BRITISH COLUMBIA

INFORMATION NOTICE

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A User Guide for Assessing the Design, Size, and Operation of Sediment Ponds Used in Mining

Purpose

This User Guide is a companion document to ***Technical Guidance 7: Assessing the Design, Size, and Operation of Sediment Ponds Used in Mining*** (ENV 2015). It provides an introductory overview of the factors that must be considered for the effective design and operation of sediment ponds. Proponents are also expected to review the full technical guidance document, available online at the Ministry of Environment (ENV) website. Both documents were prepared to help mining companies to design sediment ponds for appropriate sediment removal as part of their Erosion and Sediment Control Plan (ESCP) so that, when implemented, the plan will contribute to compliance with the *Environmental Management Act* (EMA)and the protection of the environment.

Why are Sediment Ponds important?

Surface water run-off from disturbed areas of mine sites can carry significant amounts of suspended solids into the receiving environment and potentially contribute to adverse environmental effects.

Sediment ponds are for reducing sediment loadings from mine operations when other erosion/sediment control methods are insufficient.

Mining companies are responsible for minimizing erosion from disturbed areas and for collection and treatment of run-off from these areas before it is discharged into the environment.

Key Highlights

- **Role of Government:** Mining in the Province of BC is regulated by the Ministry of Energy and Mines (MEM), the ENV and the federal government. The ENV uses Ambient Water Quality Guidelines, Water Quality Objectives, and Best Available Technology (BAT) policy when setting permit standards for sediment pond discharges.

- **Particle Size:** ENV recommends that sediment ponds be designed to capture at least a 10 micron soil particle for the 10-year, 24-hour run-off event.

- **Use of Settling Aids:** Flocculants can be used to promote the clumping of particles and therefore enhance the effectiveness of a settling pond. However, ***their use must be specifically authorized.***

- **Topographical Maps:** Accurate and up-to-date topographical maps should be used.

*Sediment pond design and Erosion and Sediment Control Plans are to be developed by a **Qualified Professional** who is registered in BC with a professional organization.*

- **Pond Design Ratio:** The preferred shape of sediment ponds is generally rectangular with the ratio of length to width being about 5-1.

- **Structural Design for Run-off Events:** All structures should be designed to structurally withstand a 1 in 200-year run-off event.

- **Suspended Solids Removal Design Flow:** The minimum design flow for removal of suspended solids in sediment ponds should correspond to the 10-year, 24-hour run-off flow.

- **Primary Pond for Coarse Sediment:** A smaller pond should be located upstream from the main sediment pond.

- **Pond Dewatering:** Sediment ponds should be provided with a means of draining or dewatering.

- **Pond Clean-Out:** Sediment ponds should either last the lifetime of the mine or should have provision for easy removal of sediment at regular intervals.

- **Inlet Design:** The inlet works of the pond should include a means for energy dissipation (such as barriers, or baffles) to spread out the flow and reduce the velocity of the incoming run-off.

- **Pond Discharge and Freeboard:** The discharge works at the outlet of the pond should be at the opposite end to the inlet section and should include an overflow spillway

to maintain a minimum 0.5 meter freeboard on the embankment during the structural design run-off event (minimum 1 in 200 years).

- **Effluent Quality:** The desired effluent quality must be assessed in relation to the environmental consequences of the construction of the requisite sized pond. Small improvements in effluent quality require large increases in pond size.

- **Sampling and Flow Monitoring:** Suitable water quality sampling and flow measuring facilities should be installed to enable monitoring of the pond inflows and discharges, if required.

- **Fish and Wildlife Barriers:** Sediment ponds should be located and constructed to avoid impacting on a fish bearing stream or fish habitat. Fisheries and Oceans Canada (DFO) regulates habitat disturbances and would have to approve any impacts to physical fish habitat. ***In general, wildlife access should be prevented.***

- **Guidelines for Sizing Sediment Ponds:** The Technical Guidance 7 document outlines three basic methods for sizing sediment ponds:

Method A	➢ Is a simplistic approach that is acceptable for ponds where the finest suspended particles will be present, thus requiring the maximum retention time. ➢ Provisions must also be made for the addition of a settling aid system. ➢ This method requires the least amount of site-specific testing, as standard assumptions on particle size and settling velocity are made.
Method B	➢ Refines the assumptions in Method A by using a settling method to provide the equivalent Stokes diameter of site-specific material, using particle size data for materials at the site.
Method C	➢ Further refines the assumptions made in Method A by using further sedimentation tests prepared from representative soil/run-off sampling. ➢ It is the preferred method when the smallest effective pond is required.

- **Water Management Plan (WMP):** The derivation of the design flows for pond sizing is necessarily based on the contributing basin area. Often during a storm event, water is routed away from problem areas to sediment ponds which are used as temporary storage. This can lead to discharge below design specifications, as the effective contributing area is increased beyond the original design assumptions, and residence time is decreased. In order to prevent this, it is recommended that the site WMP specifically outlines where water from each site component is to be routed if the available storage at the component is fully allocated.

References

Ministry of Environment (ENV). 2015. Technical Guidance 7: Assessing the Design, Size, and Operation of Sediment Ponds Used in Mining. Environmental Protection Division, BC Ministry of Environment. Available online at http://www2.gov.bc.ca/gov/content/environment/waste-management/industrial-waste/mining-smelting/guidance-documents