Section 3C

Water Quality Monitoring Plan for Dike Construction and Dewatering

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MEADOWBANK GOLD PROJECT

Water Quality Monitoring and Management Plan for Dike Construction and Dewatering

In Accordance with Water License 2AM-MEA0815

Prepared by:
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Version 2
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EXECUTIVE SUMMARY

The Nunavut Water Board (NWB) has issued Type A Water License 2AM-MEA0815 to Agnico-Eagle Mines Limited (AEM) for the Meadowbank Gold Project site authorizing the use of water and the disposal of waste required by mining and milling and associated uses.

This report documents the Water Quality Monitoring and Management Plan for Dike Construction and Dewatering specified under Water License 2AM-MEA0815 Part D, Item 11. Water quality monitoring includes several parameters (e.g., nutrients and metals), but TSS (total suspended sediments) and turbidity (primarily as a surrogate for TSS) are the major drivers of management actions during construction and dewatering. The monitoring and management plans are detailed and should serve as operating procedures for real-time actions in the field.

IMPLEMENTATION SCHEDULE

As required by Water License 2AM-MEA0815, Part B, Item 16, the proposed implementation schedule for this Plan is outlined below.

This Plan will be immediately implemented (March 2009) subject to any modifications proposed by the NWB as a result of the review and approval process.

DISTRIBUTION LIST

AEM – Environment Superintendent

AEM – Environmental Coordinator

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DOCUMENT CONTROL

Version	Date (YMD)	Section	Page	Revision
1	08/07/31			Comprehensive plan for Meadowbank Project
2	09/03/31	all		Overall revision of plan, incorporating license requirements and construction of Bay-Goose dike

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SECTION 1 • INTRODUCTION

This plan provides details of water quality monitoring and management actions specifically related to the dike construction and dewatering activities at the Meadowbank mine. The plan does not cover complementary monitoring of limnological parameters in Second Portage Lake (as part of the Fish-Out Program) nor routine water quality monitoring of both Second and Third Portage lakes (as part of the Aquatic Effects Management Program).

Water quality monitoring includes several parameters (e.g., nutrients and metals), but TSS (total suspended sediments) and turbidity (primarily as a surrogate for TSS) are the major drivers of management actions during construction and dewatering. The TSS/turbidity focus allows for direct monitoring of the major potential stressor in “real time”, thus allowing timely identification and mitigation of potential issues related to dike construction or dewatering.

This plan includes the following components:

- Review of TSS/turbidity effects and existing federal guidelines (**Section 2**);
- License requirements for the protection of fish and fish habitat at Meadowbank **(Section 3);**
- Water quality monitoring and management plan for dike construction (**Section 4**);
- Water quality and lake level monitoring and management plan for dewatering (**Section 5**); and
- References (**Section 6**).

The monitoring and management plans are detailed and should serve as operating procedures for real-time actions in the field. This plan has been revised to reflect discussions with regulatory agencies and the requirements of the Nunavut Water Board (NWB) Type A Water Licence (2AM-MEA0815) for the Meadowbank Gold Project.

SECTION 2 • REVIEW OF TSS / TURBIDITY AND EXISITING FEDERAL GUIDELINES

2.1 REVIEW OF TSS / TURBIDITY EFFECTS

Suspended solids, and associated effects on water clarity, have the potential to affect fish and fish habitat in a variety of ways, including but not limited to:

- Smothering of deposited eggs or siltation of spawning habitats;
- Smothering of benthic invertebrate communities;
- Decreased primary productivity caused by reduced light penetration;
- Reduced visibility, which may decrease feeding efficiency and/or increase predator avoidance; and
- Clogging and abrasion of gills.

Fisheries and Oceans Canada (DFO) has produced a report on effects of sediment on fish and their habitat (DFO, 2000). That report is based primarily on a more detailed paper by Birtwell (1999). The review by Birtwell is in turn based on a few sources, the most recent and comprehensive of which was prepared by Caux et al. (1997). Azimuth Consulting Group conducted a literature review to find more recent articles specific to species of interest at the Meadowbank mine, but did not find any articles.

The general findings for effects of TSS on fish and fish habitat indicate the following:

- Effects of TSS depend on both the concentration of TSS and duration of exposure;
- Effects of TSS can also be influenced by the size and shape of suspended particles;
- Concentrations of TSS that are lethal to fish over acute exposures (i.e., hours) range from hundreds to hundreds of thousands of mg/L;
- Sublethal effects on fish (e.g., reduced growth, changes in blood chemistry, histological changes) associated with chronic (weeks to months) exposures tend to be exhibited at TSS concentrations ranging from the tens to hundreds of mg/L;
- There is considerable uncertainty about potential effects of low TSS concentrations (less than tens of mg/L) over long time periods;
- Overall, the most sensitive group of aquatic organisms to TSS appears to be salmonids, and guidelines are developed to protect this group;
- Adult salmonids are generally more sensitive to short duration, high concentrations of suspended sediments than juvenile salmonids. However, both juvenile and adult fish have the potential to avoid high concentrations of suspended sediments; and

- Low suspended sediment levels are known to cause egg mortality (40%) to rainbow trout at long durations (7 mg/L at 48 days). Guidelines for long-term exposure reflect these findings.

2.2 REVIEW OF EXISTING FEDERAL GUIDELINES

Based on the findings regarding effects of suspended sediment, guidelines for TSS as well as turbidity have been put forth by various federal agencies.

TSS

The Canadian Council of Ministers of the Environment (CCME) specifies separate guidelines for TSS for clear flow and high flow periods. The guidelines are derived primarily from Caux et al. 1997, with application intended mainly for British Columbia streams. In the case of application to the Meadowbank Project Lakes, the clear flow guidelines would be most relevant – even during freshet one would not expect to see large natural fluctuations in TSS except in localized areas for short periods.

The guidelines put forth by the CCME recognize that the severity of effects of suspended sediments is a function of both the concentration of suspended sediments and the duration of exposure. Guidelines are intended to protect the most sensitive taxonomic group (salmonids) and the most sensitive life history stages. The following table summarizes the available guidelines applicable to clear water (CCME) and to mine-related effluent discharges (MMER).

Table 2.1: Existing Federal TSS Guidelines

Source	Short-Term Exposure	Long-Term Exposure
CCME 1999	Anthropogenic activities should not increase suspended sediment concentrations by more than 25 mg/L over background levels during any short-term exposure period (e.g., 24-hr)	For longer term exposure (e.g., 30 days or more), average suspended sediment concentrations should not be increased by more than 5 mg/L over background levels
MMER 2002	Maximum authorized concentration in a composite effluent sample = 22.5 mg/L. Maximum authorized concentration in a grab sample of effluent = 30 mg/L.	Maximum authorized monthly mean effluent concentration = 15 mg/L [1].

The guidelines above are based on hundreds of studies in different environments (see Caux et al. 1997). Some of the studies may not be particularly relevant to the case of suspended sediment associated with dike construction and dewatering in a lake environment. Consequently, it is worth considering whether all aspects of existing guidelines are applicable to dike construction and monitoring at the Meadowbank mine. There are two particular aspects that warrant discussion.

First, in relation to short-term exposure guidelines, it is important to note that guidance is based on findings for adults and juveniles (which are more sensitive than eggs and larvae over short durations), and that the guidance is based primarily on reviews looking at application to stream environments. In

[2] For purposes of calculating monthly means, any values below detection limits are set at one-half of the detection limit.

a stream environment, compared to a lake environment, it is difficult for fish to swim away from suspended sediments because the high degree of mixing in the water column facilitates higher uniformity in TSS concentrations. In contrast, in lakes, in particular for sediment plumes associated with construction activities or discharges, high TSS concentrations would generally be expected to be localized, with dilution over distance. In a lake situation, adult and juvenile fish (the most sensitive life stages to short-term exposure) should readily be able to swim away from a sediment plume.

Second, in relation to long-term exposure guidelines, it is important to note that guidance is heavily influenced by findings indicating the sensitivity of eggs to low-level exposure to TSS over long durations. Consequently, the long-term exposure guidelines would be rather conservative if applied during times when eggs are not present, or in areas of a lake or stream that are not spawning habitat.

Turbidity

Turbidity guidelines put forth by the CCME (1999) are based on extrapolation from the TSS guidance above, adjusted by a factor of about 3:1 (a typical average ratio for TSS: turbidity). In the case of turbidity for clear water, CCME (1999) recommends a maximum increase of 8 NTUs from background levels for a short-term exposure (e.g., 24-h period), and a maximum average increase of 2 NTUs from background levels for a longer term exposure (e.g., 30-d period).

CCME (1999) notes that in some cases short-term resuspension of sediments and nutrients in the water column can augment primary productivity, and in other cases changes in light penetration may be inconsequential if a system is limited by other factors such as nutrients. The Caux et al. (1997) study considered effects of suspended sediment not only on fish but also on algae and zooplankton. In the end, the recommendations put forth by Caux et al. (1997) are based mainly on the most sensitive taxonomic group, which is salmonids.

However, research has shown that widespread, chronic turbidity can result in reduced light penetration and subsequent reductions of primary productivity (DFO, 2000; CCME, 1999; Lloyd et al., 1987). Consequently, water clarity is of concern at broader spatial scales and longer timeframes, such as the proposed dewatering activities.

It should be noted that DFO's report on effects of sediment on fish and their habitat (DFO, 2000) endorses the guidelines for TSS put forth by the CCME (1999), but does not recommend following guidelines for turbidity. Rather, turbidity may be used as a surrogate for suspended sediment only when the relationship between the two parameters is established for a particular waterbody.

SECTION 3 • LICENSE REQUIREMENTS FOR THE PROTECTION OF FISH AND FISH HABITAT AT MEADOWBANK

During dike construction activities at Meadowbank, the following maximum monthly mean and short term maximum TSS concentrations must be met, in accordance with the NWB Type A water license, Part D, Item 15.

Table 3.1: Maximum Allowable TSS Concentrations During Dike Construction

Parameter	Maximum Monthly Mean (mg/L)	Short Term Maximum (mg/L)
TSS in areas where there is spawning habitat and at times when eggs or larvae are expected to be present (applied at monitoring stations located closest to the high value shoal areas starting Sept 1, 2008)	6	25
TSS in all other areas and at times when eggs/larvae are not present	15	50
TSS in impounded areas (e.g. northwest arm of Second Portage Lake) at all times in all areas	15	50

As AEM is committed to proactive and efficient response to any potential TSS problems, the monitoring program has been designed to provide quick feedback. This is not possible using TSS as a direct measure, because of the time required to analyze TSS in the field. Consequently, and consistent with the recommendations of the DFO (DFO, 2000), AEM has developed a relationship between turbidity and TSS, allowing the use of turbidity as a surrogate for TSS and obtaining real time results. The TSS-turbidity relationship was developed using paired data collected across a range of TSS sources concentrations (more details can be found in the Aquatic Effect Monitoring Program Targeted Study, Dike Construction Monitoring 2008 (Azimuth, 2009). The resulting linear regression was as follows:

$$\log(\text{turb}) = 0.273 + (1.19 \times \log(\text{TSS})), \; [n=125 \; r\text{-squared} = 0.79, \; p<0.001]$$

where turbidity is measured in NTUs and TSS in mg/L.

Raw turbidity data is handled in the following manner to facilitate comparisons to the maximum allowable TSS concentrations:

Comparisons to Short-Term Maximum (STM)

1. Calculate the 24-hr station mean for turbidity for each station based on measured values over the past 24 hours.
2. Use the TSS-turbidity regression (using the site-specific TSS:Turbidity) to estimate 24-hr mean TSS.
3. Compare to appropriate STM value.

Example*: Maximum turbidity values of 2.4, 3.0 and 1.2 NTUs were measured in depth profiles at Station Y over the last 24 hours, for a 24-hr mean of 2.2 NTU. Using the TSS:Turbidity relationship, the 24-hr mean TSS concentration would be 6.6 mg/L. This value would be compared against the appropriate STM concentration. This example is a slight simplification because it assumes that the samples taken are equally spaced in time. In reality, an estimate of the weighted moving average TSS concentration will be calculated, where the weight of a given sample is proportional to the time window that it covers.*

Comparisons to Maximum Monthly Mean (MMM)

1. Calculate the 30-day moving average by taking the average of the 24-hr mean TSS values for the previous 30 days for each station.

2. Compare this to the appropriate MMM value.

Example*: Station Y had 24-hr mean TSS concentrations calculated over the past 30 days. The 30-day moving average value would be compared to the appropriate MMM concentration. As with the STM case, this example is a slight simplification. In reality, an estimate of the weighted moving average TSS concentration will be calculated, where the weight of a given sample is proportional to the time window that it covers.*

During dewatering activities at Meadowbank, the maximum monthly mean and short term maximum concentrations presented in Table 3.2 must be met, in accordance with Part D, Item 16 of the NWB Type A water license. The maximum monthly mean and short term maximum concentrations are calculated similar to the examples provided above.

Table 3.2: Maximum Allowable Water Quality Concentrations During Dewatering

Parameter	Maximum Monthly Mean	Short Term Maximum
Total Suspended Solids	15.0 mg/L	22.5 mg/L
Turbidity	15 NTU	30 NTU
pH	6.0 to 9.0	6.0 to 9.0
Total Aluminum	1.5 mg/L	3.0 mg/L

As stipulated in the water license, Part D, Items 12 and 14, trigger values have been developed with corresponding management action plans; should TSS concentrations in the water body exceed the trigger values during either dike construction or dewatering, a management action plan consisting of a series of steps to be undertaken will be initiated. The trigger value for the short term maximum concentration is a single sample that exceeds the STM concentration. The trigger value for the maximum monthly mean is a 7-day moving average concentration that exceeds the MMM. The management action plans for the dike construction STM and MMM are discussed in detail in Section 4, and for dewatering in Section 5.

SECTION 4 • WATER QUALITY MONITORING AND MANAGEMENT PLAN FOR DIKE CONSTRUCTION

During dike construction, both the dike material itself as well as the disturbed material on the lake floor (particularly in the deep areas of the lakes) will contribute to increases in concentrations of suspended sediments in the water column. In the absence of sediment control measures, suspended sediment plumes would be expected to migrate to the southeast with wind-driven (prevailing winds from the northwest) currents.

The key means for minimizing suspended sediment discharges from the dike construction zones during dike construction is the deployment of a turbidity barrier using silt curtains.

4.1 SILT CURTAIN DEPLOYMENT

East Dike

The silt curtains were placed as close as possible to the construction zone (except for the portion of the east curtain that was anchored to the small island) without risking direct incidental physical contact with construction materials (Figure 1), and allowing sufficient room for anchor placement on both sides of the curtains. Curtains were suspended off of the lake floor to allow some passage of water and to avoid resuspension of sediment associated with contact between the curtains and the bottom sediments.

During construction of the East dike, elevated concentrations of TSS were measured in the lake, bypassing the turbidity barriers and causing a downstream TSS plume. A full investigation and review of the cause(s) of such an event took place in the fall of 2008. Based on that investigation, the following methods for the Bay-Goose dike are proposed.

Bay-Goose Dike

Similar to the construction of the East Dike in Second Portage Lake, the fine lakebed sediments, especially in the deep areas of Third Portage Lake, are expected to be entrained into the water column during construction of Bay-Goose Dike. However, the construction area required for building Bay-Goose Dike represents a relatively small portion of Third Portage Lake. Therefore, it is anticipated that turbidity barriers can be successfully deployed to enclose the construction area and be extended to the bottom of the lake for most of their deployment.

Figures 2 and 3 show the proposed configurations of turbidity barriers for the Bay-Goose Dike construction. The Bay-Goose Dike construction is designed to be built in two stages over two open water seasons. The figures show the opening locations, where the barriers would not cover the full water depth. These openings would allow exchange of low turbidity level water between the enclosed construction areas and the remainder of Third Portage Lake.

The proposed turbidity barriers for the north section of Bay-Goose Dike would extend to the bottom of the lake, except for the openings shown on Figure 2. During the period when the construction activities would occur at the northern portion of this dike, only the openings to the south would be active and the north openings would be closed. This would maximize the travel time for the entrained solids and provide additional opportunity for them to settle before leaving the area enclosed by the barriers. Similarly, during the period when the construction activities would occur at the southern portion of this dike, only the openings to the north would be active and the south openings would be closed.

The proposed turbidity barriers for the south section of Bay-Goose Dike would be extended to the bottom of the lake, except for the openings shown on Figure 3. During the period when the construction activities would occur at the eastern portion of this dike, only the openings to the west would be active and the east openings would be closed. This would maximize the travel time for the entrained solids and provide greater settling opportunity. Similarly, during the period when the construction activities would occur at the western portion of the dike, only the openings to the east would be active and the western openings would be closed.

Compared to other possible turbidity control measures (e.g., dredging), turbidity barriers are relatively inexpensive and easy to implement, and do not require the subsequent handling and treatment of large volumes of water and solids. However, turbidity barriers do require continuous maintenance to retain their effectiveness. A barrier could be damaged by the action of lake currents or be pulled into the water (i.e., submerged) due to the weight of sediment that could potentially accumulate at its base. Consequently, the barriers will receive constant inspection and any compromised sections will be replaced as soon as damage or submergence is noticed.

A turbidity barrier is a temporary structure and should be designed to sustain the pressure of lake currents induced by a 10-year return period design wind event. This criterion should be applied to determine the number of anchors required in the deployment of the turbidity barriers. The distance between the dike and the barrier should be decided in part based on the lake bathymetry. Deployment should be avoided on the face of steep slopes to prevent the potential accumulation of sediment at the foot of the barrier. Consideration of the presence of high value fish habitat may also be required. Custom built (Type 2 or 3 DOT) barriers will be needed for the deep portions of the lake to the east of Bay-Goose Dike.

Additional barriers would be deployed as follows (see Figures 2 and 3):

- Secondary rows of turbidity barriers would be placed along the footprint of Bay-Goose Dike to further constrain the movement of suspended solids within the construction area; and
- Lateral rows of turbidity barriers could be placed to increase the length of flow pathways within the construction areas.

Both options are intended to promote or enhance settling of suspended solids within the construction area. The secondary and lateral barriers would not extend over the full depth to allow water movement within the construction area. Final deployment locations of the barriers will be determined based on the results of a field survey prior to construction. Furthermore, adjustment to the final locations may be required based on the site conditions at the time of the deployment.

South Camp Dike

The South Camp Dike is planned to be built in the winter of 2009 in an area where ice cover is anticipated to extend to the lakebed, and negligible to no exchange of water is expected between the construction area and the lake. Therefore, the deployment of turbidity barriers is not anticipated to be necessary during South Camp Dike construction. Nevertheless, additional turbidity barriers will be maintained on site and deployed if required.

4.2 STANDARD OPERATING PROCEDURES FOR MONITORING AND MANAGEMENT

The Standard Operating Procedure (SOP) for monitoring and management of suspended sediments during dike construction is shown in Figure 4. Importantly, the SOP strives for proactive prevention and mitigation of problems. Monitoring will be conducted during daylight hours when conditions are safe for small craft.

The SOP contains the following key elements:

1. Routine TSS monitoring will include three monitoring events per day (weather/logistics permitting), approximately every six hours during daylight. Each monitoring event will include (a) inspection of silt curtain integrity/deployment, and (b) measurement of TSS/turbidity at one or more established stations (see #3 for more details).

2. Routine water quality will also be conducted on a weekly basis. Water quality sampling parameters include:

    a. Physical parameters: hardness, pH, total dissolved solids, total suspended solids;

    b. Anions and nutrients: ammonia, alkalinity – bicarbonate, alkalinity – carbonate, alkalinity – hydroxide, alkalinity – total; chloride, silicate, sulfate, nitrate, nitrite, total kjeldahl nitrogen, orthophosphate, total phosphate;

    c. Organic parameters: chlorophyll a, dissolved organic carbon, total organic carbon;

    d. Total and dissolved metals.

3. Stations for routine monitoring will be established on the outside of silt curtains, within 100 meters of the silt curtains (Figure 1 shows the sampling locations for the East dike; the sampling locations for the Bay-Goose dike will be designed in a similar manner). Not all stations will be sampled every event – for example, at the start of construction, stations that are located near the opposite side of the lake from the construction area might be sampled only periodically.

4. Construction crews will be responsible for immediately reporting any obvious silt curtain problems if they observe problems before the monitoring crew.

5. If there is a silt curtain problem, it will be immediately fixed.

6. If TSS levels (or turbidity as a surrogate) in a single sample exceeds the Short Term Maximum, this will trigger a series of actions. First, the silt curtain will be inspected in

more detail to identify any obvious problems. If there are no obvious problems, mitigative measures will be considered such as adjusting construction practices if possible (e.g., more careful placement of materials), modification of silt curtain deployment, or deployment of additional silt curtains. Second, monitoring frequency for the affected area (the station of interest plus direct neighbour stations) will be increased (1 to 4 hour intervals depending on the magnitude). Third, any plumes will be delineated spatially using a grid of monitoring stations and taking the maximum TSS (turbidity) concentration in the water column (based on depth profiling).

7. As monitoring continues, a moving 24-hour average TSS concentration will be calculated at each monitoring station. If the 24-hour average exceeds the Short Term Maximum, AEM will provide a recommended course of action to regulators.

8. If the 7-day moving average TSS concentration exceeds the maximum monthly mean, this will trigger a series of actions. First, we will first determine if the average has been heavily influenced by one or more events that have been addressed. Second, mitigative options will be considered such as re-deployment of silt curtains, deployment of additional silt curtains, and possible adjustments to construction practices.

9. If the 30-day moving average Maximum Monthly Mean is exceeded, AEM will provide a recommended course of action to regulators.

10. Follow-up monitoring of the benthic community will be conducted if significant sediment plumes are identified. While it would be expected that any adverse effects from sediment deposition would not be permanent, plume deposition areas will be monitored in the year following construction (and the next year if significant adverse effects are found). A control-impact design will be used to test for differences in benthic community (e.g., abundance and diversity) between the deposition area and an area (similar depth and substrate characteristics) unaffected by construction activities.

11. High value habitat identified in close proximity to the construction areas will be subject to a higher level of protection (i.e., lower trigger values for TSS) than other areas during the fall spawning season; sediment deposition rates will also be monitored in the high value habitat areas using sediment traps. High value habitat areas will be determined prior to the start of construction. Results will be compared across monitoring points and to existing literature on effects of deposited sediment.

SECTION 5 • WATER QUALITY AND LAKE LEVEL MONITORING AND MANAGEMENT PLAN FOR DEWATERING

5.1 WATER QUALITY MONITORING AND MANAGEMENT DURING DEWATERING ACTIVITIES

During dewatering, there is potential for sediment to become suspended as exposed substrates slump. Suspended sediment could then enter the water intake(s) and be discharged to Third Portage Lake. In addition, the discharge itself could disturb the bottom sediments in Third Portage Lake and lead to increased levels of suspended sediment. The following plans will mitigate against possible problems with suspended sediment and other key parameters (i.e., pH and aluminum) during dewatering:

1. Intake pipe(s) will be located at a sufficient distance from shore (minimum 10 meters) and, to the extent possible, in areas with highest water depth. As dewatering progresses, intakes can only be located in deep basins.

2. The discharge will be located in an area of Third Portage Lake where there is deep, low-value habitat.

Monitoring during dewatering will be primarily focused at the pump intakes, but will also include the receiving environment of Third Portage Lake. Unlike monitoring during dike construction, where turbidity was used solely as a real-time surrogate for estimating TSS (see Section 4), turbidity measurements will be used two-fold: as a surrogate for TSS (using an established site-specific relationship) and directly as an indicator of water clarity.

5.1.1 Standard Operating Procedure for Monitoring And Management

The Standard Operating Procedure (SOP) for monitoring and management of suspended sediments and other key parameters during dewatering is shown in Figure 5. Importantly, the SOP strives for proactive prevention and mitigation of problems. Monitoring will be conducted under direction of AEM’s environmental supervisor on-site. Note that while Figure 5 focuses on TSS, turbidity and the other dewatering parameters specified in the water licence follow a similar approach.

The SOP contains the following key elements:

1. Routine monitoring of TSS/turbidity in the water intake pipe(s) at a minimum of once each day, and visually inspecting the impounded area for sediment slumps and/or resulting plumes. Turbidity will be measured by opening a valve on the intake pipe and extracting a sample of water into a bucket.

2. Monitoring for other required parameters (i.e., pH and aluminum) at the water intake once a week; water samples will be collected in the same manner as described above for the turbidity sample.

3. Initial confirmation monitoring in the receiving environment to ensure that the discharge is not re-suspending sediment from the bottom of Third Portage Lake. Three days before dewatering begins and 5 days after dewatering begins, TSS will be monitored in the receiving environment (30 - 100 meters from end-of-pipe, dependent on ice conditions) to ensure that TSS/turbidity in the receiving environment are not being affected by the physical location of the discharge pipe.

4. Following the initial confirmation monitoring, TSS/turbidity will be measured in the receiving environment on a weekly basis. Monitoring will take place approximately 30 - 100 meters from end-of-pipe, dependent on stable ice conditions during ice-up.

5. If parameter levels in a single sample of the intake water exceed the STM, this will trigger a series of actions. First, visual inspections will try to identify any obvious source of slumping on the lake edges to determine if the source of sediment is likely to be short-term or more continuous. Second, monitoring frequency for the intake will be increased to hourly. Third, mitigative measures will be considered, such as movement of the intake pipe(s) and/or the use of the water treatment system.

6. If the moving 24-hour average TSS or turbidity value exceeds the STM, then dewatering will shut down while (a) mitigative measures are considered, (b) monitoring continues, (c) weather shifts (if weather is a factor), and (d) AEM provides an appropriate course of action to regulators. Dewatering will resume once the conditions that led to the elevated TSS/turbidity levels have been addressed.

7. At the same time, whenever the moving 24-hour average TSS/turbidity value at the water intake or in the receiving environment exceeds the STM, any plumes in the receiving environment will be delineated spatially. Before ice-up, this would involve sampling turbidity at 100-m intervals from the main receiving environment station, along a grid pattern until the plume is bounded. After ice-up, monitoring will be more challenging. At the least, holes will be drilled through the ice at two stations adjacent to the end-of-pipe receiving environment station. If elevated TSS concentrations are detected at these stations (based on maximum along the depth profile), more holes will be drilled, moving outwards along the 100-m grid, subject to safety concerns on the ice. All receiving environment TSS/turbidity values will be compared to the respective receiving environment triggers for plume delineation.

8. If the 7-day moving average TSS concentration at the water intake exceeds the MMM, this will trigger a series of actions. First, visual inspections will try to identify any obvious source of slumping on the lake edges to determine if the source of sediment is likely to be short-term or more continuous. Second, monitoring frequency for the intake will be increased to hourly. Third, mitigative measures will be considered, such as movement of the intake pipe(s) and/or the use of the water treatment system.

9. If the 30-day moving average Maximum Monthly Mean is exceeded, then dewatering will shut down while (a) mitigative measures are considered, (b) monitoring continues, and (c) AEM provides an appropriate course of action to regulators. Dewatering will resume once the conditions that led to the elevated TSS levels have been addressed.

10. Follow-up monitoring of the benthic community will be conducted if significant sediment plumes are identified. While it would be expected that any adverse effects from sediment deposition would not be permanent, plume deposition areas will be monitored in the year following dewatering (and the next year if significant adverse effects are found). A control-impact design will be used to test for differences in benthic community (e.g., abundance and diversity) between the deposition area and an area (similar depth and substrate characteristics) unaffected by dewatering activities.

5.2 LAKE LEVEL MONITORING DURING DEWATERING ACTIVITIES

In addition to the monitoring and management of suspended sediments, a hydraulic monitoring plan has been developed to monitor the following components:

- Water levels in Third Portage Lake on a regular and event basis;
- Outlet erosion inspections to monitor outlet stability, including potential erosion and/or debris accumulation within the outlets.

Third Portage Lake water levels will be monitored by visual inspection of a staff gauge located at sufficient distance from the outlets to limit potential lake level drawdown effects, and will be surveyed in actual elevation to ensure that the water elevation can be calculated from the reading. Lake water levels will be monitored regularly during the freshet and ice-free period based on scheduled visual readings of the staff gauge twice weekly during periods of high flow in freshet (mid-May to June) and weekly during the remainder of the ice free period prior to freeze up. The event based lake level inspection program will take place following heavy rainfall or prolonged rainfall events as they occur.

An erosion inspection plan for the central and easternmost outlets will be established to monitor outlet stability once the westernmost channel is blocked off. Specifically, the central and eastern outlets will be visually inspected to confirm that no significant erosion of the channel bed or channel banks, or accumulation of debris (including ice blocks), has occurred since the last inspection that warrants remediation, and that the channel capacity is adequate for the anticipated discharges. The regular inspection program during the snowmelt and ice free period will be based on a schedule of visual inspections twice weekly during the freshet period (approximately mid-May to June) and minimum every two weeks during the remainder of the ice-free period prior to freeze up. Significant debris accumulations observed within the outlets will be removed as soon as possible in order to minimize potential reductions in channel capacity. Additional visual inspections of each outlet will be completed following heavy rainfall or prolonged rainfall events as they occur.

SECTION 6 • REFERENCES

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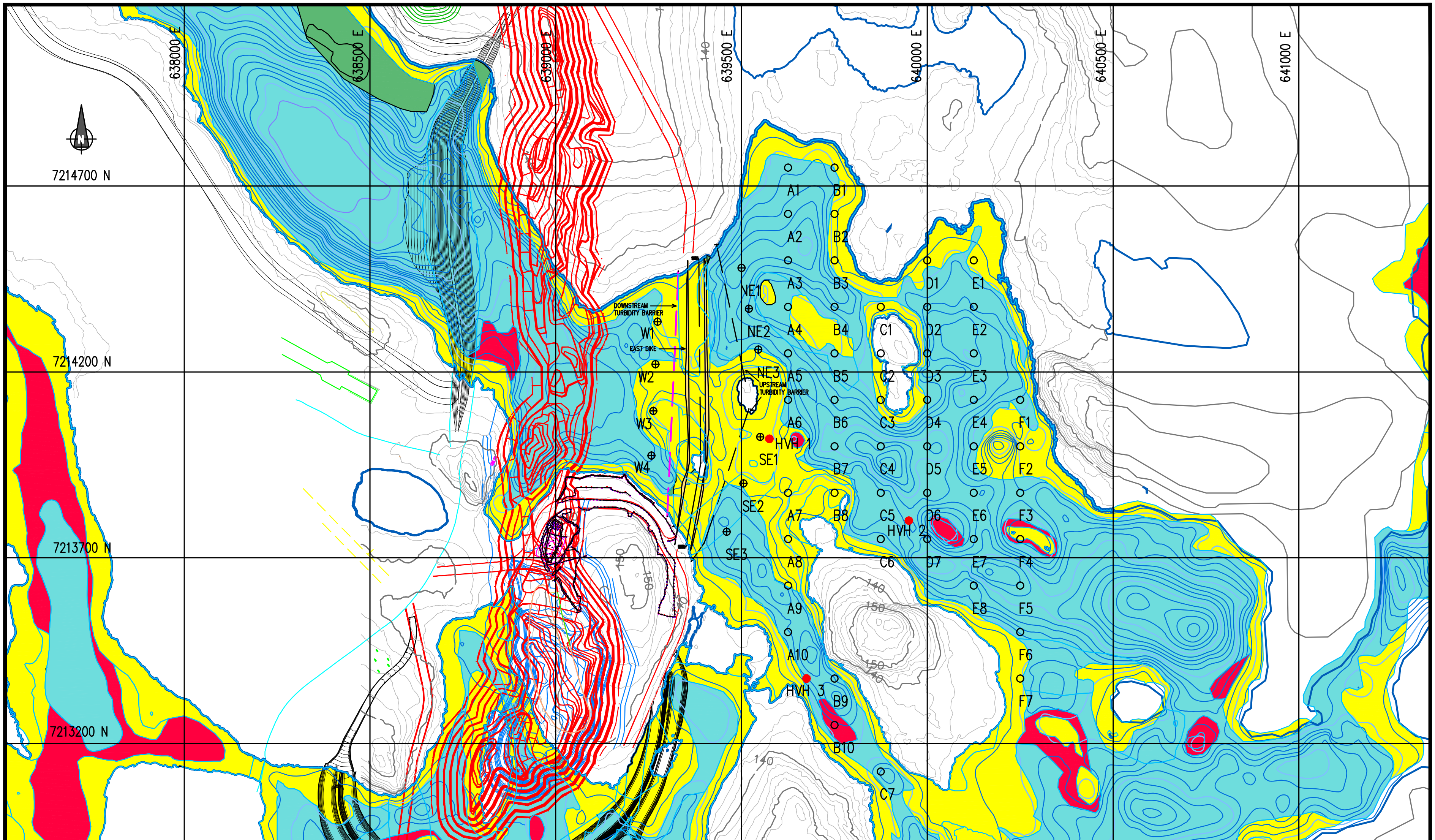

TITRE / TITLE	# DWG	REV	DESCRIPTION
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AGNICO-EAGLE
DIVISION MEADOWBANK

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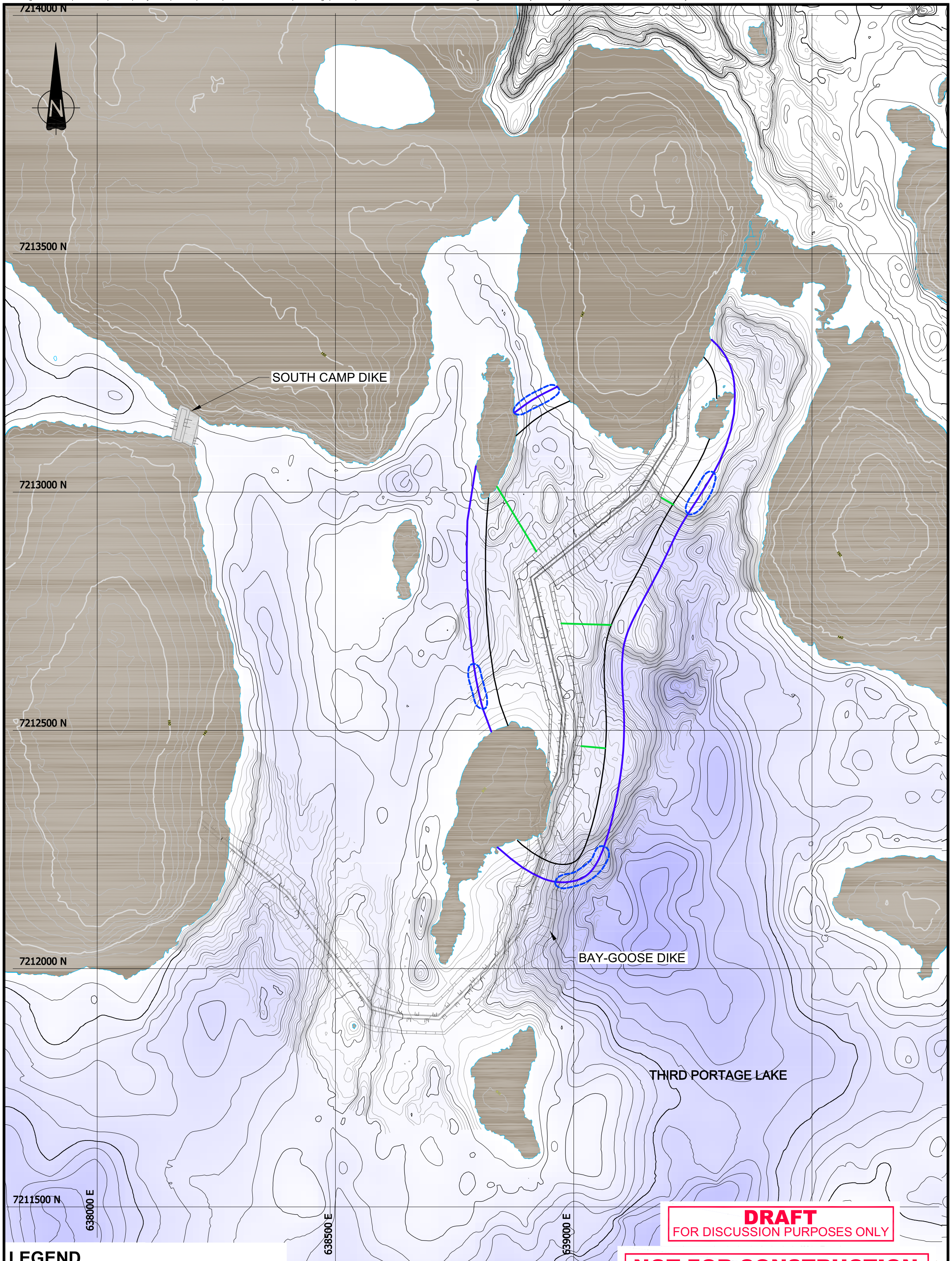
TITRE / TITLE
MEADOWBANK_GOLD_PROJECT
EAST_DIKE_CONTSTRUCTION
MONITORING_LOCATIONS

ÉCHELLE/ SCALE	FICHIER FILE	REVISION	FEUILLE/SHT PAGE/PAGES
1:10000	FCH_DESSIN		
FIGURE 1			

AE-CART-ANSI B

Drawing File: N:\Bur-Graphics\Projects\2008\1428\08-1428-0028\Drafting\6000\0814280028-6000-15_A.dwg Wednesday, January 28, 2009 9:41:25 AM By: ASalvador



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FOR DISCUSSION PURPOSES ONLY

NOT FOR CONSTRUCTION

LEGEND

- Lake Bottom Elevation, 10m Interval
- Lake Bottom Elevation, 2m Interval
- Lake Bottom Elevation, 0.5m Interval
- Shoreline
- Topography Elevation, 10m Interval
- Topography Elevation, 2m Interval
- Turbidity Barrier
- Proposed Location of open Barrier
- Secondary Turbidity Barrier
- Lateral Turbidity Barrier

0 75 150 225 300 375
SCALE IN METRES

NOTES

1. All contours are expressed as elevations.

REFERENCES

1. Bottom elevation data is combined from surveys in 2002, 2003, 2006, 2008.
2. Datum: NAD83 Projection, UTM Zone 14N.

PROJECT

AGNICO-EAGLE MINES LIMITED
MEADOWBANK DIVISION

TITLE

PROPOSED TURBIDITY BARRIER LOCATION FOR BAY-GOOSE DIKE - NORTH SECTION

Golder Associates
Greater Vancouver Office, BC

PROJECT No.	081428-0028		PHASE No.	6000
DESIGN	KD	17OCT08	SCALE AS SHOWN	REV. –
CADD	JK	19DEC08		
CHECK				
REVIEW				

FIGURE 13

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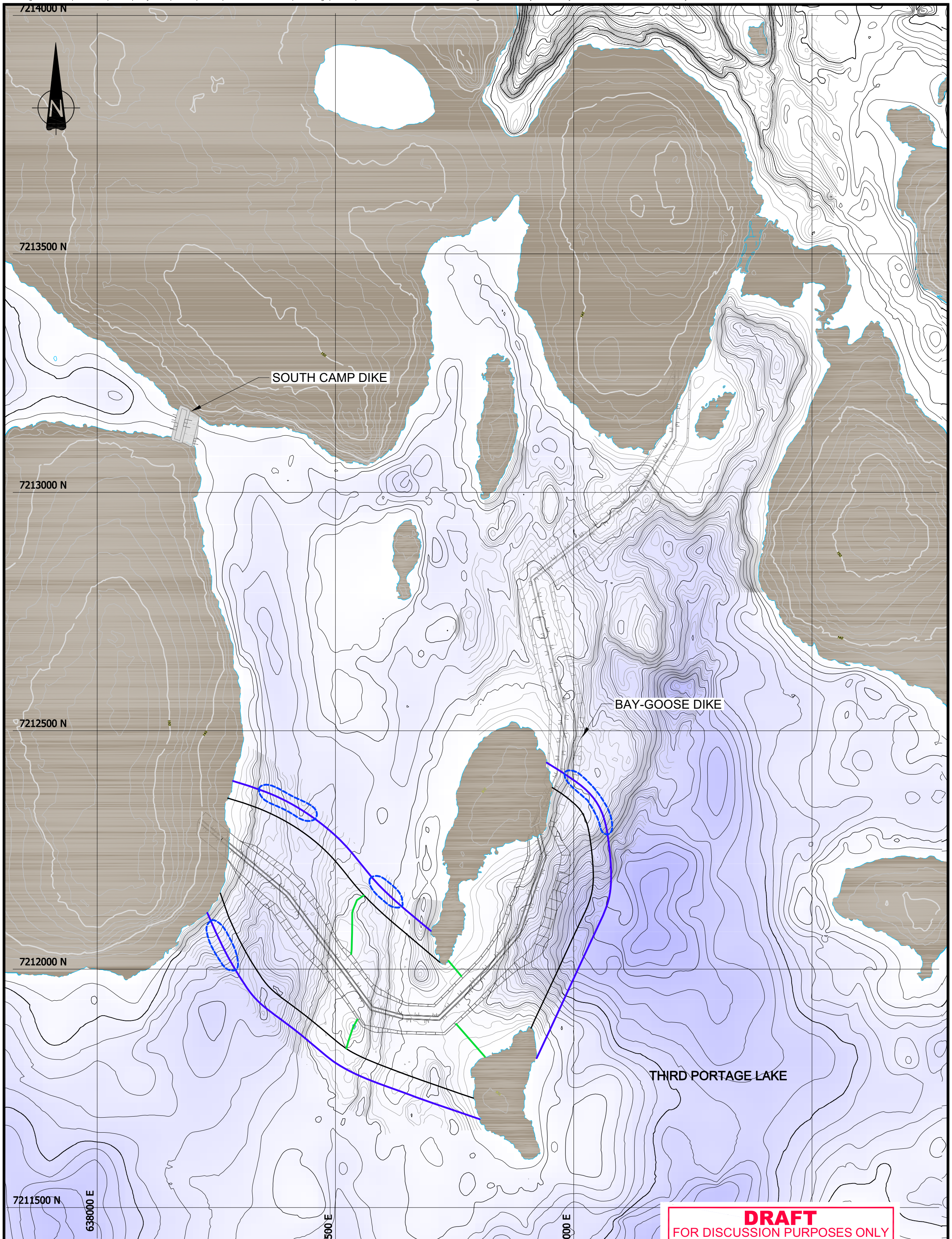

DRAFT
FOR DISCUSSION PURPOSES ONLY

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LEGEND

- Lake Bottom Elevation, 10m Interval
- Lake Bottom Elevation, 2m Interval
- Lake Bottom Elevation, 0.5m Interval
- Shoreline
- Topography Elevation, 10m Interval
- Topography Elevation, 2m Interval
- Turbidity Barrier
- Proposed Location of open Barrier
- Secondary Turbidity Barrier
- Lateral Turbidity Barrier

0 75 150 225 300 375
SCALE IN METRES

NOTES

1. All contours are expressed as elevations.

REFERENCES

1. Bottom elevation data is combined from surveys in 2002, 2003, 2006, 2008.
2. Datum: NAD83 Projection, UTM Zone 14N.

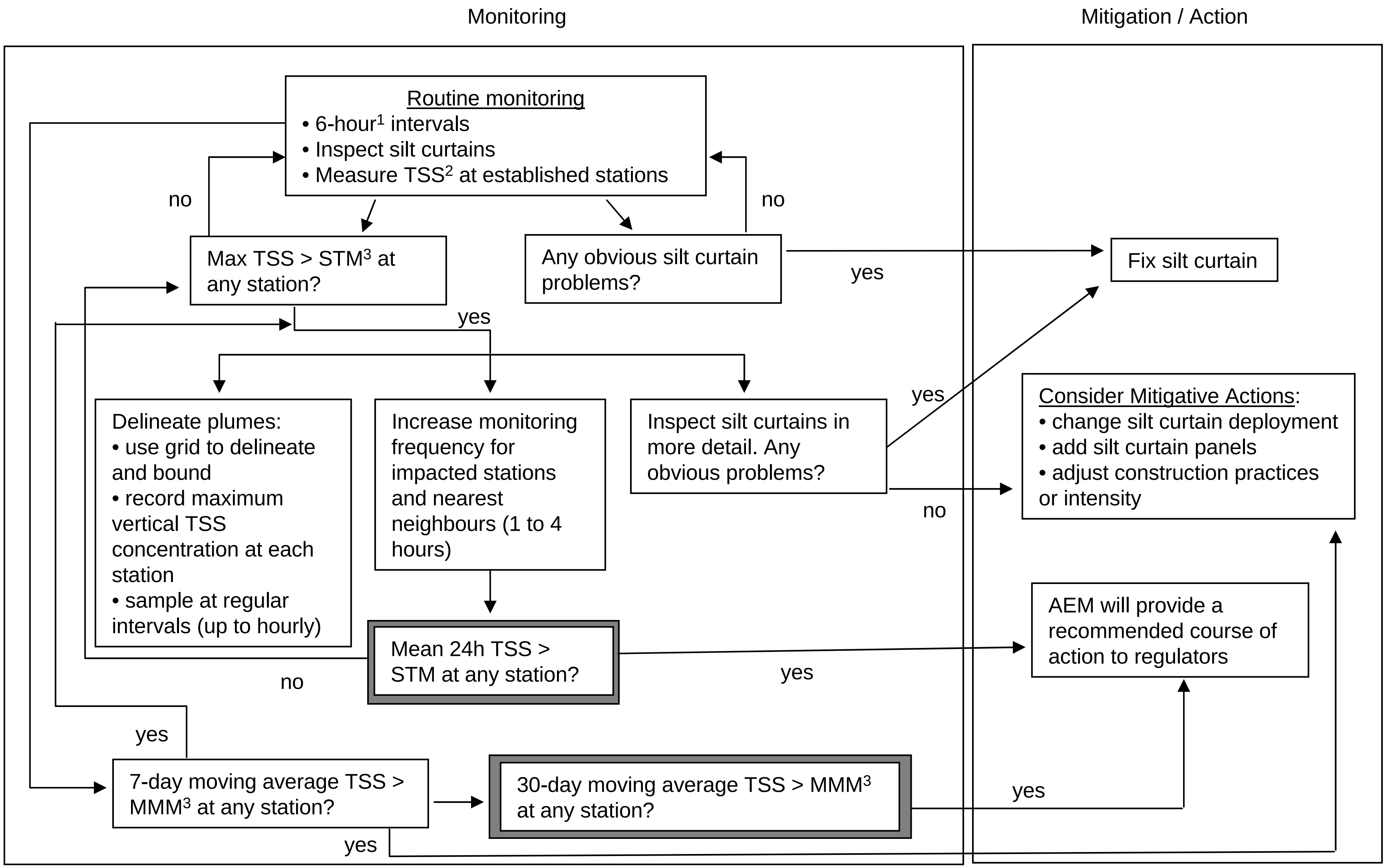
PROJECT
AEM
AGNICO-EAGLE MINES LIMITED
MEADOWBANK DIVISION

TITLE
PROPOSED TURBIDITY BARRIER LOCATION FOR BAY-GOOSE DIKE - SOUTH SECTION

Golder Associates
Greater Vancouver Office, BC

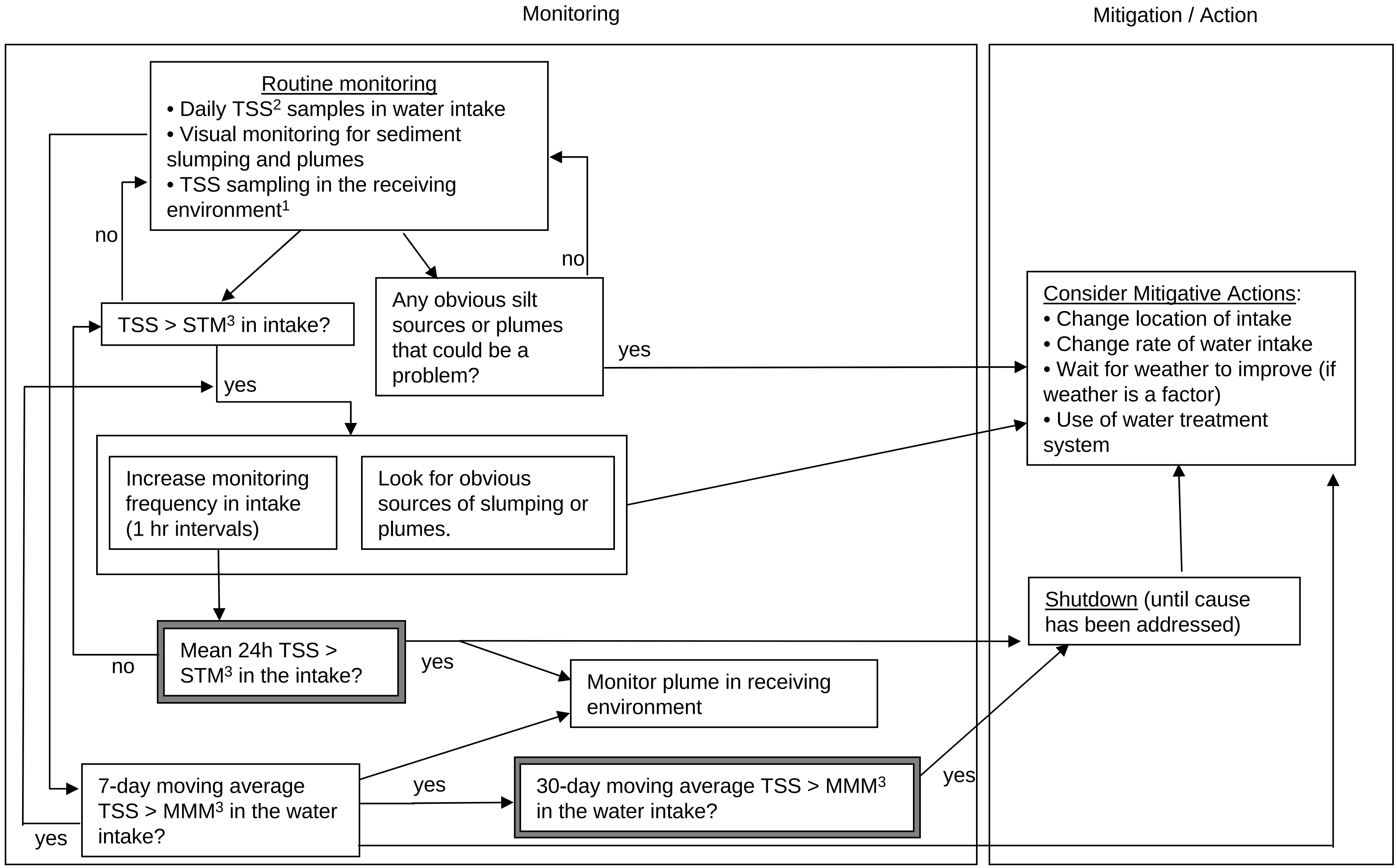
PROJECT No.	081428-0028		PHASE No.	6000	
DESIGN	KD	17OCT08	SCALE	AS SHOWN	REV. –
CADD	JK	19DEC08			
CHECK			FIGURE 14		
REVIEW					

Figure 4: Standard Operating Procedures for Suspended Sediment Monitoring and Management During Dike Construction.



Notes: 1. During daylight hours and/or weather/logistics permitting. 2. TSS will be measured using turbidity as a surrogate 3. STM = short term maximum concentration of TSS. MMM = maximum monthly mean TSS concentration.

Figure 5: Standard Operating Procedures for Suspended Sediment Monitoring and Management During Lake Dewatering.



Notes: 1. monitoring 3 days prior to start and 5 days after start of dewatering; weekly thereafter 2. TSS will be measured using turbidity as a surrogate 3. STM = short term maximum concentration of TSS; MMM = maximum monthly mean TSS concentration