

**Potential Impacts to the Aquatic Environment from the Placement of Stone Fill**

	Resource	Potential Short-term Impacts	Potential Long-term Impacts	Comments
<b>Upland Work Activities</b>				
Upland Workspace/ Materials Management & Equipment Staging	Water quality/ sedimentation	Temporary ground disturbance from heavy equipment traffic and material (stone fill) management has the potential to increase sediment transport in stormwater runoff.	No long-term impacts from upland activities are anticipated because the site will be properly stabilized and restored to pre-construction contours. No long-term activities on the site are proposed.	The potential for temporary impacts to water quality from site disturbance (i.e. erosion and sedimentation) will be properly mitigated and conducted under federal and county permits. Appropriate BMPs, including but not limited to, timber matting, equipment pads, silt fence, and straw bales, will be installed for the duration of the Project activities.
	Water quality/ petroleum hydrocarbon pollution	Accidental and incidental releases of petroleum-based fluids from construction equipment and vehicles during Project activities and fueling have the potential to enter surface waters with stormwater runoff.	No long-term impacts, or risk of impacts, to water quality from petroleum releases are anticipated as all construction equipment and vehicles will be removed from the site at the completion of the Project.	Negligible impacts to water quality from accidental and incidental releases of petroleum-based fluids from construction activities, due to the Project BMPs to be installed, including the Spill Prevention, Control, and Countermeasures (SPCC) Plan that will be implemented for the duration of the Project.
	Sound	Temporary noise-generating activities from the movement of construction equipment and materials will produce localized noise levels similar to that of common construction sites.	No long-term impacts with respect to sound and noise generated from construction activities are anticipated, as all noise-generating activities will cease at the completion of the Project.	Negligible impacts to ambient sound levels are anticipated near the riverbank because upland construction-related noise will be temporary and localized to the construction site and during normal working hours (8am to 6pm).

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	Riverbank	Movement of construction equipment, personnel, and material from the upland workspace to the barges on the river will result in temporary, localized, and minor impacts to the riverbank. A staging area for the crane and rocks skiffs will be established 30 feet from the top of the rip-rapped bank on-site. A temporary staircase or gangway will be constructed from the top of the rip-rapped bank to a temporary floating dock (if necessary). Incidental, short-term disturbance may result from these activities in the form of accidental releases of petroleum-based products from equipment and stone fill.	No long-term impacts to the riverbank are anticipated as a result of the Project. The riverbank is stabilized with rip-rap from the water's edge to top of the bank. No reconfiguration (e.g. cut & fill) will occur on the riverbank.	Negligible impacts to the riverbank will result from upland construction activities near and along the riverbank as these activities will be mitigated with the implementation of appropriate BMPs. Temporary equipment pads, timber matting, fuel spill response, and temporary staircase/gangway will mitigate direct impacts to the riverbank.
<b>Instream Construction</b>				
Construction vessel movement	Water and aquatic habitat quality/petroleum hydrocarbon pollution	Accidental and incidental releases of petroleum-based fluids from construction equipment and vessels during instream operation and fueling have the potential to discharge into surface waters.	No long-term impacts to water quality from accidental releases of petroleum-base fluids are expected. Volumes of petroleum products transported on construction vessels will be limited to that necessary for operations. All vessels and equipment will be removed from the workspace upon the completion of the Project.	Negligible impacts to water and aquatic habitat quality are anticipated from the accidental or incidental releases of petroleum-based fluids from construction equipment and vessels during instream operation and fueling. Spills would be mitigated through proper maintenance of equipment and vessels, adherence to proper fueling protocols, installation of appropriate containment as detailed in the SPCC Plan, and readiness in the event of a release.

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	Sound	The movement of construction vessels will result in localized and temporary increases in engine noise in the vicinity of the Project. Securing of the placement barge will require pile driving that will generate noise above and below the waterline. Short-term, localized impacts to people and animals near pile driving activities that perceive the sound may occur.	No long-term impacts from noise generated by pile driving to anchor the spud barge are anticipated, as the activity includes 4 piles per day and 25 strikes per pile. People or animals negatively impacted from the noise will likely avoid the area until the pile driving activities are completed.	Minor noise impacts to the aquatic environment may result from pile driving to station the placement barge during construction. This impact will be temporary and localized to the Project area.
	Air pollution	The operation of diesel- and gas-powered construction equipment and vessels may result in short-term, localized increases in air emissions during construction.	No long-term adverse impacts from air emissions resulting from the operation of diesel- and gas- powered equipment and vessels are anticipated to occur because of the limited duration of the Project.	Negligible impacts to air quality are expected because of the operation of diesel- and gas-power construction vessels and equipment, as increases in air emissions will be short-term and localized to the immediate Project vicinity.
	Boat Traffic	Temporary disruptions to local and recreational boat traffic will result within the areas of the river occupied by construction vessels for the duration of the Project. The disruptions will generally occur near the shoreline at the upland workspace and the location of the placement barge. Boaters will be asked to observe a "no wake zone" near construction activity, and encouraged to stay clear of all construction vessels, which may disrupt the activities of some boaters.	No long-term impacts to boat traffic on the Pend Oreille River are anticipated due to the Project. No construction vessels will be presented beyond the completion of construction activities and no alterations to navigation or boater access will result from Project.	Negligible impacts to boat traffic on the Pend Oreille River are anticipated due to construction vessel activities over the duration of the Project. Impacts will be short-term and mitigated by the implementation of a "no wake zone" and other appropriate instream advisories.

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	Invasive Aquatic Species/ Habitat Disruption	Short-term adverse impacts to the Pend Oreille River aquatic ecosystem and several resident species could result in the event that an invasive, aquatic species is accidentally introduced to the river by a construction vessel.	Long-term adverse impacts to the Pend Oreille aquatic ecosystem and several resident species could result in the event that an invasive, aquatic species is accidentally introduced to the river by a construction vessel.	Negligible risk of the introduction of invasive aquatic species as a direct result of Project activities or vessels in the Pend Oreille River is anticipated. Project vessels will adhere to all Idaho laws with respect to the control of invasive aquatic species and the inspection of all watercraft prior to entering the State's waters.
Transfer and Placement of Fill	Water and aquatic habitat quality/ sedimentation	Temporary, localized increases in turbidity will result during the discharge/placement of stone fill near the suspended portions of the pipelines. Accidental and incidental discharges of stone fill may occur during the transfer of rock from one container to another. These isolated discharges would amount to small volumes of fine, sandy particulate and clean rock entering the river.	No long-term impacts to water quality from the accidental or incidental releases of sediment (stone fill) are anticipated. The movement of stone fill will cease at the end of construction. Any small volume of released material may be recovered or left on the riverbed.	Negligible increases in turbidity and sedimentation are expected in the Pend Oreille River from the placement of fill near the suspended portions of the pipelines along the riverbed. These increases will be localized and short-term with no expected adverse effect to the water or aquatic habitat quality of the Pend Oreille River.
Installation of Temporary Shoreline Structures	Riverbank impacts	The installation of temporary structures to improve access from the upland workspace to the river will occupy an area of the riverbank and shoreline for the duration of construction activities.	No long-term impacts to the riverbank are anticipated from the installation of temporary shoreline structures as these structures will be removed and Project site restoration will occur immediately following the completion of construction activities.	Negligible impacts to the riverbank are anticipated from the installation of temporary shoreline access structures. The temporary structures replace the need for permanent structures and will mitigate impacts from personnel and equipment descending the riverbank and shoreline.

Habitat alteration that affects cover, interstitial space, temperature, and hydrologic function associated with rivers has the potential to create habitat for non-native, introduced and/or predatory fish species. Lake Pend Oreille and the Pend Oreille River are known to have species that prey on native species like bull trout during their early life stages. Construction methods of placing specifically selected materials over the pipeline were designed to minimize interstitial space and reduce the potential for creating habitat for predatory fish that could affect bull trout at the individual or population level. Hydrologic concerns were also considered and assessed. No new habitat would be anticipated to be created by the proposed action and in turn, no effects related to predation on would bull trout are anticipated to occur as a result of the project.

The proposed action by its nature will release materials into the water column and has the potential to mobilize and redistribute sediment through associated construction activities. Increased levels of sediment can often have adverse affects on salmonids and their habitat. Pools, an essential rearing habitat type, can be filled by deposited sediment and interstitial spaces between cobbles, which are important winter rearing habitats, can become degraded or lost (Kelsey et al., 1981). Turbidity may increase physiological stress, result in physical injury (e.g., gill abrasion), and potentially displace rearing juvenile fish (Bisson and Bilby, 1982). Juvenile salmonid avoidance of turbid waters may be one of the most important effects of suspended sediments (DeVore et al., 1980; Birtwell et al., 1984; Scannell, 1988). Although adult and larger juvenile salmonids can better tolerate higher concentrations of suspended sediments (Bjornn and Reiser, 1991), chronic exposure can cause physiological stress responses that can increase maintenance energy and reduce feeding and growth (Redding et al., 1987; Lloyd, 1987; Servizi and Martens, 1991).

The pre-construction conference, as outlined in the conservation measures, will ensure that the construction contractor and landowner strictly adhere to all items contained in the sediment and pollution control specifications. TransCanada will monitor construction activities for signs of increased turbidity or other acute effects during the implementation phase of the Project and take remedial action if necessary.

Short-term effects of mobilized sediment from Project-related activities on listed bull trout and their designated critical habitat are anticipated to be minimal and diminish relatively quickly. Consequently, the duration, magnitude, and extent of turbidity and fine sediment from the proposed action would not be anticipated to affect ESA-listed fish adversely in the action area. Over the long term, stabilization of the pipeline would result in a maintained baseline condition for this indicator

During the short-term, there is potential for spillage of fuel or hydraulic fluid from equipment during construction activities. Fish, their habitat, and aquatic organisms can be harmed or killed by accidental release of petroleum products from vehicles and equipment, or other contaminants that may occur through Project activities. Petroleum-based contaminants contain polycyclic aromatic hydrocarbons, which can be acutely toxic to salmonids at high levels of exposure and can cause chronic sublethal effects to aquatic organisms at lower levels (Neff, 1985).

The potential risk of petroleum products spilling during construction activities is reduced because the proposed action includes precautionary conservation measures that help safeguard against spillage and runoff. For example, upland machinery will be fuelled or lubricated outside of riparian areas at a distance greater than 200 feet from flowing water. A Critical Areas Fueling Plan will be developed for fueling operations on or near the water. Onboard machinery will be fueled on equipment pads by a professional oiler. Spill prevention and control plan will be on-

hand at all times and utilized appropriately, as needed. Chemical contamination in the action area would be maintained over the long term.

Pile driving activities for the Project will be limited to driving the two spud piles used to moor the placement barge during the placement of fill near the pipeline segments and 12 piles driven for temporary riverbank structures to aid project construction and to protect the riverbank. The marine contractor for the Project estimates that four piles will be driven per day when piles need to be driven due to placement barge movement or shoreline structure installation. Pile driving will not occur every day of the Project and it is highly unlikely any piles will be driven in the river channel because of depth.

The two spud piles are 10-inch diameter steel piles, typically 35 to 50 feet in height, which can be driven into place when the placement barge is stationed in water shallow enough for the spuds to hold the barge (approximately 40 feet or less in depth) for placing the stone fill. Anchors or tugboat can be used to hold the placement barge in deeper waters. It is estimated that the placement barge will be moved twice each day. Each time the placement barge is moved; the spud piles will be lifted, fastened during transport, and re-driven at the next barge location. Therefore, it is estimated that the two spud piles will be driven twice per day equating to four pile driving events per day as a result of the positioning of the placement barge. Assuming 45 days for the placement of fill, a conservative estimate for the number of days the two spud piles may be needed for positioning the barge is 25 days as anchors or the tugboat will be used the remainder of the time. Therefore, the estimated number of times the spud piles may be driven during the Project is 100 times (i.e. 25 days x two spud piles x twice per day).

The temporary structures along the shoreline will involve as many as 12 piles: two piles for a temporary floating dock and 10 piles for temporary dolphins for mooring of the barges. These piles will also be 10-inch steel piles. The estimated duration for the installation of the piles for these structures is three to five days.

Noise from pile driving will result from blows with the drop hammer for driving 10-inch steel piles on the spud barge and for temporary shoreline structures. A conservative estimate of the number of pile driving events and the number of blows by the drop hammer over the course of the Project was made. Approximately 112 piling driving events over an estimated 30 days are anticipated equating to approximately 2,800 blows with the drop hammer.

Sound waves generated by percussive pile driving can affect fish in several ways (for example, altered behavior, physical injury, or mortality). These effects depend on the intensity and characteristics of the sound; the duration; the distance and location of fish in the water column relative to the sound source; the size and mass of the fish; and the fish's anatomical characteristics (Yelverton et al., 1975). Commonly, the following three metrics are calculated and used when evaluating hydroacoustic effects to fish:

- Peak sound pressure level (LPEAK)
- Root mean square (RMS)
- Sound exposure level (SEL)

NMFS and the USFWS, however, have developed interim hydroacoustical criteria (Fisheries Hydroacoustic Working Group, 2008). The current interim criteria that the Fisheries Hydroacoustic Working Group has agreed upon for hydroacoustic disturbances for all types of effects are as follows:

- 206 decibel (dB) peak sound level
- 187 dB SEL for all listed fish greater than 2 grams and 183 dB SEL for fish less than 2 grams
- Sound pressure levels in excess of 150 dB RMS as the level that can cause temporary behavioral changes (California Department of Transportation [Caltrans], 2009)

NMFS has developed a spreadsheet for assessing the potential effect to fishes exposed to elevated levels of underwater sound produced during pile driving. Hydroacoustic analyses (Exhibit 4-2) was conducted using this spreadsheet to determine threshold criteria for driving 12-inch steel piles using a drop hammer. Although 10-inch piles would be used rather than 12-inch, underwater sound level data was not found for 10-inch steel piles. It is believed that the use of 12-inch drop hammer sound level data in the calculations would result in a reasonable approximation of underwater noise levels from a drop hammer installing 10-inch steel piles.

Larger fish such as adult salmonids will be much less affected by hydroacoustical disturbance than smaller fish. Listed bull trout in the area would likely be adults and would be greater than 2 grams in weight further reducing potential hydroacoustic impacts to listed species (Caltrans, 2009). In addition, it should be noted that the hydroacoustical analyses above were calculated for stationary fish during pile driving when in actuality fish in the area would be expected to be moving or migrating past the work area and any potential effects would therefore be reduced. A wood block or bubble curtain would be installed (prior to the driving of piles) to further reduce the effects of noise and vibration to fish associated with pile driving activities. With above conservation measures in place, no measurable affects would be anticipated to occur as a result of noise and vibration associated with pile driving.

Proposed construction activities have negligible potential to affect the existing floodplain at entry points into and out of the Project area and along the upper bank during the conduct of Project activities. No sensitive riparian and riverbank areas are located within the proposed workspace, because this area has been maintained as a utility ROW since the 1960s. In addition, no new roads would be constructed, as a floodplain access road is available. Any disturbed areas along the riverbanks will be replanted with native grass seed and mulched to help offset the effects from machinery operation into and out of work areas. Vehicle and equipment use will occur mostly 30 feet above the top of bank. Equipment pads and mats will be used to minimize ground disturbance. Over the long-term, stream bank conditions would be maintained.

Construction vessels transported to the Project area represent potential vectors for the introduction of invasive aquatic species to the Pend Oreille River and Lake Pend Oreille. The introduction of invasive species to this system could lead to ecosystem changes that may have deleterious effects on bull trout and their habitat. However, introductions are avoidable and any harmful ecological impacts from introduced non-native aquatic plants and animals from Project activities can be mitigated. Conservation measures defined above would make it highly unlikely that Project activities would result in the introduction of invasive aquatic species into the Pend Oreille River and Lake Pend Oreille because construction vessels will be washed and inspected prior to arrival in the Project area. No effects related to the introduction of aquatic invasive species would be anticipated to occur under the proposed action.