WATER QUALITY PROTECTION MEASURES

Introduction

It probably goes without saying that one cannot muck around in a wet ditch without stirring up the mud. Stirring up too much mud (sediment) without taking necessary protective measures or without obtaining a permit can land you in trouble with the agencies charged with protecting water quality. Too much sediment can cause significant harm to fish, fish habitat and other beneficial uses, and water quality standards have been set under Federal, State, and Tribal law to protect these values. This Factsheet provides guidance on how to conduct common watercourse maintenance activities without risking a stop work order or a fine when water quality impacts occur. Generally, any activity that impacts water quality will require a Hydraulic Project Approval permit from Washington State Department of Fish and Wildlife (WDFW). See Permitting Factsheet #1 Hydraulic Project Approval for more details.

Potential Impacts of Sediment Releases:

- Injury or death of fish. Sediment can clog or abrade fish gills, causing suffocation or tissue damage.
- Inability to feed. Since fish are visual feeders, sediment in water can impair their ability to forage for food.
- Infill habitat. Sediment may settle in pools or riffle habitats. This may impact salmonid egg viability or may affect food and nutrient sources by covering benthos (bottom-dwelling organisms) upon which fish depend for food.
- Clogging of irrigation intake screens and potential damage to downstream irrigated crops.

The Laws:

When undertaking any watercourse maintenance activity, controlling sediment and erosion is essential to ensure protection of fish and other aquatic species. The Federal Clean Water Act (CWA) Section 1251 & Washington State Water Pollution Control Act 90.48 (WPCA) prohibits the discharge of any pollutant from a point source into navigable waters or waters of the State. Tribal laws similarly prohibit pollutant discharges on the Lummi Indian Reservation. The Washington State Department of Ecology is charged with enforcing these laws for most of Whatcom County. The Federal Environmental Protection Agency (EPA) and the Lummi Natural Resources Department enforce these laws on the Lummi Indian Reservation. The CWA Section 404 and the River & Harbors Act of 1899 Section 10 require a Federal Permit before discharging dredged fill materials into the waters of the U.S. or before working on structures in or affecting navigable water. The Department of Army Corps of Engineers is charged with enforcing these laws. Knowing what water quality standards and permit requirements apply before engaging in any maintenance activities are the first steps to avoid liability.

Under all circumstances, maintenance activities must follow “All Known And Reasonable Technologies” (AKART) to avoid violating water quality standards for sediment releases, commonly referred to as “turbidity”. Where turbidity already exists in the “background, it need not be controlled or improved. However, maintenance activities must avoid increasing pollution beyond a specified amount. Prior to undertaking any work for Sediment Control, refer to the following factsheets in this series: BMP Factsheet #15 Fish Protection and Permitting Factsheet #4 Agency Contact Requirements.
**Measuring Sediment Releases:**

Sediment and erosion control measures should be in place both during and after works that have the potential to cause sedimentation of a watercourse. Suspended sediments are usually measured as “turbidity” and are measured as Nephelometric Turbidity Units or NTUs. Turbidity is the cloudiness or haziness of a fluid caused by individual particles (suspended solids) that are generally invisible to the naked eye, similar to smoke in air.

Turbidity can be measured in a number of ways; the most common are:

- **Turbidity meter** – This tool measures the intensity of light scattered at 90 degrees as a beam of light passes through a water sample. A meter may be available from the Whatcom County Public Works River & Flood Division or the Whatcom Conservation District.
- **Secchi disk** – This inexpensive tool uses a black and white disk in the water to measure the relative clarity of water.
- **Visual inspection** – Significant sediment releases are easily visible to the naked eye.

Aquatic Life Turbidity Criteria – Applies to all natural and modified natural watercourses and constructed watercourse reaches within 300 feet of their confluence with a natural or modified natural watercourse.

- **Salmonid Spawning, Rearing and Migration areas** - 5 NTU over natural background levels when background is 50 NTU or less. If background levels are above 50 NTUs then the increase should not exceed 10% over background levels.
- **Salmonid Rearing and Migration Only areas** – 10 NTU over background when background is 50 NTU or less and a maximum 20% increase when the background turbidity is more than 50 NTU.

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**Water Quality Guidance for Drainage Maintenance:**

Helpful definitions and typical site plan:

**Total Maintenance Dredging Work Zone** – The watercourse reach scheduled for maintenance during the year’s work window including the Immediate Maintenance Dredging Work Zone and the Sediment Control Zone.

**Immediate Maintenance Dredging Work Zone** - The watercourse reach scheduled for maintenance during the year’s work window. The reach should be noted in a Drainage Improvement District’s Drainage Management Plan.

**Sediment Control Zone** – This area begins at the downstream edge of the Immediate Maintenance Dredging Work Zone and continues downstream for 200 feet. Typically one to three silt curtains are placed in this zone to capture and settle suspended sediments (see Best Management Practice (BMP) section below).

**Point of Compliance** – The point established at the downstream end of the Temporary Mixing Zone and identified on site with a stake or some other type of visible marker. This is the point where turbidity observations or measurements are taken to monitor compliance with Clean Water Act regulations.

**Work Day** – The length of watercourse planned for maintenance work in one day. The lowest section of a watercourse’s Immediate Maintenance Dredging Work Zone will be completed in the first day with additional

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**Water Quality Protection Measures**

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**Figure 1**
upstream reaches repeated until the planned work is complete.

**Temporary Mixing Zone** – When a channel maintenance project has received all permits and approvals and BMPs are being implemented to minimize the release of sediments, then a temporary mixing zone can be used to allow sediments to settle out of the water as follows:

- For waters up to 10 cubic feet per second (cfs) at the time of disturbance, the point of compliance shall be 100 feet downstream from the activity causing the turbidity exceedance.
- For waters above 10 cfs up to 100 cfs flow at the time of construction, the point of compliance shall be 200 feet downstream from the activity causing the turbidity exceedance.

**Turbidity Best Management Practices (BMPs) Diagram** – A generic site diagram that generally illustrates watercourse maintenance dredging activities, application of BMPs and integrated fish removal procedures. See Figure #1.

**Sediment Control BMPs:**

No single BMP or combination of BMPs will work under all conditions. Therefore, in approaching the problem of managing sediment, it is essential that you be vigilant in observing any impacts of your maintenance activities and adaptively apply different or additional BMPs in order to keep the discharge of pollution to less than what is allowed. Again, there is no single magic solution to control sediment release. Follow the process of:

1. Create an adaptive management strategy before work begins;
2. Start with simplest cost-effective strategies;
3. Closely monitor water quality to see if your maintenance activities are making conditions worse; and,
4. Implement additional BMPs until the impacts are within water quality standards.

The following BMPs will help control sediment release during channel maintenance activities.

- **Dry Season.** If at all possible, plan your maintenance work for the driest time of year, usually August – September. If there is less water flowing overall, it is less likely that dirty water will flow out of your worksite. Plan your crops to make sure the watercourse is accessible during the dry season.
- **Adverse Weather.** Suspend drainage work in adverse weather. Heavy summer rains can both increase flows beyond what you may be prepared for and may stir up sediments. Wait for low water levels to return prior to proceeding with maintenance work.
- **Spoils placement.** Place excavated materials well away from the watercourse to ensure they will not erode back into the watercourse.
- **Monitor closely.** Inspect the water downstream of your work site at the end of the appropriate mixing zone (usually 100 feet). Various tools are available to measure turbidity, however visual monitoring can be an effective measurement. A general rule is that if the water above your project looks clear then it needs to look as clear below your work area.
- **Lidded Bucket.** Use an excavator equipped with a clamshell or lidded bucket to prevent muddy water from falling back into the watercourse and increasing the level of contamination. This type
of equipment will probably be required in your Hydraulic Project Approval permit (HPA).

- **Work Direction.** Conduct maintenance activities from upstream to downstream to allow the downstream vegetation to screen and trap suspended sediments. Note: Impacts to fish may be less if work takes place downstream to upstream. Consult with the WDFW Area Habitat Biologist to determine the best site specific strategy.
- **Pause your work.** If you see muddy water in imminent danger of leaving your mixing zone, the easiest BMP is to stop, let the sediments filter out, then start again. After a little trial and error you should be able to set a sustainable work pace.
- **Channel Blocking.** Block the channel downstream to slow water flow and allow sediments to fall out. Multiple installations may be needed to capture all the sediment.
- **Fabric silt curtain.** Constructed of woven filter fabric with weights at the bottom and floats at the top.
- **Coffer Dam or Check Dam.** Rock, plywood, sandbags or other temporary structure to stop water flows and let sediments filter out.
- **Water Diversion.** Pump some or all water around the work site and then return it to the channel. Isolating the work area and diverting flowing water around the worksite is the most effective method to ensure clean water law compliance. Pump intakes need to have fish screens meeting WDFW criteria to avoid entraining fish.
- **Water Removal.** Pump some or all the muddy water leaving the work area into an adjacent area for on site infiltration.
- **Coordination with Fish Removal Activities.** A silt curtain may be useful at the upstream end of the Work Day reach to isolate the reach after fish removal and to temporarily slow the flow of water through the reach.

*Deviation from this BMP may be allowed if WDFW or equivalent freshwater habitat biologist indicates pumping water around or from a channel maintenance project will create a more negative aquatic biological impact than the release of in-place sediments to downstream areas.*

**Additional Information on Instream BMPs:**

**Fabric Silt Curtain**

Drainage Improvement Districts typically own their own silt curtains. They are made of woven fabric with tapered sides, weighted bottom and a float at the top. These inexpensive curtains are easy to install and can be moved as work progresses.

- Curtains 12’ to 16’ wide and 6’ to 8’ high can be utilized in most watercourses.
- Functions are to filter some muddy water as it passes through and to slow the water flow, allowing suspended sediments to drop out.

* Install 1 – 3 curtains at 100 foot intervals beginning 100 feet below your work area.
* Anchor the curtain sides with 8’ to 10’ heavy duty metal T posts as tightly to the edge of the watercourse as possible. The fabric curtain will naturally form to fill the channel profile.
* Monitor curtains closely to ensure they are functioning. Your point of compliance for turbidity is usually 100’ below the most downstream curtain.

**Coffer Dam or Check Dam**

Coffer dams are used to isolate a channel reach in order to complete maintenance work. For greater effectiveness, coffer dams may be combined with other methods such as clean water bypasses or pumps. Coffer dams can be made of a variety of materials (rock, sandbags, wood, etc). Considerations in their use include:

- Dam materials must be anchored into the banks of the ditch to prevent seepage and erosion around the edges of the dam.
- A common practice is to line the channel with a tarp...
and then anchor it with a sandbag wall to ensure a tight installation.

- If there is water in the channel but little or no flow, temporary coffer dams may be the most cost effective means to isolate the channel and confine muddy water. Once sediments settle out, remove coffer dams slowly to prevent the release of sediments downstream.
- If there is significant water flow, a coffer dam upstream can temporarily block this flow or create a source for clean water diversion.
- A downstream coffer dam will help prevent muddy water from leaving the work area, prevent clean water downstream from flowing back into the work area and becoming contaminated, and can be used in combination with a muddy water removal pump.
- Monitor frequently. Extra material (for example, more sandbags) should be kept on site to raise the dam if water behind the dam threatens to spill over into the work area or if muddy water threatens to overflow out of the work area. Immediately repair any scour, gaps, or holes around the dam to prevent failure.
- Completely remove the dam once the maintenance work is complete.

**Water Diversion**

A water diversion redirects the water flow temporarily around the section of the watercourse where work is being conducted. Clean water is moved around the worksite to prevent contamination and then returned to the watercourse below the work area. Pumps are most commonly used however; in some cases an alternative channel or bypass flume may be used to transport some water or all water around the work site and then return it to the channel. Considerations in the use of water diversions include:

- The pumped diversion is suitable for intermittent and low flow streams that can be pumped. Pump capacity must be sufficient to handle the flow.
- Downstream sediment transport can almost be eliminated.
- Temporary coffer dams are constructed upstream and downstream of the work area.
- A pump intake screen meeting WDFW standards should be installed to protect fish and other aquatic life.
- An energy dissipation device should be installed to prevent scouring where water is pumped back into the stream.
- As water in the worksite recedes, monitor closely for distressed or stranded fish. See Factsheet #15 Fish Protection.
- Although pumping water can be expensive, sediment removal is less expensive and easier in a dry channel where an operator can see and maintain grades.

**Water Removal**

Pump water out of the worksite or pump some or all muddy water from the lower end of worksite before it contaminates receiving waters downstream. Considerations in the use of water removal include:

- If there is little or no flow and either no fish present or fish have been removed, the maintenance project site can be isolated using coffer dams. Remaining water can be pumped into an adjacent area for onsite infiltration.
- Another practice is to pump out muddy water trapped above a coffer dam or turbidity curtain before it flows downstream.
- An adjacent grass field is commonly used to receive and filter contaminated water.
- Nearby grass lined ditches may also work well to filter sediments out before water eventually returns to the channel.
- Do not pump water into adjacent natural wetlands.
- Do not pump all the water out of a channel leaving downstream aquatic life to die.
- Monitor closely to ensure that muddy water does not re-enter the channel. Be prepared to move the
outflow pipe often to prevent over saturation of fields.

Bank Erosion Controls
Exposed soils on banks and slopes are susceptible to erosion and can result in significant sediment loads. If steep banks are sloped back or if dredge spoils must be placed uphill from the work area, then measures should be taken to minimize any potential erosion. Where exposed earth is adjacent to a watercourse, controlling erosion can be as simple as seeding as soon as possible to establish vegetative cover and prevent sediment entry into the watercourse during the rainy season.

- Erosion Control Seed Mix - Any exposed soils should be immediately seeded with an appropriate seed mix such as:
  - Chewings or annual blue grass 40%
  - Festuca rubra var. commutate or Poa ann
  - Perennial rye 50%
  - Lolium perenne
  - Retop or colonial bentgrass 5%
  - Agrostis alba or Agrostis tenuis
  - White dutch clover 5%
  - Trifolium repens

- Mulch & Mats. Spreading straw over exposed soils reduces the erosive energy of rainfall and is a quick and inexpensive means to control erosion. Erosion control fabrics made of fine mesh and either straw or coconut fibers work well on steeper or erosion prone slopes.
- Silt Fencing. If excavated sediments are susceptible to erosion, install a silt fence below the sediments to prevent erosion. Silt fence should be trenched into the existing soil 4” to 6” and staked every 6’ to 10’.
- Straw Wattles. Partially trenched into the soil and staked, straw wattles are another effective means to control erosion.
- Stormwater Manual. WDOE’s “Stormwater Management Manual for Western Washington” contains detailed information about these and other useful BMPs for erosion control.

Monitoring:
- Visual or measured monitoring for turbidity should be conducted every hour.
- Monitor at the upstream edge of the Immediate Maintenance Dredging Work Zone, and at the downstream Point of Compliance.
- Record observations on a Water Quality Turbidity Monitoring Report Form.
- Each time there is an observed differential in turbidity, additional BMPs listed above should be implemented.
- Should three successive hourly visual monitorings continue to identify problems after all practicable BMPs have been implemented; the operator will contact the Department of Ecology or the Lummi Natural Resources Department for work conducted on the Lummi Indian Reservation and advise them of the situation. The purpose of the phone call is to report the occurrence, discuss BMPs being employed and consult with the department on appropriate actions to address the situation.