B.3. Bell Mine – Drainage Collection and Discharge

by
Kevin Morin
Minesite Drainage Assessment Group

and
Brian Rosendale
Bell Mine, Noranda

Bell Mine – Drainage Collection and Discharge

by

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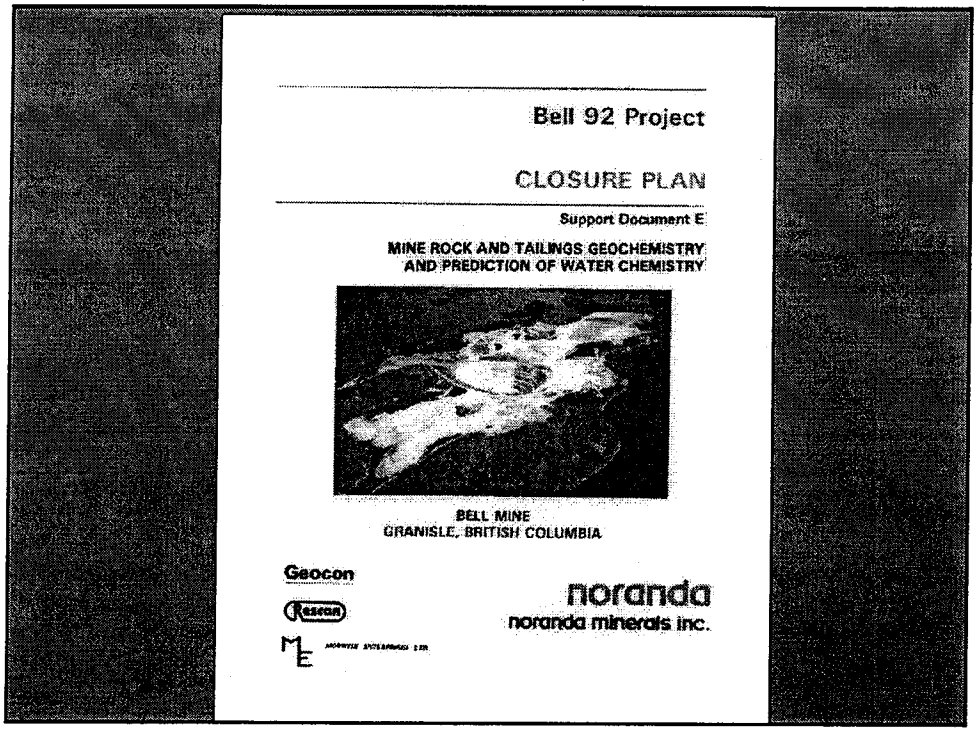
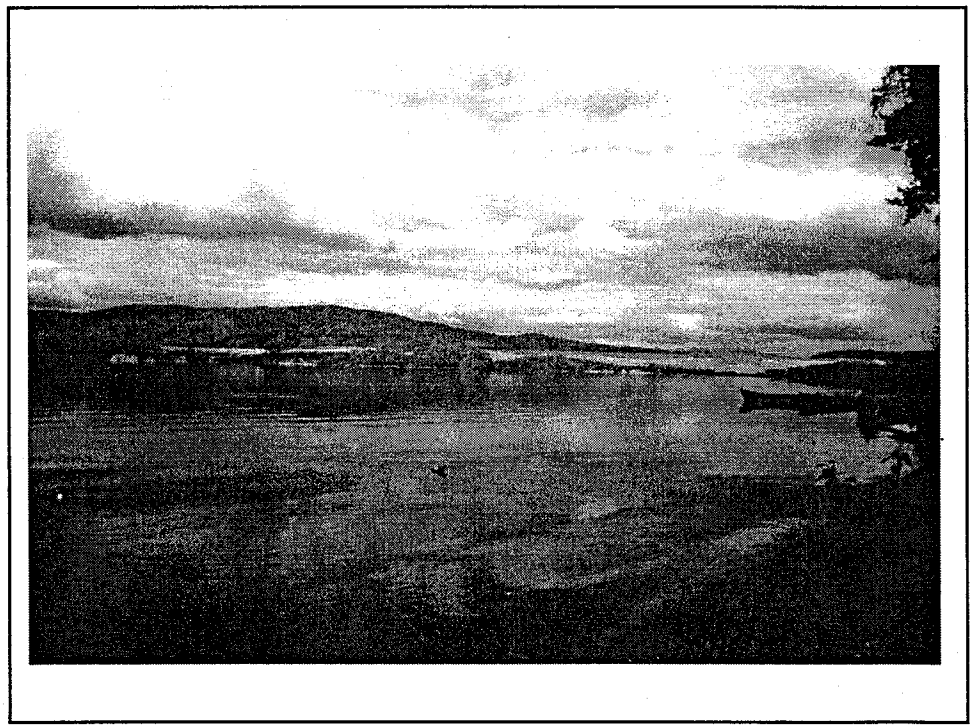
(www.mdag.com)

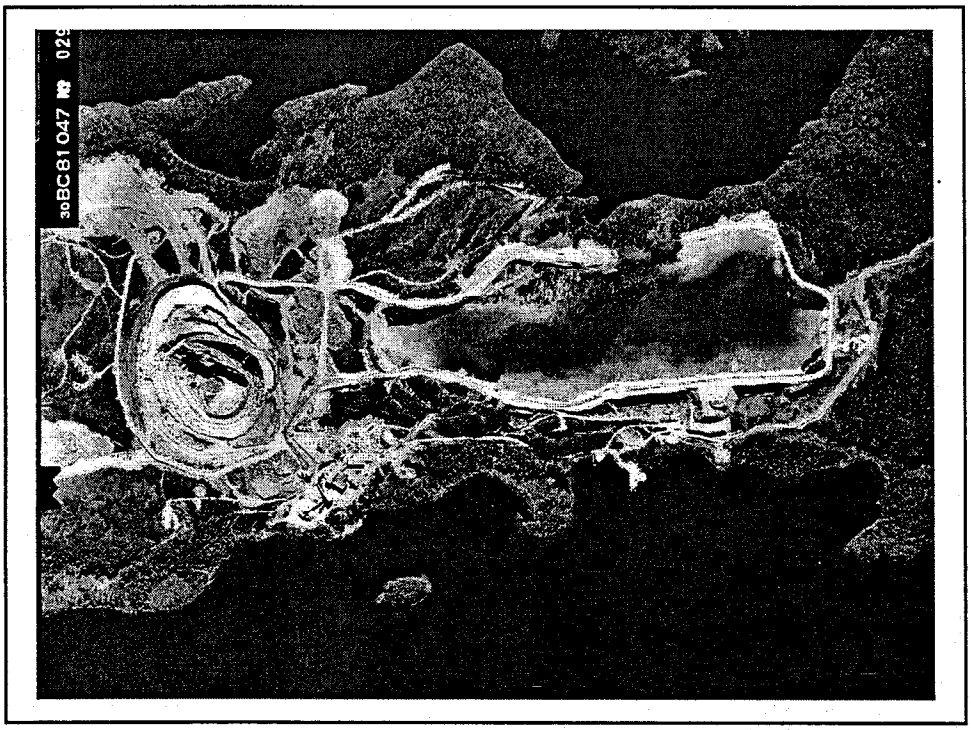
and

Brian Rosendale, Site Manager, Bell Mine, Noranda

noranda



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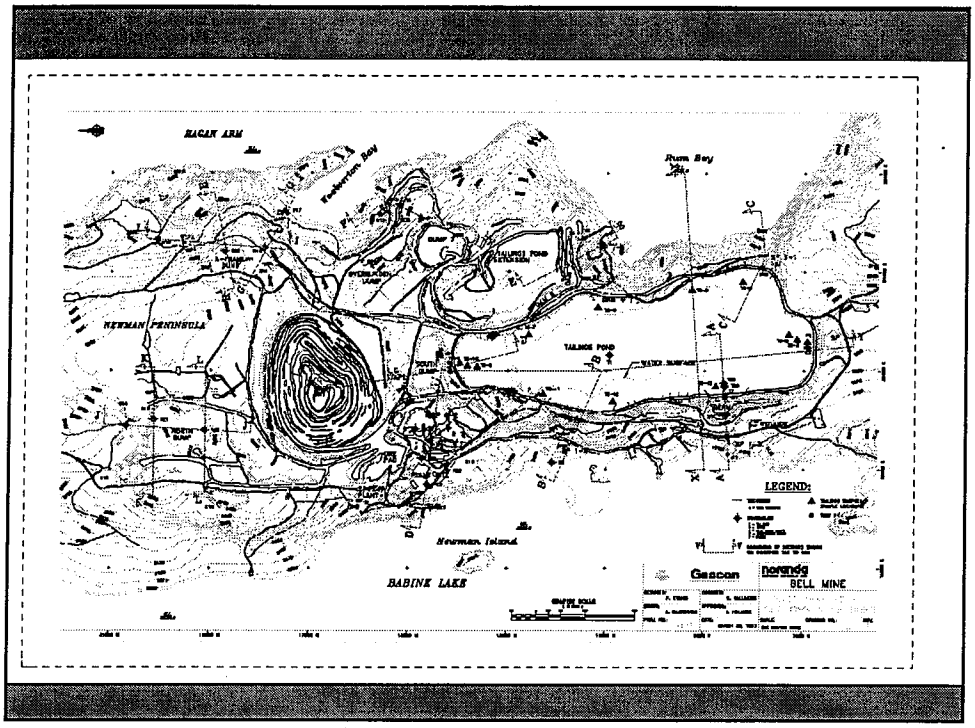
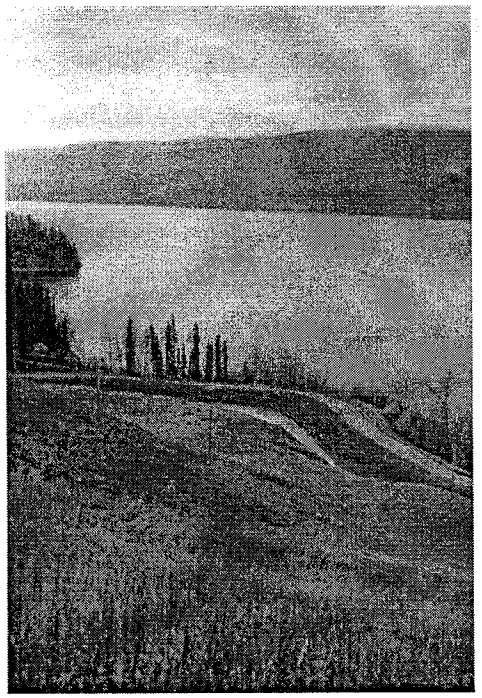
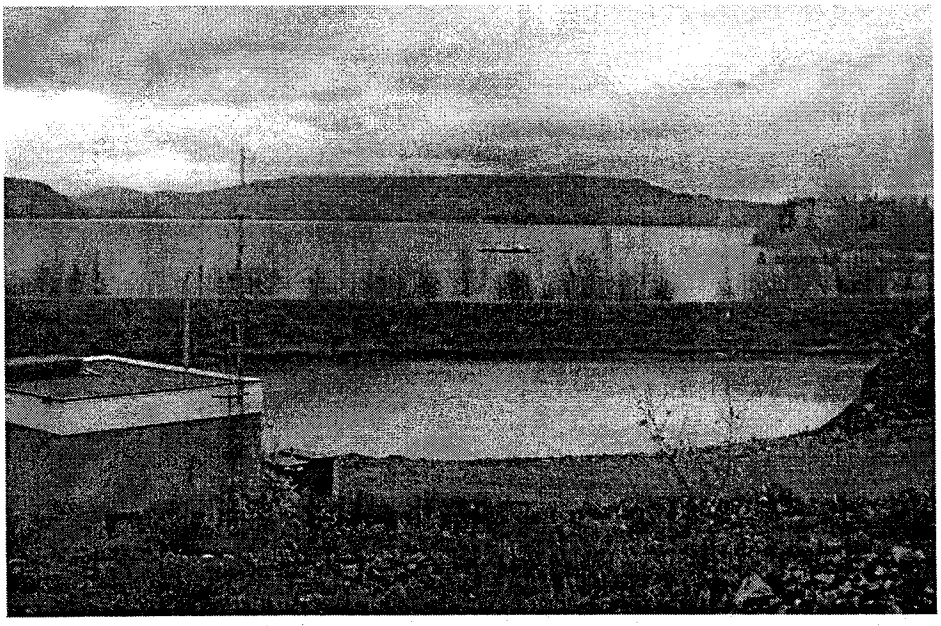
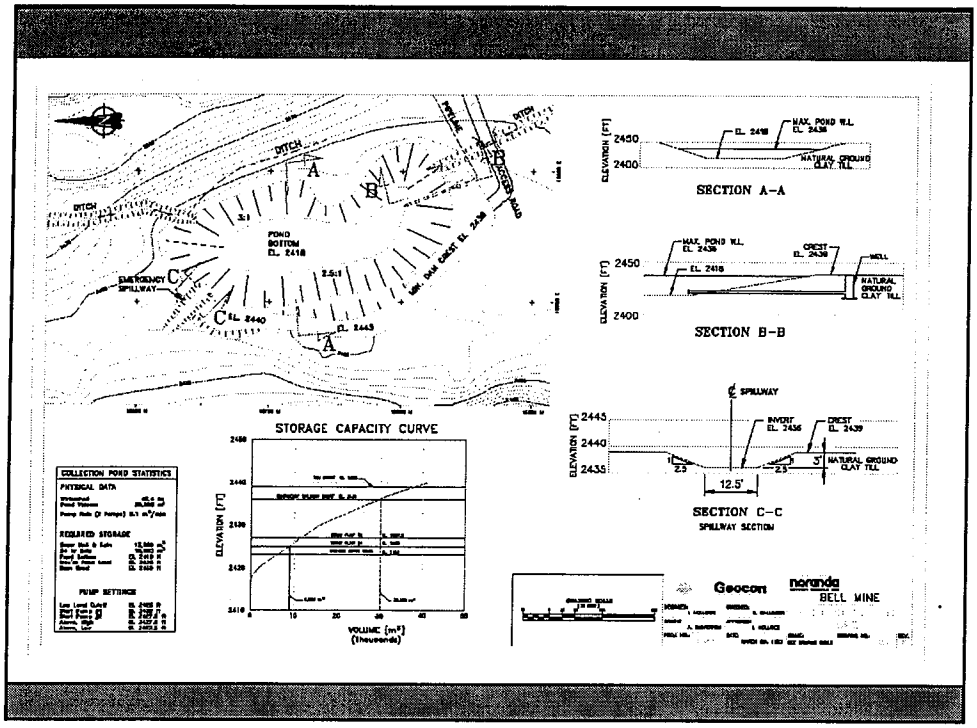
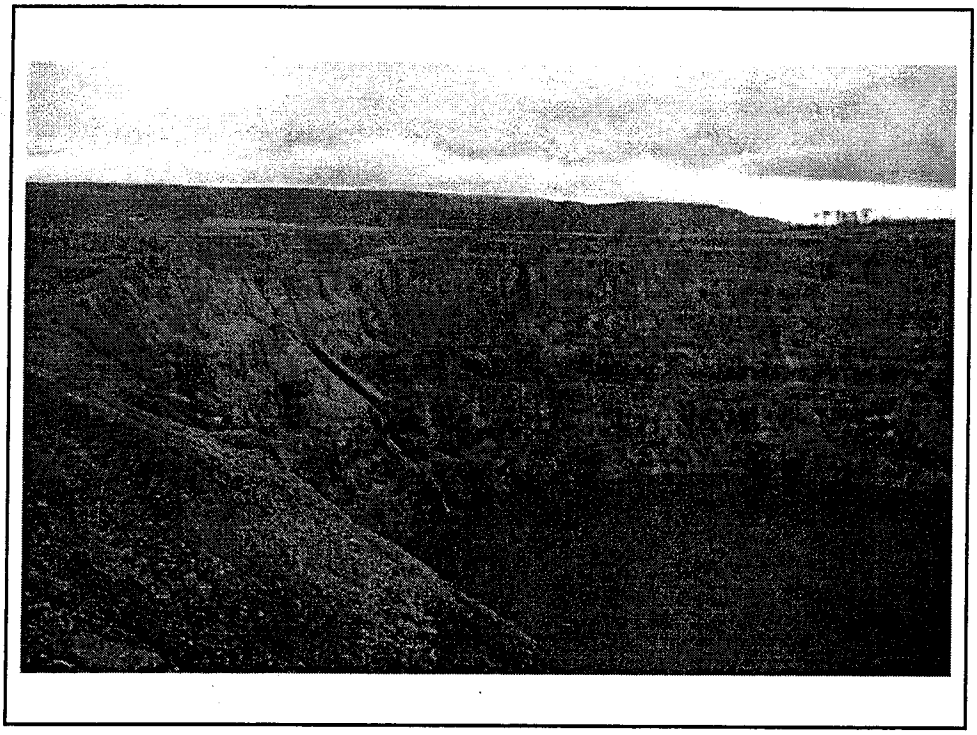

BAGAN ARM
Newman Peninsula
Newman Island
BABINE LAKE
LEGEND:
Geocon
BELL MINE






DITCH
DITCH
POND BOTTOM EL. 2418
EMERGENCY SPILLWAY
EL. 2440
EL. 2443
SECTION A-A
MAX. POND W.L. EL. 2438
EL. 2418
NATURAL GROUND CLAY TILL
SECTION B-B
CREST EL. 2438
BERM
SECTION C-C
SPILLWAY SECTION
SPILLWAY
INVERT EL. 2436
CREST EL. 2439
12.5'
STORAGE CAPACITY CURVE
ELEVATION [FT]
VOLUME [m³] (thousands)
COLLECTION POND STATISTICS
PHYSICAL DATA
RESERVE STORAGE
PUMP SETTINGS
Geocon
noranda
BELL MINE



PROVINCE OF
BRITISH COLUMBIA

Environmental Protection
Box 5000
Smithers
British Columbia V0J 2N0
Telephone: (604) 847-7388
Fax: (604) 847-7581

MINISTRY OF ENVIRONMENT,
LANDS AND PARKS

PERMIT
PE-1505

Under the Provisions of the Waste Management Act

Noranda Minerals Inc.
Bell Mine
P.O. Box 2000
Granisle, British Columbia
V0J 1W0

is authorized to discharge effluent from a closed copper mine located on Newman Peninsula, British Columbia, to seepage collection ponds, a tailings impoundment, an open pit and to Babine Lake subject to the following terms and conditions. Contravention of any of these conditions is a violation of the *Waste Management Act* and may result in prosecution.

1. AUTHORIZED DISCHARGES

1.1 This subsection applies to the discharge of supernatant from the tailings impoundment to Ross Bay in Babine Lake via a submerged outfall. The site reference number for this discharge is E209289.

1.1.1 The maximum authorized rate of discharge is 9,000 m^3/day with the annual maximum volume of effluent discharged being 300,000 m^3.

1.1.2 The characteristics of the discharge shall not exceed:

Total Suspended Solids	25 mg/L
pH	6.5-8.5

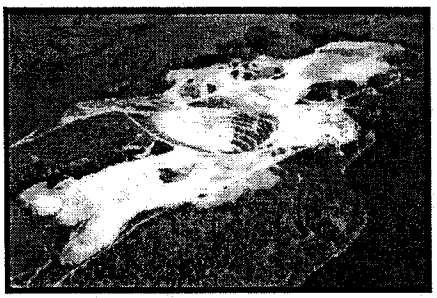
Date Issued: April 21, 1972
Date Amended: AUG 2 1 1997
Issued Recently
Page: 1 of 11

J. Ostrander, P. Eng.
Assistant Regional Waste Manager

PERMIT PE-1505

BELL MINE
WATER MANAGEMENT MANUAL

Noranda Inc.
Bell Mine
Granisle, British Columbia



June 1999

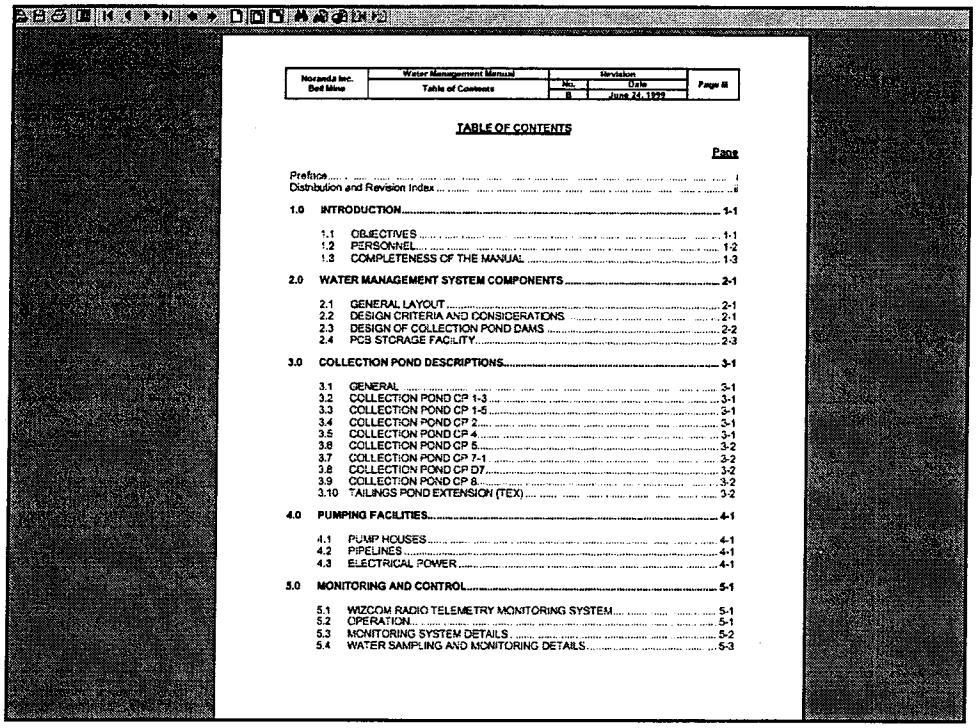
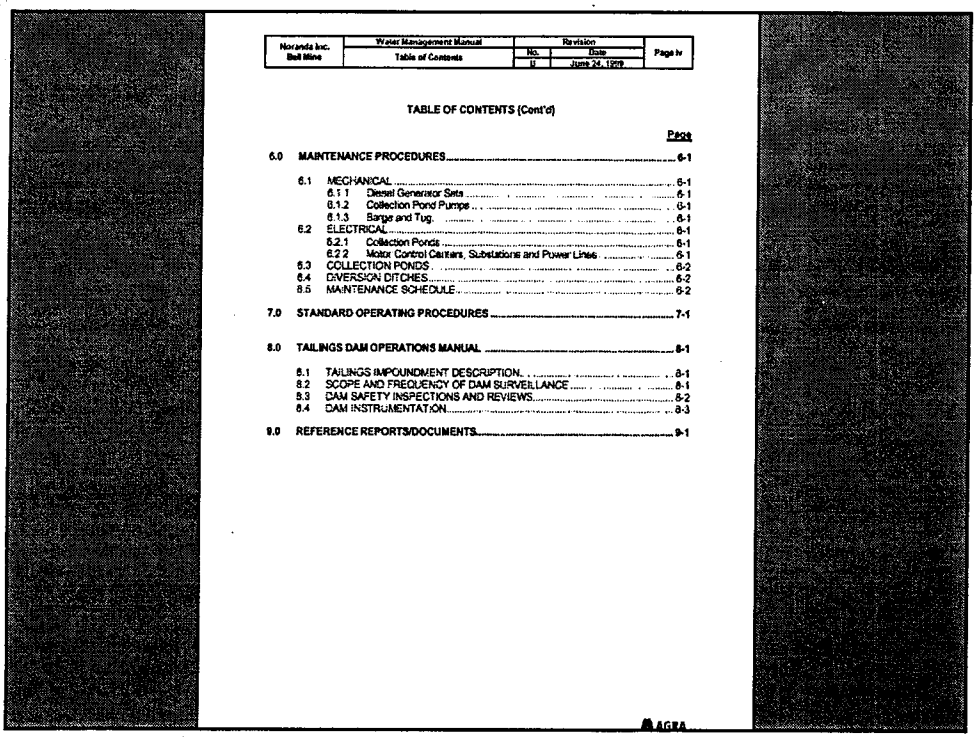


TABLE OF CONTENTS



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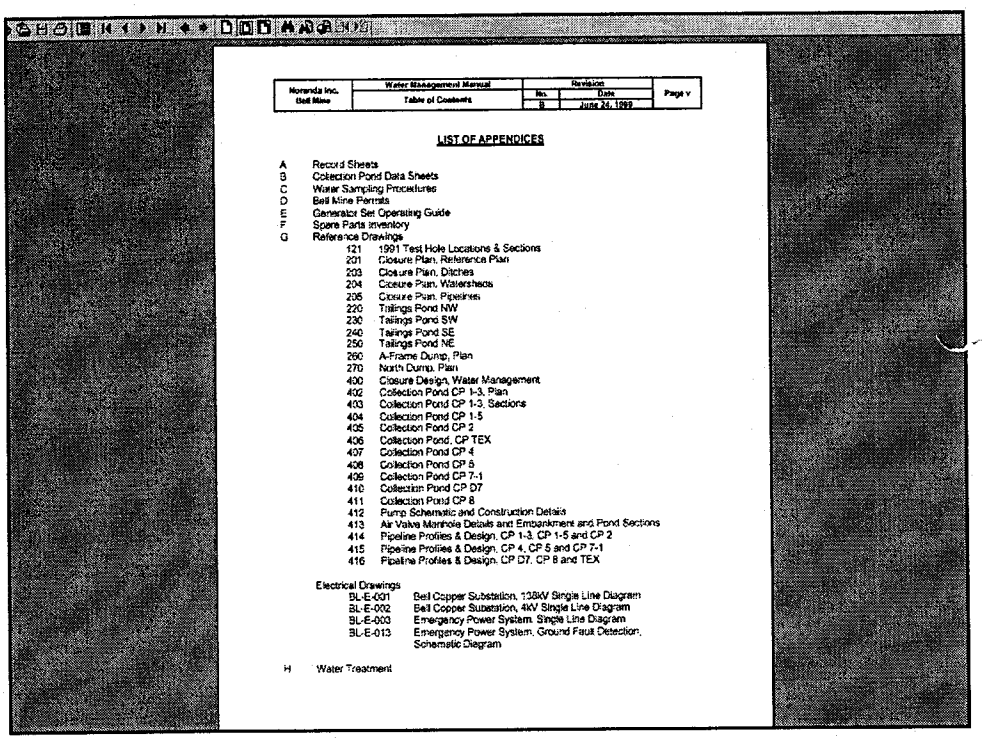


Noranda Inc. Bell Mine	Water Management Manual	Revision No.	Revision Date	Page v
	Table of Contents	B	June 24, 1999	

LIST OF APPENDICES

Key Issues in the Manual

- The key design concepts for the seepage collection facilities.
- An outline of the water management strategy for the site for the current and future conditions.
- Brief descriptions of each of the collection ponds in terms of available volume, pumping capacity and other design data.

- A description of the pumphouse facilities including the monitoring and control of these facilities.
- Water monitoring and sampling requirements (i.e., frequency of water sampling and test parameters) for the piezometers, overflow weirs and collection ponds in accordance with PE-1505 (Appendix D).
- Maintenance procedures for the seepage collection facilities, an emergency response plan in case of pump failure, pipeline failure and/or power failure, which include personnel and agencies to be contacted during emergencies.

- Operating procedure for the generator sets.
- An inventory of spare parts and equipment for future reference.
- An operating manual for the tailings dam structures.

The water management system for the mine closure was designed to meet the British Columbia Ministry of Energy, Mines and Petroleum Resources guidelines and regulations. The water management components were designed based on the following criteria:

- Collection ponds were designed to contain the 1 in 200 year flood event resulting from a combined snow melt and rainfall event or a 24 hour rainfall storm event, whichever was the governing. The design storage capacity was based on the above storm event in combination with continuous pumping to the open pit.

- Emergency spillways at the collection ponds were designed to convey the probable maximum flood (PMF) resulting from a 72 hour probable maximum precipitation (PMP) event plus maximum snow event.

- Collection ditches reporting to the ponds were designed for a 1 in 200 year flood based on a 24 hour intensity rainfall event. The collection ditches will require maintenance, for instance, in response to extreme erosion or snow/ice buildup conditions.

- Tailings impoundment can store three (3) PMF volumes simultaneously without overtopping the dam structures. Consequently, the no spillway structure was incorporated into the tailings impoundment because it was shown that the pond water level will drop with time due to lowering of the phreatic line. Furthermore, it has been shown that the pond water level is dropping with time.

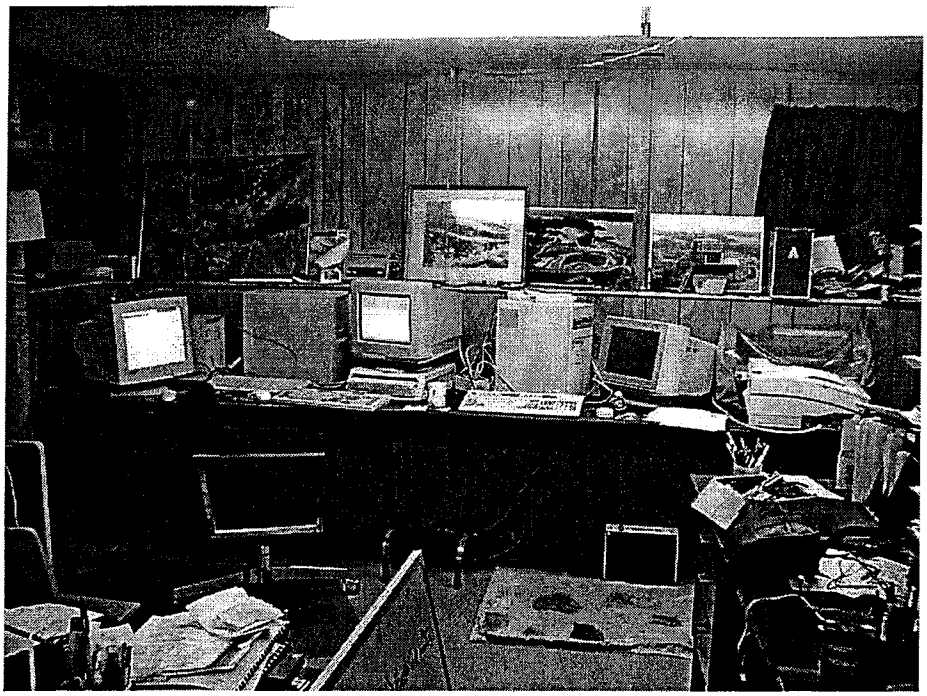
- Tailings pond extension was designed as a collection pond system as the tailings area was not fully utilized. As a result, a large reservoir with only a small water surface exists at this site. Furthermore, the pumphouse and pumping rate were designed to handle the PMF volume.

- Open pit was shown to be capable of temporarily storing the contaminated water collected at the collection ponds for a period of about 40 to 50 years before a water treatment plant needs to be installed. The maximum operating water level of the open pit was selected at El. 750 m (2,460 ft) to provide storage for a PMF event.

WIZCOM RADIO TELEMETRY MONITORING SYSTEM

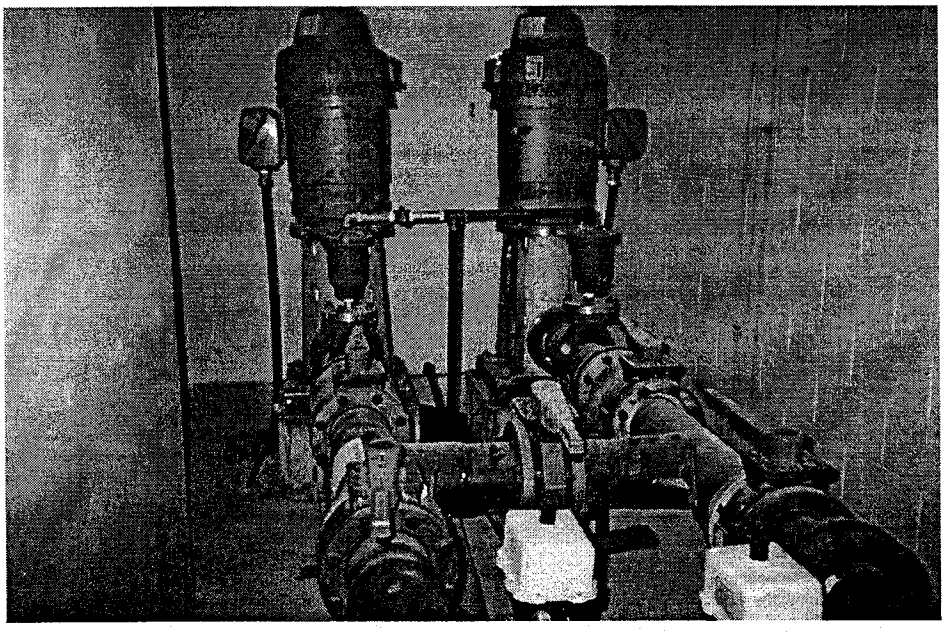
The Wizcom system is a Supervisory Control and Data Acquisition (SCADA) system which gathers information from remote stations and transmits the data to a base station computer for on time reporting, analysis and storage. The radio telemetry equipment features packet switched store-and-forward data transmission technology with advanced error correction coding structures. The central site computer facility utilizes the QNX multi-tasking, multi-user, operating environment specifically developed for IBM compatible personal computers.

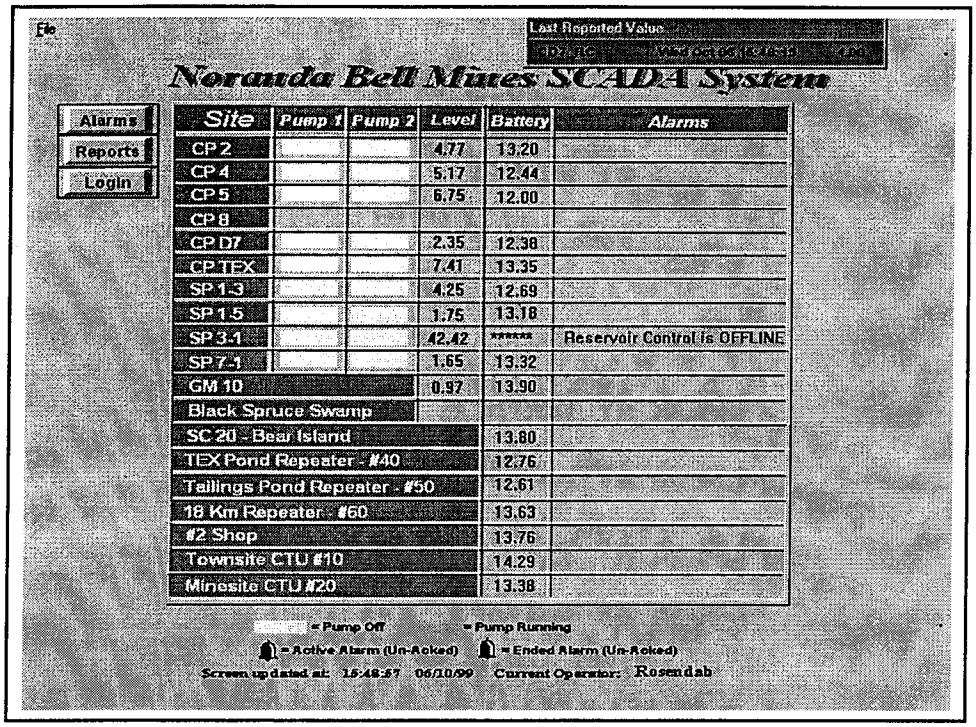
The Bell Mine Monitoring System consists of a Remote Terminal Unit (RTU) at each pump station. These communicate via radio telemetry to the Central Terminal Unit (CTU) at the Security Office. Each RTU has battery back-up power, terminal strip connection for analogue, digital and status devices, data logging memory, a radio telemetry port, and a serial port. The CTU receives information from RTUs and is connected to the base station 386 PC type computer that runs DataCommand software. In addition to data capture, control management, alarm analysis, and network communications, the base station computer provides password protected operator displays and accepts input for interrogations and control actions.

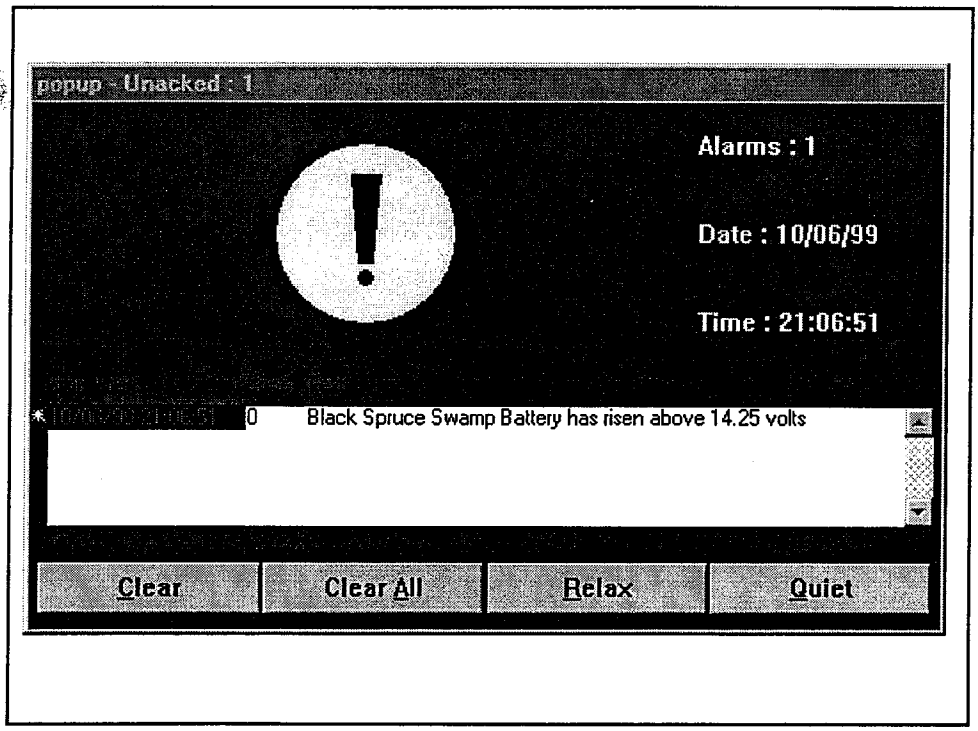


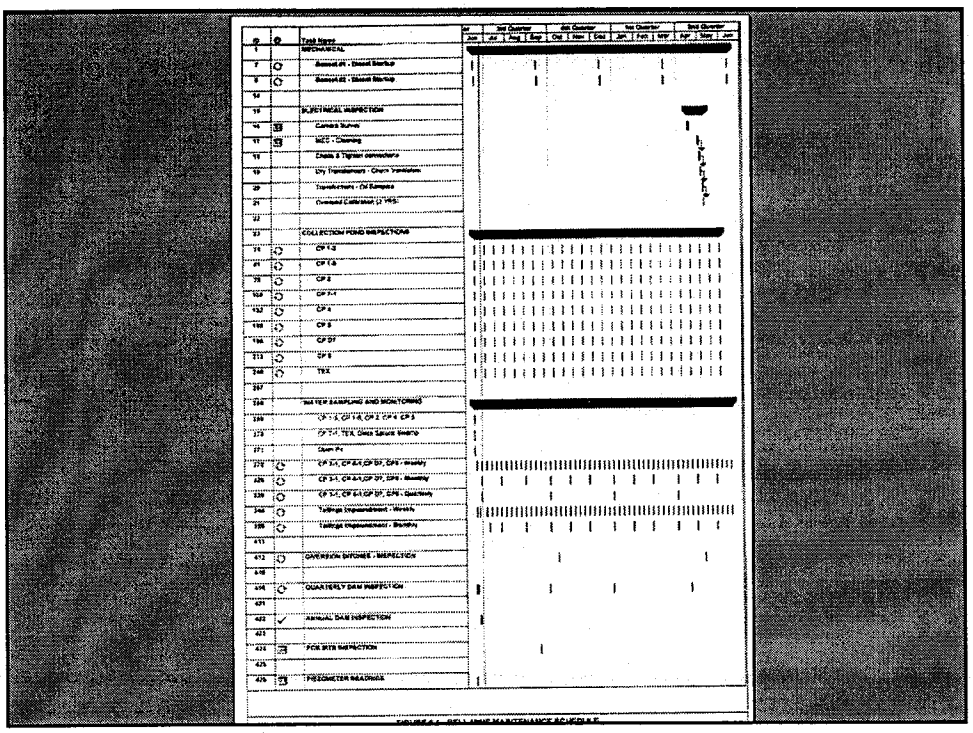
The following information is stored and/or gathered by the RTU at each pump house:

- Pump 1 Status (on, off, or FAIL)
- Pump 2 Status (on, off, or FAIL)
- Pump 1 Switches (hand or auto)
- Pump 2 Switches (hand or auto)
- Reservoir Controller (online or offline)
- Pump 1 Control (online or offline)
- Pump 2 Control (online or offline)
- Water Level (feet)
- Flow Meter (gallons per minute)
- Battery Power (volts)
- Power Status (on, off)




File
Last Reported Value
Noranda Bell Mines SCADA System
Alarms
Reports
Login
Site | Pump 1 | Pump 2 | Level | Battery | Alarms
CP 2 | 4.77 | 13.20
CP 4 | 5.17 | 12.44
CP 5 | 6.75 | 12.00
CP 8
CP D7 | 2.35 | 12.38
CP TEX | 7.41 | 13.35
SP 1-3 | 4.25 | 12.69
SP 1-5 | 1.75 | 13.18
SP 3-1 | 42.42 | ****** | Reservoir Control is OFFLINE
SP 7-1 | 1.65 | 13.32
GM 10 | 0.97 | 13.90
Black Spruce Swamp
SC 20 - Bear Island | 13.80
TEX Pond Repeater - #40 | 12.76
Tailings Pond Repeater - #50 | 12.61
18 Km Repeater - #60 | 13.63
#2 Shop | 13.76
Townsite CTU #10 | 14.29
Minesite CTU #20 | 13.38
= Pump Off
= Pump Running
= Active Alarm (Un-Acked)
= Ended Alarm (Un-Acked)
Screen updated at: 15:48:57 06/10/99 Current Operator: Rosendab


popup - Unacked : 1
Alarms : 1
Date : 10/06/99
Time : 21:06:51
0 Black Spruce Swamp Battery has risen above 14.25 volts
Clear
Clear All
Relax
Quiet



Nanamita Inc. Bell Mine	Water Management Manual	Revision		Page 7-3
	Section 7	No.	Date	
	Standard Operating Procedures	12	June 24, 1999	

TABLE 7.1B
TAILINGS IMPOUNDMENT: EMERGENCY CONDITIONS AND UNUSUAL CONDITIONS EVALUATION AND RESPONSE

Warning Sign/Situation	Actual or Potential Consequences	Action(s) to be Taken
Failure or suspected impending failure of a dam.	Catastrophic breach and release of pond.	• Initiate chain of communications.
Slumping, sliding, or bulging of a dam or adjacent ground.	Catastrophic breach and release of pond.	• Initiate chain of communications.
Sinkholes observed on tailings beach or on downstream dam slope.	Indicative of internal erosion, which could progress to the point where dam breach results.	• Initiate chain of communications. • Check downstream area of dam for areas of increased and/or turbid seepage discharge.
Extreme earthquake.	Dam failure, breach and release of pond.	• Initiate chain of communications. • Carry out dam inspection of tailings impoundment.
Severe/intense rainstorms and rapid snowmelts.	Overtopping and washout of dam, and release of pond	• Initiate chain of communications. • Carry out dam inspection of tailings impoundment.
Rapid, unexplained increase in seepage rate and turbidity from dam slope and/or foundation.	Internal erosion (piping) failure leading to breach and release of pond/dam failure	• Initiate chain of communications. • Carry out dam inspection of tailings impoundment.
Unusually high, one-time reading from a single piezometer.	Possible early warning of seepage conditions.	• Check piezometer reading. • If reading confirmed, check all other piezometers and examine downstream area of dam for changed seepage conditions.
Decreased seepage discharge accompanied by gradually increasing piezometer levels.	Possible sign of clogging of internal drainage system of dam.	• Check chemistry of seepage discharge for any changes relative to the normal
Increased presence of precipitates at seepage discharges from the downstream side of the dam	Possible sign of clogging of internal drainage system of dam.	• Check chemistry of seepage discharge for any changes relative to the normal

Note: Details of the tailings impoundment are given in Section 5.

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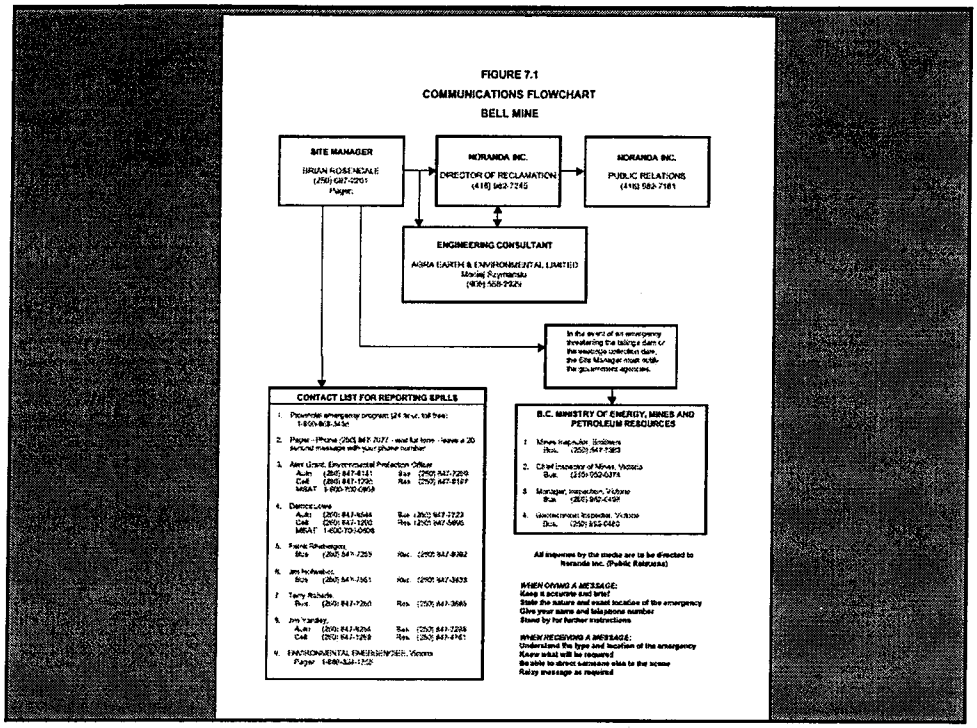

FIGURE 7.1

COMMUNICATIONS FLOWCHART

BELL MINE

WATER SAMPLING AND MONITORING DETAILS

CONCLUSIONS

- The 1992 Bell Mine Closure Plan still meets current government guidelines and recommendations for closed mines.
- The onset of acidic conditions are occurring as predicted in 1992.
- Water that is unacceptable for discharge is collected and diverted to the pit.
- The Water Management Manual contains details of all information, equipment, software, and the remote-monitoring system to ensure the water quality of Babine Lake is protected – now and when treatment of pit water begins.