



## DFO Best Management Practices for Pile Driving and Related Operations

This document is intended to provide guidance to industry contractors and their clients regarding the protection of fish and fish habitat during pile driving operations in the South Coast Area. The notification form attached to this document must be submitted to the Central Nanaimo office (250-756-7325) no less than 5 working days prior to the commencement of any pile driving works.

Most types of pile driving will result in a level of underwater noise that will at least cause changes to fish behavior. While extensive data on pile driving impacts is not yet available, it is apparent that driving of steel pipe piles with large, high energy hammers can produce underwater sound levels capable of killing fish. Sublethal injuries may also occur, resulting in reduced survival or delayed mortality. Even when sound levels are not high enough to kill or injure fish, the underwater noise caused by pile driving may cause behavioral changes such as avoidance of preferred habitat, changes to migration, reduced feeding, or reduced schooling that in turn can result in increased predation. Although beyond the scope of this BMP, underwater noise may also impact other aquatic organisms such as invertebrates, diving birds, and marine mammals.

The *Fisheries Act* prohibits the harmful alteration, disruption or destruction of fish habitat (Section 35) and the destruction of fish (i.e., killing of fish) by means other than fishing (Section 32). Without implementation of appropriate mitigation measures, certain pile driving activities can harm fish habitat and kill fish. It is the responsibility of the proponent and contractors to ensure that appropriate mitigation measures are employed and that their project does not contravene the *Fisheries Act*.

### **Standard BMP's applicable to all pile driving works/undertakings within the marine environment**

1. Project proponents and their contractors must ensure that the pile driving project does not adversely affect fish habitat. For example, where the pile driving project is intended to provide support for proposed docks/floats, an assessment of the marine environment that is located underneath these structures must be undertaken. Projects that include docks or floats may result in adverse shading impacts on marine fish habitat if they are poorly located over eelgrass or other marine vegetation.
2. With respect to existing piles that are redundant and have been treated with creosote or other preservatives or coatings, every effort must be made to extract the entire length of the pile from the ground or seabed. Methods such as pile vibrating, jetting or other appropriate technique must be utilized to remove the pile intact. Where it is not technically feasible to remove the pile intact or where the pile has broken off, every effort must be made to remove the stub in a way that is consistent with safety and the conservation of fish and fish habitat. All debris from pile removal must be disposed of at an appropriate upland disposal site in accordance with all applicable legislation, guidelines and BMP's.
3. New timber piles will comply with the DFO document "Guidelines to Protect Fish and Fish Habitat from Treated Wood Used in Aquatic Environments in the Pacific Region" (<http://www.dfo-mpo.gc.ca/Library/245973.pdf>).
4. Re-used pilings will not normally be subject to any additional treatments. However, pilings with excessive creosote must be avoided. Freshly treated creosote pilings must stand (weather) in an appropriate upland storage area for a minimum period of 45 days prior to installation. Piles with creosote may not be an appropriate for use in some areas or situations. DFO may require the use of concrete or steel piles in sensitive areas, or may require that creosote piles be covered or wrapped to provide a barrier between the creosote and non-target organisms that attach to the pile (i.e. herring spawn).
5. Creosote timber piles must be protected with rub strips wherever contact with docks or vessels is expected.
6. Contractors must position their vessels and water borne equipment associated with pile driving activities in a manner that will prevent damage to fish habitat (e.g. eelgrass, kelp beds, shellfish beds, salt marshes, etc.). In the event that fish habitat is damaged, the incident must be reported to DFO and appropriate remedial actions should be taken under the direction of DFO.
7. When cleaning out pipe piles (i.e., air lifting), sediment contained in the pipe will be pumped to the surface and processed through an approved containment system and disposed of at an approved landfill site.
8. Pipe piles must be capped or otherwise treated to prevent birds from being trapped inside the piles.
9. All equipment will be maintained in good proper running order to prevent leaking or spilling of potentially hazardous or toxic products. This includes, but is not limited to, hydraulic fluid, diesel, gasoline and other petroleum products.



10. All hydrocarbon products (fuel, oil, hydraulic fuel, lubricants), fueling equipment, and deleterious substances must be stored and handled in accordance with all applicable legislation, guidelines and BMP's. An appropriate spill prevention, containment and cleanup contingency plan for hydrocarbon products and any other deleterious substances that may be used or transported to the project site, must be in place prior to work commencing on the project to ensure that spills are contained and prevented from entering the marine environment.
11. Contractors will have emergency spill equipment available whenever working near or on the water. The emergency spill equipment should be appropriate for the specific operation (e.g., pouring concrete, refueling, etc.) and environmental conditions (e.g., marine, riverine, etc.) and equipment operators should be trained in their deployment and use.
12. All work areas must be adequately contained to prevent the release of demolition and construction debris and materials and any deleterious substances to the marine environment. All construction/demolition debris must be contained, collected and disposed of in an appropriate upland facility in accordance with existing legislation, guidelines and best management practices. Demolition operations should be monitored to determine whether the works are resulting in any adverse effects on fish or fish habitat. Any adverse effects should be reported to DFO.
13. Uncured concrete, cement, mortars and other Portland cement or lime-containing construction materials are considered deleterious substances. The proponent and all contractors must ensure that all work involving the use of concrete, cement, mortars, and other Portland cement or lime-containing construction materials must be conducted so as to ensure that sediments, debris, concrete, and concrete fines are not deposited, either directly or indirectly into any aquatic environment (e.g. any ditch, watercourse, wetland, ravine, storm sewer system, or the sea, including foreshore). Any water contacting uncured or partly cured concrete or Portland cement or lime-containing construction materials, such as the water that may be used for exposed aggregate wash-off, wet curing, equipment washing, etc., must be prevented from entering, directly or indirectly into a watercourse or a storm collection system, unless this water has been tested (to an accuracy of within +/- 0.2 pH units) and found to have a pH of between 6.5 and 9.0 pH units and a turbidity of less than 25 nephelometric turbidity units (NTU). The proponent and all contractors must ensure that suitable containment and treatment facilities are provided at the project site for the wash-down water from concrete delivery trucks, concrete pumping equipment, concrete mixing equipment, and other tools and equipment as required.
14. Wherever concrete work is proposed in or near aquatic areas, the work must be monitored by a qualified environmental consultant to ensure that all applicable BMP's are followed and the habitat provisions of the *Fisheries Act* are upheld.
15. If concrete is being placed with a concrete pump, all hose and pipe connections must be sealed and locked properly to ensure the lines will not leak or uncouple. Contractors/crews must ensure that concrete forms are not filled to overflowing.
16. All concrete forms will be constructed in a manner that will prevent fresh concrete or cement-laden water from leaking into the surrounding water.
17. All work must be undertaken and completed in such a manner as to prevent the discharge or introduction, either direct or indirect, of soils, sediment or sediment-laden water, turbid water or any other deleterious substances into the marine environment.
18. Without restricting the generality of the foregoing paragraph, with respect to the discharge or introduction of sediment, sediment-laden water, and turbid water into the marine environment, the following criteria must be complied with:

Total Suspended Solids (TSS):

- TSS should not exceed 25 mg/L

Turbidity:

Turbidity should not exceed 2 nephelometric units (NTU) when background is less than 8 NTU.

- Turbidity should not exceed 8 NTU when background is between 8 and 80 NTU.
- Turbidity should not exceed background by more than 10% when background is greater than or equal to 80 NTU.
- "Background" is defined as the level at an appropriate adjacent reference site, that is satisfactory to DFO, and is affected neither by works or activities associated with the project or the works site, nor by sediment-laden water,



- induced suspended sediments, or induced turbidity resulting from works or activities associated with the project or the work site.
- Should the project result in TSS or NTU levels in excess of the criteria outlined above, then those works and activities that might be contributing to these conditions must be halted until measures that will ensure compliance with the criteria outlined above are put in place.
- Where the suspended solids and turbidity criteria outlined above cannot be practicably achieved, work areas and those works and activities that might be contributing to these conditions must be contained and isolated from tidal and flowing waters such that fish are prevented from accessing the work areas, and sediments, sediment-laden water, and turbid water are contained and prevented from leaving the work areas.

### Timing Windows

Timing windows are a very effective BMP with respect to mitigating possible adverse effects on fish. Timing windows are intended to ensure that a project is scheduled during periods of reduced marine sensitivity. Although fish are always present in most BC waters, there are certain periods when nearshore areas are heavily utilized by fish. For example, herring move into shallow coastal areas to spawn in late winter or early spring, and high numbers of juvenile salmon migrate along coastal shorelines in the spring and early summer. Where works are proposed close to a river mouth or estuary, project proponents/contractors should also consider the timing of adult salmon migration to ensure conflicts are avoided. Site specific timing windows may be required if a project is proposed near an estuary or mouth of a fish stream.

19. The preferred timing window (time of reduced sensitivity) for pile driving activities is from July 1st to February 15th. Further restrictions may apply during the fall and winter if the project has the potential to effect adult salmon migration.

### Special BMP's for pile driving projects that may create high underwater sound

Some types of pile driving are expected to result in sound levels that require special mitigation. For example, installation of steel piles by means of a drop, diesel, or air hammer are expected to produce high sound pressure levels capable of injuring or killing fish. Accordingly, project proponents and their contractors/consultants are responsible to ensure that pile driving associated with the project does not result in underwater noise or increases in underwater peak pressures that would adversely affect fish. Increase in underwater peak pressures in excess of 30 kilopascals (kPa) are likely to adversely effect fish.

20. Any proposed pile driving activity that may result in pressure effects of greater than 30 kPa (e.g. steel piles and power hammer) must incorporate mitigation measures specifically intended to prevent increases in underwater peak pressures in excess of 30 kPa anywhere greater than 1 metre from the pile being driven from adversely affecting fish. Mitigatory measures that might be appropriate include:
  - The use of smaller diameter pipe pile.
  - The use of a vibrating hammer or non-power drop hammer.
  - Scheduling the works outside of periods of heightened sensitivity with respect to fish (e.g., periods of juvenile salmon seaward migration, periods of adult salmon upstream migration to local watercourses; periods of herring spawning)
  - The deployment of netting, or "silt curtains" to isolate the work area and prevent fish from entering any area where the pile driving shock wave might exceed 30 kPa.
  - The deployment of a "bubble curtain" of sufficient design to surround the entire length of each pile being driven and attenuate shock waves radiating out from the pile so that overpressures outside the bubble curtain do not exceed 30 kPa.
21. To ensure that mitigation measures are effective, a hydrophone can be deployed to measure in-water pressure changes resulting from pile driving, monitor the effectiveness of mitigatory measures in use (e.g., isolation curtains, bubble curtains), and to determine the need for further mitigatory measures
22. The deployment of a hydrophone to measure in-water pressure changes resulting from pile driving. Hydrophone measurements should be carried out over the entire course of pile driving, particularly during driving to resistance or seating in bedrock. Hydrophone measurements should include depth profiles taken at a range of distances radiating out from the pile being driven. Each hydrophone depth profile should include measurements taken near the water surface, near the seabed, and at mid water column. The range of distances for hydrophone depth profiles should include a depth profile within 2 metres of



the pile. The continual monitoring of shock wave pressure during pile driving is necessary to monitor the effectiveness of mitigatory measures in use (e.g., isolation curtains, bubble curtains), and to determine the need for further mitigatory measures.

23. Any proposed pile driving activity that may result in pressure effects of greater than 30 kPa (e.g. steel piles and power hammer) must be monitored by an appropriately qualified professional who is familiar with pile driving activities (including the potential affects on fish and the measures required to mitigate these affects) to ensure that effective measures are applied to mitigate adverse affects to fish and that all activities are conducted in accordance with the Fisheries Act. Monitoring must utilize hydrophones operated by appropriately qualified professionals. Pressure levels should be recorded at a range of depths throughout the water column and at varying distances and directions from the driven pile. Monitoring should be carried out throughout the pile driving from beginning to end for various piles and soil conditions and particularly during periods of heavy pile driving or pile refusal.
24. The hydrophone monitoring may be discontinued if the experience with the first 4 or 5 piles shows that the particular pile installation method in use does not result in overpressure of 30 kiloPascals (kPa), when readings are taken 1 metre from the pile being driven, and there have not been any observations of distressed or injured fish. This would only be applicable in situations where future pile driving associated with the project will use the same equipment, methods, type of piles, size of piles and the substrate that the piles are being driven into has the same characteristics as the substrate the test piles were driven into.
25. All work must be suspended and further mitigation measures need to be employed to reduce the pressure wave (e.g. bubble curtain) if pile driving activities result in hydrophone readings in excess of 30 kPa, measured 1 metre or further from the pile being driven or should there be any sign of dead or injured fish within the work area. DFO must be consulted prior to proceeding with pile driving activities.
26. Where pile driving is to occur in intertidal or shallow subtidal areas, it should be conducted during times of low water.
27. Vibratory hammer must be used wherever feasible, particularly when driving steel piles.

#### **Project Monitoring:**

28. The project must be appropriately monitored for adverse effects on fish and fish habitat by an appropriately qualified environmental monitor (EM) provided by the project proponents at their own expense. In addition, the EM must ensure that contractors/workers understand the conditions in this BMP document. The EM must have experience and knowledge in local marine biology, pile driving techniques and methods to mitigation any adverse impacts to fish and fish habitat.
29. Project proponents must empower the EM in writing to suspend works that may be harmful to fish or fish habitat, or to direct work so that it is compliant with the Fisheries Act and all other applicable legislation, guidelines and BMP's including this document.
30. The EM must be on site at all times during the course of the project whenever there is the potential for adverse effects or fish or fish habitat.
31. Upon completion of the project, the EM must provide DFO with a monitoring report summarizing the project and describing any environmental issues that arose during the project. Monitoring results should be forwarded to the appropriate contact at DFO's Oceans, Habitat and Enhancement Branch.
32. The monitoring reports should include:
  - Location of the works.
  - Contact information for the owner, contractor and monitor.
  - Documentation of any adverse effects on water quality (including suspended sediment, turbidity, pH, hydrocarbons etc) or other fish habitat impacts.
  - Suspended sediment, turbidity, pH, and hydrophone readings.
  - Distance the reading was taken from the pile or mitigation measure.
  - Depth the reading was taken.
  - Description of any pile driving activity that resulted in hydrophone readings in excess of 30 kPa.



- Description of mitigation measures applied.
- Documentation of any observations of distressed, injured or killed fish.
- Photographs.

33. If contractors are working and a herring (or other fish) spawning occurs or if they become aware of any negative impacts to fish or fish habitat, the work will be suspended until the appropriate DFO contact has been notified and has provided direction.

**Prior to the commencement of any pile driving activity it is requested that, the proponent with advice from a Qualified Environmental Professional submit DFOs Project Notification and Review Application Form found at the website <http://www.pac.dfo-mpo.gc.ca/habitat/index-eng.htm> to [referralsnanaimo@dfo-mpo.gc.ca](mailto:referralsnanaimo@dfo-mpo.gc.ca). The proponent must indicate either “Notification to DFO”, “Request a Project Review” or “Request a Fisheries Act Authorization” by way of submission of this form. If project proponents, QEP or consultants have indicated “Notification to DFO”, this indicates that they understand the conditions of this BMP document and agree to comply with all conditions. DFO does not formally respond to Notifications. Notifications are subject to monitoring and auditing by DFO.**

*The conditions of this BMP document notwithstanding, DFO may at any time and at their sole discretion, direct the project proponents and their agents/contractors/workers to suspend or alter the project, or to implement mitigation measures that avoid adverse impacts to fish or fish habitat.*

*This BMP document is valid only with respect to the mandate of DFO pursuant to the Fisheries Act, and for no other purposes. It does not purport to release the project proponent from any obligation to obtain permission from or to comply with the requirements of any other regulatory agencies. Any works seaward of higher high water (HHW) might be subject to review by the Canadian Coast Guard (CCG) Navigable Waters Protection Division pursuant to the Navigable Waters Project Act. Any works seaward of HHW may also be of interest to Land & Water BC as the provincial government has jurisdiction over the seabed of inland waters.*



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