Monitoring Report: SV-2020-11-26

Trans Mountain Expansion Project – Westridge Marine Terminal (WMT) Compliance Verification Activity (CVA) Report

Date	November 26, 2020	**Call start time:**	2:00 PM	**Call end time:**	3:35 PM
Format	Web-based conference call with Trans Mountain presenting photographs, documents and/or videos relevant to the expansion of the Westridge Marine Terminal.				
Fisheries and Oceans Canada (DFO) attendees	W.B. (A/ Senior Biologist) and K.J. (Biologist)				
Indigenous Advisory Monitoring Committee (IAMC) attendees	Musqueam Nation: R.K. (Environmental Analyst for Musqueam) IAMC – Monitoring Subcommittee: C.T. (IAMC representative – Burrard Inlet and Lower Fraser River, from Tsleil-Waututh Nation), R.C. (IAMC representative – Alberta First Nations) Note: R.C. joined late due to a conflict with another meeting				
Other attendees	Trans Mountain: K.M. (Regulatory Lead), L.B. (Field Regulatory Advisor), S.D. (Lead Environmental Inspector) and B.J. (Chief Environmental Inspector), T.A. (Construction Manager) and J.A. (Field Regulatory Advisor) Kwikwetlem First Nation (KFN): M.J. (Project IM)				

On-site contractor/equipment	**Role**
Trans Mountain Corporation (TMC)	Site Management
Kiewit Ledcor Trans Mountain Partnership (KLTP)	Prime construction contractor
JASCO Applied Sciences	Underwater noise monitoring during vibratory and impact pile driving.
Triton Environmental Consultants	Fish salvage in foreshore cells and arcs and marine mammal monitoring.
Keller	Deep soil mixing (DSM) and jet grouting works on the foreshore.
DB General	DB General drove Trestle Support 1, 2 and 3 piles and Mooring Dolphin (MD) piles via impact and vibratory pile driving. DB General to start vibratory pile driving piles for Loading Platform 3. TMC is using seal acoustic deterrent devices during impact pile driving as needed.
DB Patrick	DB Patrick is currently located offshore and installed concrete girders for Trestle Span 4.

IAMC Indigenous Monitor/IMSC Representative Questions and Comments

- Yesterday, during a joint DFO-IAMC CVA pre/debrief call, CT raised questions that are further discussed in the following sections of this report. CT's questions:
  - What is done when obstructions are encountered during pile driving?
  - How long will the turbidity curtain encompass the foreshore?

- CT shared her knowledge and concern regarding additional sediment being introduced into Burrard Inlet and how it may be redistributed. See following sections for further details.

- Yesterday, during a joint DFO-IAMC CVA pre/debrief call, RC raised questions that were further discussed in the following sections of this report. RC's questions:
  - How does TMC ensure gravel used for backfill is clean and free of contaminants?
  - Are there any mitigation measures to ensure sediment associated with the cured grout spoils are not being blown from the barge during transport to Mission?

- RC: Have any issues been raised by TMC's IM? Are there any issues or challenges they are seeing from a community stand point? Is there potential for setting up meetings between the IAMC IM's and company monitors (e.g., TMC's IM) to discuss issues or concerns?
    - MJ: No concerns or issues at this time.
    - BJ: I have not yet heard of coordinating meetings between IAMC IM's and company IMs.
    - KM: TMC may be able to facilitate meeting between TMC IMs and IAMC IM's, but will need to follow-up internally first and see what the next steps are.

- KJ relayed follow-up questions on behalf of IAMC IM (JL) who attended the previous site visit in October regarding TMC's teams involved in erosion and sediment control and the testing of a secondary bubble curtain. See below sections for more details.

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Summary of inspection discussions (use initials of participants)

Agenda Review

- Introductions
- Review scope of monthly compliance verification visits
    - WB: This call is in place of a typical in-person joint DFO-IMAC Indigenous Monitor CVA site visit given the current situation of the COVID-19 pandemic. A key part of this compliance monitoring is to verify conditions of the *Fisheries Act* Authorization for the WMT and also verifying general compliance with the *Fisheries Act*.
- Overview of current construction activities (via a slideshow presentation provided by TMC)
- Further Questions

Construction Update

SD showed a labelled schematic of the WMT construction site, including the foreshore and offshore. SD briefly described the construction works that have occurred since the October 29th compliance verification site visit.

- Foreshore:
    - Ongoing deep soil mixing and jet grouting works
- Nearshore/in-water:
    - Finished installing all sheet piles for foreshore cells and arcs
    - Backfilling in foreshore cells and behind arcs is in progress
- Offshore:
    - Impacted mooring dolphin piles
    - Installing rebar, formwork, girders, pre-cast deck panels and conducting top-deck concrete pours on Loading Platform 1/2
    - Installed girders and set pre-cast deck panels on Junction Platform 1
    - Impacted Trestle Supports 1 and 2 piles
    - DB general has set-up anchor to start vibratory pile driving works on Loading Platform 3

- WB: What percentage of piles remain to be impacted at the WMT?
    - TA: 75 of 162 pin piles have been driven so far (i.e., piles that have been vibrated and impacted to refusal).

<u>SD described specific works and mitigation measures in the foreshore/nearshore:</u>

- Completed installing foreshore sheet piles for Cell 11 and Arcs 4A, 5A and 10A via vibratory and impact pile driving. All sheet piles have now been installed for foreshore cells and arcs. Sheet-pile cells and arcs were driven below the mudline prior to fish salvage via vibratory pile driving.
    - WB asked for verification that fish and invertebrate salvage within the cells and behind the Arcs is now complete.
    - SD confirmed this was the case. TMC's subcontractor, Triton Environmental Consultants, completed the fish and invertebrate salvages last week, prior to commencing backfilling within the foreshore cells or behind the arcs.

- WB: Yesterday, during a joint DFO-IAMC CVA pre/debrief call, CT raised a question relevant to offshore pile installation: what is done when obstructions are encountered?
    - SD: If an obstruction is encountered along the foreshore while driving sheet piles, a clam-shell grab is used to dig the obstruction out of the way. This work is completed within the turbidity

curtain so that suspended sediment is not released outside the immediate work area and any material that is removed with the clam-shell grab is placed within the footprint of authorized work. During the previous in-person site visit a Trestle Support 1 pile was being driven and an obstruction was encountered.
    - TA: Before work commenced in the marine environment a geotechnical analysis was completed to position piles to avoid obstructions. In regards to the Trestle Support 1 pile observed during the October site visit, it was repositioned (approximately one metre away from original design drawings) to avoid the obstruction, on engineer approval.
    - CT: Asked for confirmation that all safety requirements are able to be maintained when relocating the pile to avoid the obstruction.
    - TA: Confirmed all safety and engineering requirements are still able to be met.

- SD explained that all sheet piles have been installed for Cell 11, which is the easternmost cell on the foreshore, and all works were completed on land.

- SD showed slides of backfilling and grading behind Arcs 4A and 5A. The aggregate will be consolidated to get rid of any voids and compact the material. The supersack wall will eventually be removed and the whole area behind the cells and arcs will be filled with aggregate.
    - KJ: Yesterday during the joint DFO-IAMC CVA pre/debrief call RC raised the question: How does TMC ensure gravel used for backfill is clean and free of contaminants?
    - SD: Lehigh Materials provides the aggregate from the Sechelt gravel pit and provides analytical information so that TMC can ensure it is free of any contaminants of concern. In order for the aggregate to compact, the backfill material does contain fine sediment. When cells are backfilled, turbidity is generated from suspension of the fine sediment. The turbidity curtain encompasses all foreshore cells to ensure fine sediment settles within it and is not introduced to the adjacent marine environment.

- WB: Yesterday during a joint DFO-IAMC CVA pre/debrief call CT raised a question: how long will the turbidity curtain encompass the foreshore?
    - SD: It will be in place until all ground improvement works (DSM and jet grouting) are completed in the foreshore cells and arcs (about a year away). Outfalls, where TMC discharges treated surface water runoff from the WMT site to the ocean, are also required to have a turbidity curtain that separates the discharged material from the marine environment in case turbidity levels of the discharge are elevated.

- CT noted that in general there is a lot of material (aggregate and sediment) being added to the foreshore and potentially to the marine environment. CT appreciates how the mitigation measures are in place and that the turbidity curtain acts as a barrier, but once the fine sediment settles and the turbidity curtain is removed, CT is concerned that the sediment may move and be redistributed throughout Burrard Inlet. CT said that mudflats on the north side of the inlet next to the Tsleil-Waututh Nation's (TWN) reserve have doubled in size since CT was young.
    - SD: The sheet-pile cells act as a barrier and mainly restrict sediment from entering the adjacent marine environment; however, they are not perfectly water-tight. As water percolates out of the cells or arcs during backfilling, very fine particles can seep out, generating the elevated turbidity. All gravel and sand-sized substrate are confined inside the cells or behind the arcs and do not enter the adjacent marine environment. The turbidity curtain acts as a secondary barrier. During backfilling TMC does test turbidity levels. Turbidity levels between 10-20 NTU's have been recorded, which is not high (SD noted that municipalities usually permit the discharge of water within 20-75 NTUs). The turbidity curtain allows the sediment to

settle and the sediment released through the sheet-pile cells is fairly small in volume. SD agreed that the Maple Wood flats next to the TWN's reserve is a depositional environment. SD noted that the area of the WMT terminal is known to be in a state of dynamic-equilibrium (similar amounts of sediment are being eroded and deposited, without a net change). Offsetting for this project will involve the construction of a rock-reef habitat built next to the foreshore cells.
    - TA: Transport of sediment was an initial concern of TM's Indigenous Monitor MJ.
    - CT: I appreciate the update, mitigations measures, and offsets being implemented. TWN was not in agreement with the offset proposed. TWN still has concerns and the cumulative effects of developments really add up.

- WB: During the process of backfilling the cells or arcs, are there any measures in place to protect the gravel pile from wind to ensure fine sediment is not being blown from the pile to the surrounding marine environment?
- KJ: In addition to WB's question, during the CVA debrief/pre call RC asked if there are any mitigation measures to ensure sediment associated with the cured grout spoils are not being blown from the barge during transport to Mission.
    - SD: When backfilling cells, a barge has aggregate (gravel and some fine sediment) piled on it. The aggregate is loaded into a hopper and then the conveyor directs the aggregate into the cell or behind the arc. There has been no spillage during this process. Cured grout spoils from the foreshore are loaded and piled onto a barge for offsite disposal. As cured grout can generate a higher pH if it enters the marine environment, a thick plastic material has been fitted under part of the conveyor that extends over the marine environment to ensure there is no spillage. On the barge, lock-blocks on either end are caulked with spray foam to ensure the barge deck is water-tight. This is inspected on a regular basis to ensure no contact water is escaping from the barge.
    - WB: Are there any mitigations measures in place to prevent wind from transporting fine sediment or particulate matter from the conveyor belt or barge during offsite transport?
    - SD: The grout spoils are quite cohesive and heavy once they are on the barge and they stay put. The spoils are monitored during loading and since there is no fine sediment, TMC has not yet flagged that as a concern. SD further noted that it was steam from the heat of the grout spoils that was visible in the photographs (which looked as though it could have been sediment fines).
    - TA: TMC limits elevation for how high the spoils and aggregate can be piled to minimize any potential for transport of material associated with wind.

- SD explained that the two main ongoing works on the foreshore include DSM and jet grouting (ground improvement works). During DSM a large drill rig with a blade drills down into the soil and as it comes up, it injects grout. Once the grout hardens it forms structural columns in the ground. The columns harden within 24 hours. Excess grout spoils are transported to the curing pits to harden prior to being loaded onto the barge for offsite disposal.
- During jet grouting, grout is injected at pressure in a pre-drilled hole. Excess grout forced to the surface is transported to the curing pit. Sheet-pile cells adjacent to the marine environment are kept about 4 feet high and any water that accumulates in these work areas is pumped to a foreshore water treatment plant to prevent any grout or grout contact water from entering the ocean.
    - KJ: Asked for an update in regards to any tests completed on the jet grouting 'test pit' located in foreshore cell 8.
    - TA: The initial tests have been completed. TMC did not see any grout come through the sheets; however, the sheets were moving due to the pressure of jet grouting. TMC will be

completing further tests with a low pressure grout rig for areas with sheet-pile cells adjacent to the marine environment. With the approval of engineering, TMC has been able to reduce the amount of jet grout columns required along the outer foreshore sheet-pile cell wall.
    - SD: DSM columns completed 4 feet away from the sheet-pile cells has only resulted in one issue when there was any interlocking problem with two sheet piles.

- SD showed picture of the THOR conveyor loading the cured grout spoils onto the barge from the foreshore. The light colouration in the photo that looks like dust is actually steam generated from the difference in temperature between the warm grout spoils and cooler surrounding air temperature. The thick plastic sheet is positioned so that any material that falls off the conveyor belt will slide back onto the foreshore.
    - KJ: Have there been any problems with cured grout spoils entering the marine environment?
    - SD: Previously TMC was using a tarp with the same structural supports under the conveyor. Grout spillage collected on the tarp and the weight caused the tarp to bend downwards and release approximately an eighth of a cubic meter of grout into the ocean. TMC measured turbidity and pH at the waters surface and at depth and did not detect any changes from background measurements, potentially because the grout spoils were cured. TMC believes there may have been an initial spike in pH, but when tested, no change was detected. TMC temporarily stopped offsite disposal via barge until the tarp was replaced with a high density polyethylene sheet. TMC also completes regular inspections and cleaning of materials that accumulate on the.

<u>SD described specific works and mitigation measures in the offshore:</u>

- Girders on Junction platform 1 now extend out to Trestle Support 6, which will ultimately extend to berth number 3.
- Girders have been installed for the trestle going out from Junction Platform 1 to Loading Platform 1/2.
- 3 of 4 concrete top-deck pours have been completed on Loading Platform 1/2.
- MD piles 1, 2, 3, and 4 have been driven and a dolphin jacket has been set on MD2.

- KJ: What have the noise levels been recorded at during impacting?
    - SD: During impacting of Trestle Support piles, variable low noise levels below 200 dB re 1µPa have been recorded. During impacting on the MD piles, higher noise levels have been recorded. These piles are larger in diameter have been sitting for a while (i.e., sediment has built up around them). No noise exceedances were reported.

- SD showed a slide with the DB Patrick barge installing girders for Trestle 4 (pre-cast deck panels on top, formwork, and concrete pours on top)
- SD showed slide of the DB General barge impact pile driving Trestle support pile 2A. The bubble curtain was visibly working in the slide. The DB General has completed driving Trestle Support 1 and 2 via impact and vibratory pile driving.

- Marine mammal monitoring is conducted by TMC's subcontractor, Triton Environmental Consultants, prior to and during impact pile driving.

- SD showed a slide of the bubble curtain manifold. TMC monitors pressure and the flow gauge during impact pile driving to verify that the right amount of air is getting to each bubble ring.

- SD showed a slide of a California seal lion (nicknamed “Eeyore”) on the marine construction boom. The sea lion has been intermittently present on site during the past month.
    - KJ: Asked if the ‘seal stops’ have been delivered and installed to discourage pinnipeds from resting on the floats of the marine construction safety boom.
    - SD: TMC has received all of them and is figuring out how best to attach them to the steel rails of the marine construction safety boom. They will be installed soon.

- SD explained that no marine mammals have been sighted in the past month other than the California sea lion and harbour seals. SD noted that “Eeyore” is branded with a mark “C16”, and that there was a branding program that occurred by the mouth of the Columbia River.

Further Questions/Comments

- KJ: Have there been any work stoppages associated with marine mammal observations?
    - SD: Work stoppages have been due to harbour seals and the California sea lion.

- KJ: Relayed follow-up questions on behalf of IAMC IM (JL) who attended the previous site visit in October.
    - Have the test results regarding the secondary bubble curtain been analyzed by JASCO yet and will these results be shared with the IAMC and DFO?
    - SD: TMC has received the draft report from JASCO on the secondary bubble curtain test today. TMC will review soon and finalized the report soon.
    - When on-site last month, SD mentioned a team of people who are involved in erosion and sediment control (ESC) measures. Are you able to elaborate on what this team does?
    - SD: The TMC team includes SD, MJ and another Environmental Inspector. This team monitors all ESC measures, identifies deficiencies and makes recommendations for improvements. KLTP has an environmental team and completes similar tasks as the TMC team. A third ESC team includes a super intendent, a foreman and labourers who implement, maintain and adjust ESC measures.

- Discussion of timing for next site visit:
    - WB: Can TM provide an update of their construction schedule for end of December? DFO is hoping to conduct an in-person compliance monitoring site visit in early January 2021.
    - KM: TMC will have a week break over Christmas (starting December 22 or 23). Construction activities will recommence after January 4.

GENERAL AND MISCELLANEOUS MITIGATION MEASURES

Measures specified within the Westridge Marine Terminal Fisheries Act Authorization Conditions:

Schedule							
2.2.6 All nearshore in-water Project construction activities (within a 50-m horizontal distance seaward of the higher high water large tide level) at the Westridge Marine Terminal shall only be carried out during a work timing window from August 16 to March 15 each year.							
Discussed/ observed:	☒ Yes ☐ No	Issue(s) identified:	☐ Yes ☒ No	Issue(s) unresolved:	☐ Yes ☐ No	Not applicable ☐	
Comments							
Nearshore works were taking place within the work timing window.							
Action Items							
None.							
Monitoring							
3.1 A qualified environmental professional must be on-site during the carrying on of in-water works, undertakings and activities, and shall monitor the works, undertakings or activities on a systematic and on-going basis to ensure that standards and avoidance measures to avoid impacts to fish and fish habitat are effective, and that unauthorized impacts to fish and fish habitat are avoided.							
Discussed/ observed:	☒ Yes ☐ No	Issue(s) identified:	☐ Yes ☒ No	Issue(s) unresolved:	☐ Yes ☐ No	Not applicable ☐	
Comments							
The Lead Environmental Inspector spoke throughout the meeting about their experiences at the WMT during construction since the last compliance verification site visit on October 29th. Qualified environmental professionals are conducting monitoring of construction activities at the WMT.							
Action Items							
None.							
Marine Mammal Observations							
2.2.7 In-water construction activities must cease if any marine mammal is observed adjacent to or within the project area such that there is risk of direct physical harm to the marine mammal. Construction activities may only resume once the marine mammal has been confirmed to have left the immediate area or has not been sighted for 30 minutes.							
Discussed/ observed:	☒ Yes ☐ No	Issue(s) identified:	☐ Yes ☒ No	Issue(s) unresolved:	☐ Yes ☐ No	Not applicable ☐	
Comments							
Trans Mountain noted that there had been delays to pile driving recently due to the presence of one or more harbour seals in the seal-specific 150 m exclusion zone prior to the commencement of pile driving. Work stoppage of impact pile driving was also due to the presence of a California sea lion within the marine mammal 1 km exclusion zone. The sea lion has been using the marine construction safety boom at the WMT as a haul-out site intermittently over the past couple of months. Impact pile driving was only conducted when the sea lion was located out of the water on the marine construction safety boom. A marine mammal monitor was required to continuously watch the sea lion to ensure works could be stopped if it looked like it was about to enter the water during impact pile driving.							
Action Items							

None.

Temporary Structures and Decommissioning of Existing Structures

The application for a *Fisheries Act* authorization states that a floating debris boom will be secured around the work area to collect drifting debris during demolition of the existing utility dock (page 3.1).

Discussed:	☐ Yes ☒ No	Issue(s) identified:	☐ Yes ☐ No	Issue(s) unresolved:	☐ Yes ☐ No	Not applicable ☒	

2.2.5 Temporary structures installed below the high-water mark shall be decommissioned and removed when they are no longer being used for construction purposes.

Discussed/ observed:	☐ Yes ☒ No	Issue(s) identified:	☐ Yes ☐ No	Issue(s) unresolved:	☐ Yes ☐ No	Not applicable ☒	

Comments

No structures are currently being decommissioned.

Action Items

None.

Pump Intake Screening

2.2.2 Water intakes of any pumps shall be designed and screened in accordance with specifications outlined in the Addendum, Fisheries and Oceans Canada's *Freshwater Intake End-of-Pipe Fish Screen Guidelines* (Fisheries and Oceans Canada 1995), and Fisheries and Oceans Canada's *Guidelines for Minimizing Entrainment and Impingement of Aquatic Organisms at Marine Intakes in British Columbia* (Fisheries and Oceans Canada 1991).

Discussed/ observed:	☐ Yes ☒ No	Issue(s) identified:	☐ Yes ☐ No	Issue(s) unresolved:	☐ Yes ☐ No	Not applicable ☒	

Comments

Screens for known water intakes have been discussed during previous site inspections. No issues were reported.

Action Items

None.

Fish Salvage

2.2.3 Fish salvage and relocation shall be conducted, as appropriate, prior to the start of construction activities so as to avoid and minimize adverse impacts to fish.

Discussed/ observed:	☒ Yes ☐ No	Issue(s) identified:	☐ Yes ☒ No	Issue(s) unresolved:	☐ Yes ☐ No	Not applicable ☐	

Comments

All fish salvages within the foreshore cells and arcs is now complete. Minnow and crab traps were used during the salvages. Perch, English sole, gunnel fish, sculpin, juvenile Dungeness crabs, red rock crabs and other species were salvaged most recently, and were subsequently transported to Barnet Marine Park for release. No issues were reported.

Action Items

None.

Integrity of Habitat Offsets

4.7 The Proponent shall not carry on any works, undertakings or activities that will adversely disturb or impact the offsetting measures.

Discussed/ observed:	☐ Yes ☒ No	Issue(s) identified:	☐ Yes ☐ No	Issue(s) unresolved:	☐ Yes ☐ No	Not applicable ☒	

Comments

Offsetting measures have yet to be installed.

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Action Items
None.

MITIGATION MEASURES SPECIFIC TO PILE DRIVING

Measures specified within the Westridge Marine Terminal Fisheries Act Authorization Conditions:

Underwater Sound Pressure Level Reduction			
2.2.8 A vibratory hammer will be used for pile driving where practical and feasible, and all in-water pile driving activities will be monitored via hydrophone to ensure underwater peak pressures do not result in adverse impacts to fish.			
Discussed/ observed: ☒ Yes ☐ No	Issue(s) identified: ☐ Yes ☒ No	Issue(s) unresolved: ☐ Yes ☐ No	Not applicable ☐
2.2.9.1 To avoid death of fish, mitigation measures (e.g., bubble curtain around the full wetted length of the pile, fish exclusion, etc.) must be implemented.			
Discussed/ observed: ☒ Yes ☐ No	Issue(s) identified: ☐ Yes ☒ No	Issue(s) unresolved: ☐ Yes ☐ No	Not applicable ☐
Comments			
Vibratory and impact pile driving occurred on Trestle Support piles and Mooring Dolphin since the last in-person site inspection. Hydrophones are being used to monitor and record underwater noise produced from all pile driving activities. No impact pile driving was occurring at the time of the site inspection. TMC reviewed how they ensure each ring on the bubble curtain is working while in use during impact pile driving.			
Action Items			
None.			
Underwater Sound Pressure Level Monitoring			
2.2.9.2 Monitoring via underwater noise recordings must be conducted continuously and within 10 meters of the pile being driven to verify that underwater sounds do not exceed the 30 kPa (209.5 dB re: 1 µPa) threshold for injury to finfish.			
Discussed/ observed: ☒ Yes ☐ No	Issue(s) identified: ☐ Yes ☒ No	Issue(s) unresolved: ☐ Yes ☐ No	Not applicable ☐
2.2.9.3. Outside of the least risk window for Burrard Inlet (August 16 – February 28), a more conservative underwater sound threshold of 22.5 kPa (207 dB re: 1 µPa) will be adhered to, and monitored, to prevent injury to finfish. If sound levels exceed this threshold, or a fish kill is observed despite mitigation measures being in place, pile driving activities are to cease immediately and mitigation methods are to be reviewed and modified in consultation with DFO.			
Discussed/ observed: ☐ Yes ☒ No	Issue(s) identified: ☐ Yes ☐ No	Issue(s) unresolved: ☐ Yes ☐ No	Not applicable ☒
2.2.9.4 If underwater noise recordings indicate that sound levels are likely to exceed the applicable threshold defined in conditions 2.2.9.2 or 2.2.9.3, the Proponent will take appropriate action with the goal of preventing the exceedance from occurring. These actions may include adjusting the force of the hammer, adjusting the mitigation measures already in place to increase their effectiveness, or implementing additional mitigation measures.			
Discussed/ observed: ☒ Yes ☐ No	Issue(s) identified: ☐ Yes ☒ No	Issue(s) unresolved: ☐ Yes ☐ No	Not applicable ☐

2.2.9.5 Upon commencement of pile driving, or recommencement after a delay of 30 minutes or more, pile installation shall ramp-up by starting with less frequent impact strikes of lower force. This ramp-up period is designed to enable any fish that may be in the area time to leave the area prior to the generation of peak pressure and noise levels for pile installation.			
Discussed/ observed: ☒ Yes ☐ No	Issue(s) identified: ☐ Yes ☒ No	Issue(s) unresolved: ☐ Yes ☐ No	Not applicable ☐
Comments			
TMC stated that during impacting of Trestle Support piles, variable low noise levels below 200 dB re: 1µPa at 10 m from the pile were recorded. During impacting on Mooring Dolphin piles, higher noise levels were recorded. The highest sound pressure level recorded during impacting was 209.1 dB re 1µPa. This did not exceed the applicable threshold during the least risk window, but TMC followed their standard operating procedures and halted pile driving. Afterwards, TMC was able to resume with lower energy on the hammer. No noise exceedances were reported.			
Action Items			
None.			
Marine Mammal Monitoring			
2.2.9.6 Prior to commencement of pile driving, or recommencement after a delay of 30 minutes or more, visual monitoring must be conducted to determine if marine mammals are present within an exclusion zone of 1 km (except for harbor seals, which will have an exclusion zone of 150 m).			
Discussed/ observed: ☒ Yes ☐ No	Issue(s) identified: ☐ Yes ☒ No	Issue(s) unresolved: ☐ Yes ☐ No	Not applicable ☐
2.2.9.7 Work may only commence if marine mammals and harbor seals are not observed in their respective exclusion zones for 30 minutes.			
Discussed/ observed: ☒ Yes ☐ No	Issue(s) identified: ☐ Yes ☒ No	Issue(s) unresolved: ☐ Yes ☐ No	Not applicable ☐
2.2.9.8 Exclusion zones must be monitored continuously during impact pile driving. If a marine mammal or marine mammals are observed within their respective exclusion zone, pile driving activities must cease until all marine mammals leave their respective exclusion zone or they have not been sighted for 30 minutes within their respective exclusion zone.			
Discussed/ observed: ☒ Yes ☐ No	Issue(s) identified: ☐ Yes ☒ No	Issue(s) unresolved: ☐ Yes ☐ No	Not applicable ☐
2.2.9.9 If underwater noise recordings reveal that the threshold of 160 dB is exceeded at the 1 km exclusion zone boundary, the exclusion zone radius must be widened to a new outer limit, where sound recordings demonstrate that the 160 dB threshold is not exceeded. Conditions 2.2.9.6 to 2.2.9.8 will need to be complied with within this new exclusion zone.			
Discussed/ observed: ☒ Yes ☐ No	Issue(s) identified: ☐ Yes ☒ No	Issue(s) unresolved: ☐ Yes ☐ No	Not applicable ☐
2.2.9.10 Pile driving may only be carried out during daylight hours to enable effective visual monitoring of marine mammal exclusion zones.			
Discussed/ observed: ☒ Yes ☐ No	Issue(s) identified: ☐ Yes ☒ No	Issue(s) unresolved: ☐ Yes ☐ No	Not applicable ☐
Comments			
The observed presence of harbour seals within the harbour seal-specific 150 m exclusion zone prior to and during impact pile driving has resulted in multiple work stoppages. TMC is using four seal acoustic deterrents within the 150 m seal-specific exclusion zone as a mitigation measure to avoid adverse impacts (e.g., auditory injury) to 'fish' (which includes marine mammals such as seal) during impact pile driving (Condition 2.2.8 of the *Fisheries Act* Authorization). Since completing the Seal Deterrent Sound Source			

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Characterization Study Report produced by JASCO, TM is now monitoring a larger marine mammal exclusion zone (expanded from 1,400 m to 1,700 m) prior to and during the deployment of 4 seal acoustic deterrent devices. Recent work stoppages to impact pile driving were also due to the presence of a California sea lion within the marine mammal exclusion zone. The sea lion has been using the marine construction safety boom at the WMT as a haul-out site intermittently for the past couple months. Impact pile driving was only conducted when the sea lion was located out of the water on the marine construction safety boom, and not exposed to underwater noise. A marine mammal monitor was required to continuously watch the sea lion to ensure works could be stopped if it looked like the animal was about to enter the water during impact pile driving. The sea lion had not been spotted within the past week.
Action Items
None.

Measures specified within the Westridge Marine Terminal Environmental Protection Plan:

Fish Salvage						
35. Immediately following the installation of each sheet pile cell, and prior to excavation and infilling of that cell, conduct a salvage of commercial, recreational and Aboriginal (CRA) fishery species via crab and fish trapping/netting and seines (where appropriate). Release captured CRA fishery species in a suitable habitat at least 500 m away from marine construction activities.						
Discussed/ observed:	☒ Yes ☐ No	Issue(s) identified:	☐ Yes ☒ No	Issue(s) unresolved:	☐ Yes ☐ No	Not applicable ☐
Comments						
All fish salvages within the foreshore cells and arcs are now complete. Minnow and crab traps were used during the salvages. Perch, English sole, gunnel fish, sculpin, juvenile Dungeness crabs, red rock crabs and other species were salvaged most recently, and were subsequently transported to Barnet Marine Park for release. No issues were reported.						
Action Items						
None.						

Turbidity Monitoring						
43. Should visual monitoring during in-water pile installation indicate concern regarding turbidity levels, the Environmental Inspector will arrange for in situ sampling of turbidity (nephelometric turbidity units). Should turbidity levels exceed specified thresholds, pile driving will temporarily be halted.						
Discussed/ observed:	☒ Yes ☐ No	Issue(s) identified:	☐ Yes ☒ No	Issue(s) unresolved:	☐ Yes ☐ No	Not applicable ☐
Comments						
No water quality issues were reported during in-water pile installation. Turbidity curtains are in place and water quality monitoring has recorded no exceedance in water quality guidelines for turbidity outside of the turbidity curtain.						
Action Items						
None.						

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MITIGATION MEASURES SPECIFIC TO FORESHORE CONSTRUCTION

Riparian Planting and Material Handling			
Westridge Marine Terminal Fisheries Act Authorization Conditions			
2.2.4 Disturbed riparian areas shall be replanted as appropriate, with native non-invasive species of vegetation.			
Discussed/ observed: ☐ Yes ☒ No	Issue(s) identified: ☐ Yes ☐ No	Issue(s) unresolved: ☐ Yes ☐ No	Not applicable ☒
Westridge Marine Terminal Environmental Protection Plan Commitments			
30. Unless otherwise approved by DFO, retain all excavated [marine] material and dispose at a land-based facility in accordance with applicable regulations.			
Discussed/ observed: ☐ Yes ☒ No	Issue(s) identified: ☐ Yes ☐ No	Issue(s) unresolved: ☐ Yes ☐ No	Not applicable ☒
Comments			
Not applicable.			
Action Items			
None.			

Water Quality Maintenance and Monitoring			
Westridge Marine Terminal Fisheries Act Authorization Conditions			
2.2.1 Effective sediment and erosion control measures (e.g., a turbidity curtain, etc.) shall be implemented before starting construction and shall be maintained during construction activities, as appropriate, to avoid the deposit and dispersion of sediment into the marine environment.			
Discussed/ observed: ☒ Yes ☐ No	Issue(s) identified: ☐ Yes ☒ No	Issue(s) unresolved: ☐ Yes ☐ No	Not applicable ☐
2.2.10 A turbidity curtain must be used to isolate the work area during the excavation of riprap in order to contain marine sediment suspended in the water column and limit the extent of sediment dispersion. During severe weather conditions that may reduce the effectiveness of, or impede the visual monitoring of, the turbidity curtain (e.g., > 70 km/h winds, or dense fog), works, undertakings or activities that may increase suspended sediment concentrations within the turbidity curtain or adversely affect the integrity of the turbidity curtain, must be suspended.			
Discussed/ observed: ☐ Yes ☒ No	Issue(s) identified: ☐ Yes ☐ No	Issue(s) unresolved: ☐ Yes ☐ No	Not applicable ☒
Westridge Marine Terminal Environmental Protection Plan Commitments			
29. During in-water excavation or rip rap, conduct water quality monitoring (WQM) as per the Water Quality Management Plan during Rip Rap Removal (Appendix H of this EPP). Conduct WQM to assess the effectiveness of the turbidity curtain and modify turbidity curtain deployment, if required.			
Discussed/ observed: ☐ Yes ☒ No	Issue(s) identified: ☐ Yes ☐ No	Issue(s) unresolved: ☐ Yes ☐ No	Not applicable ☒
Westridge Marine Terminal Sediment and Erosion Control Plan Commitments			
The in-water sediment curtain will remain intact during Foreshore construction activities to ensure sediment laden water is not discharged into Burrard inlet.			
Discussed/ observed: ☒ Yes ☐ No	Issue(s) identified: ☐ Yes ☒ No	Issue(s) unresolved: ☐ Yes ☐ No	Not applicable ☐
Comments			

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A turbidity curtain remains in place around the sheet-pile cells and attaches to the foreshore. Visual monitoring indicated that the turbidity curtain was working to effectively separate the more turbid water generated from foreshore construction activities from the adjacent marine environment. During backfilling in foreshore Cells and behind Arcs, TMC conducts water sampling inside and outside the turbidity curtain. Other turbidity curtains are in place around water outfalls that drain water from residential storm grates and treated surface wastewater from the WMT.
Action Items
None.

Additional comments or action items
None.