

1.0 GENERAL

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- .1 The Contractor's operations will be subject to the maximum allowable increase in total suspended solids (Max-TSS) within the watercourse.

1.2 DEFINITIONS

- .1 "Instream Construction Activity" means 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.
- .2 "Max-TSS" means the maximum allowable increase of total suspended solids in the watercourse from the levels at the compliance point downstream of the turbidity control structure from those immediately upstream of the worksite containment.
- .3 "Isolated Construction Activity" means any planned construction activity that occurs when working in-stream within a stable site isolation measure (i.e., coffer dams, berms, silt curtains, etc.).
- .4 "Site Isolation" means 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.
- .5 "Visually Conspicuous Plume" means a plume of suspended solids that can be visually observed in the watercourse.
- .6 "Normal Construction Activity" means any construction activity that will not cause elevated turbidity levels, and no visual indications of elevated turbidity levels.
- .7 "Scheduled Construction Activity" means any planned activity that can be expected to result in additional turbidity in the watercourse, including the installation and removal of cofferdams, silt curtains, placing of riprap in the water, grading, etc.
- .8 "Accidental Occurrence" means any situation, beyond the Contractor's control, that results in elevated turbidity levels in excess of the specified compliance limits, including situations like the unexpected breaching of a cofferdam due to flood conditions exceeding the design levels.

1.3 SAMPLING AND TESTING (QUALITY CONTROL AND QUALITY ASSURANCE)

- .1 Perform all sampling and testing of Total Suspended Solids (TSS) as specified herein.
- .2 Provide copies of the results of all sampling and testing in a daily summary format. Upon completion of Construction Activities, submit a final report containing all sampling and testing data.

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- .3 The Minister will carry out random quality assurance inspection as a means to monitor the Contractor's quality control program. Assist and cooperate with the Minister during the collection of water quality samples.
- .4 Prior to the start of construction, carry out sufficient testing to 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". Pay services of a qualified laboratory to determine the relationship.
- .5 Submit laboratory results and the linear relationship to the Minister's representative for review prior to initiating the program.
- .6 During construction, perform the following:
 - .1 Measure the suspended solids in NTU accurate to within 2% of the calibration solution of the equipment.
 - .2 Convert NTU into mg/L to establish the relationship specific to the site.
 - .3 Measure upstream and downstream NTU levels within a maximum period of 30 minutes of each other, or as directed by the Minister, unless there is a sediment release (see monitoring frequency below).

1.4 SAMPLING FREQUENCY

- .1 Perform sampling 30 minutes prior to daily construction activities until 30 minutes after construction activities have been completed. Compile all sampling information in a daily report.
- .2 Perform total suspended solid sampling at the following frequency:

Site Condition	Monitoring Frequency
Instream Construction Activities and Accidental Occurrences	<ul style="list-style-type: none"> • During construction hours, sample at a minimum of once every hour at all compliance transects. • 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. • No sampling events shall occur during Accidental Occurrences until it is safe to do so.
Isolated Construction Activities	<ul style="list-style-type: none"> • When the Contractor is working within site isolation samples will be taken at all transects at three hour intervals, during construction hours. • If sample results have not exceeded 5 mg/L above background levels for five consecutive active construction days, the sample frequency may be reduced to a minimum of twice per day, as

Site Condition	Monitoring Frequency
	directed by the Minister.

1.5 COMPLIANCE MONITORING

- .1 Compliance monitoring is dependent on the type of the watercourse. There are five types of watercourses;
 - .1 System such as lakes, reservoirs and wetlands where velocities are less than 0.5m/s;
 - .2 Watercourses where the wetted width is less than 3 m;
 - .3 Watercourses where the wetted width is between 3 m and 10 m;
 - .4 Watercourses where the wetted width is between 10 m and 50 m, and
 - .5 Watercourses where the wetted width is greater than 50 m.
- .2 For watercourses less than one meter in depth, take one measurement at 50% of the depth for each sample point along the transect. For watercourses greater than one meter in depth, take two measurements, one at 20% depth and one at 80% depth at each sample point along the transect, and average the results.
- .3 The following table summarizes the compliance monitoring locations for each watercourses.

Compliance Monitoring Locations

Type of Watercourse	Number of Transects	Sample Points Along Transect
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 1 (dependent on the size of the waterbody.)	
Wetted width less than or equal to 3 meters.	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	

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Type of Watercourse	Number of Transects	Sample Points Along Transect
Wetted width between 3 meter and 10 meters.	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 between 10 m and 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	

1.6 VISUAL PLUME MONITORING

- .1 In the event that Visually Conspicuous Plume is observed, immediately cease all activities, undertake mitigation measures, contact the Minister, and promptly initiate a plume TSS monitoring program in accordance with the following;
 - .1 Cease all activities that may have a direct or indirect effect on water quality during all plume occurrences.
 - .2 Take a sample from the middle of the plume and as close to the source of the plume as possible (within safety limits)
 - .3 Monitor at all transects and the plume sampling point as often as feasible (a minimum of an hourly basis), and continue until two consecutive monitoring events show no compliance exceedances.

1.7 COMPLIANCE CRITERIA

- .1 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.
- .2 Following completion of each TSS monitoring event, the Contractor will know if the construction activities are within compliance limits as defined in the table below. This will be accomplished as follows;
 - .1 Average the results for each of the upstream sample points to determine a background TSS (mg/L) for each event.
 - .2 Calculate the average TSS concentration (mg/L) for each of the downstream transects (cross sections) and compare the average value for each transect to the background TSS concentration (mg/L). If the result for any transect exceeds the limits in the table below, 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.
 - .3 Compare any differences with the TSS Compliance Criteria to determine if the construction works (i.e. isolated or instream construction activities) are within compliance.
- .3 Utilize equipment, labour, and procedures in a manner that ensures the maximum allowable levels of suspended solids are maintained below the following levels;

Site Conditions (Background TSS)	Exceedance Levels (TSS in Excess of Normal Background Levels)
TSS < 25 mg/L	<ul style="list-style-type: none"> • A maximum instantaneous increase of 25 mg/L over background levels at any time. An average increase of >5 mg/L over background levels for more than 24

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Site Conditions (Background TSS)	Exceedance Levels (TSS in Excess of Normal Background Levels)
	hours.
TSS 25 mg/L – 250 mg/L	<ul style="list-style-type: none"><li data-bbox="526 464 935 562">• A maximum instantaneous increase of 25 mg/L from background levels at any time.
TSS > 250 mg/L	A maximum instantaneous increase of 10% of background levels at any time.

- .4 Notify the Minister at least 48 hours (2 calendar days) prior to the start of any Instream Construction Activity.
- .5 In the event of a measurement is over the Exceedance Levels listed in the table above, or an Accidental Occurrence that results in a Visually Conspicuous Plume of sediment, cease all activities that may have a direct or indirect impact on water quality, and immediately initiate mitigation actions. Notify the Minister immediately and call the Alberta Energy and Environment Response line at 1-800-222-6514.
- .6 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 the sampling frequency table of clause 1.4.2, where the sampling frequency is to return to three hour intervals during construction hours.

1.8 RECORD KEEPING

- .1 Keep a detailed record of the sampling completed for the TSS monitoring program during Instream Construction Activity and Isolated Construction Activity and report to the Minister in a weekly summary format.
- .2 Ensure daily sampling records are up-to-date and keep onsite at all times during the period in which the monitoring program is in effect.
- .3 Upon completion of the Construction Activities, submit a final report containing all sampling and testing data to the Minister.
- .4 Include the followings in the weekly summary report;
 - .1 Brief description of the works and types of construction activities completed during the sampling.
 - .2 Date and time of each sample.
 - .3 Weather conditions at the time of each sample.
 - .4 Changes of depth of flow at the upstream transect.
 - .5 Documentation of daily NTU instrument calibrations.
 - .6 Both turbidity (NTU) and TSS (mg/L) for each sample taken.
 - .7 The daily average value (mg/L TSS) of the upstream background samples.
 - .8 The daily average value (mg/L TSS) of each downstream transect (all three sites per transect combined).
 - .9 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.

- .10 Description of events or circumstances that may have prevented or hindered completion of the TSS monitoring program.

1.9 SUBMITTALS

- .1 Provide the following submittals:
- .2 Shop Drawings of the turbidity barriers detailing the components and the material specifications of the components, 15 days prior to commencement of the Work. Provide a turbidity barriers system that has been designed and stamped by a professional Engineer registered with the Association of Professional Engineers, Geologists and Geophysicists of Alberta or a specialist in such Work authorized by the Minister.
- .3 Turbidity Control Execution Plan outlining the location of the turbidity barriers, the method of installation, anchorage details, maintenance and inspection procedures, the removal and storage procedures and contingency plans in case of a breach in the turbidity curtain, 15 days prior to commencement of the Work.
- .4 Final report referred to in 1.3.2.

2.0 PRODUCTS – NOT USED

3.0 EXECUTION

3.1 INSTALLATION

- .1 Install provisions for turbidity control at the Travers Inlet site during all periods of construction that may impact the quality of water in Travers Reservoir including at least the following:
 - .1 Initial construction of the cofferdam.
 - .2 Placement of riprap and bedding material.
- .2 Install the temporary turbidity barrier system in accordance with the turbidity control execution plan.
- .3 Remove the turbidity barriers during the periods they are not required.

END OF SECTION