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MEADOWBANK GOLD PROJECT
HYDROLOGIC MONITORING
2004 DATA REPORT

Submitted to:

Cumberland Resources Ltd.
Vancouver, British Columbia

Submitted by:

AMEC Earth & Environmental,
a division of AMEC Americas Limited
Calgary, Alberta

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STUDY TEAM

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APPENDICES

1.0 INTRODUCTION

1.1 Background

Cumberland Resources Ltd. (Cumberland) has been conducting a gold exploration program at the Meadowbank property around the Portage Lakes in Nunavut since 1987. The Meadowbank Gold project is located about 70 km north of the inland community of Baker Lake (Qamani'tuaq), in the southern Kivalliq region of Nunavut (see Figure 1.1). The next closest communities to the project are all to the southeast and lie along the northwest coast of Hudson Bay. The English and Inuit names and the distances from the project are as follows: Chesterfield Inlet (Igluligaarjuk) - 320 km; Rankin Inlet (Kangiqliniq) - 310 km; Whale Cove (Tikirarjuaq) - 355 km; and Eskimo Point (Arviat) - 450 km.

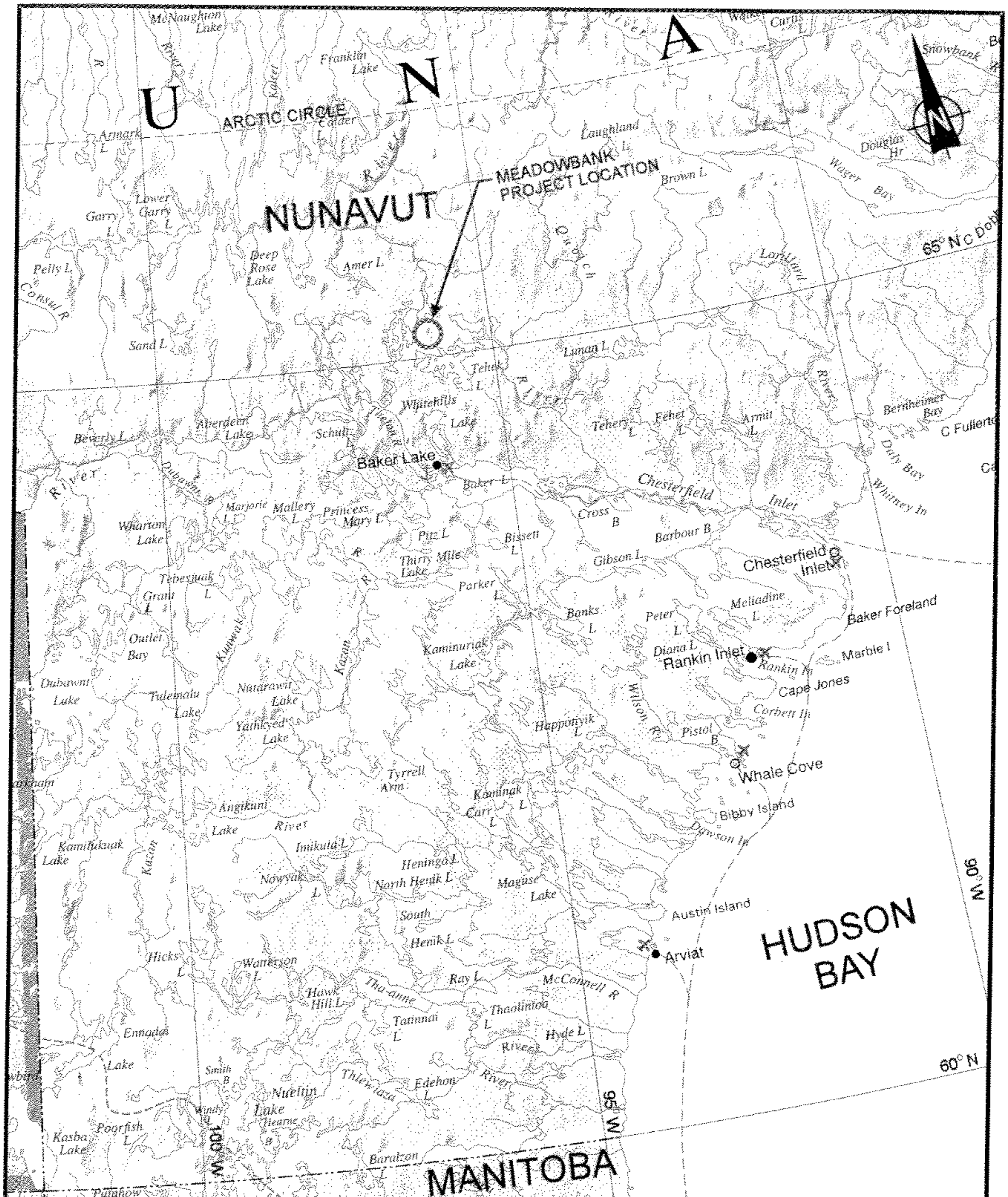
The Meadowbank project is located at the southern limit of the Northern Arctic terrestrial ecozone, which is one of the coldest and driest regions of Canada, with a Low Arctic ecoclimate. This ecozone extends over most of the nonmountainous areas of the Arctic Islands, northeastern portions of the Kivalliq region of Nunavut, western Baffin Island, and a portion of northern Quebec.

The Meadowbank project is located close to the divide between the Back River basin, which flows north into the Arctic Ocean, and the Quoich River basin, which flows east into Hudson Bay. The principal Meadowbank deposits that are proposed for development are located within the Quoich River basin, in the drainages of Third Portage Lake and Second Portage Lake, which drain easterly into Tehek Lake. Tehek Lake in turn empties into the Tehert River, a tributary of the Quoich River, which flows into Chesterfield Inlet, an arm of Hudson Bay.

This document reports the project monitoring data collected during the 2004 hydrologic year plus regional data available for the 2004 hydrologic year. Previous reports include four earlier documents prepared by AMEC for the Meadowbank Project:

- Meadowbank Gold Project, Preliminary Hydrologic Monitoring Plan, September 1998.
- Meadowbank Gold Project, Climate and Hydrology, Preliminary Description of Baseline Conditions, Potential Project Effects and Possible Mitigative Measures, June 1999.
- Meadowbank Gold Project, Hydrologic Monitoring 2002 Data Report, January 2003.
- Meadowbank Gold Project, Baseline Hydrology Report, January 2004.

Data collected prior to 2004 are documented in the previous reports, and are not included in this document except for purposes of comparison or to provide a context for the 2004 data.



MAP REFERENCE: 1:4 000 000, NATURAL RESOURCES CANADA

1:4 000 000 — 0, 40, 80, 120, 160 km

AMEC Earth & Environmental Limited	PROJECT: MEADOWBANK GOLD PROJECT
CLIENT: CUMBERLAND RESOURCES LTD.	TITLE: LOCATION PLAN

DATE:	JOB No.:	COREL FILE:	FIGURE No.:	REV.
OCTOBER 2003	CW1593.4	1593-P01.cdr	FIGURE 1.1	A

1.2 Scope of Work

The scope of work for 2004 consisted of the following:

- Spring snow surveys to determine the snow water equivalent of the snowpack in the project watersheds prior to the spring runoff;
- Hydrometric monitoring (lake levels and lake outlet discharges) including operation and maintenance of four hydrometric stations;
- Review and compilation of the meteorological data collected since 1997 at the existing on-site climate station;
- Routine maintenance of the climate station;
- Operation of an evaporation pan with trained on-site Cumberland staff performing the daily data collection;
- Acquisition of regional 2004 hydrologic year meteorological and hydrometric data;
- Data processing, computation, and analysis; and
- Preparation of a report presenting and documenting the data.

Table 1.1 summarizes the main work activities that were planned and carried out by AMEC for the year 2004 data collection program.

In addition to the planned scope of work, Cumberland also requested AMEC to conduct a reconnaissance-level hydrologic assessment of the watercourse crossings for three alternative winter road routes between Baker Lake and Meadowbank Camp. The results of that assessment work were provided separately to Cumberland, and are not included in this report.

TABLE 1.1
2004 Work Component and Activity Summary

Component	Field Activities	Office Activities
Snow Surveys and Pre-runoff Lake Levels	• Survey pre-breakup lake water levels and ice thickness at 4 stations • Measure snow depths and densities along several representative transects	• Compile, compute, and present data
Hydrometric Monitoring	• Repair, startup, and operate 4 stations • Make discharge measurements • Survey water levels • Retrieve data • Shut down 4 stations at end of season	• Compile, compute, and present data
Meteorologic Monitoring	• Repair tipping bucket rain gauge • Re-establish remote communications link • Check climate station tripod level • Retrieve data • Prepare station for winter operation	• Compile, compute, and present data
Evaporation	• Startup evaporation pan • Re-install manual rain gauge • Operate pan making daily measurements • Shut down pan	• Compile, compute, and present data
Winter Road Reconnaissance	• Aerial reconnaissance of water crossings • Hydrologic characterization (depth, width, average velocity) of identified crossings	• Compile, compute, and present data and photos

2.0 2004 WORK PROGRAM

2.1 Meteorologic Monitoring

Climate data are available for the project site since September 1997 when a climate station was established at the south camp (old camp). The station has operated continuously from September 1997 to the present.

2.1.1 Climate Station Servicing and Repairs

The climate data was downloaded from the climate station datalogger during the June/July 2004 field visit. The field visit included repairs and routine maintenance to the climate station and components. The soil heat flux sensor cable was found severed, subsequently repaired and then reinforced with armour sheathing.

A detailed description of the climate station sensors and equipment can be found in AMEC's January 2003 report "Meadowbank Gold Project – Hydrologic Monitoring 2002 Data Report" and January 2004 report "Meadowbank Gold Project – Baseline Hydrology Report".

2.1.2 Climate Station Monitoring

The datalogger was reprogrammed in June 2002 to record hourly rainfall totals and hourly averages of air temperature, relative humidity, wind speed, wind direction, wind direction standard deviation, and minimum battery voltage. Hourly data are more desirable than daily data for evaluation of short-term rainfall intensities and for characterization of wind conditions and wind energy potential. The climate data elements currently being observed, and their recording frequency are summarized in Table 2.1.

The most recent climate station dataset available for use in this baseline report was downloaded on 9 September 2004.

2.1.3 Evaporation

A class 'A' evaporation pan was established on 24 June 2002 at the south camp (old camp). The pan was relocated to the north camp in the 2003 season to facilitate daily readings taken by camp personnel. The pan data were used to estimate lake evaporation.

TABLE 2.1
Climate Data Parameters – Recording Frequency Since June 2002

Element	Units	Recording Frequency	
		Daily	Hourly
Average horizontal wind speed	m/s	✓	✓
Average wind direction	degrees	✓	✓
Standard deviation of the average wind direction	degrees	✓	✓
Maximum wind gust	m/s	✓	
Maximum wind gust direction	degrees	✓	
Maximum wind gust time of occurrence	hh:mm	✓	
Average air temperature	°C	✓	✓
Maximum air temperature	°C	✓	
Minimum air temperature	°C	✓	
Average relative humidity	%	✓	✓
Maximum relative humidity	%	✓	
Minimum relative humidity	%	✓	
Average net radiation corrected for wind speed	W/m^2	✓	
Total depth of rainfall	mm	✓	✓
Average Solar Radiation	kW/m^2	✓	
Average Soil Temperature	°C	✓	
Average Soil Heat Flux	W/m^2	✓	
Average barometric pressure	mbar		✓

2.2 Hydrometric Monitoring

A surface water hydrology program to gather data for the project basins was initiated at the start of the 2002 runoff season. Four lake outlet discharge and water level monitoring stations were installed in June 2002 and operated continuously until they were shut down for the winter in September 2002. The four stations were again operated for the same months during the 2003 and 2004 seasons. This report incorporates the hydrometric data for all three years.

A detailed description of the hydrology equipment and methods can be found in AMEC's January 2003 report "Meadowbank Gold Project – Hydrologic Monitoring 2002 Data Report" and January 2004 report "Meadowbank Gold Project – Baseline Hydrology Report".

The principal activities involved in the 2004 hydrometric monitoring program and the associated dates, were as follows:

- Station Startup: 23 June – 4 July
- Station Operation: June - September
- Seasonal Shut-Down: 9 – 15 September
- Data Compilation and Analysis: October – December

The surface water hydrology program consisted of monitoring lake levels and lake outlet discharges. Pre-runoff lake ice/water level and pre-springmelt snowcourse measurements could not be carried out in 2002 as the season was too far advanced when the monitoring program was initiated, however these measurements were carried out for the 2003 and 2004 seasons.

2.3 Spring Snow Surveys

The objective of obtaining snow data was to determine the snow water equivalent of the snowpack in the project watersheds prior to the spring runoff. Although snowfall in the Arctic generally accumulates throughout the winter period without significant melt prior to the spring runoff, meteorological station snowfall gauge data cannot be used directly in determining the amount of runoff because of the undercatch typical for such gauges in the Arctic and the significant redistribution of snow by wind and the associated sublimation losses through the winter.

The method found to be best suited to the Arctic environment has been termed the "stratified method" (Pomeroy and Gray, 1995). In this method the watershed is mapped according to landscape types (strata) or terrain units, which are characterized as typical for various accumulations of snow. After these terrain units have been determined and the watershed map delineated accordingly, snow surveys are carried out just before spring melt to obtain representative snow depth and density measurements for each terrain unit. Those values are then applied to the total area of each type of terrain unit in the watershed to obtain the total snow water equivalent.

The principal variables affecting snow accumulation are topography, vegetation and human development of the land. For the Meadowbank study area, the land is in its natural state. The vegetation is uniform, consisting of low grasses and low tundra shrubs less than 200 mm tall. The dominant variable affecting snow accumulation in the study area is topography.

The topography in the project area is partly defined by digital mapping with a contour interval of 2 metres and by 1:50 000 NTS mapping with a contour interval of 10 metres. The 2 metres contour mapping covers only a 5 km by 10 km area around the area of the main ore deposits; the NTS mapping is the best available mapping covering the complete study area at the watershed level. The study area straddles four NTS map sheets. The applicable sections of these map sheets were digitized to serve as a base map for the study area watersheds and allow GIS analysis of the terrain.

3.0 METEOROLOGICAL DATA

3.1 Air Temperature

3.1.1 Meadowbank Camp Air Temperature Data

The available temperature data for Meadowbank Camp extend over an 84-month period from September 1997 through August 2004. Those data are presented in graphical format in Appendix B6 (daily maximum and minimum values) and Appendix B7 (daily mean value, plotted with daily mean soil temperatures). A summary of the daily extremes is provided in Figure 3.1. The monthly mean and extreme air temperatures are listed in Table 3.1.

TABLE 3.1
Meadowbank Camp Air Temperature Summary

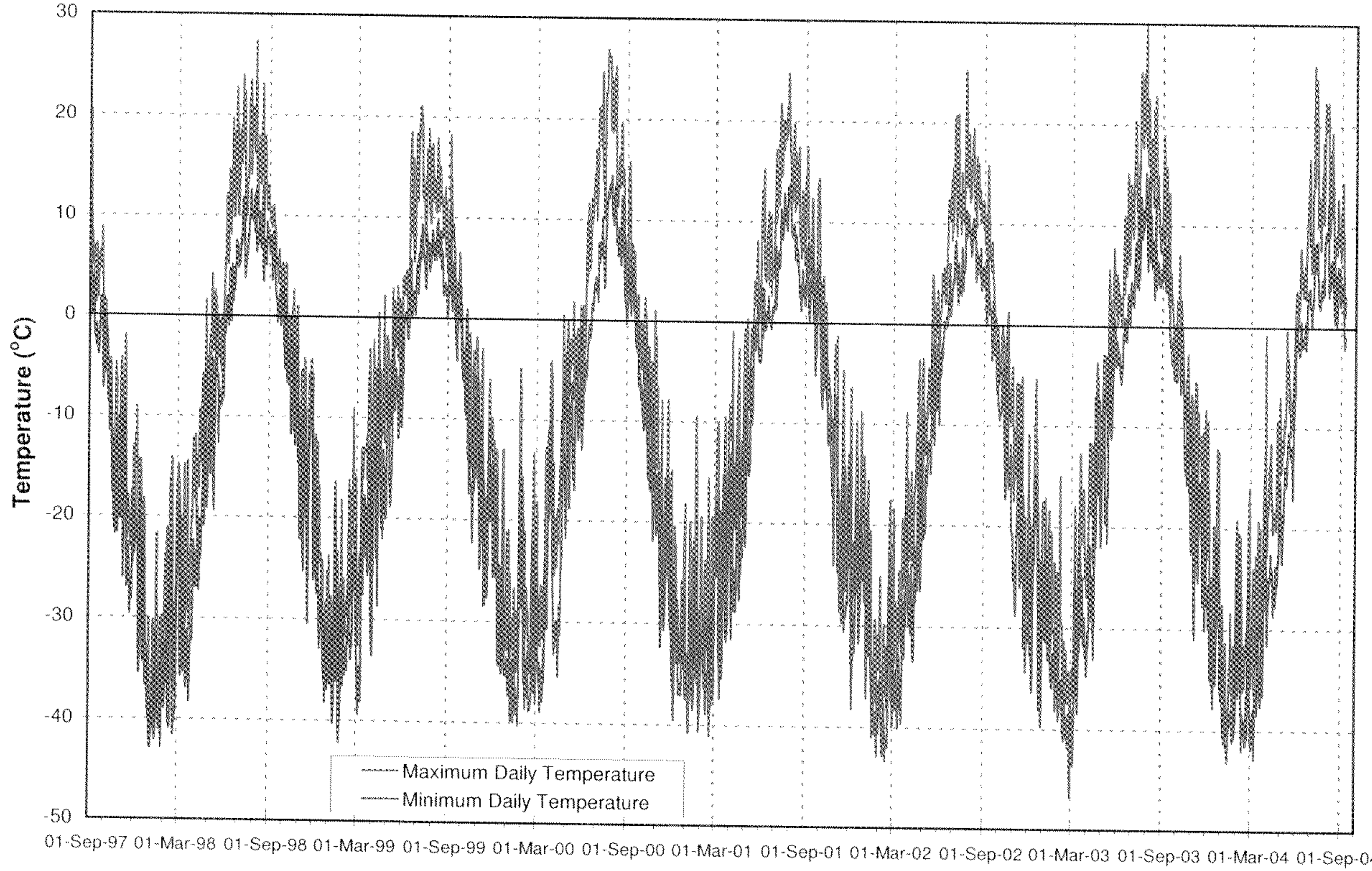
Month	September 1997 to August 2004					Sept 2003 – Aug 2004		
	Extreme Daily		Average*		Mean	Extreme Daily		Mean
	Max	Min	Max	Min		Max	Min	
January	-4.9	-43.2	-29.1	-35.5	-32.4	-26.8	-43.2	-37.5
February	-9.1	-46.8	-27.8	-35.2	-31.7	-16.0	-42.0	-31.7
March	-0.8	-43.6	-22.3	-30.5	-26.3	-0.8	-42.9	-31.1
April	2.1	-35.4	-13.3	-22.5	-17.7	-6.9	-31.5	-20.7
May	8.0	-23.4	-3.1	-9.9	-6.3	2.6	-23.4	-10.7
June	22.7	-12.9	7.6	0.0	3.7	16.7	-2.8	2.8
July	29.8	0.1	16.8	7.2	12.1	26.0	0.1	9.7
August	27.4	-0.4	13.3	6.4	9.7	22.3	0.0	8.1
September	20.5	-8.2	5.9	1.1	3.4	19.0	-5.5	3.5
October	7.1	-24.1	-4.7	-10.3	-7.4	7.1	-22.5	-6.2
November	-1.3	-34.4	-14.4	-21.5	-17.9	-5.5	-31.0	-17.6
December	-5.4	-39.8	-22.3	-29.2	-25.8	-9.3	-37.8	-26.8
Year	29.8	-46.8	-7.7	-14.9	-11.3	26.0	-43.2	-13.1

* Represents the average of the daily extremes for the month.

A comparison of the September 2003 – August 2004 temperatures indicates that conditions were generally colder than the 1997 – 2004 period as a whole.

A comparison of the air temperature summary data for Meadowbank (as reported in Table 3.1 above) with the air temperature data for the same period for the nearest regional station of Baker Lake is given in Table 3.2.

Daily Temperature Extremes
Meadowbank Camp Station September 1997 to September 2004



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Meadowbank temp.xls [Chart_Meadowbank]
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Figure 3.1

TABLE 3.2
Comparison of Monthly Air Temperature (°C) Statistics
(September 1997 through August 2004)

Month	Meadowbank Camp					Baker Lake				
	Extreme Daily		Average*		Mean	Extreme Daily		Average*		Mean
	Max	Min	Max	Min		Max	Min	Max	Min	
January	-4.9	-43.2	-29.1	-35.5	-32.4	-1.7	-45.9	-28.2	-35.5	-31.9
February	-9.1	-46.8	-27.8	-35.2	-31.7	-10.8	-46.6	-26.9	-34.8	-30.9
March	-0.8	-43.6	-22.3	-30.5	-26.3	1.5	-43.4	-21.6	-30.0	-25.8
April	2.1	-35.4	-13.3	-22.5	-17.7	19.2	-33.6	-12.4	-22.0	-17.2
May	8.0	-23.4	-3.1	-9.9	-6.3	9.4	-21.9	-2.4	-9.0	-5.7
June	22.7	-12.9	7.6	0.0	3.7	24.8	-11.2	8.8	0.3	4.6
July	29.8	0.1	16.8	7.2	12.1	31.5	0.3	17.7	6.4	12.1
August	27.4	-0.4	13.3	6.4	9.7	30.9	-1.1	14.7	5.7	10.2
September	20.5	-8.2	5.9	1.1	3.4	22.6	-9.0	7.4	0.4	3.9
October	7.1	-24.1	-4.7	-10.3	-7.4	9.8	-24.9	-3.6	-9.9	-6.8
November	-1.3	-34.4	-14.4	-21.5	-17.9	0.0	-32.6	-12.9	-20.8	-16.9
December	-5.4	-39.8	-22.3	-29.2	-25.8	-1.1	-39.8	-21.0	-28.9	-24.9
Year	29.8	-46.8	-7.7	-14.9	-11.3	31.5	-46.6	17.7	-35.5	-10.8

* Represents the average of the daily extremes for the month.

The monthly mean air temperatures for the two locations are seen to be very similar, with the Meadowbank Camp data exhibiting marginally lower air temperatures than Baker Lake. The difference between the two stations in mean monthly air temperatures for the 1997 to 2004 period ranges from 0°C to 1.0°C colder at Meadowbank.

3.1.2 Long-Term Regional Temperature Characteristics

The long-term monthly air temperature statistics for Baker Lake are listed in Table 3.3 based on the available period of record (1946 to 2004).

The above summary indicates that air temperatures in the Baker Lake region have ranged from lows of -51°C in the winter to highs of +34°C in the summer. The mean annual air temperature for Baker Lake is approximately -12°C and can drop below zero in any month of the year. Mean monthly air temperatures are above 0°C for the months of June through September.

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TABLE 3.3
Monthly Air Temperature (°C) Statistics for Baker Lake – 1946 to 2004

Month	Extreme Daily		Average		Mean
	Maximum	Minimum	Maximum	Minimum	
January	-1.7	-50.6	-29.2	-36.2	-32.7
February	-4.1	-50.0	-28.6	-35.6	-32.1
March	1.5	-50.0	-22.9	-31.3	-27.1
April	19.2	-41.1	-12.8	-22.1	-17.6
May	13.9	-27.8	-2.7	-10.0	-6.4
June	28.1	-13.9	8.2	0.2	4.2
July	33.6	-1.7	16.3	5.9	11.1
August	30.9	-3.4	14.0	5.3	9.7
September	22.6	-20.0	5.8	-0.5	2.7
October	9.8	-30.6	-4.1	-10.7	-7.4
November	2.2	-42.7	-16.0	-23.9	-19.9
December	-1.1	-45.6	-24.1	-31.3	-27.8
Year	33.6	-50.6	16.3	-36.2	-12.0

3.2 Precipitation

3.2.1 Presentation of Precipitation Data

Annual precipitation is presented in this report on a hydrologic year basis (October through September), rather than the conventional calendar year basis. The rationale for this approach is that precipitation begins to be stored as snow in October (the first month with average temperature below freezing, see Section 3.1 above), and remains in storage over winter, not to be released until the snowmelt in June the following year. Use of a calendar year imposes an artificial grid on the data that can distort the true picture of annual precipitation and runoff, and the relationship between the two.

Observed (unadjusted) precipitation data requires correction to account for "undercatch". A detailed discussion of the adjustments to precipitation amounts due to "undercatch" can be found in AMEC's January 2003 report "Meadowbank Gold Project – Hydrologic Monitoring 2002 Data Report" and January 2004 report "Meadowbank Gold Project – Baseline Hydrology Report".

3.2.2 Regional Precipitation Data

The adjusted mean monthly rainfall, snowfall and total precipitation values for Baker Lake are provided in Tables 3.4, 3.5, and 3.6, respectively. The data are shown graphically in Figure 3.2. A summary comparison of the adjusted and unadjusted total rainfall, snowfall and precipitation on an annual basis is provided in Table 3.7.

Unadjusted and adjusted values for the years 2002 and 2003 have been revised by Environment Canada. Those revisions, as well as the inclusion of 2004 data, have resulted in slight changes to overall means from those reported previously in AMEC's January 2003 report "Meadowbank Gold Project – Hydrologic Monitoring 2002 Data Report" and January 2004 report "Meadowbank Gold Project – Baseline Hydrology Report".

These tables show that regional precipitation in 2004 was below the long-term mean, and is thus a continuation of the below-average precipitation trend that began in 2003. Total snowfall in 2004 was about the same as in 2003, but 2004 rainfall was somewhat lower.

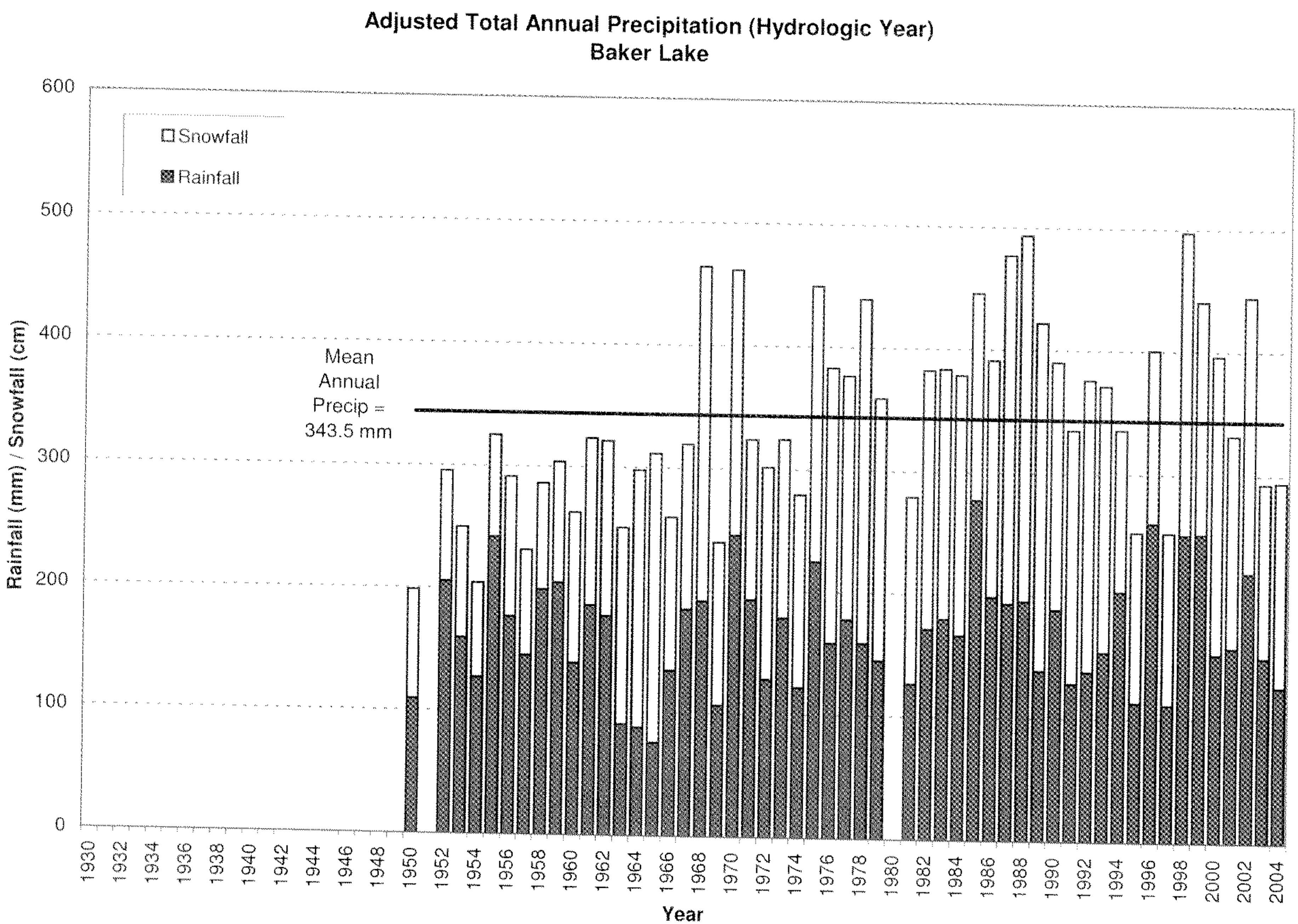

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Figure 3.2