Concentrations of phenols, BTEX, total volatiles, or total extractables were below detection limits in the sample.

5.2.1.2 Meliadine River

Water quality samples were collected from 2 stations in the Meliadine River (Figure 5-3; Appendix B, Table B1-6):

- ML-MR (spring and fall 1997, spring and summer 1998, spring 1999, spring 2000, spring and summer 2008; the outlet of Meliadine Lake to Meliadine River); and
- MR-L (spring and summer 1998; the Meliadine River upstream of Little Meliadine Lake).

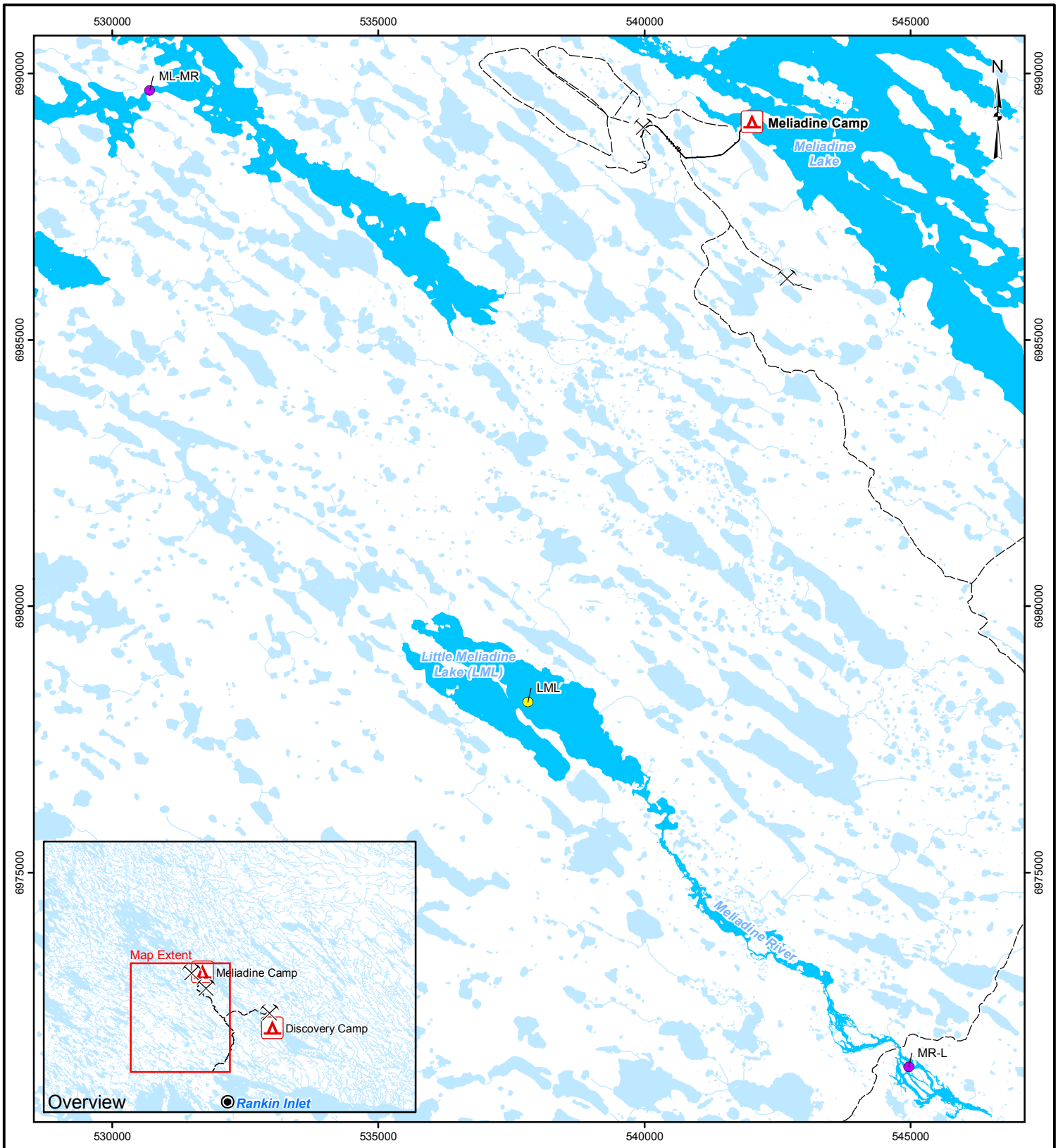
Dissolved oxygen concentrations were not measured at the ML-R station. The ML-MR station was well-oxygenated during the open water seasons with dissolved oxygen concentrations ranging from 11.1 to 16.5 mg/L and associated water temperatures from 5.6 to 12.7°C. All dissolved oxygen values were above the 9.5 mg/L CWQG for protection of early life stages of cold water fish. Field pH values ranged from 6.8 to 7.7, which were within the range of applicable guidelines.

Water quality was similar between the 2 stations and among sampling events. Field-measured conductivity ranged from 42 to 86 µS/cm. Major ions were dominated by bicarbonate (15 to 25 mg/L), calcium (5.2 to 7.6 mg/L), chloride (4.2 to 9.6 mg/L), and sodium (2.5 to 5.6 mg/L). Total alkalinity values ranged from 15 to 20 mg/L. Total hardness concentrations ranged from 16 to 24 mg/L, which indicated the waters were very soft (Table 5-3; McNeely et al. 1979). Total suspended solids concentrations were generally below detection limits (i.e., less than 3 mg/L). Total cyanide was not detected in any sample (detection limits ranged from 1 to 5 mg/L).

Nutrient concentrations were similar at the 2 stations and among sampling events. Total phosphorus concentrations ranged from 0.002 to 0.009 mg/L, lower than the guideline of 0.3 mg/L in NT and Nunavut. Total Kjeldahl nitrogen concentrations ranged from 0.11 to 0.43 mg N/L. Total ammonia was detected in less than half of the samples at concentrations ranging from 0.005 to 0.023 mg N/L. Nitrate concentrations were variable among sampling events and ranged from less than 0.005 to 0.032 mg N/L. Chlorophyll *a* concentrations were measured in 2 samples from ML-MR; concentrations were 0.355 µg/L in spring and less than 1 µg/L in summer. Total organic carbon concentrations were variable among sampling events and ranged from 1.6 to 5.1 mg/L.

Detection limits for total metals were at or below the CWQG except for cadmium, chromium, and selenium:

- Cadmium was not detected in most samples, although detection limits ranged from 0.017 to 0.1 µg/L, which were at or higher than the CWQG of 0.017 µg/L.
- Chromium was not detected in 6 samples (detection limits ranged from 0.06 to 2 µg/L). One sample from station ML-MR had a detection limit of 2.0 µg/L, which was higher than the CWQG of 1.0 µg/L for hexavalent chromium.
- Selenium was not detected in 8 samples (detection limits ranged from 0.1 to 10 µg/L). Three samples from station ML-MR had a detection limit of 10 µg/L, which was higher than the CWQG of 1.0 µg/L.



LEGEND

Water Sampling Location
- Lake
- Stream
- Camp
- Proposed Mine Site
- Proposed Road
- Watercourse
- Sampled Waterbody
- Waterbody

REFERENCE

Base data obtained from Comaplex Minerals Corporation. Water quality data obtained from the field.
Projection: UTM Zone 15 Datum: NAD 83

DRAFT

2,500 0 2,500

SCALE 1:100,000 METRES

PROJECT

COMAPLEX MINERALS CORP

COMAPLEX MINERALS CORPORATION
MELIADINE GOLD PROJECT
NUNAVUT

TITLE

WATER QUALITY SAMPLING LOCATIONS IN MELIADINE RIVER AND LITTLE MELIADINE LAKE

Golder Associates
Edmonton, Alberta

PROJECT NO. 09-1373-0010			PHASE No. 1000	
DESIGN	KS	06 Oct. 2009	SCALE AS SHOWN	REV. 0
GIS	CDB	06 Oct. 2009		
CHECK	KS	27 Oct. 2009		
REVIEW	PMC	27 Oct. 2009		

FIGURE 5-3

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Total metal concentrations were either below detection limits or below applicable guidelines with 2 exceptions:

- Cadmium concentration in one sample from ML-MR was 0.1 µg/L, which was higher than the CWQG of 0.017 µg/L. Cadmium was not detected in any other sample.
- Chromium concentrations were higher than the CWQG for hexavalent chromium (1.0 µg/L) in 3 samples (concentrations ranged from 1.1 to 2.0 µg/L) but lower than the CWQG for trivalent chromium (8.9 µg/L). Chromium was detected in 2 other samples at 0.18 and 0.9 µg/L, but was not detected in any other sample.

Organic compounds were measured in 9 samples. Phenol concentration in one sample from the ML-MR station was 10 µg/L, which exceeded the CWQG of 4.0 µg/L. In a different sample from ML-MR, total extractables concentration was 75 µg/L. Phenol concentrations in all other samples ranged from less than 1 to 2 µg/L. Concentrations of BTEX and total volatiles were below detection limits in all samples.

5.2.2 Peter Lake Drainage

Water quality samples were collected from 2 streams in the Peter Lake drainage (Figure 5-4; Appendix B, Table B1-7):

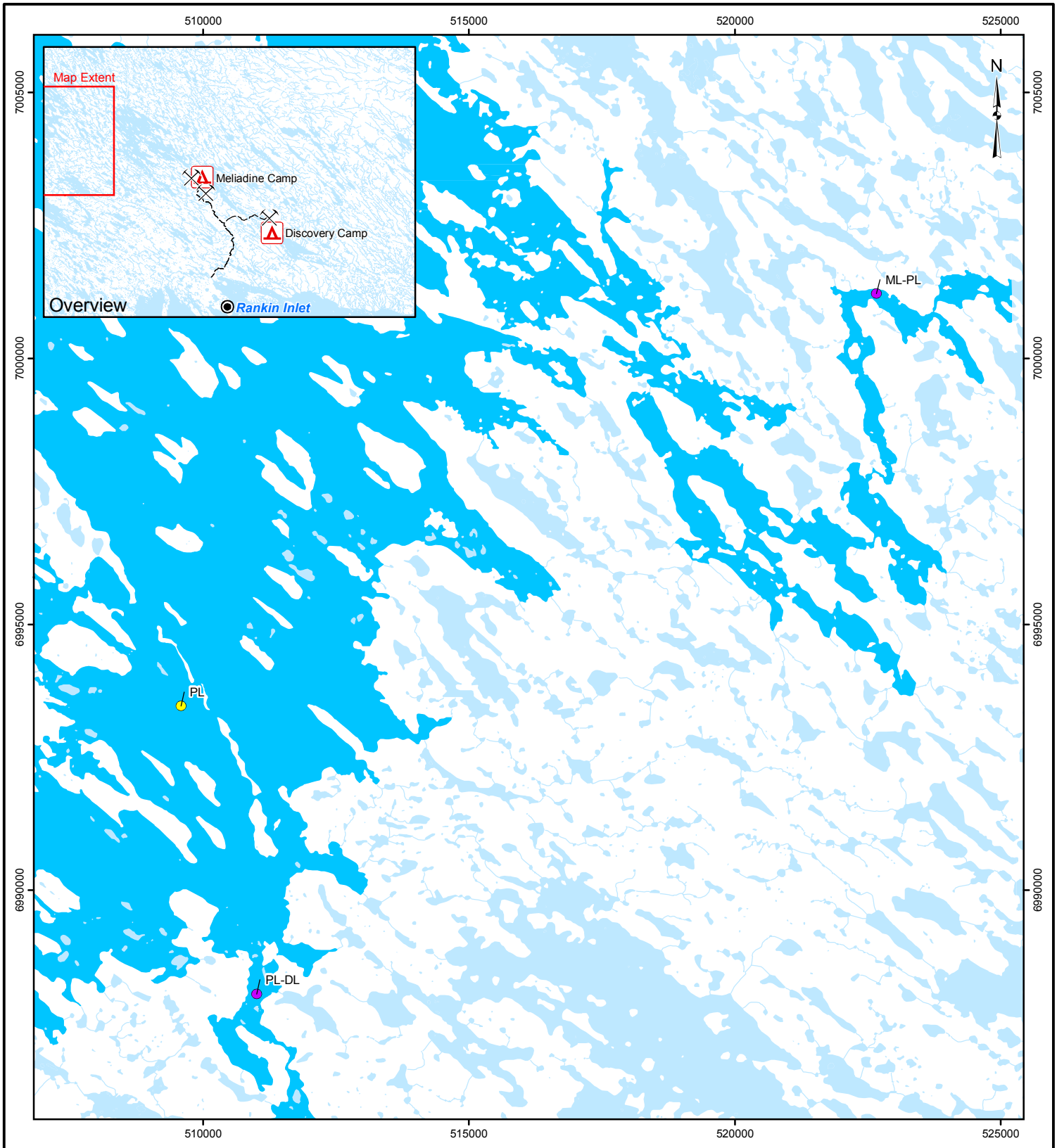
- ML-PL (spring and fall 1997, spring and summer 1998; a small outflow drains the west basin of Meliadine Lake into Peter Lake); and
- PL-DL (spring and fall 1997, spring and summer 1998; a short river section that connects Peter Lake to Diana Lake).

The 2 streams were well-oxygenated during the open water seasons with dissolved oxygen concentrations ranging from 11 to 14 mg/L and associated water temperatures from 5 to 13°C. All dissolved oxygen values were above the 9.5 mg/L CWQG for protection of early life stages of cold water fish.

Field measurements of pH and conductivity were generally similar between the 2 streams and sampling events. Field pH values ranged from 6.5 to 7.5. All pH values were within the range of applicable guidelines. Field-measured conductivity ranged from 35 to 69 µS/cm.

Concentrations of TDS did not differ among seasons, but were higher in stream ML-PL (25 to 34 µS/cm) than in stream PL-DL (15 to 19 µS/cm). This trend was reflected in the concentrations of the dominant ions (bicarbonate, calcium, chloride, and sodium):

- Bicarbonate concentrations ranged from 12 to 18 mg/L in ML-PL and 7.1 to 11 mg/L in PL-DL.
- Calcium concentrations ranged from 4.1 to 5.5 mg/L in ML-PL and 2.4 to 3.3 mg/L in PL-DL.
- Chloride concentrations ranged from 3.7 to 5.5 mg/L in ML-PL and 2.6 to 3.4 mg/L in PL-DL.
- Sodium concentrations ranged from 2.2 to 3.2 mg/L in ML-PL and 1.8 to 2.1 mg/L in PL-DL.



LEGEND

Water Sampling Location
- Lake
- Stream
- Camp
- Proposed Mine Site
- Proposed Road
- Watercourse
- Sampled Waterbody
- Waterbody

REFERENCE

Base data obtained from Comaplex Minerals Corporation. Water quality data obtained from the field.
Projection: UTM Zone 15 Datum: NAD 83

2,500 0 2,500

SCALE 1:100,000 METRES

DRAFT

PROJECT

COMAPLEX MINERALS CORP

COMAPLEX MINERALS CORPORATION
MELIADINE GOLD PROJECT
NUNAVUT

TITLE

WATER QUALITY SAMPLING LOCATIONS IN PETER LAKE BASIN

Golder Associates
Edmonton, Alberta

PROJECT NO. 09-1373-0010			PHASE No. 1000	
DESIGN	KS	06 Oct. 2009	SCALE AS SHOWN	REV. 0
GIS	CDB	06 Oct. 2009		
CHECK	KS	27 Oct. 2009		
REVIEW	PMC	27 Oct. 2009		

FIGURE 5-4

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Total alkalinity and total hardness concentrations were also higher in stream ML-PL than stream PL-DL. Total alkalinity values ranged from 12 to 15 mg/L in stream ML-PL compared to 7 to 9 mg/L in stream PL-DL. Total hardness concentrations ranged from 13 to 17 mg/L in stream ML-PL compared to 8 to 11 mg/L in stream PL-DL. Based on these data, the stream waters were very soft (Table 5-3; McNeely et al. 1979).

Total suspended solids concentrations were only detected in one sample from PL-DL at 4 mg/L. Total suspended solids were not detected in the other samples (detection limits ranged from 2 to 3 mg/L). Total cyanide concentrations were less than or equal to 1 mg/L.

Nutrient concentrations were similar between the 2 streams and sampling events. Total phosphorus concentrations ranged from 0.002 to 0.008 mg/L, lower than the guideline of 0.3 mg/L in NT and Nunavut. Total Kjeldahl nitrogen concentrations ranged from 0.14 to 0.31 mg/L. Total ammonia and nitrate concentrations were highest in the fall samples. Chlorophyll *a* was not measured in any sample. Total organic carbon ranged from 1.2 to 4.0 mg/L.

Detection limits for total metals were at or below the CWQG except for cadmium and selenium:

- Cadmium was not detected in 5 samples, although the detection limits (0.05 to 0.1 µg/L) were higher than the CWQG of 0.017 µg/L.
- Selenium was not detected in 7 samples (detection limits ranged from 0.1 to 10 µg/L). The 4 samples from the 1997 sampling event had detection limits of 10 µg/L, which were higher than the CWQG of 1.0 µg/L.

Total metal concentrations were either below detection limits or below applicable guidelines with the following exception:

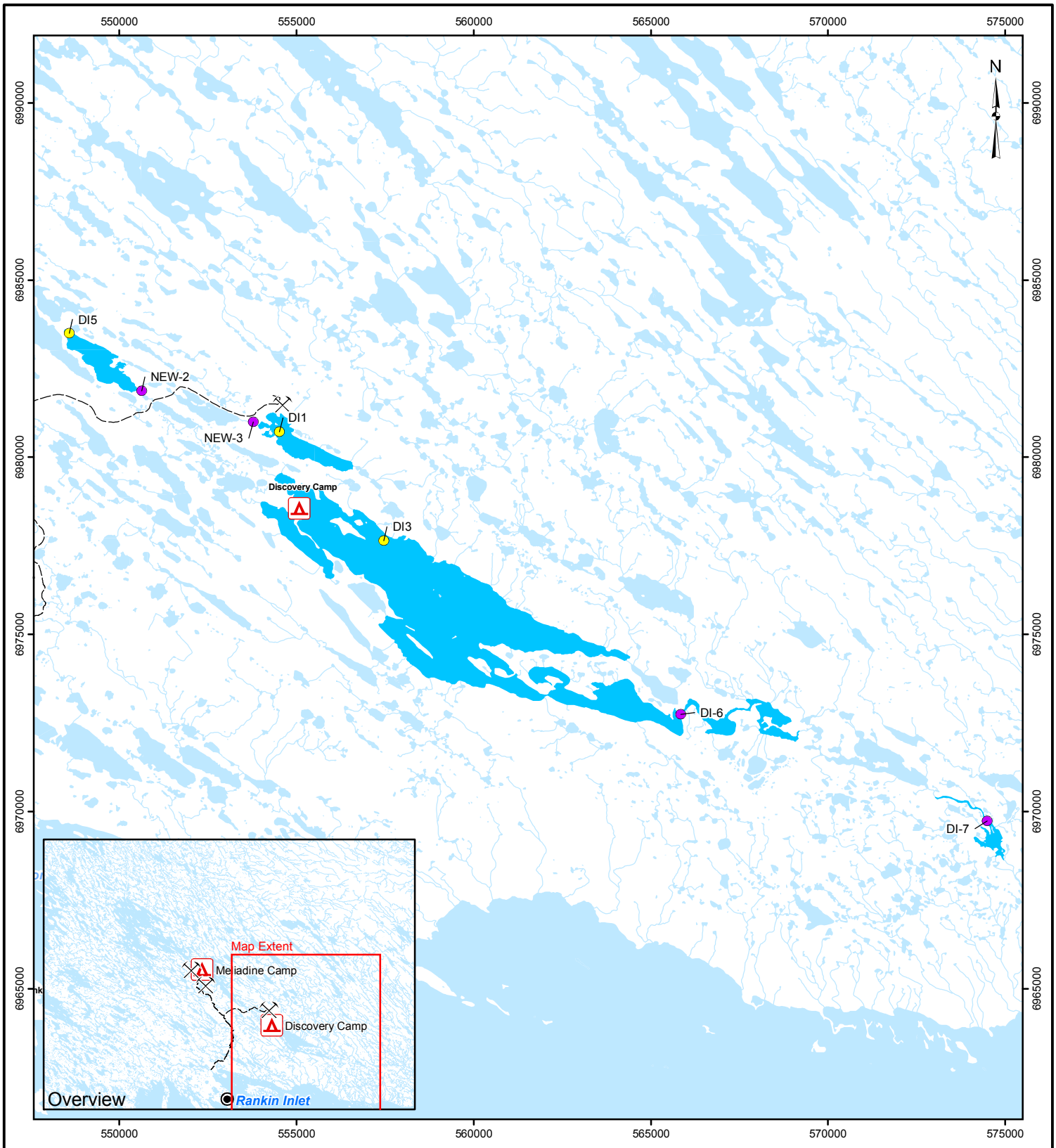
- Cadmium concentrations in 3 samples ranged from 0.05 to 0.1 µg/L, higher than the CWQG of 0.017 µg/L. Cadmium was not detected in the other samples (detection limits ranged from 0.05 to 0.1 µg/L).

Organic compounds were measured in all samples (n = 8). Phenol concentration in one sample from stream PL-DL was 5 µg/L, higher than the CWQG of 4.0 µg/L. Concentrations in the other samples ranged from less than 1 to 3 µg/L. There were no detected concentrations of volatile organic compounds such as BTEX, total volatiles, or total extractables.

5.2.3 Atulik Lake Drainage

Water quality samples were collected from 4 streams in the Atulik Lake drainage system (Figure 5-5; Appendix B, Table B1-8):

- DI-6 (summer 1995 and spring 2008; outlet of Atulik Lake);
- DI-7 (summer 1995 and spring 2008; downstream of basins below Atulik Lake on Atulik River);



LEGEND

Water Sampling Location
- Lake
- Stream

Camp

Proposed Mine Site

Proposed Road

Watercourse

Sampled Waterbody

Waterbody

REFERENCE

Base data obtained from Comaplex Minerals Corporation. Water quality data obtained from the field.
Projection: UTM Zone 15 Datum: NAD 83

DRAFT

PROJECT

COMAPLEX MINERALS CORP

COMAPLEX MINERALS CORPORATION
MELIADINE GOLD PROJECT
NUNAVUT

TITLE

WATER QUALITY SAMPLING LOCATIONS IN ATULIK LAKE BASIN

Golder Associates
Edmonton, Alberta

PROJECT NO. 09-1373-0010			PHASE No. 1000	
DESIGN	KS	06 Oct. 2009	SCALE AS SHOWN	REV. 0
GIS	CDB	06 Oct. 2009		
CHECK	KS	27 Oct. 2009		
REVIEW	PMC	27 Oct. 2009		

FIGURE 5-5

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- NEW-2 (spring 2008; outlet into Lake DI5 that flows into Meliadine Lake); and
- NEW-3 (spring 2008; outlet of Lake DI1 [i.e., Chickenhead Lake]).

The 4 streams were well-oxygenated during the open water seasons with dissolved oxygen concentrations ranging from 9.6 to 14.6 mg/L and water temperatures from 5.5 to 18°C. One exception occurred during the 1995 summer sampling event at stream DI-6 when dissolved oxygen concentration was 7.3 mg/L at a water temperature of 13.6°C (approximate dissolved oxygen saturation was ~70%). This value is below the 9.5 mg/L CWQG for protection of early life stages of cold water fish but above the 6.5 mg/L CWQG for protection of other life stages of cold water fish.

Field measurements of pH were similar among streams and sampling events. Field pH values ranged from 7.5 to 8.4. All pH values were within the range of applicable guidelines.

Stream NEW-2 was higher in conductivity, alkalinity, and hardness than the other streams. Field-measured conductivity was 82 µS/cm in stream NEW-2 compared to 30 to 41 µS/cm in the other streams. Total alkalinity values ranged from 11 to 16 mg/L except in stream NEW-2, which had a total alkalinity value of 33 mg/L. Total hardness concentrations ranged from 14 to 18 mg/L, except in stream NEW-2, which had a total hardness concentration of 37 mg/L. Based on these data, stream NEW-2 had soft water whereas all other streams in this drainage had very soft water (Table 5-3; McNeely et al. 1979).

Major ions in these streams were bicarbonate, calcium, chloride, and sodium. Concentrations of bicarbonate and calcium were higher in stream NEW-1 than in the other streams. Bicarbonate concentration was 41 mg/L in stream NEW-2 and ranged from 14 to 17 mg/L in the other streams. Calcium concentration was 12 mg/L in stream NEW-2 and ranged from 4.3 to 5.7 mg/L in the other streams. Chloride concentrations were similar among the streams and ranged from 4 to 7 mg/L. Sodium concentrations were higher in streams NEW-2 and NEW-3 (10 and 11 mg/L) compared to streams DI-6 and DI-7 (4 to 5 mg/L).

Total suspended solids concentrations were less than the detection limit of 3 mg/L. Total cyanide was also not detected in any sample (detection limit was 0.2 µg/L).

Nutrient concentrations were similar between streams and sampling events. Total phosphorus concentrations ranged from 0.007 to 0.01 mg/L, lower than the guideline of 0.3 mg/L in NT and Nunavut. Total Kjeldahl nitrogen concentrations ranged from less than 0.2 to 0.3 mg/L. Total ammonia and nitrate were not detected in any sample. Nitrite concentrations exceeded the CWQG of 0.06 mg/L in 3 samples, with values ranging from 0.06 to 0.08 mg/L. Chlorophyll *a* concentrations were only measured in the spring samples. The concentrations were highest in streams NEW-2 and NEW-3 at 10 µg/L and 31 µg/L, respectively and were 3 µg/L and 5 µg/L in streams DI-6 and DI-7, respectively. Total organic carbon ranged from 2 to 5 mg/L.

Detection limits for total metals were at or below the CWQGs except for aluminum, cadmium, chromium, copper, mercury, and silver. The highest detection limits were reported for the 1995 samples:

- The detection limit for aluminum in the 1995 samples was 200 µg/L, which was higher than the pH-dependent CWQG of 100 µg/L. Aluminum was not detected in these samples. Aluminum concentrations in the other samples ranged from 2.1 to 7.5 µg/L.

- The detection limit for cadmium was 0.2 µg/L in the 1995 samples and 0.017 µg/L in the other samples. The CWQG for cadmium is 0.017 µg/L. Cadmium was not detected in any stream sample.
- The detection limit for chromium was 15 µg/L in the 1995 samples and 0.06 µg/L in the other samples. The CWQG is 1.0 µg/L for hexavalent chromium and 8.9 µg/L for trivalent chromium. Chromium was not detected in any stream sample.
- The detection limit for copper was 10 µg/L in the 1995 samples and 1 µg/L in the other samples. The CWQG for copper is 2 µg/L. Copper was detected in 2 samples at a concentration of 1 µg/L.
- The detection limit for mercury was 0.05 µg/L in the 1995 samples and 0.02 µg/L in the other samples. The CWQG for mercury is 0.026 µg/L.
- The detection limit for silver was 15 µg/L in the 1995 samples and 0.4 µg/L in the other samples. These detection limits are higher than the CWQG of 0.1 µg/L. Silver was not detected in any sample.

All other total metal concentrations were either below detection limits or below applicable guidelines. Organic compounds were not measured in these stream samples.

5.3 Lakes

5.3.1 Meliadine Lake Drainage

5.3.1.1 Meliadine Lake

Water quality samples were collected from 8 stations within Meliadine Lake (Figure 5-1; Appendix B, Table B2-1):

- DI4 (summer 1995 and 2008);
- ML-E (summer and fall 1997; winter, summer and fall 1998; summer 2008; winter 2009);
- ML-A (winter and summer 2009);
- BOOT-1 (summer 2008 and 2009);
- BOOT-2 (summer 2008, winter and summer 2009);
- ML-W (summer and fall 1997; winter and summer 1998; summer 2008);
- ML-S (summer and fall 1997; winter, summer and fall 1998); and
- ML-SE (winter and summer 1998; summer 1999; summer 2000; summer 2008; winter 2009).

Under Ice Conditions

There were 6 stations assessed during under ice conditions: ML-E, ML-A, BOOT-2, ML-W, ML-S, and ML-SE.

Limnology profiles (surface to near-bottom) of dissolved oxygen concentration and water temperatures were measured in all 6 stations. Most stations had maximum depths of approximately 5 m and dissolved oxygen concentrations were greater than the CWQG of 9.5 mg/L at all depths. Deeper stations such as ML-E in 1998

(depth was 11.5 m) and BOOT-2 in 2009 (depth was 10 m) had dissolved oxygen concentrations in the near-bottom strata that ranged from 2.3 to 7.4 mg/L at water temperatures of 2.6 to 3.4°C. Dissolved oxygen concentrations were higher in the upper 6 m strata (i.e., greater than 9.5 mg/L).

Field measurements of conventional parameters and water chemistry samples were collected at all stations and during all sampling events. Field-measured pH values ranged from 6.7 to 6.9 at most stations and sampling events with the exception of ML-E in 1998 (pH 6.2) and ML-SE in 2009 (pH 5.5). These pH values were lower than the minimum CWQG and GCDWQ of pH 6.5. Field-measured conductivity values were 68 to 105 µS/cm for all stations except station ML-SE, which had values of 138 and 170 µS/cm.

Water quality under ice conditions was similar among the stations with the exception of ML-SE, which generally had parameter concentrations that were 2 times higher than other stations. Concentrations of these parameters were also higher than those observed during open water conditions. Major ions were dominated by bicarbonate (25 to 57 mg/L), calcium (6.6 to 17 mg/L), chloride (6.4 to 25 mg/L), sodium (4.1 to 7.5 mg/L), and sulphate (2.9 to 8.9 mg/L). Total alkalinity values were 20 to 50 mg/L and total hardness concentrations ranged from 22 to 54 mg/L. Total cyanide was not detected in any sample (detection limits ranged from 1 to 2 µg/L).

Nutrient concentrations were similar among stations and sampling events. Total phosphorus concentrations ranged from 0.003 to 0.0106 mg/L, lower than the guideline of 0.3 mg/L in NT and Nunavut. Total Kjeldahl nitrogen concentrations ranged from 0.168 and 0.94 mg/L. Total ammonia was detected in approximately half the samples at or below 0.05 mg/L. Nitrate and nitrite concentrations were usually below detection limits (0.006 to 0.050 mg N/L) except in one sample collected at station ML-E in 1998; in this sample, nitrate concentration was 0.011 mg N/L. Total organic carbon ranged from 3.9 to 5.2 mg/L.

Detection limits for total metals were at or below the CWQGs except for cadmium. Total metal concentrations were either below detection limits or below applicable guidelines with the following two exceptions:

- Cadmium concentration in one sample from station ML-E was 0.2 µg/L, which was higher than the CWQG of 0.017 µg/L. Cadmium was not detected in any other sample (detection limits ranged from 0.01 to 0.1 µg/L).
- Copper concentrations were equal to or higher than the CWQG of 2 µg/L in 3 samples from stations ML-E, ML-W, and ML-SE. The copper concentrations in these samples ranged from 2 to 3.1 µg/L. Copper concentrations in the other samples ranged from 1.4 to 1.7 µg/L.

Phenol was not detected in any sample. Other organic compounds were not analyzed in these samples.

Open Water Conditions

Limnology profiles were collected at 7 stations in Meliadine Lake during open water conditions. Stations had maximum depths that ranged from 2.0 m (BOOT-1) to 14.7 m (ML-E). Dissolved oxygen concentrations were higher than the CWQG of 9.5 mg/L at all depths during all sampling events except one. All 3 stations measured in summer 2009 had dissolved oxygen concentrations that were below 9.5 mg/L. Concentrations were similar throughout the water column and ranged from 8.8 mg/L at surface to 7.8 mg/L at bottom with water temperatures ranging from 12.6 to 15.5°C. Water temperatures during the other sampling events ranged from 9.7 to 14.3°C.

Field measurements of conventional parameters were collected at all stations and sampling events and water chemistry samples were collected during most sampling events. Most field pH values ranged from 6.8 to 7.8, with one exception. In summer 2009, the field pH at station ML-A was 6.49, which was below the minimum CWQG and GCDWQ of pH 6.5. All other pH values were within the range of applicable guidelines. Field-measured conductivity was similar among stations with a few exceptions. Most values ranged from 49 to 85 µS/cm, with the higher values occurring at station ML-SE. Most values were also similar among sampling events at the same station. An exception was station DI4, which had lower field-measured conductivity in summer 1995 (21 µS/cm) compared to summer 2008 (71 µS/cm). Total dissolved solids and concentrations of major ions were also 2 times higher in the 2008 sample than in the 1995 sample for this station.

In general, parameters were similar among sampling events and stations, although the highest concentrations were observed in station ML-SE. Total dissolved solids concentrations ranged from 21 to 51 mg/L. The major ions were bicarbonate (13 to 30 mg/L), calcium (4.3 to 9.0 mg/L), chloride (2.7 to 8.3 mg/L), sodium (1.7 to 4.2 mg/L), and sulphate (1.6 to 3.5 mg/L). Total alkalinity values ranged from 12 to 24 mg/L, indicating that these waters had a moderate to low sensitivity to acid (Table 5-2; Saffran and Trew 1996). Total hardness concentrations ranged from 13 to 27 mg/L, indicating that these waters were very soft to soft (Table 5-3; McNeely et al. 1979).

Nutrient concentrations were similar among stations and sampling events. Total phosphorus concentrations ranged from 0.003 to 0.033 mg/L, lower than the guideline of 0.3 mg/L in NT and Nunavut. Total Kjeldahl nitrogen varied from 0.14 to 0.36 mg/L. Total ammonia was detected in approximately half of the samples, ranging from 0.002 and 0.024 mg/L. Nitrate and nitrite concentrations were below detection limits in all samples (detection limits were 0.1 mg/L or lower). Chlorophyll *a* concentrations ranged from less than 0.01 to 2.4 µg/L with the exception of one sample from station BOOT-1 during summer 2008 sampling, which had a concentration of 15 µg/L. Total organic carbon ranged from 2 to 4 mg/L. Based on the total Kjeldahl nitrogen, total phosphorus, and chlorophyll *a* concentrations in different stations across the lake, Meliadine Lake was classified as oligotrophic (Table 5-4; Wetzel 1983).

Detection limits for total metals were higher than the CWQG for cadmium in most samples and higher than the CWQGs for aluminum, chromium, selenium, and silver in one or more samples:

- Aluminum was not detected in 4 samples (detection limits ranged from 0.3 to 200 µg/L). The detection limit in one of these samples was 200 µg/L, which was higher than the CWQG of 100 µg/L.
- Cadmium was not detected in 22 samples (detection limits ranged from 0.01 to 0.2 µg/L). In 13 of these samples, detection limits ranged from 0.02 to 0.2 µg/L, which were higher than the CWQG of 0.017 µg/L.
- Chromium was not detected in 15 samples (detection limits ranged from 0.06 to 15 µg/L). In 4 of these samples, the detection limit was 2 µg/L, which was higher than the CWQG of 1.0 µg/L for hexavalent chromium but lower than the CWQG of 8.9 µg/L for trivalent chromium. In one sample from 1995, the detection limit was 15 µg/L, which was higher than both CWQGs.
- Selenium was not detected in 17 samples (detection limits ranged from 0.1 to 10 µg/L). In 4 samples, the detection limit was 10 µg/L, which was higher than the CWQG of 1.0 µg/L.

- Silver was not detected in any of the 20 samples (detection limits ranged from 0.020 to 15 µg/L). In one sample from 1995, the detection limit was 15 µg/L, which was higher than the CWQG of 0.1 µg/L.

Total metal concentrations were either below detection limits or below applicable guidelines with the following 3 exceptions:

- Cadmium concentrations in 4 samples ranged from 0.05 to 4.75 µg/L, higher than the CWQG of 0.017 µg/L. Cadmium concentration was 0.011 µg/L or below detection limits in the other samples.
- Chromium concentrations in 3 samples varied between 1.41 and 2.15 µg/L, higher than the CWQG of 1 µg/L for hexavalent chromium but lower than the CWQG of 8.9 µg/L for trivalent chromium. Other detected concentrations ranged from 0.18 to 0.53 µg/L.
- Zinc concentration in one sample was 37.2 µg/L, higher than the CWQG of 30 µg/L. Other concentrations ranged from less than 0.8 to 14.7 µg/L.

Oil and grease was measured in 2 samples from BOOT-1 and BOOT-2 and concentrations were reported as less than the detection limit of 500 µg/L. Phenol concentrations ranged from less than 1 to 2 µg/L. There were no detected concentrations of BTEX, total volatiles, or total extractables.

5.3.1.2 Peninsula Lakes

Peninsula Basin A

Water quality samples were collected from 4 lakes and 7 ponds in Basin A of the Peninsula; of these, 2 lakes were assessed during under-ice conditions (Figure 5-2; Appendix B, Table B2-2):

- Lake A1 (summer 1994 and fall 1997);
- Lake A5 (summer 1994);
- Lake A6 (summer 1994; summer and fall 1997; winter and summer 1998; summer 1999; summer 2000; winter and summer 2009);
- Lake A8 (summer 1994; summer and fall 1997; winter and summer 1998; summer and fall 2007; summer 2008; and winter 2009);
- Pond A9 (summer and fall 2007);
- Pond A13 (summer and fall 2007);
- Pond A15 (summer and fall 2007);
- Pond A38 (summer and fall 2007);
- Pond A54 (summer and fall 2007; summer 2008);
- Pond A56 (summer and fall 2007); and
- Pond A57 (summer and fall 2007).

Under Ice Conditions

Limnology profiles were collected from 2 lakes under ice conditions: Lakes A6 (1998 and 2009) and A8 (1998 and 2009). Stations in both lakes had maximum depths of 2.5 to 4 m. During both sampling events, dissolved oxygen concentrations were lower than the CWQG of 9.5 mg/L at all depths. Dissolved oxygen concentrations ranged from 0.7 to 4.5 mg/L with water temperatures of less than 3°C.

Field measurements of conventional parameters and water chemistry samples were collected at both stations and both sampling events. Field-measured values of pH and conductivity were similar between sampling events and lakes. Field-measured pH ranged from 6.8 to 7.7 with the exception of the 1998 sample in Lake A6, which had a pH value of 6.4. This value was lower than the minimum CWQG or GCDWQ of pH 6.5. Field-measured conductivity ranged from 300 to 489 µS/cm.

Concentrations of total dissolved solids, major ions, total alkalinity, and total hardness were similar between sampling events and lakes. All values were higher than those observed during open water conditions. Total dissolved solids ranged from 165 to 261 mg/L. Major ions included bicarbonate (153 to 176 mg/L), calcium (45 to 66 mg/L), chloride (15 to 78 mg/L), sodium (7.5 to 12 mg/L), and sulphate (5.7 to 12.7 mg/L). Total alkalinity ranged from 125 to 145 mg/L and total hardness ranged from 137 to 216 mg/L. Total suspended solids concentrations ranged from less than 2 to 5 mg/L. Total cyanide was not detected in any sample (detection limits ranged from 1 to 2 µg/L).

Nutrient concentrations were generally similar between sampling events and lakes. Total phosphorus concentrations ranged from 0.007 to 0.0081 mg/L. Total Kjeldahl nitrogen concentrations were similar among samples, ranging from 0.88 to 1.28 mg/L. Total ammonia concentrations ranged from 0.212 to 0.448 mg N/L. Nitrate concentration was highest in the 1998 sample from lake A6 at 0.305 mg N/L and ranged from 0.03 to 0.062 mg N/L in the other samples. Total organic carbon was measured in the 1998 samples: concentrations were 9 and 10 mg/L.

Detection limits were above the CWQG for cadmium in the 1998 samples (detection limit was 0.1 µg/L), but below the CWQG in the 2008 samples (detection limit was 0.010 µg/L). Total metal concentrations were either below detection limits or below applicable guidelines with the following two exceptions:

- Lead concentration in the 2008 sample from Lake A6 was 63 µg/L, which was higher than the CWQG of 1 µg/L. Lead was not detected in any other sample (detection limits ranged from 0.05 to 5 µg/L).
- Manganese concentrations in all 4 samples ranged from 85.5 to 416 µg/L, which exceeded the GCDWQ of 50 µg/L.

Phenols were only measured in the 1998 samples; both values were below detection limits (i.e., <1 µg/L). Other organic compounds were not measured in any sample.

Open Water Conditions

Limnology profiles were collected from 3 lakes (i.e., Lakes A1, A6, and A8) in open water conditions. Stations had maximum depths that ranged from 1.8 m (Lake A1) to 4 m (Lake A6). Dissolved oxygen concentrations were higher than the CWQG of 9.5 mg/L at all depths during all sampling events except one. In summer 2009, Lake A6 had dissolved oxygen concentrations that ranged from 8.2 mg/L at surface to 5.4 mg/L at bottom with

water temperatures ranging from 14.8 to 14.8°C. Water temperatures during the other sampling events ranged from 9.8 to 19.0°C.

Field pH measurements were collected at all stations, but other field measurements (e.g., conductivity) were not reported in the 1994 or 2007 sampling events. Water chemistry samples were collected during most sampling events. Field-measured pH values ranged from 6.6 to 8.6, within the range of CWQGs. However, one 2007 sample from Lake A9 had a pH of 8.6, which was higher than the maximum GCDWQ. Field-measured conductivity in the lakes ranged from 85 to 150 µS/cm. Only laboratory-measured conductivity values were available for most ponds and the values ranged from 294 to 2 370 µS/cm.

As with conductivity, concentrations of most parameters were lower in the lakes than in the ponds. Total dissolved solids concentrations also followed this trend, with concentrations in the lakes ranging from 26 to 83 mg/L and those in the ponds ranging from 191 to 1440 mg/L. The GCDWQ of 500 mg/L was exceeded in 4 ponds (i.e., Ponds A9, A13, A54, and A56). The major ions were the same, but the concentrations were different:

- Bicarbonate concentrations ranged from 32 to 42 mg/L in the lakes and 37 to 204 mg/L in the ponds.
- Calcium concentrations ranged from 6.3 to 16.9 mg/L in the lakes and 48 to 346 mg/L in the ponds.
- Chloride concentrations ranged from 2 to 17 mg/L in the lakes and 12 to 716 mg/L in the ponds. Chloride concentration exceeded the GCDWQ of 250 mg/L in 6 samples from 4 ponds (i.e., Ponds A9, A13, A15, and A56).
- Sodium concentrations ranged from 1.1 to 3.1 mg/L in the lakes and 6 to 87 mg/L in the ponds.
- Sulphate concentrations ranged from 1.5 to 4.1 mg/L in the lakes and 4.5 to 141 mg/L in the ponds.

Total alkalinity values ranged from 16 to 35 mg/L in the lakes and 30 to 167 mg/L in the ponds. These values indicate that the lake waters had a low to moderate sensitivity to acid and the pond waters had a low to least sensitivity to acid (Table 5-2; Saffran and Trew 1996). Total hardness concentrations ranged from 19 to 51 mg/L in the lakes and 142 to 1020 mg/L in the ponds. These values indicate that the lake waters were very soft to soft and the pond waters were hard to very hard (Table 5-3; McNeely et al. 1979).

Concentrations of carbon or phosphorus were similar among sampling events but varied among lakes and ponds. Total organic carbon concentrations ranged from 3.8 to 9 mg/L in the lakes and 3.6 to 25 mg/L in the ponds. Phosphorus concentrations in the lakes and ponds were similar. Detected total phosphorus concentrations ranged from 0.004 to 0.026 mg/L, lower than the guideline of 0.3 mg/L in NT and Nunavut.

Nitrogen concentrations were generally higher in the ponds than in the lakes. Total Kjeldahl nitrogen concentrations ranged from 0.2 to 0.49 mg/L in the lakes and 0.3 to 2.2 mg/L in the ponds. Total ammonia concentrations were less than 0.05 mg N/L in the lakes, but ranged from less than the detection limit of 0.05 mg/L to 1.32 mg N/L in the ponds. Nitrate and nitrite were generally not detected in the lakes. There were exceedances of the CWQGs for nitrate and nitrite in the ponds:

- Nitrate concentrations exceeded the CWQG of 2.9 mg N/L in 2 samples from Ponds A54 and A56. Nitrate concentrations in these samples were 4.9 mg N/L (Pond A54) and 2.9 mg N/L (Pond A56). All other pond samples had nitrate concentrations equal to or less than 0.5 mg N/L.

- Nitrite concentrations exceeded the CWQG of 0.060 mg N/L in 3 samples from Ponds A13, A54, and A56. Concentrations in these samples ranged from 0.08 mg N/L (Pond A13) to 0.31 mg N/L (Pond A56). Nitrite concentrations were less than the detection limit of 0.05 mg N/L in the other samples.

Chlorophyll *a* concentrations in the lakes ranged from less than the detection limit of 0.01 to 1.50 µg/L, with the exception of 13 µg/L in the summer 2008 sample from Lake A8. Chlorophyll *a* was measured in only one pond sample at a concentration of 17 µg/L in the summer 2008 sample from Pond A54.

Total cyanide concentrations were similar among the lakes and ponds and ranged from less than 1 to 2 µg/L.

Detection limits for total metals were higher than CWQGs for cadmium and chromium in most samples and for copper, mercury, selenium, silver, and thallium in some samples:

- Cadmium was not detected in 13 samples (detection limits ranged from 0.010 to 0.2 µg/L). The detection limits in 12 of these samples were higher than the sample-specific CWQG (based on sample hardness).
- Chromium was not detected in 13 samples (detection limits ranged from 0.06 to 15 µg/L). The detection limits in 6 of these samples ranged from 2 to 5 µg/L, which were higher than the CWQG of 1.0 µg/L for hexavalent chromium. The detection limit in 4 samples was 15 µg/L, which also exceeded the CWQG of 8.9 µg/L for trivalent chromium.
- Copper was not detected in 5 samples (detection limits ranged from 1 to 10 µg/L). Four of these samples had a detection limit of 10 µg/L, which was higher than the sample-specific CWQG (based on sample hardness).
- Mercury was not detected in 16 samples (detection limits ranged from 0.01 to 0.2 µg/L). The detection limits in 6 of these samples ranged from 0.05 to 0.2 µg/L, which were higher than the CWQG of 0.026 µg/L.
- Selenium was not detected in 12 samples (detection limits ranged from 0.1 to 10 µg/L). The detection limit in 2 samples was 10 µg/L, which was higher than the CWQG of 1 µg/L.
- Silver was not detected in 18 samples, but the detection limits in 8 samples were higher than the CWQG of 0.1 µg/L (detection limits in these samples ranged from 0.4 to 15 µg/L).
- Thallium was not detected in 16 samples (detection limits ranged from 0.03 to 100 µg/L). In 4 samples, detection limit was 100 µg/L, which was higher than the CWQG of 0.8 µg/L.

Total metal concentrations were either below detection limits or below applicable guidelines with the following 9 exceptions:

- Cadmium concentrations exceeded the CWQG of 0.017 µg/L in 4 samples from lakes A6 and A8. Concentrations in these samples ranged from 0.1 to 1.05 µg/L. Cadmium was detected in one other sample from Lake A6 at a concentration of 0.017 µg/L. Cadmium was not detected in the other samples.
- Chromium concentrations exceeded the CWQG of 1.0 µg/L for hexavalent chromium in 3 samples from Lakes A6 and A8. The concentrations in these samples ranged from 1.9 to 3.48 µg/L. All concentrations were less than the CWQG of 8.9 µg/L for trivalent chromium.

- Copper concentrations in 2 samples from Lake A6 exceeded the CWQG of 2 µg/L (based on total hardness of less than 120 mg/L in these samples). The concentrations in these samples were 6.5 and 27.1 µg/L.
- Iron concentrations exceeded the CWQG and GCDWQ of 300 µg/L in one sample from Pond A15. The total iron concentration in this pond sample was 695 µg/L.
- Lead concentration exceeded the CWQG of 1 µg/L for one sample from Lake A6, which had a concentration of 2.19 µg/L.
- Mercury concentrations exceeded the CWQG of 0.026 µg/L in 2 sample from Ponds A9 and A13. Concentrations in these samples were 0.5 µg/L and 0.4 µg/L, respectively.
- Selenium concentrations exceeded the CWQG of 1 µg/L in 2 samples from Ponds A9 and A13. Concentrations in these samples were 2.2 µg/L and 1.2 µg/L, respectively.
- Zinc concentrations exceeded the CWQG of 30 µg/L in one sample from Lake A6. The concentrations in this sample was 31.9 µg/L.

Only dissolved metals were analyzed in most 2007 pond samples (i.e., 11 out of 15). Dissolved metal concentrations were similar to the total metals concentrations measured in other pond samples. Total and dissolved metal concentrations in the pond samples were also generally higher than the total metal concentrations reported in the lake samples, for example:

- Total iron concentrations in the lakes ranged from 4.6 to 160 µg/L whereas total and dissolved iron concentrations in the ponds ranged from 22 to 2 360 µg/L.
- Total manganese concentrations in the lakes ranged from 0.4 to 14.1 µg/L whereas dissolved manganese concentrations ranged from 1.7 to 174 µg/L in the ponds.

Dissolved concentrations of some metals were also higher than guidelines used to compare to total metal concentrations[6]. For example:

- The concentration of dissolved arsenic in one sample from Pond A57 was 6.7 µg/L, higher than the CWQG of 5.0 µg/L based on total arsenic.
- Dissolved chromium concentrations in 3 samples from Ponds A13, A56, and A57 were 6 to 7 µg/L, higher than the CWQG of 1.0 µg/L based on total hexavalent chromium.
- Dissolved iron concentrations in 4 samples from Ponds A9, A13, and A15 were 302 to 2 360 µg/L, higher than the CWQG and GCDWQ of 300 µg/L based on total iron.
- Dissolved manganese concentrations in 5 samples from Ponds A9, A13, A15, and A56 were 51 to 174 µg/L, higher than the GCDWQ of 50 µg/L based on total manganese.

[6] CWQGs and GCDWQs are based on total metal concentrations.

- Dissolved mercury concentrations in 3 samples from Ponds A13, A56, and A57 were 0.1 to 0.4 µg/L, higher than the CWQG of 0.026 µg/L based on total mercury.
- Dissolved selenium concentrations in 5 samples from Ponds A9, A13, and A56 were 1 to 1.7 µg/L, equal to or higher than the CWQG of 1.0 µg/L based on total selenium.
- Dissolved zinc concentrations in one sample from Pond A56 was 59 µg/L, higher than CWQG of 30 µg/L based on total zinc.

Phenol concentrations ranged from less than 1 to 2 µg/L in most samples. Phenol concentrations in one sample from lake A8 (6 µg/L) and one sample from Pond A54 (4 µg/L) equalled or exceeded the CWQG of 4.0 µg/L. Concentrations of BTEX, total volatiles, or total extractables were below detection limits in all samples.

Peninsula Basin B

Water quality samples were collected from 5 lakes and 3 ponds in Basin B of the Peninsula; of these, 4 lakes and 3 ponds were assessed during under-ice conditions (Figure 5-2; Appendix B, Table B2-3):

- Lake B2 (summer and fall 1997; winter, summer, and fall 1998; summer 1999 and 2000);
- Lake B5 (summer and fall 1997; winter, summer, and fall 1998; summer 1999, 2000, and 2008; winter 2009);
- Lake B6 (summer 2008; winter and summer 2009);
- Lake B7 (summer and fall 1997; late winter, summer, fall, and early winter 1998; summer 2008; winter 2009);
- Pond B8 (early winter 1998);
- Pond B9 (early winter 1998);
- Pond B10 (early winter 1998); and
- Lake B36 (summer 1994).

Under Ice Conditions

Limnology profiles were collected from 4 lakes: Lakes B2 (1998); B5 (1998 and 2009); B6 (2009); and B7 (1998 and 2009). Stations in these lakes had maximum depths ranging from 2.2 to 3.5 m. During both sampling events, dissolved oxygen concentrations were lower than the CWQG of 9.5 mg/L at all depths. Dissolved oxygen concentrations ranged from 1.0 to 4.2 mg/L with water temperatures of less than 3°C.

Field measurements of conventional parameters were collected at most stations except the 3 ponds (i.e., Ponds B8, B9, and B10). Field-measured values of pH and conductivity were similar among sampling events and waterbodies (i.e., lakes and ponds). Field-measured pH ranged from 6.6 to 7.5 with 2 exceptions. The 2009 sample in Lake B7 had a pH value of 5.8 and the 2009 sample in Lake B5 had a pH value of 6.45. Both of these values were lower than the minimum CWQG or GCDWQ of pH 6.5. Field-measured conductivity ranged from

139 to 674 µS/cm in the lakes. Only laboratory-measured conductivity data are available for the 3 ponds; conductivity values ranged from 454 to 1 030 µS/cm.

Water chemistry samples were collected at all stations and sampling events. Concentrations of total dissolved solids and major ions were lower in lakes than in ponds. All values were higher than those observed during open water conditions. Concentrations in the early winter 1998 sample from Lake B7 were lower than other samples from this lake, and the lowest out of all of the other samples collected in this basin.

Total dissolved solids ranged from 145 to 373 mg/L in the lakes (53 mg/L in early winter 1998 from lake B7) and 229 to 602 mg/L in the ponds. Total dissolved solids concentration in Pond B10 was 602 mg/L, higher than the GCDWQ of 500 mg/L. Major ion concentrations were similar among the lakes and ponds, with the exception of pond B10, which had higher concentrations of some ions as well as the early winter 1998 sample from Lake B7, which had the lowest concentrations of all ions. Major ions included bicarbonate (49 to 364 mg/L), calcium (14 to 154 mg/L), chloride (5.4 to 241 mg/L), sodium (2.7 to 30.3 mg/L), and sulphate (3.8 to 44 mg/L).

Total alkalinity was similar among the samples (range from 94 to 298 mg/L), with the exception of the early winter 1998 sample from Lake B7 (40 mg/L). Total hardness ranged from 118 to 303 mg/L in all samples except in pond B10 (518 mg/L) and the early winter 1998 sample from lake B7 (42 mg/L). Total suspended solids concentrations ranged from less than 2 to 11 mg/L. Total cyanide concentrations ranged from less than 1 to 2 µg/L except in pond B10, which had a total cyanide concentration of 43 µg/L. This value exceeds the CWGQ of 5 µg/L by almost 9-fold.

Nutrient concentrations were also variable among waterbodies and sampling events. Total phosphorus concentrations ranged from 0.0084 to 0.0247 mg/L. Total Kjeldahl nitrogen concentrations were similar among samples, ranging from 0.82 to 1.77 mg/L. Total ammonia concentrations ranged from 0.025 to 0.459 mg N/L. Nitrate concentrations ranged from less than 0.006 to 0.196 mg N/L. Nitrite was not detected in any sample (detection limit was 0.050 mg N/L). Total organic carbon concentrations ranged from 8.1 to 28 mg/L.

Detection limits were at or below the CWQGs for most metals except cadmium (detection limit was 0.1 µg/L). Total metal concentrations were either below detection limits or below applicable guidelines with the following 5 exceptions:

- Arsenic concentration in one sample from Lake B5 was 11.4 µg/L, higher than the CWQG of 5.0 µg/L and the GCDWQ of 10 µg/L. Arsenic concentration in one sample from Pond B10 was 5.77 µg/L, exceeding the CWQG of 5.0 µg/L. All other concentrations were less than the CWQG of 5.0 µg/L.
- Cadmium concentrations were 0.07 µg/L in the early winter 1998 sample from Lake B7, 0.32 µg/L in one sample from pond B8, and 0.41 µg/L in one sample from pond B10. These concentrations exceeded the hardness-dependent CWQGs (based on the total hardness values in these samples).
- Chromium was detected in 8 samples at concentrations that exceeded the CWQG of 1.0 µg/L for hexavalent chromium. Concentrations in these samples ranged from 1.2 to 3.73 µg/L in lake samples and 4.07 to 9.36 µg/L in pond samples. All but one sample had concentrations that were lower than the CWQG of 8.9 µg/L for trivalent chromium. Chromium was not detected in any other sample (detection limit was 1.0 µg/L).

- Copper concentrations ranged from 1.7 to 8.7 µg/L. Copper concentrations in 3 samples from Lakes B2, B5, and B7 and 2 samples from Ponds B8 and B10 exceeded the hardness-dependent CWQGs (based on the total hardness values in these samples).
- Manganese concentrations ranged from 65.1 to 383 µg/L in 7 samples from Lakes B2, B5, B6, and B7. These concentrations exceeded the GCDWQ of 50 µg/L.

Phenol was analyzed in 5 lake samples and 3 pond samples. Concentrations in the lake samples were less than the detection limit of 1 µg/L with the exception of the early winter 1998 sample from Lake B7, which had a concentration of 4 µg/L. This value was equal to the CWQG of 4.0 µg/L. Concentrations in the pond samples ranged from 9 to 12 µg/L, higher than the CWQG. Other organic compounds were not analyzed.

Open Water Conditions

Limnology profiles were collected from 4 lakes (i.e., Lakes B2, B5, B6, and B7) in open water conditions. Stations had maximum depths that ranged from 2.5 to 3.8 m. Dissolved oxygen concentrations were higher than the CWQG of 9.5 mg/L at all depths during most of the sampling events. In summer 2008, dissolved oxygen concentrations ranged from 12.1 mg/L at surface to 9.2 mg/L at bottom (2.5 m) in Lake B5. In summer 2009, dissolved oxygen concentrations ranged from 8.4 mg/L at surface to 1.7 mg/L at bottom (3.5 m) in Lake B6. Water temperatures during the sampling events ranged from 8.9 to 17.4°C.

Field measurements of conventional parameters were collected at Lakes B2, B5, B6, and B7, but only pH was collected at Lake B36 (i.e., conductivity was not measured). Concentrations were similar among lakes and sampling events. Field-measured pH values ranged from 6.5 to 8.1, within the range of applicable guidelines. Field-measured conductivity ranged from 71.5 to 141 µS/cm. Only laboratory-measured conductivity was available for lake B36, which had a value of 206 µS/cm.

Water chemistry samples were collected at most sampling events. Concentrations were similar among lakes and sampling events. Total dissolved solids concentrations ranged from 20 to 134 mg/L. The major ions concentrations were similar among the lakes. Major ions included bicarbonate (27 to 40 mg/L), calcium (8.1 to 33 mg/L), chloride (2.8 to 21 mg/L), sodium (1.8 to 3.8 mg/L), and sulphate (1.5 to 6.9 mg/L).

Total alkalinity values ranged from 22 to 33 mg/L in all lakes except Lake B36, which had a value of 92 mg/L. These values indicate that most lake waters had a low sensitivity to acid whereas Lake B36 had the least sensitivity to acid (Table 5-2; Saffran and Trew 1996). Total hardness concentrations ranged from 24 to 55 mg/L in all lakes except Lake B36, which had a value of 98 mg/L. These values indicate that most lake waters were very soft to soft whereas Lake B36 was moderately soft (Table 5-3; McNeely et al. 1979).

Nutrient concentrations were similar among the lakes. Total phosphorus concentrations were lower than 0.30 mg/L, which is the guideline in NT and Nunavut. Total Kjeldahl nitrogen ranged from 0.14 to 0.55 mg/L. Total ammonia concentrations were lower than 0.05 mg N/L. Chlorophyll *a* concentrations ranged from 0.44 to 6 µg/L. Total organic carbon concentrations ranged from 3.3 to 6 mg/L. Based on the total Kjeldahl nitrogen, total phosphorus, and chlorophyll *a* concentrations, the lakes were classified as oligotrophic (Table 5-4; Wetzel 1983).

Total cyanide concentrations were similar among the lakes, and ranged from 1 to 2 µg/L.

Detection limits were generally at or below the CWQGs with the exception of cadmium in most samples and chromium and selenium in some samples:

- Cadmium was not detected in 9 samples (detection limits ranged from 0.01 to 0.2 µg/L). In 7 of these samples, the detection limits (0.02 to 0.2 µg/L) were higher than the CWQG of 0.017 µg/L.
- Chromium was not detected in 9 samples (detection limits ranged from 0.06 to 15 µg/L). The detection limit in 3 of these samples was 2 µg/L, higher than the CWQG of 1.0 µg/L for hexavalent chromium and the detection limit for one sample was 15 µg/L, also higher than the CWQG of 8.9 µg/L for trivalent chromium.
- Selenium was not detected in 9 samples (detection limits ranged from 0.1 to 10 µg/L). In 3 of these samples, the detection limit was 10 µg/L, higher than the CWQG of 1.0 µg/L.

The highest detection limits were observed in the sample from Lake B36, which also had detection limits for aluminum, copper, mercury, and thallium that were higher than the CWQGs. Total metal concentrations were either below detection limits or below applicable guidelines with the following 4 exceptions:

- Cadmium was detected in 8 out of 17 samples. Detected concentrations of cadmium ranged from 0.03 to 21.8 µg/L, which exceeded the CWQG of 0.017 µg/L. Cadmium concentration in one sample from Lake B7 (21.8 µg/L) also exceeded the GCDWQ of 5 µg/L.
- Chromium concentrations exceeded the CWQG of 1.0 µg/L for hexavalent chromium in 6 samples from Lakes B2, B5, and B7. The concentrations in these samples ranged from 1.34 to 2.85 µg/L. All concentrations were less than the CWQG of 8.9 µg/L for trivalent chromium.
- Copper concentrations in 3 samples from Lakes B2, B5, and B7 exceeded the CWQG of 2 µg/L (based on total hardness of less than 120 mg/L as $CaCO_3$ in these samples). The concentrations in these samples were 2.2 to 2.7 µg/L.
- Zinc concentrations exceeded the CWQG of 30 µg/L in 3 samples from lakes B2 and B5. Concentrations in these samples ranged from 41.3 to 49.6 µg/L.

Oil and grease was detected in one sample from Lake B5 at a concentration of 900 µg/L. Phenol concentrations ranged from less than 1 to 3 µg/L in most samples. Phenol concentrations in one sample from lake B5 (9 µg/L) and one sample from Lake B7 (10 µg/L) exceeded the CWQG of 4.0 µg/L. In one other sample from Lake B7, phenol concentration was 4 µg/L. Concentrations of BTEX were less than detection limits or less than the CWQGs in all samples.

Peninsula Basin C

A water quality sample was collected in summer 1994 from lake C5 (Figure 5-2; Appendix B, Table B2-4). Dissolved oxygen concentration was not reported. Field-measured pH was 7.2, which was within the range of applicable guidelines. Laboratory-measured conductivity was 63.5 µS/cm and total dissolved solids concentration was 41 mg/L. Major ions included calcium (9.7 mg/L), chloride (2.1 mg/L), sodium (1.4 mg/L), and sulphate (3.6 mg/L). Bicarbonate was not measured, although it is likely a major ion in this lake as it is in other lakes in the vicinity.

Total alkalinity and total hardness were 26 mg/L and 28 mg/L, respectively. These values indicate that the lake had a low sensitivity to acid (Table 5-2; Saffran and Trew 1996) and was very soft (Table 5-3; McNeely et al. 1979). Total suspended solids concentration was less than the detection limit of 1 mg/L and turbidity was 0.37 NTU.

Concentrations of carbon species (e.g., total organic carbon) were not measured. Total phosphorus concentration was less than the detection limit of 0.30 mg/L, which is equal to the guideline of 0.3 mg/L in NT and Nunavut. Only nitrate and nitrite concentrations were measured; concentrations of these parameters were 0.008 mg N/L and 0.001 mg N/L, respectively. Chlorophyll *a* concentrations were not measured. Insufficient data were available to assess trophic status (Table 5-4; Wetzel 1983).

Total metal concentrations were either lower than the detection limits or below applicable guidelines. Detection limits were higher than CWQGs for most parameters:

- The detection limit for aluminum was 200 µg/L, higher than the CWQG of 100 µg/L.
- The detection limit for cadmium was 0.2 µg/L, higher than the CWQG of 0.017 µg/L.
- The detection limit for chromium was 15 µg/L, higher than the CWQGs of 1.0 µg/L for hexavalent chromium and 8.9 µg/L for trivalent chromium.
- The detection limit for copper was 10 µg/L, higher than the CWQG of 2 µg/L.
- The detection limit for mercury was 0.05 µg/L, higher than the CWQG of 0.026 µg/L.
- The detection limit for silver was 15 µg/L, higher than the CWQG of 0.1 µg/L.
- The detection limit for thallium was 100 µg/L, higher than the CWQG of 0.8 µg/L.

The detection limit for antimony (i.e., 200 µg/L) was higher than the GCDWQ of 6 µg/L.

Concentrations of organic compounds such as phenols, BTEX, total volatiles, or total extractables were not measured in this sample.

Peninsula Basin D

Water quality samples were collected from 2 lakes in Basin D of the Peninsula; both were assessed under ice conditions (Figure 5-2; Appendix B, Table B2-5):

- D1 (summer 1997, winter 1998); and
- D7 (summer 1994, summer and fall 1997, winter 1998).

Under Ice Conditions

Limnology profiles were collected from both lakes in winter 1998. Stations in these lakes had maximum depths of approximately 2.2 to 2.3 m. During both sampling events, dissolved oxygen concentrations were lower than the CWQG of 9.5 mg/L at all depths. Dissolved oxygen concentrations ranged from 0.2 to 2.3 mg/L with water temperatures of less than 1°C.

Field measurements of conventional parameters and water chemistry samples were collected from both lakes in winter 1998. Concentrations of most parameters were higher in Lake D1 than in Lake D7. For example, field-measured conductivity was higher in Lake D1 (1816 µS/cm) than in Lake D7 (845 µS/cm). These concentrations are also higher than those observed in open water conditions in these lakes. Total dissolved solids concentration was 1100 mg/L in Lake D1, which exceeded the GCDWQ of 500 mg/L. Total suspended solids concentration and turbidity were 139 mg/L and 210 NTU in lake D1 compared to 2 mg/L and 1 NTU in Lake D7. Total hardness and total alkalinity were approximately 2.5 times higher in Lake D1 than in Lake D7.

Detection limits were at or below CWQGs except for 3 parameters:

- The detection limits for cadmium were 0.1 and 0.5 µg/L in these samples, higher than the CWQG of 0.017 µg/L.
- The detection limits for mercury were 0.01 and 0.05 µg/L. The detection limit of 0.05 µg/L was higher than the CWQG of 0.026 µg/L.
- The detection limits for silver were 0.1 and 0.5 µg/L. The detection limit of 0.5 µg/L was higher than the CWQG of 0.1 µg/L.

Total metal concentrations were either below detection limits or below applicable guidelines with the following 4 exceptions:

- Chromium concentrations were 20.2 µg/L in Lake D1 and 12.6 µg/L in Lake D7, higher than the CWQG of 1.0 µg/L for hexavalent chromium and 8.9 µg/L for trivalent chromium.
- Copper concentration in Lake D7 was 17.8 µg/L, higher than the CWQG of 4 µg/L (based on a total hardness of 358 mg/L in this sample). The concentration of copper in Lake D1 was 3 µg/L, lower than the CWQG of 4 µg/L (based on a total hardness of 930 mg/L in this sample).
- Iron concentration in Lake D7 was 660 µg/L, higher than the CWQG and GCDWQ of 300 µg/L. The iron concentration in Lake D1 was less than the detection limit of 50 µg/L.
- Manganese concentrations were 1 520 µg/L in lake D1 and 368 µg/L in lake D7, higher than the GCDWQ of 50 µg/L.

These two lakes had some of the highest concentrations of turbidity, total suspended solids, total dissolved solids, major ions, nutrients, and total metals concentrations compared to other lakes assessed during under ice conditions. The high concentrations of the major ions were likely the result of ice formation, which concentrated the ions in the remaining water column (RL&L 1999). The high levels of phosphorus and metals were probably due to anoxic conditions. Under anoxic conditions, redox potential changes and these constituents desorb from clay and organic sediments and go into solution.

Open Water Conditions

Limnology profiles were collected from both lakes in open water conditions. Stations had maximum depths 2.2 m. Dissolved oxygen concentrations were higher than the CWQG of 9.5 mg/L at all depths during both sampling events. Water temperatures during the sampling events ranged from 13.5 to 17.4°C.

Field measurements of conventional parameters were collected in the 1997 sampling events. Field-measured pH and conductivity were similar between lakes and among sampling events; pH values ranged from 7.1 to 8.1 and conductivity from 135 to 151 µS/cm.

Water chemistry samples were only collected in Lake D7 in the summers of 1994 and 1997. Concentrations of parameters were similar between the two sampling events. Total alkalinity values were 37 mg/L in 1994 and 46 mg/L in 1997; the values indicate that the lake waters had low to least sensitivity to acids (Table 5-2; Saffran and Trew 1996). Total hardness concentrations were 38 mg/L in 1994 and 45 mg/L in 1997, which indicated that the lake waters were soft (Table 5-3; McNeely et al. 1979). Major ions were dominated by bicarbonate (46 mg/L[7]), calcium (12 and 14 mg/L), chloride (4.7 and 7.4 mg/L), and sodium (3.2 and 4.6 mg/L).

In 1994, only nitrate, nitrite, and total phosphorus were measured; the reported concentrations were less than the detection limits (detection limits ranged from 0.001 to 0.30 mg/L). In the sample collected in 1997, concentrations of total Kjeldahl nitrogen (0.31 mg/L), total phosphorus (0.018 mg/L), and chlorophyll *a* (1.68 µg/L) indicated that the lake was oligotrophic (Table 5-4; Wetzel 1983).

Detection limits were higher than CWQGs for most parameters in the 1994 sample:

- The detection limit for aluminum was 200 µg/L, higher than the CWQG of 100 µg/L.
- The detection limit for cadmium was 0.2 µg/L, higher than the CWQG of 0.017 µg/L.
- The detection limit for copper was 10 µg/L, higher than the CWQG of 2 µg/L.
- The detection limit for mercury was 0.05 µg/L, higher than the CWQG of 0.026 µg/L.
- The detection limit for silver was 15 µg/L, higher than the CWQG of 0.1 µg/L.
- The detection limit of thallium was 100 µg/L, higher than the CWQG of 0.8 µg/L.

The detection limit for antimony (200 µg/L) was higher than the GCDWQ of 6 µg/L. Total metal concentrations were either below detection limits or below applicable guidelines in the 1994 sample.

In the 1997 sample, detection limits were higher than CWQGs for 2 parameters:

- The detection limit for chromium was 2 µg/L, higher than the CWQG of 1.0 µg/L for hexavalent chromium and less than the CWQG of 8.9 µg/L for trivalent chromium.
- The detection limit for selenium was 10 µg/L, higher than the CWQG of 1 µg/L.

Total metal concentrations were either below detection limits or below applicable guidelines with the following 3 exceptions:

- Cadmium concentration was 0.2 µg/L, higher than the CWQG of 0.017 µg/L.
- Copper concentration was 2.6 µg/L, higher than the CWQG of 2 µg/L.

[7] Bicarbonate concentrations were only measured in the 1997 sample.

- Zinc concentration was 123 µg/L, higher than the CWQG of 30 µg/L.

Organic compounds such as phenol, BTEX, total volatiles, and total extractables were measured in the 1997 sample. Concentrations of all compounds except phenol were less than detection limits. Phenol concentration was 9 µg/L, higher than the CWQG of 4.0 µg/L.

Peninsula Basin E

A water quality sample was collected in summer 1994 from lake E3 (Figure 5-2; Appendix B, Table B2-6). Dissolved oxygen concentration was not reported. Field-measured pH was 7.1, which was within the range of applicable guidelines. Laboratory-measured conductivity was 47 µS/cm and total dissolved solids concentration was 29 mg/L. Major ions included calcium (6.7 mg/L), chloride (1.8 mg/L), sodium (1.1 mg/L), and sulphate (1.4 mg/L). Bicarbonate was not measured, although it is likely a major ion in this lake as it is in other lakes in the vicinity.

Total alkalinity and total hardness were both 20 mg/L. These values indicate that the lake had a low sensitivity to acid (Table 5-2; Saffran and Trew 1996) and was very soft (Table 5-3; McNeely et al. 1979). Total suspended solids concentration was less than 1 mg/L and turbidity was 0.58 NTU.

Concentrations of carbon species (e.g., total organic carbon) were not measured. Total phosphorus concentration was less than the detection limit of 0.30 mg/L, equal to the guideline of 0.3 mg/L in NT and Nunavut. Only nitrate and nitrite concentrations were measured; concentrations of these parameters were 0.006 mg N/L and 0.001 mg N/L, respectively. Chlorophyll *a* concentrations were not measured. Insufficient data were available to assess trophic status.

Detection limits were higher than CWQGs for most parameters:

- The detection limit for aluminum was 200 µg/L, higher than the CWQG of 100 µg/L.
- The detection limit of cadmium was 0.2 µg/L, higher than the CWQG of 0.017 µ/L.
- The detection limit for chromium was 15 µg/L, higher than the CWQGs of 1.0 µg/L for hexavalent chromium and 8.9 µg/L for trivalent chromium.
- The detection limit for copper was 10 µg/L, higher than the CWQG of 2 µg/L.
- The detection limit for mercury was 0.05 µg/L, higher than the CWQG of 0.026 µg/L.
- The detection limit for selenium was 5 µg/L, higher than the CWQG of 1 µg/L.
- The detection limit of silver was 15 µg/L, higher than the CWQG of 0.1 µg/L,
- The detection limit of thallium was 100 µg/L, higher than the CWQG of 0.8 µg/L.

Total metal concentrations were either lower than the detection limits or below applicable guidelines. The detection limit for antimony (i.e., 200 µg/L) was higher than the GCDWQ of 6 µg/L. Organic compounds were not measured in this sample.

Peninsula Basin G

A water chemistry sample was collected in summer 1997 from lake G2 (Figure 5-2; Appendix B, Table B2-7). A sample for chlorophyll *a* was also collected in fall 1997. Field measurements of conventional parameters were collected at both sampling events.

Limnology profiles (surface to bottom) of dissolved oxygen concentrations and water temperature were collected in summer and fall 1998. Dissolved oxygen concentrations were above the CWQG of 9.5 mg/L at all depths. Water temperature ranged from 16.0 to 17.4°C.

Field-measured pH and conductivity were similar between sampling events. Field-measured pH values were 7.8 and 7.9, within the range of applicable guidelines. Field-measured conductivity values were 67 and 75 µS/cm.

Total dissolved solids concentration in the summer 1997 sample was 44 mg/L. Major ions in this sample were bicarbonate (24 mg/L), calcium (7.2 mg/L), chloride (2.3 mg/L), and sodium (1.5 mg/L). Most of the total carbon existed as inorganic carbon (6.0 mg/L) compared to organic carbon (3.8 mg/L).

Total alkalinity and total hardness were 24 mg/L and 22 mg/L, respectively. These values indicate that the lake had a low sensitivity to acid (Table 5-2; Saffran and Trew 1996) and was very soft (Table 5-3; McNeely et al. 1979). Total suspended solids concentration was less than 3 mg/L and turbidity was 0.5 NTU. Total cyanide was not measured in these samples.

Total phosphorus concentration was 0.004 mg/L, less than the guideline of 0.3 mg/L in NT and Nunavut. Total Kjeldahl nitrogen concentration was 0.34 mg/L. Total ammonia concentration was 0.012 mg N/L and nitrate and nitrite were not detected (detection limit was 0.008 mg N/L). Chlorophyll *a* concentrations were 1.01 and 1.36 µg/L. Based on the total Kjeldahl nitrogen, total phosphorus, and chlorophyll *a* concentrations, the lake was classified as oligotrophic (Table 5-4; Wetzel 1983).

Detection limits were at or below CWQGs except for cadmium (detection limit was 0.1 µg/L; CWQG is 0.017 µg/L) and selenium (detection limit was 10 µg/L, CWQG is 1 µg/L). Total metal concentrations were either below detection limits or below applicable guidelines.

Concentrations of phenols, BTEX, and total volatiles were below detection limits. Total extractables concentration was 79 µg/L.

5.3.1.3 Little Meliadine Lake

Water quality was measured in Little Meliadine Lake (LML) during 3 sampling events: winter, summer and fall of 1998 (Figure 5-3; Appendix B, Table B2-8).

Limnology profiles (surface to bottom) of dissolved oxygen concentration and temperature were measured during each sampling event. Maximum depths at the sampling stations ranged from 14.4 to 14.8 m. Dissolved oxygen concentrations were 9.2 mg/L or higher at all depths during each sampling event. The lowest dissolved oxygen concentrations were measured during the summer event, where dissolved oxygen concentrations were below the CWQG of 9.5 mg/L at 3.0 m or deeper. Minimum dissolved oxygen concentration was 9.2 mg/L. Water temperatures ranged from less than 3°C in the winter to less than 15°C in the summer.

Field measurements of pH and conductivity were similar among sampling events. Field-measured pH values ranged from 6.35 to 6.8. The lowest pH was measured in the summer; this pH value (6.35) was lower than the

minimum CWQG and GCDWQ of 6.5. Field-measured conductivity values were higher in winter (116 µS/cm) than in summer and fall samples (70 and 76 µS/cm).

Samples for chemical analyses were only collected in the winter and summer. Concentrations of total dissolved solids, major ions, total alkalinity, and total hardness were higher in the winter than in the summer. Total dissolved solids concentrations ranged from 42 mg/L in the winter to 28 mg/L in the summer. Major ions were dominated by bicarbonate (22 to 31 mg/L), calcium (5.4 to 8.2 mg/L), chloride (5.3 to 8.0 mg/L), sodium (3 to 5 mg/L), and sulphate (1.9 to 2.9 mg/L). Total alkalinity values ranged from 18 to 25 mg/L and total hardness concentrations ranged from 17 to 26 mg/L. These values indicated that the lake waters had moderate to low sensitivity to acid (Table 5-2; Saffran and Trew 1996) and were very soft (Table 5-3; McNeely et al. 1979).

Nitrogen concentrations varied among sampling events, but phosphorus concentrations did not. Total ammonia concentrations were higher in the winter (0.02 mg/L) compared to the summer (<0.005 mg/L). However, the opposite trend was observed in total Kjeldahl nitrogen concentrations, which were higher in summer (0.36 mg/L) than in the winter (0.17 mg/L). Total phosphorus concentrations were similar between the sampling events and ranged from 0.003 to 0.005 mg/L, lower than the guideline of 0.3 mg/L in NT and Nunavut. Chlorophyll *a* was measured during summer and fall only and ranged from 0.57 to 0.90 µg/L. Based on the total Kjeldahl nitrogen, total phosphorus, and chlorophyll *a* concentrations, the lake was classified as oligotrophic (Table 5-4; Wetzel 1983).

Total organic carbon was similar between sampling events (range from 3.2 to 3.8 mg/L), but total inorganic carbon was higher in the winter (10 mg/L) than in the summer (7.1 mg/L). Total cyanide was not detected in either sample (detection limit was 1 µg/L).

Detection limits were at or below the CWQG with the exception of cadmium, which had a detection limit of 0.1 µg/L in the winter sample (CWQG is 0.017 µg/L). Total metal concentrations were either below detection limits or below applicable guidelines with the following 3 exceptions:

- Cadmium concentration in the summer sample was 0.06 µg/L, which exceeded the CWQG of 0.017 µg/L. In the winter sample, cadmium concentration was below the detection limit of 0.1 µg/L.
- Chromium concentration in the summer sample was 1.76 µg/L, higher than the CWQG of 1 µg/L for hexavalent chromium and lower than the CWQG of 8.9 µg/L for trivalent chromium. Concentration of chromium in the winter sample was 0.24 µg/L.
- Copper concentration in the winter sample was 2.2 µg/L, higher than the CWQG of 2 µg/L. The copper concentration in the summer sample was 0.9 µg/L.

Phenol was not detected in either sample (detection limit was 1 µg/L). Concentrations of BTEX, total volatiles, and total extractable were only measured in the summer sample, and were below detection limits.

5.3.1.4 DI2 Lake

Water quality was measured in Lake DI2 during 2 sampling events: summer 1994 and summer 1995 (Figure 5-1; Appendix B, Table B2-9).