bay from January 15 until April annually. Although the presence of eulachon is considered highly unlikely, as a precautionary measure ODFW recommends adjusting the normal In-Water Work window to October 1 to January 31. ODFW notes the 2019 DEIS reference to the in-water work window on pg 2-48.
Not located in 2019 DEIS	**Nest Site Searches:** The Applicant identified in the 2014 DEIS that nest site searches would be conducted prior to tree clearing to eliminate the risk that trees will be cut during nesting season, (although they will be harvested at a later date). ODFW was unable to locate language in the 2019 DEIS related to sensitive birds.	**Nest Site Searches:** ODFW recommends that the Applicant have qualified, trained staff complete surveys for Great Blue Heron Rookeries and Osprey nest sites prior to any timber harvest or pipeline construction at the appropriate time of year to complete surveys.
Chapter 4.3.3.1 pg 4-128; pg 210; Chapter 5.1.4 pg 5-4	**Exotic Plants and Wildlife:** Disturbed soils and removal of vegetation at the site combined with the installation of artificial tanks/pipeline/other structures will present opportunity for invasion of	**Exotic Plants and Wildlife:** ODFW recommends that the Applicant continue development and implantation of an upland invasive plant management plan in collaboration with ODFW and NRTAG to assist with concerns such as minimizing the potential for inadvertently benefiting exotic plants and wildlife. BMPs might include actions to

	non-native plants and are anticipated to result in further loss of habitat for native wildlife species (e.g. replacement of mourning doves *Zenaida macroura* with ring-necked doves *Streptopelia capicol*; native sparrows with house sparrows *Passer domesticus* and European starlings *Sturnus vulgaris*). There is also concern that corvid bird species (ravens, crows, jays) that are predators on snowy plover may benefit from the project. Often, exotic invasive species have a higher tolerance for direct association with humans; benefit from food wastes associated with daily human activities, and will potentially use perching and nesting opportunities that may become available due to this project, furthering displacement of native species.	minimize garbage and other human related factors which could lead to increased presence of exotic or otherwise undesirable predatory bird species such as starlings or corvids.

PCGP PIPELINE SPECIFIC COMMENTS:

Citation	Issue Identification	Recommended Resolution
Exec. Sum pg. 3; Chapter 4.2; pgs 4-72; 102; 268; 295; others	**Avoidance, Minimization, and Mitigation of Impacts to Habitat and Water Quality Associated with Stream Crossings:** Turbidity control measures for sediment generated at stream crossings, isolation of the work area, salvage of fish, Best Management Practices (BMP's) for equipment operation, measures for handling frac-outs if they occur, minimizing impacts to the riparian zone, and revegetation strategies are factors that need to be addressed for stream crossings. These have been partially, but not fully addressed by materials supplied by the applicant consultants, but not defined as a FERC permit requirement in the DEIS. It is known that ESA-listed fish specie(s) and or State Sensitive species will be present at the South Coos, North Fork Coquille, and East Fork Coquille river crossings include OC Coho salmon. State Sensitive-Vulnerable species include Coho salmon (coastal coho salmon SMU/Oregon Coast ESU). Winter steelhead (Oregon Coast ESU/coastal winter steelhead SMU) are considered Sensitive-Vulnerable in the Coquille River	**Avoidance, Minimization, and Mitigation of Impacts to Habitat and Water Quality Associated with Stream Crossings:** ODFW recommends FERC condition the project certificate such that the Applicant is required to complete consultation with ODFW and construct all fish bearing stream crossing actions within the periods identified in ODFWs standard In-Water Work timing guidance document unless otherwise approved in writing by ODFW. ODFW's standard In-Water Work timing guidance document can be viewed on our website at the flowing location: http://www.dfw.state.or.us/lands/inwater/ **Note:** ODFW advises it is not *biologically defensible to support any in-stream work during time periods when fish are actively spawning, migrating or when eggs or juveniles may be present in the gravels.* ODFW recommends FERC condition the project certificate such that the Applicant is required to complete consultation with ODFW and construct all stream crossing in a manner which avoids, minimizes and fully mitigates any residual impacts to fish and wildlife habitats consistent with the expectations identified in ODFW's Fish and Wildlife Habitat Mitigation Policy (OAR-635-415-0000 through 0025). The Department's Fish and Wildlife Habitat Mitigation Policy can be viewed on our website at the flowing location: http://www.dfw.state.or.us/OARs/415.pdf *Please see Oregon Fish and Wildlife Habitat Policy General Comment above.*

	basin, however, not in the Coos River basin. Pacific lamprey (*Entosphenus tridentata*) are considered Sensitive-Vulnerable in the Coos River, Coquille River, and Umpqua River basins making turbidity concerns heightened throughout in these watersheds, in addition to the concern within the Rogue River watershed. **Pipeline Crossing Across Coos Bay to East of Hwy 101** **Potential for Frac-Out with long distance HDD Drilling:** ODFW recognizes the JCEP/PCGP Applicant's efforts to reduce environmental impacts of the pipeline crossing to the east side of Coos Bay and foothills from the previously proposed "Open Cut" methods to HDD drilling methods. However, given the very long (> 8000 feet) HDD strategy, there remains a substantial potential for frac-out issues (defined here as the unintentional return of drilling fluids to the surface during HDD **Additional Concerns Specific to Subsurface Boring and Drilling Stream Crossing Methodologies:** ODFW's experience with other pipeline construction projects has shown that stream crossings and overland disturbance can be damaging to	ODFW recommends FERC condition the project certificate such that the Applicant is required to complete consultation with ODFW and acquire all needed state and Federal authorizations to salvage fish and/or aquatic wildlife which would otherwise be likely subject severe stress or mortality as a result in-water work, as appropriate at a site specific level . ODFW recommends salvage of fish and/or aquatic wildlife occur as appropriate and as feasible throughout the project locations. Detailed information on necessary state authorizations for fish and aquatic wildlife salvage, recommended protocols, and standard BMPs is available from ODFW upon request. • The JCEP/PCGP project needs to address turbidity control measures for sediment generated at stream crossings, isolation of the work area, salvage of fish, Best Management Practices (BMP's) for equipment operation, measures for handling frac-outs if they occur, minimizing impacts to the riparian zone, and revegetation strategies for all stream crossings containing native and migratory fish. • ODFW recommends FERC condition the project certificate such that the Applicant is required to complete consultation with ODFW and construct all fish bearing stream crossing actions within the periods identified in ODFW's standard In-Water Work timing guidance document unless otherwise approved in writing by ODFW. ODFW's standard In-Water Work timing guidance document can be viewed on our website at the following location: http://www.dfw.state.or.us/lands/inwater/. **Note:** ODFW advises this it is not *biologically defensible to support any in-stream work during time periods when fish are actively spawning, migrating or when eggs or juveniles may be present in the gravels.* ODFW recommends FERC condition the project certificate such that the Applicant is required to complete consultation with ODFW and acquire all needed state and Federal authorizations to salvage fish and/or aquatic wildlife which would otherwise be likely subject severe stress or mortality as a result

	watercourses if not carried out with extreme diligence. During construction of the Coos County Gas Pipeline horizontal directional drilling (HDD) was stated as being "clean and not impacting streambeds", however, "frac-outs" occurred and incurred environmental damage caused by drilling fluids leaking into fish-bearing streams. Drilling fluids can be water or oil-based and can include other additives. Although the bentonite base is claimed to be a benign ingredient, ODFW is unaware of what the other additives are and how harmful they can be to fish and aquatic wildlife. Between August and October of 2003 MasTec North America, Inc. was cited by DEQ for a series of water quality violations. The violations were a result of frac-outs during the horizontal drilling work for the construction of a natural gas pipeline under the North Fork of the Coquille River in Coos County. If similar frac-out related turbidity discharge impacts were to occur at the proposed Rogue River crossing, they would likely impact the significant spawning habitat for spring-run Chinook salmon in the Rogue River Basin. It is known that ESA-listed fish specie(s) and or State Sensitive	in-water work, as appropriate at a site specific level. • ODFW recommends salvage of fish and/or aquatic wildlife occur as appropriate and as feasible throughout the project locations. Detailed information on necessary state authorizations for fish and aquatic wildlife salvage, recommended protocols, and standard BMPs is available from ODFW upon request. ODFW recommends FERC require JCEP/PCGP develop frac-out containment and mitigation plans in coordination with the State of Oregon. ODFW recommends that emergency plans include immediate notification of any turbidity exceedance, frac-outs, and spills and pipeline leaks in Coos Bay. Sensitive marine environments can be severely impacted by these types of occurrences. However, impacts can be greatly minimized if ODFW biologists can quickly & accurately assess potential damages and recommend remediation actions. Should an incident like those described above occur, the project should contact Oregon Emergency Response System immediately (1-800-452-0311). In the case of leaks during pipeline operation or offloading or loading at the JCEP facility, ODFW recommends that emergency plans include surveys for fish and wildlife kills immediately following a release. **Additional Recommendations Specific to Subsurface Boring and Drilling Stream Crossing Methodologies:** Pipeline crossings using HDD or other subsurface methodologies can be expected to cause frac-outs in Coos County geology and possibly throughout the project. The Applicant should be prepared for construction stoppages, cleanup, and remediation of damages caused by frac-outs. For that reason,

	species will be present at the South Coos, North Fork Coquille, and East Fork Coquille river crossings include OC Coho salmon. State Sensitive-Vulnerable species include Coho salmon (coastal coho salmon SMU/Oregon Coast ESU). Winter steelhead (Oregon Coast ESU/coastal winter steelhead SMU) are considered Sensitive-Vulnerable in the Coquille River basin, however, not in the Coos River basin. Pacific lamprey (*Entosphenus tridentata*) are considered Sensitive-Vulnerable in the Coos River, Coquille River, and Umpqua River basins making turbidity concerns heightened throughout in these watersheds, in addition to the concern within the Rouge River watershed. **Non-fish Bearing Stream Crossings and Other Storm Water Drainage Conveyance Structures:** Although non-fish bearing stream crossings and stormwater conveyance infrastructure are not subject to the same design criteria identified above for fish bearing stream, ODFW remains concern with regard to sizing and instillation of these types of infrastructure. Culverts or other crossing infrastructure should be sized in excess of hydraulic capacity need to help facilitate wildlife connectivity between habitats and minimize potential downstream water	crossings construction timing should occur during ODFW's recommended in-water timing guidance or as otherwise approved by ODFW in writing. HDD and other subsurface boring or drilling crossing design locations should pro-actively address the risks associated with the potential for a "frac-out" or inadvertent loss of drilling fluid to the extent practicable: ODFW recommends FERC condition the project certificate such that the Applicant is required to complete consultation with ODFW including submittal of any risk assessment and geotechnical documentation for any stream crossing which are proposed as subsurface boring or drilling stream crossing actions. Submittals should also include descriptions of alternate or contingency crossing methods should the primary method result in an inadvertent loss of drilling fluid, otherwise known as a "frac-out" or otherwise fail as a successful crossing action. ODFW further recommends FERC condition the project certificate such that the Applicant is required to: • Conduct adequate geotechnical analysis to ensure frac-outs will not occur (e.g. identify vulnerable geologic issues, adjust the depth of drilling, etc.). • Provide a list of the additives used in drilling fluids and their potential effects on the aquatic environment. • Implement specific drilling BMPs to ensure constant monitoring of drilling fluid return volume so that drilling can cease immediately if drilling fluid is not returning at the expected/standard volume for a successful HDD attempt. • Identify measures that will be taken to minimize impacts of a frac-out if a frac-out occurs and mitigation that will be implemented if a frac-out occurs as cleanup is not feasible and attempts will

	quality impacts such as turbidity sedimentation transport resulting from scour at undersize infrastructure.	create additional damage. Mitigation could include: Placement of LWD; placement of clean washed spawning gravel; road drainage improvements (cross drains, improved surfacing); road decommissioning. • Establish performance bonds and/or require performance bonds of drilling subcontractor to ensure adequate funding is immediately available to address/mitigate a frac-out or other drilling failure which results in damage to fish, wildlife, or the habitats they depend on. <u>HDD Actions in the Lost River Drainage.</u> The Klamath Fish District of ODFW requests that drilling any HDD activities are implemented between July 1, and October 31, or as soon as water conditions are deemed uninhabitable by fish due to poor water quality. Shortnose suckers (*Chasmistes brevirostris*), Lost River sucker (*Deltistes luxatus*) and redband trout (*Oncorhynchus mykiss*) inhabit this stretch of river from November to July; poor water quality triggers migration to upstream refuge habitats. Fish are highly sensitive to sound waves that could be caused by drilling disturbances and sound waves could act as a migration barrier. **Non-fish Bearing Stream Crossings and Other Storm Water Drainage Conveyance Structures:** ODFW recommends that all streams be considered fish bearing unless documented to be absent of fish. If a stream crossing or storm water conveyance structure is determined to be non-fish bearing, ODFW still recommends the work be completed: • ODFW's standard In-Water Work timing guidance document or if the stream or storm water conveyance structure is dry. (see reference above). • The Applicant consider oversizing the infrastructure and installing it in such a manner to maximize its performance as a suitable wildlife crossing structure and to minimize potential for

		downstream water quality impacts such as turbidity sedimentation transport resulting from scour at undersize infrastructure.
Chapter 1.5.2.5 pgs. 1-31,32 Chapter 2.1.5 pg 2-34,35; Chapter 4, pgs 4-268-289. Appendix I Table I-2 pgs I-2-1 to I-2-47	**Site Specific River/Stream Crossing Concerns:** <u>Lost River Crossing-</u> See above specific timing recommendation <u>Rogue River Stream Crossing-</u> Pacific Connector states that if HDD of the Rogue River is unsuccessful Direct Pipe (DP) methods would be a potential option. Previously wet, open-cut crossing were also proposed. ODFW **does not** consider a wet, open-cut to be an acceptable contingency method. <u>South Umpqua Direct Pipe Technique Site #1 at MP 71.27), and South Umpqua Open Cut Site #2 at MP</u> <u>94.73; see Tables 2 and 3 -</u> This proposed crossing occurs at an ecologically important site. A gravel bar is located approximately 300 m downstream. The gravel bar at this site provides river complexity, high flow refugia and summer slow water habitats which are considered to provide both essential and limited habitat function for a variety ESA-listed	**Site Specific River/Stream Crossing Concerns**: ODFW encourages both the Applicant and FERC to acknowledge the potential for severe impacts to fish, aquatic wildlife, and the habitats they depend on by ensuring the above recommendations become conditions of any Federal Authorizations or permits for the PCGP project. ODFW recommends site specific coordination and consultation between the Applicant and Department staff to fully identify unique site specific resource concerns at these crossing locations. ODFW anticipates that significant resource impact avoidance and minimization can be realized through collaboration with local Department staff throughout the crossing design, construction, and restoration/mitigation recovery phases at these river crossing locations. **Fate Creek:** ODFW recommends the Applicant engage Department staff for assistance identifying appropriate mitigation needs at this site.

	fish, state-sensitive listed fish and aquatic wildlife. **Fate Creek:** The DEIS does not provide a site specific plan for Fate Creek. The resource plans do not address or mitigate for all impacts associated with stream crossings under ODFW's Fish and Wildlife Habitat Mitigation Policy.	
Chapter. 2.7.2 pg 2-71; pg 2-171 Chapter 4.4.3.4, pg. 4-176; pg 4-210;	**Aquatic Habitat Impact/Mitigation Concerns:** **Points of Diversion Fish Screening:** The Applicant has identified Points of Diversion (POD's) that are within 150 feet of the work area. Many POD's have water conveyance ditches outfitted with fish screens. Not all fish screens are located in the immediate vicinity of the POD. **Herbicide Use Near Streams/Wetlands:** The Applicant states that pesticides or herbicides will not be used in or within 100 feet of wetlands unless allowed by the land management or permitting agency. **Small Stream Temperature Issues:** The DEIS states in pg 4-503; that temperature increases	**Aquatic Habitat Impact/Mitigation Concerns:** **Points of Diversion Fish Screening:** ODFW recommends that the PCGP project precisely identify the location of fish screening equipment as it relates to the work area. **Herbicide Use Near Streams/Wetlands:** ODFW recommends against general use of herbicides and pesticides in wetlands. ODFW recommends any use be judicious and meet federal, state, and local, regulatory requirements. **Small Stream Temperature Issues:** ODFW recommends FERC condition the certificate to direct the Applicant to treat all intermittent waterbodies within the Coast, Umpqua, and Rogue basins the same as perennial streams and provide these streams the same level of protection, as stated in the DEIS, comparable streams on Federally managed lands. **Large Woody Debris (LWD) as Mitigation** (See Appendix A below)**:** ODFW recommends a stream habitat mitigation plan be developed for every fifth field watershed crossed in order to effectively

	on streams will be minor. However, Rogue summer steelheads primarily rely upon streams with low or intermittent flow for spawning and brief periods of rearing. Numerous intermittent streams within the Coastal Range are also important for Coho production. **Large Woody Debris (LWD) as Mitigation:** ODFW, recommends revisiting analysis and discussion of LWD as mitigation as in many cases placement of a small number of pieces of LWD do not address impacts (sediment, disturbance of channel morphology, long-term canopy removal etc.). LWD treatments as mitigation are not considered "In Kind" for impacts to riparian canopy. ODFW believes this approach, without further augmentation, would likely fall short of compensating for loss of habitat functions and values from anticipated project impacts. LWD placed haphazardly and not within a continuous project typically do not provide immediate or long term benefits for adult or juvenile salmonids. Forested riparian areas	mitigate for the life-long impacts of the project. In addition the Applicant should fully mitigate for the multiple impacts at stream crossing sites including, but not limited to: • Access roads and associated sediment production to streams. • Loss of riparian canopy that increases solar input. • Elimination of much of the filtering capacity of the RMA due to removal most other lost habitat values/benefits of riparian habitat as well. • Destabilization of stream channels and streambanks. ODFW recommends that in addition to placement of LWD at stream crossing sites the following restoration and mitigation actions may greatly complement the functional habitat benefits provide by LWD placement : • Placement of forest vegetation (limbs, small woody debris, etc.) scattered on bare soils following disturbance within 50ft. of each pipeline approach to streams. This material will be readily available due to land clearing efforts • Purchase of riparian easements on private timber or agricultural lands in the HUC 6 watershed. Appendix A below contains a number of potential mitigation options. • Placement of washed spawning gravel at all stream crossing impact sites in the Coastal Zone and considered on a site by site basis for all other stream locations. Spawning gravel is often a limited quantity habitat feature in the Coastal Zone and placement will augment productive capacity of reach impacted for salmonids. • Gravels should consist of washed drain rock from an upland source (such as the Elk River Pit in Langlois, OR • Gravels should consist of 1.5 inch diameter washed drain rock for Coho and steelhead spawning streams; 0.75 inch washed drain rock for streams where only cutthroat trout are present. • Gravels should be applied at the rate of 8.0 inch depth over the reach impacted to the width of the ACW and up the banks 2.0 feet (which will reduce bank instability). Thus if a 40 foot reach of stream

	contribute more than LWD (e.g. shade, nutrients, predatory cover, wildlife habitat, etc.) to streams.	channel is disturbed and the ACW is 8 feet wide, then the quantity needed would be 40.0 feet x (8.0 feet ACW+ (2x2 banks)) x 0.67 ft. (8.0 inches) or a total of 321 cubic feet or roughly 12.0 cubic yard (CY).
Chapter 4.6, pgs. 4-270-291; Appendix C 36pgs; Appendix H 36pgs;	**Water quality Impacts from Sedimentation, Storm water Runoff, and Roads:** **Sedimentation Impacts from Clearing and Grubbing Large sections of ROW:** This section lists actions designed to reduce run off and catch sediment. One thing missing is a discussion identifying how much area will be cleared and grubbed at one time. Lessons learned from the ODOT's Pioneer to Eddyville project (in the Coast Range Mountains) include the need to limit the amount of ground cleared of vegetation at any one time. The pipeline will cross 71 miles of the Coast Range, so special care should be taken to limit erosion and sediment loss in this section as well as any other areas of significant rainfall with steep slopes. The timing of the pipeline construction should allow for ground clearing to occur after the spring rainy season and any areas opened up should be seeded and vegetation established before the fall rains. Distance and slope can be taken into account regarding the amount of land cleared and	**Water quality Impacts from Sedimentation, Storm water Runoff, and Roads:** **Sedimentation Impacts from Clearing and Grubbing Large sections of ROW:** Given the known instability and potential precipitation levels in the Coast Range Mountains ODFW recommends: ODFW recommends that the Applicant develop a detailed written plan that identifies the maximum amount of land cleared and grubbed at one time. The plan should also identify (1) areas of high, medium, and low levels of risk for sediment escape and impacts to water bodies. Based on slope and proximity to water bodies, and (2) include a re-vegetation section that ensures re-establishment of vegetation in high and medium risk areas prior to the fall rains. **Pipeline Steep Slope Concerns and Roads:** Pipeline Steep Slope Concerns: Stabilization/erosion control of upland slopes following pipeline construction will be nearly as important as stabilization/erosion control in riparian areas adjacent to streams. Some extremely steep slopes will be encountered in the Coos County portion of the pipeline. ODFW recommends the following for locations where the pipeline will traverse or the route will be placed on slopes which qualify as High Landslide Hazard Locations (HLHL as defined in ***Oregon Dept. of Forestry Technical note 2.0 vers 2.0; (ODF Jan 1, 2003)***; in Tyee Sandstone over 65% slope on headwall locations and 75% ridges): • ODFW recommends the pipeline construction route incorporate cross slope trenching as

	grubbed, i.e. the greater the distance from a creek and the flatter slope, the less concern for down slope sediment escape and erosion that can ultimately impact water bodies. The DEIS recognizes the geological instability of the Coast Range in the following sections: Chapter 4.1; pg 4-6 , under Landforms and Erosional Coast Range paragraph 1: *"The wet conditions of the western slopes of the Coast Range, along with steep terrain composed of relatively weak rock, contribute to an active erosional environment with frequent landslides."* The Coast Range receives some of the highest precipitation totals in the continental U.S., with some areas receiving up to 200 inches per year." **Pipeline Steep Slope Concerns and Roads:** A number of miles of the pipeline will be constructed on slopes that exceed 50%. Tyee sandstone geology in the Coos and Coquille River basins and the geology of the Rogue Basin to a lesser degree are highly prone to landslides if the supporting matrix is disturbed. Additionally numerous access roads will be built to harvest timber and access construction	opposed to routing parallel to the slope whenever possible to reduce the risk of soils moving laterally in the trench downslope (mass wasting slides). • Placement of erosion control matting has been outlined as an upland soil disturbance control measure. This, in combination with cross slope placed large wood, stumps, and other wood material, is considered a modestly reasonable attempt for erosion control. ODFW recognizes that pipeline corridor management strategies are not likely to allow for placement of large wood in pipeline corridors. • ODFW recommends rock or other structures be placed across the pipeline trench at a 90˚ angle and be embedded in the undisturbed walls of the trench a minimum of 4ft. to prevent free movement of soil in the disturbed pipeline trench. These structures should be placed at 100ft. intervals. • Steep slope pipeline locations should receive additional efforts with seeding and mulching. Additionally these segments of the pipeline route should have cross slope structures and drainage networks to reduce failure risk. ODFW recommends the road network: • Have surfacing that is sufficient to accommodate travel loading and prevent erosion of the road surface through all months. • Have cross drains installed at a density/spacing that is equivalent or exceeds to recommendations in the ODF Forest Practices Technical Note Number 8 vers.1 (ODF Jan 2003). • Have mitigation for sedimentation/mass wasting issues clearly identified in-proximity regardless of ownership (federal or non-federal) as these locations have the greatest potential for measurable improvements in reducing sediment loading to streams impacted.

	of the PCGP. Essentially the pipeline route is a 229 mile road through the landscape. Mass wasting debris torrents and general erosion are considered substantial threat to ESA listed and non-ESA listed salmonids as well as amphibians. Extensive research has documented the impacts of sediments to salmonids. Work to reduce sediment input into coastal and inland streams that will be impacted by the pipeline is foundationally critical for enhancing spawning and rearing habitat for fall Chinook salmon, Oregon Coast (OC) threatened Coho salmon, Pacific lamprey (*Entosphenus tridentata*), winter steelhead (*O. mykiss irrideus)* and coastal cutthroat trout (*O. clarki clarki)* as water quality is directly linked to hatch rates and food available for these species. Sediment loading above natural background levels contributes to embedding of substrates which often results in reduced hatch rates for eggs in redds, inability of fry to emerge from redds, inhibited production of macroinvertebrates (invertebrates largely live in the interstitial spaces of gravels), and impacts on the ability of fish to obtain food due to the nature of salmonids to feed predominantly by using their sight (Burns 1970; Hall and Lanz 1969; Weiser and Wright 1988; Suttle et al. 2004; Tripp and Poulin 1992; Waters 1995). See Appendix A Figure 1-3.	**Emergency Response Notification Water Quality:** ODFW recommends that emergency plans include immediate notification of: • Turbidity exceedances, frac-outs, and spills and pipeline leaks for both the JCEP facility and PCGP. • ODFW recommends that emergency plans include surveys for fish and wildlife kills immediately following a frac-out, spill, or gas release. Should an incident like those described above occur, the project must contact Oregon Emergency Response System immediately (1-800-452-0311) in the case of leaks during pipeline operation or offloading or loading at the JCEP facility or along the PCGP route. **Natural Gas Pipeline Shut-Off Valves-LNG Control at Large Rivers:** ODFW recommends that options to have shut-off valves on each side of large stream crossings such as the South Umpqua, Rogue, and Klamath Rivers be evaluated.

	Emergency Response: Emergency plans, including immediate notification of turbidity exceedances, frac-outs, spills, and pipeline leaks for both the JCEP facility and PCGP, are considered critically important. Sensitive fish and wildlife habitats can be severely impacted by these types of occurrences. However, impacts can be greatly minimized if remediation actions are initiated quickly upon discovery of an incident. **Natural Gas Pipeline Shut-Off Valves:** ODFW remains concerned with potential impacts to fish, wildlife, and their habitats from unanticipated failures or gas releases: Is it possible to have a shut-off valve on each side of large stream crossings, such as the South Umpqua, Rogue and Klamath Rivers? If there is a rupture and a natural gas release, how long will it take for the spilling to cease? How far apart are the proposed shut-offs?	

		Natural Gas Pipeline Shut-Off Valves Controlling Transmission Pipeline Failures: ODFW remains concerned with potential impacts to fish, wildlife, and their habitats from unanticipated failures or gas releases. Therefore, ODFW recommends frequent and strategically located shut-off valves, to the extent practicable, in order to minimize the location of and extent potential impacts to fish, wildlife, and the habitats they depend on should failures or gas releases occur during construction or over the life the project. An Operations and Maintenance (O&M) plan should be developed with contingencies identified for any need repair, maintenance, or in case of a failure in and around sensitive aquatic habitats such as waterway crossings.
Chapter 2.0 Chapter 4-298-301; Appendix M 302 pgs	**Hydrostatic Testing:** The DEIS describes use of 64 million gallons of water to complete hydrostatic testing. Removal of 11,193,575 gallons from the South Umpqua fourth field HUC, including an estimated 4,562,407 gallons from the South Umpqua alone will possibly be a substantial impact on fish and wildlife resources, especially during periods of low flow and poor water quality. Transport of invasive species is a substantial concern with transport of water from a source basin and release at another point in an adjacent watershed. Damage and control costs of invasive species in the United States are estimated to be more than	**Hydrostatic Testing:** ODFW recommends: • ODFW notes changes to the Hydrostatic Testing Plan that assist with guiding erosion potential and encourages continued efforts to alleviate this impact to reduce erosion impacts due to pipeline testing discharge. • In addition, the project proponents need to continue to incorporate methods to eliminate the possibility of spreading invasive species (such as New Zealand mud snails, smallmouth bass fry) especially given that the pipeline may convey water between non-hydraulically connected basins and in some instances, be “cascaded” across the landscape to be used for the next segment. Minimizing the risk, as discussed in the plan, is not adequate. Water diverted will need to be tested along with water at the nearest discharge waterbody to see if stream pathologies are similar or measures taken to ensure water released is sterilized. • NMFS-approved screening on diversions is required and fish passage at these locations must be maintained. • In addition, test water should not be allowed to drain into waters of the State and chlorinated

	$138 billion annually and 80% of endangered species are deleteriously impacted by these species through predation or competition (Pimental et. al). Impacts from invasive fish species alone cost $6.03 billion annually (Cusack et. al.). If testing occurs in the fall this is a period of adult anadromous migration including fall Chinook, coho, and winter steelhead. Also, this can be the period of lowest stream flow, and water for hydrostatic testing water may be unavailable unless purchased from existing available water sources such as reservoirs. Inter-basin mixing of water could adversely affect migration of adult anadromous fish (salmon, steelhead and lamprey) to their natal streams through a phenomenon known as false attraction. Supplying water from an Oregon Department of Environmental Equality 303(d) TMDL Water Quality limited waterbody to a basin of higher water quality may result in reduced water quality in the source watershed. Hydrostatic testing will require additional staff to survey for the Northern Spotted owl due to noise disturbance on the pipeline route. It is uncertain	water should not be used for the testing unless the release location will not enter a stream, wetland, or waterway. • ODFW recommends continued efforts to develop the Hydrostatic Testing Plan as well as a Hydrostatic Monitoring protocol with the intent of approval of the plan by ODFW, other state and federal agencies. The survey will monitor ramping, fish stranding, and water temperature at pumping and release sites, salvage fish, and document fish losses. The project proponents should conduct the surveys with competent biological staff. • A summary report of monitoring would be submitted to the agencies, along with compensation for losses to fish and wildlife resources.

	and not addressed in the DEIS as to if this will have additional impacts on nesting Northern Spotted Owls.	
DEIS Section 4.1, 4.3, 5.3, and Condition #25; Also Appendix F-10 Part 4 Hydrostatic Testing	**Water Quantity and Quality related to Hydrostatic Testing:** Groundwater impacts: Section 4.3, Page 4-81 discussion of construction impacts does not acknowledge impacts to local landowners or impacts to fish and wildlife. **Instream Flow:** Section 4.3, Page 4-109 does not discuss whether and how the use of this water for hydrostatic testing represents a change in character of use, which would trigger a WRD Water Rights Transfer per ORS 540.505 to 540.580 and OAR 690 Divisions 380 and 382. **Hydrostatic test water treatment:** Section 4.3, Page 4-109 the DEIS discusses treatment of the discharge water with a 'mild chlorine treatment', however the temporary impacts to water quality are not evaluated. **Instream Water Rights at Hydrostatic Source Locations:** Table 4.3.2.2-7, Page 4-110 outlines the potential water sources for hydrostatic testing	**Water Quantity and Quality related to Hydrostatic Testing:** Groundwater impacts: Section 4.3, Page 4-81 ODFW recommends this section more fully address how the pipeline could impact groundwater supplies, springs, seeps, and wells. **Instream Flow:** ODFW recommends the DEIS more fully address whether the hydrostatic uses will require water rights transfers and what that will mean for impacts to fish and wildlife and to other local uses. **Hydrostatic test water treatment:** ODFW recommends the DEIS more fully describe the chlorine application rates and potential impacts to water quality even with the minimization measures described therein.

	but does not identify potential impacts to existing instream water rights. **Cross-Basin Discharge**: Section 4.3, Page 4-111 discusses the plan for cascading test water across watershed basins. While the DEIS discusses how it will minimize introduction of pathogens across basins it does not address the impacts of overall decreased water quantity within the source basin. **Water Availability for Intake:** Section 4.3, Page 4-111 also Page 4-98 (mention of Coos River, East and Middle Fork Coquille Rivers, Olalla Creek, South Umpqua Riger, Rogue River, Lost River, and Klamath River) discusses the potential effects on downstream flow associated with hydrostatic testing. The DEIS estimates reduction of less than 10% of typical monthly flow. However the DEIS does not acknowledge that in some years there may not be water available even for a Limited License. In low-water years, existing instream water rights might not be met already during the "dry season" so further withdrawal could cause additional harm. **Point of Diversion Effects**: Section 4.3, Page 4-118 the DEIS	**Instream Water Rights at Hydrostatic Source Locations:** ODFW recommends FERC include a condition for PCGP to check for Instream Water Rights at all hydrostatic sources, and evaluate the timing of water use when water is available. **Cross-Basin Discharge**: ODFW recommends FERC evaluate the impacts of an overall decrease in water quantity within source basins that may result from hydrostatic testing. If water quantity may decrease in source basins, ODFW also recommends FERC include a condition for the applicant to consult with ODFW and WRD to mitigate for this lost water quantity. **Water Availability for Intake:** ODFW recommends FERC evaluate low-water years when instream water may not even be available for hydrostatic testing, even with a Limited License. The DEIS should examine what alternate strategies might be used in these situations, and also how these additive impacts to fish and wildlife will be minimized or offset. The DEIS should also mention decreased flow as a potential impact to fish in Section 4.6.1.3.

	states "*Pacific Connector would consult with the landowner if impacts on a water supply's point of diversion cannot be avoided, and prior to construction would work together to identify an alternate location to establish the diversion*". Moving a point of diversion has the risk of causing injury to instream water rights. Moving a point of diversion requires a WRD water right transfer application, which can take significantly more time to review than a limited license application. A water right transfer can also require fish and wildlife habitat mitigation, if the transfer may cause permanent impacts to the instream flows. See ORS 540.530. **Cumulative Impacts to Water Quantity**: Section 4.1.4.1.2 does not consider the cumulative impacts to water quantity, which may result from hydrostatic testing, dust abatement, and other water uses. **Dust Abatement**: Section 5.3 bottom of page 5-3. The DEIS concludes that 75,000 gallons per day of water for dust control would not result in significant impacts on surface water resources. However, ODFW contends that further withdrawal from the streams and rivers named in the DEIS	**Point of Diversion Effects**: FERC and the PCGP should be aware of the State of Oregon's statutes regarding Point of Water Diversion (ORS 540.530) and build in adequate time for the process.

	may have an adverse impact to fish and wildlife due to reduced flow. Instream water rights are already not met much of the year in these areas. **Instantaneous Flow Reduction**: Condition #25 on Page 5-18. This condition requires PCGP to file a Hydrostatic Test Plan allowing water withdrawal not to exceed an instantaneous flow reduction of more than 10% stream flow. This condition is problematic because existing instream rights are often not met much of the year on small streams. Ten percent on a small stream in summer may have a large impact on instream flow. This metric of 10% is not consistent with state water allocation based on water availability.	**Cumulative Impacts to Water Quantity**: ODFW recommends cumulative impacts to water quantity be addressed in the DEIS. **Dust Abatement**: ODFW recommends the DEIS reanalyze its determination for the impacts to fish and wildlife associated with dust abatement water withdrawals.

		Instantaneous Flow Reduction: ODFW recommends PCGP coordinate with WRD and ODFW to establish the appropriate metric for downstream flows in the Hydrostatic Test Plan, and that Condition #25 in the DEIS be amended to reflect this coordination.
Chapter 4.3 pgs 4-131-134; Appendix H 37pgs	**Wetland Habitat Impact/Mitigation Concerns:** The project is anticipated to produce substantial turbidity to wetlands adjacent to the pipeline Right of Way and road networks associated with the project. Additionally, noise from hydrostatic testing will likely impact amphibian populations, potentially disrupting breeding cycles. Table 4.3.3.2-1 Summary of Wetland Impacts by notes 112.2 affected wetland acres 0.91 acres of permanent impacts within the pipeline route. Major wetland functions include water storage, carbon sequestration, slow water release, maintenance of high water tables, temperature regulation, nutrient cycling, sediment retention, accumulation of organic matter, filtration, and maintenance of plant (by provision of substrate for plant colonization) and animal communities. Measures need to be taken to eliminate the risk of spreading invasive	**Amphibian Direct Mortality and Long-Term Passage:** ODFW recommends the Applicant meet with a Department biologist to discuss the need for amphibian salvage depending on the specific proposals for construction through or near waterways and wetlands. ODFW recommends surveys are completed for both amphibians and reptiles. Additionally: • ODFW recommends that final constructed designs provide for amphibian passage along the pipeline route (i.e. installing cross drains under access roads that connect wetlands). Installation of culverts with stream simulation design is considered to fully provide for amphibian passage. There will be a number of locations where fish are not present that passage for amphibians may need to be provided on a case by case basis. • ODFW recommends the PCGP project staff consult for all wetland locations >0.1 acre in size with Department staff at least 1.0 months prior to disturbance to determine methodologies to reduce impacts to amphibians and identify if salvage is necessary.

	plants and noxious weeds. The monitoring needs to contain specific goal criteria and contain contingency plans if restoration attempts are not successful. **Big Butte Creek Fifth Field HUC:** The DEIS notes that an extremely long wetland crossing 1,680 feet (0.31 mile) and 4.21 acres of wetland impact is proposed in this watershed **Amphibian Direct Mortality and Long-Term Passage:** The PCGP project is anticipated to incur notable mortality to amphibians resulting from proposed construction methods in riparian areas, stream adjacent wetlands, and perched wetlands. Amphibians range in mobility from highly mobile to extremely limited. Installation of crossings where there is currently stream/wetland connectivity can result in increased predation and reduced capacity of amphibians to access needed habitats. This is critical where wetland are ephemeral. The DEIS does not outline that reptile surveys will be	

	conducted.	
Chapter 1.0, pgs 1-31, 32; 2-56, 61, 69; Chapter 3.0 pgs 3-20-23 Chapter 4.2.3.1 pgs 4-72 Appendix H 37p	**Amphibian Salvage Expectations:** **ODFW's Scientific Take Permits:** Scientific take permits are relevant to coordinate salvage and movement of fish and wildlife species impacted during a project. **Amphibian Salvage:** The JCEP staff proposed that in order to mitigate potential impacts on amphibians and reptiles it would conduct pre-construction surveys for the northern Pacific pond turtle, northern red-legged frog, and clouded salamander. Individuals located within the construction area would be captured and transported to suitable nearby habitats, agreed to with the ODFW.	**Amphibian Salvage Expectations:** **ODFW's Scientific Take Permits:** ODFW recommends a condition be included for the Applicant to apply for and comply with state scientific taking permits. • ODFW recommends that the pipeline staff report quantified known injuries and mortalities by species during construction of the project. • ODFW recommends that the PCGP staff report injuries and mortalities of fish and wildlife by species associated with operation of the pipeline or in an emergent condition. **Amphibian Salvage:** ODFW recommends FERC condition the project certificate such that the Applicant is required to acquire all needed state and Federal authorizations to salvage amphibians which would otherwise be likely subject severe stress or mortality as a result in-water work or wetlands impacts, as appropriate at a site specific level . ODFW recommends salvage of amphibians occurs as appropriate and as feasible throughout the project locations. Detailed information on necessary state authorizations for fish and aquatic wildlife salvage, recommended protocols, and standard BMPs are available from ODFW upon request. ODFW also recommends increasing the number of wildlife ramps to avoid reptile and amphibian entrapment in the pipeline trench (Section 4.5).
Chapter 4.5 pgs 289-291; Table 4.5.2.3-5	**Riparian Habitat Impact/Mitigation Concerns:** Riparian vegetation within the Riparian Management Area (RMA) zone near streams, wetlands, and waterways is	**Riparian Habitat Impact/Mitigation Concerns:** (See Appendix A below): ODFW recommends that riparian vegetation buffers that: RMA vegetation meet or exceed State and local

	critically important for the health of Oregon's native fish populations, especially in the drier parts of the pipeline corridor such as the Rogue and Klamath watersheds. Native fish in the state are predominantly cold water species that evolved in stream conditions that were in most cases facilitated by climax or second growth hardwood and conifer forest, thus near maximum shade that the stand would produce. The Oregon Dept. of Environmental Quality has identified 303d temperature listed streams including numerous streams through the pipeline route. These listings relate directly to removal of riparian vegetation since the 1800's. ODFW notes that PCGP staff have developed a water temperature model to evaluate the impacts of the project at specific stream crossings. Table 4.3.2.2-9 identifies through modeling efforts that some streams impacted by the PCGP will be cooler following removal of the riparian corridor. The results of this model seem counterintuitive to the principle of riparian width and size having a direct positive correlation with shading and cooler micro-climates to help	government requirements be implemented on non-federal lands. All disturbed areas need to be replanted with native vegetation. ODFW recognizes that the proposed crossing locations may be on lands where private landowners may not allow the full setback to be replanted. In these situations, ODFW does not object if mitigation for permanent riparian impacts occurs off-site provided that it occurs within proximity within the same HUC 6 watershed and on private lands. <u>Thinning as Mitigation:</u> ODFW recommends this treatment is unlikely to produce results that benefit fish and their habitats as the results are distant in the future due to the long period for trees to grow and mature. Accordingly this action should not be assumed to provide fish/stream benefits and should be used only on a very limited basis with clearly defined objectives that address location specific limiting factors.

	keep stream temperatures cold. In addition BLM modeling in 2013 showed notable temperature increase potential for very small streams of 1˚-5˚F. (Additional information about the scientific merit of different types of Riparian treatment is explored in Appendix B of these comments and recommendations below.	
DEIS ES pgs 1-6; Chapter 2.1.2-2.7.2 Chapter 4.6	**Upland Impact/Mitigation Concerns:** ODFW has previously provided feedback to the Applicant: • Regarding snag creation, and elk habitat/forage. Previous feedback for creating forage areas for deer and elk using ODFW's recommended forage seeding mixture has not been addressed. • ODFW's recommended snag retention concept has been addressed, but the species of conifers, minimum diameter at breast height (dbh) used, and number per acre or linear foot were not estimated. • ODFW's recommended down wood concept has been addressed, but the species of trees, minimum dbh used, linear feet per acre, and number per acre were not estimated. • ODFW's recommended legacy tree concept was not addressed at all including the species of trees, minimum	**Upland Impacts/Mitigation Concerns:** (See Appendix A below): ODFW recommends further discussion of upland mitigation proposals, including: • Mitigation in the form of incorporating specific snag densities, down wood, danger tree replacement, and legacy trees. Many of these rare upland habitat types may provide essential habitat function for critical life stages of fish and wildlife. If habitats or habitat function are mis-categorized and/or critical habitat functions are not adequately compensated for, the proposed mitigation sites may fail to meet or exceed ODFW's specific mitigation recommendations. • ODFW recommends further discussions regarding elk and deer forage plantings within the pipeline corridor with the recommendation that production wildlife forage be considered a goal of the final vegetative community in the pipeline corridor.

	dbh used, and number per acre were not estimated.	
Chapter 4.14.13; Appendix I, 174pgs	**Forest and Vegetation Impacts:** Table 4.5.2.3-1 (Summary of Construction and Operation-related Disturbance states that 433 acres of Lowland Conifer/Hardwood; 722 acres of Montane Mixed Conifer and Mixed Conifer Hardwood; 3 acres of Western Juniper/Mountain Mahogany; 68 acres of Shrub Steppe; 17 acres of Westside Grassland; 2 acres of Eastside Grassland and <2.0 acres of Westside Riparian, Eastside Wetland/Riparian Wetlands will be crossed. The DEIS provides reference to documents on proposed wetland and waterway mitigation and some planting methods, however, there needs to be continued development of the BMP's for impacts to vegetation and soils in the pipeline corridor as erosion along pipeline corridors during and immediately following pipeline construction can hinder land restoration work, expose shallow laid pipes and risk negative impacts for on- and off-site fish and wildlife habitat resources (Hann et al.). Use of only native herbaceous, shrub, and tree species is prescribed in the DEIS. However; the establishment of vegetation using native grasses,	**Forest and Vegetation Impacts:** ODFW recommends the following: • Additional development of BMP's for pipeline vegetation/soil disturbance is recommended. • Only native herbaceous (grass/forb), shrub, and tree species be used for restoration of disturbed sites unless natives will be unsuitable for site stabilization or specific species of non-natives are recommended to wildlife forage value. The establishment of vegetation using native grasses, trees and shrubs (although preferable in most instances) may prove ineffective if there is a lack of understanding of local conditions and their influence on vegetation growth, poor plant/seed selection, inappropriate soil management practices and inadequate vegetation management plans. • Generally, ODFW recommends choosing: 1. In-kind native species are used to ensure local ecological integrity, 2. Use of species adapted to the local climatic and soil conditions, use species with appropriate engineering properties for erosion control, 3. Mixture of species with a range of establishment rates, including rapidly establishing species to colonize the area and stabilize the surface and slower establishing species which will determine the composition of the mature vegetation cover. • Surveying stocking density of forest vegetation on the third growing season across the pipeline route, not only selected segments. • Include prescriptions for restoring shrubs to the corridor, especially in Jackson County's designated deer winter range. Plans should include efforts to restore *Ceanothus spp*., which may require scarification.

	trees and shrubs is often ineffective if there is a lack of understanding of local conditions and their influence on vegetation growth, poor plant/seed selection, inappropriate soil management practices and inadequate vegetation management plans. Typically, choosing in-kind native species for revegetation helps ensure local ecological integrity. The use of species adapted to the local climatic and soil conditions include those with appropriate properties for erosion control and mixtures of species with a range of establishment rates. Mixtures should include rapidly establishing species to colonize the area and stabilize the surface and slower establishing species which may also influence the composition of the mature vegetation cover. The mitigation will need to address the permanent loss of vegetation and mitigate for the loss of function that will occur until the vegetation compares to pre-project conditions. Vegetation not directly on waters of the United States may still lead to impacts that have the potential to affect water quality. Human-induced fragmentation of the landscape is among the factors reducing the number of natural corridors and the possibilities of re-colonization	

	of plant and animal species with poor dispersal capacities. This is especially true of amphibians in forested habitats (Todd et. al). A mitigation plan needs to be developed that addresses project related forest, vegetation, and grassland impacts. In fact, the mitigation plan (Appendix I) provides documentation on wetlands and waterbodies, but does not address upland habitat and forest impacts. In the context of described limits to revegetation of the ROW, the currently proposed impacts to riparian areas may result in net loss of habitat function. The Applicant proposes to keep a ten foot wide area over the pipeline in an herbaceous state and a 30 foot wide area with no trees or shrubs greater than fifteen feet tall. If these impacts are unavoidable, they need to be addressed in the mitigation plan. **Monitoring of forest Vegetation (Erosion Control and Revegetation Plan) pg. 42 Table 13.13-1:** Monitoring of reforestation will take place the first and third fall following planting, on Lakeview BLM and Forest Service lands, but only the first year on the Coos, Roseburg, and Medford BLM	

	Districts and on Private Lands. No shrubs are included in the planting mix, except for Klamath County. Shrubs are an important component of upland habitats in southern Oregon. They are especially important as winter forage on deer winter range in Jackson County. *Ceanothus cunneatus* is especially important but may require seed scarification.	
Chapter 2.1.2-2.7.2 Chapter 4.6	**Non-Forested Habitats, Duration of Habitat Mitigation/Restoration Benefits Commensurate to Habitat Impacts:** The DEIS indicates that non-forested habitats within the temporary construction right-of-way would be restored relatively quickly. Shrub steppe habitats can take considerable time to restore to pre-project functional condition especially sage brush species which can take decades to regrow to their previous structural condition.	**Non-Forested Habitats, Duration of Habitat Mitigation/Restoration Benefits Commensurate to Habitat Impacts:** ODFW recommends impacts to habitats be quantified into reasonably likely time frames measured in years. ODFW recommends mitigation be proposed to compensate for the temporal loss of impacted and then restored habitats. ODFW recommends the functional benefits of mitigation meet or exceed the likely duration of impacts regardless of if they are estimated to be shorter term, longer term, or life of the project in duration.
Table 4.6.1-1, also Section 4.6.1.2 and Table 4.6.2-1	**Species Status Corrections:** The gray wolf is incorrectly labeled as delisted in the state of Oregon Western snowy plover nesting area on the North Spit likely to be impacted by increased recreational pressure associated with the new JCEP	**Species Status Corrections:** The gray wolf is still state-listed as Threatened in the western half of Oregon, including this project area. ODFW recommend the table be updated to reflect this potential impact to western snowy plovers.

	facility employees and construction crews. Short-tailed albatross is state-listed as endangered, but this section says no state status. In the Western snowy plover section, the DEIS does not mention the federal Habitat Conservation Plan which was approved by the USFWS in 2010. The four federally listed sea turtles discussed in this section are also state listed on the Oregon Endangered Species Act. In Table 4.6.2-1 the western snowy plover is omitted. Gray whale is a state endangered species, but has been federally delisted.	ODFW recommends the DEIS be corrected for state status of short-tailed albatross. ODFW recommends the DEIS consider how the proposed action aligns with decisions made in the 2010 Western Snowy Plover Habitat Conservation Plan. The DEIS should also discuss in this section how state agencies' actions on state-owned land are regulated through OAR 635-100-0000-0040. The DEIS should also reference that the plover was state listed in 1987. Sea turtles' state status should be included in the DEIS. The green sea turtle and leatherback sea turtle are listed as endangered on the OESA, and the loggerhead sea turtle is listed as state threatened. ODFW recommends the table be corrected to add in the western snowy plover. ODFW recommends correction for gray whale status as state endangered and federally delisted.
Chapter. 4.6.1, pgs.4-310-329 Table 4.6.1-1	**Species Occurrence/Status Species Corrections:** **Pacific Fisher:** Fisher are mentioned in the DEIS.	**Species Occurrence/Status Species Corrections:** ODFW recommends revision of information in the DEIS to reflect the following species occurrence/status information:

	However, Fisher may become a listed species in the near future and their presence has been documented in the PCGP route through BLM sampling efforts. **Oregon Spotted Frog:** This species is now federally listed. **Bald Eagle:** There are a number of nest sites known within a five mile distance of the pipeline route. **Western Pond Turtles and Yellow-legged Frogs** are not addressed in the T&E Section of the DEIS, however both of these species have been proposed for federal listing per the ESA. **Wolverines** are listed as threatened under the Oregon Endangered Species Act.	**Pacific Fisher:** ODFW recommends the Applicant considers how this project may contribute to a federal listing decision. **Oregon Spotted Frog:** ODFW recommends the Applicant conduct surveys to identify use of habitats in the pipeline corridor by this species. **Bald Eagle:** Department recommends nest surveys be completed to document bald eagle nesting locations within 1.0 mile of the pipeline route as well as consistent descriptions of nest surveys. **Western Pond Turtles and Yellow-legged Frogs**: ODFW recommends that FERC analyze effect for both of these species, and that they be included in the consultation with the USFWS. ODFW believes the determination will be a likely to affect for both species. **Wolverine:** ODFW recommends correction.
Section 4.6.2.2	California brown pelican – The DEIS states that "brown pelicans are regularly seen in moderate numbers during the summer months in Coos Bay". This is very out of date. Many more birds have recently been present along the Oregon Coast, attempted nesting activity has also occurred, and birds have also stayed later into the fall each year.	ODFW recommends correction.

Section 4.6.3.2	The ODFW responsibility for state-listed species under the Oregon Endangered Species Act is incorrectly omitted from this section. This section is also incorrect about ODFW authority for invertebrates – ODFW has authority for marine and intertidal invertebrates.	ODFW recommends correction.
2014 DEIS Appendix L Draft Biological Evaluation, pg. 97; **2019 DEIS** Not addressed	**Bald Eagle Impacts:** The draft Biological Evaluation lists only 2 nest sites within 1-5 miles of the proposed pipeline. A number of other nest sites exist on non-federal lands in Klamath County. The Draft Biological Evaluation states that disturbance to breeding individuals is not anticipated yet, construction activities are planned (pending waiver) for the Klamath County portion of the pipeline which could cause disturbance to nesting eagles. Bald eagles generally begin nesting in early February. Where in the DEIS are potential impacts to bald eagles addressed on non-federal lands?	**Bald Eagle Impacts:** ODFW recommends the Draft Biological Evaluation be updated to correct these inaccuracies and address potential impacts to bald eagles and nest sites on Federal and non-Federal lands. ODFW recommends the Draft Biological Evaluation also be updated to correct these inaccuracies and address potential impacts to bald eagles and nest sites during winter construction in Klamath County and on Federal and non-Federal lands alike.
Chapter 4.5; pg 4-191	**Eagle nests:** Permits are required to remove eagle nests	**Eagle nests:** If eagle nests are present, ODFW recommends the Applicant coordinate with USFWS prior to removal of potentially empty or abandoned nests to ensure compliance with the Bald and Golden Eagle Protection Act (BGEPA).
2014 DEIS Appendix L Draft Biological	**White-headed Woodpecker Impacts:** The Draft Biological Evaluation	**White-headed Woodpecker:** ODFW recommends correcting this information in the Draft Biological Evaluation to reflect adjustments to timber harvest management within the range of this species and

Evaluation, pg. 102 **2019 DEIS** Not addressed	states that timber harvest on federal lands target large diameter ponderosa pine. This was most certainly true in the past but since the 1990s, Forest Service standards and guidelines mostly prohibit harvest of trees greater than 21 inch diameter. A larger threat to white-headed woodpecker habitat is overstocked forest stands as a result of fire suppression and lack of disturbance.	impacts related to habitat transition.
2014 DEIS Appendix L Draft Biological Evaluation, pg. 120 **2019 DEIS** Western Pond Turtle distribution not updated	**Western Pond Turtle:** The Draft Biological Evaluation states that western pond turtles have not been documented on Fremont-Winema National Forest. However, they are documented on non-federal lands in Klamath County, specifically at proposed crossing at Klamath River and potentially at Lost River crossing. The Draft Biological Evaluation also states that in Oregon, WPT are found up to elevations of 3,000 feet, yet in Klamath County pond turtles are known to occur at elevations of 4,200 feet elevation and likely higher elevations. Potential impact to WPT is likely underestimated and should be reevaluated.	**Western Pond Turtle:** ODFW recommends correcting information for western pond turtle in the Draft Biological Evaluation.

2014 DEIS Appendix L Draft Biological Evaluation, pg. 124, Lines 25-30 **2019 DEIS** Western Pond Turtle Nesting Habitat not addressed	**Western Pond Turtle Nesting Habitat:** The Determination of Effects with regard to the western pond turtle (WPT) states*: "In considering the potential direct, indirect, and cumulative impacts, it is determined that the proposed action "may impact individuals or habitat, but is not likely to contribute to a trend toward federal listing or loss of viability of the species" "for the Western pond turtle because impacts would be limited to dispersing individuals as there are no known nesting or overwintering sites within 1 mile of the Project on NFS land, and the Project would impact only approximately 3 percent of potentially suitable habitat within the analysis area."* This determination is based on limited and incomplete information regarding the known or potential presence of WPT in Coos, Douglas, Jackson, and Klamath Counties (see BE Page 120, Lines 25-28, and Page 122, Lines 16-20). To date comprehensive WPT surveys have not been conducted in Oregon, however, some work has been done. ODFW is aware of over 1630 records of captured animals from 69 unique sites within the four counties named above. It is likely local Department office observation databases contain many more observations. WPT nests are known to be very difficult to find, and can be located as far as ½ mile from their aquatic habitat. WPT are	**Western Pond Turtle Nesting Habitat:** ODFW recommends either the Applicant should conduct Western Pond Turtle nesting habitat surveys or should assume all habitats within ½ mile of a waterway or wetland known to contain Western Pond Turtles be assumed to be suitable nesting habitat if all of the below are present: • Clay soils are present; • Vegetation consists of primarily of sparse gasses and forbs; • The slope is less than 60%; • And the habitat is outside of the floodplain. Department biologists can assist the Applicant with narrowing down the likely locations of Western Pond Turtle nesting habitat.

2014 DEIS; Chapter 4.6, pg. 525 2nd paragraph **2019 DEIS** There is no mention of raptor surveys	**Wildlife Survey Methodology #1:** The following discusses known raptor nest surveys: *"Surveys of known nests of raptor species with nesting buffers that intersect the pipeline right-of-way would be conducted prior to tree clearing. Those species include bald eagle, great gray owl, and peregrine falcon. If nests are active, clearing trees and disturbance by airplane or helicopter within buffers would be delayed until after the nesting period."* This statement raises the following questions/concerns: • When would the surveys occur? And if during the early part of the nesting season would there be follow up surveys to determine that the nest was truly inactive? For example, due to the possibility of re-nesting attempts, it would be premature to determine that a golden eagle nest was inactive prior to May 15th. • Some raptors have multiple nests and nest establishment can occur within a territory during the onset of any breeding season. Many raptors do not nest in the same nest on individual years. "Surveying known raptor nests" would not be sufficient to find and avoid new nests of established	**Wildlife Survey Methodology:** ODFW recommends the Applicant provide detailed documentation on proposed nest survey methodology including: • Protocols, survey timing, and minimum experience requirements for surveyors. • Information should be species specific and include means to address all four components of corresponding issue/concern. • Raptor nest surveys should occur for both known and new nests prior to clearing of the PCGP ROW. • The list of raptors identified for pre-timber falling surveys should be expanded to include golden eagle, northern goshawk, Swainson's hawk, flammulated owl, and short-eared owl. With the exception of golden eagle, which is a federally protected species, the other species are Oregon Conservation Strategy species and/or state Sensitive Species.

	pairs and surveying ahead of the construction would also be necessary to find and avoid nests of new raptor pairs that choose to nest in the pipelines path. The qualifications of personnel tasked with conducting the surveys and the survey methodologies are not provided. However, the potential for inappropriate survey methodologies or timing, and the use of unqualified personnel is a concern.	
2014 DEIS Appendix L, Biological Evaluation, pg. 7, Line 2-4 Not addressed in 2019 DEIS	**Wildlife Survey Methodology #2:** *"Initial surveys were conducted in the spring of 2007. Additional surveys were conducted in 2008 and 2010….."* In order to attain viable survey results, it is imperative that appropriate survey methodologies are used and the timing of surveys be tailored to each species life history. However, it is unclear (1) what survey methodologies were used; (2) when surveys occurred; (3) where the surveys occurred, or (4) which species were surveyed. One might assume red tree vole, northern spotted owl, and great gray owl as those are the only three vertebrate terrestrial species identified in the BE or EA for which surveys were reported.	**Wildlife Survey Methodology:** ODFW recommends the Applicant provide detailed documentation on proposed occurrence survey methodology including: protocols, survey timing, and minimum experience requirements for surveyors. Information should be species specific.
2014 DEIS	**Scope of Wildlife Surveys:**	**Scope of Wildlife Surveys:** Although surveying for

Appendix L, Biological Evaluation, pg. 9-23, Table 1. Not addressed in 2019 DEIS	Based the table of the 42 vertebrate species considered in the document, only 3 (7%) received surveys. 93% of all vertebrate species considered in the document did not receive surveys. ODFW is concerned that not only is the level of survey effort is insufficient to identify specific locations of all species identified by PCGP, and the lack of survey effort may have missed many other species not considered by PCGP. For example those species on the Oregon Conservation Strategy and state Sensitive Species lists that were not considered by PCGP.	every possible species and habitat which could occur along the alignment is beyond the scope of reasonableness, surveying for only 3 of 42 likely vertebrates may be too narrow of survey scope. ODFW recommends the Applicant complete some type of general wildlife surveys perhaps during the spring when the likelihood of observing many of the herptile, bird, and small mammal species would be likely. ODFW recommends any general wildlife survey methodology be coordinated with both ODFW and the USFWS prior to implementation to maximize efficiency and efficacy.
Chapter 4.5 pg 4-188-189; 4-211-217	**Noise and Direct Impacts to Wildlife:** The PCGG project will incur substantial disturbance due to direct interaction of construction activities as well as the associated noise. These impacts will likely displace a number of species including MAMU, NSO, and golden eagles, others during construction, with long-term impacts due to the change of the habitat with clearing of the pipeline route. "*We estimate that noise from general construction of the pipeline would*	**Noise and Direct Impacts to Wildlife:** ODFW has previously recommended that when any blasting, pile driving, or other loud noise producing activity takes place. ODFW requests clarification regarding the potential daily magnitude and duration of construction and operational related disturbances, and determination if these disturbances are likely to occur during periods when currently existing (non-related) disturbances are minimized or absent. ODFW recommends: • The Applicant consult the Oregon Forest Practices Act guidelines for ospreys and great blue herons protections; • The Applicant consult USFWS under the Bald and

	range from the Leq of about 93 dBA at 50 feet, to 85 dBA at 100 feet, and 72 dBA at 300 feet. *Ambient sound levels in much of the Pacific Connector pipeline route area probably would be similar to the Arcata Fish and Wildlife Office's projections (FWS 2006a)."* Construction noise concerns are considered a substantial disturbance factor for the sum of the PCGP project. It is unclear from the above if the timing of disturbance has been considered. For example, if construction of the terminal and related facilities will occur during a 24 hour period, or only during daylight periods.	Golden Eagle Protection Act for federal recommendations to protect bald and golden eagles nests; and, • The applicant consult with USFWS for potential impacts to snowy plovers; • The Applicant consults USFWS under the Federal Endangered Species Act for federal recommendations to protect spotted owls and marbled murrelets. ODFW recommends the Applicant re-analyze potential noise impacts to wildlife using a more robust and suitable methodology acceptable to ODFW and the USFWS. If further analysis indicates greater likely impacts to wildlife than this analysis estimates, those additional impacts should be avoided, minimized, and mitigated for (mitigation sequencing), as practicable and in collaboration with Department and USFWS.
Chapter. 4.5 pg. 4-273; 4.6, pg 4-324-329	**Conflicting Construction Timing Restrictions:** To date the PCGP application has only partially defined the timing of construction actions that will have impacts to fish and wildlife resources (e.g. stream crossings, marbled murrelet nesting, spotted owl habitat impacts). Managing the timing of impact is directly related to minimizing impacts (e.g. rainfall/water quality, sediment transport, nesting of murrelets). **Conflicting Avian Impact Avoidance Timing Restrictions:** Site clearing and timber	**Conflicting Construction Timing Restrictions:** ODFW recommends more fully developing defendable guidelines for: • Construction timelines and recommended timing restrictions in coordination with ODFW to minimize impacts to species that have specific vulnerability due low abundance and habitat selection. • The current documents still include potential for unresolved timing restriction and construction scheduling conflicts: i.e. conflicts between seasonal restrictions for bird nesting, winter range habitat, in-water work periods, and T&E species. • Conflicting Avian Impact Avoidance Timing Restrictions: ODFW believes potential impacts to Spotted owls and marbled murrelets from timber cutting, timber removal, clearing and grubbing, blasting, and any other form of disturbance could be further minimized during the breeding season. Specific buffer distances for each potential

	removal is to occur between October and March to avoid impacts to Spotted Owls and Marbled Murrelets. However, Chapter 4, page 4-637, 2nd and 3rd bullet state: • Blasting for the pipeline trench may occur within 0.25 mile of MAMU stands between April 1 and September 30; • Helicopter use for removal of timber during pipeline construction within 0.25 mile of 9 MAMU stands (7 occupied and 2 presumed occupied) during the breeding period (between April 1 and September 15) could occur and disturb MAMU adults and nestlings, as well as potentially blow nestlings out of the nest tree within 7 MAMU stands (5 occupied and 2 presumed occupied) from rotor wash. And further, on Chapter 4.6, Page 4-329: *Noise from blasting and helicopter use during pipeline construction within 0.25 mile of NSO sites during the late breeding season would occur and could increase the risk of predation to fledglings that are generally not as able to escape as adults during the latter part of the breeding season;* Based on the above, it appears timber cutting and grubbing will	disturbance type should be coordinated with the USFWS.

	occur outside the breeding season to protect spotted owls and marbled murrelets, but timber removal via helicopter and blasting at locations with spotted owls and marbled murrelets will occur during the breeding season. Biologically, protecting the birds from some forms of disturbance during the breeding season while allowing other forms of disturbance may not result in the overall desired avoidance and minimization outcomes for spotted owls and marbled murrelets.	
Chapter 4.1 pg 4-31	**Use of Blasting Mats to Minimize Noise Disturbance:** The following quote states that blasting mats will be used where the use of explosives is required: *"Blasting mats or padding would be used on all shots where necessary to prevent scattering of loose rock onto adjacent property and to prevent damage to nearby structures and overhead utilities."*	**Use of Blasting Mats to Minimize Noise Disturbance:** ODFW recommends that in order to minimize noise impacts to wildlife, blasting mats are used wherever the use of explosives is required.
Chapter. 4, pg. 4-181- Table 4.5.1.1-1; Table 4.5.1.2-3; Table	**Likely Underestimate of Migratory Bird Take:** Site clearing and timber removal is to occur between October and March to avoid impacts to Spotted Owls and Marbled Murrelet, but areas without either species will be grubbed	**Likely Underestimate of Migratory Bird Take:** ODFW recommends a complete reassessment of potential migratory bird take including direct and indirect take occur in coordination with the USFWS - Migratory Bird Program experts.

4.6.3.5-1	and cleared year round. This will result in significant take of migratory birds. Based on the 2014 DEIS there were estimates that 1660 individual birds were estimated to be displaced, resulting in the loss of close to 10,000 eggs/young by pipeline construction actions. The 2019 DEIS does not address this issue or make note. This estimate only considers take from physical clearing and grubbing, but does not include noise or other forms of take.	
Chapter 4.4.1.6; and Integrated Pest Management Plan (IPMP)	**Noxious Weeds/Invasive Plants:** Invasive species (e.g. noxious weeds) have been identified as one of the seven key conservation issues (threats to conservation) in Oregon in the Oregon Conservation Strategy (Oregon Conservation Strategy; ODFW 2005). Hundreds of thousands of dollars are expended annually on both public and private lands to combat invasion and expansion of noxious weeds and their deleterious effects on fish, wildlife, and their habitats. Specific invasive concerns include: • Gorse in the Coos Bay region	**Noxious Weeds/Invasive Plants:** ODFW recognizes the efforts of the Applicant in developing the "*Integrated Pest Management Plan".* However, ODFW recommends that the Applicant complete a more comprehensive noxious weed control plan prior to issuance of a site certification or completion of the NEPA process. ODFW recommends broader scale monitoring for noxious weeds, beyond the targeted sites discussed. ODFW recommends that performance metrics be included in order to document success or failure of the "*Integrated Pest Management Plan",* and that additional mitigation be undertaken if the final state of the pipeline is not satisfactory regarding avoidance, prevention, and minimization of noxious weeds.

	has had substantial negative impacts on elk production in the Coastal frontal zone. • Scotch broom is considered a substantial factor decreasing production of elk and deer forage across the Coast range and some of the interior locations of Oregon. • It is strategically important that equipment be cleaned prior to being mobilized from locations where gorse is present and when moving to different sections of the pipeline. • ODFW considers the risk of weed spread on mitigation sites and where mitigation measures are employed to likely be high rather than low. • ODFW is not listed as a consulting agency in the IPMP. The local ODA's weed expert did not know her agency had provided comments when contacted by ODFW. ODFW has concerns that the ODA may not have been coordinated with by the Applicant. • The IPMP states "These surveys were conducted by local biologists who are familiar with priority listed noxious weeds." ODA weed experts have previously expressed concern about people's ability to properly identify noxious weeds. ODFW expresses concerns relating to the credentials/experience of the biologists used? • Pacific Connector's Environmental inspectors	ODFW recommends wash stations for equipment be set up to handle aquatic invasive species as well. Equipment should be cleaned between individual subbasins at the HUC 6 level or if the machinery has been in a known area with invasive/noxious weeds. ODFW recommends that FERC include conditions outlining that the noxious weed plan have specific strategies (i.e. cleaning of equipment, monitoring, and control measures) for the JCEP project and individual reaches of the PCGP project. Mowing is considered a preferential treatment to herbicides when effective. ODFW recommends the Applicant acknowledge that the risk of invasion of noxious weeds on the pipeline route and mitigation sites is likely high and ensure the following: • ODFW recommends the Applicant fund an Oregon Dept. of Agriculture (ODA) weed extraction teams within the affected counties (See Appendix A, List 4). • ODFW recommends the PCGP project include ODFW in the list of agencies consulted and include our comments for noxious weed management. • ODFW recommends the Applicant describe the experience/qualifications of the staff used to conduct noxious weed surveys. • ODFW recommends the PCGP project should provide some level of assurance that environmental inspectors will have the capacity in their schedule to ensure noxious weed management concerns are addressed. • ODFW recommends that EI's should inspect new equipment arriving on site. Any protections given to federal lands should also be given to non-federal lands • ODFW recommends the PCGP project develop an incentive/dis-incentive program to greatly increase the likelihood the potential for a contractor driven inspection system (with random EI investigations)

	will make determinations about washing equipment. How will decision of environmental inspectors be protected from logistic pressures? • IPMP notes contractors will inspect their own equipment prior to moving from construction yards to federal lands. This brings up two issues: 1. Can contractors adequately perform their own inspections? 2. Why is there a distinction between federal and non-federal land for the noxious weed management efforts? • The IPMP notes that EI's will perform random inspections. What kind of consequence will there be if inspections fail? Is there a reward system for compliance? • The IPMP indicates that during reclamation the contractor will return any graded material to infested sites. • The IPMP has indicated cleaning stations will be established at borders of NFS lands and on adjacent BLM lands. • The IPMP indicates that extra monitoring will occur along the ROW in areas with increased likelihood of noxious weed contamination (i.e. known infestations, hydrostatic testing stations) on federal lands for 3-5 years after construction, with additional surveys for 3	to function effectively. • ODFW recommends a buffer should be applied to known noxious weed infestation areas. Accordingly, soil should not be moved out of these sites. These sites should be treated to prevent spread of noxious weeds to uninfested areas. • ODFW recommends that protection measures for federal lands should also be applied to non-federal lands. • ODFW recommends the PCGP project needs to provide extended monitoring at known infestation sites, dewatering stations, and all other high-risk sites on private lands as well. Monitoring the ROW only likely inadequate. ODFW recommends that PCGP employ independent consultant noxious weed specialists to conduct periodic on-going monitoring to maintain a sufficient level of certainty that noxious weed issues are addressed. Periodic monitoring needs to be completed for the life of the project on all disturbed ground with special emphasis at known infestation, dewatering stations, and equipment cleaning locations.

	years after presumed eradication. The IPMP details that monitoring of disturbed sites will occur throughout the life of the project by PCGP operational personnel. Properly identifying noxious weeds before they are fully established is an acquired skill. ODFW has concerns with the PCGP ensuring continuous monitoring capable of documenting invasive weeds effectively.	
Erosion Control and Revegetation Plan, Chapter 10.10 Erosion Control and Revegetation Plan, Chapter 10.9-1, pg. 33	**Seeding Prescriptions:** **Timing of Seeding** The ECRP calls for seeding to be conducted within 6 days of final grading, weather and soil conditions permitting, according to FERC's Upland Plan. Seeding in late winter for potions of the ROW in Klamath County could be too late for successful revegetation. This may require coming back the next fall/early winter to conduct seeding to insure that revegetation objectives are met. **Seed Mixes:** Specific Seed Mix 6 and 7 could be improved upon to be more effective and provide greater wildlife habitat function.	**Seeding Prescriptions:** **Timing of Seeding: ODFW recommends** the Applicant plan for additional seeding as a contingency if the initial seeding occurs too late to be effective **Seed Mixes:** ODFW recommends: • For Seed Mixture 6, recommend addition of bitter cherry and serviceberry as shrub species to be seeded for M.P. 181-198 in Klamath County, in addition to antelope bitterbrush and birchleaf mountain mahogany. • For Seed Mixture 7, recommend addition of curleaf mountain mahogany to be seeded for M.P. 198-228 in Klamath County in addition to antelope bitterbrush. ODFW recommends that private properties be surveyed prior to construction to determine if non-native plants are dominant. Non-native seed mixes should only be used on properties that already have a significant presence of non-native seed. • Some of the non-native grasses listed tend to establish permanently and out-complete native grasses. Replace non-natives such as bentgrass, red fescue, tall fescue, and ryegrass (annual or perennial) with blue wildrye, California brome, or California oatgrass.

		• Where needed to compete with established non-native plants (as determined by pre-surveys) ODFW recommends the following non-natives: timothy, orchard grass, white clover, red clover, birdsfoot trefoil, and subterranean clover.
ES pgs Chapter 4.6; 4.7 Integrated Pest Management Plan Chapt. 1, Chapt. 2, Chapt. 4, Chapt. 5, Chapt. 6, Chapt. 7. Erosion Control and Revegetation Plan, Chapter 12.9-1, pg. 51 Chapter 4.5 pg. 458	**ROW Maintenance:** Maintenance of the PCGP Right of Way (ROW) will likely restrict natural revegetation, particularly any larger tree or shrub recruits which exceed allowable height thresholds. The method of management (herbicides or mechanical) has potential to impact the capacity, albeit highly altered to support some wildlife. From experience on previous utility ROWs, herbicides were used to control vegetation resulting in erosion and lack of vegetation for wildlife forage and habitat. **Mowing of ROW Corridors:** The DEIS indicates that there will be moving to maintain the 30-foot wide pipeline corridor maintenance from April 15th to August 1, during the growing season. Conducting vegetation clearing during this time frame will likely impact nesting grassland and shrub-adapted birds.	**ROW Maintenance:** ODFW recommends use of mechanical means to maintain the ROW, with use of herbicide as an exception. An exception would be in cases where herbicides may be necessary to control noxious weeds at specific locations with specific difficult issues, which should be defined by the Applicant. ODFW recommends that if herbicides are needed at specific locations, weeds be spot sprayed. **Mowing of ROW Corridors:** ODFW recommends maintaining corridor vegetation from September-November to more effectively avoid potential impacts during migratory bird nesting periods.
General	**Capping Piling to Prevent Perching:** For both the JCEP and PCGP project ODFW recommends fitting any new pilings with devices to prevent	**Capping Piling to Prevent Perching:** Predatory piscivorous birds strategically perch around industrial facilities on piling that do not have measures to eliminate the ability of these birds to perch/roost. Ecologically the relevance is related to an increased capacity to feed within the area and impact species

	perching of piscivorous birds. This is a standard request from ODFW to Applicants on Fill/Removal permits when the Applicant installs pilings. These caps are readily available.	such as fall Chinook, coho salmon, and steelhead juveniles. If additional perch locations are created for piscivorous birds as a result of the proposed project, predation on resident and juvenile fish will likely increase along the project, and would be of particular concern in the vicinity of the project terminus at Coos Bay and near larger rivers such as the South Coos River, South Umpqua, and Rogue.
Chapter 4.5 misc. Recreation Management Plan (RMP)	**Direct Mortality of Terrestrial Wildlife Species Due to Collisions with Construction Related Traffic:** What conditions will be required to minimize vehicle collisions. A fairly high number of deer vehicle collisions were documented during construction of the Ruby Pipeline in eastern Klamath County. In addition, there very likely were numerous other wildlife species killed by construction vehicles (small avian species, small mammals, etc.) Will there be additional mitigation for direct mortality of wildlife species? **Off-Highway Vehicle Barriers:** Road closures on pipeline access roads that do not have other utility will be critical to reducing impacts to species such as elk, MAMU, and NSO. Closure of these roads will also reduce winter travel and damage related to recreational motorsport activities that commonly occur in wetlands	**Direct Mortality of Terrestrial Wildlife Species Due to Collisions with Construction Related Traffic:** ODFW recommends the Applicant develop and enforce credible series construction traffic related BMPs such as speed limits to minimize direct mortally of wildlife due to collisions with construction related traffic. **Off-Highway Vehicle Barriers:** ODFW recommends revisiting analysis and discussion of methods for ensuring that road closures are effective during and post-construction. • Off-highway vehicle (OHV) barrier proposals were modified by the Applicant through previous comments from ODFW to include boulders and tank traps in addition to signage. • ODFW recommends that contingencies be planned in case the proposed OHV exclusion efforts prove ineffective. Such contingencies may require maintenance measures. • ODFW recommends security patrols along ROW to discourage OHV use. • ODFW recommends a regular schedule for inspection of all OHV barriers along the pipeline route and repair OHV barriers throughout the life of the project. Where necessary exclusion devices should be upgraded. • ODFW recommends the PCGP project develop a plan in coordination with ODFW to Plan to mitigate for OHV damage at least in part by Funding law-enforcement patrols within the Jackson TMA, and purchasing and restoring property that has been previously damaged.

	and streams. Anti-OHV devices are passive and as such will likely only detect damage as it occurs with no capacity to prevent OHV impacts directly when they are occurring. There is no mention of monitoring of the effectiveness of the OHV barriers in the RMP. Despite best management practices and patrols, illegal use of the ROW by OHVs is expected to occur. The need for mitigation should be expected by the PCGP project. ODFW notes that there are numerous locations in the pipeline route where OHV issues occur. ODFW works cooperatively with partners to maintain Travel Management Areas in the Camel Hump and Obenchain areas to minimize OHV disturbance to wintering wildlife. Department staff is available for consultation on minimizing impacts in these areas.	
General	**Environmental Inspectors:** ODFW fully recognizes that properly trained environmental inspectors are able to greatly increase the potential for maximizing habitat	**Environmental Inspectors:** ODFW recommends that the Applicant determine the number of environmental inspectors they will need and coordinate with state and federal agencies depending on the training they will receive.

	conservation measures.	ODFW recommends that the PCGP project have environmental inspectors on all active construction segments of the pipeline project.
General	**Public Communications:** There is currently a significant need for a representative of the JCEP/PCGP project to serve as a public communications specialist to the project area constituents. Additionally, there is a need for planning regarding how recreational users of fish and wildlife resources in Coos Bay and along the pipeline route will obtain information concerning the project: e.g. will recreation be restricted at the JCEP site, mitigation site access, pipeline route access; access to the PCGP corridor during construction, etc.) Restrictions to recreational accessibility can result in substantial impacts to the local economic conditions of affected communities.	**Public Communications:** The JCEP/PCGP project needs to develop a project communication plan in collaboration with ODFW to consult with and inform fishing groups and other recreational users on construction actions on a real time basis. Including but not limited to: • Will recreation (clamming, crabbing, and duck hunting) be restricted at the JCEP site during construction/following construction? • Will mitigation sites (Kentuck, wetland mitigation sites) be open to public recreation, hunting, and fishing access during construction/following construction? • Will the pipeline route be open to access for fishing and hunting (the route will cross major salmon and steelhead fishing streams as well as historical hunting locations) during construction/following construction? • Will the Coast Guard restrict recreational access to any portion of the bay, other than the shipping channel during the period when a LNG ship is moving into or out of the bay. Will there be safety restrictions on any portion of the bay when the ship is docked in the slip? • How and where will any residual impact to public access or recreational opportunities be fully mitigated?

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Oregon Department of Geology and Mineral Industries

The Oregon Department of Geology and Mineral Industries (DOGAMI) is providing review comments on the Draft Environmental Impact Statement (DEIS), dated March 2019, and relevant supplemental resource reports, dated September 2017.

DOGAMI finds the information in the DEIS to be incomplete; has comments on DOGAMI's regulatory requirements; has comments about possible deficiencies in the scientific and engineering analyses relating to geologic hazards; and at this point is not satisfied that regulatory requirements will be met and geologic hazards will be adequately addressed to ensure public safety. We provide herein 1) General Review Comments, and 2) Specific Comments on the DEIS.

As noted in our comments, DOGAMI is reiterating a number of unresolved comments on JCEP and PCGP resource reports that were first included in a memo to the Oregon Department of Energy (ODOE), dated November 6, 2017 (https://www.oregon.gov/energy/facilities-safety/facilities/Documents/JCEP-PCGP/2017-11-06-DOGAMI-Comments.pdf). At that time, DOGAMI found that many geologic hazard analyses were inadequate. Now, DOGAMI is concerned that key portions of the DEIS were insufficiently prepared, and in some cases either wrong or inadequate. This raises questions about the process undertaken to develop the DEIS and, more importantly, elevates DOGAMI's concerns about public safety.

DOGAMI has regulatory and statutory authority on mining operations and building of certain structures in the tsunami inundation zone. The Applicant must comply with Oregon laws and Oregon building code requirements. This includes Oregon Revised Statute Chapter 517.750(16)—the JCEP project will need one (1) Operating Permit for the LNG terminal facility and the PGCP project will need one (1) or more Operating Permits for the pipeline facility, any applicable requirements of ORS 455.446-455.447 and Section 1803.2.1 Tsunami Inundation Zone of the Oregon Structural Specialty Code (Oregon Revised Statutes [ORS] 455.446 and 455.447).

Thank you for the opportunity to assist with this project. If you have any questions, please contact me at 971-673-1555 (brad.avy@oregon.gov) or Yumei Wang at 503-913-5749 (yumei.wang@oregon.gov).

Sincerely,

Brad J. Avy

Director and State Geologist

General Review Comments

Geologic hazards are prevalent in the proposed project area. The proposed project is in a high seismic hazard area due to the Cascadia Subduction Zone, which can produce a magnitude 9 earthquake, and the proposed JCEP terminal facility is located in the Cascadia tsunami inundation zone. If all geologic hazards are not carefully identified and addressed before design and construction, then the possible impacts could negatively impact human and environmental safety. Significant earthquake hazards include but are not limited to the Cascadia Subduction Zone and crustal faults (e.g., Basin and Range faults), especially in Klamath County. Landslide hazards exist in the coastal plains, Coast Range, Klamath Range, Cascade Range and Basin and Range.

DOGAMI's concerns relate to the expected performance of the proposed facilities, the possible impacts and the safety of people. Geologic hazards have not been adequately characterized and proposed mitigation of the hazards is incomplete. Specific unresolved concerns include:

1. Key portions of the DEIS were insufficiently prepared, and in some cases either wrong or inadequate, raising questions about the process undertaken to develop the DEIS (i.e., a lack of sufficient Applicant technical review), which could lead to adverse consequences for public safety;
2. Seismic hazards, including Cascadia earthquakes and identification, characterization and mitigation of quaternary faults and their hazards;
3. The long duration of shaking expected with a magnitude 9 earthquake;
4. Ground failure of the softer and looser soils, including earthquake-induced liquefaction and lateral spreading;
5. Landslide hazards, including earthquake-triggered landslides, require the use of lidar to identify as a first step in characterizing hazards and proposing mitigation;
6. Tsunami hazards analyses, including tsunami hazards with the proposed channel and estuarine modifications, and how currents, debris and ballistics may negatively impact the surrounding areas and safety of people;
7. Tsunami scour in the nearby area, including dynamic erosion of the North Spit dunes, and how the Maximum Considered Tsunami (MCT), that is, the design tsunami, may impact the local landforms, proposed facilities, nearby development and safety of people;
8. Tsunami design criteria. Will the design meet and/or exceed the minimum design requirements specified in the International Building Code's reference to the American Society of Civil Engineers 7 Minimum Design Loads and Associated Criteria for Buildings and Other Structures Chapter 6 on Tsunami Loads and Effects?;
9. Tsunami safety action plans, including tsunami evacuation plans and an evaluation of the response time to mobilize an LNG vessel during a distant tsunami;

10. Appropriate application of best management practices (BMP). For example, the best practice described in the DEIS using slope gradients to define where BMPs are implemented during construction is inadequate;
11. Instrument monitoring safety programs. For example, the landslide monitoring method described in the DEIS would not allow adequate time to mitigate landslide hazards during a Cascadia earthquake where many co-seismic landslides could be simultaneously triggered in direct response to the shaking; and,
12. Dependencies on existing infrastructure, such as roads and levees, which may fail during disasters causing safety concerns.

DOGAMI encourages designing and building for ***disaster resilience*** and ***future climate*** using science, data and community wisdom to protect against and adapt to risks. This will allow people, communities and systems to be better prepared to withstand catastrophic events and future climate—both natural and human-caused—and be able to bounce back more quickly and emerge stronger from shocks and stresses. This includes:

- Using best practices supporting public safety
- Using a long-term view to protect citizens, property, environment, and standard of living
- Integrating resilience, where possible, by avoiding high risk areas or embracing higher performance standards than may be required by building codes and regulations. This will lessen damage and speed recovery after disasters and improve continuity of operations.

Finally, all relevant laws and regulations (e.g., State of Oregon's Oregon Revised Statutes, Oregon Administrative Rules, Oregon building codes, Federal Laws, and local regulations), standards, guidelines should be met, clearly documented and, where helpful, explained. Additional site-specific geologic and tsunami hazard evaluations and proper mitigation of hazards are required to ensure public safety. All methods should be documented and described, including assumptions and uncertainties.

Specific Comments on the DEIS

Citation	Issue Identification	Recommended Resolution
1.5.1 Federal Environmental Laws, Regulations, Permits, Approvals, and Consultations: Table 1.5.1	Oregon Department of Geology and Mineral Industries – Mineral Land Regulation and Reclamation (MLRR) Program is not listed as a permitting agency in Table 1.5.1. The JCEP project will need one (1) Operating Permit for LNG terminal facility and the PGCP project will need one (1) or more Operating Permits for the Pipeline per Oregon Revised Statutes (ORS) Chapter 517.750	Include DOGAMI – MLRR as a State permitting agency in Table 1.5.1
1.5.2 State Agency Permits and Approvals: Section 1.5.2.1, Page 1-30	Add DOGAMI-MLRR to text in Section 1.5.2. The JCEP project will need one (1) Operating Permit for LNG terminal facility and the PGCP project will need one (1) or more Operating Permits for the pipeline per Oregon Revised Statutes (ORS) Chapter 517.750	Add DOGAMI MLRR to section 1.5.2.1, page 1-30: The mission of the DOGAMI is to provide earth science information **and regulation** to make Oregon safe and prosperous. DOGAMI identifies and quantifies natural hazards, and works to minimize potential effects of earthquakes, landslides, and tsunamis. Its administrative rules at OAR chapter 632 includes the identification of Tsunami Inundation Zones under division 5. The agency is also the steward of Oregon's mineral resources, and it regulates mining activities, and oil and gas exploration and production on non-federal lands. **The JCEP and PGCP projects fall under the definition of "surface mining" under ORS Chapter 517.750(16). The JCEP project will need one (1)**

		Operating Permit for the LNG terminal facility and the PGCP project will need one (1) or more Operating Permits for the pipeline facility.
2.1.3 BLM and Forest Service Land Management Plan Amendment Actions (whole section)	Any quarry sites, on land managed by the BLM or Forest Service, used as aggregate material sources for ANY construction activities related to either the JCEP or the PGCP facilities, will need to obtain either Exclusion Certificates (excavating less than or equal to 5,000 cubic yards) or mine Operating Permits (excavating more than 5,000 cubic yards) from DOGAMI – MLRR. Note quarries permitted under DOGAMI permits must have approved fill plans (OAR 632-030-0025(bb)) prior to the placement of imported fill used for permanent reclamation purposes. Imported fill must meet DEQ's definition of Clean Fill (OAR 340-093-0030 (18)) or the use must be specifically allowed by Department of Environmental Quality by rule, permit or other written authorization.	Identify ALL quarry site locations via coordinates (latitude and longitude) that will be used as sources of construction aggregate. Identify ALL quarry site locations via coordinates (latitude and longitude) that will be used as fill disposal. Ensure that ALL quarry sites used as sources of construction aggregate are covered under Exclusion Certificates or mine Operating Permits issued by DOGAMI – MLRR. Any of those sites used for the disposal of fill must have approved fill plans on file with DOGAMI – MLRR.
2.4 CONSTRUCTION PROCEDURES (whole section)	Any quarry sites used as aggregate material sources, for construction activities related to either the JCEP or the PGCP facilities that excavate more than 5,000 cubic yards of material need to obtain mine Operating Permits prior to initiating excavation/construction activities.	Place a requirement and/or a condition ensuring that ALL quarry sites used as aggregate material sources, for construction activities related to either the JCEP or the PGCP facilities that excavate more than 5,000 cubic yards of material obtain mine Operating Permits prior to initiating excavation/construction activities.
3.4 PIPELINE ROUTE ALTERNATIVES AND VARIATIONS (whole section)	The PGCP requires one (1) or more Operating Permits from DOGAMI (as noted above). DOGAMI cannot have overlapping permit boundaries covering the same land. Therefore, the pipeline route must avoid intersecting the permit boundary of any quarry site that is covered under a DOGAMI Operating Permit. Any areas where there is the	Require that the pipeline route avoid the permit boundary for any quarries covered by existing DOGAMI Operating Permits.

	potential for overlap of two or more Operating Permit boundaries must be resolved in advance of DOGAMI permitting.	
Section 4.1.2.2 Mineral Resources – Mine Hazards - Heppsie Quarry (pg 4-10) pdf pg. 198/1120	The Heppsie Quarry site will need to be covered under a DOGAMI Operating Permit prior to the excavation of aggregate for construction activities.	Place a requirement and/or a condition ensuring that ALL quarry sites used as aggregate material sources for construction activities related to either the JCEP or the PGCP facilities that excavate more than 5,000 cubic yards of material obtain mine Operating Permits prior to initiating excavation/construction activities.
Section 4.1.2.5 Rock Sources and Permanent Disposal Sites (pg 4-25 and 4-26) pdf pg. 213/1120	As noted above: Any quarry sites used as aggregate material sources for ANY construction activities related to either the JCEP or the PGCP facilities, will need to obtain either Exclusion Certificates (excavating less than or equal to 5,000 cubic yards) or mine Operating Permits (excavating more than 5,000 cubic yards) from DOGAMI – MLRR prior to the initiation of excavation activities. Further, quarries permitted under DOGAMI Operating Permits must have approved fill plans (OAR 632-030-0025(bb)) prior to the placement of imported fill used for permanent reclamation purposes. Imported fill must meet DEQ's definition of Clean Fill (OAR 340-093-0030 (18)) or the use must be specifically allowed by Department of Environmental Quality by rule, permit or other written authorization.	Place a requirement and/or a condition ensuring that ALL quarry sites will have the appropriate certificate or permit issued by DOGAMI in advance of initiating excavation activities. Any of those sites used for the disposal of fill must have approved fill plans on file with DOGAMI – MLRR.
Section 4.1.2.6 Blasting During Trench Excavation pg 4-27 pdf pg. 215/1120	Ensure that there are no impacts from blasting to properties not owned or under the control of the PGCP permittee. Ensure that ALL federal guidelines for quarry blasting are followed (NFPA 495 Ch. 11).	Place a requirement and/or a condition prohibiting impacts beyond the right-of-way boundary under the control of the PGCP permittee. Place a requirement and/or a condition requiring that the federal guidelines for quarry blasting are followed (NFPA 495 Ch. 11).
Section 4.1.3.2 Mineral Resources on	Any quarry sites, on land managed by the BLM or Forest Service, used as aggregate material sources for ANY construction activities related to either the JCEP or the PGCP	Place a requirement and/or a condition ensuring that ALL quarry

Federal Lands pg 4-35 pdf pg. 223/1120	facilities, will need to obtain either Exclusion Certificates (excavating less than or equal to 5,000 cubic yards) or mine Operating Permits (excavating more than 5,000 cubic yards) from DOGAMI – MLRR. Note quarries permitted under DOGAMI permits must have approved fill plans (OAR 632-030-0025(bb)) prior to the placement of imported fill used for permanent reclamation purposes. Imported fill must meet DEQ's definition of Clean Fill (OAR 340-093-0030 (18)) or the use must be specifically allowed by Department of Environmental Quality by rule, permit or other written authorization.	sites used as aggregate material sources, for construction activities related to either the JCEP or the PGCP facilities that excavate more than 5,000 cubic yards of material obtain mine Operating Permits prior to initiating excavation/construction activities.
Section 4.1.3.3 Rock Sources and Permanent Disposal Sites on Federal Lands pg 4-36 pdf pg. 224/1120	Quarries permitted under DOGAMI permits must have approved fill plans (OAR 632-030-0025(bb)) prior to the placement of imported fill used for permanent reclamation purposes. Imported fill must meet DEQ's definition of Clean Fill (OAR 340-093-0030 (18)) or the use must be specifically allowed by Department of Environmental Quality by rule, permit or other written authorization.	Place a requirement and/or a condition ensuring that ALL quarry sites covered under DOGAMI Operating Permits have a fill plan approved by DOGAMI prior to being used for permanent fill disposal.
4.2.1.2 Project-Specific Soil Limitations pg 4-44 pdf pg. 222/1120	The DEIS notes that some soils at the JCEP terminal site may not meet DEQ's definition of Clean Fill (OAR 340-093-0030(18). A fill plan per OAR 632-030-0025(bb) is required as part of the Operating and Reclamation Plan prior to placement of permanent reclamation fill. All fill must meet DEQ's definition of clean fill or be specifically authorized for placement in writing by ODEQ.	Place a requirement and/or a condition ensuring that a fill plan per OAR 632-030-0025(bb) is required as part of the Operating and Reclamation Plan submitted to DOGAMI as part of the Operating Permit application for the Terminal site.
4.2.2.3 Pipeline-Specific Topics - Soil Limitations - Reclamation Sensitivity pg 4-60 pdf pg. 248/1120	The approved EIS revegetation plan for areas identified to be revegetated in this section should be included in the Operating and Reclamation Plan submitted to DOGAMI as part of the Operating Permit application for the Terminal site.	Place a requirement and/or a condition ensuring that the revegetation plan be consistent with the Operating and Reclamation Plan submitted to DOGAMI as part of the Operating Permit application for the Terminal site.
Appendix D Table D-7 Rock Sources and Permanent Disposal Sites identified for the	These sites will need to obtain either Exclusion Certificates (excavating less than or equal to 5,000 cubic yards) or mine Operating Permits (excavating more than 5,000 cubic yards) from DOGAMI – MLRR. Note quarries permitted under DOGAMI permits must have approved fill plans (OAR 632-030-0025(bb)) prior to the placement of imported fill used	Place a requirement and/or a condition ensuring that ALL quarry sites will have the appropriate certificate or permit issued by DOGAMI

construction of the pipeline pg D7-1/7-2	for permanent reclamation purposes. Imported fill must meet DEQ's definition of Clean Fill (OAR 340-093-0030 (18)) or the use must be specifically allowed by Department of Environmental Quality by rule, permit or other written authorization.	in advance of initiating excavation activities. Any of those sites used for the disposal of fill must have approved fill plans on file with DOGAMI – MLRR.
Appendix F.10, Appendix Q Overburden and Excess Material Disposal Plan	DOGAMI issues life of mine permits. Material placed in DOGAMI permitted sites as reclamation backfill cannot be considered temporary. Permanent areas should be identified for those currently designated as "Permanent or Temporary".	Acknowledge that material placed in DOGAMI permitted sites as reclamation backfill cannot be considered temporary. If the placement is temporary the material must be removed from the disposal site prior to the closing of the DOGAMI permit.
4.14 CUMULATIVE IMPACTS – Appendix N, Table N-1 pg N-1 to N-8	Activities listed in the past, present, or reasonably foreseeable actions that may need to be permitted by DOGAMI. Instances where the pipeline is in proximity to existing quarry operations may require modification to those quarries blasting plans to prevent impacts to the pipeline. Any aggregate sources used for construction may need DOGAMI Exclusion certificates or Operating Permits. Any additional gas wells or activity associated with the (MEC) coal bed methane sites may need additional permits from DOGAMI.	Acknowledge that past, present, or reasonably foreseeable actions may require additional permitting and/or approvals from DOGAMI – MLRR.
DEIS Section 13.3 Natural Hazards and Conditions; starting on page 17	DOGAMI concludes that the current level of geologic hazard evaluations and proposed mitigation are inadequate to ensure public safety.	DOGAMI recommends that additional site-specific geologic and tsunami hazard evaluations and proper mitigation of hazards are performed to ensure public safety.
DEIS Section 4.1.2.3 Seismic and Related Hazards; page 4-11	DOGAMI concludes that inaccurate and incomplete information in the DEIS raises concern that the seismic hazard evaluations presented in the DEIS are not sufficiently accurate or detailed to ensure public safety. DEIS states that there are two primary mechanisms for generating earthquakes of design significance along pipeline route, CSZ event and local earthquakes associated with Klamath Falls seismic "hot spot". This list should include intraplate earthquakes in the subducting slab, and seismicity in the Klamath Falls area is only a seismic "hot spot" because of the occurrence of two M 6 earthquakes in 1993 and their associated aftershocks, otherwise the seismicity of the area	Revise assessment of major earthquake source zones with accurate and properly referenced information and include intraplate earthquakes.

	is not unusual.	
DEIS Section 4.1.2.3 Seismic and Related Hazards; page 4-11	DOGAMI concludes that inaccurate and incomplete information in the DEIS raises concern that the seismic hazard evaluations presented in the DEIS are not sufficiently accurate or detailed to ensure public safety. The DEIS incorrectly states that there were two large (M 6.3 and 7.0) earthquakes in the area in 1873. There was only one, its location and magnitude are poorly constrained, and it has been interpreted by many as an intraplate event.	Revise description of major historic earthquakes with accurate and properly referenced information.
DEIS Section 4.1.2.3 Seismic and Related Hazards; page 4-11	DOGAMI concludes that inaccurate and incomplete information in the DEIS raises concern that the seismic hazard evaluations presented in the DEIS are not sufficiently accurate or detailed to ensure public safety. The DEIS notes that most of the pipeline construction area has experienced few historical earthquakes but fails to note that the period of historical record is short in this lightly populated region, and that the historical record is probably only complete for magnitudes > ~4.	Revise description of major historic earthquakes with accurate and properly referenced information. That includes discussion of the completeness and length of record.
DEIS Section 4.1.2.3 Seismic and Related Hazards; page 4-11	DOGAMI concludes that inaccurate and incomplete information in the DEIS raises concern that the seismic hazard evaluations presented in the DEIS are not sufficiently accurate or detailed to ensure public safety. The DEIS appears to base its assessment of geologically mapped faults along the pipeline alignment on an outdated and very small scale statewide geologic map (Walker and McLeod 1991).	Revise assessment of geologically mapped faults with up to date information from DOGAMI digital geologic map (OGDC-6) at a minimum, preferably by reference to all existing geologic maps along alignment. The assessment must be prepared by a qualified and licensed professional.
DEIS Section 4.1.2.3 Seismic and Related Hazards; page 4-11	DOGAMI concludes that inaccurate and incomplete information in the DEIS raises concern that the seismic hazard evaluations presented in the DEIS are not sufficiently accurate or detailed to ensure public safety. The DEIS states that most faults along the pipeline alignment are not considered active in the USGS Quaternary fault database. DOGAMI staff have identified dozens of active faults in Oregon over the last decade using high resolution lidar data, virtually none of which were in the USGS database. The database is incomplete and inaccurate and should not be used as the sole source of information about fault activity.	Revise assessment of geologically mapped faults by study of the high resolution lidar topography for the entire pipeline alignment. The assessment must be prepared by a qualified and licensed professional.
DEIS Section 4.1.2.3 Seismic and Related Hazards; page 4-11	DOGAMI concludes that inaccurate and incomplete information in the DEIS raises concern that the seismic hazard evaluations presented in the DEIS are not sufficiently accurate or detailed to ensure public safety. The DEIS states that many earthquakes of M 2 or larger have occurred	Accurately and consistently characterize historical seismicity in the Klamath Falls area and assess its tectonic

	during historical times in the Klamath Falls area, in direct conflict with an earlier statement that very few historical earthquakes have occurred along the pipeline alignment. It notes a geographic association of these events with the boundary between the Basin and Range and Cascade Range but fails to note that the virtually all recorded earthquakes in the area are aftershocks from the 1993 M 6 events.	significance with updated references. The assessment must be prepared by a qualified and licensed professional.
DEIS Section 4.1.2.3 Seismic and Related Hazards; page 4-12	DOGAMI concludes that inaccurate and incomplete information in the DEIS raises concern that the seismic hazard evaluations presented in the DEIS are not sufficiently accurate, detailed or referenced to ensure public safety. The DEIS lists earthquake-induced landslides as one of the primary seismic hazards to pipelines. This statement is true, and earthquake-induced landslides are arguably one of the greatest threats to the proposed pipeline, yet there is no evaluation of the hazard in the Seismic and Related Hazards section and only a cursory and totally inadequate mention in the landslide hazard section.	Provide an in-depth, quantitative evaluation of the potential for earthquake induced landslides along the segments of pipeline where expected ground shaking is high enough to potentially trigger such events. The assessment must be prepared by a qualified and licensed professional.
DEIS Section 4.1.2.3 Seismic and Related Hazards; page 4-12	DOGAMI concludes that inaccurate and incomplete information in the DEIS raises concern that the seismic hazard evaluations presented in the DEIS are not sufficiently accurate, detailed or referenced to ensure public safety. The DEIS asserts that empirical studies “demonstrate that welded steel pipelines are not prone to failure during earthquakes”, which overstates conclusions of the references cited to support it. One of the two studies cited indicated that during the 2011 Tohoku M 9 subduction earthquake, welded steel water pipe experienced failures at a rate of 1 per ~ 10km, which contradicts the assertion that such pipelines are not prone to failure.	Revise the assessment of pipeline vulnerability with consistent and properly referenced information. The assessment must be prepared by a qualified and licensed professional.
DEIS Section 4.1.2.3 Seismic and Related Hazards; page 4-13	DOGAMI is concerned that the apparent lack of familiarity with seismic hazard assessment procedures evidenced in the DEIS suggests that it may not be relied on to ensure public safety. The DEIS notes the distinction between earthquake magnitude and ground motion, which while correct is such a basic distinction that it is questionable to be included in an engineering seismology discussion for a major project like this. Probabilistic spectral ground motions are the standard of practice for this kind of design, and the DEIS should detail how the study was done, including methods, data and assumptions used.	Provide a probabilistic ground motion assessment prepared by a qualified and licensed professional for the entire pipeline using accurate and up to date methods and data.
DEIS Section 4.1.2.3 Seismic and Related Hazards; page 4-13	DOGAMI is concerned that the apparently lack of familiarity with seismic hazard assessment procedures evidenced in the DEIS suggests that it may not be relied on to ensure public safety. The DEIS states that the pipeline would be designed using PGA values that correspond to an M 8-9 CSZ	Provide a probabilistic ground motion assessment prepared by a qualified and licensed professional for the entire

	earthquake and a specific return period (a deterministic hazard assessment, though the range of M 8-9 is huge), but the standard of practice for such design is to do a probabilistic seismic hazard assessment (PSHA). Regardless of whether the intent is to design using deterministic or probabilistic ground motions, the DEIS should present the most current recurrence and probability data for Cascadia earthquakes. There is no discussion, in this section or Section 4.13.1.5 (Earthquakes, Tsunami and Seiche) of Cascadia recurrence or probability. The issue of up-to-date Cascadia recurrence information was raised in the DOGAMI November 6, 2017 review memo (comment 19), and has still not been adequately addressed.	pipeline using accurate and up to date methods and data, and specifically addressing Cascadia recurrence.
DEIS Section 4.1.2.3 Seismic and Related Hazards; page 4-13	DOGAMI is concerned that the apparently lack of familiarity with seismic hazard assessment procedures evidenced in the DEIS suggests that it may not be relied on to ensure public safety. The DEIS asserts that the USGS has prepared a PSHA for the US in general (true) and "for the region that would be crossed by the pipeline in particular" which is true only in that the pipeline area is in the US. The DEIS also cites the wrong reference for the USGS National Seismic Hazard Maps (NSHM), instead referencing the Quaternary Fault Database, which is one dataset underpinning the NSHM.	Provide a probabilistic ground motion assessment prepared by a qualified and licensed professional for the entire pipeline using accurate and up to date methods and data.
DEIS Section 4.1.2.3 Seismic and Related Hazards; page 4-13	DOGAMI is concerned that the apparently lack of familiarity with seismic hazard assessment procedures evidenced in the DEIS suggests that it may not be relied on to ensure public safety. The DEIS states, "PGAs for the Project were calculated for the specific 475-year and 2,475-year return periods and the site-specific PGA of 0.5g for each corresponding milepost interval of the pipeline alignment". This statement does not make sense. The issue of providing clear and complete ground motion information was raised in the DOGAMI November 6, 2017 review memo (comment 10), and has still not been adequately addressed.	Provide a probabilistic ground motion assessment prepared by a qualified and licensed professional for the entire pipeline using accurate and up to date methods and data.
DEIS Section 4.1.2.3 Seismic and Related Hazards; page 4-13	DOGAMI is concerned that the apparently lack of familiarity with seismic hazard assessment procedures evidenced in the DEIS and the lack of accurate use of data suggests that it may not be relied on to ensure public safety. The DEIS states "The highest 475-year return period PGAs expected along the pipeline alignment are about 17 percent (MP 0 to 2.0 and MP 9R to 16BR) of gravity." This is not supported by data and appears to be incorrect. The USGS NSHM 2014 PGA data for the 10% in 50 years return period has values that range from 10.5%g to 29.5%g for sites within 5 km of the pipeline alignment. The issue of providing clear and complete ground motion information was raised in the DOGAMI November 6, 2017 review memo (comment 10) and has still not been adequately addressed.	Provide a probabilistic ground motion assessment prepared by a qualified and licensed professional for the entire pipeline using accurate and up to date methods and data. Accurately report data from USGS NSHM.

DEIS Section 4.1.2.3 Seismic and Related Hazards; page 4-13	DOGAMI is concerned that the apparently lack of familiarity with seismic hazard assessment procedures evidenced in the DEIS suggests that it may not be relied on to ensure public safety. The DEIS follows the previously referenced statement about probabilistic PGA values for the pipeline with "The University of Washington (2001) noted that these intensities are moderate and relate Instrumental Intensity VIII and a "Moderate to Heavy" potential damage to aboveground structures as described by the Modified Mercalli Intensity scale". There is no place in a modern PSHA discussion for the conflation of probabilistic ground motions with seismic intensities, which very crudely quantify earthquake effects. Intensity is completely irrelevant to designing a pipeline, and its inclusion in this paragraph suggests that the DEIS preparer has little expertise in seismic hazard assessment.	Provide a probabilistic ground motion assessment prepared by a qualified and licensed professional for the entire pipeline using accurate and up to date methods and data.
DEIS Section 4.1.2.3 Seismic and Related Hazards; page 4-14	DOGAMI is concerned that the reliance on literature for determining whether there are active faults along the pipeline alignment may miss potentially hazardous fault crossings and result in a pipeline design that fails to ensure public safety. High resolution lidar is publicly available for approximately 99% of the pipeline alignment, and it should be evaluated by a trained professional geologist for geomorphic evidence of young faults beyond those identified in the literature. In the last 10 years, DOGAMI has identified dozens of previously unknown active faults by this method, and we know that the USGS Quaternary fault database contains only a small percentage of the actual active faults present in Oregon. The issue of inadequate fault hazard analysis was raised in the DOGAMI November 6, 2017 review memo (comments 23, 24, 25, 34) and has still not been adequately addressed.	Conduct a detailed evaluation of lidar topographic data along the pipeline alignment for evidence of Quaternary surface faulting. Follow up on any identified features with appropriate field investigations including trenching if warranted. The assessment must be prepared by a qualified and licensed professional.
DEIS Section 4.1.2.3 Seismic and Related Hazards; page 4-14	DOGAMI is concerned that the DEIS has overlooked or ignored published information about Quaternary faults crossed by the pipeline alignment, and this oversight fails to ensure public safety. Near mile 215, the pipeline alignment crosses the Adams Point Fault, which forms 2-4 m scarps in latest Quaternary lake sediments (DOGAMI Open File Report 03-03). The issue of inadequate fault hazard analysis was raised in the DOGAMI November 6, 2017 review memo (comments 23, 24, 25, 34) and has still not been adequately addressed.	Properly evaluate the hazard associated with the Adams Point fault and design any necessary mitigation measures.
DEIS Section 4.1.2.3 Seismic and Related Hazards; page 4-16	DOGAMI is concerned that scope limiting assumptions about liquefaction hazards may result in liquefaction assessment that is not adequate to ensure public safety. The DEIS states "Areas along the proposed pipeline that are subject to being under water-saturated soils within the pipeline depth…" which implies that there is no concern about liquefaction occurring below the depth of the pipeline trench. Lateral	Liquefaction potential should be evaluated for the entire susceptible section where ever the alignment crosses susceptible soils.

	spreading resulting from liquefaction at depths below the pipeline trench could pose a serious threat to the pipeline even if the soil surrounding the pipeline itself was not liquefied. The issue of inadequate liquefaction hazard analysis was raised in the DOGAMI November 6, 2017 review memo (comments 2, 12, 13, 26) and has still not been adequately addressed.	
DEIS Section 4.1.2.3 Seismic and Related Hazards; page 4-16	DOGAMI concludes that inadequately evaluated or referenced liquefaction evaluations are not adequate to ensure public safety. Table 4.1.2.3-2 lists river or stream crossings with potential liquefaction/lateral spreading hazards but no references or supporting borehole, geotechnical or geologic data for the sites are provided. It is not possible to determine whether the liquefaction potential assessments are adequate in the absence of such data. The issue of inadequate liquefaction hazard analysis was raised in the DOGAMI November 6, 2017 review memo (comments 2, 12, 13, 26, 28, 29) and has still not been adequately addressed.	Provide a detailed, accurate and comprehensive liquefaction hazard analysis and mitigation design with supporting data. The assessment must be prepared by a qualified and licensed professional. For site specific liquefaction and liquefaction consequences evaluations, DOGAMI considers methods outlined in the following as state-of-practice: National Academies of Sciences, Engineering, and Medicine. 2016. *State of the Art and Practice in the Assessment of Earthquake-Induced Soil Liquefaction and Its Consequences*. Washington, DC: The National Academies Press. https://doi.org/10.17226/23474. https://www.nap.edu/catalog/23474/state-of-the-art-and-practice-in-the-assessment-of-earthquake-induced-soil-liquefaction-and-its-consequences
Section 4.13.1.5 FERC Engineering and Technical Review	DOGAMI concludes that the evaluation of potentially active faults near the terminal facility is inaccurate and incomplete and may not ensure public safety. The discussion of the Barview Fault misstates the age of the youngest features	Conduct seismic hazard analyses that include paleoseismic studies of potentially active faults

of the Preliminary Engineering Designs (Earthquakes, Tsunami and Seiche); page 4-735	offset by the fault by millions of years. The DEIS also ignores the Charleston Fault, which offsets Quaternary surfaces 19 m and whose northward projection offshore passes within a few km of the terminal site. The DEIS also makes no note of paleoseismic data that suggests quaternary offset across a buried fault in Pony Slough, immediately south of the terminal site. (Briggs, 1994 PSU Thesis https://pdxscholar.library.pdx.edu/open_access_etds/4739/) The issue of inadequate fault hazard analysis was raised in the DOGAMI November 6, 2017 review memo (comments 23, 24, 25) and has still not been adequately addressed.	that might impact the proposed facilities. Evaluate the potential presence of buried extensions of the Charleston fault or Pony Slough fault near the site. The assessment must be prepared by a qualified and licensed professional.
Section 4.13.1.5 FERC Engineering and Technical Review of the Preliminary Engineering Designs (Earthquakes, Tsunami and Seiche); page 4-735	DOGAMI is concerned that the apparent lack of familiarity with seismic hazard assessment procedures evidenced in the DEIS suggests that it may not be relied on to ensure public safety. The DEIS twice mentions “Affection faulting” or “affecting faulting” which are not terms in use in seismic hazard assessment.	Provide a probabilistic ground motion assessment prepared by a qualified and licensed professional for terminal facilities using accurate and up to date methods and data.
Section 4.13.1.5 FERC Engineering and Technical Review of the Preliminary Engineering Designs (Earthquakes, Tsunami and Seiche); page 4-737	DOGAMI is concerned that the DEIS does not mention certain critical ground motion parameters that are essential for a design that will ensure public safety. For large magnitude Cascadia Subduction Zone earthquakes, the duration of shaking can be in the range of 3-5 minutes, which has a huge impact on the performance of structures and soils. The DEIS has no discussion of this problem. This issue was raised in the DOGAMI November 6, 2017 review memo (comment 1) and has still not been adequately addressed.	Provide a probabilistic ground motion assessment prepared by a qualified and licensed professional for terminal facilities using accurate and up to date methods and data and addressing all relevant ground motion parameters including duration of shaking.
Section 4.13.1.5 FERC Engineering and Technical Review of the Preliminary Engineering Designs (Earthquakes, Tsunami and Seiche); page 4-738	DOGAMI is concerned that the apparent lack of familiarity with seismic hazard assessment procedures evidenced in the DEIS suggests that it may not be relied on to ensure public safety. The DEIS includes a long discussion of the correlation between PGA, Mercalli Intensity and Richter magnitude. This has no relevance to a modern seismic hazard assessment for a project of this scale and importance and calls into question the credibility of this section of the report. Probabilistic spectral ground motion parameters are the standard of practice for evaluating and designing this kind of facility.	Provide a probabilistic ground motion assessment prepared by a qualified and licensed professional for the entire pipeline using accurate and up to date methods and data.

Section 4.13.1.5 FERC Engineering and Technical Review of the Preliminary Engineering Designs (Earthquakes, Tsunami and Seiche); page 4-739	DOGAMI is concerned that the cursory treatment of liquefaction hazards at the JCEP terminal site is not adequate to ensure public safety. Liquefiable soils have been identified throughout the site, and CSZ M 8-9 earthquake ground motions will certainly be large enough to trigger liquefaction. The DEIS appears to leave the management of this known and great hazard to future design work. Liquefaction, along with tsunami inundation and earthquake induced landslides are among the greatest threats to the project's integrity and safety, and all should be rigorously evaluated and have detailed mitigation measures developed prior to approval. The inadequate treatment of this severe acknowledged hazard in the DEIS is completely inconsistent with the risk it poses to the public safety and the scale of mitigation required. The issue of inadequate liquefaction hazard analysis was raised in the DOGAMI November 6, 2017 review memo (comments 2, 12, 13, 26) and has still not been adequately addressed.	Provide a detailed, accurate and comprehensive liquefaction hazard analysis and mitigation design with supporting data. The assessment must be prepared by a qualified and licensed professional.
DEIS page 1-22 Table 1.5.1-1	The Applicant suggests "Review of Structural Designs in Tsunami Zone" is within DOGAMI's purview, which is incorrect.	Based on Building Code Division requirements, the Applicant may be required to consult with DOGAMI "for assistance in determining the impact of possible tsunamis on the proposed development and for assistance in preparing methods to mitigate risk at the site of a potential tsunami."
DEIS page 1-22 Table 1.5.1-1	The DEIS incorrectly refers to Building Code Section 1802.1 for DOGAMI's authority on "Review of Structural Designs in the Tsunami Zone" (which as noted in the above comment is incorrect). Building Code Section 1802.1 includes definitions.	Cite correct Building Code Sections and refer to the correct authorities. Based on Building Code Division requirements, the Applicant may be required to consult with DOGAMI "for assistance in determining the impact of possible tsunamis on the proposed development and for assistance in preparing methods to mitigate risk at the site of a potential tsunami."
DEIS page 4-739	"Jordan Cove conducted hydrodynamic and tsunami	Provide a detailed

	modeling studies for the Project site and indicated a tsunami generated by a megathrust earthquake on the CSZ would present the greatest tsunami inundation risk at the project site and the maximum design tsunami run-up elevation for the project site is no greater than 34.5 feet NAVD 88 including co-seismic subsidence and sea level rise effects."	tsunami hazard analyses prepared by a qualified professional for the proposed facilities and its surroundings. Document the analyses, data, assumptions, results, proposed mitigations, and any issues in a clear manner. Explicitly specify in the DEIS report, which earthquake scenario (L1, XL1, XXL1 or ASCE7) was used for modeling the runup elevation. Per reports +34.5 ft navd88 corresponds to the L1 model scenario.
DEIS page 4-739	"For the Project site and in accordance with more recent tsunami modeling completed for the Southern Oregon Coast (Witter et al. 2011), the estimated subsidence would be on the order of 7.6 feet."	Document the analyses, data, assumptions, results, proposed mitigations, and any issues in a clear manner. Explicitly specify in the DEIS report, that the referenced subsidence is associated with an L1 earthquake scenario.
DEIS page 4-739	"Jordan Cove also indicated that furthermore tsunami protection berms, safety critical elements of the facility, point of support elevations, invert levels and underside of essential equipment, would be at least 1 foot above the estimated maximum run-up elevation and most will be far above that elevation."	Explicitly specify in the DEIS report, which earthquake scenario (L1, XL1, XXL1 or ASCE7) is being referenced here.
2.11.1-JCEP-Final-RR11, p56	"A distant earthquake in Alaska or Japan could result in a tsunami with a relatively long lead-time (12 to 24 hours) before reaching the Oregon coast."	Provide a detailed tsunami hazard analyses, including distant tsunami hazards, prepared by a qualified professional for the proposed facilities and its surroundings. The results should be integrated into tsunami safety plans.

		DOGAMI estimates that an Eastern Aleutian generated tsunami is expected to arrive on the Oregon coast in 3 hours 40 minutes to about 4 hours (Allan et al 2018). Conversely, a Japanese tsunami is expected to arrive on the Oregon coast in as little as 9 hours 40 mins (Allan et al. 2012)
2.11.1-JCEP-Final-RR11, p56	"All ships in Coos Bay, including an LNG carrier, would be directed to depart the harbor by the USCG COTP. LNG carriers at the LNG Terminal will be facing the basin entrance and Coos Bay and would be adequately manned, as required by the USCG, with the ability to get underway in a short time period while berthed. Therefore, the LNG carriers would be able to depart relatively quickly from the LNG Terminal and head out to sea in the event of a distant tsunami, in response to notice and instructions from the USCG COTP."	An evaluation of the time taken to mobilize a vessel and get underway should be described in more detail. Typical large vessel mobilization generally takes at minimum 30 minutes, though times closer to 1 hour are more common (Allan et al, 2018). Consideration should therefore be given to vessel mobilization time, and the time taken to transit along the navigation channel and offshore into deep water prior to the arrival of the tsunamis. For example, a vessel traveling at 12 knots along the 7 mile navigation channel from the JCEP site, will take ~30 minutes to reach the mouth of Coos Bay.
2.11.1-JCEP-Final-RR11, p56	"It is established that it would take approximately 25 to 30 minutes for a large tsunami generated from the CSZ to reach Coos Bay after the earthquake event occurs."	Provide a detailed tsunami hazard analyses, including Cascadia tsunami arrival times, prepared by a qualified professional for the proposed facilities and its surroundings. DOGAMI's analyses indicate that the

		local tsunami arrives @ 24 minutes at the JCEP site. Maximum inundation occurs at 31 minutes.
2.11.1-JCEP-Final-RR11, p56	"This amount of time would be adequate for the terminal to stop loading operations and disconnect from the LNG vessel and use two tug boats already in the slip to counteract the forces placed on the LNG carrier hull by the arriving tsunami."	Bear in mind that the region would be subject to 3-5 minutes of strong shaking, when normal operations would be severely challenged. Hence, this statement seems optimistic at best. Does the presence of the two tugs in the slip mean that these vessels would already be underway?
2.11.1-JCEP-Final-RR11.pdf, p56	"If the LNG carrier is traversing the channel during the tsunami, the tugs would also provide assistance against the force of the tsunami wave coming up the channel as described above."	This statement seems optimistic at best. Recommend JCEP re-evaluates their vessel emergency response plan to a local tsunami.
2.13.1-JCEP-RR13-Public-1-of-7-1.pdf, p64	"A uniform roughness was used for these simulations."	Document the analyses, data, assumptions, results, proposed mitigations, and any issues in a clear manner. Please specify the roughness used.
2.13.3-JCEP-RR13-Public-3a-of-7-2.pdf, p7	"To assess the effect of roughness, M&N simulated Scenario L1 with a composite roughness map where areas below 0.0 MSL (pre-event conditions) have a roughness defined by a Manning number of 0.0313 representing channel conditions and areas above 0.0 MSL (pre-event conditions) have a higher roughness defined by a Manning number of 0.05."	Document the analyses, data, assumptions, results, proposed mitigations, and any issues in a clear manner. Please justify choice of roughness criterion (n=0.05) adopted for areas above 0.0 MSL, versus n=0.0313 used for the seabed.
2.13.3-JCEP-RR13-Public-3a-of-7-2.pdf, p15	"According to a study published by the U.S. Geological Survey in 2008, there is a 10% probability that a CSZ earthquake of magnitude 8–9 will occur over the next 30 years (DOGAMI, 2012)."	USGS (2012) estimated a full margin rupture at 7-12% next 50 years; 37-42% for southern Oregon.

		Goldfinger (2017) revised downward (i.e. more frequent) the recurrence of CSZ earthquakes for the central northern Oregon coast to ~340 years. He estimates that the conditional probability of a major event taking place is 16-22 % chance in the next 50 years.
2.13.3-JCEP-RR13-Public-3a-of-7-2.pdf, p29 to33	"As it can be seen from the figures, the comparison shows a very good agreement between the two models for surface elevation and flow velocities of the leading wave as well as time of tsunami arrival at all stations."	We agree, though note that there are significant phase differences in the tsunami time series after the initial wave arrives. Please explain these discrepancies.
2.13.3-JCEP-RR13-Public-3a-of-7-2.pdf, p34	"Based on the comparison of model results presented in Section 4.0 between M&N and DOGAMI, the simulation used uniform roughness defined by a Manning number of 0.0313 and uniform eddy viscosity defined by a Smagorinsky coefficient of 0.28"	This is confusing. Do you mean another suite of modeling was performed where a uniform surface roughness was used that equaled 0.0313? Please clarify with respect to a previous comment noted above on surface roughness.
2.13.5-JCEP-RR13-Public-4-of-7.pdf, p10	"According to a study published by the U.S. Geological Survey in 2008, there is a 10% probability that a CSZ earthquake of magnitude 8–9 will occur over the next 30 years (DOGAMI, 2012)."	USGS (2012) estimated a full margin rupture at 7-12% next 50 years; 37-42% for southern Oregon. Goldfinger (2017) revised downward (i.e. more frequent) the recurrence of CSZ earthquakes for the central northern Oregon coast to ~340 years. He estimates that the conditional probability of a major event taking place is 16-22 % chance in the next

		50 years.
DOGAMI memo dated November 6, 2017. DOGAMI Comments Related to Geological Hazards and the Proposed Jordan Cove LNG Terminal and Pacific Connector Gas Pipeline.	How the proposed facilities may negatively impact the tsunami hazards in the surrounding areas and safety of people;	This issue was raised in the DOGAMI November 6, 2017 review memo (comment #3) and has still not been adequately addressed. What are the impacts to the surrounding area? What are the tsunami evacuation plans during construction? What are the tsunami evacuation plans during operations? What are negative impacts to the people in the surrounding area and revised evacuation plans for those areas?
DOGAMI memo dated November 6, 2017. DOGAMI Comments Related to Geological Hazards and the Proposed Jordan Cove LNG Terminal and Pacific Connector Gas Pipeline.	Tsunami scour in the nearby area and how the Maximum Considered Tsunami (MCT), that is, the design tsunami, may impact the local landforms, including the dunes, and proposed facilities and safety of people;	This issue was raised in the DOGAMI November 6, 2017 review memo (comment #4) and has still not been adequately addressed.
DOGAMI memo dated November 6, 2017. DOGAMI Comments Related to Geological Hazards and the Proposed Jordan Cove LNG Terminal and Pacific Connector Gas	Dynamic erosion of the North Spit dunes in response to the design tsunami and how it may impact tsunami runup at the proposed facilities and safety of people;	This issue was raised in the DOGAMI November 6, 2017 review memo (comment #5) and has still not been adequately addressed.

Pipeline.		
DOGAMI memo dated November 6, 2017. DOGAMI Comments Related to Geological Hazards and the Proposed Jordan Cove LNG Terminal and Pacific Connector Gas Pipeline.	Tsunami debris impacting the nearby area and how it may impact the local landforms, including the dunes, proposed facilities and safety of people;	This issue was raised in the DOGAMI November 6, 2017 review memo (comment #6) and has still not been adequately addressed.
DOGAMI memo dated November 6, 2017. DOGAMI Comments Related to Geological Hazards and the Proposed Jordan Cove LNG Terminal and Pacific Connector Gas Pipeline.	Section 6.4.1.4 Tsunamis of the Resource Report 6 Jordan Cove Energy Project refers to the existing Trans Pacific Parkway/US- 101 Intersection as being in the tsunami inundation zone. The Applicant states, "To maintain grades, improvements to the intersection will not remove the intersection from the tsunami inundation zone." There appears to be only one access road for the proposed Jordan Cove LNG facility. This access road is in the tsunami inundation zone. In order for the access road to be reliably useable for safety purposes after a future tsunami disaster, it would need to incorporate both earthquake and tsunami resistant designs. These designs would need to factor in potential cyclic strain, liquefaction and lateral spreading from ground shaking. In addition, the designs would need to account for tsunami forces, including flooding, velocities, scour, buoyancy and debris impact. Has this roadway and access to the proposed facilities been evaluated for possible damage due to tsunami forces, such as tsunami scour and tsunami debris impact? Please provide analyses, results and, if needed, proposed mitigation that addresses both post-earthquake and post-tsunami safety for proposed berms, roadways and elevated ground. Related documents should be complete, clearly organized and presented to allow for peer review by qualified specialists.	This issue was raised in the DOGAMI November 6, 2017 review memo (comment #15) and has still not been adequately addressed.
DOGAMI memo dated November 6, 2017. DOGAMI Comments Related to Geological	The Applicant states (on page 8): "The PCGP Project is located in relatively sheltered areas of Coos Bay, where the effects of a tsunami on the pipeline are expected to be relatively minor". DOGAMI requests the tsunami analyses that supports this statement. What tsunami modeling was conducted for the proposed pipeline alignment? What are the tsunami flow depths used to estimate scour potential? Were tsunami scouring forces evaluated for both the	This issue was raised in the DOGAMI November 6, 2017 review memo (comment #18) and has still not been adequately addressed.

Hazards and the Proposed Jordan Cove LNG Terminal and Pacific Connector Gas Pipeline.	incoming (inflow) and outgoing (outflow) tsunami waves?	
DOGAMI memo dated November 6, 2017. DOGAMI Comments Related to Geological Hazards and the Proposed Jordan Cove LNG Terminal and Pacific Connector Gas Pipeline.	The Applicant states (on page 46): "As currently planned the portions of the pipeline that are crossing waterbodies that have the potential to be impacted by tsunami scour, will be installed using trenchless methods at depths well below the potential scour depths. Therefore, tsunami scour is not considered a hazard to the pipeline project." The Applicant further states, "The modeling analysis showed that some temporary scour may occur in Coos Bay along the pipeline during inundation of the tsunami (approximately 1 to 2 hours)." The Applicant indicates that scour from tidal currents and river flows are approximately 3 feet at the pipeline crossing, and "it is recommended to use a 3-foot depth of scour resulting from tsunami impact". DOGAMI requests the Applicant provide information on maximum potential scour depth from a Cascadia tsunami. Also, DOGAMI requests information on the minimum factor of safety the Applicant applied to address the maximum potential scour depth from Cascadia tsunamis along the proposed alignment in greater Coos Bay area.	This issue was raised in the DOGAMI November 6, 2017 review memo (comment #38) and has still not been adequately addressed.
DOGAMI memo dated November 6, 2017. DOGAMI Comments Related to Geological Hazards and the Proposed Jordan Cove LNG Terminal and Pacific Connector Gas Pipeline.	The Applicant, in general, found that their MIKE21 modeling matched the DOGAMI L1 first wave arrival (which reflects the largest wave), although wave amplitudes and phase differences were observed for later wave arrivals. No explanation is provided to account for the latter differences. DOGAMI requests further discussion of differences in the modeling results after the initial wave arrival to account for phase and amplitude differences observed in the modeling results.	This issue was raised in the DOGAMI November 6, 2017 review memo (comment #39) and has still not been adequately addressed.
DOGAMI memo dated November 6, 2017. DOGAMI Comments Related to	DOGAMI requests that the Applicant provide peer reviewed documentation that describes the MIKE21 FM model and its ability to model tsunami inundation. Many issues are unclear, for example, does MIKE21 adequately account for the (vertical) wave runup on the wall and/or composite structure?	This issue was raised in the DOGAMI November 6, 2017 review memo (comment #40) and has still not been adequately addressed.

Geological Hazards and the Proposed Jordan Cove LNG Terminal and Pacific Connector Gas Pipeline.		
DOGAMI memo dated November 6, 2017. DOGAMI Comments Related to Geological Hazards and the Proposed Jordan Cove LNG Terminal and Pacific Connector Gas Pipeline.	DOGAMI requests that the Applicant provide further explanation of the approach used to define the digital elevation model (DEM). In particular, how does the developed grid differ from the tsunami grids generated by NOAA's National Center for Environmental Information (NCEI). These data may be obtained here: https://www.ngdc.noaa.gov/mgg/inundation/tsunami/.	This issue was raised in the DOGAMI November 6, 2017 review memo (comment #41) and has still not been adequately addressed.
DOGAMI memo dated November 6, 2017. DOGAMI Comments Related to Geological Hazards and the Proposed Jordan Cove LNG Terminal and Pacific Connector Gas Pipeline.	DOGAMI requests that the Applicant explain to what extent has the model been tuned to match the DOGAMI L1 scenario and inundation results.	This issue was raised in the DOGAMI November 6, 2017 review memo (comment #42) and has still not been adequately addressed.
DOGAMI memo dated November 6, 2017. DOGAMI Comments Related to Geological Hazards and the Proposed Jordan	DOGAMI requests that the Applicant provide a better depiction of the three cases used to define the design crests. It is unclear whether the design reflects a berm, wall, or a composite structure around the perimeter of the entire complex, or portions of the complex. Please provide figures that characterize the proposed design.	This issue was raised in the DOGAMI November 6, 2017 review memo (comment #43) and has still not been adequately addressed.

Cove LNG Terminal and Pacific Connector Gas Pipeline.		
DOGAMI memo dated November 6, 2017. DOGAMI Comments Related to Geological Hazards and the Proposed Jordan Cove LNG Terminal and Pacific Connector Gas Pipeline.	DOGAMI requests that the Applicant explain why mean high water (MHW) was used as opposed to MHHW (as used by DOGAMI).	This issue was raised in the DOGAMI November 6, 2017 review memo (comment #44) and has still not been adequately addressed.
DOGAMI memo dated November 6, 2017. DOGAMI Comments Related to Geological Hazards and the Proposed Jordan Cove LNG Terminal and Pacific Connector Gas Pipeline.	Values of future sea level rise (SLR) presented by the Applicant are based on existing (historical) trends derived for the Charleston tide gauge. Based on its current rate, estimates were made out into the future (i.e. 30 years). This is an overly simplistic approach that assumes the past is the key to the future and hence discounts possible acceleration of SLR in the future. A more effective approach would be to base future estimates on the National Research Council (2012) SLR study that was completed for the US West Coast. National Research Council estimates account for expected local tectonic changes as well eustatic and steric responses and are a more reasonable (and current) estimates for the future. Please address SLR using current scientific data and methods.	This issue was raised in the DOGAMI November 6, 2017 review memo (comment #45) and has still not been adequately addressed.
DOGAMI memo dated November 6, 2017. DOGAMI Comments Related to Geological Hazards and the Proposed Jordan Cove LNG Terminal and Pacific	Provide analysis of the potential role of sediment erosion of the North Spit dunes caused by the design tsunami. Research on the US East Coast suggests that sediment erosion during a tsunami may be significant and could impact inundation extents and runup (Tehranirad et al., 2015, 2016; Tehranirad, 2016). This notion is also supported by field studies following the March 11, 2011 Tohoku, Japan tsunami (Goto et al., 2012; Tanaka et al., 2012).	This issue was raised in the DOGAMI November 6, 2017 review memo (comment #46) and has still not been adequately addressed.

Connector Gas Pipeline.		
DOGAMI memo dated November 6, 2017. DOGAMI Comments Related to Geological Hazards and the Proposed Jordan Cove LNG Terminal and Pacific Connector Gas Pipeline.	Provide analyses of the potential role of tsunami wave reflection/focusing/defocusing as the tsunami impacts the proposed LNG facilities and its possible public safety implications for the surrounding Coos Bay environment. Tsunami waves that impact against proposed protective structures (e.g., berm, wall or composite structure) and the subsequent transfer of that energy to other areas within the bay is a public safety concern. DOGAMI requests additional modeling for the purposes of addressing public safety. All documents should be complete, clearly organized and presented to allow for peer review by qualified specialists.	This issue was raised in the DOGAMI November 6, 2017 review memo (comment #47) and has still not been adequately addressed.
DOGAMI memo dated November 6, 2017. DOGAMI Comments Related to Geological Hazards and the Proposed Jordan Cove LNG Terminal and Pacific Connector Gas Pipeline.	DOGAMI requests that the Applicant provide analysis of maritime vessels and their potential to become ballistics within the bay be submitted to Oregon Department of Energy as part of the Emergency Response Plan. Maritime evacuation planning in response to the tsunami should be conducted and provided.	This issue was raised in the DOGAMI November 6, 2017 review memo (comment #48) and has still not been adequately addressed.
DOGAMI memo dated November 6, 2017. DOGAMI Comments Related to Geological Hazards and the Proposed Jordan Cove LNG Terminal and Pacific Connector Gas Pipeline.	DOGAMI requests that the Applicant provide analysis on the potential for off-site debris impacting the facilities and the potential ramifications with respect to public safety.	This issue was raised in the DOGAMI November 6, 2017 review memo (comment #49) and has still not been adequately addressed.
DOGAMI memo	DOGAMI requests that the Applicant provide information on	This issue was raised in

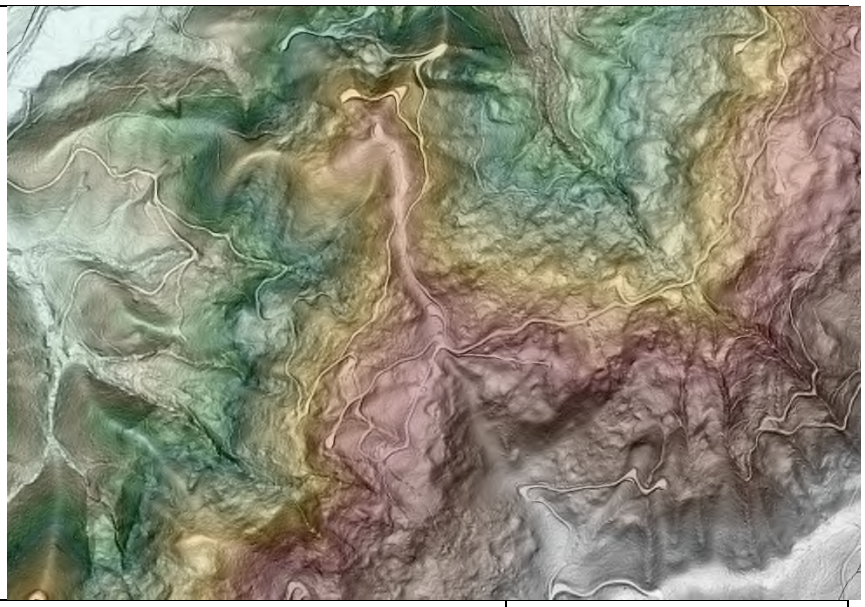
dated November 6, 2017. DOGAMI Comments Related to Geological Hazards and the Proposed Jordan Cove LNG Terminal and Pacific Connector Gas Pipeline.	each of the DEMs used for the tsunami model. For example, were three different DEMs used that reflect the three different case studies: berm, wall and composite structure? Please provide the DEMs.	the DOGAMI November 6, 2017 review memo (comment #50) and has still not been adequately addressed.
DOGAMI memo dated November 6, 2017. DOGAMI Comments Related to Geological Hazards and the Proposed Jordan Cove LNG Terminal and Pacific Connector Gas Pipeline.	Elevated structures, including elevated berms, used for assembly areas in the tsunami inundation zone are subject to ASCE 7-16 chapter 6 requirements. The Applicant must design all elevated structures in the ASCE tsunami zone to be used as assembly areas in accordance with ASCE 7-16 chapter 6 to ensure public safety. Design documents should be complete, clearly organized and presented to allow for peer review by qualified specialists.	This issue was raised in the DOGAMI November 6, 2017 review memo (comment #51) and has still not been adequately addressed.
PCGP RR6 App A.6 Part 1, section 4.5.3.2, page 30	The applicant states it used ODF guidelines and DOGAMI RML hazard zones.	Provide a detailed landslide hazard analyses prepared by a qualified professional using current state of practice methods that include lidar as a base map for the proposed facilities and its surroundings. Document the analyses, data, assumptions, results, proposed mitigations, and any issues in a clear manner. Both the DOGAMI RML and ODF RML methods are for preliminary screening and/or used outdated data sources.

DEIS, p4-18	"Mass-movement of rapid-shallow landslides is typically triggered by large, infrequent storm events."	"infrequent" is a relative term. Define and reference this conclusion. There is data in SLIDO which confirms shallow landslides in the Tyee occurring within basins on the 5-10 year time frame.
DEIS, p 4-18	"These features can usually be identified on topographic maps or aerial photos based on distinctive contour or vegetative patterns."	Lidar has been concluded to be the only definitive method for finding deep slides in western Oregon. Restate the sentence or provide modern reference to support this conclusion or complete mapping using lidar along the entire length of the route. Burns, W. J., 2007, Comparison of remote sensing datasets for the establishment of a landslide mapping protocol in Oregon. AEG Special Publication 23: Vail, Colo., Conference Presentations, 1st North American Landslide Conference.
DEIS, p 4-19	"Shallow-rapid landslides are unlikely to induce long-term strain to a pipeline, but rather more likely to expose the pipe and result in a loss of support where it crosses a debris slide source area."	This is completely site dependent. If the pipe is at the surface, a shallow slide could run into the pipe. Define the situations where this occurs.
DEIS p 4-19	"The purpose of the first phase study was to identify existing landslides as well as areas susceptible to landslides within one-quarter mile of the initial alignment by reviewing published maps and digital data (Burns et al. 2011a, 2011b), aerial photographs and LiDAR-generated hillshade models. The purpose of following two phases was to further evaluate only those landslide hazard sites that represent potentially moderate or high risk to the pipeline, based on the results of the previous phase of evaluation."	SLIDO is a compilation of published data and ranges from very poor older data from decades ago to the best available modern lidar based data. We don't recommend using it to make decisions about where to look

		further and in more detail. Site specific evaluations should be completed using lidar data in order to complete phase 1 correctly and completely.
DEIS p 4-20	"The intent was to identify areas that have some potential to be affected by RMLs so that they would be considered and evaluated appropriately."	Potential Rapidly Moving Landslide Hazards in Western Oregon (Hofmeister et al. 2002) is a preliminary screening tool and based on outdated datasets. Site specific evaluations including modern methods should be completed using lidar data in order to evaluate areas that have potential for shallow landslides.
DEIS p 4-20	"Based on available topographic mapping, no slopes along the pipeline alignment east of MP 166 exceed 65 percent or appear to be at high risk of rapidly moving landslide occurrence."	Conclusions should be supported by modern references. Site specific evaluations should be completed using lidar data to evaluate areas that have potential for shallow landslides.
DEIS p 4-20	"Using LiDAR where available, 10-meter digital elevation model, and aerial photography, Pacific Connector identified moderate and high risk RML sites along the proposed route."	Site specific evaluations should be completed using lidar data to evaluate areas that have potential for shallow landslides.
DEIS p 4-20	"Larger, deep-seated landslides can usually be identified from topographic maps (including LiDAR) and aerial photographs."	Lidar has been concluded to be the only definitive method for finding deep slides in western Oregon. Site specific evaluations should be completed using lidar data to evaluate areas that have potential for shallow landslides. Burns, W. J., 2007,

		Comparison of remote sensing datasets for the establishment of a landslide mapping protocol in Oregon. AEG Special Publication 23: Vail, Colo., Conference Presentations, 1st North American Landslide Conference.
DEIS p 4-21	"the Klamath Falls region (with relatively recent events of magnitudes 5.9 and 6.0) and the Coos Bay region (with the potential for very large, long recurrence interval, Cascadia megathrust events)."	USGS Cascadia ground motion maps predict the effects of a Cascadia will be much further inland that just the Coos Bay region. The entire pipeline route is in a high seismic zone. Revise the sentence to reflect current science on earthquake hazards.
DEIS p 4-21	"Six landslides were identified as posing a moderate to high potential risk and were evaluated further in the field."	This number of landslides is very low compared to what has been recently mapped in areas just north of the pipeline route using lidar based mapping. Lidar has been concluded to be the only definitive method for finding deep slides in western Oregon. We recommend the applicant use lidar data to map the landslides. Burns, W.J., Duplantis, S., Jones, C.B., and English, J.T., 2012. Lidar data and Landslide Inventory Maps of the North Fork Siuslaw River and Big Elk Creek Watersheds, Lane, Lincoln, and Benton Counties: Oregon Department of Geology and Mineral Industries, Open-File Report O-12-

			07. http://www.oregongeology.org/pubs/ofr/p-O-12-07.htm Burns, W.J., Herinckx, H.H., and Lindsey, K.O., 2017. Landslide inventory of portions of northwest Douglas County, Oregon, Oregon Department of Geology and Mineral Industries, Open-File Report O-17-04. Esri geodatabase with internal metadata, external metadata in .xml format, 4 map plates (in both print and onscreen resolutions), scale 1:20,000. http://www.oregongeology.org/pubs/ofr/p-O-17-04.htm
DEIS p 4-21	"Ridgetops are generally considered to be stable"		Provide a modern reference for this statement. Recent mapping in the coast range has found landslides propagating to and over the ridges. See references in above comment.
DEIS p 4-22	"All of the moderate- and high-hazard deep-seated landslides identified along the alignment were avoided"	If lidar and site-specific landslide hazard mapping was not performed to locate these areas, there are likely many areas missed and therefore not "all" are identified or avoided. An example can be seen in the following lidar image of the route from MP89-90. The PCGP mapping in Appendix F identified one landslide on the NE side of the route ridge. However, as a qualified professional can see in the lidar image, landslides are located along both sides of the ridge and on the slope down to the valley towards the NW.	

		
DEIS p 4-22	"All known hazardous landslides thought to pose a risk to the pipeline have been avoided through routing."	If lidar and site-specific landslide hazard mapping was not performed to locate the hazardous areas, there are likely many hazards missed and therefore not "all" have been identified or avoided.
DEIS p-4-22	"Following Pacific Connector's proposed BMPs described in the ECRP would limit potential adverse impacts on slope stability for those side slopes segments that are less than 30 percent gradient. In general, these BMPs include using well-drained structural fill placed in lifts and compacted for the side slope sites with gradients of 30 percent or greater oriented perpendicular to the pipeline."	Using slope gradient alone does not work in areas of existing landslides. Many deep landslides are on slopes with very low gradients. A critical component is identifying where the existing landslides and hazards are located and addressing each one individually regardless of slope gradient. Even small amounts of grading on existing landslides can cause significant problems.
DEIS p 4-23	"Monitoring higher-risk areas along the pipeline can aid in detecting landslide occurrence and movement so that action can be taken to prevent damage to the pipeline."	This method only applies to very limited group of types of landslides and triggering types. For example, during a future

		Cascadia earthquake, it will be very difficult to monitor, detect movement and take action before the co-seismic landslides have already moved and damaged the pipeline.
DEIS p 4-24	"Although the pipeline route does not cross active or recently active landslides, if any landslides do occur or become reactivated after the pipeline is installed, Pacific Connector would monitor the slide movement so that mitigation can be identified and implemented prior to damage occurring to the pipeline."	This unsubstantiated conclusion needs analyses and data to support it. For example, collecting lidar for the entire route and mapping all the existing landslides and evaluating them.
PCGP RR6 App A.6 part 1, page 28	"Some of the Pipeline route adjustments intended to avoid identified hazards, as well as land acquisition issues, resulted in route alignments that extended outside the area of LiDAR coverage. Supplemental LiDAR and aerial photograph data were acquired for many of these localized reroute areas. Nevertheless, some of the later reroute alignments are currently outside the area of LiDAR and aerial photograph coverage."	DOGAMI recommends the Applicant obtain high resolution lidar for all areas that may impact the proposed facilities or pipeline along the proposed route. Lidar coverage should be collected with enough buffer distance to characterize potential seismic and landslide hazards. For example, for landslide hazards, the lidar should include from the valley bottom to the top of the ridge. Also, there is publicly available lidar data along most all of the pipeline route as well as statewide aerial photography. Please evaluate the potential large landslides keeping in mind that landslides may extend from the tops of ridges and may move downslope to block rivers. In addition, lidar should be used to evaluate seismic sources. The issue of inadequate

		landslide hazard analysis was raised in the DOGAMI November 6, 2017 review memo (comment #35) and has still not been adequately addressed.
PCGP RR6-AppA.6-part 1, p28	"However, most landslides can be placed in two general categories: (1) shallow-rapid landslides (debris slides/flows); and (2) deep-seated landslides."	Provide a comprehensive, detailed landslide hazard analyses prepared by a qualified professional for the proposed facilities and its surroundings. Document the analyses, data, assumptions, results, proposed mitigations, and any issues in a clear manner. Co-seismic lateral spreads are an important type of landslide which could affect the facility and pipeline.
PCGP RR6-AppA.6-part 1, p29	"generally greater than 50 percent"	Document the analyses, data, assumptions, results, proposed mitigations, and any issues in a clear manner. Provide references for all numbers.
PCGP RR6-AppA.6-part 1, p29	"DOGAMI, in cooperation with other agencies, produced a map of Potential Rapidly Moving Landslide Hazards in Western Oregon (Hofmeister et al., 2002)."	This map is considered for preliminary screening and was created before lidar data became widely available. Site-specific evaluation of RML should be performed by the consultants using lidar data and modern methods. The issue of inadequate landslide hazard analysis was raised in the DOGAMI November 6, 2017 review memo (comment #37) and has still not been adequately addressed.
PCGP RR6-	"The source, transport and depositional zones comprising	This map (DOGAMI IMS-

AppA.6-part 1, p30	the RML hazard areas were not differentiated on the maps/GIS data provided by DOGAMI."	22) is considered for preliminary screening and was created before lidar data became widely available. It is also not intended to make site-specific decisions. In this example, the IMS-22 data appears to be further misused to make non-site-specific evaluations. Site-specific evaluation of RML should be performed by the consultants using lidar data and modern methods. The issue of inadequate landslide hazard analysis was raised in the DOGAMI November 6, 2017 review memo (comment #36) and has still not been adequately addressed.
PCGP RR6-AppA.6-part 1, p31	"The initial relative risk to the Pipeline posed by the source, transport and depositional zones are considered to be high, moderate and low, respectively."	Provide a reference or documentation for this unsubstantiated conclusion. Debris flow depositional areas can be extremely dangerous and impactful depending on the size of the event. Concluding the risk is "low" for these areas needs substantial support from referenceable scientific studies.
PCGP RR6-AppA.6-part 1, p32	The greatest potential for reactivating large, deep-seated landslide movement is from human activity, seismic activity, stream erosion, and/or above-normal precipitation that extends over several months or years.	Provide a reference or documentation for this unsubstantiated conclusion.
PCGP RR6-AppA.6-part 1, p32	"The Pipeline is located within 1,000 feet and is upslope or downslope of the landslide"	Provide a reference or documentation for the unsubstantiated conclusion that 1,000 ft is far enough up or downslope to examine. Landslides should be

		evaluated to the extent for which they could impact the pipeline.
PCGP RR6-AppA.6-part 1, p33	"Surficial, geomorphic and vegetative features suggest that the landslide is active or dormant-historic (past movement less than 100 years ago) (Keaton and Degraff, 1996)."	Landslide age should not be used to determine hazard or risk.
PCGP RR6-AppA.6-part 1, p33	"Alignment is at a proximity that is sufficiently far from the landslide"	Provide a reference or documentation for the unsubstantiated conclusion that "sufficiently far" is far enough for the pipeline to be safe.
PCGP RR6-AppA.6-part 1, p34	During this phase, routing specialists were consulted to identify potential alternative routes around moderate to high risk landslides that appeared to be active or to have the potential to reactivate.	Analysis of risk should be quantitative using acceptable state-of-practice methods. For example, "landslides that appeared to be active or have potential to reactivate" is very vague and not conclusive.
PCGP RR6-AppA.6-part 1, p34	4.6. Landslide Hazard Avoidance and Minimization of Adverse Effects	If lidar and site-specific landslide hazard mapping was not performed to locate these areas, there are likely many areas missed and therefore not "all" are identified or avoided.
PCGP RR6-AppA.6-part 1, p35	"To ensure long term stability, it is important that fill slopes constructed at gradients of 30 percent or greater be engineered."	A simple slope gradient is not sufficient to identify where engineered cuts and fills should be performed. For example, many deep landslides have slopes much less than 30 percent.
PCGP RR6-AppA.6-part 1, p35	"Perforated drains should be surrounded by 12 inches of drain rock and all of which wrapped in a geotextile filter fabric."	If water is being collected at the surface or subsurface, a plan for where the water will be discharged is critical. Provide a water plan including collection and discharge. Discharging water in a non-designed

		method can cause slope instability. Using lidar to map all the existing landslides along the entire length of the pipeline route on both sides of the route all the way to the ridge top or all the way to the valley bottom is the only way to ensure discharging of water will not increase slope instability.
PCGP RR6-AppA.6-part 1, p35	4.6.2.1. SURFACE AND NEAR SURFACE WATER MANAGEMENT	If water is being collected at the surface or subsurface, a plan for where the water will be discharged is critical. Provide a water plan including collection and discharge. Discharging water in a non-designed method can cause slope instability. Using lidar to map all the existing landslides along the entire length of the pipeline route on both sides of the route all the way to the ridge top or all the way to the valley bottom is the acceptable way to help ensure discharging of water will not increase slope instability.
PCGP RR6-AppA.6-part 1, p37	"During Pipeline construction, qualified professionals with experience in slope stability will observe Pipeline construction within the identified landslides. If indications of instability are observed, necessary mitigative actions will be taken."	Pre-construction, construction, and post-construction stability analysis should be performed before the project is started so that potential adverse effects can be identified and mitigation prior to construction.
PCGP RR6-AppA.6-part 1,	The proposed PCGP Pipeline does not cross known active or recently active landslides that require installation of	If lidar and site-specific landslide hazard mapping

p37	instrumentation. The ancient landslides crossed by the proposed PCGP Pipeline alignment will be monitored as part of the system-wide monitoring conducted by PCGP.	was not performed to locate these areas, there are likely many areas missed and therefore not "all" hazards have been identified nor avoided. Provide a detailed landslide hazard analyses prepared by a qualified professional using current state of practice methods that include lidar as a base map for the proposed facilities and its surroundings. Document the analyses, data, assumptions, results, proposed mitigations, and any issues in a clear manner.
DOGAMI memo dated November 6, 2017. DOGAMI Comments Related to Geological Hazards and the Proposed Jordan Cove LNG Terminal and Pacific Connector Gas Pipeline.	Dependencies on existing infrastructure, such as roads and levees, which may fail during disasters causing safety concerns;	This issue was raised in the DOGAMI November 6, 2017 review memo (comment #7) and has still not been adequately addressed.
DOGAMI memo dated November 6, 2017. DOGAMI Comments Related to Geological Hazards and the Proposed Jordan Cove LNG Terminal and	On the basis of Oregon Administrative Rules per Division 21, OAR 345-021-0010(1)(h)(F)(i-ii), which states: "(i) An explanation of how the applicant will design, engineer, construct and operate the facility to integrate disaster resilience design to ensure recovery of operations after major disasters. (ii) An assessment of future climate conditions for the expected life span of the proposed facility and the potential impacts of those conditions on the proposed facility" (Accessed from: https://secure.sos.state.or.us/oard/viewSingleRule.action?ruleVrsnRsn=234447), DOGAMI encourages designing and	This issue was raised in the DOGAMI November 6, 2017 review memo and has not been adequately addressed.

Pacific Connector Gas Pipeline.	building for ***disaster resilience*** and ***future climate*** using science, data and community wisdom to protect against and adapt to risks. This will allow people, communities and systems to be better prepared to withstand catastrophic events and future climate—both natural and human-caused—and be able to bounce back more quickly and emerge stronger from shocks and stresses. This includes: • Using best practices supporting public safety • Using a long-term view to protect citizens, property, environment, and our standard of living • Integrating resilience, where possible, by avoiding high risk areas or embracing higher performance standards than may be required by building codes and regulations. This will lessen damage and speed recovery after disasters and improve continuity of operations.	

Oregon Department of Land Conservation and Development

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DLCD is Oregon's designated coastal management agency statutorily responsible for acting on the required certification of consistency with the Oregon Coastal Management Program (OCMP) pursuant to Section 307 (c)(3)(A) of the Coastal Zone Management Act (CZMA). An applicant for any federally-permitted project must obtain a CZMA consistency concurrence for the federal permit or license to be valid in Oregon's coastal zone.

These comments focus on the deficiencies of the Draft Environmental Impact Statement (DEIS) as guided by the implementing regulations for NEPA documents at 40 CFR Part 1502 and 18 CFR Part 380. DLCD submits these comments with the perspective that deficiencies in DEIS information, regarding the assessment (or lack thereof) of impacts and the resulting mitigation from the assessed impacts, affects the federal consistency review process. DLCD uses NEPA documents, like the Federal Energy Regulatory Commission's (FERCs) DEIS, to evaluate the coastal effects of a proposed project per the federal consistency regulations at 15 CFR Part 930. A CZMA coastal effects evaluation includes reasonably foreseeable effects to natural resources and cultural resources, as well as impacts to economics, aesthetics, and recreation reliant on coastal resources. Comments we submitted during the Notice of Intent (NOI) scoping period in 2017 emphasized the necessity of a robust and comprehensive DEIS in order to be able to conduct an adequate review to determine consistency of this federally-licensed and permitted project with the OCMP. Although other state agencies have identified issues that may apply to the entire project under their respective jurisdictions, for CZMA consistency review, DLCD focuses on our coastal partners' issues and concerns within Oregon's coastal zone. Detailed information for any coastal partner issue included below is provided in each state agency comment section. State agency comment sections may raise additional issues as well.

In the published NOI, FERC staff identified issues (pg 7-8) that merited attention and inclusion in the relevant sections of the DEIS (40 CFR § 1502.9). Additionally, Oregon state agencies identified additional issues, including those related to enforceable policies of Oregon's networked coastal program, in comments to the FERC on August 15, 2017. The DEIS should have thoroughly address those identified issues in order to provide an assessment of impacts and mitigation for impacts in Oregon's coastal zone. Table 1 lists the issues identified by FERC staff and state coastal partners of the OCMP, to what extent the issue was analyzed in the DEIS, what is missing from the FERC's analysis, and the relevance of the information and analysis to federal consistency review.

Table 1. Topics identified in Notice of Intent or in scoping period comments and remaining deficiencies in the DEIS with relationship to the CZMA federal consistency review process.

Issues	Source	Extent Analyzed in 2019 DEIS	Missing from 2019 DEIS	Relationship to CZMA Analysis
Reliability and safety of LNG carrier traffic and natural gas pipeline	Commission Staff in NOI	Section 4.10.1.1 Marine Traffic Section 4.13.1.3 Safety and Reliability focuses on collisions with LNG carriers. Conclusion Section 5.1.10: Increased marine traffic would be less than historic ship traffic and so no significant impact to other marine traffic.	--Safety of other commercial and recreation vessels, aside from collisions with LNG carriers (*i.e*. increased wait times to enter Coos Bay in changing weather conditions because of LNG carrier security zone) --Time of year 70 construction vessels or 120 LNG carriers will be present. If all year, how will vessels safely navigate winter weather conditions or location of anchorage if within Territorial Sea if not able to enter bay. --Locations where marine traffic can wait safely in bay while LNG carrier passes. See Figure 1 based on a carrier 50 yards wide. --No discussion regarding what maximum size carrier the bay can accommodate safely.	Coastal effects evaluation for local coastal economies.
Impacts to aquatic resources from dredging access channel and slip and pipeline crossings	Commission Staff in NOI	Section 4.3 Water Resources and Wetlands Section 4.6 T&E Species Appendix H: Lists temporary and permanent impacts Conclusion Section 5.1.3.1; 5.1.3.2; 5.1.3.3:	--Please see DEQ comments for detailed information for missing analysis regarding water quality. --Please see ODFW comments for detailed information on missing analysis regarding: --Fish, wildlife, and associated habitats; e.g. the deepwater draft slip; salinity intrusion from dredging; impacts to aquatic organisms; and other aquatic concerns. Lack of assessment of riparian and	Coastal effects evaluation for impacts to natural/cultural resources and related local coastal economies.

		No significant impacts	steep slope impacts of the pipeline project. --Mitigation for temporary impacts to aquatic resources is a concern. Applicant and DEIS have specified mitigation actions for permanent impacts, however, the DEIS does not identify the temporary impacts fully for both JCEP and PCGP or propose mitigation. (*i.e.* impacted wetlands on pipeline route may take 4+ years to recover ecological function from pipeline impacts). --Mitigation for temporally related habitat function impacts. --Without specified mitigation that is tailored to address fish and wildlife habitats/ecology, it is not possible to balance impacts with offsets and come to a conclusion regarding total environmental impacts for the project.	
Potential impacts on the LNG terminal resulting from an earthquake or tsunami	-Commission Staff in NOI -State of Oregon scoping period comments; DOGAMI comments August 15, 2017; pg 8	Section 4.1 Geological Resources Section 4.13 Reliability and Safety	-- Please see DOGAMI comments for detailed information regarding missing analyses including the following topics: -- Geologic hazards have not been comprehensively identified, addressed in the DEIS, nor mitigation proposed for impacts. -- Dependencies on existing infrastructure, such as roads and levees, which may fail during disasters causing public and environmental safety concerns have not been	Coastal effects evaluation for impacts to local coastal economies and natural/cultural resources.

			included. --Tsunami hazards analyses, including tsunami hazards with the proposed channel and estuarine modifications from related Port project, specifically how currents, debris and ballistics may negatively impact the surrounding areas and safety of people, have not been included. --An explanation of how the applicant will design, engineer, construct and operate the facility to integrate disaster resilience design to ensure recovery of operations after major disasters. --An assessment of future climate conditions for the expected life span of the proposed facility and the potential impacts of those conditions on the proposed facility -- ASCE 7-16 (issued 2016) design standards include tsunami requirements, while the older versions do not. No discussion regarding new tsunami requirements or why most recent standards were not used.	
Impacts of pipeline construction on federally listed threatened and endangered species including northern	Commission Staff in NOI State of Oregon scoping period comments; ODFW comments August 15,	Section 4.6 lists impacts to federally listed species throughout. May affect and likely to adversely affect 12 species. Section 4.7 lists	--Please see ODFW comments for detailed information regarding missing analyses. --The DEIS notes some mitigation (*i.e.* older stand management); however, without specific assessment of impacts in relation to mitigation it is difficult to balance effects and come to a	Coastal effects evaluation for impacts to natural/cultural resources and local coastal economies (salmon; recreational and commercial).

spotted owl, marbled murrelet, and salmon	2017; pg 15-34	total late successional (old) forest acres on BLM land. 159.19 acres, BLM Coos Bay District, Section 2.1.7 Non-federal land mitigation still in development. Section 5.1.6 states no mitigation has been proposed by applicant to date.	conclusion regarding total environmental impacts for the project.	
Impacts of pipeline construction to private landowners including the use of eminent domain	Commission Staff in NOI	Section 2.3.2 Statement of ability for Project to use the right of eminent domain	--Entire analysis of impacts of exercising eminent domain on landowners, livelihoods, land-associated businesses, and property values.	Coastal effects evaluation for impacts to coastal economies.
Cumulative effects from additional large-scale projects in Coos Bay; particularly related Channel Modification project.	State of Oregon scoping period comments; ODFW comments August 15, 2017; pg 15	Section 4.14: Statements acknowledge cumulative effects of the Port's Channel Modification throughout. Acknowledged project is likely to have the largest contribution to cumulative impacts on Coos Bay. (pg 4-794) Appendix N lists	--Please see ODFW comments for detailed information regarding missing analyses including: --Limited analysis of impacts and lack of quantification of mitigation to offset impacts including, but not limited to: cumulative cubic yards, cumulative duration of disturbance in the waterway, cumulative conversion of shallow to deep-water habitat, cumulative changes in water current, cumulative changes to natural and conservation estuary management units in	Coastal effects evaluation for impacts to natural/cultural resources and economics.

		total acres whether upland or aquatic) from all regional projects.	Bay, cumulative mitigation for permanent aquatic habitat changes including oyster, clam, shrimp, crab and other aquatic ecosystem-dependent economies. --Unable to locate Table 4.14.2.3-1 as reference in Section 5 (pg 5-11). Projects with largest estuarine impacts warrant deeper, quantifiable cumulative analysis.	
Impacts to non-listed species and upland habitats and associated mitigation for impacts.	State of Oregon scoping period comments; ODFW comments August 15, 2017; pg 28	Section 2.1.7 Non-federal land mitigation still in development. Section 4.6 briefly describes state listed species.	-- Please see ODFW comments for detailed information regarding missing analyses including the following: -- No analysis for state species of concern, habitats of concern, state protected wildlife, associated mitigation for species habitats via state's habitat mitigation policy.	Coastal effects evaluation for impacts to natural/cultural resources

Additional topics of concern that are not sufficiently addressed in the DEIS are in Table 2.

Table 2. Additional deficiencies of the DEIS identified by DLCD.

Topic	Sections/Pages	Missing from 2019 DEIS	Relationship to CZMA Analysis
Impacts of spatial restrictions of channel use to recreational and commercial fisheries. Please see Figure 1.	Section 4.8.1.1 JC Terminal Recreation and Visual Resources: Acknowledges impacts to crabbing/clamming, boating, and fishing because of LNG carrier security zone (pg 4-540-541) Section 4.9.1.7 Recreation/Tourism and 4.9.1.8 Commercial	Analysis regarding economic impacts from LNG carrier security zone requirements (*i.e*. missing preferred fishing times, tides, or other critical natural resource timing issues due to 2-3.5 hour delay (page 2-14) while LNG carrier is in navigation channel). The time estimation in Section 4.8 (pg 4-541) conflicts with information on pg 2-14 and also on pg 4-598 (20-30 minutes). Bar pilots guiding commercial ships report passing approx. 6 recreational boats (pg 4-541) and 2 commercial fisheries boats (pg 4-597) per trip. The width of carrier plus security zone (likely 500 yard radius around moving ship (pg	Coastal effects evaluation for impacts to local coastal economies from safety considerations and associated delays

	Fishing: Acknowledges impacts from LNG carrier security zone (4-596-598). Sections 5.1.8.1 and 5.1.9 Conclusion: No significant impacts commercial or recreational fisheries vessels or economies.	4-623)), is approximately ¾ of a mile (See Figure 1). No spatial analysis of security zone for LNG carrier including pinch points, safe waiting areas, vessel delays, and associated impacts to fisheries-dependent economies. The security requirements for LNG carriers are not similar to other deep-draft vessel use of the channel, warranting additional analysis.	
Impacts to regional resources and economy from global climate change due to additional atmospheric carbon inputs	Section 4.14: Cumulative Impacts Acknowledges broad impacts to nation from climate change. (pg 4-804-807).	Analysis does not include unique challenges to coastal region from: climate change and sea level rise, decreased income for natural resource-dependent economies, or increased wildfire. Analysis does not include alternative to require stricter emission mitigation, or mitigation to offset regional impacts.	Coastal effects evaluation for impacts to local coastal economies and natural resources.
Impacts to culturally-important resources in project area (Terminal and pipeline)	Section 4.11 Cultural Resources; Acknowledges the TCP nomination document as part of an impending ethnographic study (pg 4-637). Appendix L: Tables within list many sites in need of further survey and testing or that are currently unevaluated. L-13 mentions TCP and need to assess.	The DEIS does not include relevant information compiled in the traditional cultural property historic district nomination document or the impending ethnographic study from the applicant. Without the information, impacts cannot be assessed, or alternatives identified to avoid, minimize, or mitigate impacts to resources.	Coastal effects evaluation for impacts to cultural resources.

Of most concern to DLCD are the sweeping mitigation and inventory recommendations that rely on the applicant providing the FERC information after issuance of the certificate order for the proposed project. That approach denies other permitting processes at the federal and state level, including federal consistency review, necessary information. Oregon created a networked coastal program, which means

coastal partners and their state authorities are part of the federal consistency review currently under way. Relying on mitigation agreements after the certificate order, leaves partner state agencies without the information necessary to process permits and make decisions, including DLCD. A particular example is Recommendation #6 (pg. 5-13), which requires to the applicant to request and allows FERC to approve major alterations after order issuance ("minor field adjustments," as defined in the DEIS, do not require FERC approval). Such alterations would likely require permit modifications by various state agencies in the coastal zone, and depending upon the significance of the change, implicate an additional federal consistency review per 15 CFR § 930.66. Similar challenges exist for Recommendation #33 for cultural resource inventories and associated plans and comments. Many of these 'post-order' conditions circumvent the state's opportunity to analyze impacts and provide the FERC comments on the extent of impacts and adequacy of mitigation for a broad array of issues in order to inform the final EIS.

The deficiencies of the DEIS identified above and the lack of analysis for relevant topics identified by FERC staff and state coastal partners lead DLCD to recommend that FERC prepare a revised or supplemental DEIS document, as provided for in 40 CFR § 1502.9, that includes the missing environmental analysis with an additional opportunity for public comment before moving toward a final EIS. Without necessary data and information, and adequate analysis of the project impacts, DLCD will be challenged to use the EIS to come to a decision regarding the applicant's certification statement for consistency with the OCMP.

Additionally, FERC should consider detailed comments each coastal partner agency offers in this comment document, not only because they identify deficiencies in the DEIS, but also because the missing information is relevant to analysis of OCMP enforceable policies for the federal consistency review of this proposed project. Each partner agency has provided specific issues related to their mission and regulatory authority. Table 3, below, details information gaps and coastal zone impacts that remain of concern in the DEIS and that are explicitly related to enforceable policies of the OCMP. This list is not exhaustive, however marks major issues that have been ongoing for the duration of the proposed project. If the information remains outstanding and the state agency concern is not ameliorated, it will affect the ability of FERC to issue a license that is consistent with the OCMP. DLCD recommends that FERC resolve these issues before issuance of the final EIS, as well as include them in the final EIS, not only to fully address impacts and mitigation associated with impacts from the project, but also to help align the project more fully with the OCMP.

Table 3. Outstanding issues in the DEIS that are related to CZMA federal consistency review in the Coastal Zone portion of the proposed project. Table 3 is demonstrative; not exhaustive. Additional details for each issue, as well as additional issues, are in each coastal partner comment section. Additional enforceable policies may apply for issues listed.

Broad Issue/Concern	Coastal Partner	Applicable OCMP Enforceable Policy (not exhaustive)
Upland mitigation and temporal mitigation that directly addresses specific impacts for fish and wildlife for the pipeline route. Mitigation noted in DEIS is exclusively for federal lands (currently none on non-federal land; pg 2-36; Section 2.1.7). Mitigation actions address federal lands management goals and may not provide net benefit for fish	ODFW	ORS 496.012

and wildlife.		
Avoidance of Category 1 habitat.	ODFW	ORS 496.012; ORS 496.182
Mitigation for T&E species (no proposed mitigation; pg 5-5; Section 5.1.6)	ODFW, ODA	ORS 496.012; ORS 506.109; ORS 564.115; ORS 564.120
Salvage plans and permits (incidental take) for aquatic construction; protected wildlife have been acknowledged, but not completed by applicant.	ODFW	ORS 496.012; ORS 506.109
Fish passage requirements for crossings.	ODFW	ORS 509.585; ORS 509.610
Ability of project to meet water quality standards such as turbidity, biocriteria, and applicable statewide narrative criteria.	DEQ	Various provisions in ORS chapter 468B
Adequacy of plans for turbidity, sedimentation, dredge material management, construction and post construction stormwater.	DEQ	Various provisions in ORS chapter 468B
Analysis demonstrating avoidance/minimization of wetland impacts at individual wetland/waterway scale.	DSL	ORS 196.800; ORS 196.805; ORS 196.810; ORS 196.815; ORS 196.818; ORS 196.825; ORS 196.830; ORS 196.845; ORS 196.855; ORS 196.880; ORS 196.905
Alternatives to selected dredge material disposal sites and methods.	DSL	ORS 196.800; ORS 196.805; ORS 196.810; ORS 196.815; ORS 196.818; ORS 196.825; ORS 196.830; ORS 196.845; ORS 196.855; ORS 196.880; ORS 196.905
Alternative analysis for size and shape of slip and access channel.	DSL	ORS 196.800; ORS 196.805; ORS 196.810; ORS 196.815; ORS 196.818; ORS 196.825; ORS 196.830; ORS 196.845; ORS 196.855; ORS 196.880; ORS 196.905
Identification of sources and release sites of hydrostatic testing water to avoid out-of-basin diversions, impacts, and identify alternatives.	WRD	Various provisions in ORS chapters 536 and 537
Identification of water sources for project needs like dust control to understand impacts and identify alternatives.	WRD	Various provisions in chapters 536 and 537
Identification of water sources that may result in changes to established diversion locations.	WRD	Various provisions in chapter 537

Lastly, the DEIS provides a general discussion of the required CZMA consistency certification at section 1.5.1, and a brief analysis for the certification at section 1.5.1.8, section 4.7.1.2, and 4.7.2.3. Specifically, there is a recommended condition at 4.7.1.2 that states:

> "Jordan Cove and Pacific Connector should not begin construction of their respective Project facilities until the companies each file with the Secretary a copy of ODLCD's determination of consistency with the CZMA" (DLCD's emphasis added).

It is unclear whether, or in what manner, FERC could or would enforce this condition. In particular, the use of the word "should" in directing the applicants to not begin construction prior to filing the required consistency certification makes this condition advisory in nature.

The requirement of the CZMA is clear and unambiguous: any license provisionally granted by the FERC is not valid until Oregon has formally concurred with the applicant's certification of consistency. There is specific purpose for the requirement that concurrence with the state's consistency certification is issued before federal permits; that purpose is to ensure that state program requirements have been fully considered and incorporated into any final federal decision. The implementing regulations of the CZMA clearly anticipate and authorize state-imposed conditions to modify a project in order to achieve consistency. Specifically, the provisions of 15 CFR § 930.62(d), state:

> "During the period when the State agency is reviewing the consistency certification, the applicant and the State agency should attempt, if necessary, to agree upon conditions, which, if met by the applicant, would permit State agency concurrence. The parties shall also consult with the Federal agency responsible for approving the federal license or permit to ensure that the proposed conditions satisfy federal as well as management program requirements (see also § 930.4)."

15 CFR § 930.4 further states:

> "Federal agencies, applicants, persons and applicant agencies should cooperate with State agencies to develop conditions that, if agreed to during the State agency's consistency review period and included in a Federal agency's final decision under subpart C or in a Federal agency's approval under subparts D, E, F or I of this part, would allow the State agency to concur with the federal action."

Given that the federal consistency review could result in state-imposed conditions to modify the project, FERC must know the outcome of this review before issuing a decision. However, most importantly, if FERC does issue a license provisioned on obtaining a concurrence from Oregon, it is a matter of federal regulation that the applicant does not begin construction prior to a federal consistency decision. Based on these requirements of the CZMA, DLCD requests that the recommended condition at section 4.7.1.2 be changed to reflect Condition #30 (Section 5.2, pg 5-19) and language altered to be consistent throughout the EIS. The FERC should clarify that pursuant to CZMA § 307 (c)(3)(A), the FERC license is not effective until Oregon concurs with the applicant's consistency certification and that any conditions included with the concurrence will become conditions of the FERC license.

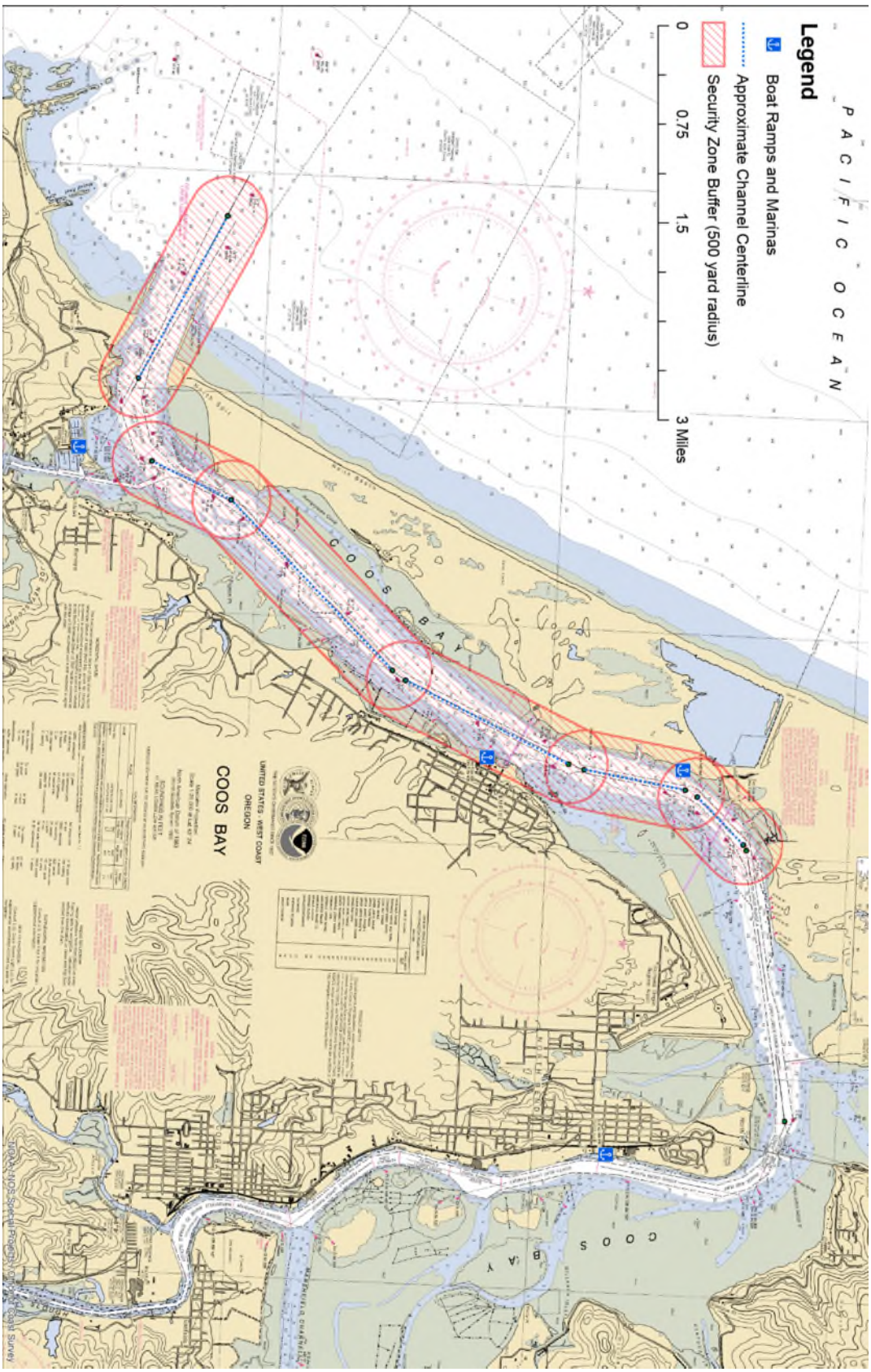
Legend
Boat Ramps and Marinas
Approximate Channel Centerline
Security Zone Buffer (500 yard radius)
0
0.75
1.5
3 Miles
PACIFIC OCEAN
COOS BAY
COOS BAY
UNITED STATES - WEST COAST
OREGON

Figure 1

Oregon Parks and Recreation Department, State Historic Preservation Office

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As a federal undertaking, compliance with the National Historic Preservation Act (NHPA), specifically, Sections 101 and 106 is necessary for the Jordan Cove Energy Project. The SHPO, as well as other consulting parties, have defined roles in the Section 106 process, included in the implementing regulations (36 CFR 800). Many of our comments below relate directly to the 36 CFR 800 process, which is separate from, but can be coordinated with the National Environmental Policy Act (NEPA) review.

The NHPA review is addressed in the document, and summarized in the Conclusions and Recommendations (5.1) section of the DEIS. In that section FERC states that the cultural resources investigations are incomplete; that they have not yet completed the process of complying with Sections 101 and 106 of the NHPA; and that consultation with tribes, SHPO and applicable federal land-managing agencies have not been concluded. FERC additionally recommends that Jordan Cove and Pacific Connector "not construct or use any of their proposed facilities, including related ancillary areas for staging, storage, temporary work areas, and new or to-be-improved access roads, until all studies and consultation necessary to complete compliance with the NRHP have been completed. A memorandum of agreement (MOA) is recommended to address adverse effects and define treatment plans to mitigate impacts." Regarding these conclusions and recommendations, please consider the following:

Consultation with SHPO
As mentioned above, FERC acknowledges that consultation has not concluded. Consultation is addressed throughout the document, such as on Page 1-27 to 1-28, where it states: "The FERC is responsible under Section 106 and its implementing regulations, to consult with the Oregon State Historic Preservation Office (SHPO), identify historic properties within the APE, and make determinations of NRHP eligibility and project effects, on behalf of all the federal cooperating agencies." On page 4-633 it further states that consultations began with the issuance of the Notice of Intent (NOI) on June 9, 2017. On the following page, it states that previous versions of the projects between 2006 and 2015 informed FERC's current consultations.

While useful for understanding the long history of the undertaking, Oregon SHPO wishes to caution FERC that prior consultations from 2006 to 2015 are less applicable, because in many ways the undertaking is very different. The facility has changed, pipeline routes have changed, staffs have changed, and our understanding of effects to historic properties have become more informed. Due to these changes, meaningful, early and often consultation would provide a solid foundation for compliance with Section 101 and 106 of the NHPA. However, consultation with the lead federal agency has been sporadic, general, and consequently, not meaningful as would be hoped for such a large and complex undertaking.

For example, consultation for the current undertaking is primarily described as the mass- mailed scoping document NOI. Our office responded to the NOI, identifying it as a scoping document, and not consultation. That being said, there was a reference to the need for consultation (per 36CFR800.4) in the NOI, where FERC states: "The project-specific Area of Potential Effects (APE) will be defined in

consultation with the SHPO as the Project develops." Our office responded in a June 27, 2017 letter stating that we looked forward to consulting with FERC on the APE. Our response letter to the NOI is referenced in Appendix L, where under the column heading Purpose/Description it reads: "SHPO will assist FERC staff with the development of a definition for the area of potential effects (APE) for the new project". However, since that letter, our office has not been consulted with on the APE (per 36 CFR 800.4).

It is therefore surprising to see the APE defined in the DEIS on page 4-645, with the incorrect statement "as stated in our NOI, we define the APE as…". The statement is incorrect because the NOI did not define the APE. It merely indicated FERC would consult with SHPO to determine the APE. Since our June 2017 response to the NOI, consultation has not occurred, and the APE was developed without addressing the 36 CFR 800.4 process.

Page 4-633 states that consultation began with the NOI on June 9th, 2017. In the same paragraph, it states that the NOI "contained Section 106-specific text initiating consultations with the SHPO…". As stated above, the NOI is not a consultation document, but rather a public comment /scoping document. For one of the largest undertakings in Oregon, references to consultation mainly include NOI soliciting SHPO for its views on effects on historic properties in a single sentence, and a table in Appendix L that includes two letters from FERC to SHPO (one the NOI, and the second, an invitation to help produce the EIS), and three letters from SHPO to FERC. According to 36 CFR 800.3(c)(3), the agency official should consult with the SHPO in a manner appropriate to the nature of the undertaking. While we understand that the Section 106 process is still on-going, we are concerned at the level of consultation related to the nature of the undertaking, and the failure to include SHPO in consultation on the APE. Our office also feels strongly that consultation with appropriate consulting parties would be incredibly beneficial for this undertaking.

General Comments

As stated above, FERC recommends that Jordan Cove and Pacific Connector "not construct or use any of their proposed facilities, including related ancillary areas for staging, storage, temporary work areas, and new or to-be-improved access roads, until all studies and consultation necessary to complete compliance with the NRHP have been completed." With all the iterations of the project over the years, including the current version, there have been numerous permits and projects conducted that are outside the NHPA process, but should be included due to the potential to effect historic properties. As the lead federal agency, these are issues that could be discussed during meaningful, early and often consultation with consulting parties regarding the undertaking. It is also worth mentioning that communications between consulting parties and the project proponent are referenced in the DEIS as support for FERC consultation. However, when these groups convened to develop a draft Memorandum of Agreement for the undertaking, FERC is on record stating that they will not sign, but instead develop their own MOA and circulate among consulting parties for comment. On that topic, please note, much has been learned since the 2011 MOA, and a similar document would not be considered appropriate or adequate. Since the current group has been meeting for several months, it would be beneficial if FERC engaged the consulting parties in the development of an MOA as opposed to circulating something without their significant input.

Regarding the statement that surveys have identified archaeological sites that require monitoring during construction, and that further testing has been recommended for some sites that cannot be avoided, please note that there are also areas of high probability that would need monitoring, as opposed to only areas where sites have been identified. In addition, there are other types of historic properties that will

be affected by the undertaking. Part of that is addressed in the DEIS where FERC acknowledges that the Section 101 and 106 processes have not yet been concluded.

Oregon Department of Transportation

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The Oregon Department of Transportation (ODOT) has the responsibility to preserve the operational safety, integrity, and function of the state's highway facilities. ODOT must also ensure that improvements to the highway system can be accomplished without undue impacts or damage to utilities within the highway right-of-way. It is ODOT's understanding that the proposed Jordan Cove Energy (natural gas terminal facilities) and Pacific Connector Natural Gas pipeline projects and associated activities could or will interface with state and/or interstate highways by crossing the highway, running parallel to the highway within the right-of-way, or running parallel to the highway just outside of the right-of-way. It is also ODOT's understanding that additional access may be needed to ODOT's facilities, and that traffic on ODOT's facilities may increase due to the projects (both during construction and upon project completion during regular operations and project maintenance).

General Requirements

Construction that may impact the state right-of-way (including interstate highways) is subject to Oregon Revised Statute (ORS) 374.305, under which no person, firm, or corporation may place, build, or construct on any state highway right-of-way, any approach road, structure, pipeline, ditch, cable or wire, or any other facility, thing, or appurtenance without first obtaining written permission from ODOT. The developers (Jordan Cove Energy Project, L.P. and Pacific Connector Gas Pipeline, L.P.), therefore, must obtain permits from each ODOT District Office where project work will occur *prior to commencing construction within the highway right-of-way or usage of access connections to the right-of-way*. The developer must also meet the requirements in Oregon Administrative Rule (OAR) Chapter 734 Division 51 for approach permitting and Division 55 for utility permitting through special provisions and should review rule requirements before completing plan sets and construction plans to understand stipulations related to the construction phase and future project operations and maintenance. ODOT Districts have some discretion in the issuance of a permit in order to address site specific situations such as weather/season, traffic volume, terrain, etc.

The following conditions must be fulfilled before a permit to work in the ODOT right-of -way will be issued:

- Developers must notify and work directly with ODOT where the proposed location of the terminal and pipeline facilities and associated activities are shown to be within the Potential Impact Radius (PIR) of any state highway. The PIR is based on minimum federal safety standards found in 49 CFR Part 192.
- Developers shall provide ODOT with a set of plans that include, but are not limited to, detailed construction staging plans for the terminal facility and associated LNG transfer facilities (e.g., Wharf, LNG storage tanks), expansion of upland industrial lands and access road improvements as well as pipeline route maps and construction staging plans. Developers will work with ODOT to develop

design standards for all pipes and related structures within the PIR of a state highway. Design requirements include the following:

- Minimum of 10 feet of cover from the top of the pipe will be the norm unless special acceptance of a lesser amount is authorized for a specific reason. A minimum of 10 feet of cover should be used as the standard within ODOT right-of-way.
- All pipe crossings of the highway shall be properly cased, or – for uncased pipeline crossings – a substantial increase in the pipeline design standards will be required.
- In no instance shall the pipeline be installed in an open trench across a state highway.
- In no instance shall the pipeline attach to or be suspended within state highway bridge structures.
- State highway access to all pipeline surface structures and assemblies, such as but not limited to gate valves and monitoring equipment, shall comply with OAR 734 Division 051 and all required conditions stated herein. A preferred location for pipeline surface structures and assemblies is outside of state highway right-of-way.
- Temporary state highway access locations, used for construction activities, shall also comply with OAR 734-051 and all required conditions stated herein. Modifications appropriate to provide safe operation shall be constructed at all temporary state highway access locations, prior to construction usage. Safety modifications must be removed and the state highway and access points be returned to their original condition upon completion of construction activities.
- Applicant must address specific site concerns associated with their terminal and pipeline route and associated project facilities. These concerns shall be addressed to the satisfaction of the appropriate Oregon Department of Transportation District offices prior to issuance of a permit to perform work within the state's highway right-of-way.
- Annually, or as changes dictate, updated emergency contact information (names and phone numbers) shall be delivered to each ODOT District Manager in which the terminal and pipeline and associated project facilities may affect state highway operations and maintenance activities.

The developers are responsible to secure all state, federal, and local permits and clearances as required under federal, state, and local statutes or codes for all areas within ODOT state highway right-of-way that are impacted by the development.

All impacts to the traveling public on state highways will be approved by the ODOT local District Office(s) prior to those impacts occurring. Utility coordination will be the responsibility of the developers. The terminal and pipeline projects will need to provide traffic mitigation for all state highways affected, and the mitigation approved by ODOT prior to and for the duration of the impact.

Highway Classification and Milepoints

It is unclear throughout the DEIS when a "state highway" is being referenced. A permit from ODOT would be required for any work on a highway that is part of the state highway system including Interstate highways and other highways on the National Highway System. It would be prudent to

specifically identify all highways and roads by their appropriate jurisdictional authority; as part of the National Highway System, State Highway System, County Highway System, and other local, private, and federal land management agency roads. Properly identifying the correct highway and road classification is necessary to submit permit requests to ODOT as well as the other agencies or owners.

Highway Classification

In DEIS Section 4.10.2.1 (Access Roads), not all of the highways listed on page 4-626 to be crossed by the pipeline "*Major state and federal highways that would be crossed by the pipeline include*" are part of the state highway system, as follows:

- Highway 227, and Butte Falls Highway, are both under Jackson County road authority and therefore are not part of the State Highway System. Crossings of those County highways should be coordinated with that County road authority.
- ODOT does not allow open cut crossings on the State Highway System, including Interstate Highways.

Highway Milepoints

Also in DEIS Section 4.10.2.1, and also in Appendix C: *Pipeline Route and Work Area Maps*, ODOT recommends clarifying that the Milepoints ("MP") depicted both in written text in Section 4.10.2.1 and as displayed on maps and other graphics in the DEIS and Appendix C are "Pipeline MPs". ODOT also recommends that on the Pipeline Location Maps in Appendix C that every location where the pipeline intends to cross a State or Interstate Highway, the approximate State Highway Milepoint (MP) should also be displayed and in a different color than the pipeline Milepoints. This will eliminate confusion for the reader and should add consistency with Section 4.10.2.1 with the [corrected] listing of **"***Major state and federal highways that would be crossed by the pipeline include*"**.**

Traffic Impacts

In DEIS Section 4.10.1.2 (Motor Vehicle Traffic), on page 4-625, the DEIS recommends, and ODOT agrees and further recommends to the FERC, that:

Prior to construction, Jordan Cove should file documentation that it has entered into development agreements with ODOT, Coos County, and the City of North Bend, as recommended in the *Traffic Impact Analysis* report.

Over-sized Loads

ODOT recommends that the DEIS clearly state and reference requirements for Over Dimensional (O-D) permitting for the operation of the pipe delivery trucks, and any other over-dimensional loads, that will operate on state and interstate highways. O-D permitting on ODOT highways requires District approval for specific length trucks. Routing, time-of-day, and pilot vehicle requirements will be enforced, as appropriate, for the "hauling routes" in all affected ODOT Districts. The developers should reference ODOT's Over-Dimension Operations website in the DEIS for permitting procedures and requirements: https://www.oregon.gov/ODOT/MCT/Pages/Over-Dimension.aspx

Pipeline Building/Trenching and Depth

The proposed pipeline burial methods and pipeline depth information provided in the DEIS do not fully conform to ODOT's standard requirements. All ODOT highways are required to be crossed via boring, directional drilling, or other tunneling techniques. Developers must work with ODOT District Permitting and receive approval prior to any digging activities on or along ODOT right-of-way.

ODOT requires the pipeline to be installed with a minimum of 10 feet of cover within the entire roadway right-of-way, measured at the lowest point within the right-of-way—for instance, below the lowest ditch bottom—for all Districts. *This includes all ODOT state highway and interstate highway crossings within those highways' right-of-way boundaries.*

Additionally, the pipeline design team will need to submit calculations that insure that the pipe wall thickness, at all highway crossings, is increased so that bursting pressure meets or exceeds the "49 CFR PART 192, Class 3" standards, for a Potential Impact Radius (PIR) > 900 feet. ODOT recommends that the DEIS reference this calculation consistent with all appropriate state and interstate highway crossings and that those highway crossings be indicated by approximate highway Milepoint (in text and in graphics as relevant).

Utility Coordination

Utility relocation requires approval and coordination with ODOT for any work in/across/under ODOT right-of-way if not otherwise included in permit requests. Specific utility relocation requests will be handled through the appropriate ODOT District Office. Any permit issued by ODOT would be issued to the utility company that owns the utility line or facility, not to their contractor. If Pacific Connector is the utility owner, then the permit would be issued to them.

Oregon Department of Water Resources

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No.	Citation	Issue Identification	Recommended Resolution
1	Section 2 – Description of the Proposed Action. Pg.2-61 & 2-62 (PDF Pgs. 132-133)	**Diverted Open-Cut Crossing, with references to Flume, or Dam and Pump.** This section fails to account for interference with and/or damage to an existing water right holder, or diversion structures that might be located in an area that water would be diverted from during use of these methods.	This Department recommends that the applicant research any stretches of streams where these methods are contemplated, to determine if water rights exist. Water right holders that could be affected may need to be contacted to determine the best way to mitigate impacts.
2	Section 4.3 – Water Resources and Wetlands, In-Stream Flow sub-section. Pg.4-109 (PDF Pg. 297)	**Hydrostatic Testing.** This section speaks to the sources for obtaining water for hydrostatic testing, and that for any surface-water use, proper authorization would be obtained from OWRD. Existing water rights, other than municipal use, cannot be used because they are issued for a specific use in a specific location, possibly during a specific time.	Water from any source other than a municipality will require authorization from OWRD. A Limited License under ORS 537.143 is a typical method for obtaining water on a short term or fixed duration basis. The applicant is advised to contact the Department well in advance of water needs to determine best sources.
3	Section 4.3 – Water Resources and Wetlands, In-Stream Flow sub-section. Pg.4-111 (PDF Pg. 299)	**Out-of-basin diversions**. This section speaks to release of hydrostatic test water and the *Draft Hydrostatic Testing Plan* developed with input from several groups. OWRD was not consulted on this draft plan. The document states, “Where possible, test water would be released within the same basin from which it is withdrawn.” ORS 537.801 et seq. addresses diversion of waters from basins of origin and defines “Basin” to mean “one of the	The applicant is advised to work closely with the Department to locate sources of water and to determine the appropriate mechanisms for appropriating water. Insofar as a significant amount of water may be transported outside the boundaries of the basin of origin, the applicant must work with the Department through the processes provided in ORS 537.803 – 870.

		river basins within this state" as defined by Department maps. ORS 537.801(3) states, "…the waters of the state may not be appropriated, stored or diverted for use outside the basin of origin except in compliance with ORS 537.801 to 537.860, including, if applicable, the prior approval of the Legislative Assembly under ORS 537.810."	
4	Section 4.3 – Water Resources and Wetlands, In-Stream Flow sub-section. Pg.4-112 (PDF Pg. 300)	**Dust Control.** This section speaks to the sources for obtaining water for dust control, and that for any surface-water use proper authorization would be obtained from OWRD. Existing water rights, other than municipal use, cannot be used because they are issued for a specific use in a specific location, possibly during a specific time.	Water from any source, other than a municipality, will require authorization from OWRD. A Limited License under ORS 537.143 is a typical method for obtaining water on a short term or fixed duration basis. The applicant is advised to contact the Department well in advance of water need to determine appropriate sources.
5	Section 4.3 – Water Resources and Wetlands, Point of Diversion Effects sub-section. Pg.4-118 (PDF Pg. 306)	**Alternate Point of Diversion Locations.** This section discusses consulting with the landowner if impacts on a water supply's point of diversion cannot be avoided, identifying an alternate location to establish the diversion.	Changing the location of a point of diversion under an existing water right requires state approval through a transfer application process, pursuant ORS 540 and OAR 690-380. The Draft EIS does not address or contemplate this requirement. The applicant is advised to work closely with the Department in regards to alternate points of diversion locations and apply for the required transfer well in advance of water needs.
6	Section 5 – Conclusions and Recommendations, #25. Pg.5-18 (PDF Pg. 1104)	**Instantaneous Flow Reduction.** This recommendation relates to the Hydrostatic Test Plan, requiring that any water withdrawal from a flowing stream does not exceed an instantaneous flow reduction of more than 10 percent of	Please be aware that withdrawal not exceeding an instantaneous flow reduction of more than 10 percent of stream flow may, in the absence of mitigation, cause an impact or injury to existing water rights, including but not limited to, instream water rights.

		stream flow.	

Oregon Department of Forestry

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The ODF's comments are primarily related to the clearing, grading, construction, operation, and maintenance of project components that would be located across state and privately owned forest lands. In these instances project operators are responsible for review and compliance with applicable requirements found in statute and code.

Depending on the location of project activities, operator requirements and considerations may include but are not limited to the following conditions:

State and Private Forest Lands - Project activities involving commercial forest activity on state and private forest lands are governed by the Oregon Forest Practices Act, Oregon Revised Statute (ORS) 527, and Oregon Administrative Rules (OAR) chapter 629 divisions 605 through 665. These apply even though the forest activity is a peripheral component of the project (DEIS Section 4.5.2 Timber). The forest practice rules are intended to provide resource protection and to set standards for planning forestry practices including harvesting, road construction and maintenance, protecting water quality in waters of the state, limiting effects on specified wildlife and other resource sites, chemical and petroleum product provisions, fish passage, peak flows, providing for public safety down slope of high landslide hazards, and determining reforestation or land conversion requirements.

Conversion of Forestlands – While nothing in the Forest Practices Act shall prevent the conversion of forestland to any other use (ORS 527.730), administrative rules address the conversion to non-forest use to ensure the conversion process is coordinated with other relevant federal, state, and local agencies.

Protection of forestlands from wildfire (Permit to Use Fire or Power Driven Machinery (PDM) The Oregon Department of Forestry is responsible for matters related to wildfire on forests within the state and project activities occurring on forest land may be subject to wildfire prevention and suppression requirements of Oregon Revised Statute chapter 477 and the associated administrative rules. In addition, every person conducting an operation inside or within 1/8 of a mile of an ODF forest protection district that uses fire or power driven machinery must first obtain a written permit (within the Notification), also known as a PDM. Fire prevention requirements must be adhered to. Some of these include but are not limited to: the need to limit or stop work during periods of elevated fire danger, the need to provide firefighting tools, the need to provide water supplies and pumping equipment, the need to provide fire watch personnel, the need to suppress wildfires originating from forest activities and construction, the need to dispose of debris in a specified manner, and the need to accept liability for the state's cost of suppressing wildfires originating from forest activities and construction. Following completion of the initial project activity, operation and maintenance activities will be subject to many of these same requirements. Additional information regarding these requirements is available at the Oregon Department of Forestry's website, http://www.oregon.gov/odf/Pages/fire/fire.aspx.

Additional comments are provided in the following table:

No.	Citation	Issue Identification	Recommended Resolution
1	Section 1.5.2.6, Oregon Department of Forestry, Page 1-32, Para 2	This section acknowledges the need for Notification for a forest operation but fails to address that need for a written plan for all ownerships where operations occur.	The DEIS discusses harvest and loss of forestland but fails to acknowledge the submission of a written plan in addition to notification. Written plans are part of the submission and such plans are an accompanying document to Notification. The Notification serves three purposes: notification of a forest operation (ORS 527.670), a request for a Permit to Use Fire or Power Driven Machinery (PDM, ORS Chapter 477), and notice to the Department of Revenue of timber harvest (ORS 321.550). Notifications are to be submitted via the online E-Notification system (www.ferns.odf.state.or.us/E-Notification). A separate notification should be filed for each county and timber owner affected by the project. All notifications require a 15 day waiting period before activity may begin unless a waiver is requested.
2	Section 4.7.2.2, Existing Land Use, Forestland, Page 4-417, Para 1	This section refers to regulatory requirements and route and clearing upland forest and land use change. This section fails to mention the need for an Alternate Practice where land use change results in a conversion of forestland.	The DEIS discusses harvest and loss of forestland, in which case conversion of forestland to other land uses (ORS 527.730) or practices not in statute or rule requires the submission of a Plan for Alternate Practice and written approval from the State Forester at the time of the operation.
3	Section 4.1.2.4 Landslide Hazards and Slope Stability Page 4-18 thru 4-25, Para 1	Section refers to Landslide and Slope Stability, but does not reference forest operations. Forest Practices Act landslide hazard assessment and standards may be applicable. Reference to forest operations is absent.	It is anticipated that most or all landslide public safety hazards associated with the project will fall under other jurisdictions due to land use conversion. Where clearings are not permanent and forest land use is maintained or proposed roads have a combined Pipeline and forest use, provisions for public safety under Forest Practices Act Rule Division 623 may be necessary. Reference to appropriate sections of the final EIS with equal or greater protection standards may also meet requirements.

4	Potentially Contaminated Soils and Groundwater, Accidental Spills Section 4.2.2.2, Pages 4-59 through 4-68.	Forest Practices Act and Chemical Rules standards may be applicable in the course of forest operations, reference to the FPA and forest operations is absent.	Provisions for spills of hazardous materials or applications of chemicals may have applicable standards under Forest Practices Act Rule Division 620 or reference to appropriate sections of the final EIS with equal or greater protection standards.
5	Surface Water, Pacific Connector Pipeline Project Section 4.3.2.2, Page 4-92 and other sections relevant to water quality	Forest Practices Act and water quality linkage, document does not identify relationship with FPA required written plan or alternate plan where water quality elements are	Through the Notification process, provisions for surface water quality under the Forest Practices Act (FPA) and rules will need to be addressed. Details would be submitted in either a Written Plan or Alternate Plan. Details may include specific provisions for meeting the FPA or reference appropriate sections of the final EIS with equal or greater protection standards or where land use conversion places water protection under other jurisdictions.
6	Wetlands Section 4.3.3, Pages 4-118 through 4-134	Forest Practices Act and wetland, lake linkage	Through the Notification process, provisions wetlands under the Forest Practices Act (FPA) and rules may need to be addressed (Divisions 645, 650, 655). Details would be submitted in either a Written Plan or Alternate Plan. Details may include specific provisions for meeting the FPA or reference appropriate sections of the final EIS with equal or greater protection standards or where land use conversion places water protection under other jurisdictions.
7	Other Special Status Species Section 4.6.3 page 4-368 Para 1	This section speaks about additional wildlife species that have special status or consideration by other federal or state agencies, beyond those listed as Threatened or Endangered under the federal ESA. The Oregon Forest Practices Act requires protections for certain wildlife species under Oregon Administrative Rule 629, Division 665. The FPA has specific rules for Northern Spotted Owl nest sites (OAR-629-	Forestry recommends that the applicant address protections afforded to wildlife under the Oregon Forest Practices Act in the EIS. Of particular note is the great-blue heron. Although this species is protected by law through the FPA, in association with forest operations, it is not addressed as a special status species in the EIS. Furthermore, these protection standards need to be addressed throughout the EIS. Activities such as timber harvest operations that occur near a known site of one of these species may require a written plan to address

		665-0210); Bald Eagle nest sites (OAR 629-665-0220), winter roost sites (OAR 629-665-0230), and foraging perch sites (OAR 629-665-0240); Osprey nest sites (OAR 629-665-0110), and Great Blue Heron rookeries (OAR 629-665-0120). Written plans which describe how forest operations will be conducted to avoid a conflict may also be required for operations near known sites of marbled murrelets under OAR-629-0170(5)(d) or OAR-629-0190(2). Similarly, written plans may be required for operations near certain band-tailed pigeon mineral springs or golden eagle nest sites under OAR-629-0170(5)(a) or OAR-629-0190(1).	how the operation will be conducted to avoid a conflict with the wildlife site. Exceptions to the FPA rules for spotted owls or marbled murrelets may apply if the applicant has a valid Incidental Take Permit from the USFWS. Other exceptions would need to be addressed through a Plan for Alternate Practice which must indicate how the operation will be conducted to result in a net equal or greater outcome for the species in question.
8	Other Special Status Species Section 4.6.3 page 4-368 Para 1	The proposed route indicates that the Pacific Connector pipeline project may go through or near known nest patches of spotted owls.	Forest operations on non-federal lands near a known nest site of a spotted owl may require a Written plan or Plan for Alternate Practice. This may include a requirement to designate a 70 acre core area of suitable spotted owl habitat, as described in rule in OAR 629-665-0210(1)(a). Exceptions to the FPA rules for spotted owls may apply if the applicant has a valid Incidental Take Permit from the USFWS. Other exceptions would need to be addressed through a Plan for Alternate Practice which must indicate how the operation will be conducted to result in a net equal or greater outcome for the species in question.
9	Section 4.6.3 page 4-368 Para 1	This section describes “special status species”. The FPA and species which receive protection under the FPA are not included in this section or Appendix I.	Recommend adding Oregon Department of Forestry and species protected under the Forest Practices Act to this section and Index referencing “special status species”.

Appendices

Appendix A: ODFW Recommended Mitigation Actions: Coos, Coquille, Umpqua, Rogue, and Klamath Watersheds

Table 1. Examples of projects with high to moderate ecological benefit for aquatic fish and wildlife resources.

Ecologically Beneficial Aquatic Related Projects Noted in DEIS	**Ecologically Beneficial Upland Related Projects Noted in DEIS**
Riparian planting; riparian enhancement; riparian easements; etc.	Relocation of matrix to LSR
Fish Passage Improvements	Noxious weed treatments
Large Wood instream	Road Closures
Relocation of matrix to LSR	Riparian planting; riparian enhancement; riparian easements; etc.
Road decommissioning	Snag creation
Stream crossing repair	Riparian Vegetation Management (thinning/Stack and burn)
Road storm-proofing	Pre-commercial thinning designed to improve mature forest conditions
Road Surfacing	Upland LWD placement
Road Closures	Pre-commercial thinning designed to improve mature forest conditions

Riparian Vegetation Management (thinning/Stack and burn)	Planting for Mardon Skipper

List 1. Potential projects to mitigate for aquatic resource impacts and sites in the Rogue River basin.

Streams crossed by pipeline

Little Butte Creek

1. Top RBFAT passage sites: Charlie; Bieberstad; Walcot; LBID site; Brown Ditch; Tucker Ditch; LBMD, others
2. Funding for water leases with willing landowners
3. Fund replacement of county culvert on Bitterlick Creek
4. Riparian project on Eagle Point urban tributaries, especially the golf course near the visitor center

NF Little Butte Creek

1. Top RBFAT passage sites: Hanley; MID NFLB, others
2. Funding for water leases with willing landowners
3. Find and implement riparian projects

SF Little Butte Creek

1. Top passage sites: MID SFLB; Hoeft Ditch; Klingle Meyers; Ragsdale; Tonn Ditch; Burrell Ditch; Omega, others
2. Funding for water leases with willing landowners
3. Find and implement riparian projects
4. Bank stabilization, fencing, planting on West/Hodgkin properties

Salt Creek

1. Passage at C2 Cattle Ranch diversion, coho found higher in the system
2. Culvert replacement on tributaries.

Indian Creek

1. Find and implement passage projects
2. Funding for water leases with willing landowners
3. Find and implement riparian projects
4. Implement large wood projects on BLM land
5. Implement outreach at Aunt Caroline's Park in Shady Cove

WF Trail Creek

1. Culvert replacement on West Fork and trib of West Fork at mill property
2. Culvert replacement on Buck Rock Creek (ODOT).
3. Culvert replacement on X trib near confluence of Trail Creek and Rogue.
4. Funding for water leases with willing landowners
5. Large wood projects on BLM land on West Fork Trail
6. Additional engineered wood structure on private land on West Fork Trail

<u>High priority summer steelhead steams (tribs of pipeline streams)</u>

Lost Creek

1. Riparian fencing and planting project on ranch property
2. Riparian projects on other private above ranch
3. Large wood project on ranch property

Lake Creek

1. Riparian fencing and planting project on ranch property
2. Find and implement passage projects where applicable

Antelope Creek

1. Restoration on ODOT property at confluence with Little Butte Creek???
2. Find and implement passage projects
3. Funding for water leases with willing landowners

4. Find and implement riparian projects

Other streams with high potential for restoration

Big Butte Creek

1. Funding for water leases with willing landowners

Table 2. Aquatic restoration/mitigation potential projects in the Rogue River basin.

Admin Unit	Fifth Field	Mitigation Group	Project Name	Quantity	Unit	Rationale
Medford BLM	Trail Creek	Aquatic and Riparian	Trail Creek Instream LWD	2.6	miles	Lack of large wood and recruitment of LWD into streams is a consistent factor limiting aquatic habitat quality in all watersheds crossed by Pacific Connector.
Medford BLM	Trail Creek	Road Surfacing	Road sediment reduction	16.3	miles	Road surfacing helps reduce sedimentation.
Medford BLM	Trail Creek	Road storm proofing	Road sediment reduction	4.3	miles	Storm-proofing restores hydraulic connectivity and reduces sediment.
Forest Service	Trail Creek	Road storm proofing	Road sediment reduction	0.6	miles	Storm-proofing restores hydraulic connectivity and reduces sediment.
Forest Service	Trail Creek	Rd decommissioning	Road sediment reduction	1.1	miles	Reduces sedimentation and restores hydraulic connectivity.
Medford BLM	Trail Creek	Rd decommissioning	Road sediment reduction	2.7	miles	Reduces sedimentation and restores hydraulic connectivity.
Medford BLM	Shady Cove-RR	Aquatic and Riparian	LWD	2.5	miles	Lack of large wood and recruitment of LWD into streams is a consistent factor limiting aquatic habitat quality in all watersheds crossed by Pacific Connector.
Medford BLM	Shady Cove-RR	Road sediment reduction	Road sediment reduction	1	miles	Improve existing roads.
Medford BLM	Shady Cove-RR	Road re surface	Road sediment reduction	1.5	miles	Improve existing roads.
Medford BLM	Big Butte	Road Surfacing	Road sediment reduction	6.4	miles	Reduces sedimentation and restores hydraulic connectivity.

Medford BLM	Little Butte	Road sediment reduction	Road sediment reduction	9	miles	Resurface roads in the Ashland RA
Medford BLM	Little Butte	Road sediment reduction	Road sediment reduction	9.4	miles	Resurface roads in the Butte Falls RA
Forest Service	Little Butte	Aquatic and Riparian	S Fk Little Butte LWD	1.5	miles	Placing 75 pieces of LWD into the South Fork by helicopter.
Forest Service	Little Butte	Aquatic and Riparian	Stream crossing decom.	32	sites	Restoring stream crossings reconnects aquatic habitats. Restoration includes riparian plantings to offset impact of shade removal at pipeline X's.

Table 2. Aquatic restoration/mitigation potential projects in the Rogue River basin continued.

Admin Unit	Fifth Field	Mitigation Group	Project Name	Quantity	Unit	Rationale
Forest Service	Little Butte	Road sediment reduction	Road decommissioning	53.2	miles	Remove roads and re plant.
Medford BLM	Little butte	Aquatic and Riparian	Little Butte Cr Fish Screen	1	site	Screen Lost Creek diversion and build permanent diversion structure.
Medford BLM	Little butte	Aquatic and Riparian	Lost Creek Instream LWD	8.6	miles	Lack of large wood and recruitment of LWD into streams is a consistent factor limiting aquatic habitat quality in all watersheds crossed by Pacific Connector.
Medford BLM	Little butte	Road sediment reduction	Little Butte Cr road imprv.	3.5	miles	Improve existing roads by restoring surface.
Medford BLM	Little butte	Road sediment reduction	Little Butte Cr rd decom.	10.6	miles	Remove roads to decrease sediment input in the Ashland RA.
Medford BLM	Little butte	Road sediment reduction	Little Butte Cr rd decom.	2.4	miles	Remove roads to decrease sediment input in the Butte Falls RA.

List does not include terrestrial habitat improvements, fire suppression, or stand density fuel break mitigation on federal land.

These actions are for off site mitigation only. On site mitigation includes placement of LWD at crossings etc.

List 2. Information for properties with potential for mitigation related to aquatic resources.

Dodes Cr Road Elk Creek subbasin

http://www.landandfarm.com/property/175.1_Acres_in_Jackson_County_Oregon-1473980/

Kane Cr

http://www.landandfarm.com/property/517.56_Acres_in_Jackson_County_Oregon-1473891/

Antelope Creek—**Antelope Creek Conservation Opportunity Area**

http://www.landandfarm.com/property/58_Acres_in_Jackson_County_Oregon-1471319/

Modoc Road with vernal pool:--**North Medford Conservation Opportunity Area**

http://www.landandfarm.com/property/212.67_Acres_in_Jackson_County_Oregon-1298398/

Evans Creek –1.5 miles of creek frontage

http://www.landandfarm.com/property/Rural_Residential_See_Remarks_Rogue_River_OR-1365916/

Indian Creek/Crowfoot Creek—**Shady Cove Foothills Conservation opportunity Area**

This isolated acreage is surrounded by Federal BLM land and is located in the heart of a well-known elk hunting area. The topography is graced with peaks and valleys that are permeated with logging roads and skid trails throughout. The headwaters of both Indian Creek and Crowfoot Creek originate on the parcel. The average elevation is 2500' MSL and the site index provides a mixture of merchantable timber, oak groves and open rock faces. Timber inventory data reveals a mixture of timber types and volumes. This property is uniquely located between Lost Creek Lake, the Rogue River, Big Butte Creek and the town of Shady Cove and is made up of three separate but contiguous tax lots

http://www.landandfarm.com/property/480_Acres_in_Jackson_County_Oregon-1674024/

Headwaters of Dead Indian Creek

This idyllic parcel is comprised of one square mile of gently undulating wilderness terrain and is endowed with over a mile of frontage of the headwaters of Dead Indian Creek, a major tributary of the South Fork of Little Butte Creek. The property lays just 1/2 mile from a paved county road and yet is completely surrounded by and easily accessed through BLM land on all sides. It's adjacent to the popular Buck Prairie recreational trail system, a winter haven for snowmobiling and cross country skiing enthusiasts, and a summer hiking and hunting mecca. It's just 5 miles to the boat launch at Howard Prairie Lake Recreation Area, a major local fishing, sailing and boating attraction.

There is plenty of merchantable and sub-merchantable timber growing on the property making this a legitimate and sustainable legacy investment opportunity. The property rests at about 5000' elevation.

http://www.landandfarm.com/property/648_Acres_in_Jackson_County_Oregon-1380787/

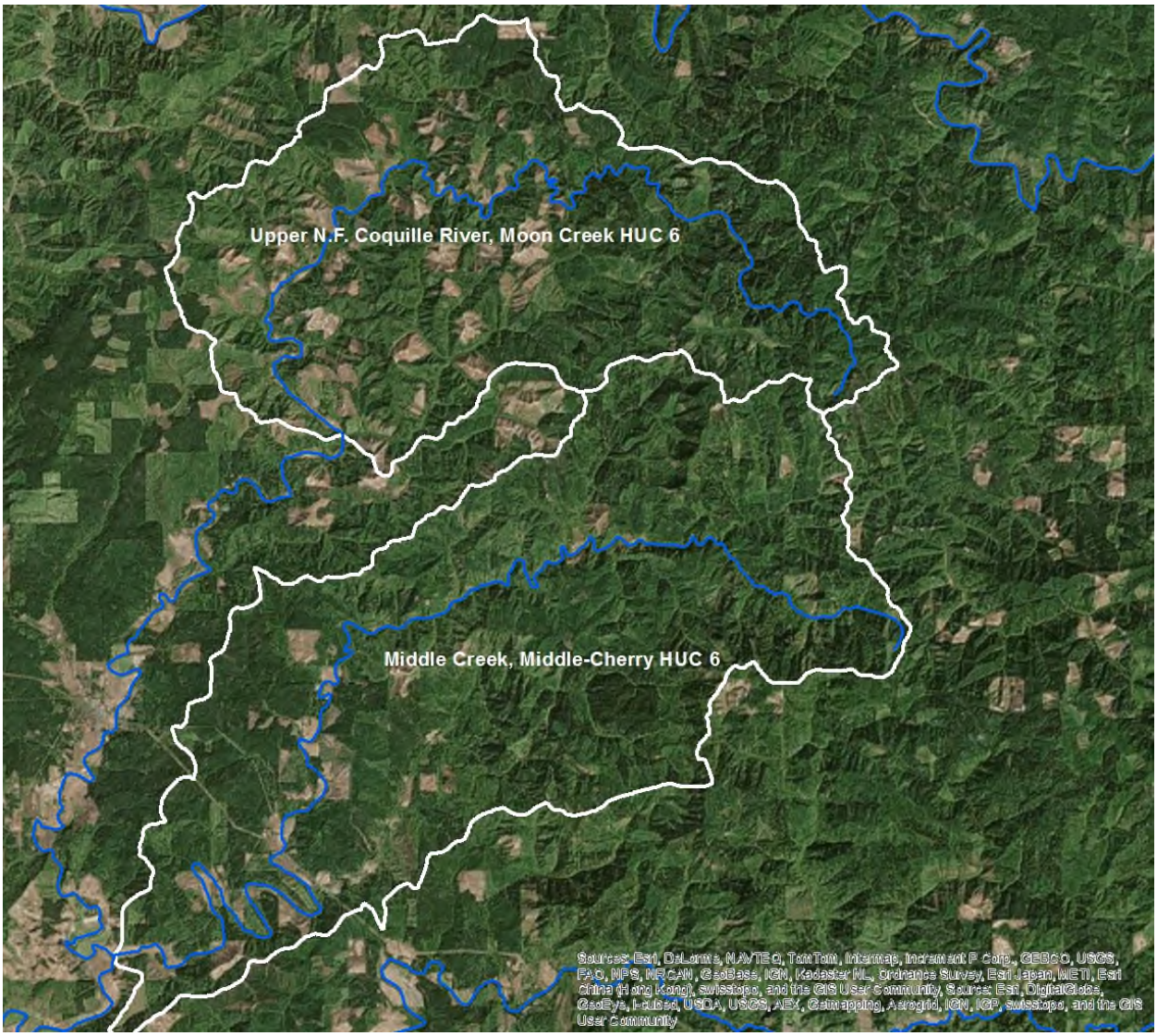

Figure 1. Subwatersheds in the Coquille River Basin with high potential for benefits to wildlife habitat, water quality and fisheries resources through: 1. older age timber management (80-120yrs.); 2. road decommissioning; 3. High Landslide Hazard Location stand easements establishment; 4. Riparian corridor easements/purchase.

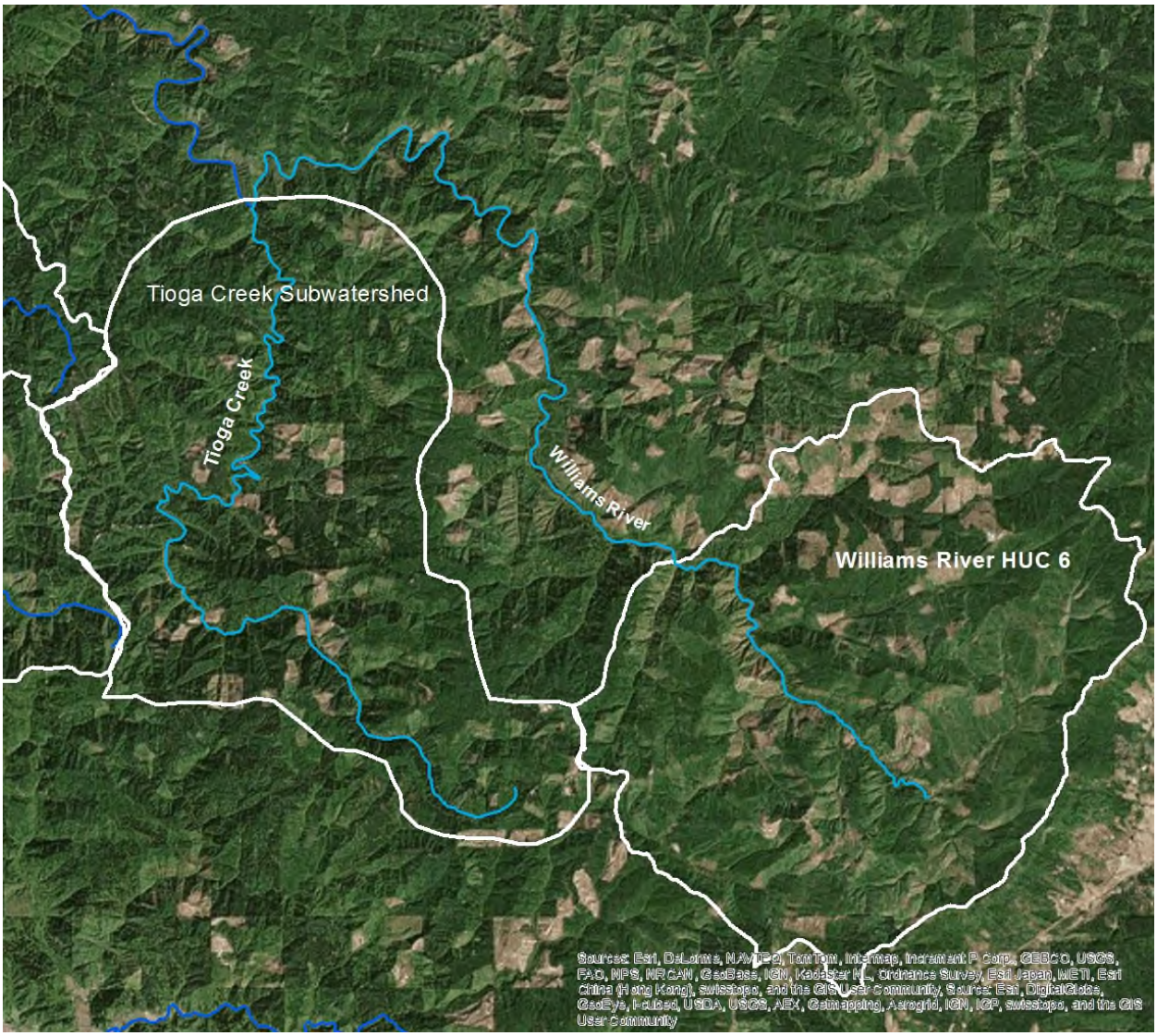

Figure 2. Subwatersheds in the Coos River Basin with high potential for benefits to wildlife habitat, water quality and fisheries resources through: 1. older age timber management (80-120yrs.); 2. road decommissioning; 3. High Landslide Hazard Location stand easements establishment; 4. Riparian corridor easements/purchase.

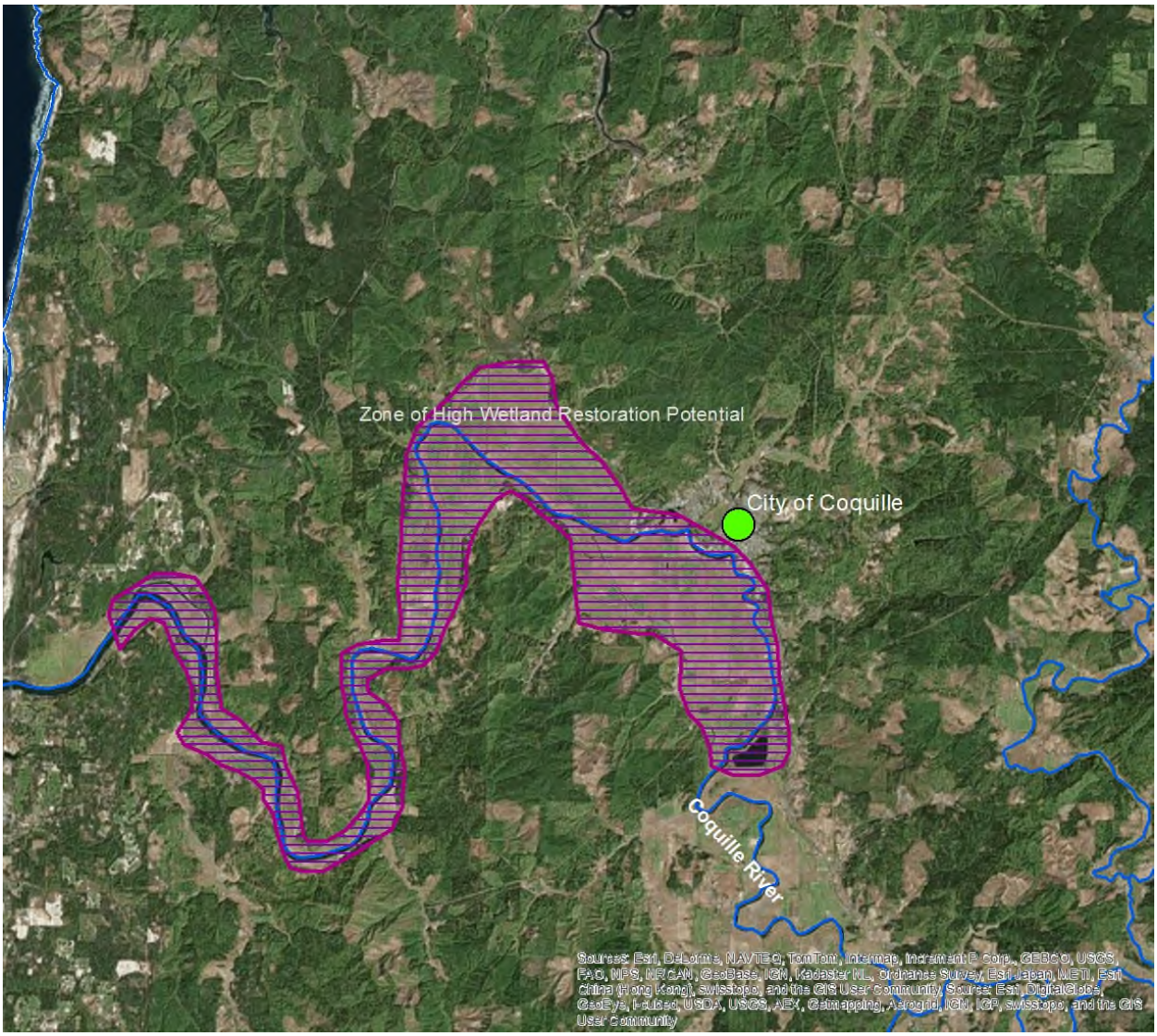

Figure 3. Subwatershed in the Coquille River basin with high potential for benefits to fish and wildlife resources through wetland restoration and protection.

Table 3. Types of mitigation projects that could be conducted on purchased mitigation lands in Jackson County

Wedgeleaf Ceanothus brush clearing
Oak stand thinning
Removal of small diameter conifers from oak stands
Controlled burns
Travel management patrols
Repair of ground degraded by
Restoration of hardwood component in stands with history of conifer management
Noxious weed control
Placement of LWD in upland areas

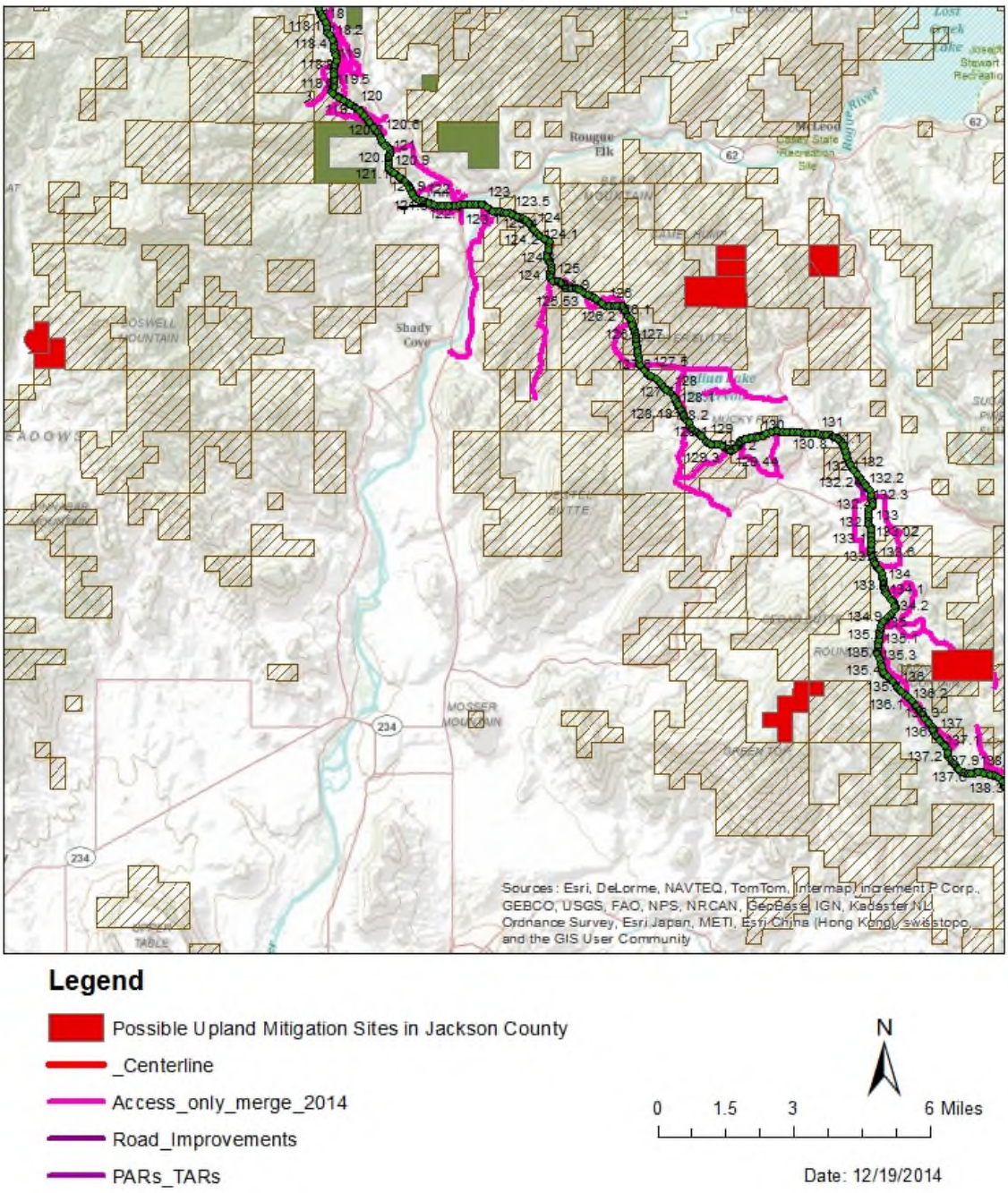

Figure 4. Mitigation sites in Jackson County in relation to the PCGP proposed route.

Table 4. Upland locations for proposed mitigation in Jackson County.

Property Block by TMA Unit	ROW D Priority	Map Nmbr.	FEEOWNER	INCAREOF	CITY	STATE	ACREAGE	TM_MAPLOT	SITEADD	VEG_NAME
Boswel Mtn.	1	8	MERIWETHER SOUTHERN OR	FOREST CAPITAL PARTNERS	INDEPENDENCE	OR	108.35	34-2W-16-500	EAST EVANS CR RD	Siskiyou-Sierra mixed conifer forest
Boswel Mtn.	2	1	MERIWETHER SOUTHERN OR	FOREST CAPITAL PARTNERS	INDEPENDENCE	OR	123.21	34-2W-16-900	EAST EVANS CR RD	Siskiyou-Sierra mixed conifer forest
Camel Hump B	3	4	MERIWETHER SOUTHERN OR	HANCOCK FOREST Mgmt.	VANCOUVER	WA	320	34-1E-1600	CROWFOOT RD	Siskiyou-Sierra mixed conifer forest
Camel Hump B	4	5	MERIWETHER SOUTHERN OR	HANCOCK FOREST Mgmt.	VANCOUVER	WA	80	34-1E-1500	CROWFOOT RD	Siskiyou-Sierra mixed conifer forest
Camel Hump B	5	3	MERIWETHER SOUTHERN OR	HANCOCK FOREST Mgmt.	VANCOUVER	WA	80	34-1E-1400	CROWFOOT RD	Siskiyou-Sierra mixed conifer forest
Camel Hump A	6	0	PLUM CREEK TIMBERLANDS LP		SEATTLE	WA	160.24	34-1E-10-900	CROWFOOT RD	Siskiyou-Sierra mixed conifer forest
Camel Hump A	6	0	PLUM CREEK TIMBERLAND		SEATTLE	WA	160.24	34-1E-10-900	CROWFOOT RD	Siskiyou mixed evergreen forest

			S LP							
Obench ain B	7	7	MERIWETHER SOUTHERN OR	HANCOCK FOREST Mgmt.	VANCOUVE R	WA	320	35-1E-5200	OBENCHAI N RD	Siskiyou-Sierra mixed conifer forest
Obench ain A	8	2	PLUM CREEK TIMBERLAND S LP		SEATTLE	WA	40	35-1E-6700	WORTHING TON RD	Siskiyou-Sierra mixed conifer forest
Obench ain A	9	6	PLUM CREEK TIMBERLAND S LP		SEATTLE	WA	240	35-1E-6800	WORTHING TON RD	Siskiyou-Sierra mixed conifer forest

List 4. Information from ODA Noxious Weed Program identifying noxious weed issue locations.

Potential Noxious Weed Sites for Mitigation

due to Proposed Pipeline Installation

Locations submitted by Oregon Department of Agriculture's Noxious Weed Program on December 22, 2014 (Carri Pirosko)

FUNDING FOR WEED ERADICATION ON LANDS OWNED BY ODA'S PRIVATE PARTNERS WOULD NEED TO BE COORDINATED THROUGH ODA TO PROTECT PRIVACY.

Potential Noxious Weed Sites for Mitigation due to Proposed Pipeline Installation (Jackson County)

Garlic Mustard on the banks of the Rogue River from Kelly Slough down through the Wild and Scenic Section of the Rogue River

Dyer's woad along the I-5 corridor from the California/Oregon border, up and over the Siskiyou Summit, and to Exits into Ashland

Skeletonweed control along the I-5 corridor from the California/Oregon border to the Jackson/Josephine County line and into Douglas County.

Japanese knotweed along the banks of tributaries feeding into the Rogue River throughout Jackson, Josephine Counties.

Perennial pepper weed on the banks of Emigrant Lake.

Eurasian watermilfoil in the marina and sections of

Leafy spurge in the cities of Ashland and Medford.

Potential Noxious Weed Sites for Mitigation due to Proposed Pipeline Installation (Douglas County)

<u>Paterson's Curse</u>

Douglas County

10599 Old Highway 99, Dillard

3845 Roberts Mountain Road, Myrtle Creek

Distaff thistle

Douglas County

Happy Valley Area

3203 Happy Valley Road, Roseburg

1200 Buell Lane, Roseburg

518 Buell Lane, Roseburg

520 Buell Lane, Roseburg

Metz Hill/Green Valley Area

331 Metz Hill Road, Oakland

1600 Metz Hill Road, Oakland

1601 Metz Hill Road, Oakland

2945 Metz Hill Road, Oakland

7888 Green Valley Road, Oakland

7275 Green Valley Road, Oakland

7279 Green Valley Road, Oakland

791 Scott Road, Oakland

Glide Area

16909 North Bank Road, Roseburg

16400 North Bank Road, Roseburg

16988 North Bank Road, Roseburg

297 Single Tree Lane, Roseburg

2589 Sunshine Road, Roseburg

LoneRock Timberland Co. Ranches, several properties in Glide area

Dixonville Area

17047 Dixonville Road, Roseburg

15241, Dixonville Road, Roseburg

2126 S. Deer Creek Road, Roseburg

974 Brumbach Road, Roseburg

Myrtle Creek Area

3842 Roberts Mountain Road, Myrtle Creek

3845 Roberts Mountain Road, Myrtle Creek

4993 Clarks Branch Road, Roseburg

Umpqua Highway

10850 N. Umpqua Highway, Roseburg

17271 N. Umpqua Highway, Roseburg

10190 N. Umpqua Highway, Roseburg

Spurge laurel

Douglas County

Project location: (directions to the site)
I-5 South to exit 138/Oakland; I-5 South to Exit 136 turn left onto Central follow central to Waite St turn right follow Wait St down to stop sign turn right onto Southside Rd.

Project GPS, from heart of infestation:
Latitude: 24'45.01"N Longitude: 19'37.10"W - Spurge laurel

Japanese knotweed

Douglas County

Project location: (directions to the site)
Deer Creek: I-5 South to exit 124 turn right onto Harvard at light follow Harvard to Stephens follow Stephens to Diamond Lake BLVD turn right follow Diamond Lake BLVD out to Buckhorn RD. (Myrtle Cr.)
I-5 South to exit 109 – N. Old Pacific HWY, turn left on N.W. 4th Ave turn right onto Division St. stay on Division St. until you come to the North Myrtle/ South Myrtle "Y" take a left –North Myrtle Rd.

Project GPS, from heart of infestation:
Latitude: 12'37.53"N Longitude: 15'41.58"W – Japanese knotweed

Portuguese broom

Douglas County

Project location: (directions to the site)
I-5 south Exit 159 on Anlauf Rd., to Cox Rd., then east to roads accessing the treatment area; or I-5 north exit 154, then west under freeway to Anlauf Rd., then north to Cox Rd.

Project GPS, from heart of infestation:
Latitude: 38’18.72”N Longitude: 11’25.89”W Portuguese broom

Gorse

Douglas County

Gorse- Scattered sites around Douglas County; Map available upon request.

Project GPS, from heart of one infestation:
Latitude: 23’48.94”N Longitude: 18’08.78”W Gorse

Appendix B: ODFW Comment Related Supportive Figures, Tables, and Information.

(Including expanded comments on riparian concerns and recommendations)

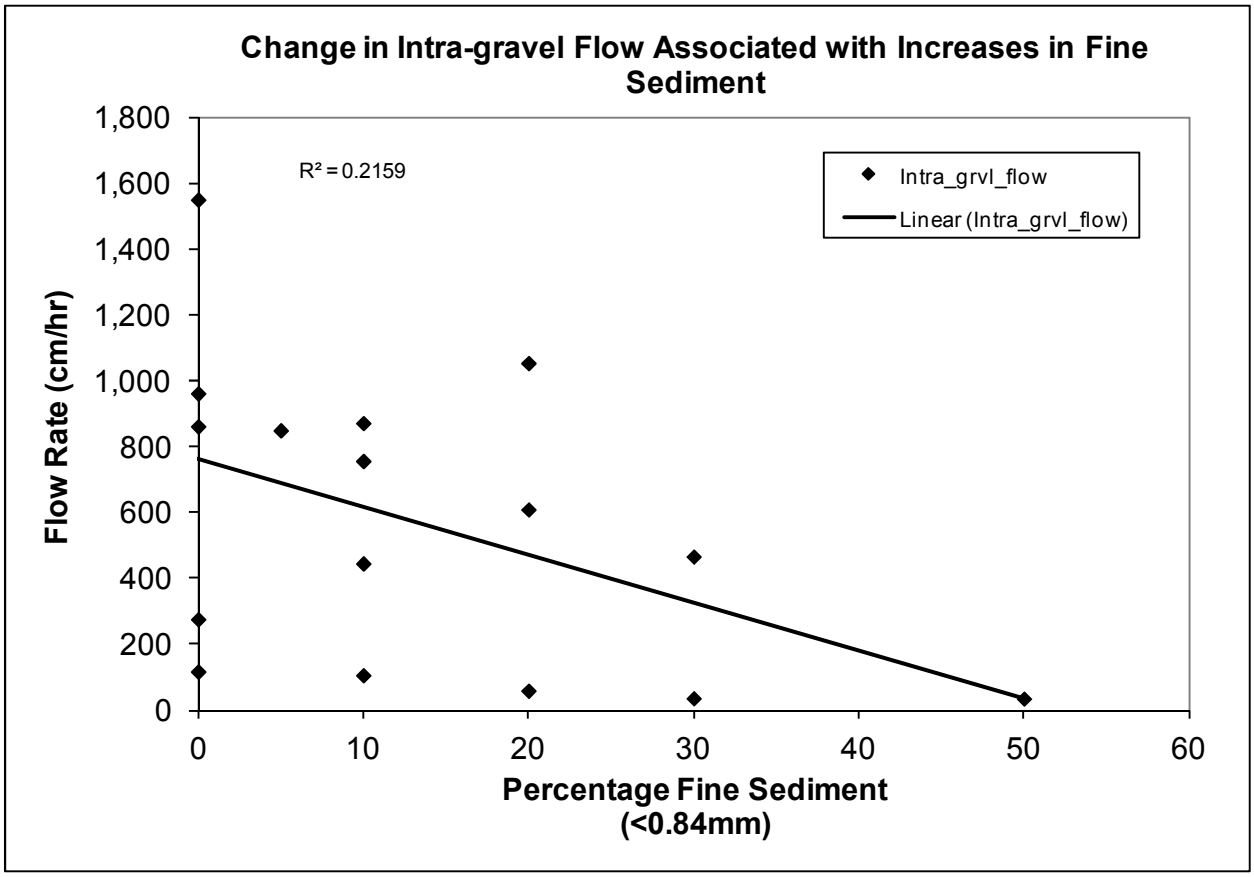

Figure 1. Change in intergravel flow of sediment Reiser and White 1988.

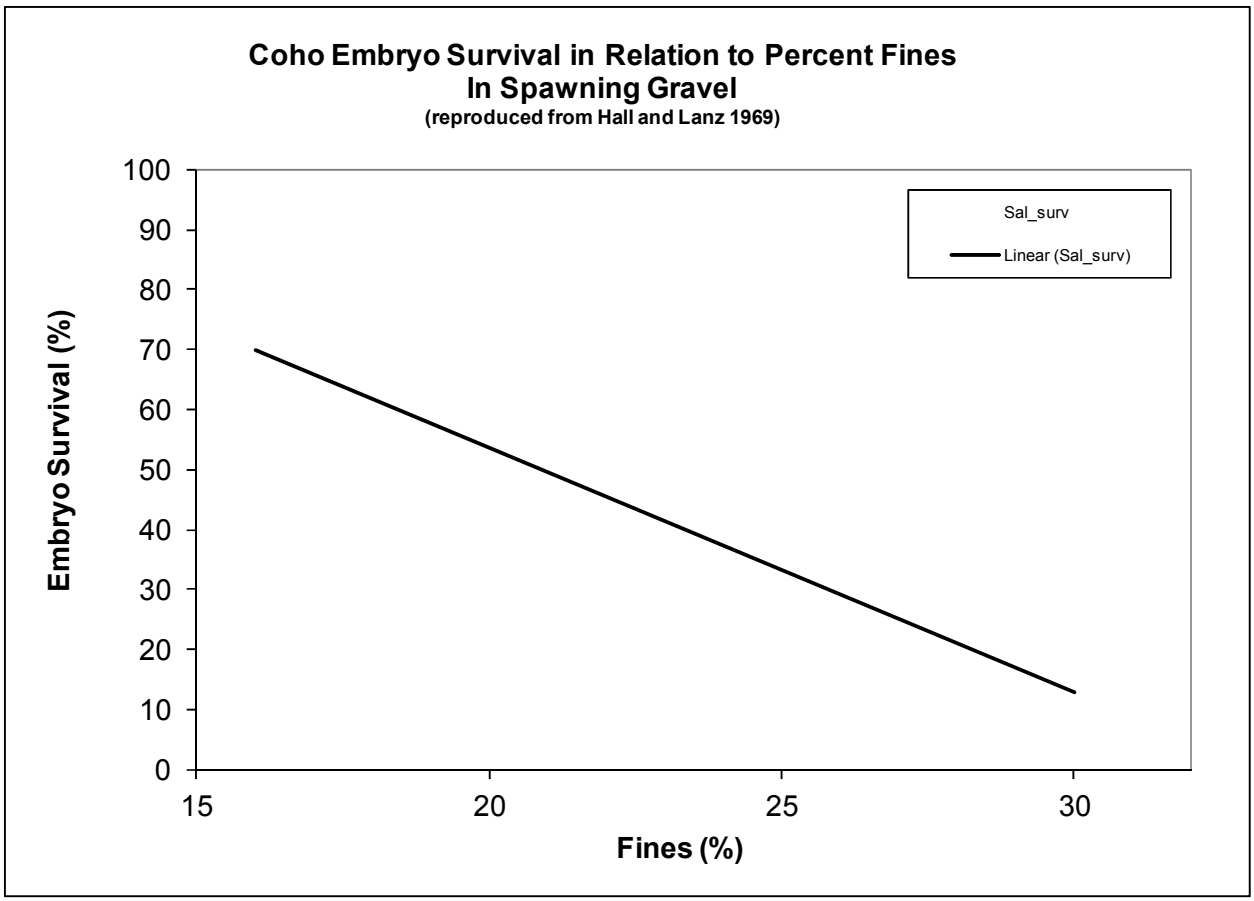

Figure 2. Coho embryo survival in relation to gravel embeddedness from Hall and Lanz 1969.

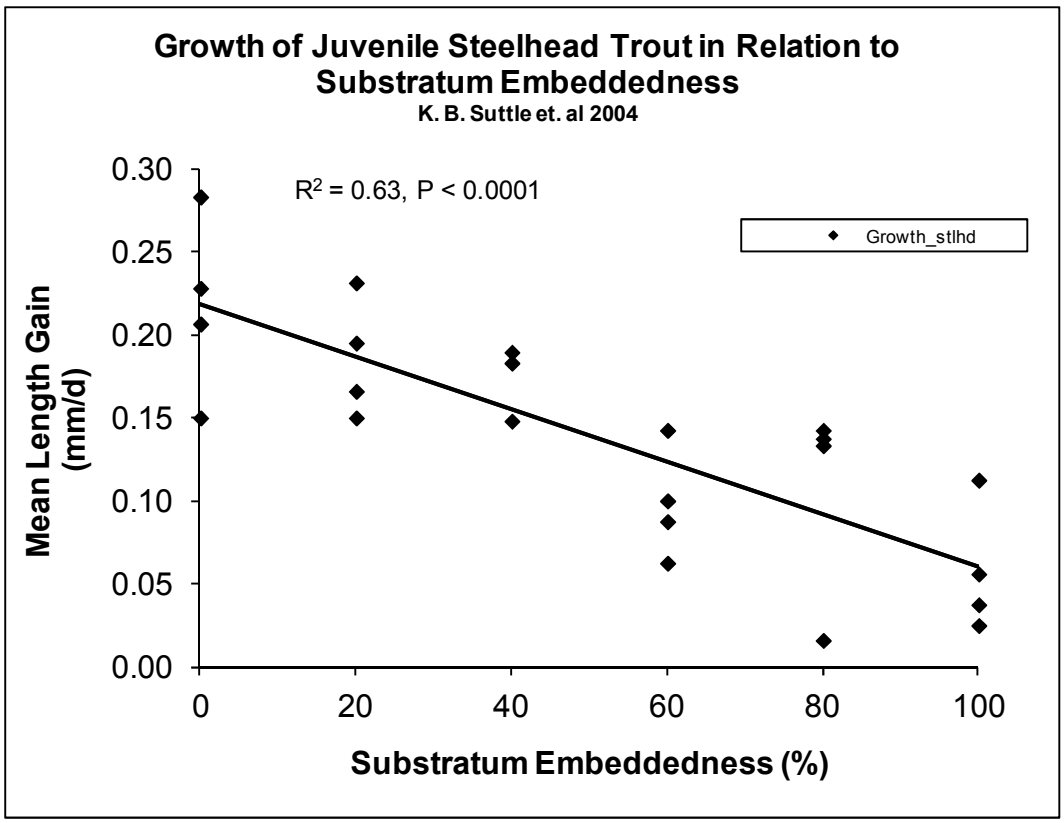

Figure 3. Growth of juvenile steelhead trout in relation to substrate embeddedness Suttle et. al 2004.

Table 2. Mean Monthly Flows 12/1/1905-9/30/2008 at Brockway Gauge (South Umpqua RM 138.7).

Mean, Minimum, and Maximum Flows in cfs, Sums in cfs·days

Month	# Values	Mean	Minimum	Maximum	Sum	Std Dev
1	77	6944	262	16000	534702.39	4215
2	77	6155	341	15400	473898.27	2953
3	77	4671	882	10900	359669.77	2354
4	77	3221	589	7380	247991.40	1491
5	77	1996	446	6910	153665.77	1184

6	77	881	142	3310	67859.37	546
7	76	265	53	576	20151.45	120
8	76	136	40	392	10359.90	65.0
9	76	149	50	587	11321.80	82.2
10	75	448	103	6040	33581.20	730
11	75	2569	190	13600	192643.17	2477
12	76	5680	184	20000	431669.90	4506

Source: Oregon Water Resources Department Flow Data

Table 3. Mean Monthly Flows 10/1/1910-9/30/2008 at Tiller (South Umpqua RM 187). Mean, Minimum and Maximum Flows in cfs, Sums in cfs·days

Month	# Values	Mean	Minimum	Maximum	Sum	Std Dev
10	71	188	35	1790	13340.18	245
11	71	1009	48	3980	71615.09	833
12	71	2038	67	7480	144698.56	1601
1	70	2116	90	4720	148085.14	1229
2	70	1968	95	4910	137726.09	937
3	70	1721	328	4780	120453.25	855
4	70	1422	433	2760	99527.30	492
5	70	1079	231	2090	75517.93	491
6	70	511	108	1640	35747.39	302
7	70	152	49	301	10636.06	58.4
8	70	75.9	30	206	5315.52	26.8
9	70	73.0	39	364	5107.95	44.6

Appendix B (Cont.): Expansion of riparian discussion from Department comments on the JCEP/PCGP DEIS**.**

Chapter 2.0 Table 2.1.5-1 Chapter 4.0; and Appendix F	**Riparian Habitat Impacts:** A. Riparian vegetation within the Riparian Management Area (RMA) zone near streams, wetlands, and waterways is critically important for the health of Oregon's native fish populations, especially in the drier parts of the pipeline corridor such as the Rogue and Klamath watersheds. Fish in the state are predominantly cold-water species that evolved in stream conditions that were generally in most cased related to climax or second growth hardwood and conifer forest, thus near maximum shade that the stand would produce. Oregon Dept. of Environmental Quality has identified 303d temperature listed streams including numerous streams through the pipeline route. These listings relate directly to removal of riparian	**Riparian Habitat Impacts:** A. The Department recommends for riparian vegetation: • RMA vegetation meet or exceed State and local government requirements be implemented on non-federal lands. All disturbed areas need to be replanted with native vegetation. The department recognizes that the proposed crossing locations may be on lands where private landowners may not allow the full setback to be replanted. In these situations, the Department does not object if mitigation for permanent riparian impacts occurs off-site provided that it occurs within proximity within the same HUC 6 watershed and on private lands. *(Note: The department recognizes recommendation in this section may not be possible).* Riparian ordinances in Coos and Douglas counties have been defined as a 50ft. minimum setback. Where the pipeline is adjacent to a stream corridor, the department recommends that riparian hardwood native vegetation be replanted and allowed to regenerate from the OHW mark to a distance of 50ft. minimum upslope in the pipeline corridor. The Department recommends: • Plants should include a minimum of at least 3 shrub species and 2 hardwood and 2 conifer tree species native to the location. • Plants should be installed from bare root or preferred 1 gallon or 2 gallon stock from a genetic source within 60 air miles and 1000ft. of elevation of the site. • Planting spacing should be 3ft. maximum and

	vegetation since the 1800's. The department notes that PCGP staff have developed a water temperature model to evaluate the impacts of the project at specific stream crossings. Chapter 4.3 identifies through modeling efforts that some streams impacted by the PCGP will be cooler following removal of the riparian corridor, which is not scientifically logical. • OC Coho salmon production across the pipeline route has been significantly deleteriously impacted by historical removal of vegetation from the RMA. Further impacts are considered as highly negative for this species as well as Fall Chinook Salmon, winter steelhead, and Coastal Cutthroat Trout. • The DEIS identifies extensive measures on federal lands where RMA's are currently considered in "Good" condition to further improve these stands. These measures are noted by the Department, but will fully fail to address damage to RMA's on private lands. • B. The Department has repeatedly raised concerns over inadequacy of	continue upslope. • *(Note: The Department recognizes the need for the pipeline to maintain a maintenance corridor. Accordingly, the above recommendations in A. are likely not feasible and in lieu of on site mitigation off-site mitigation is recommended such .* B. The Department recommends coordination with Department staff to develop Riparian Mitigation off-set mitigation (see comments below). *<u>Note:</u> In Jackson County, the riparian setback for all streams except the Rogue River is 50 feet from the ordinary high water level; the setback on the Rogue is 75 feet. As part of its review process for land use actions, Jackson County typically requires applicants to fill out a Riparian Landscape Plan showing how the proposed project will mitigate for unavoidable impacts to riparian areas. These plans must be reviewed and approved by the department before the County will accept them. Planting measures should be the same as section A.* <u>C. If the Applicant is unable to ensure the recommendations above in A and B</u>, The Department recommends the 30-foot wide area centered on the pipeline where the current proposal is to allow no trees taller than 15 feet be allowed to grow; as there will be a 30-foot wide area which will be maintained in an herbaceous state that provides very limited RMA function. The maintenance corridor will alter the vegetation in riparian areas for the life of the project and should require mitigation. Pacific Connector should calculate the amount of permanent impact from this loss of vegetation using the local riparian setback ordinances and be required to provide mitigation accordingly. Most riparian habitats will be considered Habitat Category 2 or 3 under the department Habitat Mitigation policy. In order to meet a "Net Benefit" through habitat restoration, the

	proposed riparian vegetation buffers for the PCGP on non-federal land. The proposed 25-foot replanting zones on private and state lands are not consistent with county or state requirements for riparian areas which may also vary depending on specific location within state and private forest lands. Agreed riparian buffers on federal land are 100 ft. minimum. For example, Douglas County Land Use and Development Ordinance (LUDO) requires the department to complete an inspection for any land use action that will affect the Riparian Vegetation Corridor. Other counties that the pipeline passes through have similar riparian vegetation-related ordinances. The Douglas County ordinance requires the Department to grant approval to reduce the setback or, if that is not possible, there is an appeals process through the county planners. C. Providing shade to streams is a critically important function of riparian areas, but there are many other functions. Healthy riparian areas contribute wood to streams which create habitat for	D. <u>Thinning as Mitigation:</u> The department recommends: • This treatment be used only on a very limited basis if at all. • This type of treatment only be used in subbasins where no stream or downstream reach of a connected stream is considered 303d listed. <u>Additional Riparian Recommendations:</u> The department recommends revisiting analysis and discussion of the following specific riparian impacts/mitigation components of the 2009 project FEIS: Revisit the sufficiency of the Compensatory Mitigation Plan (CMP) to fully mitigate project impacts. The CMP which was developed in close consultation with the USFS and other federal agencies and has been considered by the applicant to be sufficient to mitigate for impacts to federal and private lands. The department does not concur with the above conclusion. • The vast majority of proposed mitigation will occur on Federal lands whereas impacts to habitats will occur across Federal, State, and private ownerships creating an inequitable disparity between impact site and mitigation site location. According to the DEIS, a total of 90.7 acres of various types of riparian vegetation will be removed within riparian zones on federal property with additional acres on private ownership that are within watersheds that provide critical habitat for either Oregon Coast (OC) and Southern Oregon/Northern California Coast (SONCC) coho salmon. Most of this habitat (70%) is on private land. The CMP focuses on a late successional and mid-seral forest subset within the lost riparian

	fish and slow down stream flows during storms. Plant roots hold the soil in place which helps to prevent erosion. Riparian vegetation filters runoff reducing the amount of sediment and pollutants that enter the stream. Many terrestrial wildlife species rely on riparian vegetation for food, shelter, and migration corridors. D. <u>Thinning as Mitigation:</u> The DEIS notes in TABLE Table 2.1.5-1 and other locations thinning of the riparian forest as mitigation. The department recognizes that this treatment will produce harvest revenue, however, assuming that this treatment is aimed at producing greater growth through reducing stock densities, the department considers this treatment experimental and unlikely to yield benefits for fishery resources on medium and small streams as: • Due to existing stream protection buffers on federal lands most stands timber near streams are >60yrs. in age. Individual trees in these stands largely have attributes (sufficient size and	vegetation habitat. Most of this habitat (63%) is on private land. Yet, nearly the entire menu of mitigation for these impacts occurs on public land. Throughout project reviews, the department has recommended that mitigation occur on private lands where it may not occur otherwise. • The Department recommends further consideration of mitigation options on non-federal lands in order to achieve mitigation site locations commensurate to impact site locations. • The Department recommends that mitigation proposals should be expanded for impacts to fish species in addition to late successional and mid-seral forest riparian habitat across the pipeline route including the range of both OC and SONCC coho salmon. The proposed project would result in a loss of function of other riparian habitat types due to a lack of adequate proposed mitigation. The Department recommends other priorities for mitigation in addition to large wood. These include, but are not limited to: • Purchase of in-stream water rights from willing sellers • Protection of riparian habitat on private land (purchases or easements from willing sellers), • Restoration of fish passage, and • Restoration of riparian habitat such as fencing and planting, non-native vegetation control, etc. (multi-year projects) See Appendix B in this document. FERC's staff has previously recommended that PCGP develop a stream mitigation plan. The department has previously requested this as well. • The Department recommends that the applicant complete a stream, riparian, wetland, and upland mitigation plan for all

	height) to provide good-excellent LWD for small streams and fair-good for smaller medium sized streams. • A number of small tributaries where treatments are proposed feed into larger tributaries that are 303d listed for temperature. If a particular stand is providing maximum shading overstocked and thinning will reduce shading there becomes a need for discussion to determine "Limiting Factors" for salmonids by individual watershed prior to thinning treatment. Increasing water temperature at time zero in the context of increasing LWD 100-200yrs. in the future fails to meet ecological objectives. • Thinning of overstocked stands decreases tree mortality, improves growth rates, and theoretically extends the life expectancy of trees. Overstocked stands have more disease issues and greater mortality, thus contributing more snag habitat and large wood to streams in upcoming years, while allowing	impacts (on federal and non-federal lands), which is acceptable to state and federal natural resource agencies and approved by the department prior to FERC authorization of this project. The Department notes that proposed mitigation measures in the CMP are likely not adequate. Each of these stream crossings will need to be assessed during a site visit with a department biologist to assess project-related impacts. These site visits will be used to determine: • The Department anticipates that the applicant will use all measures available to determine fish distribution, however, in the rare instance that there remains uncertainty concerning fish use of a stream department staff will need to assist with historic and present fish presence/absence if unknown and species expected to be present. • Individual Habitat Categorization under the department Habitat Mitigation Policy and to assist the project proponents in determining suitable mitigation to offset those • The Department strongly objects to the Environmental Investigator (EI) determining mitigation needs during implementation as described in the FERC Wetland and Waterbody Construction and Mitigation Procedures. Site specific impacts will need to be assessed at each stream or river crossing to determine mitigation needs for each unique site based on the department Fish and Wildlife Habitat Mitigation Policy.

	remaining trees to continue to grow. • There is no existing dataset documenting from time zero through to 200-300yrs. when it could be determined if the original treatment produced greater quantity of large wood for stream complexity.	

Jordan Cove LNG Plans Not Good Enough For People Or Environment, Oregon Says

by **Jes Burns** (/contributor/jes-burns/) Follow OPB July 12, 2019 2:45 p.m. | Updated: July 15, 2019 7:34 a.m. | Ashland, Ore.

The state of Oregon says federal environmental impact findings for the Jordan Cove liquefied natural gas project are inadequate and sometimes incorrect. State agencies submitted 250 pages of comments to federal energy regulators (file:///C:/Users/JPR-operations/Downloads/OR%20AGENCY%20COMMENTS%20ON%20DEIS%20) late last week on the project's draft environmental impact statement (DEIS). The Federal Energy Regulatory Commission (FERC) has the power to determine whether the controversial project can be built.

The Canadian company Pembina is proposing to build an LNG export terminal and pipeline in southwest Oregon. Natural gas from the Rockies and Canada would be piped from a new pipeline juncture in the Klamath County town of Malin about 230 miles across public and private property to a terminal at the Port of Coos Bay. There, the gas would be liquefied and loaded onto tanker ships bound for Asia.

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Jordan Cove Would Be Oregon's Top Carbon Polluter If Built (/news/article/jordan-cove-oregon-lng-carbon-pollution/)

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Several Oregon state agencies reviewed economic, environmental and social impacts outlined in the project's DEIS (https://www.ferc.gov/industries/gas/enviro/eis/2019/03-29-19-DEIS/03-29-19-DEIS.pdf), for which the public comment period closed on July 5. The overall message was that Jordan Cove and federal energy regulators do not tell the full story of how the project will affect local communities.

Natural Disasters

Some of the most critical feedback came from Oregon's Department of Geology and Mineral Industries (DOGAMI), which evaluated Jordan Cove's plans to handle landslides, tsunamis and a Cascadia subduction zone earthquake (https://www.opb.org/news/series/unprepared/).

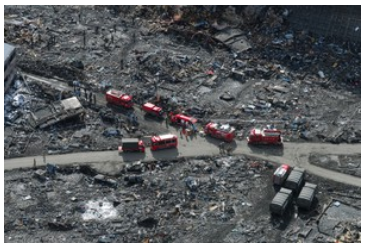
"Geologically, it's a very active area," said DOGAMI resiliency engineer Yumei Wang of the four-county region in southwest Oregon.

She said for natural disasters like a Cascadia earthquake, it's not if it's going to happen, it's when.

"When it happens, has the facility been designed to be safe? You don't want to have things exploding and failing in a ways that hurt the public," she said.

This planning for safety and resiliency is referred to as "mitigation." Wang said the problems start with the underlying assessment of the

FULL COVERAGE



(/news/series/unprepared/)

Unprepared: Will We Be Ready For The Megaquake In Oregon? (/news/series

(/news/article/oregon-coos-bay-fishermen-brace-impact-jordan-cove-channel-widening-projects-/)

Coos Bay Fishermen Brace For Impacts From Jordan Cove And Channel-Widening Projects (/news/article/oregon-coos-bay-fishermen-brace-impact-jordan-cove-channel-widening-projects-/)

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Jordan Cove LNG Project Entering Important Permitting Stretch (/news/article/jordan-cove-lng-project-entering-important-permitting-stretch/)

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/unprepared/)

A magnitude 9.0 earthquake off the Northwest coast could hit at any time. How can we prepare for this impending and unpredictable disaster?

(https://www.opb.org/firstlook/)

risk of these natural disasters because Jordan Cove relied on outdated information and technology in their analysis.

For example, DOGAMI states in comments that Jordan Cove planners relied on earthquake fault data from the U.S. Geological Service along the pipeline route. But by examining recent maps made using lidar (a laser surveying method), "DOGAMI has identified dozens of previously unknown active faults." Lidar technology (https://www.opb.org/television/programs/ofg/segment/oregon-tallest-tree-champion-douglas-fir-brummit-doerner/) can also be used to identify landslide activity.

"They didn't characterize the hazards adequately," Wang said. "Because they didn't do that, they really can't propose mitigation that is acceptable because they haven't done that first step."

Fish And Wildlife Habitat

Oregon's fish and wildlife agency also looked critically on FERC's analysis of the environmental impacts of the project.

ODFW examined the pipeline and terminal plan to see if the company is proposing enough habitat restoration to offset what would be lost through construction. In regulatory terms, these kinds of projects are also referred to as "mitigation."

"The way we're reading the proposal, the end result would be a net loss in fish and wildlife habitat. So we don't find that that allows us to meet our public trust

responsibility," said Sarah Reif, statewide energy coordinator for ODFW.

A view of Coos Bay from spot where Jordan Cove LNG terminal ship will be excavated, if approved by regulators.

Jes Burns/OPB

The agency submitted a list of dozens of additional restoration projects that would need to be done to ensure no net loss of fish and wildlife habitat.

"Those would all be necessary and then some," Reif said. "We talk about what we think would be necessary to offset the loss of, for example, eelgrass (https://www.opb.org/news/article/kelp-seagrass-oysters-ocean-change/) in the Coos Bay estuary [or] late successional forest habitat for [marbled] murrelet and [northern spotted] owls."

These habitat types will be destroyed through the dredging of the terminal slip and laying of the pipeline through public forests.

In addition, ODFW says that the regulatory documents "grossly underestimate" the economic impact the project will have on the state's $2.5 billion commercial and recreational fishing industries (https://www.opb.org/news/article/port-orford-oregon-economy-climate-change-dungeness-crab-

season/). The comments specifically point out the importance of the Coos Bay estuary in providing habitat for young Dungeness crab, a cornerstone fishery for fishing fleet in Coos County, and concerns that dredging associated with the Jordan Cove project would diminish the productivity of the bay.

Carbon Footprint

In its comments to FERC, the state of Oregon also aimed criticism the energy agency itself.

Last February, the commission first applied what it called a "new approach (https://www.ferc.gov/media/news-releases/2019/2019-1/02-21-19-CP15.asp#.XSjLguhKiUn)" to calculating the emissions of climate warming gasses like carbon dioxide and methane for liquefied natural gas projects. FERC decided to only consider emissions associated with the immediate footprint of the project.

For Jordan Cove, that would be 2.14 million metric tons of carbon dioxide equivalent in Oregon alone. If built, it would be the largest greenhouse gas emitter in the state (https://www.opb.org/news/article/jordan-cove-oregon-lng-carbon-pollution/), higher even than Oregon's only coal-fired power plant.

The DEIS says "it is not currently possible to determine localized or regional impacts from [greenhouse gas] emissions from the Project." And without that, "we are unable to determine the significance of the Project's contribution to climate change."

In its response, Oregon argues this approach is not good enough and "fails to describe and assess the potential impacts on Oregon's lands and state waters due to air contaminant emissions, including greenhouse gas emissions, from the transportation of

Yurok Tribal Councilor Ryan Ray speaks out against the Jordan Cove LNG project at a federal hearing in Medford.

Jes Burns/OPB

LNG during natural gas exploration, collection, distribution and export to markets outside the United States."

From the latest international climate assessment (https://nca2018.globalchange.gov/chapter/24/), it's known that climate change has already resulted in longer wildfire seasons in the Pacific Northwest. Warmer winters have led to reductions in the mountain snowpack. This is speeding the historically slow release of water for communities, agriculture, rivers and fish. In addition, climate change is expected to continue affecting the natural resources sector of the Northwest economy, with impacts on coastal fishing, Douglas fir plantations, vineyards and farming.

Oregon argues FERC's assessment that life-cycle climate impacts of Jordan Cove are "outside the scope" of the regulatory documents is "legally incorrect."

Jordan Cove officials say they are reviewing the comments and will submit responses to FERC by the July 22 deadline.

After receiving Jordan Cove's responses, federal energy

regulators will decide what additional measures, if any, are required.

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McCullough Research

Robert F. McCullough, Jr.
Principal

Date: June 5, 2019

To: McCullough Research Clients

From: Robert McCullough
Michael Weisdorf
Eric Shierman

Subject: The Questionable Economics of Jordan Cove LNG Terminal

A decade ago, one member of Oregon's congressional delegation asked us for a review of the Jordan Cove LNG import terminal proposed for Coos Bay.[1,2] The analysis was not difficult. The price of LNG exported to Japan from Alaska is reported in both Japan and Alaska. These prices were higher than the increasing amounts of natural gas appearing on the market from Alberta and Wyoming. Clearly, Jordan Cove was not a competitive solution for the import of LNG.

Jordan Cove's owners gradually realized that the new technologies of oil and natural gas made the import proposal uneconomic and changed the direction of LNG to a proposed export terminal in 2012.[3]

However, there are a number of good reasons to question whether this is a good location and a good project design. First, the supplies for Jordan Cove are taken from the Malin hub in southern Oregon. This puts the terminal at a six-hundred-mile disadvantage in transportation costs. Second, the announced costs of the terminal are high by market standards – significantly higher than its competitors. Third, the technology of Jordan Cove – using natural gas as opposed to electricity for compression – makes it less efficient than its competitors in British Columbia or the Gulf Coast.

Our analysis indicates that Jordan Cove will have a significant cost disadvantage compared to its competitors – approximately 25%. We also calculate the chance of Jordan Cove reaching operation is only one third.

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[1] McCullough Research. *Memo on LNG Pricing.* April 8, 2008.
[2] LNG refers to Liquified Natural Gas. LNG is a liquid when maintained at 260 degrees (F) below zero.
[3] Jonathan Thompson. "A pipeline built years ago may start to export Rocky Mountain gas to Asia." *High Country News*, April 14, 2014. https://www.hcn.org/blogs/goat/how-a-little-noticed-pipeline-might-make-natural-gas-exports-possible

Jordan Cove is currently at the pre-FID stage in its development. FID is an industry term standing for "Final Investment Decision". The FID is a critical decision that initiates actual financing and construction. The justification for proceeding to FID usually depends on two different analyses:

1. Is the location and facility likely to succeed given the past history of feed gas and ultimate markets?
2. How competitive is this specific facility compared to its peers?

The price differential between feed gas at the production site and delivered LNG at the destination market forms the economic basis for the decision to invest in LNG export projects. The chart in Figure 1 below shows the price history for Platts JKM (Japan/Korea Marker) price index, the global market with the highest price premium, as well as the price of Canadian feed gas at the AECO hub, which in recent years has traded at the lowest prices in North America.[4]

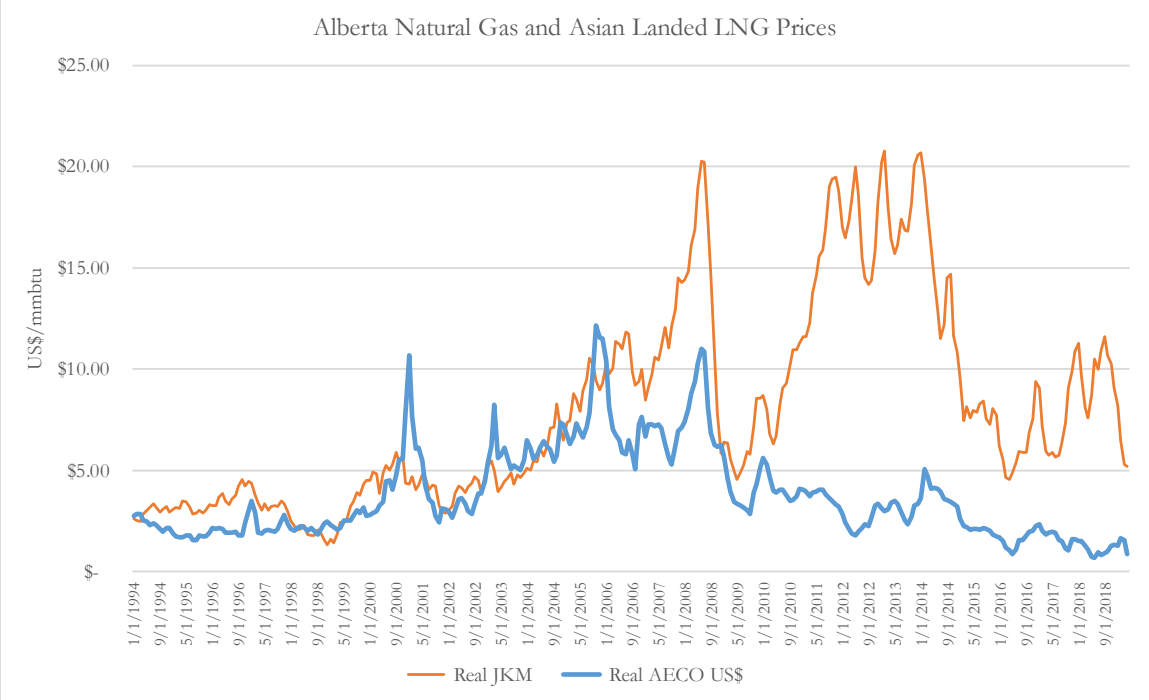

Figure 1: Natural Gas Prices in Canadian and Japanese Markets

[4] "Platts JKM™ is the Liquefied Natural Gas (LNG) benchmark price assessment for spot physical cargoes. It is referenced in spot deals, tenders and short-, medium- and long-term contracts both in Northeast Asia and globally." https://www.spglobal.com/platts/en/our-methodology/price-assessments/natural-gas/jkmt-japan-korea-marker-gas-price-assessments

A number of LNG export projects were proposed, planned, invested in, and built in the years following the 2011 Tohoku earthquake and resultant nuclear accidents at Fukushima Daiichi. During this period, all of Japan's nuclear reactors were taken offline, and large quantities of LNG were imported to replace the lost megawatts of electric power, causing the large increase seen in the JKM price marker. As nuclear plants begin to come back online in Japan, and the global LNG supply has expanded, the premium prices at JKM have begun to fall back in line with other natural gas markets around the world. Although Japan, with little to no gas supplies of its own, will continue to import gas from other markets, it seems unlikely that the large price premium observed from 2011-2016 will be a permanent feature of this market, which currently trades below $6/MMBtu.

The price of LNG in Japan has dropped markedly in the last six months, and even more dramatically in the last 3 years.[5] The following chart in Figure 2 shows the spread between JKM LNG and the Henry Hub index price of North American natural gas.

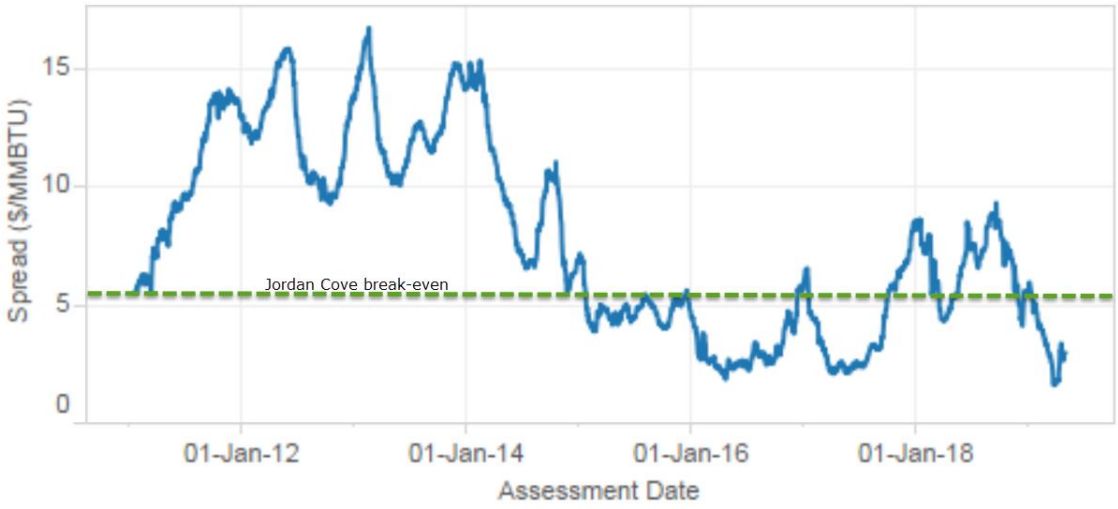

Figure 2: Recent JKM Price Changes

Beyond just the costs of feed gas itself, the costs of building, maintaining and operating an LNG export terminal must be recovered from the sale of LNG in the export market. The Jordan Cove Energy Project proposes to operate as a tolling model, providing liquefaction,

[5] *LNG Daily*, S&P Global Platts. https://www.spglobal.com/platts/en/products-services/lng/lng-daily

storage, and transport services to buyers of natural gas, who will pay a tolling fee per unit (MMBTU) based on the costs involved.[6]

Reviewing the materials submitted to FERC by the applicant allows us to calculate the tolling fee that would be needed to fully recover the costs of the project. Similar data is available for the British Columbia LNG terminal that received its FID last year. LNG Canada, sited at Kitimat, British Columbia, is larger than Jordan Cove, closer to inexpensive Alberta natural gas, and has better technology.[7]

The industry leader in North America is Cheniere Energy.[8] They have massive projects already in operation and plan an additional 30 MTPA to come into operation in the near future. Their data is contained in many sources and is generally subject to SEC rules on reporting.

The following table compares the three projects:

	Jordan Cove	LNG Canada	Cheniere
Output (MTPA)	7.8	14	31.5
Pipeline Cost (Billion $)	$ 2.46	$ 4.77	
LNG Project Cost (Billion $)	$ 7.30	$ 10.77	$ 30.00
Required Profit Margin for FID (Billion $)	$ 0.98	$ 1.55	$ 3.00
Total (Billion $)	$ 12.05	$ 19.18	$ 33.00
Per MTPA	$ 1.54	$ 1.37	$ 1.05
Annualized/MTPA @ 10% Real RoR	$0.16	$0.15	$0.11
Annualized/MMBTU	$3.33	$2.95	$2.26
O&M	$ 0.05	$ 0.04	$ 0.02
O&M/MMBTU	$0.94	$0.83	$0.32
Natural Gas Basis Differential ($/MMBTU)	($0.07)	($0.64)	$0.00
Required Margin @ FID	$4.27	$3.78	$2.58
Transportation to Asia ($/MMBTU)	$0.87	$0.87	$1.50
Required Margin at Asian Market	**$5.07**	**$4.01**	**$4.08**

Table 1: Comparison of Jordan Cove, LNG Canada, and Cheniere

[6] "Tolling" is an industry term that indicates that natural gas suppliers can bring natural gas to the LNG facility and have it compressed into liquified natural gas and delivered to the final market. The facility operator does not own the product at any point.

[7] Compression of natural gas into a liquid can be done by electricity or natural gas. Electricity is less expensive and more reliable. Jordan Cove's competitors are using electricity. Jordan Cove is using natural gas.

[8] Cheniere Energy, once an importer of LNG to its Sabine Pass, LA terminal, became the first Gulf Coast LNG exporter in early 2016. https://www.cheniere.com/terminals/lng/

The calculation of the minimum tolling fee that an LNG project can charge and make an acceptable project starts with the proposed output in millions of metric tons per annum. The pipeline cost from existing natural gas hubs to the project is added in the second line.

The cost per MMBTU (Millions of British Thermal Units) is derived by dividing the cost per MTPA by the BTU content of a metric ton of LNG.

Annual O&M costs are assumed to be 3% of the total project cost. Cheniere has a lower O&M cost available from its financial reports and financial presentations.

The basis differential for natural gas supplies is discussed below. Put simply, natural gas costs less at the well head – Alberta or Texas/Louisiana – than it does at the end of the pipeline.

The required profit margin is assumed to be 10% of the total investment. This is a standard industry assumption reflecting the risks of investing in the volatile LNG industry.

Transportation to Asia is taken from Cheniere's financial reports and estimates for West Coast projects. The West Coast is closer to Asia and has a significant transportation advantage.

The final line, in bold, sums the costs and arrives at the amount that the projects require as a fee for natural gas suppliers to take their feed gas to Asia.

The next chart (Figure 3) shows the price of Canadian natural gas in Alberta, the cheapest possible feedstock for the project plus the Jordan Cove tolling fee, as compared to the JKM price marker. The convergence of these two series seen in recent years suggests that the economics of this project are questionable at best.

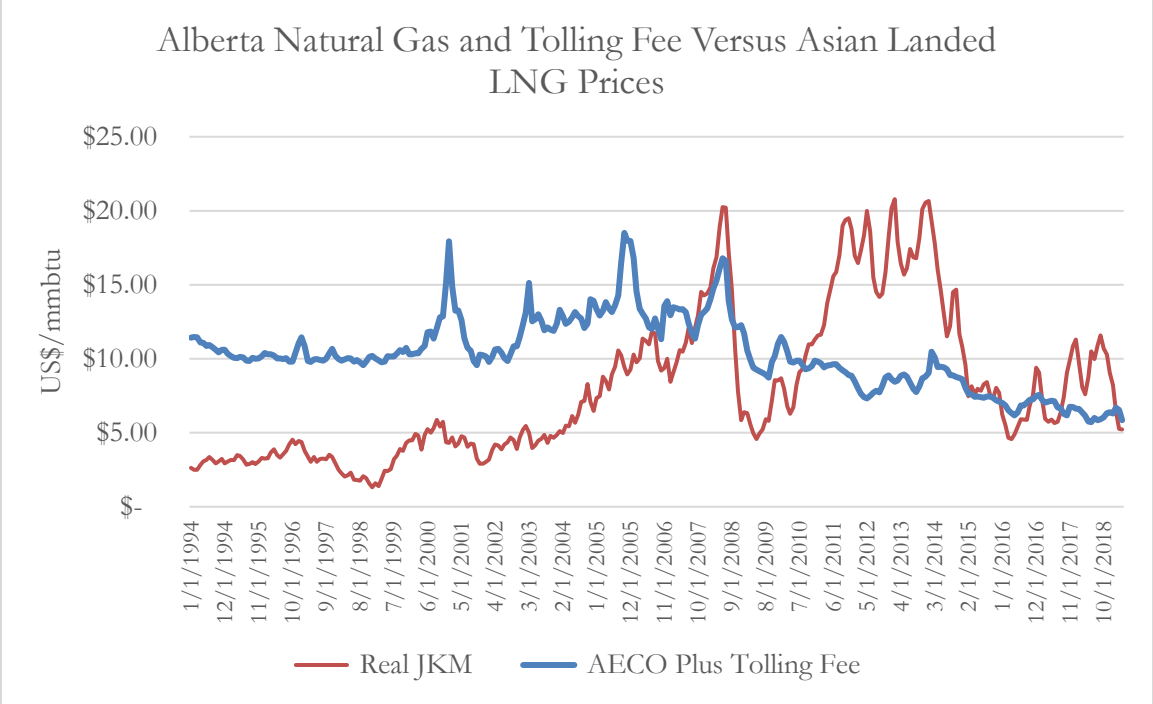

Figure 3: Delivered Cost and Asian Prices

In addition to our retrospective analysis, McCullough Research has developed a Monte Carlo model designed to predict the probability of success for West Coast LNG export terminals.

The Monte Carlo method was invented by Stanislaw Ulam during the Second World War at Los Alamos National Laboratory where models were used to help design the first thermonuclear weapons. One of the challenges Dr. Ulam and his colleagues faced in developing atomic fission was the sheer complexity of the possible reactions. Calculating over all possible interactions was impossible given the limited computers of his era (who generally were staff doing computations on mechanical calculators). The Monte Carlo method relies on large volumes of random samples. Each pick of variables is called a "game" and the results, when averaged, closely approximate what a very extensive analysis might develop. Today, Monte Carlo models are frequently used in economics, finance, engineering, and science.

Our model compares all the possible combinations of feed gas and Asian landed gas prices observed over the past decade, to generate a total of 92,416 games. Even with the unusually high post-earthquake prices of 2011-16 included in the study period, this analysis indicates that the probability of Jordan Cove successfully reaching FID is no more than 34%, as shown in Figure 4 below.

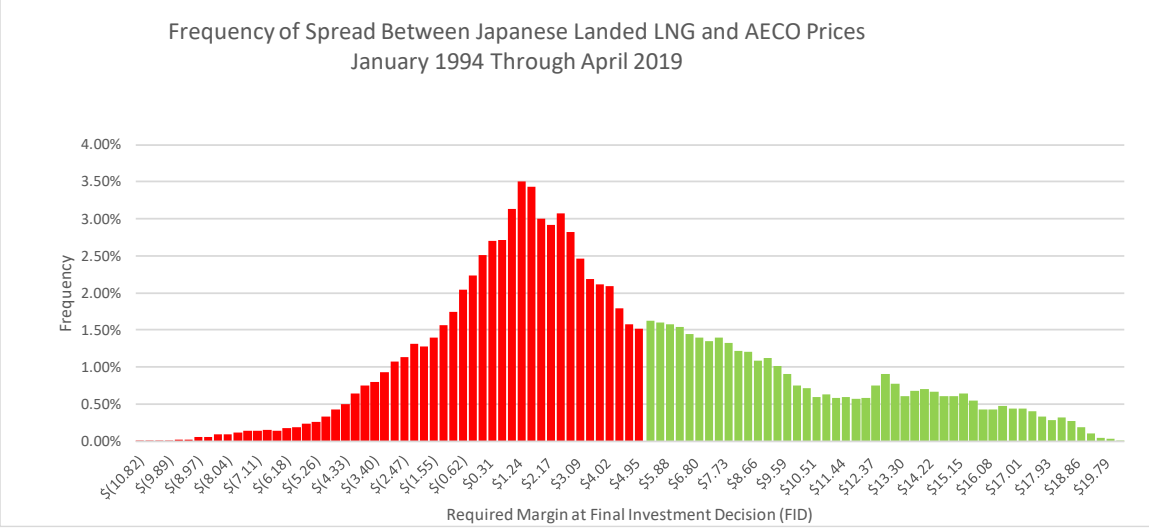

Figure 4: Monte Carlo Results

The modeling suggests strongly that more often than not, the spread between these prices is substantially less than what would be required to cover the costs of Jordan Cove, let alone earn any profits.

A critical issue in the future of Jordan Cove is the supply of natural gas and, very importantly, its price. The West Coast's major market for natural gas is in California. Pipelines extend into California from the north (Alberta and Colorado) and the east (the Gulf States).

Not surprisingly, prices are lower at the wells and increase with distance. Since California enjoys competition between different sources, the price for natural gas tends to increase or decrease with the major trading hub at Henry Hub, Louisiana. When prices fall at Henry Hub, competitors elsewhere in the U.S. and Canada must lower their prices to compete.

The locations where multiple suppliers and customers meet to negotiate transactions are known as a "hub". The term is meant to remind us of a wheel where spokes (pipelines) fan out from a central location.

On the West Coast there are ten major hubs as shown in the map in Figure 5:

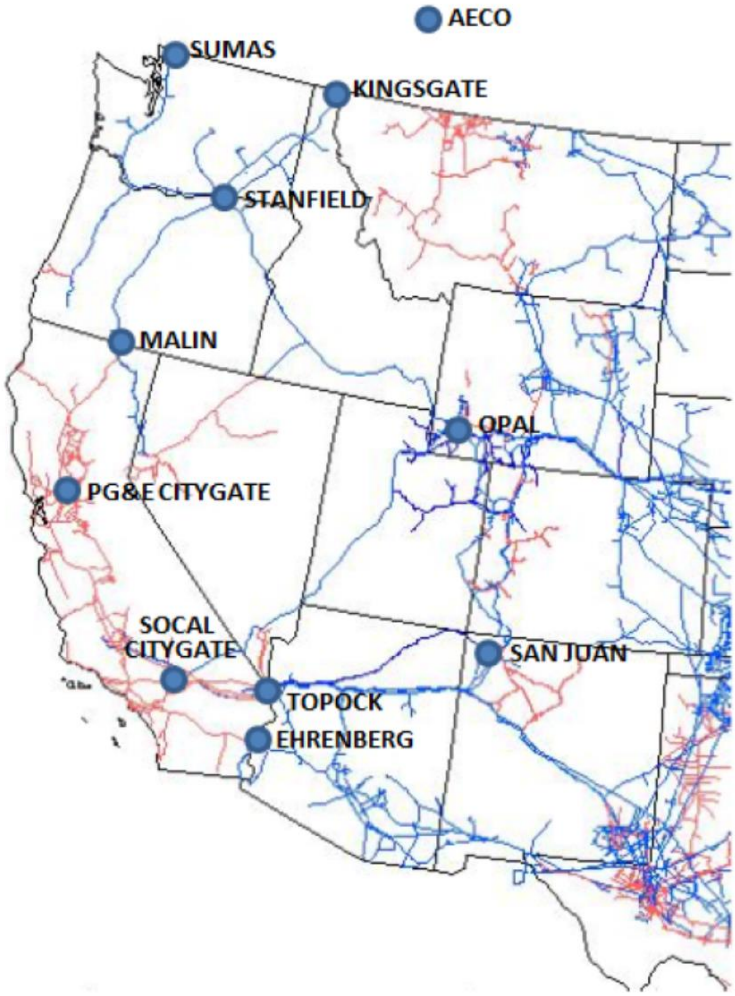

Figure 5: West Coast Natural Gas Hubs and Pipelines[9]

The trader's term for the difference in prices between hubs is *basis differential*. This value represents the expected difference between lower priced areas like Alberta and high-priced areas like Southern California. Traders watch these differentials and seize upon moments when they can profit by moving natural gas between hubs.

Financial markets like the Chicago Mercantile Exchange (which now includes the New York Mercantile Exchange – NYMEX) and the Intercontinental Exchange (ICE) document prices at the various hubs and facilitate long term commodity contracts.

[9] Bonneville Power Administration. Power Market Price Study and Documentation, BP-18-E-BPA-04. Page 40. https://www.bpa.gov/secure/Ratecase/Documents.aspx

An LNG export project like Jordan Cove requires a firm supply of feed gas delivered to its location, which is the purpose of the Pacific Connector pipeline connecting the proposed export terminal to the natural gas trading hub at Malin, Oregon near the California border.

The commercial success of the project thus very much depends on future movements in the price of gas at Malin. Commodities futures contracts, used to hedge against the risk of adverse price movements, are typically executed with respect to a basis differential, which specifies a discount or premium above or below an index price. Gas futures are priced with respect to the spot price at the Henry Hub in Louisiana, which is the delivery location specified by NYMEX for natural gas futures contracts and thus serves as the index price of US natural gas.[10]

As shown in Table 2 below, most Pacific Northwest gas hubs trade at a discount to Henry Hub, while California markets trade at a premium. The basis differential from Henry Hub at Malin is an estimate of the cost of long-term gas supply to the Jordan Cove project, while the competing LNG Canada project will be able to source its feed gas at a much lower price, due to the much wider basis discount seen at the AECO hub in Alberta.[11]

[10] "Henry Hub refers to the central delivery location (or, hub) located near the Louisiana's Gulf Coast, connecting several intrastate and interstate pipelines. Henry Hub has been used as a pricing reference for the futures since April 1990." https://www.cmegroup.com/trading/why-futures/welcome-to-nymex-henry-hub-natural-gas-futures.html

[11] "The AECO-C price is derived from the U.S. Henry Hub market price, taking into account transportation differentials, regional demand, and the U.S./Canadian dollar exchange rate. Similarly, the Alberta Reference Price (ARP) is derived from the AECO-C price, taking into account Alberta pipeline transportation costs." https://www.aer.ca/providing-information/data-and-reports/statistical-reports/commodity-prices-methodology

BPA Rate Cases: Power Risk and Market Price Studies						
FY	2014	2015	2016	2017	2018	2019
Henry Hub	$4.08	$4.35	$3.86	$4.05	3.24	3.25
AECO	-0.37	-0.39	-0.4	-0.42	-0.61	-0.64
Kingsgate	-0.19	-0.19	-0.16	-0.16	-0.2	-0.21
Malin	-0.09	-0.08	-0.03	-0.04	-0.07	-0.07
Opal	-0.12	-0.13	-0.13	-0.15	-0.13	-0.13
PG&E	0.25	0.27	0.31	0.32	0.34	0.36
SoCal City	0.05	0.05	0.24	0.26	0.22	0.22
Ehrenberg	0.05	0.05	0.12	0.13	0.04	0.04
Topock	0.05	0.05	0.12	0.13	0.04	0.04
San Juan	-0.12	-0.1	-0.16	-0.17	-0.13	-0.13
Stanfield	-0.15	-0.14	-0.1	-0.11	-0.14	-0.14
Sumas	-0.03	-0.06	-0.09	-0.1		

Table 2: BPA Rate Case Basis Differentials

Table 2 shows estimates for basis differentials developed by the Bonneville Power Administration.[12] Their estimate for 2019 is that Alberta's natural gas prices are $.64/MMBTU less than the hub at Henry Hub, Louisiana. By the time natural gas has travelled to the Oregon/California border, the price advantage has fallen to $.07/MMBTU. One of the reasons why LNG Canada has received its Final Investment Decision is that its natural gas supply is directly from the oil and natural gas fields priced at the AECO hub.

In conclusion, Jordan Cove faces a number of insurmountable challenges:

1. Jordan Cove's costs are higher – roughly $1 / MMBTU more – than its competitors.
2. With the rapid decline in Asian landed LNG prices, it is unlikely that it will reach a Final Investment Decision.
3. Its technology is likely to be less reliable and more costly than the electric compression methods used elsewhere.

As with a number of other LNG export projects proposed for the Pacific Northwest, the chances of its successful completion seem quite low.

[12] Bonneville Power Administration. Power Market Price Study and Documentation for BPA Rate Case in 2014, 2016, 2018, 2020. (e.g. BP-20-E-BPA-04) https://www.bpa.gov/secure/Ratecase/Documents.aspx

Robert McCullough – *Curriculum Vitae*

Principal
McCullough Research, 3816 S.E. Woodstock Place, Portland, OR 97202 USA

Professional Experience

1985-present	Principal, McCullough Research: provide strategic planning assistance, litigation support, and planning for a variety of customers in energy, regulation, and primary metals
1996-present	Adjunct Professor, Economics, Portland State University
1990-1991	Director of Special Projects and Assistant to the Chairman of the Board, Portland General Corporation: conducted special assignments for the Chairman in the areas of power supply, regulation, and strategic planning
1988-1990	Vice President in Portland General Corporation's bulk power marketing utility subsidiary, Portland General Exchange: primary negotiator on the purchase of 550 MW transmission and capacity package from Bonneville Power Administration; primary negotiator of PGX/M, PGC's joint venture to establish a bulk power marketing entity in the Midwest; negotiated power contracts for both supply and sales; coordinated research function
1987-1988	Manager of Financial Analysis, Portland General Corporation: responsible for M&A analysis, restructuring planning, and research support for the financial function; reported directly to the CEO on the establishment of Portland General Exchange; team member of PGC's acquisitions task force; coordinated PGC's strategic planning process; transferred to the officer's merit program as a critical corporate manager
1981-1987	Manager of Regulatory Finance, Portland General Electric: responsible for a broad range of regulatory and planning areas, including preparation and presentation of PGE's financial testimony in rate cases in 1980, 1981, 1982, 1983, 1985, and 1987 before the Oregon Public Utilities Commission; responsible for preparation and presentation of PGE's wholesale rate case with Bonneville Power Administration in 1980, 1981, 1982, 1983, 1985, and 1987; coordinated activities at BPA and FERC on wholesale matters for the InterCompany Pool (the association of investor-owned utilities in the Pacific Northwest) since 1983; created BPA's innovative aluminum tariffs (adopted by BPA in 1986); led PGC activities, reporting directly to the CEO and CFO on a number of special activities,

	including litigation and negotiations concerning WPPSS, the Northwest Regional Planning Council, various electoral initiatives, and the development of specific tariffs for major industrial customers; member of the Washington Governor's Task Force on the Vancouver Smelter (1987) and the Washington Governor's Task Force on WPPSS Refinancing (1985); member of the Oregon Governor's Work Group On Extra-Regional Sales (1983); member of the Advisory Committee to the Northwest Regional Planning Council (1981)
1979-1980	Economist, Rates and Revenues Department, Portland General Electric: responsible for financial and economic testimony in the 1980 general case; coordinated testimony in support of the creation of the DRPA (Domestic and Rural Power Authority) and was a witness in opposition to the creation of the Columbia Public Utility District in state court; member of the Scientific and Advisory Committee to the Northwest Regional Power Planning Council

Economic Consulting

2016-present	Expert witness to the U.S. Department of Justice on nuclear rate case
2016-present	Advisor to the City of Logansport on utility project development and decision-making
2016	Expert testimony for Gratl and Company before the Supreme Court of British Columbia on costs of Site C project delay
2015-present	Advisor to Huu-ay-aht tribe on Sarita Bay LNG project in British Columbia
2015-present	Analysis and expert testimony for Illinois Attorney General in official FERC complaint against MISO
2015-present	Advisor to Calbag Metals on generation project
2015-2016	Advisor to Oregon Department of Justice in the investigation of taxes owed the state by Powerex Corp.
2015	Economic analysis of the proposed 1100 MW hydro project, Site C, for the Peace Valley Landowner Association
2014-2015	Market analysis of the NYISO for the New York State Assembly

2014	Advisor to the Grand Council of the Cree on uranium mining in Quebec
2014-present	Support for the investigation of Barclays Bank
2013-present	Retained to do a business case analysis of the Columbia Generating Station by the Physicians for Social Responsibility
2013	Advisor to Environmental Defense Fund on gasoline and oil issues in California
2013	Advisor to Energy Foundation on Ohio competitive issues
2013	Export market review in the Maritime Link proceeding
2011	Consultant to Citizens Action Coalition of Indiana on Indiana Gasification LLC project
2010	Analysis and expert witness testimony for Block Island Intervenors concerning Deepwater offshore wind project
2010	Analysis for Eastern Environmental Law Center of 25 closed cycle plants in New York State
2010	Advisor on BPA transmission line right of way issues
2009-2010	Advisor to Gamesa USA on a marketing plan to promote a wind farm in the Pacific Northwest
2009-2010	Expert witness in City of Alexandria vs. Cleco
2009	Expert witness in City of Beaumont v. Entergy
2008-2009	Consultant to AARP Connecticut and Texas chapters on the need for a state power authority (Connecticut) and balancing energy services (Texas)
2008	Expert witness on trading and derivative issues in Barrick Gold litigation
2008-2014	Advisor to Jackson family in Pelton/Round Butte dispute
2007-2014	Advisor to the American Public Power Association on administered markets
2006-present	Advisor to the Illinois Attorney General on electric restructuring issues

2006-2007	Advisor to the City of Portland in the investigation of Portland General Electric
2006	Expert witness for Lloyd's of London in SECLP insurance litigation
2005-2007	Expert witness for Federated Rural Electric Insurance Company and TIG Insurance in Cowlitz insurance litigation
2005-2007	Advisor to Grays Harbor PUD on market manipulation
2005-2007	Advisor to the Montana Attorney General on market manipulation
2005-2006	Expert witness for Antara Resources in Enron litigation
2005-2006	Advisor to Utility Choice Electric
2004-2005	Expert witness for Factory Mutual in Northwest Aluminum litigation
2004	Advisor to the Oregon Department of Justice on market manipulation
2003-2006	Expert witness for Texas Commercial Energy
2003-2004	Advisor to The Energy Authority
2002-2005	Advisor to the U.S. Department of Justice on market manipulation issues
2002-2004	Expert witness for Alcan in Powerex arbitration
2002-2003	Expert witness for Overton Power in IdaCorp Energy litigation
2002-2003	Expert witness for Stanislaus Food Products
2002	Advisor to VHA Pennsylvania on power purchasing
2002	Expert witness for Sierra Pacific in Enron litigation
2002-2004	Advisor to U.S. Department of Justice
2002-2007	Expert witness for Snohomish PUD in Enron litigation

2002-2010	Expert witness for Snohomish in Morgan Stanley investigation
2001-2008	Expert witness for City of Seattle, Seattle City Light and City of Tacoma in FERC's EL01-10 refund proceeding
2001-2008	Advisor to VHA Southwest on power purchasing
2001-2005	Advisor to Nordstrom
2001-2005	Advisor to Steelscape Steel on power issues in Washington and California
2001	Advisor to California Steel on power purchasing
2001	Advisor to the California Attorney General on market manipulations in the Western Systems Coordinating Council power markets
2000-2007	Expert witness for Wah Chang in PacifiCorp litigation
2000-2001	Expert witness for Southern California Edison in Bonneville Power Administration litigation
2000-2001	Advisor to Blue Heron Paper on West Coast price spikes
2000	Expert witness for Georgia Pacific and Bellingham Cold Storage in the Washington Utilities and Transportation Commission's proceeding on power costs
1999-2002	Advisor to Bayou Steel on alternative energy resources
1999-2000	Expert witness for the Large Customer Group in PacifiCorp's general rate case
1999-2000	Expert witness for Tacoma Utilities in WAPA litigation
1999-2000	Advisor for Nucor Steel and Geneva Steel on PacifiCorp's power costs
1999-2000	Advisor to Abitibi-Consolidated on energy supply issues
1999	Expert report for the Center Helios on Freedom of Information in Québec
1999	Advisor to GTE regarding Internet access in competitive telecommunication markets

1999	Advisor to Logansport Municipal Utilities
1998-2001	Advisor to Edmonton Power on utility plant divestiture in Alberta
1998-2001	Energy advisor for Boise Cascade
1998-2000	Advisor to California Steel on power purchasing
1998-2000	Advisor to Nucor Steel on power purchasing and transmission negotiations
1998-2000	Advisor to Cominco Metals on the sale of hydroelectric dams in British Columbia
1998-2000	Advisor to the Betsiamites on the purchase of hydroelectric dams in Québec
1998-1999	Advisor to the Illinois Chamber of Commerce concerning the affiliate electric and gas program
1998	Intervention in Québec's first regulatory proceeding on behalf of the Grand Council of the Cree
1998	Market forecasts for Montana Power's restructuring proceeding
1997-2004	Expert witness for Alcan in BC Hydro litigation
1997-2003	Advisor to the Manitoba Cree on energy issues in Manitoba, Minnesota and Québec; Advisor to the Grand Council of the Cree on hydroelectric development
1997-1999	Advisor to the Columbia River Intertribal Fish Commission on Columbia fish and wildlife issues
1997-1998	Advisor to Port of Morrow regarding power marketing with respect to existing gas turbine plant
1997-1998	Expert witness for Tenaska in BPA litigation
1997	Advisor to Kansai Electric on restructuring in the electric power industry (with emphasis on the California markets)
1996-1997	Bulk power purchasing for the Association of Bay Area Cities
1996-1997	Advisor to Texas Utilities on industrial issues

1996-1997	Expert witness for March Point Cogeneration in Puget Sound Power and Light litigation
1996	Advisor to Longview Fibre on contract issues
1995-2000	Bulk power supplier for several Pacific Northwest industrials
1995-1999	Advisor to Seattle City Light on industrial contract issues
1995-1997	Advisor to Tacoma Utilities on contract issues
1995-1996	Expert witness for Tacoma Utilities in WAPA litigation
1994-1995	Advisor to Idaho Power on Southwest Intertie Project marketing
1993-2001	Northwest representative for Edmonton Power
1993-1997	Expert witness for MagCorp in PacifiCorp litigation
1992-1995	Advisor to Citizens Energy Corporation
1992-1994	Negotiator on proposed Bonneville Power Administration aluminum contracts
1992	Bulk power marketing advisor to Public Service of Indiana
1991-2000	Strategic advisor to the Chairman of the Board, Portland General Corporation
1991-1993	Chairman of the Investor Owned Utilities' (ICP) committee on BPA financial reform
1991-1992	Financial advisor on the Trojan owners' negotiation team
1991	Advisor to Shasta Dam PUD on the California Oregon Transmission Project and related issues
1990-1991	Advised the Chairman of the Illinois Commerce Commission on issues pertaining to the 1990 General Commonwealth Rate Proceeding; prepared an extensive analysis of the bulk power marketing prospects for Commonwealth in ECAR and MAIN
1988	Facilitated the settlement of Commonwealth Edison's 1987 general rate case and restructuring proposal for the Illinois Commerce Commission; reported directly to the Executive Director of the Commission; responsibilities included financial

	advice to the Commission and negotiations with Commonwealth and interveners
1987-1988	Created the variable aluminum tariff for Big Rivers Electric Corporation: responsibilities included testimony before the Kentucky Public Service Commission and negotiations with BREC's customers (the innovative variable tariff was adopted by the Commission in August 1987); supported negotiations with the REA in support of BREC's bailout debt restructuring
1981-1989	Consulting projects including: financial advice for the Oregon AFL-CIO; statistical analysis of equal opportunity for Oregon Bank; cost of capital for the James River dioxin review; and economic analysis of qualifying facilities for Washington Hydro Associates
1980-1986	Taught classes in senior and graduate forecasting, micro-economics, and energy at Portland State University

Education

Unfinished Ph.D.	Economics, Cornell University; Teaching Assistant in micro- and macro-economics
M.A.	Economics, Portland State University, 1975; Research Assistant
B.A.	Economics, Reed College, 1972; undergraduate thesis, "Eurodollar Credit Creation"

Areas of specialization include micro-economics, statistics, and finance

Papers and Publications

June 22, 2017	"Trump plan to sell BPA lines misguided"
April 11, 2017	"Affordable power or Site C power: British Columbia must choose"
February 28, 2017	"My View: Trade tariffs would hurt Americans", *The Portland Tribune*
January 8, 2017	"Many lives of Jordan Cove may have come to an end", *The Oregonian*

July 22, 2016	"Balancing an aging Hanford nuke plant against cheaper firm market power purchases", *The Oregonian*
July 7, 2016	"More roads needed to handle growth", *The Portland Tribune*
July 7, 2016	"Close the expensive Columbia Generating Station", *The Oregonian*
June 29, 2016	"Our future is in green energy, not aging, costly nuclear plants", *The Seattle Times*
May 12, 2016	"Diesel tax on heavy trucks is the right move", *The Portland Tribune*
May 2016	"Aspirational Planning: A Statistical Model of Hawthorne Bridge and Tilikum Crossing Bicycle Ride Counts", *Hatfield Graduate Journal of Public Affairs 1(1).*
January 19, 2016	"A good time for a sensibly managed Portland gas tax", *The Oregonian*
October 15, 2015	"A plan to fix Portland's roads", *The Portland Oregonian*
June 2015	"Estimating the Longevity of Commercial Nuclear Reactors", *Public Utilities Fortnightly*
December 2014	"Nuclear Winter", *Electricity Policy*
July 2013	"Mid-Columbia Spot Markets and the Renewable Portfolio Standard", *Public Utilities Fortnightly*
April 14, 2013	"Selling Low and Buying High", *The Oregonian*
December 2012	"Are Electric Vehicles Actually Cost-Effective?", *Electricity Policy*
November 30, 2012	"Portland's Energy Credits: The trouble with buying 'green'", *The Oregonian*
July 2009	"Fingerprinting the Invisible Hand", *Public Utilities Fortnightly*
February 2008	Co-author, "The High Cost of Restructuring", *Public Utilities Fortnightly*
March 27, 2006	Co-author, "A Decisive Time for LNG", *The Daily Astorian*
February 9, 2006	"Opening the Books", *The Oregonian*

August 2005	"Squeezing Scarcity from Abundance", *Public Utilities Fortnightly*
April 1, 2002	"The California Crisis: One Year Later", *Public Utilities Fortnightly*
March 13, 2002	"A Sudden Squall", *The Seattle Times*
March 1, 2002	"What the ISO Data Says About the Energy Crisis", *Energy User News*
February 1, 2001	"What Oregon Should Know About the ISO", *Public Utilities Fortnightly*
January 1, 2001	"Price Spike Tsunami: How Market Power Soaked California", *Public Utilities Fortnightly*
March 1999	"Winners & Losers in California", *Public Utilities Fortnightly*
July 15, 1998	"Are Customers Necessary?", *Public Utilities Fortnightly*
March 15, 1998	"Can Electricity Markets Work Without Capacity Prices?", *Public Utilities Fortnightly*
February 1998	"Coping with Interruptibility", *Energy Buyer*
January 1998	"Pondering the Power Exchange", *Energy Buyer*
December 1997	"Getting There Is Half the Cost: How Much Is Transmission Service?", *Energy Buyer*
November 1997	"Is Capacity Dead?", *Energy Buyer*
October 1997	"Pacific Northwest: An Overview", *Energy Buyer*
August 1997	"A Primer on Price Volatility", *Energy Buyer*
June 1997	"A Revisionist's History of the Future", *Energy Buyer*
Winter 1996	"What Are We Waiting for?" *Megawatt Markets*
October 21, 1996	"Trading on the Index: Spot Markets and Price Spreads in the Western Interconnection", *Public Utilities Fortnightly*

McCullough Research Reports

June 13, 2017	"Privatization of Bonneville Power Administration's Transmission Assets"
May 8, 2017	"Response to Public Power Council staff comments on replacing the Columbia Generating Station with lower cost renewables"
April 3, 2017	"Who actually pays for the Columbia Generating Station?"
February 15, 2017	"Replacing the Columbia Generating Station with Renewable Energy"
November 14, 2016	"Review of 'Economic Analysis of Proposed Changes to the Single Dwelling Zone Development Standard'"
October 5, 2016	"The Falling Price of Renewable Energy Relative to Conventional Generation"
October 3, 2016	"Statistical Evidence on the Increase in Portland Home Values Correlated with Historic Districts"
September 5, 2016	"Why are House Prices so high in the Portland Metropolitan Area?"
July 8, 2016	"Historic District Econometric Literature Review"
June 21, 2016	"Columbia Generating Station (CGS) Market Update"
November 19, 2015	"Market Cost of the Columbia Generating Station During the FY 2014/2015 Refueling Cycle"
September 30, 2015	"Decrypting New York's "Secret" Electric Bids"
September 9, 2015	"Market Power in West Coast Gasoline Markets: September Update"
September 8, 2015	"August 10, 2015 PADD 2 Gasoline Spike at BP Whiting's Pipestill 12"
July 23, 2015	"Market Power in West Coast Gasoline Markets: July Update"
June 23, 2015	"Market Power in West Coast Gasoline Markets: June Update"
May 25, 2015	"Site C Business Case Assumptions Review"
April 7, 2015	"2015 Paducah Update"

April 6, 2015	"Market Power in West Coast Gasoline Markets: April Update"
March 23, 2015	"Market Power in West Coast Gasoline Markets"
March 20, 2015	"Daniel Poneman and the Paducah Transaction"
January 2, 2015	"Data and Methodological Errors in the Portland Commercial Street Fee"
December 15, 2014	Report to the Bureau d'audiences publiques sur l'environment (BAPE), "Uranium Mining in Quebec: Four Conclusions"
February 11, 2014	"Energy Northwest's Revised Analysis of the Paducah Fuels Transaction"
January 25, 2014	"Energy Northwest Losses in the 2013 Forward Purchase of Nuclear Fuel"
January 2, 2014	"Review of the November 2013 Energy Northwest Study"
December 11, 2013	"Economic Analysis of the Columbia Generating Station"
February 21, 2013	"McCullough Research Rebuttal to Western States Petroleum Association"
November 15, 2012	"May and October 2012 Gasoline Price Spikes on the West Coast"
June 5, 2012	"Analysis of West Coast Gasoline Prices"
October 3, 2011	"Lowering Florida's Electricity Prices"
July 14, 2011	"2011 ERCOT Blackouts and Emergencies"
March 1, 2010	"Translation" of the September 29, 2008 NY Risk Consultant's Hydraulics Report to Manitoba Hydro CEO Bob Brennan
December 2, 2009	"Review of the ICF Report on Manitoba Hydro Export Sales"
June 5, 2009	"New York State Electricity Plants' Profitability Results"
May 5, 2009	"Transparency in ERCOT: A No-cost Strategy to Reduce Electricity Prices in Texas"
April 7, 2009	"A Forensic Analysis of Pickens' Peak: Speculation, Fundamentals or Market Structure"

March 30, 2009	"New Yorkers Lost $2.2 Billion Because of NYISO Practices"
March 3, 2009	"The New York Independent System Operator's Market-Clearing Price Auction is Too Expensive for New York"
February 24, 2009	"The Need for a Connecticut Power Authority"
January 7, 2009	"Review of the ERCOT December 18, 2008 Nodal Cost Benefit Study"
August 6, 2008	"Seeking the Causes of the July 3rd Spike in World Oil Prices" (updated September 16, 2008)
April 7, 2008	"Kaye Scholer's Redacted 'Analysis of Possible Complaints Relating to Maryland's SOS Auctions'"
February 1, 2008	"Some Observations on Societe Generale's Risk Controls"
June 26, 2007	"Looking for the 'Voom': A Rebuttal to Dr. Hogan's 'Acting in Time: Regulating Wholesale Electricity Markets'"
September 26, 2006	"Did Amaranth Advisors, LLC Attempt to Corner the March 2007 NYMEX at Henry Hub?"
May 18, 2006	"Developing a Power Purchase/Fuel Supply Portfolio: Energy Strategies for Cities and Other Public Agencies"
April 12, 2005	"When Oil Prices Rise, Using More Ethanol Helps Save Money at the Gas Pump"
April 12, 2005	"When Farmers Outperform Sheiks: Why Adding Ethanol to the U.S. Fuel Mix Makes Sense in a $50-Plus/Barrel Oil Market"
April 12, 2005	"Enron's Per Se Anti-Trust Activities in New York"
February 15, 2005	"Employment Impacts of Shifting BPA to Market Pricing"
June 28, 2004	"Reading Enron's Scheme Accounting Materials"
June 5, 2004	"ERCOT BES Event"
August 14, 2003	"Fat Boy Report"
May 16, 2003	"CERA Decision Brief"
January 16, 2003	"California Electricity Price Spikes"

November 29, 2002	"C66 and Artificial Congestion Transmission in January 2001"
August 17, 2002	"Three Days of Crisis at the California ISO"
July 9, 2002	"Market Efficiencies"
June 26, 2002	"Senate Fact Sheet"
June 5, 2002	"Congestion Manipulation"
May 5, 2002	"Enron's Workout Plan"
March 31, 2002	"A History of LJM2"
February 2, 2002	"Understanding LJM"
January 22, 2002	"Understanding Whitewing"

Testimony and Comment

December 14, 2016	Testimony to the U.S. Court of Federal Claims on behalf of the U.S. Department of Justice regarding nuclear rate case
February 10, 2016	Testimony before the Supreme Court of British Columbia on the costs and benefits of delaying Site C dam
August 24, 2015	Testimony to the New York State Public Service Commission on behalf of the New York State Legislative Assembly
May 29, 2015	Testimony before the Federal Energy Regulatory Commission on behalf of Illinois Attorney General Lisa Madigan
December 15, 2014	Testimony before the Bureau d'audiences publiques sur l'environment (BAPE) in Quebec, "Uranium Mining in Quebec: Four Conclusions"
November 15, 2012	Testimony before the California State Senate Select Committee on Bay Area Transportation on West Coast gasoline price spikes in 2012
July 20, 2010	Testimony before the Rhode Island Public Utility Commission on the Deepwater offshore wind project
April 7, 2009	Testimony before the U.S. Senate Committee on Energy and Natural Resources on "Pickens' Peak"

March 5, 2009	Testimony before the New York Assembly Committee on Corporations, Authorities and Commissions, and the Assembly Committee on Energy, "New York Independent System Operators Market Clearing Price Auction is Too Expensive for New York"
February 24, 2009	Testimony before the Energy and Technology Committee, Connecticut General Assembly, "An Act Establishing a Public Power Authority" on behalf of AARP
September 16, 2008	Testimony before the U.S. Senate Committee on Energy and Natural Resources, "Depending On 19th Century Regulatory Institutions to Handle 21st Century Markets"
January 7, 2008	Supplemental Comment ("The Missing Benchmark in Electricity Deregulation") before the Federal Energy Regulatory Commission on behalf of American Public Power Association, Docket Nos. RM07-19-000 and AD07-7-000
August 7-8, 2007	Testimony before the Oregon Public Utility Commission on behalf of Wah Chang, Salem, Oregon, Docket No. UM 1002
February 23 and 26, 2007	Testimony before the Federal Energy Regulatory Commission on behalf of Public Utility District No. 1 of Snohomish County, Washington, Docket No. EL03-180
October 2, 2006	Direct Testimony before the Régie de l'énergie, Gouvernement du Québec on behalf of the Grand Council of the Cree
August 22, 2006	Rebuttal Expert Report on behalf of Public Utility District No. 1 of Snohomish County, Washington, Docket No. H-01-3624
June 1, 2006	Expert Report on behalf of Public Utility District No. 1 of Snohomish County, Washington, Docket No. H-01-3624
May 8, 2006	Testimony before the U.S. Senate Democratic Policy Committee, "Regulation and Forward Markets: Lessons from Enron and the Western Market Crisis of 2000-2001"
December 15, 2005	Direct Testimony before the Public Utility Commission of the State of Oregon on behalf of Wah Chang, Wah Chang v. PacifiCorp in Docket UM 1002
December 14, 2005	Deposition before the United States District Court Western District of Washington at Tacoma on behalf of Federated Rural Electric Insurance Exchange and TIG Insurance Company, Federated Rural Electric Insurance Exchange and

	TIG Insurance Company v. Public Utility District No. 1 of Cowlitz County, No. 04-5052RBL
December 4, 2005	Expert Report on behalf of Utility Choice Electric in Civil Action No. 4:05-CV-00573
July 27, 2005	Expert Report before the United States District Court Western District of Washington at Tacoma on behalf of Federated Rural Electric Insurance Exchange and TIG Insurance Company, Federated Rural Electric Insurance Exchange and TIG Insurance Company v. Public Utility District No. 1 of Cowlitz County, Docket No. CV04-5052RBL
May 6, 2005	Rebuttal Testimony before the Federal Energy Regulatory Commission on behalf of Public Utility District No. 1 of Snohomish County, Washington, Docket No.EL03-180, et al.
May 1, 2005	Rebuttal Expert Report on behalf of Factory Mutual, Factory Mutual v. Northwest Aluminum
March 24-25, 2005	Deposition by Enron Power Marketing, Inc. before the Federal Energy Regulatory Commission on behalf of Public Utility District No. 1 of Snohomish County, Washington, Docket No.EL03-180, et al.
February 14, 2005	Expert Report on behalf of Factory Mutual, Factory Mutual v. Northwest Aluminum
January 27, 2005	Supplemental Testimony before the Federal Energy Regulatory Commission on behalf of Public Utility District No. 1 of Snohomish County, Washington, Docket No. EL03-180, et al.
April 14, 2004	Deposition by Enron Power Marketing, Inc. and Enron Energy Services before the Federal Energy Regulatory Commission on behalf of Public Utility District No. 1 of Snohomish County, Washington, Docket No.EL03-180, et al.
April 10, 2004	Rebuttal Testimony on behalf of the Office of City and County Attorneys, San Francisco, California, City and County Attorneys, San Francisco, California v. Turlock Irrigation District, Non-Binding Arbitration
February 24, 2004	Direct Testimony before the Federal Energy Regulatory Commission on behalf of Public Utility District No. 1 of Snohomish County, Washington, Docket No.EL03-180, et al.

March 20, 2003	Rebuttal Testimony before the Federal Energy Regulatory Commission on behalf of the City of Seattle, Washington, Docket No. EL01-10, et al.
March 11-13, 2003	Deposition by IdaCorp Energy L.P. before the District Court of the Fourth Judicial District of the State of Idaho on behalf of Overton Power District No. 5, State of Nevada, IdaCorp Energy L.P. v. Overton Power District No. 5, Case No. OC 0107870D
March 3, 2003	Expert Report before the District Court of the Fourth Judicial District of the State of Idaho on behalf of Overton Power District No. 5, State of Nevada, IdaCorp Energy L.P. v. Overton Power District No. 5, Case No. OC 0107870D
February 27, 2003	Direct Testimony before the Federal Energy Regulatory Commission on behalf of the City of Tacoma, Washington and the Port of Seattle, Washington, Docket No. EL01-10-005
October 7, 2002	Rebuttal Testimony before the Federal Energy Regulatory Commission on behalf of Public Utility District No. 1 of Snohomish County, Washington, Docket No. EL02-26, et al.
October 2002	Expert Report before the Circuit Court of the State of Oregon for the County of Multnomah on behalf of Alcan, Inc., Alcan, Inc. v. Powerex Corp., Case No. 50 198 T161 02
September 27, 2002	Deposition by Morgan Stanley Capital Group, Inc. before the Federal Energy Regulatory Commission on behalf of Nevada Power Company and Sierra Pacific Power Company, Docket No. EL02-26, et al.
August 8-9, 2002	Deposition by Morgan Stanley Capital Group, Inc. before the Federal Energy Regulatory Commission on behalf of Nevada Power Company and Sierra Pacific Power Company, Docket No. EL02-26, et al.
August 8, 2002	Deposition by Morgan Stanley Capital Group, Inc. before the Federal Energy Regulatory Commission on behalf of Public Utility District No. 1 of Snohomish County, Washington, Docket No. EL02-26, et al.
June 28, 2002	Direct Testimony before the Federal Energy Regulatory Commission on behalf of the City of Tacoma, Washington, Docket No. EL02-26, et al.

June 25, 2002	Direct Testimony before the Federal Energy Regulatory Commission on behalf of Public Utility District No. 1 of Snohomish County, Washington, Docket No. EL02-26, et al.
June 25, 2002	Direct Testimony before the Federal Energy Regulatory Commission on behalf of Nevada Power Company and Sierra Pacific Power Company, Docket No. EL02-26, et al.
May 6, 2002	Rebuttal Testimony before the Public Service Commission of Utah on behalf of Magnesium Corporation of America in the Matter of the Petition of Magnesium Corporation of America to Require PacifiCorp to Purchase Power from MagCorp and to Establish Avoided Cost Rates, Docket No. 02-035-02
April 11, 2002	Testimony before the U.S. Senate Committee on Commerce, Science and Transportation, Washington DC
February 13, 2002	Testimony before the U.S. House of Representatives Subcommittee on Energy and Air Quality, Washington DC
January 29, 2002	Testimony before the U.S. Senate Committee on Energy and Natural Resources, Washington DC
August 30, 2001	Rebuttal Testimony before the Federal Energy Regulatory Commission on behalf of Seattle City Light, Docket No. EL01-10
August 16, 2001	Direct Testimony before the Federal Energy Regulatory Commission on behalf of Seattle City Light, Docket No. EL01-10
June 12, 2001	Rebuttal Testimony before the Public Utility Commission of the State of Oregon on behalf of Wah Chang, Wah Chang v. PacifiCorp in Docket UM 1002
April 17, 2001	Before the Public Utility Commission of the State of Oregon, Direct Testimony on behalf of Wah Chang, Wah Chang v. PacifiCorp in Docket UM 1002
March 17, 2000	Rebuttal Testimony before the Public Service Commission of Utah on behalf of the Large Customer Group in the Matter of the Application of PacifiCorp for Approval of Its Proposed Electric Rate Schedules and Electric Service Regulations, Docket No. 99-035-10
February 1, 2000	Direct Testimony before the Public Service Commission of Utah on behalf of the Large Customer Group in the Matter of the Application of PacifiCorp for Approval of Its Proposed

	Electric Rate Schedules and Electric Service Regulations, Docket No. 99-035-10

Presentations

January 23-24, 2017	"Are Electric Markets Obsolete?", Buying & Selling Electric Power Conference, Seattle, Washington
December 3, 2015	"Ozymandias: Seventeen years of administered markets, high costs, and poor eligibility", Utility Markets Today, Rockville, Maryland
May 6, 2014	"Economic Analysis of the Columbia Generating Station", Energy Northwest, Boise, Idaho
April 30, 2014	"Economic Analysis of the Columbia Generating Station", Portland State University, Portland, Oregon
April 22, 2014	"Economic Analysis of the Columbia Generating Station", Clark County, Vancouver, Washington
January 9, 2014	"Economic Analysis of the Columbia Generating Station", Northwest Power & Conservation Council, Portland, Oregon
January 1, 2014	"Economic Analysis of the Columbia Generating Station", Bonneville Power Administration, Portland, Oregon
December 2, 2013	"Economic Analysis of the Columbia Generating Station", Skamania, Carson, Washington
December 1, 2013	"Peak Peddling: Has Portland Bicycling Reached the Top of the Logistic Curve?" Oregon Transportation Research and Education Consortium, Portland, Oregon
July 12, 2013	"Economic Analysis of the Columbia Generating Station", Tacoma, Washington
June 21, 2013	"Economic Analysis of the Columbia Generating Station", Seattle City Light, Seattle, Washington
January 29, 2013	"J.D. Ross (Who)", Portland Rotary Club, Portland, Oregon.
January 13, 2011	"Estimating the Consumer's Burden from Administered Markets", American Public Power Association conference, Washington, DC
October 15, 2009	"The Mysterious New York Market", EPIS, Tucson, Arizona

October 14, 2009	"Do ISO Bidding Processes Result in Just and Reasonable Rates?", legal seminar, American Public Power Association, Savannah, Georgia
June 22, 2009	"Pickens' Peak Redux: Fundamentals, Speculation, or Market Structure", International Association for Energy Economics
June 5, 2009	"Transparency in ERCOT: A No-cost Strategy to Reduce Electricity Prices in Texas", Presentation at Texas Legislature
May 8, 2009	"Pickens' Peak", Economics Department, Portland State University
April 7, 2009	"Pickens' Peak: Speculators, Fundamentals, or Market Structure", 2009 EIA energy conference, Washington, DC
February 4, 2009	"Why We Need a Connecticut Power Authority", presentation to the Energy and Technology Committee, Connecticut General Assembly
October 28, 2008	"The Impact of a Volatile Economy on Energy Markets", NAESCO annual meeting, Santa Monica, California
April 1, 2008	"Connecticut Energy Policy: Critical Times…Critical Decisions", House Energy and Technology Committee, the Connecticut General Assembly
May 23, 2007	"Past Efforts and Future Prospects for Electricity Industry Restructuring: Why Is Competition So Expensive?", Portland State University
February 26, 2007	"Trust, But Verify", Take Back the Power Conference, National Press Club, Washington, DC
May 18, 2006	"Developing a Power Purchase/Fuel Supply Portfolio"
February 12, 2005	"Northwest Job Impacts of BPA Market Rates"
January 5, 2005	"Why Has the Enron Crisis Taken So Long To Solve?", Public Power Council, Portland, Oregon
September 20, 2004	"Project Stanley and the Texas Market", Gulf Coast Energy Association, Austin, Texas
September 9, 2004	"Back to the New Market Basics", EPIS, White Salmon, Washington

June 8, 2004	"Caveat Emptor", ELCON West Coast Meeting, Oakland, California
June 9, 2004	"Enron Discovery in EL03-137/180"
March 31, 2004	"Governance and Performance", Public Power Council, Portland, Oregon
January 23, 2004	"Resource Choice", Law Seminars International, Seattle, Washington
January 17, 2003	"California Energy Price Spikes: The Factual Evidence", Law Seminars International Seattle, Washington
January 16, 2003	"The Purloined Agenda: Pursuing Competition in an Era of Secrecy, Guile, and Incompetence"
September 17, 2002	"Three Crisis Days", California Senate Select Committee, Sacramento, California
June 10, 2002	"Enron Schemes", California Senate Select Committee Sacramento, California
May 2, 2002	"One Hundred Years of Solitude"
March 21, 2002	"Enron's International Ventures", Oregon Bar International Law Committee, Portland, Oregon
March 19, 2002	"Coordinating West Coast Power Markets", GasMart, Reno, Nevada
March 19, 2002	"Sauron's Ring", GasMart, Reno, Nevada
January 25, 2002	"Deconstructing Enron's Collapse: Buying and Selling Electricity on The West Coast", Seattle, Washington
January 18, 2002	"Deconstructing Enron's Collapse", Economics Seminar, Portland State University
November 12, 2001	"Artifice or Reality", EPIS Energy Forecast Symposium, Skamania, Washington
October 24, 2001	"The Case of the Missing Crisis" Kennewick Rotary Club, Kennewick, Washington
August 18, 2001	"Preparing for the Next Decade"
June 26, 2001	"Examining the Outlook on Deregulation"

June 25, 2001	Presentation, Energy Purchasing Institute for International Research (IIR), Dallas, Texas
June 6, 2001	"New Horizons: Solutions for the 21st Century", Federal Energy Management-U.S. Department of Energy, Kansas City, Kansas
May 24, 2001	"Five Years"
May 10, 2001	"A Year in Purgatory", Utah Industrial Customers Symposium-Utah Association of Energy Users, Salt Lake City, Utah
May 1, 2001	"What to Expect in the Western Power Markets this Summer", Western Power Market Seminar, Denver, Colorado
April 23, 2001	"Emerging Markets for Natural Gas", West Coast Gas Conference, Portland, Oregon
April 18, 2001	"Demystifying the Influence of Regulatory Mandates on the Energy Economy" Marcus Evans Seminar, Denver, Colorado
April 4, 2001	"Perfect Storm", Regulatory Accounting Conference, Las Vegas, Nevada
March 21, 2001	"After the Storm 2001", Public Utility Seminar, Reno, Nevada
February 21, 2001	"Future Imperfect", Pacific Northwest Steel Association, Portland, Oregon
February 12, 2001	"Power Prices in 2000 through 2005", Northwest Agricultural Chillers, Bellingham, Washington
February 6, 2001	Presentation, Boise Cascade Management, Boise, Idaho
January 19, 2001	"Wholesale Pricing and Location of New Generation Buying and Selling Power in the Pacific Northwest", Seattle, Washington
October 26, 2000	"Tsunami: Market Prices since May 22nd", International Association of Refrigerated Warehouses, Los Vegas, California
October 11, 2000	"Tsunami: Market Prices since May 22nd", Price Spikes Symposium, Portland, Oregon
August 14, 2000	"Anatomy of a Corrupted Market", Oregon Public Utility Commission and Oregon State Energy Office, Salem, Oregon

June 30, 2000	"Northwest Market Power", Governor Locke of Washington, Seattle, Washington
June 10, 2000	"Northwest Market Power", Oregon Public Utility Commission and Oregon State Energy Office, Salem, Oregon
June 5, 2000	"Northwest Market Power", Georgia Pacific Management
May 10, 2000	"Magnesium Corporation Developments", Utah Public Utilities Commission
May 5, 2000	"Northwest Power Developments", Georgia Pacific Management
January 12, 2000	"Northwest Reliability Issues", Oregon Public Utility Commission

Volunteer Positions

2015-Present	Board member, Portland State University Master in Public Policy Advisory Committee
2016-Present	Eastmoreland Neighborhood Association, Treasurer
2013-2016	Eastmoreland Neighborhood Association, President
2013-Present	Southeast Uplift Neighborhood Coalition, President
2013-Present	City of Portland Office of Management and Finance Advisory Committee
1990-Present	Chairman, Portland State University Economics Department Advisory Committee

FEDERAL ENERGY REGULATORY COMMISSION
WASHINGTON, D.C. 20426

OFFICE OF ENERGY PROJECTS

In Reply Refer To:
OEP/DG2E/Gas Branch 3
Jordan Cove Energy Project L.P.
Docket No. CP17-495-000

VIA Electronic Mail

October 4, 2019

Ms. Natalie Eades
Jordan Cove Energy Project L.P.
NEades@pembina.com

Re: Environmental Information Request – Industrial Waste Water Pipeline

Dear Ms. Eades:

In order to address concerns expressed by the Bureau of Land Management (BLM) regarding the feasibility of installing the proposed industrial waste water pipeline (IWWP) along the Trans-Pacific Parkway, please provide a map of the proposed IWWP at a horizontal scale of 1" = 200'. This map should indicate landownership and illustrate topographic features, such as sand dunes and wetlands. This map should also depict the adjacent Trans-Pacific Parkway and North Spit rail spur as well as all existing utilities (water, power, fiber optics, etc.). Confirm sufficient space is present within the existing easement to successfully accommodate construction and operation of the IWWP by indicating on the aforementioned map (or other drawing) all required workspaces. Also, in an accompaniment to the map, describe IWWP construction methods (general and special). If sufficient space is unavailable within the existing easement, describe facility/route alternatives, including any impact on BLM or U.S. Department of Agriculture Forest Service (Forest Service) administered lands. Specifically, at a minimum, describe the feasibility of an alternative pipeline route that would avoid the BLM parcel located north of the terminal site and would locate a portion of the IWWP within the proposed Access and Utility Corridor. Lastly, document consultation with the BLM and Forest Service regarding the proposed IWWP location, construction feasibility, and any potential alternative facilities/routes.

This information is necessary to complete the final Environmental Impact Statement for the Jordan Cove Energy Project. Please file your response in accordance with the provisions of the Commission's Rules of Practice and Procedure. 18 CFR

385.2010 (Rule 2010) requires that you serve a copy of the response to each person whose name appears on the official service list for this proceeding.

You should file a complete response within 7 days of the date of this letter. The response must be filed with the Secretary of the Commission at:

Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street NE, Room 1A
Washington, DC 20426

If certain information cannot be provided within this time frame, indicate which items will be delayed and provide a projected filing date. When filing documents and maps, be sure to prepare separate volumes, as outlined on the Commission's website at http://www.ferc.gov/resources/guides/filing-guide/file-ceii.asp and https://www.ferc.gov/docs-filing/labeling-guidance.pdf for labeling controlled unclassified information (CUI). Critical Energy Infrastructure Information (CEII) (e.g., plot plans showing equipment or piping details) and privileged information (PRIV) (e.g., cultural resources material containing location, character, or ownership information) are considered CUI. This information should be filed as non-public and labeled as: "**CUI//CEII– DO NOT RELEASE**" (18 CFR 388.113), "**CUI//PRIV – DO NOT RELEASE**" (18 CFR 388.112), and as otherwise appropriate with other statutes for labeling CUI (e.g., "**CUI//CEII/SSI – DO NOT RELEASE**"). All CUI should be filed separately from the remaining information, which should be marked **"Public."**

File all responses under oath (18 CFR 385.2005) by an authorized representative and include the name, position, and telephone number of the respondent. For all materials submitted, in addition to the copies filed with the Secretary of the Commission, please provide an electronic copy to our third-party environmental contractor, Tetra Tech (to the attention of John Crookston).

Sincerely,

John Peconom
Environmental Project Manager
Office of Energy Projects

Site Selection and Design for LNG Ports and Jetties

Information Paper No. 14

SIGTTO

Site Selection and Design for LNG Ports and Jetties

with views on

RISK LIMITATION during PORT NAVIGATION

and CARGO OPERATIONS

Information Paper No. 14

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The Society of International Gas Tanker and Terminal Operators (SIGTTO) is a non-profit making organisation dedicated to protect and promote the mutual interests of its members in matters related to the safe and reliable operation of gas tankers and terminals within a sound environment. The Society was founded in 1979 and was granted consultative status at IMO in November 1983. The Society has over 160 companies in membership who own or operate over 95% of the world's LNG tankers and terminals and over 55% of the world's LPG tankers and terminals.

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Contents

2 PRINCIPAL RECOMMENDATIONS

2.1 PORT DESIGN

Approach Channels. Harbour channels should be of uniform cross-sectional depth and have a minimum width, equal to five times the beam of the largest ship.

Turning Circles. Turning circles should have a minimum diameter of twice the overall length of the largest ship, where current effect is minimal. Where turning circles are located in areas of current, diameters should be increased by the anticipated drift.

Tug Power. Available tug power, expressed in terms of effective bollard pull, should be sufficient to overcome the maximum wind force generated on the largest ship using the terminal, under the maximum wind speed permitted for harbour manoeuvres and with the LNG carrier's engines out of action.

Traffic Control. A Vessel Traffic Service (VTS) System should be a port requirement and this should be able to monitor and direct the movement of all ships coming within the operating area of LNG carriers.

Operating Limits. Operating criteria, for maximum wind speed, wave height, and current, should be established for each terminal and port approach. Such limits should match LNG carrier size, manoeuvring constraints, and tug power.

Speed Limits. Speed limits should be set for areas in the port approach presenting either collision or grounding risks. These limits should apply not only to LNG carriers but also to any surrounding traffic.

2.2 THE JETTY

Exclusion of Ignition Sources. No uncontrolled ignition source should be within a predetermined safe area centred on the LNG carrier's cargo manifold.

Mooring Layout. The terminal should provide mooring points of a strength and in an array which permits all LNG carriers using the terminal to be held alongside in all conditions of wind and current.

Quick Release Hooks. All mooring points should be equipped with quick release hooks. Multiple hook assemblies should be provided at those points where multiple moorings lines are deployed so that not more than one mooring line is attached to a single hook.

Emergency Release System. At each hard arm the terminal should fit an ERS system, able to be interlinked to the ship's ESD system. This system must operate in two stages: the first stage stops LNG pumping and closes block valves in the pipelines; the second stage entails automatic activation of the dry-break coupling at the PERC together with its quick-acting flanking valves. The ERS System should conform to an accepted industry standard [15].

Powered Emergency Release Couplers (PERCs). The terminal should fit a PERC in each hard arm together with quick-acting flanking valves so that a dry-break release can be achieved in emergency situations.

Terminal Security. An effective security regime should be in place to enforce the designated ignition exclusion zone and prevent unauthorised entry into the terminal and jetty area, whether by land or by sea.

Operating Limits. Operating criteria, expressed in terms of wind speed, wave height, and current, should be established for each jetty. Such limits should be developed according to ship size, mooring restraint, and hard arm limits. Separate sets of limits should be established for (a) berthing, (b) stopping cargo transfer, (c) hard arm disconnection and (d) departure from the berth.

3 ACKNOWLEDGMENTS

The content of this paper is based on reports from a company having SIGTTO membership and, in this respect references [1] and [2] were most valuable. The navigational aspects, as detailed in chapters 9 and 10, came about as personnel in that company assessed marine operational risks for new LNG terminals. In one case, the new project was in Europe where the project analysis was carried out in accordance with a European Council Directive for assessing risks and environmental impacts. This is a process which, while being driven by national law, is also of direct concern to the companies involved.

These requirements led the project leaders to consider how the risk of some classes of accident might be better established and, in particular, what the consequences of a large LNG release might be, either in the port approach — due to grounding or collision; or alongside — due to fracture of the hard arm.

The company concluded that such a large release of LNG had never happened. Nevertheless, in some situations such an event was found to be feasible. From a marine viewpoint the scenarios which could lead to a major release were identified and recommendations were prepared to further reduce the chance of any such happening.

This paper also draws on earlier publications from SIGTTO and similar societies which are relevant to the management of port risks.

4 INTRODUCTION

At the time of site selection, the level of marine risk is determined by the position chosen for the terminal and this is especially true of terminals handling hazardous cargoes such as LNG. Once the port is in operation, the risks identified during planning should be controlled by suitable equipment and pre-arranged procedures. This should include the on-going need to keep other industry or populations remote from the plant.

As can be seen from much of its earlier work, SIGTTO urge acceptance of a wide range of equipment and procedures for the reduction of operational risk. To supplement past work, this paper recommends that for new sites the LNG terminal, and its port area, should be examined as a unique risk system. This paper focuses, therefore, on accident exposure and risk management not only during cargo operations alongside, but also during the port transits of LNG carriers.

Implicit in site selection is the recognition of risk. As described elsewhere [3], risk consists of a combination of event frequency and consequence. Thus, port designers are often faced with a number of choices when selecting a site, and these choices can arise from a variety of competing pressures. As described in risk assessment theory, operational solutions are found by acceptance, or non-acceptance, of some categories of risk. However, whatever remote frequencies may be tolerated for a smaller release, there is no acceptable frequency for a large release.

In essence, the issue being addressed is how best to minimise port risks by design factors at the start of a project. As can be seen in the paper there are three components in this equation. Initially questions on satisfactory jetty position and design are covered. Operational procedures are then addressed. Thereafter, having questioned the robustness of these procedures with respect to human elements, the consequences of collisions and groundings are studied and methods of limiting the effect of such accidents are considered. By this means, any high risk scenario is identified during design and this then requires special handling to restrict occurrence.

From a navigational standpoint and as alluded to in the above paragraph, the paper suggests that while the human controls called upon during ship manoeuvring deserve high ranking, of themselves, they can never be considered one-hundred per cent secure: this is because questions of human error can prevail. However, back-up is achieved if it is known that, in a grounding or collision, an LNG

carrier's cargo containment system is most unlikely to be breached. To achieve this end, a detailed study of each port approach is needed and, to give this subject greater clarity, examples are given at section 10.3.

To cover the main risks (as identified), the possibility of liquid spillage during cargo operations at the jetty is also discussed. Here, a three stage solution is offered. First, well deployed moorings. Second, well engineered and interlinked ESD systems. Third, the fitting of PERCs, with quick-acting valves included on either side; all controlled by an ERS system.

Having addressed all risks — big and small — alongside and in the port approach, an outcome from the risk analysis which makes an accident virtually impossible is clearly the most satisfactory. If, however, the outcome shows consequences of a serious nature then, clearly, it is necessary to draw up detailed contingency plans. But, in some circumstances, such as a large LNG release close to a populated area, it may be impossible to devise a realistic contingency plan because of the nature of the problem. Herein lies a conundrum which may only be resolved by further reducing the chance of a major release by designing-out the problem.

The precautions, as recommended by SIGTTO in this paper, do not offer a single package that reduces operational risk to some quantifiable and acceptable level; indeed it is suspected that the pattern of operational risk is too complex to be easily handled in this way. However, this cautionary note aside, the industry's objective must be to further reduce risk whenever possible.

Of course, the safety of life is vital, and so also is continuing public confidence in the trade. However, the enormous financial exposures of LNG projects also must be safeguarded. In some circumstances it is found that the protection given to save life also protects the commercial exposure. In other cases, however, personal safety can be assured while unacceptable business risks remain - so suggesting the improved standards, as recommended in this report, are necessary not only due to personnel hazards but also to protect the business risk.

Important factors such as personnel training, contingency planning or matters of a general safety nature are not covered in this paper; the aim has been to focus more on matters of equipment and issues of navigational interest. Nevertheless, these extra factors are fundamental to future safety in the LNG sector and, as a matter of course, should always be taken into account.

5 DEVELOPMENT OF LNG STANDARDS

The history of developments in the LNG industry has been marked by two separate but interwoven strands. Firstly there was a continuous effort to design systems to reduce the probability of large escapes of gas. On the other hand extra standards — often oil industry based — were re-specified in light of experience and technological improvement. Indeed, as the LNG industry moves into the 21st century it remains true that future improvements should not be altogether separated from progress in the oil world and, where possible, LNG terminalling standards should continue to grow in parallel with port operations generally.

An example of an LNG standard having developed along technological lines is that covering on-shore storage tanks. For a period, earthen embankments were used for support against the force of sudden release from the inner tank. Subsequently, through adoption of improved inner tank material, the probability of catastrophic crack propagation was much reduced. Now, earthen bunds are no longer needed. Similar changes occurred in the design of LNG carriers, where sophisticated methods for assessing crack propagation now allow the secondary barrier to be omitted in two free-standing cargo containment systems - the Moss Rosenberg spherical design and the IHI prismatic design.

To date, the greatest investment to reduce port risks is the limitation of gas escape at the ship/shore interface and on the jetty. Here the application of industry recommendations for jetty design and mooring systems [4] provides a secure base for LNG transfer. Furthermore, the references mentioned in chapter 6 direct port designers to construct jetties handling hazardous cargoes in remote areas

where other ships do not pose a (collision) risk and where any gas escape cannot affect local populations. When this advice is combined with that from SIGTTO [5] — as outlined in section 7.2.2 — risks at the jetty are vastly reduced.

It can be seen, therefore, that progress in defining LNG standards have taken a step-by-step pattern which can be summarised as follows:

- a start was made with the existing framework of standards for oil
- these were then adapted for the characteristics of LNG
- changes in shipping and terminalling standards were then addressed, and
- finally the engineering challenges for cryogenic systems were answered

Present day standards for limiting problems are thus the result of sensible evolution rather than a well-focused set of risk related measures. Indeed, experience shows that the process was, simply, one of progressive improvement, the motivation being a desire to make operations safer. However, it is at the time of site selection that the foundations of high quality risk management can be laid and where overall cost/benefit judgements are best formed and it is in these areas where this paper recommends the introduction of risk management techniques.

Although the criteria for site selection may differ between LNG terminals, the majority are common to all. Some, such as the proximity of the plant to centres of population, lie beyond the pure marine interest and outside the main scope of this paper. But others, including the harbour movements of LNG carriers, the density of marine traffic (covering the nautical risks to LNG carriers) and the terminal itself, much influence the overall risk which eventually has to be controlled and these concepts are covered in more detail in the following chapters.

6 SITE SELECTION

6.1 GENERAL

At its most elementary level, site selection for LNG loading terminals is predicated by the location of production areas and, at receiving terminals, the situation is dependant upon the location of markets. Thereafter, fine tuning within the selection process is influenced by the optimisation of infrastructure costs such as gas transmission systems, access to trunklines and other distribution networks.

Hence, site selection is driven largely by factors aimed at minimising transportation and storage costs. With this in mind, it can be appreciated that marine criteria are only a part of the overall process. Therefore, at the stage of site selection, input from marine experts consists mainly in optimising fleet capacity (numbers and sizes of ships) and checking civil engineering matters at the ship/shore interface, at the terminal and in the terminal/port approach. This latter aspect is achieved by obtaining the required depth of sheltered water, providing good access to the sea and achieving immediate adjacency to the LNG terminal.

From a marine viewpoint there is little prospect to escape from these basic factors. Prices and hence, to a large extent demand, remain linked to the costs of alternative energies and, LNG's unique environmental benefits notwithstanding, the product must retain market competitiveness. Thus, as the future unfolds, continuing efforts to economise on handling costs and freight rates are likely.

In the site selection process the challenge, therefore, is to limit marine risks while positioning the jetty within realistic limits. Already there are generally accepted criteria and regulatory requirements to guide port designers in achieving this synthesis and most are covered in this paper.

6.2 JETTY LOCATION

The recommended site selection process removes as many risks as possible by placing LNG terminals in sheltered locations remote from other port users. References [6], [7] and [8] all direct port designers to construct jetties handling hazardous cargoes in remote areas where other ships do not pose a (collision) risk and where any gas escape cannot affect local populations.

Furthermore, choosing a jetty position within a sheltered location limits the dynamic forces acting on a ship from sea-waves which, in turn, could break a ship's mooring lines. Considering the standard LNG carrier of about 135,000 m^3 capacity, the waves likely to have such effects are those approaching from directly ahead or astern, having *significant heights* exceeding 1.5 metres and *periods* greater than 9 seconds. Seas approaching the berthed ship from an incidence angle of 90° (to the bow) have much lower cut-off points. It is, therefore, recommended that harbour protection be provided against low frequency waves, either by choice of location or by construction of an effective breakwater. Alternatively, an enhanced mooring system may be designed, suited to dynamic effects (but also taking into account the suitability of gangway access for the moving ship). Without such assurance the mooring system, which is the only defence against ship break-out, could be put at risk.

Jetty location should also be chosen to reduce the risk of passing ships striking a berthed LNG carrier but subjective judgement comes into assessing safety from this standpoint. The acceptability of such positions should be determined only after detailed consideration of local circumstances. However, as far as port design is concerned, some features are clear cut. For example, positioning an LNG terminal on the outside of a river bend raises the risk that a passing ship may strike the berthed carrier if the manoeuvre is not properly executed. This is possible because, at some point on the bend, the manoeuvring ship must head directly at the berthed LNG carrier. In this respect, and following the reasoning in reference [3], ships of over 10,000 tonnes displacement operating at normal harbour speeds — say 10 knots — when striking at 90°, present a hazard to a berthed LNG carrier's containment system. It follows, therefore, that building a jetty in such locations is normally considered unsuitable.

Furthermore, large ships passing near to a berthed LNG carrier can cause surging or ranging along the jetty, with consequential risks to the moorings and this phenomenon should be guarded against. This can occur at jetties located in channels used by large ships and, because of this, these positions are not recommended.

The added risks from increased traffic encounters, and extended shallow-water navigation, when positioning an LNG jetty farther inside a port, must also be considered — but these risks are covered more fully in chapters 9 and 10.

As can be seen, choosing the site for an LNG jetty comprises a mixture of checks, some derived from quantitative analyses, others owing more to subjective judgement. However, when considering an LNG carrier alongside, site selection is directed mainly at minimising the risks of ship strikings, limiting interactive effects from passing ships and reducing the risks of dynamic wave forces within mooring lines.

7 DESIGN CRITERIA FOR JETTIES

When the site selection process finally establishes the best position for an LNG terminal, its design is set within two sets of criteria — root criteria and specific criteria. These are categorised as shown below.

7.1 ROOT CRITERIA FOR HAZARDOUS LIQUID CARGOES

Basic safety for gas, chemical or oil tankers and their respective terminals is governed by ISGOTT [9]. This book contains an essential list of design and operational practices and is amended from time to time in accordance with new experience. In addition to ISGOTT, in establishing safe designs, the use of other guidelines published by SIGTTO, OCIMF, IAPH, PIANC, IALA, and BSI is encouraged. Some of these documents are referred to in chapter 11 — see references [10], [11] and [12]. However, most of these industry documents are general in nature and seldom discuss event frequency nor, for that matter, specific ship-types. In order to cover the hazards more effectively, reference [13] is of help in the gas trades — although written more from the viewpoint of existing plant.

Until the publication of this paper, within the standard suite of industry publications, the possible consequences of an accident are also left largely unaddressed. Previously, it was only reference [14] which gave some guidance on this subject. However, taken together, these older sources provide a robust framework of root criteria around which jetty designs are established and other standards (specific criteria — see below) are then specially tailored to the needs of LNG.

Thus, existing recommendations provide the root criteria for jetty design, in terms of:

- strength of mooring systems
- positioning breasting dolphins
- position, size, and spacing, of hard arms
- depth, width, and alignment, of harbour channels

Such recommendations provide terminals with a good set of design standards. They are not, however, exhaustive nor can they be applied without knowledge of local conditions, so they can rarely be used to prepare a complete checklist for LNG — other measures must be adopted (see section 7.2).

It can be seen, therefore, that within the root criteria, a system is established for securing a safe berth; but this is one within which there may remain a significant, albeit remote, probability for an accident to happen. In developing criteria suited to LNG the separation of each risk into its frequency and consequence is crucial. Thus, when considering even the remote possibility of major accidents, the application of existing standards, though relevant, is insufficient to obtain suitable assurance. Accordingly, at LNG jetties, risk related methods should be adopted which address event probabilities, and seek, as far as possible, to quantify the frequency of occurrence.

7.2 SPECIFIC CRITERIA FOR LNG

7.2.1 General

Although the root criteria, as discussed above, are included in LNG terminal design, risk considerations usually identify the need for yet other equipment or procedures — the site specific criteria. These methods can be more demanding than the root criteria and are often applicable to operational practices and geographical areas for which industry guidance is not yet fully established. However, a new series of standards from CEN, entitled Installations and Equipment for Liquefied Natural Gas, will be appropriate to European usage — perhaps even further afield.

Additional specific criteria are also found from risk factors lying beyond normal operations at the ship/shore interface. These conditions can include hazards from outside influences such as other marine traffic and nearby ignition sources. As an example, some LNG terminals patrol the perimeter of the offshore safety zones with guard boats — see section 7.2.4. A further example is to declare the air-space over an LNG terminal as being a restricted zone where no aircraft is allowed to fly without written permission.

The specific criteria have thus grown through experience in analysing and managing terminals. They have wide application in the reduction of risks at LNG terminals and are therefore included among the recommendations to be applied during terminal design. In the following sections some specific criteria are discussed in greater detail.

7.2.2 Mooring

For the LNG trades, site selection includes extensive collection of environmental data, including wave spectra. From this, the oscillations of berthed ships are estimated and the individual loads in each mooring line are pre-calculated for critical conditions. Within the trade, this means that not only mooring standards [4] should apply but also the additional force of dynamic wave action should be taken into account. So, while the root criteria for mooring systems act as the design basis, the behaviour of mooring and cargo handling equipment is made site specific for the prevailing conditions. These analyses establish jetty specifications for:

- mooring bollard strength and position
- mooring load-monitoring equipment, and
- hard arm envelopes and cut-off points for automatic operation of the ERS system

7.2.3 Cargo Transfer Operations

All LNG companies ensure that gas carriers can lie safely alongside while transferring cargo. Here, references [14] and [15] are of great value in achieving this aim. By adding the standards for ship's cargo manifolds and detail on surge pressure control [16], which are among the many valuable contributions made

in recent years, even greater assurance is provided. Yet experience shows that specific criteria should be adopted to adequately control risks over the whole spectrum of port and terminalling operations and these should find a place in the design. In this respect, to guard against the consequences of hard arm failure, specific criteria should limit the possibility of significant LNG spills. This question is addressed in reference [15] where the following equipment is recommended to be fitted at hard arms:

- interlinking of ship and shore ESD systems
- establishing a common standard of linkage for ship/shore ESD control
- fitting PERCs and their quick-acting valves
- linking ESD systems and PERCs into a unified control system called ERS

In addition to other matters, reference [5] takes a fresh look at the operation of Emergency Release Systems (ERSs) where it will be found that many events can cause triggering of the system. For the purposes of this paper it should be noted, however, that the ERS is expected to function in two distinct steps. The first step is cargo pump stoppage and closure of the ESD valves in pipelines, both on-board ship and on shore. The second step is closure of the quick acting valves (at the PERC) and the release of the PERC by automatic means. More detail may help to explain this two-stage operation. Here, it should be appreciated that within the ERS's electronic logic for the hard arm, sensors are installed to detect ship movement. Some movements are within the proscribed limits; others are of significance; and yet others are dangerous. Ship movements to the outer edge of the safe area may trigger an alarm. However, movements into the first ERS area activate valve closure and pump stoppage (ESD) — this is still an intermediate area but one in which automatically initiated controls are considered necessary. Finally, if the ship moves beyond this intermediate zone — into the danger area — automatic release of the PERC is actuated quite independently from human intervention.

To illustrate this concept a diagram is provided below.

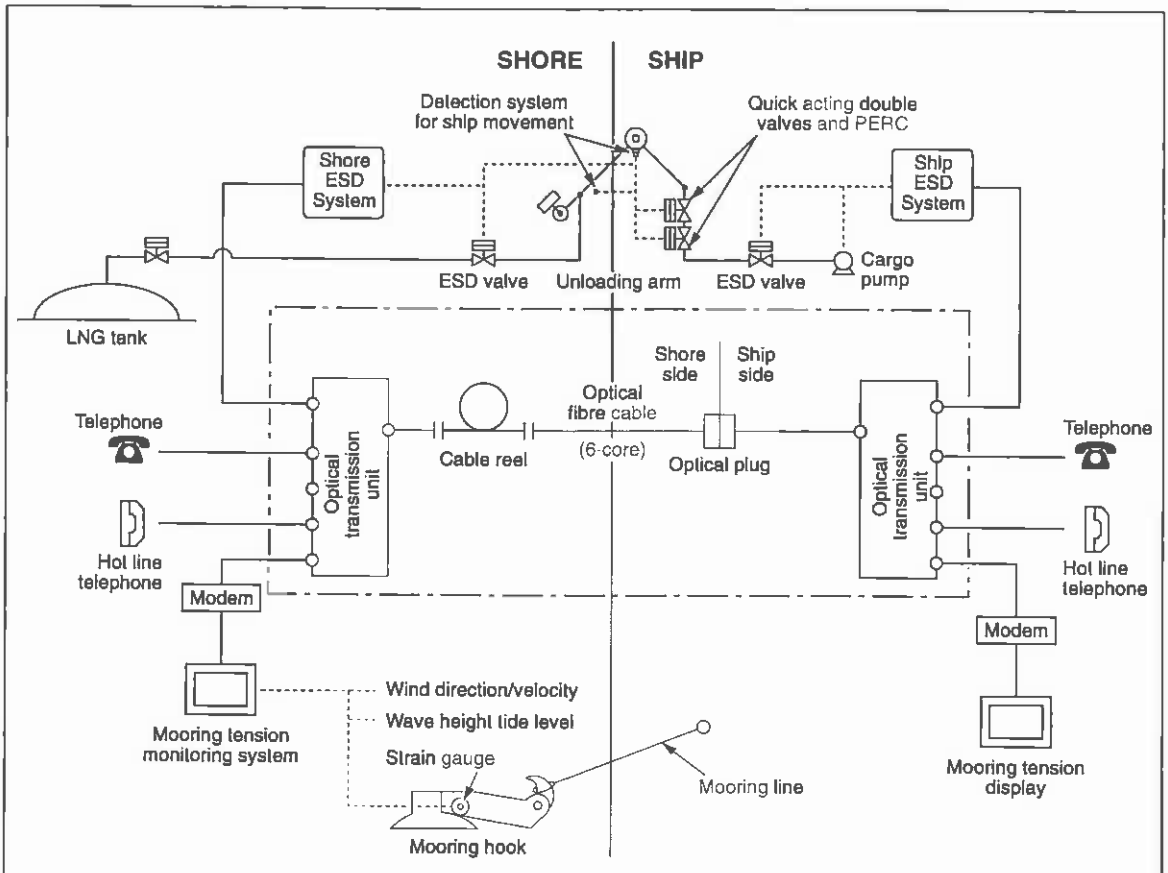

Figure 1: Interlinkage of ESD Systems and PERC Operation - The ERS

In developing these criteria, the underlying rationale is that the mooring lines must provide secure attachment between ship and shore allowing very little relative movement. This means the hard arms also remain secure and the risk of arm rupture, caused by ship break-out, should not occur. However, although this basic framework underpins safety at the ship/shore interface, it provides only a single defence against risk of spillage and the generation of dangerous gas clouds.

Therefore, a second defence comprising an interlinked ESD system is used, this being manually activated by the jetty operator or automatically by ship movement beyond the limits of a predetermined envelope. Automatic activation is triggered (amongst other alarms — see reference [5]) when sensors in the ERS system detect unacceptable ship movement so allowing the ESD controls to stop cargo flow and close pipeline valves — usually within 30 seconds. The progress of activation must be first to stop the pump and then to close the valve nearest to the pump — this restricts the magnitude of surge pressures so limiting any risk of hard arm damage because of high transient over-pressures.

However, and as mentioned above, it is recommended that a third defence be provided to ensure protection for the hard arms against damage from ship break-out and further reduce the maximum quantity of LNG spilled. This is the inclusion of PERCs (fitted within the arms) which allow hard arms to be safely, quickly (about 5 seconds), and automatically disconnected if an LNG carrier should break-out from its jetty. Hence, if all else fails and an LNG carrier breaks away from a jetty the maximum spill is no more than about 15 litres of liquid for the standard 16 inch diameter arm.

Safety issues apart, the PERC (and its accompanying ERS system) is a highly desirable protection of business interests. Often the jetties at LNG installations are but single entities, and if put out of action, total supply can be severely jeopardised. It will be seen, therefore, that in LNG projects, where massive investments are involved and the income of many parties depend on uninterrupted cargo deliveries, any risk of damage to jetties must be eliminated as far as possible. For these reasons, SIGTTO believe that such equipment is an essential risk reduction technique.

Further measures to prevent gas release include surge pressure control systems. Because surge pressures can cause hard arm and pipeline damage, the cargo handling system must be designed by keeping the possibility of surge in mind. This may lead to increased scantlings for pipelines, the fitting of bursting discs with surge pressure drums, or quick-acting relief lines returning surge pressures to the cargo tank.

7.2.4 Ignition Risk

In the event of an LNG spill the possible extent of a gas cloud must be considered. Here it should be appreciated that the risk of ignition from spilled LNG can extend for some considerable distance and, therefore, ignition controls must extend beyond the immediate area and this may be both inside and outside the terminal boundary.

Clearly, it is important to remove all risks of ignition as far as it is practicable to do so. Procedures taken to limit the risk of spills, and minimise their scale, reduce the probability of gas cloud ignition. But even the marginal risks remaining can be unacceptable in a business where a first rate safety record is vital to sustain confidence. Further precautions are therefore adopted to limit ignition sources on the jetty and in its environs.

As mentioned in section 7.2.1, in some ports guard boats are used to patrol the offshore safety zones with a view to excluding other traffic. Often these craft are also fitted out for other emergency purposes and feature in contingency plans. Figure 2 below shows the general arrangement for one such craft.

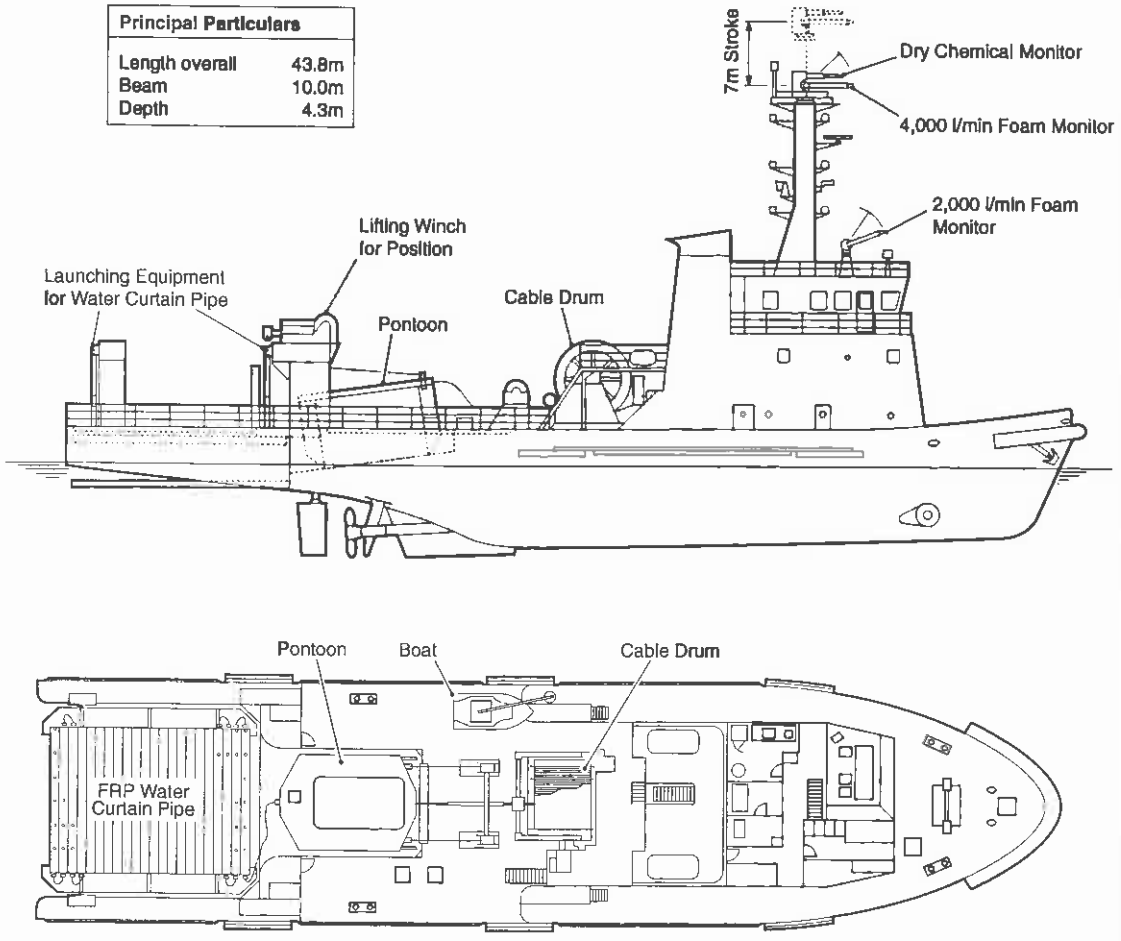

Figure 2: A Guard Boat Outfitted for Emergency Response
Details from Tokyo Electric Power Co. Inc. (see LNG 10, Conference Proceedings)

The area over which ignition-free zones should extend is determined by an analysis of the formation and dispersion characteristics of gas clouds resulting from a range of spill scenarios under a variety of weather conditions. The result provides the likelihood and possible extent of gas clouds in the vicinity of the jetty.

The range of a flammable gas cloud generated by a spill is principally dependant on spill rate and duration but inevitably some subjectivity must accompany the assessment of each spill scenario. Other factors such as climatic conditions, wind direction and speed are also of importance. In addition local topography such as harbour structures and the presence of the LNG carrier itself can have an effect.

Thus, determination of the minimum area from which all ignition sources must be excluded will vary from terminal to terminal and such determination should form part of the design considerations. Sometimes quite large zones, free from ignition sources, are considered desirable especially when terminal safety systems such as fire pumps could be engulfed within the gas cloud.

7.2.5 Specific Criteria - a Summary

In summary the essentials for a safe LNG berth are as follows:

Essential design for a safe LNG jetty

- find a location suitably distant from centres of population
- provide a safe position, removed from other traffic and wave action
- construct mooring points in a satisfactory array and of suitable strength
- use hard arms for cargo transfer
- interlink ship and shore ESD systems
- provide a two stage ERS system, linking ESD protocols with PERC operation
- fit hard arms with PERCs, together with quick acting valves
- fit wind speed and direction monitoring equipment
- install load monitoring equipment on mooring line quick release hooks
- determine maximum credible spill, gas cloud range, and ignition-free safety zones

Apart from the essential design factors listed above, the following terminal procedures should be in place.

Terminal procedures for the LNG carrier alongside

- set limits on the mooring system for wind speed, wave height, and current
- set wind limits for cargo stoppage, hard arm disconnection, and unberthing
- restrict the speed of large ships passing close to berthed LNG carriers
- control visitors and vehicles coming into jetty safety zones
- establish ignition-free offshore zones to stop entry by small craft
- disallow simultaneous LNG operations and ship movements at adjacent jetties
- have available local weather forecasts with suitable warning systems
- have pilots and tugs ready at short notice for emergency departure

Port planning should also ensure that advance procedures are available to control a ship's port entry. In this regard it is most important that each arrival is carefully agreed between the ship and terminal. In particular this should include up-to-the-minute information on berth availability, especially in times of bad-weather forecasts, when last minute changes in berth availability can be anticipated. To safeguard ships in transit from any last-minute change in status on berth availability a contingency plan should be available to include detail on suitable anchorages, lay-by areas or turning circles where the ship can wait or turn round to proceed back to the port entrance.

As a port moves into the operational phase critical revision of existing port procedures is recommended on a frequent basis. By this means, ship operators and terminal managers can be continually assured that cargo planning procedures remain valid, tugs numbers (and power) remain suitable and that matters of contingency planning remain up to date.

8 RISK MANAGEMENT IN THE PORT APPROACH

National authorities and LNG companies devote considerable resources to reduce any risk that an LNG terminal may present to the port environs. This is most apparent during design when special emphasis on the security of nearby population centres is obtained by applying Environmental Impact Assessments and application of references [6] and [8]. At this stage, the risks associated with an LNG carrier as it navigates through the port approach are also addressed and, to illustrate these matters, typical safety routines for the offshore areas are listed in the following paragraphs. Reference may also be made to publications from IAPH, PIANC, BSI and IALA on this subject and some of these standards are given in chapter 11.

8.1 PORT CONTROLS

Taken globally, the frequency of nautical accidents, such as strikings, collisions and groundings, to any class of ship are greater in port approaches and during berthing when compared to frequency rates at sea. For the whole class of gas carriers (LNG and LPG) such accidents account for over half the total reported and, when time factors are taken into account, this confirms that the opening statement also holds true in the gas trade. However, from historical records, it is good to report that serious incidents of this type are extremely rare for LNG carriers; indeed, only one such incident (a grounding) is known to have occurred at a receiving port, none at a loading port and none at all anywhere in the world since 1980.

This successful management of LNG ports can be explained only by the controls unique to the LNG business which have a significant risk reduction effect. At present these distinguishing features consist of:

- effective VTS (traffic management) and the use of escort craft
- adequate tug power to control LNG carriers, even in dead-ship conditions
- strict operating conditions
- regular ships in each trade, and
- high quality seagoing personnel

Some of these points are further explained below:

8.1.1 Vessel Traffic Systems (VTS)

Establishing safe conditions for the port transit of LNG carriers is always a matter of importance. This is usually a direct responsibility of the port authority. However, operational risk management on a day by day basis is a task shared between port authority, terminal owner and ship operator. In most cases there is agreement over the procedures required to assure low risk levels but, as a minimum, a good VTS system, as specified by the International Maritime Organization (Resolution A.578-14) for marine traffic management is recommended to prevent close encounters between LNG carriers and other ships.

Subordinate specifications concerning traffic management, such as the safe distances for other ships to pass LNG carriers, depend on the risks identified in particular situations. For example, in areas of high traffic density, the shore-based VTS may be supplemented by an escort craft (or guard boat) to attend the LNG carrier; in other situations, the VTS may suspend other traffic movements in the channel during the LNG carrier's approach. Whatever specific arrangements are made, they should aim to much limit collision risks caused by close encounters with other ships.

Other conditions for establishing safe operations in port are similar to those required for the harbour movements of any large ship, such as, adequate navigation marks and lights, limiting ship movements in poor visibility, and a high standard of pilotage service all of which contribute to minimising the risk of grounding.

The quality of pilotage service is particularly important. As part of terminal planning it is vital to secure not only consistent high quality in harbour pilotage operations but also to fix pilot boarding areas at

a suitable distance offshore, beyond which the LNG carrier is not allowed to continue inwards without the pilot being on board. Many port authorities use navigational simulators for training their harbour pilots and, when used wisely, simulator courses can yield valuable results. Not least among the advantages of simulator training are the benefits which can be gained by learning how to build good bridge teamwork and an appreciation of Passage and Voyage Planning routines.

In another context, (see section 6.2) marine traffic management can also be important when the position of the jetty is taken into account. If large ships are allowed to pass close by, interactive effects can cause mooring line failure on the LNG carrier. Although such locations are not recommended, depending on the site chosen for the terminal, it may be necessary to limit the speed of passing ships and this may be achieved by VTS controls.

8.1.2 Tugs

Following the same weather which determines port design parameters, the operating limits for LNG carriers should also be specified in terms of wind speed and current drift. These parameters are then used to calculate the maximum wind forces acting on the largest LNG carrier using the port, and thence the number and power of the tugs needed for berthing manoeuvres is specified. There must always be sufficient tug assistance to control LNG carriers in the maximum permitted operating conditions and this should be specified assuming the ship's engines are not available. This method gives different results from one terminal to another. Accordingly, minimum tug power is not an absolute value. Nevertheless, it has been found that for LNG carriers of 135,000 m^3 capacity, acceptable standards are usually in the range of three or four tugs having a combined bollard pull between 120 to 140 tonnes. These tugs should be able to exert approximately half of this total power at each end of the ship. Given that four tugs are provided, in terms of tug propulsion, this suggests that each tug should have engines capable of a minimum of 3,000 horsepower, although this is dependant on propeller configuration.

8.1.3 Operating Conditions

When port design is being considered the aim should be to limit navigational risks involving LNG carriers within the port area. The extent of the system developed depends on factors such as:

- number and type of ships and other craft using the port
- port accident records
- navigational distances and difficulty through the port and jetty approach
- the maximum draft of the ships
- the nature of the sea-bed (rock, sand or mud)
- tidal conditions (tidal ranges and tidal currents)
- weather conditions (wind, waves, sea-ice and visibility)
- proximity of the terminal to populated areas and industrial sites

After studying such factors, port designers and port authorities can introduce LNG-related provisions appropriate to the local port. The operational procedures and equipments which follow from these considerations, and already adopted in many LNG ports, are summarised below.

8.1.4 Summary of LNG Port Procedures

Port procedural limits for weather

- establish weather limits for port closure
- draw up procedures to give advance weather warnings to ships
- restrict port manoeuvring of LNG carriers in strong winds
- restrict port manoeuvring of LNG carriers in reduced visibility
- establish safe anchorages at the port entrance and within the harbour

Port controls for approach channels

- provide suitable short range navigational aids for approach channels
- provide escape routes in cases where a ship is unable to berth
- establish port suitability for day and night transits
- set safe manoeuvring limits for, visibility, wind, current, and wave height
- relate channel widths to the beam of the largest ship
- relate turning circle diameters to the length of the largest ship
- set speed limits for channels to limit heavy groundings or penetrating collisions

Port controls for tugs and escort craft

- set safe weather limits for berthing
- provide tugs farther to seaward; beyond the normal 'assistance' area
- provide escort craft suited to the circumstances
- establish tug power as being sufficient to overcome maximum set wind conditions
- have pilots and tugs available at short notice for emergency departures

Procedures and systems regarding traffic control

- establish a VTS control to coordinate the movement of all craft within the port
- limit other traffic movements in the port while LNG carriers are in transit
- set a moving safety zone in approach channels ahead and astern of LNG carriers
- adopt Traffic Separation Schemes (TSS) in appropriate approach channels

In addition to these points other operational factors should be addressed. These can include instructing ships to carry appropriate charts and nautical publications and to implement Voyage Planning routines. Port authorities should also ensure that harbour pilots use the practice of Voyage Planning. However, being more in the realms of ship operation, these issues fall beyond the scope of this paper.

Study of the foregoing lists shows that only rarely are the criteria absolute, or conditions unchanging. Obviously water depth is critical, as are severe weather conditions, but in many other cases either the procedures, or the conditions they are set to control, have flexible application. Indeed, it is suggested in reference [14] that the principal value of listing the criteria is to identify the hazards with a view to setting operational procedures to control them. Similar reasoning is evident in reference [1], and its check list of risk reduction options is used as a basis for the Appendix to this paper. Hence, within many existing navigational controls, it is usual, as a consequence of human factors, for a low level of residual risk to remain. Under present industry guidelines, this is true even after the optimisation process for site selection is complete. Thus, in some existing ports this risk remains to be controlled on a day by day basis.

Of course, for new terminals, present day standards involving Environmental Impact Assessments, and similar procedures, should be even more effective in securing a low risk operation. However, within these systems, expert marine advice is necessary to ensure that, when a large gas release is considered, limited only by human elements, the consequences are controlled by other methods such as those discussed in chapters 9 and 10.

9 THE HUMAN ELEMENT

Accident reports show that effective risk management, whether in port or at sea, is often frustrated by an inability to completely obviate human error or uncharacteristic human behaviour. Indeed, the large majority of shipping casualties continue to occur as a result of the human element. But the relationship between operator error and risk assessment remains obscure; this is because human responses are difficult to predict and the process of human reaction is not fully understood.

For these reasons, risk management systems usually take the possibility of human error into account, attempting to control it by other means. Such methods can include alarms, ESD systems, engineered

fail-to-safe equipment, equipment redundancy (back-up), and procedures. As appropriate, these devices include multiple cross-checking features. The positive contribution of all these measures to risk reduction is clear. However, casualty data shows (see sections 8.1 and 10.1), that even for LNG carriers, current techniques involving human controls are less than one-hundred per cent effective. Thus, when limiting the chance of a significant accident — to match a very low risk exposure — the range of industry standards covered in chapter 8 are found to be less than foolproof.

This paper suggests, therefore, that it is necessary in the port approach, to adopt a method of risk management which, as far as possible, discounts the contribution of human judgement. In particular, this chapter not only addresses the need to consider accidents where human judgement has proved helpful in limiting the consequences but also to consider the increased risk in some areas when human controls have failed — perhaps thus endangering the ship's cargo tank containment system.

Drawing on the discussion in chapter 10, the ship's speed which may damage the cargo containment system can be estimated. By this means, for parts of the port approach, speed controls can be established to limit the consequences of collisions, strikings and groundings. In the case of a ship grounding it is possible to assess whether the potential damage might cause cargo containment system rupture. This can be done by:

- reference to the quality of the sea-bed
- assessing the possible courses of the grounding ship
- estimating the ship's speed at the time, and
- applying the criteria given in references [17] and [18]

A similar list of criteria can be developed for collisions but the first item, as listed above, would be omitted and another added; vis, the angle of strike. In addition, references [19] to [26] should be studied.

This paper suggests, therefore, that each port should be investigated for the presence of the dangers which could cause critical impacts during the harbour transit of an LNG carrier and recommends that port designers, when assessing individual hazards, take the possibility of human error into account. This should be done to ensure a satisfactory safety margin is provided — that is, in the event of accident, an assurance ruling out cargo containment system rupture. It can be seen therefore that, when using this method, the following listing of existing safeguards are assumed to fail:

- operational procedures
- back up system warnings, and
- human controls

Evidently (see chapter 10) such high risk events are extremely rare in LNG shipping. Nevertheless, only after the above investigation has been completed can appropriate assurance be secured which protects a ship's cargo containment system against rupture. Because of the unquantifiable nature of the human element, this paper suggests that only by removal of all possibilities for containment system penetration can the correct level of port security be obtained.

10 GROUNDING AND COLLISION RISK

With respect to ship navigation, any hazard which may result in a large release of LNG can be identified by assessment of the energy necessary to penetrate the ship's inner and outer hulls. The double-hull arrangement provides LNG carriers' containment systems with protection to all but high impact. This means that, as part of port design there is every prospect for preventing a large gas release without introducing unrealistic port restrictions. However, and following from chapter 9, it should be seen that an important element to avoid, where possible, is any procedure over-dependant on human controls.

In this chapter, therefore, consideration is given to LNG carrier groundings and collisions with a view (through ship operation and port design) to reduce the risk of major gas releases. Clearly, once a terminal is in operation, knowledge that such accidents are virtually impossible, provides valuable input for future operations.

10.1 HULL DAMAGE - A HISTORICAL REVIEW

Analysis of SIGTTO and other casualty records give a reliable picture of the accident profile of the LNG shipping industry in the period between 1982 and 1996. However, because some categories of minor incident were considered unreportable, it is probable that the data is incomplete. Nevertheless, it is virtually certain that the data includes every incident, such as grounding and collision, having potential for damaging a ship's cargo containment system.

The data-base shows that the cargo handling and port-related accidents recorded in this period, and with the ships fully operational, numbered only ten. Of these:

- one occurred whilst manoeuvring in a port (propeller struck channel buoy)
- five involved ships breaking out from the jetty with the hard arms connected
- three involved mechanical failure, and
- one records a fire on the engine room switchboard

In none of these cases was the LNG carrier's cargo containment system put at risk.

For the period between 1962 and 1982 the data is less comprehensive, but still it is extremely unlikely that any significant incident, threatening an LNG carrier's cargo containment system, would have gone unreported. In this period there are only six accidents which might be categorised as posing a hazard to the ship's cargo containment system. Within this time frame there are five reported collisions and five reported groundings. One of the collisions involved an LNG carrier being struck whilst berthed, the others were outside port and none resulted in serious damage to the cargo containment system. Of the groundings only two (one in port and the other at sea) involved serious structural damage to the ship's bottom and in neither case was the cargo tank containment system penetrated.

The two serious grounding incidents demonstrate the capacity of LNG carriers to sustain bottom damage without experiencing rupture of the containment system.

Records show that there are no comparable data that would similarly demonstrate the resistance of an LNG carrier's side structures to collisions. Nevertheless, there are tools available for predicting such resistance, giving results which, when used with care, are able to establish the minimum energy required to put a cargo containment system at risk — see section 10.2.2.

So, although it has never happened over some three decades of LNG carriage, an important risk to be considered in port analysis is the possible release of cargo during groundings or collisions. Though open to interpretation, good estimates are available for the energy required to penetrate an LNG carrier's double hull so putting the ship's internal cargo tank containment system at risk. It is therefore possible to identify accident scenarios with potential for such damage and plan to remove them from port areas. Accordingly, when designing a port, the aim should be to limit the probability of high energy impacts on LNG carriers, such that damage to a ship's hull is minimised.

10.2 RISK OF STRUCTURAL DAMAGE TO LNG CARRIERS

10.2.1 General

The structure of LNG carriers, incorporating double bottom tanks and double sides, gives high resistance to the impact of grounding and collision. This is supported over many years of research (see references [17] to [26]), some of which is described in the following sections.

10.2.2 Collision Damage

One method [19], in which collision energy is assumed to be absorbed by the structures of both ships was, for many years, the accepted way for assessing collision resistance. Predictions using this method relied upon empirical resistance factors, mostly derived using data from actual impacts. More recent methods (see chapter 11), which include a better understanding of failure and collapse mechanisms, have led to more accurate predictions and these methods seem to be especially effective for low energy collisions; although the method first mentioned still gives acceptable results in high energy situations.

The results of such analyses are dependant on the impact angle (of the striking ship), the bow shape of the striking ship and the structure of the struck ship. Therefore conservative interpretations must be placed on such analyses, particularly if the results are intended to support the conclusions of a wider risk assessment.

Significant studies on the question of collision damage are included in the references. Based upon published methods, the following table lists examples of the resistance of a stationary 135,000 m^3 LNG carrier, expressed against the critical impact speed required to hole the outer hull but not to rupture the cargo tank containment system.

Hull Resistance for a 135,000 m^3 LNG Carrier	
Displacement of Colliding Ship (tonnes)	Critical Impact Speed (knots)
93,000	3.2
61,000	4.2
20,000	7.3

For the reasons indicated above, the results shown in the table are considered to be realistic and provide conservative estimates — so allowing a satisfactory margin for error.

10.2.3 Grounding Damage

Typical publications covering grounding damage are listed in the references — in some cases a reference may dwell on oil tanker topics, however, with respect to the double bottom depths, as present day oil tanker design is similar to that in LNG carriers, the references remain helpful. Indeed the references suggest that the similar structure in LNG carriers gives the same level of protection from low energy grounding and similar assurance in a significant proportion of high energy incidents.

Accurate prediction of damage in grounding incidents is difficult. But, given a smooth sea-bed of sand or mud, impact energy is usually spread over a large area of the ship's bottom and, with this cushioning effect, upward penetration is minimised. Rock bottoms cause more jagged penetrations with the impact being absorbed over a much smaller area.

10.2.4 Hazardous Penetration

As can be seen from the foregoing overview, analytical tools are available which can, with reasonable accuracy, predict damage to ship's hulls in collision and grounding situations. This means it is possible to set criteria for accident severity (in terms of ship's speed) below which rupture of the cargo containment system is virtually impossible.

It therefore becomes feasible to consider ways to analyse port approach channels so that any risk of cargo containment rupture can be removed and the remote possibility of an uncontrolled release of LNG reduced to non-credible proportions.

Hence, by removing individual risks in each port such as:

- rock outcrops or reefs
- underwater obstructions, and
- close encounters with other ships

from the main shipping channels and their immediate environs, port risks can be reduced to a level where a large release of LNG becomes too remote to imagine.

10.3 EXAMPLES

In this section practical application of the recommendations given in sections 10.1 and 10.2 is illustrated by simplified examples for a hypothetical port. The port in question is shown in Figure 3.

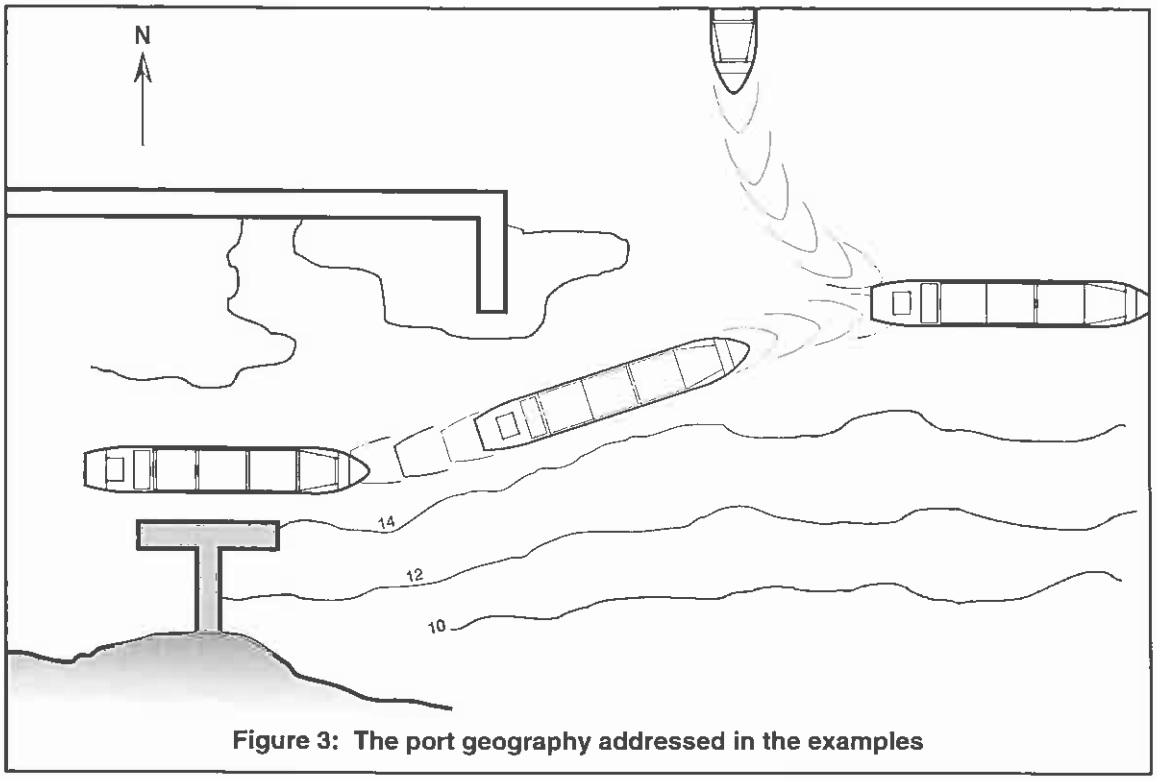

Figure 3: The port geography addressed in the examples

10.3.1 Striking a Fixed Structure - Example 1

Harbour entry is carried out in accordance with the manoeuvre illustrated in Figure 3. This involves moving stern-first through the port entrance under the control of tugs.

The following conditions are assumed to apply:

- Tug numbers, tug power, and operating conditions are specified for the port such that the LNG carrier is fully controlled by tugs alone, even in case of ship engine failure.
- Penetration of the ship's outer hull, through striking the corner of the harbour wall, is calculated to require a side-on speed of 5 knots. Furthermore, the calculations show that this damage will not extend to the cargo tank containment system. (For this scenario, the worst case condition occurs with impact on the ship's parallel body and with the transverse velocity at 90° to the point of impact).
- Misjudgment by those controlling the manoeuvre is assumed.
- At a point on the ship's track (from which impact on the corner of the harbour wall is possible) simultaneous failure of the ship's engines, and sufficient of the tugs for loss of control, is assumed. This is assessed as being possible once in 5 million operations.
- The most likely part of the ship to strike the wall is the ship's stern structure. Collision damage in this area cannot put the cargo containment system immediately at risk.

- The critical speed of 5 knots for a side-on striking cannot be achieved from any point in the manoeuvre since the ship's maximum drift speed in open sea conditions, in wind speeds of 30 knots, is calculated as just 4 knots. This wind produces conditions in which tugs cannot operate; and therefore, under such conditions, the port would be closed. In any case the wind does not contribute sufficient extra speed, to that already given by the tugs, for a 5 knot side-on speed to be achieved from the stern-first manoeuvre.

Solution

With the effects of harbour wall fendering discounted and the resistance of the cargo tank containment system ignored, the probabilities of sustaining cargo tank containment system penetration through striking the harbour wall are assessed as non-credible.

10.3.2 Grounding - Example 2

Assuming human error has occurred, the arriving LNG carrier overshoots the initial port-hand turn of the entry manoeuvre with excessive speed and, through technical failure or misjudgment, the tugs fail to stop the ship. As a result the carrier enters shallow water to the east of the jetty and grounds.

- It is assumed that the ship's last course before grounding can result in angles of impact from head-on (bow-on) to beam-on (side-on).

- Head-on grounding is assumed to have a higher speed than from other directions since any other angle of impact implies a change of course — hence speed loss.

- The sea-bed is free of obstructions and smooth, hence point penetrations are not possible. The slope of the sea-bed is two metres in every 100 metres over the ground.

- The maximum possible head-on grounding speed is assessed at 12 knots. Higher speeds are considered impossible because of shallow water effects, which slow the ship, and because the ship should have put its engines into manoeuvring mode (slower than full sea speed) well in advance. For this reason, grounding speeds for all other angles of impact must be less than 12 knots.

- Impact energy for a head-on grounding is mostly absorbed by structural damage forward of the cargo containment area, and the ship's forward speed is reduced to less than 6 knots (half the initial speed) before the ship's bottom under the cargo tanks takes the ground. The residual impact energy is then spread broadly through the bottom structure as the ship runs over a 2:100 gradient and this is calculated to be insufficient (with a smooth sea-bed) to achieve penetration of the cargo containment system.

- Groundings with the LNG carrier at any other angle to the shore, other than head-on, involve progressive combinations of speed reduction and structural deformation of the ship's bottom forward of the cargo tanks - until, with the beam-on grounding, the impact is taken wholly on the ship's side, but with a speed less than 6 knots.

Solution

Actual grounding incidents and theoretical calculations together suggest that rupture of the cargo containment system is non-credible in any of the cases.

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APPENDIX

LNG PORTS - RISK REDUCTION OPTIONS

General Requirements for LNG Carriers (Where figures are given they refer to LNG carriers of 135,000 m^3 capacity)	
1	**The Port**
1.1	**Port Analysis**
	Speed restrictions for LNG carriers should be appropriate to limit grounding and collision damage.
1.2	**Approach Channels and Turning Basins**
	Navigable depths (for most LNG carriers) should generally not be less than 13 metres below the level of chart datum.
	Under-keel clearances should be established in accordance with the sea-bed quality.
	Channel width should be about five times the beam of the ship (approximately 250 metres).
	Turning areas should have a minimum diameter of two to three times the ship's length (approximately 600 to 900 metres).
	Short approach channels are preferable to long inshore routes which carry more numerous hazards
	Traffic separation schemes should be established in approach routes covering many miles.
	Anchorages should be established at the port entrance and inshore, for the safe segregation of LNG carriers and to provided lay-by facilities in case, at the last moment, the berth proves unavailable.
1.3	**Navigational Aids**
	Buoys to mark the width of navigable channels should be placed at suitable intervals.
	Leading marks or lit beacons, to mark channel centrelines and to facilitate rounding channel bends, should be appropriately placed.
	Electronic navigational aids, to support navigation under adverse weather conditions, are needed in most ports.
	Lit navigational aids should be provided to allow ship movements at night.
1.4	**Port Services**
	Tugs should be made available and three to four are normally required giving 140 tonnes total bollard pull. (Tugs may be required to meet LNG carriers farther offshore).
	Mooring services are often required and these services should normally provide a minimum of two boats, each having at least 400 horsepower.
	Escort services comprising fast patrol craft, to clear approach channels, turning areas, jetty, etc. should be provided in busy port areas.
	Firefighting services comprising specially equipped craft, or, one or more suitably equipped tugs should be provided.

1.5	**Port Procedures**
	Traffic control or VTS systems should be strictly enforced to ensure safe harbour manoeuvring between the pilot boarding area and the jetty.
	Speed limits should be introduced in appropriate parts of the port approach, not only for the LNG carrier but also for other ships.
	Pilotage services should be required to provide pilots of high quality and experience. Pilot boarding areas should be at a suitable distance offshore.
	Ship movements by nearby ships, when the LNG carrier is pumping cargo, should be disallowed.
	Pilots and tugs should be immediately available in case the LNG carrier has to leave the jetty in an emergency.
1.6	**Port Operating Limits**
	Environmental limits for wind, waves, and visibility should be set for ship manoeuvres and these should ensure adequate safe margins are available under all operating conditions.
	Weather limits for port closure should be established.
1.7	**Weather Warnings**
	Forecasting for long range purposes should be provided to give warning of severe storms, such as typhoons and cyclones.
	Forecasting for short range purposes, such as those required for local storms and squalls, should be made available.
2	**The Jetty**
2.1	**Jetty Location**
	Jetty location should be remote from populated areas and should also be well removed from other marine traffic and any port activity which may cause a hazard.
	The maximum credible spill and its estimated gas-cloud range should be carefully established for the jetty area.
	River bends and narrow channels should not be considered as appropriate positions for LNG carrier jetties.
	Breakwaters should be constructed for jetty areas exposed to sea action, such as excessive waves and currents.
	Restrictions, such as low bridges, should not feature in the jetty approach.
	Ignition sources should be excluded within a predetermined radius from the jetty manifold.
2.2	**Jetty Layout**
	Mooring dolphin spacing - between the outermost dolphins - should not be less than the ship's length (approximately 290 metres).
	Mooring dolphins should be situated about 50 metres inshore from the berthing face.
	Mooring points should be suitably positioned, and have suitable strength, for the environmental conditions.
	Quick-release hooks should be provided at all mooring points.

	Breasting dolphin spacing should be designed to ensure that the parallel body of the ship is properly supported.
	Fendering for the dolphins, and for the berth face, should be to a suitable standard.
2.3	**Jetty Equipment**
	Pipelines and pumps etc should be designed to provide a rapid port turn-round.
	Emergency Release Systems at the hard arms should be fitted in accordance with industry specifications. The ERS should be suited to both ship and shore by interlinking and a PERC should be fitted to each hard arm for emergency stoppage and quick release purposes.
	Emergency shut-down valves should be fitted to both ship and shore pipelines and should form part of the ERS system.
	Powered emergency release couplings (PERCs) with flanking quick-acting valves should be fitted to the hard arm as part of the ERS system.
	Plugs both on ship and shore to carry all ESD and communication signals should be standardised.
	Surge pressure control should be provided in LNG pipelines.
	Communications equipment (telephone, hot-line and radios) should be provided for ship/shore use.
	Load monitors, to show the mooring force in each mooring line, should be fitted to quick release hooks.
	Gangways should be provided to give safe emergency access to or from the ship.
2.4	**Basic Firefighting Facilities**
	Water curtain pumps and pipelines should be provided.
	Fixed Dry Powder systems should be provided.
	Gas detection monitors should be fitted at strategic locations.
	Fireproof material should be used for the construction of hard arms (no aluminium).
2.5	**Jetty Procedures**
	On shore jetty safety zones should be effectively policed while the ship is alongside thus providing control over visitors and vehicles.
	Offshore safety zones should be effectively policed by a guard boat to limit the approach of small craft.
	Passing ships, close to the jetty, should have their speed controlled by the harbour VTS system.
	Communications procedures should be well established and tested.
	Contingency plans should be available in written form.
	Operating procedures should be available in written form.
	A Port Information/Regulation Booklet should be provided for passing operational advice to the ship.