

## Special Provision - Turbidity

### 1. DEFINITIONS

Instream Construction Activity	Any planned instream construction activity below the high water mark that has the potential to result in additional turbidity in the watercourse. This would include the installation and removal of isolation measures (i.e., cofferdams, berms, silt curtains, etc.), placing of riprap in the water, bank excavation, etc.
Isolated Construction Activity	Any planned construction activity that occurs when working in-stream within a stable site isolation measure (i.e., coffer dams, berms, silt curtains, etc.).
Site Isolation	The placement, erecting or installation of a system whose function is to assure sediment produced from construction activities is contained to the isolated work site.
Visually Conspicuous Plume	A plume of suspended solids that can be visually observed in the watercourse.
Accidental Occurrence	Any situation, beyond the Contractor's control, that results in elevated turbidity levels in excess of the specified compliance limits. This would include situations like the unexpected breaching of a cofferdam due to flood conditions exceeding the design levels.

### 2. SAMPLING AND TESTING

The Contractor is responsible for all sampling and testing of Total Suspended Solids (TSS) as specified herein.

Prior to the start of Construction, the Contractor shall determine the normally occurring linear relationship between Total Suspended Solids (TSS) and turbidity in the watercourse as per the *Conversion Relationship between Nephelometric Turbidity Units (NTU) into mg/L for Alberta Transportations' Turbidity Specification*.

- <http://www.transportation.alberta.ca/Content/docType245/Production/The%20conversion%20of%20Nephelometric%20Turbidity%20Units.pdf>

Laboratory results and the linear relationship will be sent to the Consultant for review prior to initiating the program. During construction, the Contractor shall:

- Measure suspended solids in NTU accurate to within 2% of the calibration solution of the equipment;
- Convert NTU into mg/L to establish the relationship specific to the site; and
- Measure upstream and downstream NTU levels within a maximum period of 30 minutes of each other, or as directed by the Department, unless there is a sediment release (see monitoring frequency below).

The Consultant shall be afforded full access to facilities for random quality assurance inspection. The results of the Consultant’s quality assurance testing will serve to monitor the Contractor’s quality control program.

### 3. SAMPLING FREQUENCY

Sampling shall occur from 30 minutes prior to daily construction activities until 30 minutes after construction activities have been completed. All sampling information shall be compiled in a daily report. The frequency of total suspended solid sampling by the Contractor shall be in accordance with the following:

**Table 1      Sampling Frequency**

Site Condition	Sampling Frequency
<p style="text-align: center;"><b>Instream Construction Activities and Accidental Occurrences</b></p>	<ul style="list-style-type: none"> <li>• During construction hours, sample at a minimum of once every hour at all compliance transects.</li> <li>• If an exceedance or plume is observed, sampling shall be done within the plume until TSS levels have returned to acceptable background levels for two consecutive sampling events.</li> <li>• No sampling events shall occur during Accidental Occurrences until it is safe to do so.</li> </ul>
<p style="text-align: center;"><b>Isolated Construction Activities</b></p>	<ul style="list-style-type: none"> <li>• When the Contractor is working within site isolation samples will be taken at all transects at three hour intervals, during construction hours.</li> <li>• If sample results have not exceeded 5 mg/L above background levels for five consecutive active construction days the sample frequency may be reduced, or halted altogether, as directed by the Consultant.</li> </ul>

#### 4. COMPLIANCE MONITORING

Compliance monitoring is dependent on the type of the watercourse. There are five types of watercourses:

- Systems such as lakes, reservoirs and wetlands where velocities are less than 0.5 m/s;
- Watercourses where the wetted width is less than 3 m;
- Watercourses where the wetted width is between 3 m and 10 m;
- Watercourses where the wetted width is between 10 m and 50 m, and
- Watercourses where the wetted width is greater than 50 m.

Table 2 summarizes the compliance monitoring locations for each watercourse. For watercourses water depth less than 1 m, one measurement will be taken at 50% of the depth for each sample point along the transect. For watercourses greater than 1 m deep, two (2) measurements will be taken at 20% and 80% of water depth at each sample point along the transect and the results averaged.

**Table 2 Compliance Monitoring Locations**

<b>Watercourse Type</b>	<b>Number of Transects</b>	<b>Sample Points Along Transect</b>
Systems such as lakes, reservoirs and wetlands where velocities are less than 0.5 m/s.	Transect 1: the lesser of 5 m, or the maximum surface dimension of the waterbody.	5 m intervals around the circumference of the turbidity barrier.
	Transect 2: 20 m from Transect 1 (dependent on the size of the waterbody).	
	Transect 3: 20 m from Transect 2 (dependent on the size of the waterbody).	
Wetted width $\leq 3$ m	Background: upstream of the work area	50% of wetted width at each transect
	Transect 1: 1 stream width from work area	
	Transect 2: 2 stream widths from work area	
	Transect 3: 3 stream widths from work area	
Wetted width $> 3$ m and $\leq 10$ m	Background: upstream of the work area	33% and 67% of wetted width at each transect
	Transect 1: 1 stream width from work area	
	Transect 2: 2 stream widths from work area	
	Transect 3: 3 stream widths from work area	
Wetted width $> 10$ m and $\leq 50$ m	Background: upstream of the work area	25%, 50%, and 75% of wetted width at each transect
	Transect 1: 30 m downstream from work area	
	Transect 2: 60 m downstream from work area	
	Transect 3: 90 m downstream from work area	
Wetted width greater than 50 m	Background: upstream of the work area	25%, 50%, and 75% of wetted width transect
	Transect 1: 50 m downstream from work area	
	Transect 2: 125 m downstream from work area	
	Transect 3: 225 m downstream from work area	

## 5. VISUAL PLUME MONITORING

In the event that a visually conspicuous plume is observed, the Contractor shall immediately cease all Work, undertake mitigation measures, contact the Consultant, and promptly initiate a plume TSS monitoring program in accordance with the following:

- All Work that may have a direct or indirect effect on water quality will cease during all plume occurrences.
- A sample must be taken from the middle of the plume and as close to the source of the plume as possible (within safety limits).
- Monitoring will be done at all transects, and the plume sampling point, as often as feasible (a minimum of an hourly basis), and will continue until two consecutive monitoring events show no compliance exceedances.

## 6. COMPLIANCE CRITERIA

Criteria are set by the current versions of the Environmental Quality Guidelines for Alberta Surface Waters, which are based on the Canadian Council of Ministers of the Environment.

Following completion of each TSS monitoring event, the Contractor will know if the construction activities are within compliance limits as defined below in Table 3. This will be accomplished as follows:

- The results for each of the upstream sample points will be averaged to determine a background TSS (mg/L) for each event.
- The average TSS concentration (mg/L) shall be calculated for each of the downstream transects (cross sections). The average value for each transect will be compared to the background TSS concentration (mg/L). If the result for any transect exceeds the limits in Table 3, the project is not in compliance. The average value for any transect is calculated as the arithmetic average of the sample points in that transect.
- Any differences will be compared with the TSS Compliance Criteria to determine if the construction works (i.e. isolated or instream construction activities) are within compliance.

The Contractor's operations shall utilize equipment, labour, and procedures that ensure that the levels of suspended solids are maintained below the following levels:

**Table 3 Maximum Allowable Increase of Total Suspended Solids**

Site Conditions (Background TSS)	Exceedance Levels (TSS in Excess of Normal Background Levels)
TSS < 25 mg/L	<ul style="list-style-type: none"> <li>• A maximum instantaneous increase of 25 mg/L over background levels at any time.</li> <li>• An average increase of &gt;5 mg/L over background levels for greater than 24 hours.</li> </ul>
TSS 25 mg/L – 250 mg/L	<ul style="list-style-type: none"> <li>• A maximum instantaneous increase of 25 mg/L from background levels at any time.</li> </ul>
TSS > 250mg/L	<ul style="list-style-type: none"> <li>• Maximum instantaneous increases of 10% of background levels at any time.</li> </ul>

The Contractor shall notify the Consultant at least 48 hours (2 calendar days) prior to the start of any Instream Construction Activity.

In the event of a measurement is over the Exceedance Levels listed in Table 3, or an Accidental Occurrence that results in a visually conspicuous plume of sediment, the Contractor shall cease all Work that may have a direct or indirect impact on water quality and immediately initiate mitigation actions. The Contractor shall immediately notify the Consultant and call the Alberta Energy and Environment Response line at 1-800-222-6514.

If an exceedance occurs during Isolated Construction Activity and a reduced sampling program is in effect, the sampling frequency must be reset to the requirements, as listed in Table 1, where the sampling frequency is to return to three hour intervals during construction hours.

**7. RECORD KEEPING**

A detailed record of the sampling completed for the TSS monitoring program during Instream Construction Activity and Isolated Construction Activity shall be kept by the Contractor and reported to the Consultant in a weekly summary format. The Contractor shall ensure that daily sampling records are up-to-date and kept onsite at all times during the period in which the monitoring program is in effect. Upon completion of the Construction Activities, the Contractor shall also forward a final report containing all sampling and testing data to the Consultant. The weekly summary report shall include at a minimum:

- Brief description of the works and types of construction activities completed during the sampling period.
- Date and time of each sample.

- Weather conditions at the time of each sample.
- Changes of depth of flow at the upstream transect.
- Documentation of daily NTU instrument calibrations.
- Both turbidity (NTU) and TSS (mg/L) for each sample taken.
- The daily average value (mg/L TSS) of the upstream background samples.
- The daily average value (mg/L TSS) for each downstream transect (all three sites per transect combined).
- Documentation of all non-compliance instances, including the level of exceedance, the duration of exceedance, the mitigation measures taken, verification of the reporting of the exceedance and any related communications with regulators regarding the exceedance event, and future measures to be taken to avoid or control further exceedances.
- Description of events or circumstances that may have prevented or hindered completion of the TSS monitoring program.

## **PAYMENT**

- Payment for sampling, testing and reporting of TSS for Instream Construction Activity and Isolated Construction Activity will be made at the unit price bid per day for 'Total Suspended Solids (TSS) Testing', for each day that testing is mandated. Payment will be full compensation for all testing as required to establish the linear relationship between TSS and NTU as well as for each 24 hr. period; including labour, equipment, tools and incidentals necessary to complete the work to the satisfaction of the Consultant.
- All costs associated with sampling, testing and reporting of TSS associated with Accidental Occurrences will be considered incidental to the Work, and no separate or additional payment will be made.