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From: Tyree Mullaney [tyree@mvlwb.com]
Sent: Monday, December 14, 2009 4:41 PM
To: permits@mvlwb.com
Subject: FW: YZF SNP Report October 2009 MV2001L3-0012
Attachments: YZF SNP October 2009 FINAL.pdf

Please post to the registry.

Thanks,

Tyree Mullaney
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From: Jon Posynick [mailto:Jon_Posynick@gov.nt.ca]
Sent: December-11-09 2:59 PM
To: tyree@mvlwb.com
Subject: YZF SNP Report October 2009

Ms. Mullaney,

Please find the attached Yellowknife Airport (YZF) Surveillance Network Program Report for October 2009.

If you have any questions, please contact me at the information below.

Regards,

Jon Posynick

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***DEPARTMENT OF TRANSPORTATION
GOVERNMENT OF THE NORTHWEST TERRITORIES***

Surveillance Network Program

**MV2001L3-0012
Water Quality Report, October 2009**



**November 2009
Planning, Policy and Environment Division
Department of Transportation**

Table of Contents

1.0 Background	2
2.0 Introduction	2
3.0 Sampling Locations	2
4.0 Materials	3
5.0 Methods	3
6.0 Results and Discussion.....	4
6.1 Glycols	4
6.2 COD	4
6.3 E. coli and Coliforms.....	5
7.0 Conclusion	5

Appendix A: Quality Assurance/Quality Control

Appendix B: Table 1: Lab Results For Water Licence N1L8-1728

1.0 BACKGROUND

The Yellowknife Airport is in close proximity to Long Lake. As per Water License MV2001L3-0012, Part B, Item 3, a Surveillance Network Program (SNP) was developed to monitor environmental impacts of aircraft deicing and maintenance garage activities at the Yellowknife Airport. The Department of Transportation (DOT) conducted sampling at various stations located across the highway at Long Lake, adjacent to the airport's main apron, Taxiway 'C' and infield areas.

2.0 INTRODUCTION

Surface and ground water samples were obtained from SNP stations S1, W4, and L1, L2, L4, L5. Samples were analyzed for the following parameters: chemical oxygen demand (COD), and glycols.

The sampling procedure followed the sampling protocol as set out by the Canadian Environmental Protection Act Glycol Guideline. Please refer to the Quality Assurance and Quality Control (QA/QC) Program in Appendix 'A' for information regarding the sampling techniques used.

Mr. Jon Posynick, Environmental Analyst-Intern and Ms. Terri Bugg, Environmental Analyst completed water sampling for the October 2009 Sampling Network Program (SNP).

3.0 SAMPLING LOCATIONS

<u>Station number</u>	<u>Description</u>
S1	Surface water located on Highway #3, near west end of culvert. 11 V 631835 6929030
W4	Groundwater monitoring well located west of ATB tile field. 11 V 631924 6929401
L1	Located on Long Lake, approximately 200 m to the North of the ATB. 11 V 632189 6929332
L2	Located on Long Lake, approximately 200 m to the North of the ATB. 11 V 632197 6929319

- L4 Located on Long Lake, approximately 200 m to the North of the ATB.
11 V 632231 6929321
- L5 Located on Long Lake, approximately 200 m to the North of the ATB.
11 V 632324 6929338

4.0 MATERIALS

Field-testing using an OAKTON 35630-00 Portable pH meter could not be completed as the meter is in need of repair due to meter damage at the time of sampling. Samples were obtained in correlation with appropriate procedures as outlined in the QA/QC program (Appendix A). All samples were collected in bottles supplied by Maxxam Analytics Inc. and were not re-used.

5.0 METHODS

Station S1 was sampled on September 25, 2009 and then again on October 8, 2009. S1 was sampled during adequate volume and flow. Samples for station S1 were collected by submerging a bottle in a flowing area of water with the mouth of the bottle pointed downstream.

Groundwater monitoring well sampling from site W4, was completed by purging the wells on October 7, 2009 and sampling 24 hours later. Purging and sampling were conducted using a disposable bailer. The well at site W3 did not contain water and therefore was not sampled. Weather at the time of purging and sampling was mostly cloudy, windy; approximately -3°C and it had been snowing off and on.

Sampling at the Glycol Retention Facility (GRF) was completed on October 8, 2009. The GRF was sampled prior to removal of the contents in order to make room for more glycol impacted snow during the 2009/10 de-icing season. During sampling there was a 5 cm sheet of ice covering the GRF. A hole was broken through the ice and sampling bottles were submerged to attain the sample. Weather at the time of sampling was mostly cloudy, windy; approximately -3°C and it had been snowing off and on.

On September 25, 2009 station's L1, L2, L4, and L5 were located with a *Garmin etrex Legend* handheld GPS and samples were gathered via canoe as these sites are located on Long Lake, away from shore. Weather at the time of sampling was approximately 10°C, mostly sunny, and windy.

Sampling preservation and storage of surface water samples for laboratory analysis was conducted according to the guidelines provided by Maxxam

Analytics Inc. Latex or Nitrile gloves were worn when collecting and handling all samples.

6.0 RESULTS AND DISCUSSION

Table 1, of the Tables section, provides a summary of the laboratory analysis of glycols at the sampling stations.

6.1 Glycols

In 2007, the runway de-icing area was repaved and re-graded to minimize runoff entering into Long Lake. Also, the glycol retention facility was created to reduce the levels of glycol entering Long Lake. The glycol retention facility is a bermed and lined facility with a 750,000 L capacity. A number of measures have been implemented to reduce the loss of de-icing fluids into the surrounding environment at YZF including the North Apron Expansion project, in which the existing apron was expanded to the north and the de-icing bay was re-contoured; construction of the glycol retention facility (GRF), a bermed and lined facility with a 750,000 L capacity, to receive 'pink snow' collected from the de-icing area by Airport Maintenance crews; and ongoing monitoring and sampling of glycol use at the airport. Currently, DOT is finalizing a Glycol Management Plan for the Yellowknife Airport, YZF.

Results above CCME Guidelines for the Protection of Aquatic Life were found at the Glycol Retention Facility on October 8, 2009. The result for ethylene glycol was found at 520 mg/L which is above the CCME guideline of 192 mg/L. and over the 100 mg/L threshold (CEPA), specified in the water license, to allow discharge of liquid contained in the GRF. This year's ethylene glycol level is lower than the level obtained in October 2008, of 4000 mg/L, which prevented discharge of liquid in the GRF at that time due to being over the discharge threshold of 100 mg/L. In comparison with last years level, we are seeing a decrease likely due to the natural attenuation of glycol over time caused by interaction with the surrounding environment. However, it is unlikely that the GRF will reach the CEPA regulated level for glycol water discharge of 100 mg/L, as a result DOT has explored options and new technologies designed at reaching and maintaining the 100 mg/L level for stored glycol water.

Propylene glycol (PG) results were also found to be above the 100 mg/L (CEPA) as specified in the *License Conditions* of the water license. Similarly to ethylene glycol, PG is biodegradable over time. There is an increase in PG at the GRF when compared to results from October 2008 where the level was found at a concentration of 36 mg/L. This is likely a result of increased use of Propylene glycol during the winter months during which time glycol contaminated snow would have been moved to the GRF.

All other GRF results were found below CCME guidelines for the Protection of Aquatic Life and those set out in CEPA.

The GRF had a sheet of ice covering its surface that was approximately 5 cm thick. At the bottom of the GRF there is a layer of gravel which is currently covered by an orange-coloured algae-like substance that has formed. There was no detectable odor present at the time of sampling.

At site W4 the ethylene glycol level was found to be at 160 mg/L while the propylene glycol level was found to be at 470 mg/L. These elevated levels are directly attributable to de-icing activities which began on September 27, 2009 at the Yellowknife Airport. In particular, Air Canada Jazz and Canadian North use Propylene Glycol as a part of their de-icing program, and both have reported using glycol prior to DOT purging and sampling. Elevated levels at site W4 are of concern because glycol accumulates in the frozen ground over the winter. Once Freshet begins the concentrated and frozen glycol is released and moves through the groundwater table below the de-icing pad and eventually to site S1 and finally Long Lake.

The increase in propylene glycol at W4 is an indication of use due to de-icing activities occurring prior to purging and sampling.

Sampling at the GRF was carried out prior to issuance of a tender for glycol removal services to remove liquid from the GRF to a location in Alberta for disposal.

6.2 COD/BOD

As glycol is aerobically biodegraded, it places a high oxygen demand and reduces dissolved oxygen concentration levels. Chemical oxygen demand is a useful measure of water quality in that it quantifies (mg/L) the amount (mg) of oxygen consumed by the decomposition of organic (biodegradable) pollutants (i.e. glycol) and oxidation of inorganic pollutants, per litre (L) of solution. Glycol can reduce oxygen levels to below recommended levels even at concentrations below the guidelines, which is why it is an important parameter to monitor. Anaerobic metabolism of glycol can produce toxic byproducts like acetaldehyde, ethanol, acetate and methane.

Biochemical oxygen demand (BOD) is used to measure (mg/L) the amount (mg) of dissolved oxygen used by organic pollutants, per litre (L) of solution. However, the water license (MV2001L3-0012) requires that COD and glycols are monitored at the GRF two weeks prior to discharge and at site S1. BOD is likely not required since the test for COD encompasses both organic and inorganic pollutants.

Chemical Oxygen Demand (COD) was found to be at 4600 mg/L at the GRF and is high when compared with the levels found at L1 (16 mg/L), L2 (10 mg/L), L4 (11 mg/L), and L5 (14 mg/L). Aside from the biodegradation of glycol, the high level of COD at the GRF (relative to levels at Long Lake) could be attributed to any number of factors as the two sites are not similar in size, depth, or volume; Long Lake is constantly moving, causing vertical mixing of layers and aeration of the water, whereas the GRF is a small, stagnant pond. The sheet of ice covering over the GRF would limit interaction of the liquid with the surrounding air even further, thereby contributing to an environment where COD would be high.

DOT monitors COD and glycol levels because of the potential impacts on aquatic life and within surrounding aquatic habitats that high levels of glycol and low levels of available oxygen can have.

6.3 E. coli and Coliforms

In 2005, the airport septic system was changed from utilization of a septic leaching field to a septic pump system. Therefore, the license monitoring requirements for E.coli and Coliforms were removed. It should be noted that during sampling on October 8, a strong sewage odor was present at S1 and may be due to anaerobic degradation of glycol products in the groundwater table since a similar sewage odor is present at the GRF.

7.0 CONCLUSION

Levels at sites S1, L1, L2, L4, and L5 were well within the thresholds as indicated by the CCME Guidelines for the Protection of Aquatic Life, and as set out in the License itself. Since it is a reflection of glycol use during the summer months when there is no de-icing activity, low levels of glycol and COD are expected at these sites during the fall season.

Elevated levels at the GRF and at site W4 are most likely associated with weather conditions and de-icing activities at the time of sampling.

When compared with the levels from the May 2009 SNP Report, the levels at S1 were considerably lower for Ethylene Glycol and COD. The elevated levels in May were most likely due to the timing of sampling and the occurrence of freshet.

Another round of sampling will be conducted for this water license in the spring, 2010.

APPENDIX A

Quality Assurance/Quality Control Program

***Department of Transportation
Government of the Northwest Territories***

***Yellowknife Airport
Water License MV2001L3-0012***

Quality Assurance/Quality Control Program



May 2009

Table of Contents

1.0 Introduction	2
2.0 Sample Collection	2
2.1 Sampling Locations	2
2.2 Sampling Equipment	3
2.3 Sampling Methods	4
3.0 Sample Handling	5
3.1 Sample Preservation	5
3.2 Sample Identification	6
3.3 Sample Transportation	6
4.0 Lab Analysis	6
4.1 Lab Requirements	6
4.2 Lab Reporting Requirements	6

1.0 INTRODUCTION

The purpose of this Quality Assurance /Quality Control (QA/QC) document is to outline methods for the collection, sampling, handling and storage of Yellowknife Airport water samples.

2.0 SAMPLE COLLECTION

2.1 LOCATION

The sampling sites are located along Long Lake, airside at the Yellowknife Airport, off the side of Highway #3 by the airport, in Long Lake and at the Maintenance Garage.

<u>Station number</u>	<u>Description</u>
S1	Surface water located on Highway #3, near west end of culvert. 62°28'40" N, 114°26'31" W
S3	Surface water located north-west of S1, along west side of Highway #3. 62°28'45" N, 114°26'34" W
L1	Long Lake, approx. 30 meters from shoreline (632189 mE, 6929332 mN)
L2	Long Lake, approx. 30 meters from shoreline (632197 mE, 6929319 mN)
L3	Long Lake, approx. 30 meters from shoreline (632199 mE, 6929299 mN)
L4	Long Lake, approx. 60 meters from shoreline (632231 mE, 6929321 mN)
L5	Long Lake, approx 100 meters from shoreline (632324 mE, 6929338 mN) (control)
WELL 3	Groundwater monitoring well located east of ATB septic leaching field. (62°28.281'N, 114°26.466' W)
WELL 4	Groundwater monitoring well located west of ATB septic leaching field. (62°28.334' N, 114°26.466' W)
WELL 5	Groundwater monitoring well located north of ATB septic leaching field. (62°28.358' N, 114°26.523' W)
MG1	Groundwater monitoring well located approximately 15 meters north of the YZF maintenance garage.

2.2 SAMPLING EQUIPMENT

At each of the sampling locations, an OAKTON 35630-00 Portable pH meter will be used to measure pH and temperature. The portable field meter will be calibrated with standard solutions prior to commencing the field tests and will also be rinsed with distilled water between samples. Latex or nitrile sampling gloves will be worn to prevent cross contamination.

In addition to field-testing, water samples will also be collected at each of the sampling locations. Maxxam Analytics will analyze these samples. The parameters to be analyzed by Maxxam include: total coliforms, *Escherichia coli*, biological oxygen demand (BOD), chemical oxygen demand (COD), nitrates, nitrites, ammonia, total phosphorous, total ammonia, glycol and metals. In addition, some samples will be examined for the different types of glycol (mainly ethylene glycol, diethylene glycol, and propylene glycol), as per the SNP requirements. Maxxam Analytics will transport these samples to a recognized laboratory in the south for analyses.

The samples will be collected, handled, and stored in accordance with the appropriate protocols for each parameter. Bottles supplied by the laboratory will be used at every sampling site and will not be re-used. Latex or nitrile sampling gloves will be worn by those collecting and handling the samples.

The equipment required for the various samples is as follows:

- Equipment supplied by the laboratory for analyzing nitrates is a 250mL plastic bottle.
- Equipment supplied by the laboratory for analyzing nitrites is a 250mL plastic bottle
- Equipment supplied by the laboratory for analyzing ammonia is a 250mL plastic bottle. – preserved with sulfuric acid
- Equipment supplied by the laboratory for analyzing Biological oxygen demand is a 500mL plastic bottle
- Equipment supplied by the laboratory for analyzing Chemical oxygen demand is a 250mL plastic bottle. – preserved with sulfuric acid
- Equipment supplied by the laboratory for analyzing total, phosphorous is a 250mL plastic bottle. – preserved with sulfuric acid
- Equipment supplied by the laboratory for analyzing metals is a 250 mL plastic bottle. – preserved with nitric acid

2.3 SAMPLING METHODS

At each sampling location an OAKTON 35630-00 Portable pH/Con meter will be used to measure pH and temperature by placing the probe directly in the water sample. Once readings for a site have been recorded, the probe of the portable field meter will be rinsed with distilled water any impurities. Sampling gloves will be worn during testing to avoid cross contamination.

Grab samples will be taken by submerging a bottle under water, if possible with the mouth pointed downstream. Bailers will be used to collect water samples from groundwater wells. The methods to be used when sampling groundwater monitoring wells are outlined below. These have been taken from "Soil and Groundwater Sampling Field Manual, Arctic "A" Airport Soil and Groundwater Monitoring Program" acquired from the Planning and Policy Division of the Department of Transportation.

Prior to sampling, the groundwater monitoring wells will be purged of all water then allowed to recharge for 24 hours prior to sampling.

Procedure for groundwater sampling from a monitoring well:

1. Place a clean piece of plastic sheet on the ground immediately beside the monitoring well.
2. Remove the cap from the top of the monitoring well casing. Place the cap on the plastic sheet.
3. Raise the bailer from the well using the rope already attached. As the rope is removed from the well, make sure it is placed on the plastic sheet.
4. Pour the contents of the bailer into a waste container.
5. Return the bailer to the well. Allow it to refill.
6. Repeat steps 3-4 three more times.
7. Raise the bailer from the monitoring well.
8. Fill the sample container from the bottom of the bailer (if the bailer has a bottom emptying device).
9. Seal the sample container.
10. Write the sample number on the container label.
11. Place the container in the cooler.

Samples that to be later analyzed in the laboratory will be obtained according to protocols provided by Maxxam Analytics (see below). Latex or nitrile sampling gloves will be worn when collecting and handling the samples and preservatives.

Maxxam Analytical guidelines for sampling are as follows:

- To measure nitrates the bottle will be rinsed 3 times with the sample and then filled to the shoulder and capped.
- To measure nitrites the bottle will be rinsed 3 times with the sample and then filled to the shoulder and capped.

- To measure ammonia the bottle will be rinsed 3 times with the sample and then filled to the shoulder, and preservatives (Sulfuric Acid) will be added before the bottle is capped.
- To measure biological oxygen demand the bottle will be rinsed 3 times with the sample and then filled to the shoulder and capped.
- To Measure chemical oxygen demand the bottle will be rinsed 3 times with the sample and then filled to the shoulder, and preservatives (Sulfuric Acid) will be added before the bottle is capped.
- To measure total, dissolved phosphorous the bottle will be rinsed 3 times with the sample and then filled to the shoulder, filtered, and preservatives (Sulfuric Acid) will be added before the bottle is capped.
- To measure metals the bottle will be rinsed 3 times with the sample, filled to shoulder of bottle, and preservatives (Nitric Acid) will be added before the bottle is capped.
- To measure glycol the bottle will be rinsed 3 times with the sample and the vial will be filled to ensure no headspace.

Any leftover supplies will be returned to the laboratory.

3.0 SAMPLE HANDLING

3.1 SAMPLE PRESERVATION

The guidelines provided by Maxxam Analytical for preserving the various samples are as follows:

- Samples that will be analyzed for total coliforms do not require any preservatives but will be stored at 4°C and sent to the laboratory within 24 hours.
- Samples that will be analyzed for fecal coliforms do not require any preservatives but will be stored at 4°C and sent to the laboratory within 24 hours.
- Samples that will be analyzed for Escherichia coli do not require any preservatives but will be stored at 4°C and sent to the laboratory within 24 hours.
- Samples that will be analyzed for fecal streptococci do not require any preservatives but will be stored at 4°C and sent to the laboratory within 24 hours.
- Samples that will be analyzed for nitrates will be stored at 4° C.
- Samples that will be analyzed for nitrites will be stored at 4° C.
- Samples that will be analyzed for ammonia will be stored at 4° C.
- Samples that will be analyzed for biological oxygen demand will be stored at 4° C.
- Samples that will be analyzed for total phosphorous will be stored at 4° C.
- Samples that will be analyzed for metals will be preserved with nitric acid and stored at 4° C.

- Samples that will be analyzed for glycol do not require any preservatives but will be stored at 4°C and sent to the laboratory within 24 hours.

3.2 SAMPLE IDENTIFICATION

Once samples are collected, they will be labeled with a waterproof pen. Samples will also be recorded on a chain of custody form that will include information such as the site owner's name, sampling date, time, sample ID and location. The chain of custody form will be submitted to the laboratory along with the samples; a copy will also be retained by DOT. When field testing, a log sheet will be used to record information such as: the date, time, location, sample ID and names of those conducting the testing, as well as pH and temperature.

3.3 TRANSPORTATION

The water samples will be promptly delivered to Maxxam Analytical (same day delivery) for analysis. While in transit, the sealed samples will be stored snugly, upright and immobile, in an ice-packed cooler.

4.0 LAB ANALYSIS

4.1 LAB REQUIREMENTS

Maxxam Analytical, Yellowknife will be used to analyze all samples and will supply the required bottles and preservatives for sampling. Refer to Appendix B for a list of sampling equipment and preservation methods.

4.2 REPORTING REQUIREMENTS

One field sample will be collected for each site on the sampling event date, these will be analyzed by Maxxam Analytics and the results will be included in reports.

APPENDIX B

LABORATORY RESULTS FOR OCTOBER 2009

Table 1: Laboratory analysis of water samples from sites S1, W4, L1, L2, L4, L5, and GRF

All measurements are recorded in mg/L unless otherwise indicated.

Bold text indicates results above criteria.

	CCME Guidelines for the Protection of Aquatic Life	CCME Guidelines for Drinking Water	S1		W4	L1	L2	L4	L5	GRF
Date			Sep 25	Oct 8	Oct 8	Sep 25	Sep 25	Sep 25	Sep 25	Oct 8
Parameter										
Ethylene Glycol	192	NF	<10	<10	160	<10	<10	<10	<10	520
Diethylene Glycol	NF	NF	<10	<10	<10	<10	<10	<10	<10	<10
Triethylene Glycol	NF	NF	<10	<10	<10	<10	<10	<10	<10	<10
Tetraethylene Glycol	NF	NF	<10	<10	<10	<10	<10	<10	<10	<10
Propylene Glycol	500	NF	<10	15	470	<10	<10	<10	<10	310
COD	NF	NF	NA	NA	NA	16	10	11	14	4600

NF – Not Found ND – Not Detectable N/A – Not Applicable