GOLDCORP CANADA LTD.
HOLLINGER MINE

MINE CLOSURE PLAN AMENDMENT

Submitted to:

Ministry of Northern Development, Mines & Forestry
Mining and Minerals Division
933 Ramsay Lake Road
Sudbury, Ontario
P3E 6B5

Prepared by:

AMEC Earth & Environmental
a Division of AMEC Americas Limited
160 Traders Blvd. E., Suite 110
Mississauga, Ontario, L4Z 3K7

On behalf of:

Goldcorp Canada Ltd.
Porcupine Gold Mines
4315 Gold Mine Road
South Porcupine, Ontario, P0N 1H0

December 2010
TC81525

PREAMBLE

The Hollinger Mine is located south of Highway 101 at its intersection with Highway 655, with some limited sections on the north side of Highway 101, within the City of Timmins, Township of Tisdale, District of Cochrane, approximately 0.5 km east-southeast of the downtown core of Timmins, Ontario.

Kinross Gold Corporation (Kinross) obtained ownership of the Hollinger Mine property as part of a land package when it acquired the assets of the former owner, Royal Oak Mines, following its bankruptcy in late 1999. The Porcupine Joint Venture (PJV) was formed in July 2002 between Placer Dome (CLA) Limited and Kinross to maximize resource and infrastructure potential of the two companies' holdings in the Porcupine mining camp. In May 2006, Goldcorp Canada Ltd. (Goldcorp) purchased the Canadian assets of Placer Dome CLA, becoming operator and 51% owner of the joint venture, with Kinross owning the remaining 49%. In September 2007, Goldcorp entered into a binding agreement with Kinross to acquire Kinross' 49% share of the Porcupine Gold Mines (PGM). PGM is now 100% owned and operated by Goldcorp. The current PGM operations consist of the Dome Underground Mine and mill, the Hoyle Pond mine, the Pamour open pit stockpiles, with inactive properties that include the Dome Open Pit, Nighthawk Lake, Hollinger, McIntyre, Hallnor and its associated properties, Aunor, Delnite, Owl Creek, Naybob, Preston and Paymaster properties.

The Hollinger Mine Site (Site) is currently in a state of inactivity. However, after having conducted a number of environmental and pre-feasibility level studies in 2007 through 2010, Goldcorp is planning to redevelop the Hollinger site as a new open pit complex. The open pit operation will involve the development of a series of pit phases (pushbacks) that will be used to access shallow ore zones, located entirely within the existing Hollinger Mine property

Key aspects of the proposed development of the Hollinger Mine Site include:

- Development of a phased open pit, consisting of several stages generally referenced as:
    - 92 Pit;
    - Millerton Pit;
    - Central Pit;
    - Vipond Pit;
- Development of mine rock and overburden storage facilities;
- Development of temporary ore stockpiles;
- Construction of a Transportation Corridor linking the Hollinger Project Site with the Dome Mill;

- Use of existing ore processing and tailings deposition facilities at the Dome Mine for processing Hollinger ore;
- Development of an Environmental Control Berm around the perimeter of the Hollinger site;
- Enhancement of the existing mine dewatering infrastructure; and
- Development of limited site infrastructure.

There are no plans to erect new permanent buildings at the Hollinger Site, as all maintenance and warehousing infrastructure required to support Hollinger Site mining operations will be provided by existing facilities located at the Dome Mine. Portable buildings or trailers will be used as needed for in-field maintenance and a lunch-room. Explosives manufacturing and storage facilities required for Hollinger Site mining operations will also be provided by existing facilities at the Dome Mine, with explosives to be transported to the Hollinger Site on an as-required basis.

Office facilities for the Hollinger Project will be provided by the historic Hollinger office building adjacent to the north side of the Hollinger Mine Site.

Goldcorp is submitting this certified Closure Plan Amendment to Ministry of Northern Development, Mines and Forestry (MNDMF) for their review and acceptance with the understanding that it is a supplemental document to the previously filed Hollinger Mine Closure Plan submitted by Goldcorp in December 2006. Rehabilitation measures presented herein are reflective of the expected future operating conditions at the Hollinger Site.

Also, following review of the December 2010 Closure Plan by the provincial ministries and the City of Timmins, a number of comments and recommendations were provided. A response to all comments was provided in a separate letter to the Director, attention: Andrew Persad, dated May 30, 2011 (Appendix F). Additionally, a number of replacement pages were provided in the Closure Plan to reflect responses to comments on the December 2010 Closure Plan. These replacement pages are identified within this Closure Plan with a **“May 2011”** date in the header.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

1.0 LETTER OF TRANSMITTAL

May 31, 2011

Ms. Cindy Blancher-Smith
Director - Mineral Development and Lands Branch
Ministry of Northern Development and Mines
Willet Green Miller Centre
Level B4, 933 Ramsey Lake Road
Sudbury, OntarioP3E 6B5

Dear Ms. Blancher-Smith:

Re: Hollinger Mine - Closure Plan Amendment

Pursuant to Part VII of the Ontario *Mining Act*, and Ontario Regulation 240/00, Goldcorp Canada Ltd. (Goldcorp) is pleased to submit eleven copies of the enclosed Closure Plan Amendment for the Hollinger Mine Site, which will include a new open pit and underground mining complex, overburden and mine rock stockpiles, an Environmental Control Berm, a mine water collection and treatment system (covered under a separate closure plan), and associated infrastructure (excluding all tailings facilities formerly associated with the mine that are covered under separate closure plans or ownerships).

This document, including the financial assurance cost estimate, as well as the December 31, 2006 filed Closure Plan, constitutes the entire Closure Plan Amendment and is being submitted to the Director for filing/approval under the Act. It is understood that Goldcorp is solely responsible for ensuring that the proposed closure measures defined herein are implemented in accordance with the Plan, including any future amendments as may be filed with, and approved by the Director.

In accordance with Schedule 2 of Ontario Regulation 240/00, I hereby authorize László Götz, Environmental Manager, to act on behalf of Goldcorp Canada Ltd. in future dealings with your Ministry, and other regulatory agencies, in all matters pertaining to this Closure Plan Amendment. Mr. Götz can be contacted at the Dome Mine Site at 705-235-6720

I look forward to receiving acknowledgement of receipt of this certified plan.

Yours truly,
Goldcorp Canada Ltd.

FoR Mr. Chris Cormier
Mine General Manager

2.0 CERTIFICATION

2.1 Certification by Proponent

I (We) hereby certify that:

a) The attached closure plan complies in all respects with the *Mining Act* and Ontario Regulation 240/00, including the Code;

b) The proponent (Goldcorp Canada Ltd.) relied upon qualified professionals in the preparation of the closure plan, where required, under the *Mining Act* and the Regulation, including the Code;

c) The cost estimates of the rehabilitation work described in the attached closure plan are based on the market value cost of the goods and services required by the work;

d) The amount of financial assurance provided for in the attached closure plan is adequate and sufficient to cover the cost of the rehabilitation work required in order to comply with the *Mining Act* and the Regulation, including the Code;

e) The proponent (Goldcorp Canada Ltd.) has carried out reasonable and good faith consultations with appropriate representatives of all Aboriginal peoples affected by the project (these consultations are ongoing);

f) The attached closure plan constitutes full, true and plain disclosure of the rehabilitation work currently required to restore the site to its former use or condition or to make the site suitable for a use the Director sees fit in accordance with the *Mining Act* and the Regulation, including the Code.

The undersigned are authorized, as employees of the company, to act on behalf of Goldcorp Canada Ltd.

Geo R Burns

Mr. George Burns
Executive Vice-President, Canada & USA
Goldcorp Canada Ltd.

Mr. Lindsay Hall
Executive Vice-President & CFO
Goldcorp Inc.

AMEC Earth & Environmental (AMEC)
a division of AMEC Americas Limited
160 Traders Blvd. East, Suite 110
Mississauga, Ontario L4Z 3K7
Tel. (905) 568-2929
Fax (905) 568-1686

AMEC Earth & Environmental, a division of AMEC Americas Limited, is a certified member of the association of Professional Engineers of Ontario - PEO Certificate #1585769.

The following is certification of key AMEC personnel involved with the preparation and review of the enclosed Closure Plan:

Certification of David Simms

On behalf of Goldcorp Canada Ltd. (Goldcorp), I have prepared the Hollinger Mine Closure Plan Amendment, with input from Goldcorp personnel and others, and certify that the proposed closure measures (i.e., those requiring certification, as per subsection 12(3) of Part VII of the Act) are in accordance with the requirements of Part VII of the Act and the Mine Rehabilitation Code. Specifically, I provide certification regarding:

- Current site conditions (including mine rock geochemistry);
- Project plans;
- Removal of buildings and infrastructure; and,
- General site area reclamation and revegetation.

David Simms, B.Sc., Ph.D. mining environmental specialist employed with AMEC Earth & Environmental - Mississauga, residing in Richmond Hill, Ontario.

Dr. Simms holds the title of Principle, Environmental Assessment and Resource Development and has been employed by AMEC for 33 years with a principal focus on projects for the mining industry, including the preparation and management of mine closure plans. Dr. Simms was the lead AMEC consultant responsible for the overall organization and preparation of the pre-feasibility environmental studies and permitting for the Hollinger Project.

I examined the Project site on multiple occasions between May 2007 and May 2010, and the Closure Plan is based on personal examination of the Project, as well as information contained in:

- Baseline studies conducted by AMEC addressing: aquatic ecology (AMEC 2008b), hydrogeology (2008c and 2010), surface and ground water quality (AMEC 2008b and AMEC 2008c; terrestrial ecology (AMEC 2008e), and Goldcorp data files;

- LiDAR 2006 detailed topographic mapping provided by Goldcorp;

- Geochemical test work data provided by Goldcorp and Ecometrix 2008;

- Project plans provided by Goldcorp as part of Project pre-feasibility and feasibility studies; and,

- The 2006 Hollinger Mine Closure Plan provided by Goldcorp.

I do not have any direct or indirect interest, current or expected, in the Hollinger Project or Goldcorp or any Goldcorp affiliates, including any direct or indirect beneficial ownership in the securities of Goldcorp or any of its affiliates.

____
Signed,
May 25, 2011

Certification of Debbie Dyck

On behalf of Goldcorp Canada Ltd. (Goldcorp), I have prepared the Hollinger Mine Closure Plan Amendment, with input from Goldcorp personnel and others, including the extensive water quality monitoring database provided by Goldcorp as part of their regular site monitoring program, and certify that the proposed closure measures (i.e., those requiring certification, as per subsection 12(3) of Part VII of the Act) are in accordance with the requirements of Part VII of the Act and the Mine Rehabilitation Code. Specifically, I provide certification regarding:

- The applicability of tests and frequency of monitoring for surface water; and,
- The applicability of tests and frequency of monitoring for groundwater.

Debbie Dyck, P.Eng., Associate Environmental (Chemical) Engineer, employed with AMEC Earth & Environmental - Mississauga location (member of the association of Professional Engineers of Ontario – Registration #90353145), residing in Mississauga, Ontario.

Qualifications: over 20 years of consulting experience focused primarily on projects for the mining industry, including on and off site water quality issues, performance of wastewater treatment systems, baseline and environmental impact studies, and closure plan preparation. Ms. Dyck's certification is based on personal review of the data collected by AMEC over the course of AMEC's involvement with the current and proposed future operations at the Hollinger

Mine Site, as well as information provided by Goldcorp in association with the Closure Plan Amendment enclosed herein.

I do not have any direct or indirect interest, current or expected, in the Hollinger Project or Goldcorp or any Goldcorp affiliates, including any direct or indirect beneficial ownership in the securities of Goldcorp or any of its affiliates.

Signed,
May 25, 2011

Certification of Simon Gautrey

On behalf of Goldcorp Canada Ltd. (Goldcorp), I have prepared the Hollinger Mine Closure Plan Amendment, with input from Goldcorp personnel and others, and certify that the proposed closure measures (i.e., those requiring certification, as per subsection 12(3) of Part VII of the Act) are in accordance with the requirements of Part VII of the Act and the Mine Rehabilitation Code. Specifically, I provide certification regarding:

- Hydrogeological baseline studies; and,
- Groundwater modeling.

My certification is based on personal review of the data collected by AMEC over the course of AMEC's involvement with the current and proposed future operations at the Hollinger Mine Site, including the results of hydrogeological modeling, as well as information provided by Goldcorp in association with the Closure Plan Amendment enclosed herein.

Simon Gautrey, P.Geo., Senior Hydrogeologist, employed with AMEC Earth & Environmental - Mississauga location (Professional Geoscientist, Ontario #0461), residing in Hamilton, Ontario.

Qualifications: 15 years of government and consulting experience including 6 years with AMEC. Simon specializes in the groundwater components of environmental site assessments for mines and other large water takings. His areas of expertise include: assessing the effects of development on groundwater resources; aquifer testing; assessing groundwater withdrawals on potential fish habitats; municipal groundwater studies; and obtaining water taking permits.

I do not have any direct or indirect interest, current or expected, in the Hollinger Project or Goldcorp or any Goldcorp affiliates, including any direct or indirect beneficial ownership in the securities of Goldcorp or any of its affiliates.

____
Signed,
May 25, 2011

In preparing the Closure Plan Amendment, AMEC personnel relied on the following supporting documentation and information available:

a) Goldcorp Canada Ltd., December 2006. Closure Plan for the Hollinger Mine.

b) AMEC Earth & Environmental, March 2008a. Pre-Feasibility Environmental Baseline Studies - Synopsis, Goldcorp Canada Ltd., Hollinger Project.

c) AMEC Earth & Environmental, March 2008b. Pre-Feasibility Environmental Baseline Studies – Aquatic Ecosystem Existing Conditions Report, Goldcorp Canada Ltd., Hollinger Project.

d) AMEC Earth & Environmental, January 2008c. Pre-Feasibility Environmental Baseline Studies – Hydrogeology Report, Goldcorp Canada Ltd., Hollinger Project.

e) AMEC Earth & Environmental, January 2008d. Pre-Feasibility Environmental Baseline Studies – Surface Water Hydrology, Goldcorp Canada Ltd., Hollinger Project.

f) AMEC Earth & Environmental, January 2008e. Pre-Feasibility Environmental Baseline Studies – Terrestrial Baseline Report, Goldcorp Canada Ltd., Hollinger Project.

g) AMEC Earth & Environmental, September 2010. Hydrogeological Assessment in Support of the Permit to Take Water and Certificate of Approval Application for the Hollinger Project, Goldcorp Canada Ltd., Hollinger Project.

h) Ecometrix Incorporated, June 2008. Geochemical Evaluation of Waste Rock – Hollinger Mine.

i) Aerial photographs (MNR 1994).

j) Other mine site information (and discussions) provided by Goldcorp personnel.

k) Golder Associated, December 2010. Crown Pillar Geotechnical Studies for Hollinger Project Open Pit.

AMEC and its employees have not, directly or indirectly, received or expect to receive any interest, direct or indirect, in the Project of the proponent or any of the proponent's affiliates, or beneficially own, directly or indirectly, any securities of the proponent or any of its affiliates.

3.0 PROJECT INFORMATION

3.1 Proponent Information

Name of Project:

Hollinger Project
Township of Tisdale, District of Cochrane, Ontario

Project/Mailing Address:

Goldcorp Canada Ltd.
Porcupine Gold Mines
4315 Gold Mine Road
South Porcupine, Ontario
P0N 1H0

Property Location:

The property is located 0.5 km east-southeast of the downtown core of Timmins, Ontario, on the south side of Highway 101.

Name and Address of Owner:

Goldcorp Canada Ltd.
Suite 3201 – 130 Adelaide Street West
Toronto, Ontario
M5H 3P5

Authorized Contact Person:

Mr. László Götz, Environmental Manager
Phone: (705) 235-6720
Fax: (705) 235-6598
Email: laszlo.gotz@goldcorp.com

3.2 Land Tenure Information

No change from information provided in the 2006 Closure Plan with the exception that patent lands upon which the Transportation Corridor will be developed, linking the Hollinger Mine Site with the Dome Mine Site, have been acquired by Goldcorp (Figure 3-1). See attached Tables 3-1 and 3-2 for Land Tenure Information (Surface Rights and Mineral Rights) on the Haul Road.

3.3 Site Plan

A description of the existing site conditions, and a general site plan, are provided in the December 2006 Closure Plan document. There have since been no changes to the existing site conditions.

A site plan, showing the location of the key features for the proposed open pit operations, is provided in Figure 3-2. The Hollinger Project will include an open pit complex, overburden and mine rock stockpiles, an Environment Control Berm, temporary ore stockpiles, access roads (and Transportation Corridor), dispensing facilities, a temporary lunch room trailer and a maintenance shelter Further details of the Hollinger Mine Site infrastructure are provided in Section 5.0.

It is further proposed to continue mine dewatering from the McIntyre No. 11 Shaft, with continued discharge of mine water to Little Pearl Tailings Pond (LPTP). Associated closure requirements for the McIntyre No. 11 Shaft site and the LPTP site are addressed in the McIntyre Mine and LPTP Closure Plans.

The current mine plan provides for open pit operation and, potentially, UG mining operations. Planned open pit operations involve the development of a staged open pit, consisting of several pit phases generally referenced as the 92 Pit, Millerton Pit, Central Pit and Vipond Pit. The 92 Pit is located east of the Shania Twain Centre and northeast of the Fairway Village Trailer Park. The Millerton Pit is the westernmost of the four pits, being located between the Shania Twain Centre and Hollinger Park. The Central Pit is located in the central part of the property, south of the Highway 101 corridor commercial centre and the Luzenac property. The Vipond Pit is located at the southeast end of the property, west of the Vipond Ball Park.

The open pit would be mined in a series of pushbacks with some overlap in the pit mining schedules, such that more than one pushback could be in operation at any one time. Current plans call for the ultimate pit to reach a depth of approximately 112 metres (m) above mean sea level (amsl). The existing ground surface at the Hollinger Project Site averages approximately 335 m amsl, and varies from approximately 315 to 355 m amsl. The maximum depth of the 92, Millerton, Central and Vipond pits will be approximately 116, 175, 230, and 75 m below ground surface (mbgs), respectively, covering a combined total surface area of approximately 57.8 hectares (ha).

Table 3-1
Mineral Tenure Rights Ownership (see Figure 3-1a)

PARCEL	PIN	LOCATION	OWNER	DATA DATE
1008SND	65406-0034	PT LOT 10 CON 2	51% Goldcorp Canada Ltd. / 49% Goldcorp Inc.	16-Jul-2010
11166WT	65407-0001 now 65407-0653	NW PART S PART LOT 9 CON 2 AS DEFINED	Company A	3-Mar-2011
11167WT	65407-0004 now 65407-0655	NE PART S PART LOT 9 CON 2 AS DEFINED	Company A	3-Mar-2011
11169WT	65408-0146 now 65408-0166	NW PART S PART LOT 8 CON 2 AS DEFINED	Company A	3-Mar-2011
11168WT	65408-0147 now 65408-0164	NE PART S PART LOT 6 CON 2 AS DEFINED	Company A	3-Mar-2011
8368WT	65410-0097	PT LOT 7 CON 1, PT LOT 8 CON 1	Company B	27-Jul-2010
8368WT	65408-0153	SE PART LOT 8 CON 2 AS DEFINED	Company B	23-Feb-2010
3762WT	65410-0066	SE1/4 N1/2 LOT 7 CON 1	51% Goldcorp Canada Ltd. / 49% Goldcorp Inc.	27-Jul-2010
3763WT	65398-0149	SW1/4 N1/2 LOT 6 CON 1	51% Goldcorp Canada Ltd. / 49% Goldcorp Inc.	27-Jul-2010
4455SWS	65398-0146	NW PT S1/2 LOT 6 CON 1	51% Goldcorp Canada Ltd. / 49% Goldcorp Inc.	27-Jul-2010
3290SWS	65398-0150	SE1/4 N1/2 LOT 6 CON 1	51% Goldcorp Canada Ltd. / 49% Goldcorp Inc.	27-Jul-2010
3329SWS	65398-0151	PT LOT 5 CON 1	51% Goldcorp Canada Ltd. / 49% Goldcorp Inc.	27-Jul-2010
3327SWS	65398-0130	PT LOT 5 CON 1	51% Goldcorp Canada Ltd. / 49% Goldcorp Inc.	27-Jul-2010
3231SWS	65398-0129	SW1/4 N1/2 LOT 4 CON 1	51% Goldcorp Canada Ltd. / 49% Goldcorp Inc.	27-Jul-2010

Goldcorp Canada Ltd. does not have any agreements with company A or B regarding these mineral rights

Table 3-2
Surface Tenure Rights Ownership (see Figure 3-1b)

PIN	LOCATION	OWNER	PIN DATE
65406-0033	PT LOT 10 CON 2	51% Goldcorp Canada Ltd. / 49% Goldcorp Inc.	16-Jul-2010
65406-0034	PT LOT 10 CON 2	51% Goldcorp Canada Ltd. / 49% Goldcorp Inc.	16-Jul-2010
65407-0001 now 65407-0652	NW PART S PART LOT 9 CON 2 AS DEFINED	51% Goldcorp Canada Ltd. / 49% Goldcorp Inc.	3-Mar-2011
65407-0004 now 65407-0654	NE PART S PART LOT 9 CON 2 AS DEFINED	51% Goldcorp Canada Ltd. / 49% Goldcorp Inc.	3-Mar-2011
65408-0146 now 65408-0165	NW PART S PART LOT 8 CON 2 AS DEFINED	51% Goldcorp Canada Ltd. / 49% Goldcorp Inc.	3-Mar-2011
65408-0147 now 65408-0163	NE PART S PART LOT 6 CON 2 AS DEFINED	51% Goldcorp Canada Ltd. / 49% Goldcorp Inc.	3-Mar-2011
65408-0154	NE 1/4 of N1/2 LT 8 CON 1	100% Goldcorp Canada Ltd.	3-Feb-2011
65410-0077	NE 1/4 of N1/2 LT 8 CON 1	100% Goldcorp Canada Ltd.	3-Feb-2011
65410-0072	PT LT 8 CON 1	51% Goldcorp Canada Ltd. / 49% Goldcorp Inc.	27-Jul-2010
65410-0067	NE 1/4 of S 1/2 LT 7 CON 1, NW 1/4 S 1/2 LOT 7 CON 1, SW 1/4 N 1/2 LOT 7 CON 1	51% Goldcorp Canada LTD / 49% Goldcorp Inc.	27-Jul-2010
65410-0068	PT LOT 7 CON 1	The Hydro-Electric Power Commission of Ontario	27-Jul-2010
65410-0066	SE1/4 N1/2 LOT 7 CON 1	51% Goldcorp Canada Ltd. / 49% Goldcorp Inc.	27-Jul-2010
65398-0149	SW1/4 N1/2 LOT 6 CON 1	51% Goldcorp Canada Ltd. / 49% Goldcorp Inc.	27-Jul-2010
65398-0146	NW PT S1/2 LOT 6 CON 1	51% Goldcorp Canada Ltd. / 49% Goldcorp Inc.	27-Jul-2010
65398-0150	SE1/4 N1/2 LOT 6 CON 1	51% Goldcorp Canada Ltd. / 49% Goldcorp Inc.	27-Jul-2010
65398-0151	PT LOT 5 CON 1	51% Goldcorp Canada Ltd. / 49% Goldcorp Inc.	27-Jul-2010
65398-0130	PT LOT 5 CON 1	51% Goldcorp Canada Ltd. / 49% Goldcorp Inc.	27-Jul-2010
65398-0153	PT LOT 5 CON 1	51% Goldcorp Canada Ltd. / 49% Goldcorp Inc.	27-Jul-2010
65398-0135	PT LOT 5 CON 1	51% Goldcorp Canada Ltd. / 49% Goldcorp Inc.	27-Jul-2010

Two UG operations are currently being considered with one operation to be positioned adjacent to the Millerton Pit at the western end of the property, and the second operation likely to be positioned near to the existing McIntyre No, 11 Shaft. Further study is required to determine the exact locations of UG openings for both operations. The UG operations are not part of the current mine plan.

Most of the overburden stripped from the initial stages of mining will be used, along with mine rock, for construction of the Environmental Control Berm. Overburden stripped from the remaining pit phases would be variably used for progressive rehabilitation of mine rock piles and the Environmental Control Berm, to assist with Site area revegetation efforts at closure, with any remaining materials to be co-mingled with mine rock stockpiles. The balance of the overburden stripped for pit development is currently expected to be stockpiled on-site to be used during closure.

A substantial portion of the mine rock will be used to construct the site perimeter Environmental Control Berm, which will initially be constructed to an elevation of approximately 20 m, with overall slope angles ranging from approximately 2H:1V to 3H:1V. Over time, the berm will be graded into the slope of the overall backfilling over the property, which could reach ultimate heights of 40 to 60 m above the current surface in local areas. The toe of the constructed perimeter berm will follow approximately along the current property fenceline along its north, west and south margins. Mine rock will also be used to finalize the construction of the transportation corridor. Mine rock not required for construction of the transportation corridor and perimeter Environmental Control Berm will be used to backfill the existing and future open pits. Excess mine rock that cannot be accommodated at the Hollinger Site will be deposited at the Dome site.

Most of the Site runoff from within the Environmental Control Berm will drain internally to the open pit workings, and from there will pass through the rock and be captured by the McIntyre No. 11 Shaft mine dewatering system reporting to LPTP.

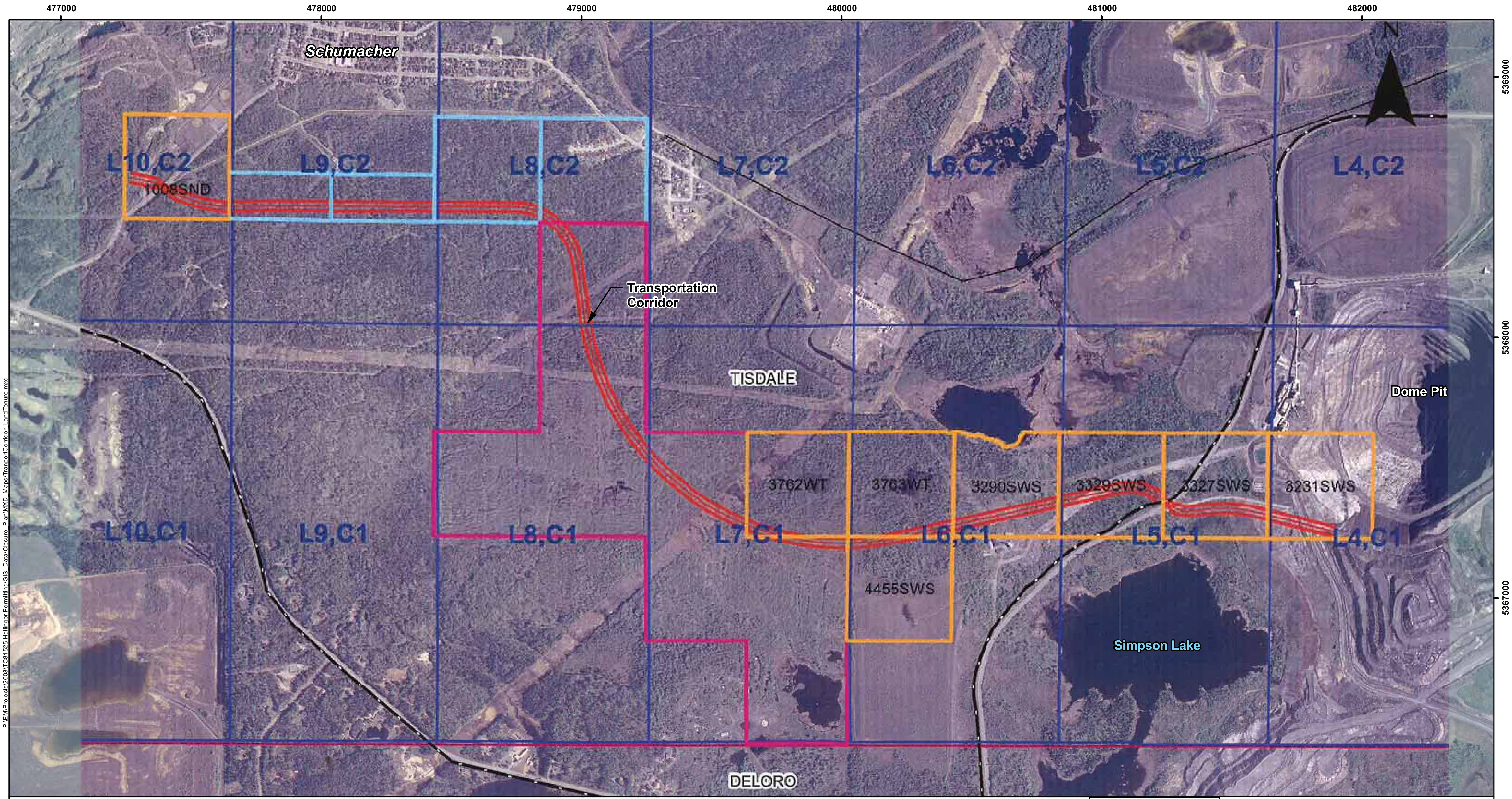
Runoff from the external face of the Environmental Control Berm, as well as a portion of the runoff from within the bermed area, that seeps beneath the berm to areas outside of the berm, will be directed to existing external ditching bordering the Vipond Road, the Shania Twain Road, and other existing perimeter road systems. This ‘external runoff’ is expected to be of a quality suitable for discharge to receiving waters. However, due to potentially elevated suspended solids, in some localized areas, runoff from these localized areas may be directed to settlement ponds, if and as required, prior to discharge to receiving waters.

Current plans call for the ore to be hauled by truck from the Hollinger Mine Site to the existing nearby Dome Mill. To accommodate haulage a designated Transportation Corridor will be constructed and maintained. The Transportation Corridor will be constructed of rock fill and gravel to a width of approximately 30 m.

Trucks used to transport ore to the Dome Mill are currently expected to be 100 to 150 tonne trucks (Caterpillar 777 or Caterpillar 785 or similar). It is expected that at full operation, a total of 6 to 8 trucks per hour, operating on a twenty-four hour, seven days a week (24/7) basis, will be required to transport ore to the Mill. This will vary over the start-up period of the mine, before full production is obtained. Modified hours of operation may also be implemented, especially during early phase operations, depending on noise restrictions and production requirements.

The Transportation Corridor will necessarily cross two public roads, Vipond Road and Gold Mine Road. These crossings are currently envisaged to be culvert-type overpasses, similar to crossings currently in use at other PGM operations in the area (for example, Langmuir Road). These will allow for full 2-lane access as is currently accommodated by these roadways. The exact design for the crossings will depend on further discussions with the City.

P:\EM\Projects\2008\TC81525 Hollinger Permitting\GIS Data\Closure Plan\MXD Maps\TranportCorridor LandTenure.mxd



LEGEND

🟧 Goldcorp mineral rights	— Hollinger Haul Road
🟦 Company A mineral rights	
🟥 Company B mineral rights	

NOTES:

GOLDCORP
PORCUPINE GOLD MINES

amec

HOLLINGER PROJECT

Mineral Rights Land Tenure along the Transportation Corridor

Datum: NAD83
Projection: UTM Zone 17N

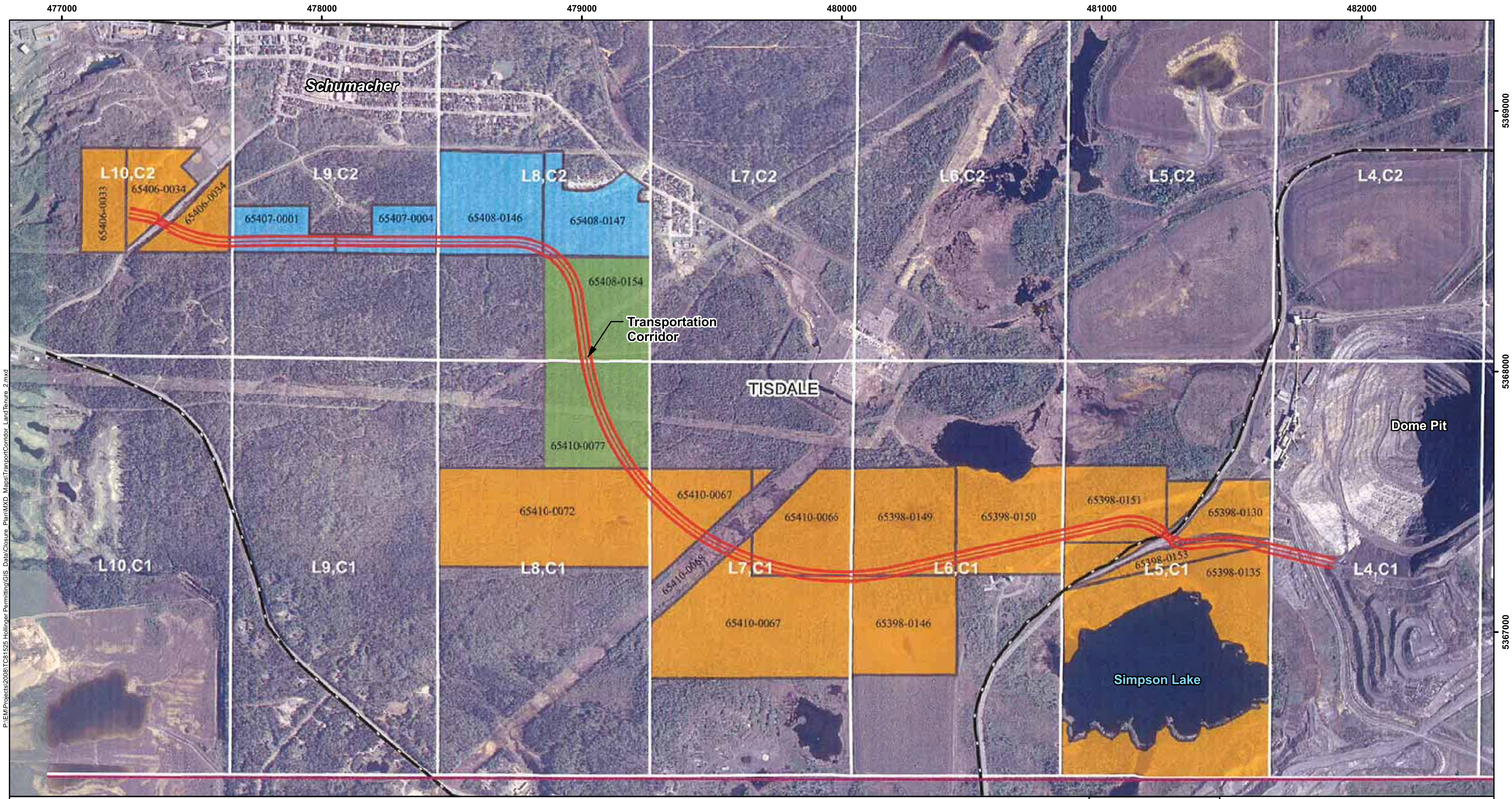
PROJECT N°: TC81525

FIGURE: 3-1a

SCALE: 1:13,939

DATE: November 2010

0 0.4 0.8 1.6 2.4 3.2 4
Kilometres



P:\EM\Projects\2008\TC81525 Hollinger Permitting\GIS Data\Closure Plan\MXD Maps\TranportCorridor LandTenure 2.mxd

LEGEND

Hollinger Haul Road	🟦 Harrower - Goldcorp Agreement
🟧 Goldcorp	🟩 City of Timmins - pending Goldcorp

NOTES:

Datum: NAD83
Projection: UTM Zone 17N

0 0.4 0.8 1.6 2.4 3.2 4
Kilometres

N S W E

GOLDCORP
PORCUPINE GOLD MINES

amec

HOLLINGER PROJECT

Surface Rights Land Tenure along the Transportation Corridor

PROJECT N^o: TC81525	**FIGURE: 3-1b**
SCALE: 1:13,952	DATE: November 2010

P:\EM\Projects\2008\TC81525 Hollinger Permitting\GIS_Data\Closure_Plan\MXD_Maps\Proposed_Site_Plan.mxd

LEGEND

- 🟨 Existing and Proposed Site Features within Scope of this Environmental Review
- 🟧 Existing Site Features not within Scope of this Environmental Review
- ⬭ Underground Works (Approximate, not currently part of the project)

NOTES:
- Outlines of facilities and site features are approximate.

Datum: NAD83
Projection: UTM Zone 17N

0 0.5 1 2 3 4 5 Kilometres

N S W E

GOLDCORP
PORCUPINE GOLD MINES

amec

HOLLINGER PROJECT

Proposed Site Plan

PROJECT N^{o}: TC81525	**FIGURE: 3-2**
SCALE: 1:18,003	DATE: October 2010

4.0 CURRENT SITE CONDITIONS

4.1 Land Uses

No change from information provided in the 2006 Closure Plan.

4.2 Topography

No change to current conditions.

Proposed features that will change the topography of the current setting will include the open pits, Environmental Control Berm, Transportation Corridor, and the overburden and mine rock stockpiles. These features are shown in Figure 3-2.

4.3 Surface Water

4.3.1 Drainage Patterns

No change from information provided in the 2006 Closure Plan. Note a correction to the reference of Table 4-1 in the last paragraph of this subsection; watershed areas and average annual runoff are summarized in Figure 4-2 (not Table 4-1) of the 2006 Closure Plan document.

4.3.2 Drainage Sources and Watersheds

No change from information provided in the 2006 Closure Plan, with the exception that an updated site area watershed map is provided in Figure 4-1, and historic Porcupine River flow data are provided in Tables 4-1 through 4-3. Goldcorp has also recently set up two additional flow monitoring stations on the Porcupine River and one station on Skynner Creek as per Section 10.

4.3.3 Surface Water Quality

No change to the information provided in the 2006 Closure Plan document, with the exception of the following additional information:

The Hollinger Site is located at the junction of the Porcupine River, Skynner Creek, Town Creek, and Gillies Lake/Town Creek watersheds. The dominant watersheds draining the area surrounding the Site are those of Porcupine and South Porcupine Rivers. A selective field program was carried out by AMEC in 2007 to augment the substantive existing water sampling database of the local study area (LSA) with respect to surface water quality, sediment quality, benthic invertebrates, aquatic habitat, and fisheries resources. The following subsections provide a summary of the 2007 sampling results. Details of the AMEC 2007 sampling program are provided in the Aquatics Ecosystem Existing Conditions Report (AMEC, 2008), included as Appendix A.

4.3.3.1 Porcupine River Watershed

The Porcupine River, to the point of its confluence with the South Porcupine River just west of Porcupine Lake, has a watershed area of 32.0 square kilometres (km^2), exhibits a low gradient, and is interrupted by numerous beaver dams. Its headwaters drain LPTP, Pearl Lake, and Clearwater Lake.

Headwater areas of the Porcupine River are influenced by mine water pumped from the McIntyre No. 11 Shaft headframe, and by seepage and runoff from the McIntyre and Coniaurum tailings areas. Mid-channel reaches are affected by drainage from the ERG tailings facility, and the lower reach is affected by treated effluent discharge from the Dome tailings facility. Of these various contaminant sources, only the McIntyre No. 11 Shaft discharge and the Dome tailings discharge are active. As a result of the above activities, sulphate and a number of key metals, most notably copper, are elevated above natural background conditions (Table 4-4). However, compared with historic conditions, overall metal concentrations in the Porcupine River system appear to be improving with time. Sediment quality degradation is also evident for a number of parameters (principally metals) along the river mainstem (Table 4-5). Essentially all parameters, for which there are provincial sediment quality guidelines, are in exceedance of the guidelines at some level. Edwards Creek, which is a principal tributary to the Porcupine River, on the other hand, shows little, if any, signs of water quality or sediment quality degradation. Mining activity within the Edwards Creek basin has been more limited, and historic Dome Mine tailings areas which could drain to Edwards Creek have been partially rehabilitated.

4.3.3.2 South Porcupine River Watershed

The South Porcupine River watershed, to the point of its confluence with the Porcupine River west of Porcupine Lake, measures 42.7 km^2. Its headwaters originate in McDonald and Simpson Lakes. Much of the drainage basin is influenced by past and present mining activity, including flows reporting from the existing Dome property, and from the historic Aunor, Delnite, Buffalo Ankerite, Paymaster and Preston East mine facilities.

TABLE 4-1
PORCUPINE RIVER MONTHLY FLOW DATA (m^3/s)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
1977	0.826	0.432	2.75	17.4	7.12	2.39	1.6	0.98	6	3.03	7.39	2.08	4.32
1978	0.833	0.555	0.41	2.61	27.5	10.2	7.25	1.33	1.71	7.67	2.47	1.4	5.38
1979	0.893	0.826	1.36	21	31.6	9.95	2.12	1.02	3.73	10.3	5.74	2.32	7.6
1980	1.06	1.21	0.595	22.4	15.5	4.22	3.1	1.91	4.56	6.5	3.09	1.36	5.44
1981	0.736	1.47	3.19	25.9	13	2.73	1.3	0.557	0.525	3.47	3.46	1.36	4.8
1982	1.07	0.788	0.829	9.33	21.1	2.75	4.75	0.949	4.86	13.3	5.98	2.75	5.75
1983	0.976	0.614	1.7	7.29	35.9	8.62	1.28	1.34	4.02	6.36	3.65	1.9	6.19
1984	1.13	1.83	1.77	19.5	6.54	11.7	6.64	1.19	1.25	2.51	5.03	3.67	5.2
1985	1.47	0.784	0.811	18.1	12.6	3.36	6.98	2.91	1.59	5.28	6.62	2.12	5.23
1986	1.09	0.904	1.01	21.7	12.9	2.42	1.92	5.04	4.88	9.04	4.35	1.89	5.6
1987	1.31	0.971	1.64	10.7	4.49	3.42	4.3	5.19	4.22	7.58	4.07	2.33	4.2
1988	1.41	1.26	1.29	16.7	22.6	2.57	1.07	7.62	5.66	6.63	13.9	4.07	7.07
1989	1.29	1.08	1.02	12.3	27.9	7.79	2.87	3.33	1.44	2.91	5.54	1.95	5.81
1990	1.26	1.09	5.1	20.7	17.1	6.62	6.72	1.76	2.51	11.5	6.89	2.81	7.04
1991	1.19	0.856	1.43	23.9	8.08	1.48	0.498	1.14	1.78	4.18	3.61	2.34	4.2
1992	0.957	0.838	0.806	15.1	17.3	1.26	0.634	2.27	7	7.35	5.25	2.48	5.11
1993	1.29	0.649	0.949	13.8	23.4	7.34	3.85	2.4	3.68	6.92	3.64	2.05	5.86
1994	0.852	0.802	1.04	13.5	12.5	6.49	3.87	4.59	3.54				
Mean	**1.091**	**0.942**	**1.539**	**16.218**	**17.618**	**5.295**	**3.375**	**2.529**	**3.498**	**6.737**	**5.334**	**2.287**	**5.576**

TABLE 4-2
PORCUPINE RIVER WATERSHED MONTHLY RUNOFF EQUIVALENTS (mm/d)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
1977	0.178	0.093	0.593	3.749	1.534	0.515	0.345	0.211	1.293	0.653	1.592	0.448	0.931
1978	0.179	0.120	0.088	0.562	5.925	2.198	1.562	0.287	0.368	1.653	0.532	0.302	1.159
1979	0.192	0.178	0.293	4.525	6.809	2.144	0.457	0.220	0.804	2.219	1.237	0.500	1.638
1980	0.228	0.261	0.128	4.826	3.340	0.909	0.668	0.412	0.983	1.400	0.666	0.293	1.172
1981	0.159	0.317	0.687	5.580	2.801	0.588	0.280	0.120	0.113	0.748	0.745	0.293	1.034
1982	0.231	0.170	0.179	2.010	4.546	0.593	1.023	0.204	1.047	2.866	1.288	0.593	1.239
1983	0.210	0.132	0.366	1.571	7.735	1.857	0.276	0.289	0.866	1.370	0.786	0.409	1.334
1984	0.243	0.394	0.381	4.201	1.409	2.521	1.431	0.256	0.269	0.541	1.084	0.791	1.120
1985	0.317	0.169	0.175	3.900	2.715	0.724	1.504	0.627	0.343	1.138	1.426	0.457	1.127
1986	0.235	0.195	0.218	4.676	2.779	0.521	0.414	1.086	1.051	1.948	0.937	0.407	1.207
1987	0.282	0.209	0.353	2.305	0.967	0.737	0.926	1.118	0.909	1.633	0.877	0.502	0.905
1988	0.304	0.271	0.278	3.598	4.869	0.554	0.231	1.642	1.220	1.429	2.995	0.877	1.523
1989	0.278	0.233	0.220	2.650	6.011	1.678	0.618	0.717	0.310	0.627	1.194	0.420	1.252
1990	0.271	0.235	1.099	4.460	3.684	1.426	1.448	0.379	0.541	2.478	1.485	0.605	1.517
1991	0.256	0.184	0.308	5.150	1.741	0.319	0.107	0.246	0.384	0.901	0.778	0.504	0.905
1992	0.206	0.181	0.174	3.253	3.727	0.271	0.137	0.489	1.508	1.584	1.131	0.534	1.101
1993	0.278	0.140	0.204	2.973	5.042	1.581	0.830	0.517	0.793	1.491	0.784	0.442	1.263
1994	0.184	0.173	0.224	2.909	2.693	1.398	0.834	0.989	0.763				
Mean	**0.235**	**0.203**	**0.332**	**3.494**	**3.796**	**1.141**	**0.727**	**0.545**	**0.754**	**1.452**	**1.149**	**0.493**	**1.202**

TABLE 4-3
PORCUPINE RIVER MONTHLY RETURN PERIOD FLOW DATA (mm/d)

Return Period (yrs)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Low Flow Condition													
2	0.231	0.191	0.274	3.140	3.286	0.927	0.552	0.425	0.630	1.304	1.054	0.471	1.184
5	0.194	0.142	0.164	1.978	2.011	0.519	0.275	0.232	0.355	0.860	0.747	0.364	1.023
10	0.178	0.122	0.125	1.553	1.556	0.384	0.191	0.169	0.263	0.692	0.625	0.318	0.947
20	0.165	0.107	0.100	1.272	1.260	0.299	0.141	0.130	0.205	0.578	0.539	0.284	0.889
50	0.152	0.093	0.078	1.016	0.992	0.226	0.101	0.097	0.155	0.472	0.455	0.251	0.828
100	0.144	0.084	0.066	0.875	0.847	0.187	0.080	0.080	0.129	0.413	0.408	0.230	0.790
High Flow Condition													
2	0.231	0.191	0.274	3.140	3.286	0.927	0.552	0.425	0.630	1.304	1.054	0.471	1.184
5	0.274	0.257	0.458	4.987	5.367	1.653	1.107	0.779	1.119	1.977	1.487	0.610	1.372
10	0.299	0.301	0.598	6.350	6.936	2.237	1.593	1.068	1.511	2.457	1.779	0.698	1.481
20	0.322	0.342	0.747	7.751	8.570	2.871	2.152	1.387	1.936	2.940	2.064	0.781	1.578
50	0.350	0.395	0.959	9.709	10.883	3.806	3.020	1.862	2.561	3.600	2.440	0.885	1.694
100	0.370	0.434	1.132	11.273	12.752	4.589	3.783	2.263	3.083	4.118	2.726	0.962	1.777

Note: Data calculated using the 2 parameter log normal distribution

TABLE 4-4
PORCUPINE RIVER SYSTEM WATER QUALITY DATA

Parameters	Units	PWQO CRITERIA	CEQG PAL CRITERIA	ODWS CRITERIA	CDWQG CRITERIA	Porcupine River System										South Porcupine River System											
						Pearl Lake		River DS of Pearl Lake	Edwards Creek US	Edwards Lake	River at Hwy 101		River Outlet to Porcupine Lake	River Outlet to Porcupine Lake		McDonald Lake	McDonald Lake	River DS of McDonald Lake - 300m	River DS of McDonald Lake -1000m	Simpson Lake 1 North Basin	Simpson Lake 2 South Basin	River DS-1 Dome Discharge	River DS-2 Dome Discharge	River US Dome Discharge		River DS Dome Discharge	
Source →						Goldcorp		Minnow 2001	AMEC 2007	AMEC 2007	Minnow 2005		Beak 1999	Minnow 2005		Beak 1999	AMEC 2007	Beak 1999	Beak 1999	AMEC 2007	AMEC 2007	Beak 1999	Beak 1999	Minnow 2005		Minnow 2005	
Time Interval →						Jan 06 - Sep 07		Oct 01	Sep 07	Sep 07	Jun 03 - Sep 04		Sep/Oct 97	Jun 03 - Sep 04		Sep/Oct 97	Sep 07	Sep/Oct 97	Sep/Oct 97	Sep 07	Sep 07	Sep/Oct 97	Sep/Oct 97	Jun 03 - Sep 04		Jun 03 - Sep 04	
Statistic →						O.R.	Mean n = 20	N = 3	SS	SS	O.R.	Mean n = 11/12	SS	O.R.	Mean n = 9	Mean n = 3-4	SS	Mean n = 3	Mean n = 3	SS	SS	Mean n = 3	Mean n = 2	O.R.	Mean n = 11/12	O.R.	Mean n = 11/12
Acidity	(mg/L)					6.9 - 65.8	16.0	9.5	4.2	11.7			14			11.3	1.8	15.3	26.7	2,7	5.4	25.3	5				
Ammonia as N	(mg/L)					0.07 - 2.4	0.30	0.005	<0.07	<0.07	<0.1 - 0.5	0.2	0.11	<0.1 - 4.2	1.7	0.09	<0.07	0.08	<0.44	<0.07	<0.07	<0.11	<0.05	<0.1 - 0.3	0.1	<0.1 - 9.2	4.6
Chloride	(mg/L)			250 (AO)	250 (AO)	40.1 - 168	96.20		231	86	55 - 100	73	42	37 - 76	53	26	38	19	43	25	29	40	47	11 - 21	15	15 - 54	39
Conductivity	(µs/cm)					1132 - 2672	2213	1991	1111	662	520 - 1930	1238	1070	463 - 1650	1141	275	330	363	586	640	663	897	1205	227 - 618	448	331 - 1330	969
Dissolved Organic Carbon	(mg/L)							5.7			6.5 - 12.0	9.6	7.5	4.6 - 9.5	7.0	6.4		6.9	7.4			7.7	6.3	7.4 - 16.0	10.1	3.3 - 9.6	6.3
Hardness (CaCO3)	(mg/L)			80-100 (OG)		513 - 1740	1299	889	202	220	236 - 787	452	532	219 - 450	326	120	122	182	283	282	294	314	564	119 - 340	240	171 - 347	267
Nitrate as N	(mg/L)		13	10 $^{+}$		<0.005 - 13.7	<1.35		<0.005	<0.005	<0.05 - 0.10	0.06	3.27	0.73 - 6.21	3.56	<0.05	<0.005	<0.05	<0.06	0.24	0.06	0.84	7.3	<0.01 - 0.53	0.12	0.72 - 5.44	3.62
Nitrite as N	(mg/L)		0.05	1		<0.01	<0.01		<0.01	<0.01	<0.06	<0.06	<0.01	<0.06 - 0.59	0.25	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01 - <0.06	<0.06	<0.01 - 0.58	0.17
pH	units	6.5 - 8.5	6.5 - 9	6.5 - 8.5	6.5-8.5	7.34 - 8.1	7.86	7.69	8.04	7.85	6.58 - 8.01	7.49	8.0	7.05 - 7.95	7.38	7.9	8.4	7.8	<7.7	8.36	8.05	7.77	8.2	6.77 - 8.66	7.41	6.96 - 8.5	7.38
Phosphate	(mg/L)					<0.001	<0.001		<0.1	<0.1	<1	<1		<1	<1		<0.001			<0.001	<0.001			<1	<1	<1	<1
Sulphate	(mg/L)			500(AO)$^{++}$	500 (AO)$^{++}$	404 - 3315	1238	770	11.1	35.4	160 - 760	450	348	140 - 650	406	8	6.65	4.3	52.7	283	273	209	382	51 - 150	107	94 - 460	326
Total Alkalinity (CaCO3)	(mg/L)			30-500 (OG)		114 - 312	173	173	170	188	82 - 174	141	212	86 - 145	113	98	109	163	214	89.5	109	206	198	76 - 238	159	82 - 152	107
Total Cyanide	(mg/L)					<0.005 - 0.007	<0.005	0.011	<0.005	<0.005	<0.01	<0.01	<0.002	<0.01	<0.01	<0.002	<0.005	<0.002	<0.002	<0.005	<0.005	<0.002	<0.002	<0.01	<0.01	<0.01 - 0.02	<0.01
Total Dissolved Solids	(mg/L)			500 (AO)	500 (AO)	838 - 2812	2029.0	1449	682	459	406 - 1430	944	781	367 - 1170	808	156	217	210	360	373	390	597	863	189 - 486	364	246 - 857	669
Total Organic Carbon	(mg/L)							6.2			7.7 - 12.0	10.8		5.2 - 10.1	7.7									8.1 - 16.0	10.8	3.8 - 11.0	7.1
Total Suspended Solids	(mg/L)					1.3 - 133	15.3	<1	1.9	<1	<2 - 11	3.0	4	<2 - 5	2	<1.3	<10	6.7	2.7	<10	<10	3.7	2.5	<1 - 4	<2	<2.0 - <3.0	<2.1
Total Phosphorus	(mg/L)	0.03*				<0.05 - 0.124	<0.054	0.023	<0.1	<0.1	<0.03 - 0.10	0.05	0.02	<0.03 - 0.12	0.05	0.01	<0.05	0.027	0.023	<0.05	<0.05	0.02	0.015	0.01 - 0.08	0.04	<0.03 - 0.14	0.05
Turbidity	NTU												0.7			0.53		1.4	0.83			1.6	0.4				
Aluminum (filtered)	(mg/L)	0.075**	0.1	0.10 (OG)	0.10 (OG)	<0.00004 - 0.0479	<0.0091	0.009*	0.0082	0.007	<0.01 - 0.15*	0.05*	0.006	0.02 - 0.11*	0.05*	0.016	0.0065	0.007	<0.006	0.0025	0.0031	0.0057	<0.006	<0.01 - 0.05*	0.02*	<0.01 - 0.04*	0.02*
Antimony	(mg/L)	0.02*			0.006^{II}				<0.003	<0.003	<0.05	<0.05	0.0009	<0.05	<0.05	<0.0005	<0.00009	<0.0005	<0.0006	<0.00009	<0.00009	0.0012	0.0018	<0.05	<0.05	<0.05	<0.05
Arsenic	(mg/L)	0.1 (0.005*)	0.005	0.025^{I}	0.025^{II}	<0.0002 - 0.0146	<0.0022	<0.002	<0.002	<0.002	<0.005	<0.005	0.005	0.006 - 0.016	<0.012	0.002	0.0026	0.017	0.068	0.0144	0.0074	0.019	0.011	0.024 - 0.110	0.050	0.012 - 0.028	0.019
Cadmium	(mg/L)	0.0002	0.000017	0.005	0.005	<0.00004 - 0.0011	<0.00016	<0.0001	<0.0005	<0.0005	<0.0001 - 0.0002	<0.00012	0.00005	<0.0001 - 0.0003	<0.00013	<0.00006	<0.00004	<0.00005	<0.00005	<0.00004	<0.00004	<0.00005	<0.00005	<0.0001 - <0.002	<0.0003	<0.0001 - <0.002	<0.0003
Calcium	(mg/L)					135 - 400	301	192	67	52.9	56.9 - 144	111.1	134	52.2 - 116	92.4	35.1	37.5	52.6	80.1	62.2	67.3	95.9	151	27.6 - 78.4	60.7	40.1 - 95.8	72.9
Chromium	(mg/L)	0.0089 (as Cr III)	0.0089 (as Cr III)	0.05	0.05	<0.00003 - 0.366	<0.036		0.0004	<0.0004	<0.02	<0.02	0.0008	<0.02	<0.02	0.0007	<0.00003	0.0007	0.0007	<0.00003	<0.00003	0.00093	0.00085	<0.02	<0.02	<0.02	<0.02
Cobalt	(mg/L)	0.0009				<0.00006 - 0.0053	<0.00077		<0.0005	<0.0005	<0.01	<0.01	0.003	<0.01 - 0.07	0.05	<0.0002	<0.00006	0.00043	0.0017	<0.00006	<0.00006	0.0089	0.0054	<0.01	<0.01	<0.01 - 0.10	0.06
Copper	(mg/L)	0.005	0.004	1.0 (AO)	1.0 (AO)	<0.00006 - 0.0128	<0.0049	0.0015	0.0043	0.0016	0.008 - 0.012	0.010	0.0093	0.008 - 0.073	0.031	0.0008	0.0011	0.00053	0.0025	0.0062	0.0049	0.019	0.013	<0.005 - 0.012	<0.006	<0.006 - 0.117	0.041
Iron	(mg/L)	0.3	0.3	0.30 (AO)	0.30 (AO)	0.018 - 1.23	<0.17	0.1	0.0998	0.0494	0.15 - 0.29	0.21	0.17	0.08 - 0.30	0.17	0.063	0.039	0.30	0.51	0.0147	0.0427	0.157	0.17	0.11 - 0.41	0.17	0.05 - 0.41	0.13
Lead	(mg/L)	0.025 (0.005)*	0.007	0.01	0.010	<0.0002 - 0.0666	<0.0067	<0.0007	<0.008	<0.008	<0.02	<0.02	0.0002	<0.02	<0.02	<0.0001	<0.0002	0.00033	0.00017	<0.0002	<0.0002	<0.0001	<0.0001	<0.02	<0.02	<0.01 - <0.02	<0.02
Magnesium	(mg/L)					42.7 - 180	130		8.48	21.5	22.7 - 76.1	55.6	40.2	21.6 - 45.4	35.0	6.8	7.4	11	17.9	33.7	34.4	27.2	41.1	12.1 - 39.0	28.4	17.0 - 31.3	22.2
Manganese	(mg/L)				0.05(AO)	0.0168 - 1.63	0.262		0.0193	0.0909	0.019 - 0.075	0.04	0.0196	0.02 - 0.06	0.04	0.0043	0.0126	0.049	0.193	0.0198	0.0456	0.084	0.066	0.007 - 0.467	0.113	0.007 - 0.225	0.079
Mercury	(mg/L)	0.0002	0.000026	0.001	0.001	<0.0001	<0.0001	<0.00005			<0.0001 - 0.0003	<0.00012	<0.0001	<0.0001 - 0.0003	<0.00012	<0.0001		<0.0001	<0.0001			<0.0001	<0.0001	<0.0001 - 0.0002	<0.0001	<0.0001 - <0.002	<0.0001
Molybdenum	(mg/L)	0.04*	0.073			<0.00009 - 0.0084	<0.0032	0.0047	0.0032	<0.002	<0.02	<0.02	0.0072	<0.02	<0.02	<0.0001	<0.00009	<0.0001	0.00053	0.00440	0.00390	0.0074	0.013	<0.02	<0.02	<0.02 - 0.02	<0.02
Nickel	(mg/L)	0.025	0.15			<0.00005 - 0.0088	<0.0028	0.002	0.0007	0.0026	<0.02	<0.02	0.033	<0.02	<0.02	0.002	<0.00005	0.0047	0.009	0.0034	0.0024	0.037	0.068	<0.02	<0.02	<0.02 - 0.04	0.05
Potassium	(mg/L)					3.25 - 13	9.63		1.36	0.989	1.76 - 5.34	3.46	12.1	2.15 - 27.80	15.19	<0.53	0.454	<0.6	1.3	3.72	3.53	17.9	20.4	0.61 - 2.16	1.42	1.9 - 35.3	19.6
Sodium	(mg/L)			200 (AO), (20)^{2}	200 (AO), (20)^{2}	33.1 - 110	83.4		174	50.2	21.8 - 56.2	43.3	50.9	17.5 - 116.0	76.3	15.6	19.9	12.80	25.1	20.7	22.4	60.9	65	5.87 - 17.6	13.0	9.1 - 128	85.7
Vanadium	(mg/L)	0.006*							0.002	<0.00004	<0.002 - 0.007	0.003	<0.002	<0.002 - 0.006	0.003	<0.002	<0.00004	<0.002	<0.002	<0.00004	<0.00004	<0.002	<0.002	<0.002 - 0.003	0.002	<0.002 - 0.004	0.003
Zinc	(mg/L)	0.03 (0.02)*	0.03	5.0 (AO)	5.0 (AO)	<0.002 - 0.053	<0.014	0.017	0.005	0.0049	<0.01 - 0.03	<0.012	0.018	<0.01 - 0.04	<0.014	0.0013	<0.0008	0.0017	0.004	0.001	0.0041	0.0033	0.008	0.002 - 0.29	0.04	<0.01 - 0.05	<0.014

🟩	Individual sample or sample mean exceeds PWQO
🟩	Upper end of observed range exceeds PWQO
🟧	Individual sample or sample mean exceeds CEQG PAL
🟨	Upper end of observed range exceeds CEQG PAL
🟪	Individual sample or sample mean exceeds PWQO and CEQG PAL
⬜	Upper end of observed range exceeds PWQO and CEQG PAL

* Interim Objective

** Value based on filtered samples (Aluminum values with single [*] are unfiltered)

TABLE 4-5
PORCUPINE RIVER SYSTEM - SEDIMENT QUALITY DATA

Parameters	Units	PSQG LEL[a]	PSQG SEL[b]	CEQG PEL[c]	Porcupine River System															South Porcupine River System												
					Pearl Lake	River DS of Pearl Lake	Edwards Creek US (Area 5)	Edwards Creek US (Area 5)	Edwards Creek US (Area 5)	Edwards Creek US (Area 5)	Edwards Creek US (Area 6)	Edwards Creek US (Area 6)	Edwards Creek US (Area 6)	River at Hwy 101		River US Porcupine L.		River US Porcupine Lake		McDonald Lake Shallow	McDonald Lake Deep	River DS of McDonald Lake - 300m	River DS of McDonald Lake - 1000m	Simpson Lake 1? North Basin Shallow	Simpson Lake 1? North Basin Deep	Simpson Lake 2? South Basin Shallow	Simpson Lake 2? South Basin Deep	River US Dome Discharge		River DS Dome Discharge	River DS Dome Discharge	
Source →					Minnow 2001	Minnow 2001	AMEC 2007	AMEC 2007	AMEC 2007	AMEC 2007	AMEC 2007	AMEC 2007	AMEC 2007	Minnow 2005		Beak 1999		Minnow 2005		AMEC 2007	AMEC 2007	Beak 1999	Beak 1999	AMEC 2007	AMEC 2007	AMEC 2007	AMEC 2007	Minnow 2005		Beak 1999	Minnow 2005	
Time Interval →					Oct 01	Oct 01	Sep 07	Sep 07	Sep 07	Sep 07	Sep 07	Sep 07	Sep 07	Sep 04		Oct 97		Sep 04		Sep 07	Sep 07	Oct 97	Oct 97	Aug 07	Aug 07	Aug 07	Aug 07	Sep 04		Oct 97	Sep 04	
Statistic →					N = 3	N = 3	SS	SS	SS	Mean n=3	SS	SS	Mean n=2	O.R	Mean n = 5	O.R	Mean n = 5	O.R	Mean n = 5	SS	SS	Mean n = 3	Mean n = 4	SS	SS	SS	SS	O.R	Mean n = 5	Mean n = 3	O.R	Mean n = 5
Sediment ID							S2007-13638	S2007-13637	S2007-13659	-	S2007-13642	S2007-13658	-							S2007-13640	S2007-13639			S2007-13651	S2007-13634	S2007-13650	S2007-13643					
Predominant Substrate					sand / silt	sand / silt											silt / clay			sand	silt with fine sand &	silt with fine sand &	silt with fine sand &							silt with fine sand &		
Loss on Ignition (LOI)	%						7.28	6.13	43.6	19.0	2.57	16.7	9.6			9.6 - 11	10.3			1.86	1.28	14.7	10.3	24.0	25.1	12.2	20.1			5.8		
pH	units						6.7	7.1	7.3	7.0	6.8	7.1	7.0							7.0	7.2	6.7	7.0	6.4	6.8	7.3	6.6			7.35		
Total Kjeldahl Nitrogen	µg/g	550	4,600				1830	1690	13500	5673	703	5520	3112	650 - 1,900	1300			1,000 - 1,900	1400	682	538			4400	9150	3470	5200	1,200 - 7,400	3,900		1,400 - 7,900	3,700
Total Organic Carbon	% solids	1	10		6.6	13	2.3	1.5	21	8.3	3.2	5.6	4.4	1.3 - 3.7	2.2	2.4 - 3.4	2.9	1.3 - 2.9	2.10	0.7	0.4	5.4	3.7	5.9	11.0	4.5	6.4	2.1 - 17	8.0	2.2	2.1 - 9.3	4.5
Total Phosphorus	µg/g	600	2,000											340 - 540	450			380 - 550	470									410 - 610	520		350 - 660	480
Aluminum	µg/g				4833	3933	6650	4250	8460	6453	3390	5320	4355	7,900 - 15,000	11,000	8,400 - 11,000	9340	7,500 - 13,000	9,600	2180	2280	2525	7300	7610	16200	15000	12700	11,000 - 16,000	13,000	6667	8,300 - 15,000	11,000
Antimony	µg/g				1.8	1.1	<0.5	<0.5	2.7	<1.2	<0.5	<0.5	<0.5	<0.2 - 0.3	0.2	0.2 - 0.4	0.28	0.3 - 0.3	0.3	<0.5	<0.5	<0.4	<0.2	0.7	1.3	2.0	1.7	0.3 - .06	0.4	0.4	0.4 - 2	0.9
Arsenic	µg/g	6	33	17	42.7	12.0	0.5	<0.5	65.7	<22.2	1.0	2.1	2	21 - 51	38	59 - 98	79	51 - 110	75	4.3	3.4	404	238	19.9	64.4	125	93.1	390 - 980	640	247	220 - 420	320
Barium	µg/g				84.7	34.7	30.6	18.5	29.2	26	6.4	29.7	18	21 - 42	27	23 - 43	33.2	15 - 25	20	7.7	14.4	24.3	36.5	23.9	29.3	25.5	46.3	17 - 88	54	18.7	16 - 96	48
Beryllium	µg/g				<0.2	<0.2	<0.2	<0.2	0.2	<0.2	<0.2	<0.2	<0.2	<0.2 - 0.3	0.2	0.2 - 0.4	0.26	<0.2 - 0.2	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.2	<0.2	0.3	<0.2 - 0.4	0.3	<0.2	<0.2 - 0.2	0.2
Bismuth	µg/g				1.8	0.4	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.2 - 0.3	0.3	<0.2	<0.2	<0.2 - 0.2	0.2	<0.2	<0.2	<0.2	<0.3	<0.2	<0.2	<0.2	<0.2	<0.2 - 0.2	0.2	<0.2	<0.2 - 0.3	0.2
Cadmium	µg/g	0.6	10	3.5	7.3	2.1	<0.5	<0.5	1.3	<0.8	<0.5	0.6	<0.55	0.2 - 0.4	0.3	0.4 - 0.6	0.54	0.2 - 0.4	0.3	<0.5	<0.5	0.37	0.40	0.7	1.9	1.5	1.4	0.2 - 0.8	0.4	0.21	0.2 - 0.9	0.5
Calcium	µg/g				79000	8400	6270	10500	10600	9123	14600	13100	13850			11,500 - 21,368	18863			5450	15800	17,583	28050	5540	8380	34600	10800			34233		
Chromium	µg/g	26	110	90	34.7	26.0	22	18	35	25	20	20	20	24 - 40	32	39 - 50	44.8	32 - 57	41	9	10	64.3	50	38	36	68	196	87 - 120	110	65	74 - 110	85
Cobalt	µg/g				29.0	21.7	5	3	56	21	6	5	5	11 - 23	17	21 - 33	28.2	19 - 26	22	2	2	10.9	19	10	24	19	20	22 - 33	28	41.3	39 - 200	110
Copper	µg/g	16	110	197	1,467	517	14	11	5,110	1712	91	22	57	160 - 520	280	260 - 560	384	170 - 260	200	6	5	26.7	337	343	2900	2060	1290	230 - 790	430	553	430 - 1,600	740
Iron	µg/g	20,000	40,000		20,667	7,533	9620	5940	30200	15253	6260	11000	8630	24,000 - 47,000	37,000	23,000 - 30,000	26800	22,000 - 39,000	29,000	4250	3980	9,667	23000	12300	47300	46600	23200	25,000 - 50,000	40,200	34667	38,000 - 51,000	45,000
Lead	µg/g	31	250	91.3	115.0	36.3	7	<5	29	<14	<5	7	<6	7.1 - 12	10	15 - 22	19.8	8.0 - 19	11	<5	<5	28.7	18	17	42	24	43	10 - 15	13	8.8	6.1 - 22	12
Magnesium	µg/g				8,900	2,867	3210	4160	5570	4313	4520	4240	4380			10,708 - 17,688	15727			2620	4550	13,603	13376	4660	10200	20000	11400			25613		
Manganese	µg/g	460	1,100		1,187	207	155	104	774	344	109	362	236	670 - 1,500	1,000	580 - 830	742	430 - 720	580	49	178	220	683	241	388	1020	266	670 - 1,400	1,100	1057	1,200 - 2,400	1,800
Mercury	µg/g	0.2	2	0.486	1.6	0.40	0.03	0.02	1.70	0.6	0.03	0.02	0.03	0.74 - 1.7	1.2	0.99 - 1.4	1.2	0.54 - 1.1	0.75	<0.01	0.01	0.08	0.13	0.14	5.90	0.29	0.69	0.09 - 0.20	0.15	0.13	0.08 - 0.18	0.12
Molybdenum	µg/g				23.0	11.4	<2	<2	10	<5	<2	<2	<2	0.6 - 2.8	1.4	2.0 - 3.9	3.2	1.4 - 2.0	1.7	<2	<2	0.4	4.7	<2	40	11	3	1.5 - 3.1	2.2	4.7	3.7 - 16	9.5
Nickel	µg/g	16	75		68.3	49.3	13	10	775	266	46	13	30	29 - 58	42	110 - 170	148	66 - 93	76	6	6	98.3	51.3	47	96	76	127	120 - 230	160	230	180 - 880	370
Phosphorus	µg/g				767	577	375	330	825	510	189	609	399							273	359			310	703	605	559					
Potassium	µg/g				413.0	247.0	577	424	874	625	237	799	518							143	174			328	1050	560	804					
Selenium	µg/g				5.0	3.7										1.2 - 2.3	1.9					2.9	2.0							2.3		
Silver	µg/g				7.6	1.7	<0.25	<0.25	0.58	<0.4	0.30	<0.25	<0.28	0.3 - 1	0.6	0.7 - 1.7	1.3	0.4 - 0.6	0.5	<0.25	<0.25	0.13	0.34	0.37	0.72	1.41	0.99	0.3 - 0.5	0.4	1.8	1 - 7	3.5
Sodium	µg/g				563.0	483.0	281	282	889	484	258	1380	819							201	225			286	403	275	343					
Sulphur	µg/g				13,833	9,167																										
Vanadium	µg/g				16.0	9.2	17	12	22	17	12	16	14	19 - 33	27	25 - 31	28	19 - 32	24	8	8	10.6	26.3	22	49	41	39	26 - 39	35	26.7	27 - 45	34
Zinc	µg/g	120	820	315	4,100	1,133	53	28	1070	384	47	75	61	110 - 170	140	150 - 210	182	91 - 160	110	16	13	64.0	187	88	781	162	160	120 - 150	130	91.7	84 - 170	120

🟩	Individual sample or sample mean exceeds PSQG LEL
▨	Upper end of observed range exceeds PSQG LEL
🟧	Individual sample or sample mean exceeds PSQG SEL
🟨	Upper end of observed range exceeds PSQG SEL
🟥	Anomalous value

Water quality conditions in the South Porcupine River are generally similar to those discussed above for the Porcupine River, with many of the same parameters being of potential concern (Table 4-4). McDonald Lake is located outside of the zone of mining influence, but starting approximately 1,000 m downstream from the lake evidence of sulphate and metal enrichment is present. Simpson Lake also shows elevated concentrations of sulphate and a number of metals, most notably copper. Sediment quality data for the South Porcupine River are similar to those described above for the Porcupine River, with the exception of McDonald Lake which shows virtually no signs of sediment metals enrichment (Table 4-5).

4.3.3.3 Town Creek Watershed

The Town Creek system drains Gillies Lake, low gradient tailings areas to the east of Highway 655, as well as significant portions of the City of Timmins property. The connection between Gillies Lake and Town Creek is subsurface, by way of a buried pipeline. The low gradient tailings to the east of Highway 655 (the Hollinger tailings) were deposited in the former northeastward extension of Gillies Lake during the 1920's and 1930's. These tailings are partially sulphidic and potentially acid generating. Extensive rehabilitation of these tailings has recently been completed by Goldcorp.

The water quality of both headwater drainages to Town Creek, namely Gillies Lake and the Hollinger/McIntyre tailings deposits on the east side of Highway 655, show the influence of past mining activity (Table 4-6). This is particularly the case for the tailings deposit drainages, which prior to recent reclamation activities showed low pH, strongly elevated sulphate values, and elevated metals concentrations. Downstream of Highway 655, water quality improves somewhat. Sediment quality data for Gillies Lake and Town Creek are similar to those of the Porcupine River and other local drainages that have been influenced by past mining activities, as evidenced by elevated concentrations of a number of metals.

4.3.3.4 Skynner Creek Watershed

Skynner Creek has a watershed of 13.4 km^2 and drains natural areas, as well as a portion of the City of Timmins, the Hollinger Golf Course, and the Kayorum tailings area. The creek drains west to the Mountjoy River, which flows north into the Mattagami River. The creek is a generally low gradient system which is interrupted by numerous beaver dams. Much of the Skynner Creek drainage system passes through terrain dominated by glaciofluvial sand deposits.

TABLE 4-6
WEST WATERSHEDS - WATER QUALITY DATA

Parameters	Units	PWQO CRITERIA	CEQG PAL CRITERIA	ODWS CRITERIA	CDWQG CRITERIA	Synner Creek System								Perch Lake System		Mountjoy River			Town Creek System							
						Skynner Cr. By Koyarum Tailings	Skynner Cr. US of Pine St.	Skynner Cr. at Pine St.	Skynner Cr. at Pine St.	Skynner Cr. at Pipeline Crossing	Cowboy Lake	Skynner Cr. DS of Cowboy L.	Skynner Cr. US Mountjoy R.	Perch Lake	Miller Lake	Mountjoy River US	Mountjoy River Mid-section	Mountjoy River DS	Gillies Lake	Gillies Lake		Town Cr. At Hwy 655	Town Cr. DS of Hwy 655 at Murray St.	Town Cr. DS of Hwy 655 at Murray St.	Town Cr. at McLean Dr.	Town Cr. US Mattagami River
Source →						Minnow 2002	Minnow 2002	Minnow 2002	AMEC 2007	AMEC 2007	AMEC 2007	AMEC 2007	AMEC 2007	AMEC 2007	AMEC 2007	AMEC 2007	AMEC 2007	AMEC 2007	A.Beech 2000	Minnow 2002		Senes 2007	Minnow 2001	Senes 2007	Minnow 2001	Senes 2007
Time Interval →						May 01			Sep 07	Sep 07	Sep 07	Sep 07	Sep 07	Sep 07	Oct-07	Sep 07	Sep 07	Sep 07	Aug - Sep 00	Aug 00 - Oct 01		2001 - 2003	Oct 01	2001 - 2003	Oct 01	2001 - 2003
Statistic →						Mean n = 4	SS	SS	SS	SS	SS	SS	SS	SS	SS	SS	SS	SS	n = 5	O.R. n = 42	Mean n = 42	Mean	Mean n = 3	Mean	Mean n = 3	Mean
Acidity	(mg/L)								14.6	14.1	6.2	9.1	8.2	2.1		3.2	2.6	2.9					8.5		1.8	
Ammonia as N	(mg/L)								<0.07	<0.07	<0.07	<0.07	<0.07	<0.07		<0.07	<0.07	<0.07		<0.005 - 1.04	0.28	1.71	<0.048	0.24	<0.005	0.17
Chloride	(mg/L)			250 (AO)	250 (AO)				174	172	70.2	56.4	80.1	4.03		1.26	2.1	6.46								
Conductivity	(µs/cm)					1878	872	1017	1698	1620	800	865	1027	57.8		220	229	249		370 - 1848	1161	2240	1495	1263	1284	1089
Dissolved Organic Carbon	(mg/L)																						2.5		3.9	
Hardness (CaCO3)	(mg/L)			80-100 (OG)		688	380	430	796	732	328	440	365	21		108	112	116		21 - 580	391	976	654	622	533	491
Nitrate as N	(mg/L)		13	10^{+}					<0.005	<0.005	<0.005	<0.005	<0.005	<0.005		<0.005	<0.005	<0.005								
Nitrite as N	(mg/L)		0.05	1					<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01	<0.01								
pH	units	6.5 - 8.5	6.5 - 9	6.5 - 8.5	6.5-8.5	7.89	7.84	7.97	8.03	8.02	8.1	7.79	7.91	7.31		8.1	8.07	8.1	8.0	7.33 - 8.44	8.03	3.69	7.9	7.62	8.17	7.82
Phosphate	(mg/L)								<0.001	<0.001	<0.001	<0.1	<0.1	<0.001		<0.001	<0.001	<0.001								
Sulphate	(mg/L)			500 (AO)$^{++}$	500 (AO)$^{++}$				776	688	240	108	246	5.6		4.08	5.36	6.74		10 - 763	226.0	1433	1287	456	363	330
Total Alkalinity (CaCO3)	(mg/L)			30-500 (OG)					238	240	152	227	175	14.4		110	112	117					178		179	
Total Cyanide	(mg/L)								0.007	<0.005	<0.005	<0.005	<0.005	<0.005		<0.005	<0.005	<0.005		0.002 - 0.046	0.017	0.02	<0.005	0.014	<0.007	0.017
Total Dissolved Solids	(mg/L)			500 (AO)	500 (AO)				910	810	440	838	683	40		146	164	160		236 - 1043	762		1150		759	
Total Organic Carbon	(mg/L)																						3.3		4.3	
Total Suspended Solids	(mg/L)								<10	<10	<10	51	9.1	<10		<10	<10	<10		<1.0 - 29.5	5.8	37.1	<1.0	9.7	<1.9	27.1
Total Phosphorus	(mg/L)	0.03*							<0.05	<0.05	<0.05	<0.1	<0.1	<0.05		<0.05	<0.05	<0.05					0.022		0.014	
Turbidity	NTU																									
Aluminum (filtered)	(mg/L)	0.075**	0.1	0.10 (OG)	0.10 (OG)	<0.022*	0.055*	0.11*	0.0097	0.0073	0.007	0.01	0.0046	0.0147		0.0125	0.0151	0.0173					0.023*		0.113*	
Antimony	(mg/L)	0.02*			0.006^{II}	<0.002	<0.002	<0.002	<0.00009	<0.00009	<0.00009	<0.003	<0.003	<0.00009		<0.00009	<0.00009	<0.00009								
Arsenic	(mg/L)	0.1 (0.005*)	0.005	0.025^{I}	0.025^{II}	0.0038	0.003	0.002	0.0021	<0.0002	<0.0002	<0.002	<0.002	<0.0002		<0.0002	<0.0002	<0.0002	<0.005	<0.005 - 0.048	<0.007	0.01	<0.002	0.006	<0.002	0.0057
Cadmium	(mg/L)	0.0002	0.000017	0.005	0.005	0.00012	0.00013	0.00009	<0.00004	<0.00004	<0.00004	<0.0005	<0.0005	<0.00004		<0.00004	<0.00004	<0.00004		<0.002 - 0.002	<0.002		<0.0001		<0.0001	
Calcium	(mg/L)								154	142	74.8	89.7	75	4.23		35.1	35	36.4					177		152	
Chromium	(mg/L)	0.0089 (as Cr III)	0.0089 (as Cr III)	0.05	0.05	<0.002	<0.002	<0.002	0.0006	0.0007	<0.00003	0.001	<0.0004	<0.00003		0.0005	0.0007	0.001								
Cobalt	(mg/L)	0.0009				0.013	0.008	0.010	0.0106	0.0086	0.0023	0.0028	0.0014	<0.00006		<0.00006	<0.00006	<0.00006								
Copper	(mg/L)	0.005	0.004	1.0 (AO)	1.0 (AO)	0.0045	0.010	0.007	0.013	0.0047	0.0023	0.0164	0.0047	0.0009		0.0017	0.0023	0.0024	<0.007	<0.005 - 0.017	<0.006	0.51	0.0019	0.026	0.0043	0.025
Iron	(mg/L)	0.3	0.3	0.30 (AO)	0.30 (AO)	0.78	0.56	0.60	0.375	0.0605	0.0234	0.488	0.102	0.0875		0.21	0.369	0.329	0.288	0.009 - 0.635	0.079	67	0.59	1.35	0.4	1.23
Lead	(mg/L)	0.025 (0.005)*	0.007	0.01	0.010	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.008	<0.008	<0.0002		<0.0002	<0.0002	<0.0002	<0.006	<0.005 - 0.010	<0.005	0.01	<0.0005	<0.0005	0.00093	0.008
Magnesium	(mg/L)								102	91.4	37.4	51.5	40.7	2.42		8	8.26	8.53								
Manganese	(mg/L)				0.05 (AO)	0.148	0.16	0.10	0.0682	0.113	0.0373	0.055	0.0561	0.0134		0.029	0.0435	0.054								
Mercury	(mg/L)	0.0002	0.000026	0.001	0.001																		<0.00005		<0.00005	
Molybdenum	(mg/L)	0.04*	0.073			<0.002	<0.002	<0.002	0.0038	0.0037	0.0032	0.0052	0.0046	<0.00009		<0.00009	<0.00009	0.002					<0.001		<0.001	
Nickel	(mg/L)	0.025	0.15			0.0033	0.003	0.003	0.0029	0.0019	0.0008	0.0029	0.002	<0.00005		0.0008	0.0009	0.0014	<0.004	<0.003 - 0.010	<0.004	0.26	0.0047	0.010	0.003	0.011
Potassium	(mg/L)								7.81	6.35	2.31	3.66	2.73	0.501		0.422	0.466	0.525								
Sodium	(mg/L)			200 (AO), (20)^{2}	200 (AO), (20)^{2}				108	108	40.9	57.5	47.9	2.52		1.91	2.42	3.94								
Vanadium	(mg/L)	0.006*							<0.00004	<0.00004	<0.00004	0.0027	0.0021	0.0001		0.0003	0.0005	0.0004								
Zinc	(mg/L)	0.03 (0.02)*	0.03	5.0 (AO)	5.0 (AO)	<0.003	<0.003	<0.003	0.0066	0.0019	0.0023	0.006	0.0014	0.0039		0.0032	0.0048	0.0025	0.022	<0.001 - 0.089	<0.019	1.56	<0.023	0.063	0.012	0.083

🟩	Individual sample or sample mean exceeds PWQO
🟩	Upper end of observed range exceeds PWQO
🟧	Individual sample or sample mean exceeds CEQG PAL
🟨	Upper end of observed range exceeds CEQG PAL
🟪	Individual sample or sample mean exceeds PWQO and CEQG PAL
⬜	Upper end of observed range exceeds PWQO and CEQG PAL

* Interim Objective

** Value based on filtered samples (Aluminum values with single [*] are unfiltered)

TABLE 4-7
WEST WATERSHEDS - SEDIMENT QUALITY DATA

Parameters	Units	PSQG LEL[a]	PSQG SEL[b]	CEQG PEL[c]	Synner Creek System					Perch Lake System			Mountjoy River									Towne Creek System		
					Skynner Cr. By Koyarum Tailings	Skynner Cr. US Pine St.	Skynner Creek at Pipeline Crossing	Cowboy Lake Shallow	Cowboy Lake Deep	Perch Lake Shallow	Perch Lake Deep	Miller Lake	Mountjoy River US (Area 1)	Mountjoy River US (Area 1)	Mountjoy River US (Area 1)	Mountjoy River US (Area 1)	Mountjoy River MS (Area 4)	Mountjoy River DS (Area 2)	Mountjoy River DS (Area 2)	Mountjoy River DS (Area 2)	Mountjoy River DS (Area 2)	Gillies Lake	Town Cr. at Murray St.	Town Cr. at McLean Dr.
Source →					Minnow 2002	Minnow 2002	AMEC 2007	AMEC 2007	AMEC 2007	AMEC 2007	AMEC 2007	AMEC 2007	AMEC 2007	AMEC 2007	AMEC 2007	AMEC 2007	AMEC 2007	AMEC 2007	AMEC 2007	AMEC 2007	AMEC 2007	Minnow 2002	Minnow 2001	Minnow 2001
Time Interval →					May 01	May 01	Sep 07	Sep 07	Sep 07	Sep 07	Sep 07	Oct 07	Sep 07	Sep 07	Sep 07	Sep 07	Sep 07	Sep 07	Sep 07	Sep 07	Sep 07	May 01	Oct 01	Oct 01
Statistic →					Mean n = 3	Mean n = 3	SS	SS	SS	SS	SS	SS	SS	SS	SS	Mean n = 3	SS	SS	SS	SS	Mean n = 3	Mean n = 3	Mean n = 3	Mean n = 3
Sediment ID							S2007-13652	S2007-13647	S2007-13654	S2007-13656	S2007-13645	S2007-16565	S2007-13641	S2007-13635	S2007-13636	na	S2007-13646	S2007-13655	S2007-13653	S2007-13649	na			
Predominant Substrate					silty sand	sand / silt																	sand	fine sand/ silt
Loss on Ignition (LOI)	%						6.56	4.01	3.12	3.07	87.9	5	2.15	3.08	0.77	2.00	1.03	2.53	3.10	0.68	2.10			
pH	units						7.0	7.2	6.5	6.7	5.7	7.2	6.8	6.7	7.2	6.9	7.0	6.9	6.9	7.5	7.1			
Total Kjeldahl Nitrogen	µg/g	550	4,600				1880	1340	14000	712	17100	1260	670	691	160	507	284	613	643	138	465			
Total Organic Carbon	% solids	1	10		11.0	3.4	2	1.4	13	1.1	23	18000	0.9	1.0	0.4	0.7	0.4	0.8	1.0	0.4	0.7	9.2	0.8	1.6
Total Phosphorus	µg/g	600	2,000																					
Aluminum	µg/g				3,167	5,333	4670	1860	10800	3000	9380	14800	3550	3400	1950	2967	2310	2550	3680	2270	2833	5,633	2,533	4,733
Antimony	µg/g				<0.23	<0.2	<0.5	<0.5	0.8	<0.5	0.6	0.6	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.7	<0.2	<0.2
Arsenic	µg/g	6	33	17	63.7	29.3	<0.5	1.7	47.8	<0.5	8.0	0.6	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	62.0	5.8	7.0
Barium	µg/g				22.5	40.0	20.4	9.0	35.2	9.8	66.2	59.9	17.5	19.2	8.7	15	11.3	13.7	18.4	9.7	14	34.7	36.0	27.3
Beryllium	µg/g				<0.2	<0.2	<0.2	<0.2	0.2	<0.2	0.3	0.5	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Bismuth	µg/g				<0.43	<0.23	<0.2	<0.2	0.6	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	1.0	<0.2	<0.2
Cadmium	µg/g	0.6	10	3.5	0.5	0.2	<0.5	<0.5	1.5	<0.5	1.4	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1.4	0.1	0.5
Calcium	µg/g						14500	13000	17300	1420	4240	9360	9160	9620	2870	7217	5660	7850	9230	14500	10527		3,233	7,133
Chromium	µg/g	26	110	90	10.3	14.3	16	10	39	11	21	32	13	13	10	12	9	10	15	10	12	18.3	10.8	19.3
Cobalt	µg/g				12.8	18.0	4	4	55	2	6	9	3	3	2	3	2	2	3	2	2	21.0	7.5	17.3
Copper	µg/g	16	110	197	118	340	41	89	7950	3	39	16	4	5	2	4	3	5	13	10	9	420	55.3	130
Iron	µg/g	20,000	40,000		24,167	18,267	6430	3150	26400	3460	9780	20300	5390	5370	3350	4703	3560	4060	5850	4110	4673	32,000	13,000	18,333
Lead	µg/g	31	250	91.3	10.1	8.3	5	<5	39	<5	46	12	<5	<5	<5	<5	<5	<5	7	5	6	69.0	4.1	21.7
Magnesium	µg/g						7480	1350	8250	1250	1820	9490	5580	5190	1920	4230	3530	3870	5650	4630	4717		1,333	3,600
Manganese	µg/g	460	1,100		637	720	125	57	464	48	134	401	196	196	110	167	122	100	152	83	112	683	987	793
Mercury	µg/g	0.2	2	0.4			0.02	0.01	0.15	<0.01	0.11	0.03	0.01	0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01		0.08	0.07
Molybdenum	µg/g				<0.43	<0.23	<2	<2	3	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	1.1	<0.2	0.3
Nickel	µg/g	16	75		27.8	38.0	13	10	521	7	17	20.0	8	7	6	7	5	6	9	7	7	50.7	14.9	25.7
Phosphorus	µg/g						425	194	773	224	1040	427.0	321	340	195	285	261	285	303	230	273		287	373
Potassium	µg/g						506	139	1040	113	596	1920.0	338	363	131	277	202	254	389	211	285		160	397
Selenium	µg/g				<1.0	<1.0																2.3	<0.2	<0.2
Silver	µg/g				0.7	1.2	<0.25	<0.25	0.47	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	3.1	<0.2	<0.2
Sodium	µg/g						332	217	802	177	322	372.0	209	219	180	203	196	207	219	195	207		53.0	102.0
Sulphur	µg/g																						827	630
Vanadium	µg/g				10.2	11.7	14	6	25	9	22	33.0	11	11	7	10	7	8	12	9	10	17.0	6.3	11.3
Zinc	µg/g	120	820	315	140	99.0	23	16	318	13	150	42.0	17	18	13	16	10	18	35	29	27	857	49.7	187

🟩	Individual sample or sample mean exceeds PSQG LEL
🟩	Upper end of observed range exceeds PSQG LEL
🟧	Individual sample or sample mean exceeds PSQG SEL
🟨	Upper end of observed range exceeds PSQG SEL
🟥	Anomalous value

Headwater drainage from the City of Timmins and the Kayorum tailings area shows elevated concentrations of a number of metals (Table 4-6). However, water quality tends to improve further downstream. Skynner Creek sediments are also enriched with a number of metals, most notably arsenic, copper and nickel (Table 4-7). Water and sediment quality conditions improve further downstream. Cowboy Lake shows generally good water quality, but there are indications of sediment metals enrichment in the deep water sediments. No data are available for Skynner Lake, but it is unlikely that this lake has been affected by past the mining activity, as it is not down-gradient from any such operations.

4.3.3.5 Perch Lake Watershed

The Perch Lake system is a smaller drainage system, located adjacent to the Skynner Creek watershed, which also flows to the Mountjoy River. Similar to the Skynner Creek system, much of the Perch Lake watershed is founded on glaciofluvial sand deposits, and therefore potentially exhibits a stronger surface water/groundwater interconnection.

Perch Lake water and sediment quality data are generally indicative of natural background conditions.

4.3.3.6 Mountjoy River Watershed

The Mountjoy River receives drainage from both the Skynner Creek and Perch Lake systems, and in turn drains to the Mattagami River a short distance downstream of the Perch Lake system inflow. The Mountjoy River drains an area of approximately 540 km^2. Water and sediment quality data for the Mountjoy River were generally indicative of natural background conditions, with no suggestion of mine related drainage influences.

4.4 Groundwater

The following subsections are to replace the information presented in Section 4.4 of the 2006 Closure Plan document (including the associated subsections).

Due to the age of the operations at the Hollinger Mine, there are no baseline data available to define the groundwater regime in the Project area prior to the start of mining. Following from the recommendations presented in the Groundwater and Surface Water Monitoring Plan (AMEC 2006; see Appendix D of the 2006 Closure Plan document), a hydrogeological evaluation of the Hollinger Site was conducted to characterize and evaluate the existing physical and chemical environment relating to the groundwater system. The following is a summary of the results from the hydrogeological evaluation.

4.4.1 Methodology

The hydrogeological evaluation consisted of a review of existing data sources directly relevant to the Site, as well as a number of specific field surveys, which were conducted mainly between July and November 2007. Existing data sources were used to obtain a general understanding of the Site characteristics, including overburden stratigraphy, bedrock geology, existing mine workings, historic pumping rates and groundwater conditions.

Based on AMEC's review of the available data for the Site, it was concluded that the overburden, shallow bedrock and deep bedrock aquifers along the proposed pit perimeter required further instrumentation. At the time of this study, one large pit, as opposed to a series of smaller pits through sequential pushbacks, had been proposed. The AMEC 2008c Pre-Feasibility Environmental Baseseline Studies – Hydrogeology Report was updated in 2010 "Hyrdrogeologic Assessment in Support of PTTW and C. of A. Application for the Hollinger Property" report (Appendix B). The 2010 hydrogeologic report provided updated groundwater modelling to match the current open pit mine plan.

A total of 13 locations (Figure 4-1), immediately outside of the proposed open pit areas, were selected to install multi-level monitoring wells in order to:

- Determine the composition and extent of the overburden and bedrock deposits;
- Characterize aquifer conditions and properties; and
- Provide information as to the existing or potential for interference with surrounding land use and/or surface water features.

The overburden and shallow bedrock aquifers were investigated through the use of a track-mounted, standard soils auger drilling rig, equipped with split-spoon sampling and NQ bedrock coring equipment and capabilities. Soil samples were collected via split-spoon sampling equipment throughout the overburden deposits on 0.76 m intervals, and bedrock coring and samples were completed continuously throughout shallow bedrock in 1.5 m runs.

Four deep bedrock instrumentations (two on the north perimeter and two on the south perimeter) were completed to address both the fractured bedrock areas, as well as the solid rock mass in order to obtain site specific estimates of key model input parameters, such as bedrock hydraulic conductivity values and specific yield. The four deep bedrock aquifer boreholes were completed using a truck mounted water well drilling rig, using 150 mm diameter dual rotary drilling technology, to depths between 134 and 183 m below grade in order to facilitate packer testing of respective fractured and unfractured rock masses. Locations of the shallow and deep monitoring well installations are presented in Figure 4-1.

The packer testing program involved the testing of bulk hydraulic conductivities of the entire open borehole for the shallow bedrock holes, as well as targeting discrete fractured intervals and other zones of hydraulic significance (i.e., weathered versus un-weathered zones, etc.). The deep bedrock holes were subjected to continuous packer testing on 20 m wide intervals over the entire depth of the hole. The data were used to assist in the development of a representative computer model for the hydrogeologic system.

4.4.2 Data Analysis

4.4.2.1 Overburden

Generally, the oldest overburden unit in the area is the Matheson boulder-sand-silt till, which is typically found overlying the bedrock surface in depressions in the bedrock surface. The deposition of the till took place beneath the Wisconsin ice sheet, along with sand and gravel esker deposits. A significant esker deposit is located in the northern part of the LSA running parallel to Highway 655.

The esker complex formed before the silts and clays were deposited, and consequently the silts and clays tend to overlie the esker sands and gravels. Deposits of sand, however, can be found over the clay as a result of erosion and reworking of the esker and ice-contact deltas. Finally, with time, peat and organic soils formed in shallow wet areas.

Overburden thickness is generally limited, except at the north side of the Hollinger Site (between LPTP and Pearl Lake), where the overburden thickness exceeds 70 m (210 feet).

4.4.2.2 Bedrock

The Hollinger-McIntyre deposit is hosted by mafic volcanic rocks of the central and upper Tisdale assemblages that are intruded by porphyritic intrusions. Mafic volcanic rocks in the deposit have generally been divided into three units: the Northern, Central and Vipond Formations.

The Hollinger Mine historically was developed on gold bearing veins, which are structurally controlled by lithologic contacts and deformation zones associated with altered Central and Vipond Formation volcanics. The lavas have been intruded by a group of porphyry stocks, the largest of which is the Pearl Lake Porphyry. The porphyries are generally conformable to the folds within enclosed rocks.

The core of the Hollinger-McIntyre deposits is an elliptical area of high strain developed along the south limb of the Central Tisdale anticline, which surrounds the Pearl Lake porphyry and is approximately 450 to 600 m wide by more than 3 km in length. The elliptical fold of the Central Tisdale anticline contains a series of subsidiary folds including the Northern anticline, Hollinger syncline and the Hollinger anticline. The elliptical nature of this structure in plan view is due to the non-cylindrical, doubly plunging properties that close the structure to both the east and west.

4.4.2.3 Hydrostratigraphic Units

In general, the Site is comprised of six hydrostratigraphic units. Table 4-8 summarizes the general stratigraphy in the study area. Units 1, 2 and 3, however, are not present or continuous across the entire Hollinger Site area. For example, in the vicinity of LPTP and Pearl Lake, Unit 2 is not present and the overburden is comprised solely of Units 1 and 3.

Table 4-8
Hydrostratigraphic Units

Hydrostratigraphic Unit	Approximate Range in Thickness (m)	Composition	Expected Hydraulic Conductivity
Unit 1 (surficial layer, unconfined aquifer)	0 – 12	Fill material, peat, sands	Moderate (sand) to High (mine rock and peat)
Unit 2 (middle aquitard)	0 – 5	Silt, clay and clayey silts	Low
Unit 3 (lower overburden aquifer)	0 – >70	Sands, glacial till	Moderate
Unit 4 (shallow fractured bedrock aquifer)	0 to 30 into bedrock	Slates, greywackes, conglomerates and volcanics	Moderate to Low
Unit 5 (intermediate regional bedrock system)	30 to 120 into bedrock	Slates, greywackes, conglomerates and volcanics	Typically Low (potentially higher hydraulic conductivity along fault and fracture zones)
Unit 6 (deep regional bedrock system)	120 to 400 into bedrock	Slates, greywackes, conglomerates and volcanics	Typically Low (potentially higher hydraulic conductivity along fault and fracture zones)

4.4.2.4 Hydraulic Conductivity Test Results

AMEC compiled the data and completed estimations of the hydraulic conductivity values for the tested stratigraphy and zones. These results showed increasing hydraulic conductivity with depth, which does not follow the typical pattern of hydraulic conductivity within deep bedrock aquifers typically observed in Northern Ontario (i.e., tighter with depth). In this case, the apparent increasing hydraulic conductivity with depth is thought to reflect limitations of the packer testing equipment rather than the actual distribution of hydraulic conductivity. In particular, the packer testing results for some of the deeper intervals are questionable and it is possible that the tests at the deep intervals exceeded the capability of the equipment to maintain a seal at depth during the field program. As a result, these values likely over estimate the hydraulic conductivity of the deeper rock. This interpretation is supported by observations of a lack of drilling fluid losses, suggesting that there are no permeable zones within the area of deeper rock.

4.4.2.5 Monitoring Well Installations

Following completion of the packer tests, a monitoring well was installed in each of the boreholes completed in bedrock within the most conductive interval. In addition, a number of these instruments were twinned with shallower multi-level installations in either bedrock or overburden (if adequate depth of such materials permitted).

Water level data were collected during the weeks of July 19 (Event 1), September 25 (Event 2), and November 12 (Event 3), 2007. A table of water level depths is provided along with the well screen installation depths (below existing grade) (Table 4-9):

Table 4-9
Groundwater Level Data

Monitoring Well ID	Water Levels (mtoc)			Top of Screen (mbgl)	Bottom of Screen (mbgl)
	Event 1	Event 2	Event 3		
BH07HG01	1.65	1.83	0.9	7.9	10.9
BH07HG02	1.90	2.30	1.39	9.4	12.4
BH07HG03	3.60	Lost	Lost	3.1	6.1
BH07HG03D	NC	22.50	21.32	145	155
BH07HG04	11.85	12.60	8.29	9.1	12.1
BH07HG05C	NC	0.52	0.42	3.1	4.6
BH07HG05BR	NC	2.8	2.6	172	182
BH07HG06	9.70	9.93	5.76	9.2	12.2
BH07HG07	NC	9.08	8.49	8.9	11.9
BH07HG08	NC	11.01	11.80	9.2	12.2
BH07HG09A	7.58	9.8	9.8	6.8	9.8
BH07HG09B	NC	12.73	12.4	35	45
BH07HG09C	NC	12.50	13.59	101	111
BH07HG010	12.96	12.92	12.93	9.1	12.1
BH07HG011	NC	6.40	5.91	10.7	13.7
BH07HG012	9.60	9.58	9.38	8.9	11.9
BH07HG013A	NC	5.90	4.77	4.8	7.8
BH07HG013B	NC	11.71	10.68	13	23
BH07HG013C	NC	13.84	12.71	143	153

Notes:
Event 1 – week of July 19, 2007
Event 2 – week of September 25, 2007
Event 3 – week of November 12, 2007
NC = the well was not complete at the time of this event
mtoc = meters below top of casing
mbgl = meters below ground level

Groundwater flow in the Hollinger Mine area is south towards Skynner Creek, northeast towards Little Pearl Tailing Pond and Pearl Lake, and northwest towards Gilles Lake, with the three groundwater divides converging near the topographic bedrock high near the centroid of the project area. The groundwater table was generally found to be relatively shallow (i.e., within 10 m at most locations). The seasonal groundwater fluctuations observed between the monitoring events is apparent in Table 4-9 and exhibits a typical trend of lower water table in both the shallow and deep aquifers in the summer and early fall, with an increase in water table elevation occurring in the fall with the increase in available recharge (i.e., direct precipitation to existing pits and infiltration). No apparent trend is observed with respect to the ongoing dewatering operations associated with the current water taking from the existing McIntyre Mine UG workings in order to dewater the mine workings to a controlled elevation.

4.4.3 Numerical Modelling

A numerical three-dimensional steady-state groundwater flow model was developed and used to estimate the seepage rate into the proposed open pits and to assess the likely effect of dewatering on the groundwater levels in the aquifer. The developed model was used to simulate groundwater flow in both the overburden and bedrock aquifer zones.

The geologic setting used for the model domain was derived from the hydrostratigraphic units (described in Section 4.4.2.3), the hydraulic conductivity estimates and the surrounding surface water features. Groundwater recharge and discharge zones, existing mine workings and boundary conditions were also included in the model.

The model domain extends over approximately 9 km to the south (Mountjoy River), 9 km to the east (Porcupine River and Lake), approximately 3 km to the west (Mattagami River) and 20 km to the north, to the outflow of Bigwater Lake into the North Porcupine River. In the vertical direction, the model extends from the ground surface down to a depth of approximately 500 to 600 m. Groundwater flow below this depth and beyond the boundaries of the model domain is expected to provide negligible contribution to the simulated seepage into the proposed pits and existing UG mine workings.

Input parameters (hydraulic conductivities and recharge rates) were initially assigned to the various overburden and bedrock aquifer zones. These parameters were modified through the process of model calibration. The calibration of a groundwater flow model is a demonstration that the model is capable of reproducing field measured heads and flows: the so-called calibration values. Calibration of the model is achieved by adjusting the physical and hydraulic parameters that are associated with highest degree of uncertainty in order to obtain a reasonable match between computed and observed (measured) data. Despite some noticeable local discrepancies between computed and observed hydraulic heads, the model properly replicates the overall water levels and expected groundwater flow system. The correlation between computed and observed hydraulic heads demonstrated a relatively good agreement between computed and observed data: mean, mean absolute and root mean squared errors (discrepancies between computed and observed heads) were 0.5 m, 2.8 m, and 3.6 m, respectively. The ratio of the root mean squared error to the total head loss (or water table relief) in the area of interest was approximately 7.6%. Therefore, the errors represent only a small portion of the overall model response.

4.4.4 Evaluation and Discussion

Modelling results indicated that the total seepage rate into the proposed pits and existing UG mine workings (down to an elevation of the proposed pit floor) is expected to be approximately 8,900 to 12,400 cubic metres per day (m^3/d) at the end of the open pit mine life. The model-predicted seepage rate is considered to be conservative, as it applies to open pits that have been excavated to their maximum extent. This estimate relates strictly to groundwater seepage and does not include water that would be released from storage from the existing UG workings, or any process (drilling) water added to the system during mining activities, or direct precipitation. Water released from storage from the existing UG workings can be considerable depending on the rate of progression of open pit development. For the current mine plan predicted UG void dewatering rates range from approximately 1,000 to 9,000 m^3/d.

Based on the results of the current modelling efforts, under both the base and conservative cases, the radius of influence within the shallow bedrock is estimated to have the potential to depressurize bedrock underlying Pearl Lake, LPTP, Gillies Lake and possibly Clearwater Lake (Figure 4-3). Gillies Lake is underlain by clay substrates and is therefore not susceptible to pit dewatering effects. Water levels in LPTP, Pearl Lake and Clearwater Lake will be maintained during mine dewatering because UG water will be pumped from the McIntyre No. 11 shaft into LPTP which will then flow into Pearl and Clearwater Lakes. The surface water bodies to the south of the Site, such as the McDonald Lake, Skynner Lake and Perch Lake systems, are all beyond the estimated radius of influence of the mine dewatering and are not interpreted to have the potential for significant effects from the proposed dewatering. These findings are consistent with the effects reported on these systems as a result of historic dewatering efforts from the existing UG mine workings.

4.4.5 Groundwater Quality

4.4.5.1 Monitoring Wells

As part of the November 2007 hydrogeological program, AMEC collected representative groundwater samples from 16 of the 18 monitoring wells installed within the LSA (two of the monitoring wells were dry). Groundwater sampling results are summarized in Table 4-10. Not all of the data specified in the Code were analyzed. Specifically, acidity, cyanide, ammonia, aluminum, calcium, mercury, and molybdenum were not sampled. Missing parameters will be sampled as part of future monitoring. Results are compared to the Ontario Drinking Water

Standards (ODWS); however, these guidelines are based on potable water supply and thus do not directly apply to the baseline groundwater data. There are no groundwater users within 500 m of these monitoring wells.

For discussion purposes only, the results were also compared to the Provincial Water Quality Objectives (PWQO), since the groundwater will ultimately be pumped and discharged (after treatment) to a surface receiving water course (it is not implied, however, that the PWQO would be used as effluent criteria) for the proposed operations.

In general, the ground water quality in the vicinity of the Hollinger project site is characterized by elevated concentrations of alkalinity, conductivity, hardness, sulphate, total dissolved solids (TDS) and various metals, including iron and manganese. Hardness and manganese concentrations exceeded the ODWS for every monitoring well sampled during the fall 2007 monitoring event and are considered to be representative of the Hollinger Mine area. Iron and zinc concentrations were also above the PWQO in several samples.

The poorest groundwater quality, with respect to ODWS, was noted for monitoring wells MW-4 and MW-7. ODWS exceedances at MW-4 included alkalinity, dissolved organic carbon (DOC), hardness (10 times the average of the remainder of the samples), pH, sulphate (20 times the average of the remainder of the samples), TDS, cadmium, copper, iron, lead, manganese and zinc. These elevated concentrations are likely associated with previous mining activities on the project site. Concentrations of the above metals were also above the PWQO criteria. The low pH and elevated metals evident at MW-4 are likely the result of a direct localized groundwater connection between this sampling well and the acidic Gillies Lake tailings to the north.

ODWS exceedances at well MW-7 included alkalinity, hardness (three times the average of the remainder of samples), sulphate (more than two times the average of the remainder of the samples), TDS and manganese. The reason for the degradation of water quality in this area is unclear, as it is located south of the Hollinger Park. All parameters are noted to be below the PWQO criteria.

Information from the well survey conducted by AMEC in July 2010 indicates that there is better quality potable water being used for domestic supply in the Delnite-Gold Mine Road area, approximately 1 km to the southeast of the Hollinger Mine Site.

4.4.5.2 Mine Dewatering

The existing Hollinger UG workings are interconnected with the McIntyre UG workings. Upper mine levels in both mines continue to be dewatered to the present day, to an approximate level of 25 m (80 ft) below ground surface (measured at the McIntyre headframe) and about 10 m below ground surface in the vicinity of the proposed Millerton Pit (i.e., to an elevation of approximately 300 m amsl), to help manage near surface groundwater levels in the area.

Table 4-10

Groundwater Quality – Hollinger Mine Site Monitoring Wells (November 2007)

Parameters	**Units**	**ODWS**	**MW-1**	**MW-2**	**MW-3**	**MW-4**	**MW-5A**	**MW-5B**	**MW-6**	**MW-7**	**MW-8**	**MW-9B**	**MW-9C**	**MW-11**	**MW-12**	**MW-13A**	**MW-13B**	**MW-13C**
General Chemistry			BH07HG-01	BH07HG-02	BH07HG-03	BH07HG-04	BH07HG-05A	BH07HG-05B	BH07HG-06	BH07HG-07	BH07HG-08	BH07HG-09B	BH07HG-09C	BH07HG-03	BH07HG-12	BH07HG-13A	BH07HG-13B	BH07HG-13C
Alkalinity (as CaCO3)	mg/L	30-500 OG	269	319	288	**<1**	301	191	346	**531**	269	265	328	233	257	183	215	193
Conductivity	uS/cm		1280	1180	1470	7120	1390	980	1040	2150	1250	1030	1100	603	1140	1320	846	925
DOC	mg/L	5 AO	3.4	3.9	4	**17**	4.7	2.1	1.4	3.9	3.1	4.4	2.2	0.5	1	1.8	**5.1**	1
Hardness (as CaCO3)	mg/L	80-100 OG	**410**	**920**	**200**	**5200**	**750**	**460**	**500**	**1600**	**840**	**30**	**350**	**280**	**440**	**440**	**17**	**330**
Nitrate (as N)	mg/L	10 MAC	<0.1	<0.1	2.1	3.2	0.3	<0.1	0.2	0.8	5.1	1	1.3	1	0.4	<0.1	<0.2	0.3
Nitrite (as N)	mg/L	1 MAC	<0.001	<0.001	0.07	0.01	<0.01	<0.01	0.02	0.02	0.03	0.6	<0.01	0.02	<0.01	<0.001	0.2	<0.01
pH	pH Units	6.5-8.5	7.9	8	8.2	3.9	7.9	8	8	7.9	8	**8.6**	8	8	8	8	**9.4**	8
Sulphate	mg/L	500 AO	142	250	318	**6060**	424	248	196	**808**	363	146	90	73	57	435	145	64
Total Dissolved Solids (TDS)	mg/L	500 AO	404	433	**620**	**1220**	441	376	358	**549**	454	**527**	450	283	466	476	484	396
Metals																		
Arsenic	mg/L	0.025 IMAC	0.001	0.003	0.001	<0.005	0.008	0.02	0.006	<0.001	<0.001	0.008	0.001	<0.001	<0.001	<0.001	**0.16**	0.002
Cadmium	mg/L	0.005 MAC	<0.0001	<0.0001	<0.0001	**0.12**	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	mg/L	0.05 MAC	<0.005	<0.005	<0.005	<0.030	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Copper	mg/L	1 AO	0.001	0.001	0.002	**2.5**	0.002	<0.001	0.003	0.005	0.003	0.008	0.002	0.002	<0.001	0.002	0.007	0.003
Iron	mg/L	0.3 AO	**0.38**	**0.88**	<0.100	**61**	**3**	**0.37**	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100
Lead	mg/L	0.01 MAC	<0.0005	<0.0005	<0.0005	**0.007**	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Manganese	mg/L	0.05 AO	**0.24**	**0.9**	**0.068**	**130**	**0.52**	**0.19**	**0.047**	**0.25**	**0.42**	**0.068**	**0.036**	**0.006**	**0.3**	**0.49**	**<0.002**	**0.007**
Zinc	mg/L	5 AO	0.067	0.032	0.018	**33**	0.02	0.015	0.018	0.015	0.02	0.03	0.016	0.01	<0.005	0.024	0.01	0.021

Notes:

Parameters expressed as mg/L, unless otherwise noted. Exceedences of the ODWS are indicated by **BOLD** entries.

ODWS - Ontario Drinking Water Standards (Ministry of the Environment, 2003)

MAC - Maximum Acceptable Concentration IMAC - Interim Maximum Acceptable Concentration AO - Aesthetic Objective OG - Operational Guideline

Dewatering occurs by way of UG pumping from the nearby McIntyre No. 11 Shaft, with water discharged to the LPTP for treatment (settling).

As an additional approximation of the Hollinger Mine groundwater quality, the last three years of monitoring results for the McIntyre No. 11 Shaft discharge (prior to entering the LPTP) were reviewed. Annual average monitoring data for 2006 to 2009 are summarized in Table 4-11.

Table 4-11
McIntyre No. 11 Shaft Annual Average Monitoring Data (2006 to 2009)

Parameter	**Units**	**C of A Limit**	**2006**	**2007**	**2008**
Acidity (pH 8.3)	mg $CaCO_3$/L			137.7	69.1
Alkalinity	mg $CaCO_3$/L			425	450
Total ammonia	mg/L			0.15	0.25
Chloride	mg/L			80.0	53.7
Conductivity	umhos/cm			2699	2479
Total cyanide	mg/L			<0.005	<0.005
Total hardness	mg/L			1773	1562
Lab pH	pH unit	6 - 9.5	7.09	7.19	7.29
Sulphate	mg/L			1295	706
Total dissolved solids	mg/L			2366	2270
Total suspended solids	mg/L	30*	47.9	27.9	24.1
Metals					
Total Aluminium	mg/L			0.0174	0.0023
Total Arsenic	mg/L		0.0307	0.0306	<0.0286
Total cadmium	mg/L		<0.001	<0.0005	<0.0005
Dissolved calcium	mg/L			461	418
Total copper	mg/L	0.3	<0.005	<0.0012	<0.0014
Total iron	mg/L		14.9	12.4	10.3
Dissolved iron	mg/L			6.54	2.10
Total lead	mg/L	0.2	<0.005	<0.007	<0.007
Total mercury	mg/L			<0.0001	<0.0001
Total molybdenum	mg/L			0.0021	0.0021
Total nickel	mg/L	0.5	0.0140	0.0103	0.0095
Total zinc	mg/L	0.5	0.0375	0.0288	0.0228

* C of A effluent criteria for total suspended solids is an objective.

Under existing conditions, the principal water quality consideration is iron, wherein reduced Fe^{2+} iron in groundwater exhibiting low oxygen conditions is brought to surface, and at which point water contact with the air oxygenates the soluble Fe^{2+} iron converting it to the insoluble Fe^{3+} form (principally as $Fe[OH]_3$), resulting in an elevated total suspended solids condition in the water column. As shown in Table 4-11, the iron concentrations are relatively high, as expected. These concentrations decrease significantly once the water discharges into the LPTP where oxygenation, precipitation and settlement occur, prior to final discharge to Pearl Lake. All other metal parameters are considered to be low and are similar to the concentrations observed in the monitoring wells (Section 4.4.5.1).

Despite the low metal concentrations (excluding iron), concentrations of the general parameters, including alkalinity, conductivity, hardness, sulphate and dissolved solids, are noted to be much higher in the McIntyre No. 11 Shaft discharge than the concentrations observed in the majority of the monitoring wells. These higher concentrations can be attributed to contact of the groundwater with the UG mine workings as the water is drawn toward to the McIntyre No. 11 Shaft.

4.5 Terrestrial Plant and Animal Life

The following information is to replace the information presented in Section 4.5 (and associated subsections) of the 2006 Closure Plan document.

4.5.1 Methodology

AMEC conducted a terrestrial biophysical inventory of the LSA to characterize and evaluate the existing environment and to provide baseline data as input to pre-feasibility designs and to support permitting requirements for the Hollinger Project. The inventory comprised a review of existing data sources, as well as field surveys.

A review of existing documents provided information on biophysical Site characteristics, habitat, wildlife, rare species and communities, and general cultural/historic aspects of the general project area. Prior to undertaking the field studies, an initial classification of habitats was undertaken using recent LiDAR imagery (May 2006), and Forest Inventory Maps (Ontario Ministry of Natural Resources, 1981 & 1992). Vegetation boundaries were then checked in the field and adjusted as necessary. Forest community types were classified in accordance to the Field Guide to Forest Ecosystems of Northeastern Ontario (FECO; Taylor *et al.,* 2000). Communities not included in FECO, such as wetlands and human disturbance areas, were classified in accordance with the Ecological Land Classification (ELC) system (Lee et al. 1998). Field surveys to define vegetation community types and plant species compositions were completed during June 2007. Each community type was documented with photographs. Vegetation mapping was completed using LiDAR aerial photographs and entered into a Geographic Information System (GIS), ARC View 9.1 database.

Breeding bird surveys for the general project area were also undertaken in June 2007 in accordance with the protocols described for the Ontario Breeding Bird Atlas (Cadman *et al.,* 1987; Birds Ontario, 2007), using point count surveys. Bird species were identified through vocalizations, as well as through visual observations. In addition, marsh bird surveys were conducted using broadcast tape playback calls. Species identification was determined using Sibley (1999) and the official bird call registry from the Ontario Breeding Bird Atlas (Salvadori 1995). Incidental observations (based on tracks, calls and scat) of other wildlife such as mammals, amphibians, reptiles and butterflies, were undertaken as an adjunct to vegetation and bird surveys. Significant wildlife habitat was also identified.

Particular care was taken during the field work to detect any federally or provincially designated species, notably Species at Risk as identified by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC 2006), and by the Committee on the Status of Species at Risk in Ontario (COSSARO).

4.5.2 Results

The project area is located on the border of two distinct terrain types; to the south and west is Precambrian Shield terrain and to the north and east are the low lying clay plains. Local topography ranges from 280 m to about 365 m above average sea level. There is an extensive history of mining, forestry and urbanization in and around the Project site, which is reflected in many vegetation communities present being characterized by a predominance of younger forest stands dominated by pioneer species, as well as by the presence of disturbed non-forested areas.

4.5.2.1 Vegetation Communities

The LSA is comprised of 27 distinct plant communities (Figure 4-2). These include five deciduous forest community types, six mixed forest community types, and three coniferous forest community types, together with a variety of plantation forests, cultural thickets and meadows, coniferous swamps, fen and bog communities, marshes, tailings areas, and open water communities.

Deciduous forest vegetation community types included:

- White Birch–Mountain Maple stands;
- Trembling Aspen–Bush Honeysuckle–Large-leaved Aster stands;
- Trembling Aspen–White Birch–Beaked Hazel–Bracken Fern stands;
- Trembling Aspen-Balsam Poplar-Speckled Alder stands; and

- Balsam Poplar-Trembling Aspen-Mountain Maple-Ferns stands.

The Trembling Aspen – White Birch- Beaked Hazel – Bracken Fern community type was the most abundant community type throughout the study area. Most of the Trembling Aspen and White Birch stands are young and show evidence of recent disturbance.

Mixed forest communities were comprised of varying proportions of: Trembling Aspen, Jack Pine, White Birch, White Spruce, Black Spruce and Balsam Fir. There are six mixed forest vegetation types, of which only two are described in the FECO, namely White Birch-White Spruce, and Trembling Aspen-Black Spruce-Bush Honeysuckle-Herb Rich. The other four mixed forest communities included:

- White Spruce-Jack Pine-Trembling Aspen;
- Balsam Fir-Trembling Aspen;
- Jack Pine-Trembling Aspen; and
- White Birch-Jack Pine.

Jack Pine – Trembling Aspen stands, and Trembling Aspen – Black Spruce – Bush Honeysuckle – Herb Rich stands, were the most common mixed forest community types.

Coniferous forest community types included Black Spruce-Herb Rich; Jack Pine-Black Spruce-Feathermoss; and Black Spruce-Jack Pine-Feathermoss, of which Black Spruce – Herb Rich stands are the most abundant. Along with native coniferous forests, Jack Pine plantation forests (cultural plantations) were also common.

Cultural thickets are regenerating areas previously cleared or disturbed and are often dominated by Trembling Aspen, Balsam Poplar, White Birch and willow species, together with a variety of shrub and ground species. A single Cultural Meadow community was also identified on previously disturbed sites. Tailings areas (Sand Barrens) occur throughout the LSA and exhibit varying states of vegetation re-growth from higher density grass/herbaceous community development, to extensive areas of bare soil, with or without shrub and sapling cover. Sand Barrens occupied a combined area of 1,123 ha, making them the second most abundant plant community type in the LSA.

There were two coniferous swamp types present within the LSA; Tamarack-Black Spruce and Black Spruce. Other wetland community types present in the area included limited expressions of open fens, shrub fens, and open treed bogs; together with more extensive marsh habitat. Cattail marshes were the most abundant wetland type in the LSA, with an area of approximately 528 ha, representing the third most abundant vegetation community studied. Most of the creeks, rivers, ponds and lakes are lined with cattail marsh communities (Figure 4-2). Open water habitats are also widespread.

4.5.2.2 Wildlife

Evidence of mammals recorded during Site investigations was limited to that involving Beaver (*Castor canadensis*), Black Bear (*Ursus americanus)*, Red Squirrels (*Tamiasciurus hudsonicus*), Masked Shrews (*Sorex cinereus*), Snowshoe Hares (*Lepus americanus*), Porcupines (*Erethizon dorsatum*), Red Fox (*Vulpes vulpes*) and Moose (*Alces alces*). Three of the four bear sightings were in the vicinity of the Dome Mine.

Seventy-five bird species were observed within the LSA during the investigation. These species were compiled through the breeding bird point counts, marsh bird survey and incidental observations.

The varied vegetation habitats across the study site support a diverse breeding bird population. There were 67 different species detected though the breeding bird point count surveys. Overall, deciduous forests had the highest species richness with 43 species, followed by mixed forest with 34 species, wetlands with 33 species, and coniferous forests with 29 species.

The species with the largest numbers of sightings (≥10 sightings) were all habitat generalists, which were expected given the disturbed nature of the site. Ten of the 16 species were found in all four habitat types (deciduous, mixed, coniferous and wetland) including: White-throated Sparrow (*Zonotrichia albicollis*), American Robin (*Turdus migratorius*), Red-eyed Vireo (*Vireo olivaceus*), Nashville Warbler (*Vermivora ruficapilla*) and Chestnut-sided Warbler (*Dendroica pensylvanica*). Five of the species were found in three of the four habitat types, including: American Crow (*Corvus brachyrhynchos*), Swainson's Thrush (*Catharus ustulatus*) and Song Sparrow (*Melospiza melodia*). Several species were observed on only one occasion, although sometimes in large numbers on that one occasion in the case of flocking species.

A single Virginia Rail and two Pied-billed Grebes responded to the marsh bird playback surveys. Other noteworthy sightings included three pairs of Red-necked Grebes (*Podiceps grisgena*) observed at various marshes.

Eleven species of birds were identified as probable breeders and 5 species of birds were confirmed as breeders.

Regionally rare species observed included a group of Sandhill Cranes (*Grus canadensis*) which flew over the LSA during a breeding bird survey. Also a pair of Green-winged Teal (*Anas crecca*) was found on a marsh by the ERG tailings area in the northeast of the LSA. Singing males were recorded for several regionally rare species including; Black-billed Cuckoo (*Coccyzus erythropthalmus*), Brown Thrasher (*Toxostoma rufum*), Warbling Vireo (*Vireo gilvus*), and Connecticut Warbler (*Opororis agilis*). The other regionally rare species detected on site included Pied-billed Grebe, Virginia Rail, Mourning Dove (*Zenaida macroura*) and Black-throated Blue Warbler (*Dendroica caerulescens)*.

4.5.2.3 Other Species: Amphibians and Reptiles, Butterflies

Only two species of amphibians were detected during the Site investigation; the Green Frog (*Rana clamitans*) and Mink Frog (*Rana septentrionalis*). No reptiles were observed. Other species of amphibians and reptiles with ranges that include the Hollinger Site include: Blue-spotted Salamander (*Ambystoma laterale*), Spotted Salamander (*Ambystoma maculatum*), American Toad (*Bufo americanus*), Spring Peeper (*Pseudacris crucifer*), Wood Frog (*Rana sylvatica*), Northern Leopard Frog (*Rana pipiens*) and Common Gartersnake (*Thamnophis sirtalis*) (MacCulloch, 2002). None of these species are ranked as rare federally or provincially (NHIC, 2007).

Four species of butterflies were observed on site. The most notable of these was the Monarch Butterfly (*Danaus plexippus)*, which is currently listed as being of Special Concern, Schedule 1 Species at Risk (SARA) species, as well as being ranked provincially as a species of Special Concern. Monarchs were seen in various locations including around open and disturbed habitats near current and historic, mine and tailings sites.

4.5.3 Evaluation and Discussion

4.5.3.1 Rarity and Protective Status

None of the forested and wetland vegetation communities in the LSA are provincially and/or federally rare (NHIC, 2007); nor were any provincially or federally threatened or endangered plant or wildlife species observed within the LSA.

The only “wildlife” species detected on site that is a federal and provincial conservation concern is the Monarch Butterfly, which is designated as a special concern on both the COSEWIC and COSSARO lists. It is a schedule 1 SARA species. SARA protects wildlife found on federal lands, as well as their critical habitat. However, as the Project site is not on federal land and the Monarch Butterfly is currently designated as a species of special concern (federally and provincially), these considerations do not apply.

All migratory birds listed under the *Migratory Birds Convention Act* (MBCA*)* are protected. The *Fish and Wildlife Conservation Act (*FWCA*)* also protects several species of birds and in particular raptors and other species such as blackbirds which are not included in the MBCA. The FWCA also protects certain amphibians, reptiles and mammals from hunting, collection or the collection of their eggs.

There are no Areas of Natural and Scientific Interest (ANSI), Environmentally Sensitive Areas (ESA) or Provincially Significant Wetlands (PSW) within the LSA. There are, however, three Conservation Areas within the study area; Gillies Lake Conservation Area and Hersey Lake Conservation Area, which are located on either side of Highway 655 just north of Highway 101; and the White Waterfront Conservation Area located on the east side of South Porcupine River on the west edge of Porcupine Lake.

4.5.3.2 Significant Wildlife Habitat and Linkages

The Ontario Ministry of Natural Resources (MNR) defines significant wildlife habitat as ecologically important in terms of features, functions, representation or amount, and contributing to the quality and diversity of an identifiable geographic area or Natural Heritage System (MNR 2000). Examples include Moose over wintering habitat, snake hibernacula, bat roosts, Marten (Martes americana) dens, habitat for species of conservation concern, rare vegetation communities, interior forest habitat, old growth forests, animal movement corridors, and wetlands. These areas, if and where present, should be given consideration in the planning and mitigation of proposed development activities on any site.

The importance of site area wildlife habitat in the LSA is diminished by the disturbed and fragmented nature of area forests. However, wherever reasonable, efforts will be made to minimize unnecessary disturbance to wetland communities and to large and diverse forest tracts. Major tree clearing efforts will also be avoided during the breeding bird season.

The site has an extensive history of mining, forestry and urbanization. The vegetation communities reflect this history of disturbance; consequently there is very little left that is considered ecologically significant.

4.6 Aquatic Plant and Animal Life

Detailed aquatic habitat field investigations were conducted during August to October 2007 to build on an already extensive pre-existing database. Prior to undertaking these studies, a delineation of habitats was undertaken using high resolution, coloured LiDAR air photo imagery. Field work undertaken during 2007 reviewed watercourses within the LSA with the exception of the Porcupine River system, for which extensive data already exist. The LiDAR imagery, in combination with historic and newly acquired data, was used to develop standardized watercourse descriptions for the entire LSA.

Fish sampling was also conducted during the summer and fall of 2007 to confirm fish species community distribution in areas where such data were lacking, most notably the Mountjoy River and Perch Lake systems, as well as Simpson Lake, McDonald Lake, and Fuller Mine Pond. Fish were collected using a variety of capture techniques including electrofishing (boat and backpack) and baited minnow traps.

Details of the aquatic studies conducted by AMEC in 2007 are included in the Aquatics Ecosystem Existing Conditions Report (AMEC, 2008), included as Appendix A. The following sections provide a summary of existing site conditions.

4.6.1.1 Porcupine River Watershed

The Porcupine River, to the point of its confluence with the South Porcupine River just west of Porcupine Lake, exhibits a low gradient, and is interrupted by numerous beaver dams. Its headwaters drain LPTP, Pearl Lake, and Clearwater Lake.

The majority of the Porcupine River mainstem is classed as Reach Type 4 habitat, which exhibits flat topography and extensive beaver activity, resulting in poorly defined channels with frequent ponded areas, and a channel width generally greater than 20 m. These broader channel sections are interspersed with narrower channel sections of Reach Type 3A, together with sections of poorly defined channel (Reach Type 5), and minor areas of anthropogenic channelization (Reach Type 6A). Edwards Creek is characterized by Reach Type 4 habitat, downstream of Edwards Lake, and by more variable habitats upstream of Edwards Lake. Edwards Lake itself is a small on-line waterbody with a shoreline dominated by marshlands.

Pearl Lake has a surface area of 30 ha, and maximum and mean depths of 12 m and 5 m, respectively. The lake shoreline is characterized by a mix of rocky substrate with overhanging vegetation, dense cattails with soft bed substrate, and an anthropogenically altered shoreline (constructed road). Clearwater Lake is smaller and shallower, with an overall surface area of 11.3 ha, and with maximum and mean depths of 6 m and 2 m, respectively. Land use surrounding Clearwater Lake consists of historic tailings management areas, sporadic mixed forest communities, and low density residential development. Shoreline vegetation is dominated by cattail marsh throughout.

The Porcupine River mainstem supports a variety of coarse and forage fish including Brook Stickleback, Mottled Sculpin, Pearl Dace, Yellow Perch and White Sucker, with Yellow Perch apparently being the most prevalent species. The lower reaches of the river above Porcupine Lake support a fish community of Northern Pike, White Sucker and Yellow Perch. Edwards Creek, upstream and downstream of Edwards Lake, supports a fish community consisting of Brook Stickleback, Creek Chub, Fathead Minnows, Finescale Dace, Northern Redbelly Dace and Pearl Dace. Yellow Perch and White Sucker may also have access to this area. Pearl Lake supports a fish community consisting of Yellow Perch, Rock Bass, Brook Stickleback, Fathead Minnow, Lake Chub, and White Sucker. Clearwater Lake supports Yellow Perch, White Sucker and Brook Stickleback.

More detail on aquatic environment is provided in Appendix A.

4.6.1.2 South Porcupine River Watershed

The South Porcupine River headwaters originate in McDonald and Simpson Lakes. Much of the drainage basin is influenced by past and present mining activity including flows reporting from the existing Dome property, and from the historic Aunor, Buffalo Ankerite, Paymaster and Preston East mine facilities.

Similar to the Porcupine River, the majority of the South Porcupine River channel was classified as Reach Type 4 habitat (Figure 4-3). Much of the remainder of the watercourse consists of narrower (channel generally less than 5 m in width) Reach Type 3 habitat. McDonald Lake has a surface area of 12.5 ha, and maximum and mean depths of 29 m and 11 m, respectively. Simpson Lake consists of two distinct basins separated by a 200 m long narrows, with a combined lake area of 36.7 ha, and with maximum and mean depths of 9.5 m and 3.0 m. Both lakes exhibit variable shoreline habitat types comprising exposed bedrock, wetlands, and altered shoreline areas.

The South Porcupine River hosts a diverse fish community consisting of Yellow Perch, White Sucker, Northern Pike, Brook Stickleback, Fathead Minnow, Mottled Sculpin, Northern Redbelly Dace, and Pearl Dace. McDonald supports Brook Stickleback, Rock Bass, Slimy Sculpin, Smallmouth Bass, White Sucker, and Yellow Perch, with Rock Bass being the dominant species. Simpson Lake supports a fish community of Blacknose Shiner, Brown Bullhead, Northern Pike, Spottail Shiner, Slimy Sculpin and Yellow Perch. Creek Chub, Finescale Dace, Northern Redbelly Dace, and Pearl Dace were captured at the lake outflow channel.

4.6.1.3 Skynner Creek Watershed

Skynner Creek drains natural areas, as well as a portion of the City of Timmins, the Hollinger Golf Course, and the Kayorum tailings area. The creek drains west to the Mountjoy River, which flows north into the Mattagami River. The creek is a generally low gradient system which is interrupted by numerous beaver dams. Much of the Skynner Creek drainage system passes through terrain dominated by glaciofluvial sand deposits.

The major portion of the Skynner Creek system consists of Reach Type 4 habitat. Anthropogenically affected creek sections occur in headwater areas adjacent to the Kayorum tailings stack, and further downstream adjacent to the gas line right-of-way. Narrower channel sections also occur, but are limited. Near the creek confluence with the Mountjoy River there is a broad area through the Mountjoy floodplain where the creek channel becomes very poorly defined as it passes through a dense alder thicket. Cowboy Lake has a surface area of 4.4 ha with a maximum depth of 6.3 m and mean depth of 2.5 m. The lake shoreline comprises a mix of wetland dominated and rock dominated substrate types. Skynner Lake has a surface area of 6.3 ha and is ringed with marshlands.

The upper portion of Skynner Creek supports a fish community consisting of Brook Stickleback, Creek Chub, Fathead Minnows, Finescale Dace, Northern Redbelly Dace and Pearl Dace. Further downstream, the fish community consisted of Creek Chub as the dominant species, together with Brook Stickleback, Fathead Minnow, Johnny Darter, Northern Redbelly Dace, and White Sucker. Cowboy Lake supports a fish community consisting of Blacknose Shiner, Northern Pike, Yellow Perch and White Sucker. Northern Pike was the dominant species. Skynner Lake is remote and was not sampled.

4.6.1.4 Perch Lake Watershed

The Perch Lake system is a smaller drainage system, located adjacent to the Skynner Creek watershed, which also flows to the Mountjoy River. Similar to the Skynner Creek system, much of the Perch Lake watershed is founded on glaciofluvial sand deposits, and therefore potentially exhibits a stronger surface water/groundwater interconnection.

Four waterbodies are associated with the Perch Lake watershed and all were assessed during the 2007 field program, namely Perch Lake, Peroli Lake, Miller Lake, and Miller Pond. The first three lakes are similar in size and exhibit shallow depths. Miller Pond, near the system outflow to Mountjoy River, is slightly larger. The margins of all four lakes are dominated by shallow wetlands. The only well defined “creek” channel in the entire Perch Lake system is an approximately 570 m long creek section extending from the outflow of Peroli Lake to downstream Miller Lake.

The fish community of the Perch Lake system is variable. Northern Pike and Yellow Perch were found in all of the lakes except Perch Lake. Brown Bullhead occurred in the lower two lakes (Miller Lake and Miller Pond). White Sucker was only captured in Miller Pond. Small fish captured in the system included Brook Stickleback, Fathead Minnow, Finescale Dace, Johnny Darter and Northern Redbelly Dace in Perch Lake; Black Nose Shiner and Iowa Darter in Peroli Lake; Northern Redbelly Dace in Miller Lake; and Johnny Darter in Miller Pond. The greater diversity of small fish species in Perch Lake may reflect the apparent absence (or reduced numbers) of predatory pike and perch in this lake. Sampling in 2007 revealed no evidence of Walleye in Miller Pond, despite anecdotal reports of a small seasonally migrant population in the Mountjoy River system.

4.6.1.5 Mountjoy River Watershed

The Mountjoy River receives drainage from both the Skynner Creek and Perch Lake systems, and in turn drains to the Mattagami River, a short distance downstream of the Perch Lake system inflow.

That portion of the Mountjoy River system bordering the LSA is characterized by one reach type - Type 1. The river in this area exhibits a uniform, u-shape cross-sectional profile with an average width and depth of 23 m and 3 m, respectively. The overall gradient is flat and the system is strongly meandering. Substrates consist mainly of fine depositional materials (silt, sand) overlying a compacted clay bed. The river banks are unstable and poorly vegetated. The Mountjoy River fish community consists of Blacknose Shiner, Log Perch, Northern Pike, Rock Bass, Slimy Sculpin, Walleye, White Sucker and Yellow Perch. This system was the only system within the LSA where Walleye were encountered. However, the general abundance of fish was low relative to other areas.

4.6.1.6 Town Creek Watershed

The Town Creek system drains Gillies Lake, low gradient tailings areas to the east of Highway 655, and significant portions of the City of Timmins property. The connection between Gillies Lake and Town Creek is subsurface, by way of a buried pipeline. The low gradient tailings to the east of Highway 655 (the Hollinger tailings) were deposited in the former northeastward extension of Gillies Lake during the 1920's and 1930's. These tailings are partially sulphidic and potentially acid generating. This tailings area is currently undergoing rehabilitation to improve water quality to Town Creek, with significant improvements to date.

Headwater portions of the Town Creek system east of Highway 655 are developed within historic tailings deposits. Further downstream, west of Highway 655, Town Creek is influenced by urban development, characterized by intermittent channelization through residential areas. Gillies Lake measures 20.5 ha, with a maximum depth of 5 m and mean depth of 2 m. The lake exhibits an anthropogenic shoreline with more limited naturalized areas dominated by cattails, sedges, alder and willow species. Lake bed materials are comprised of finer sediments (clay and silt), together with some historic tailings, all overlain with fine muck and organic sediments.

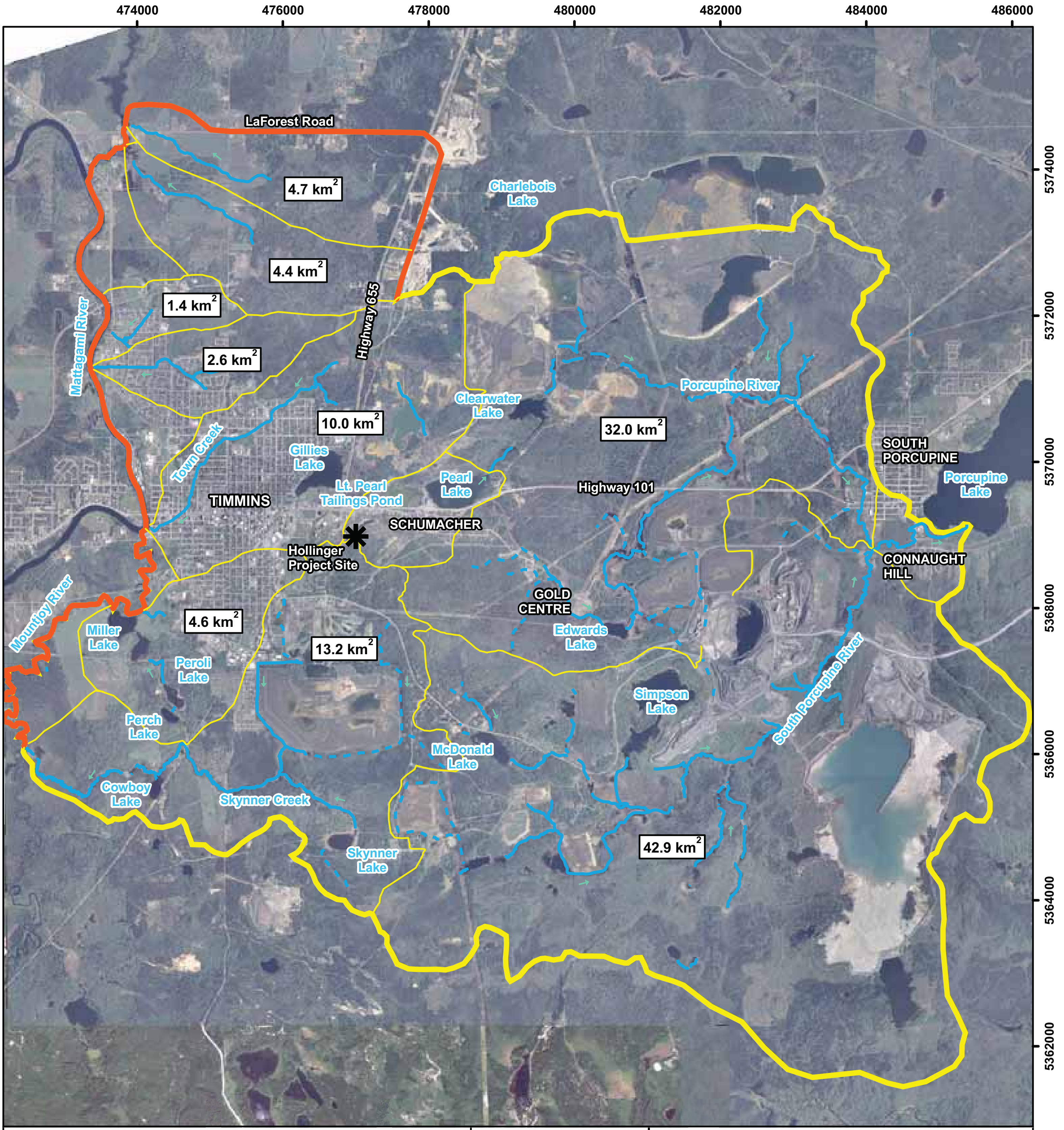
Town Creek supports a modest population of Brook Stickleback, reflecting the limited and poor habitat conditions offered by this system. Gillies Lake supports a more diverse fishery comprised of Lake Chub, Pearl Dace, Pumpkinseed, White Sucker and Yellow Perch, with Yellow Perch being the dominant species.

4.6.1.7 Northwest Watersheds

The four other smaller watersheds that drain the area west of Highway 655 and north of the Town Creek system all drain directly or indirectly (through Kraft Creek) to the Mattagami River. Little or no historical data are available for these systems, and no particular effort was directed at these systems other than to define their general character, since there no realistic potential of their being developed as part of the Hollinger Project.

4.7 Previous Site Activities and Potential Hazards

No change from information provided in the 2006 Closure Plan.



P:\EMProjects\2008\TC81525 Hollinger Permitting\GIS_Data\Closure_Plan\MXD_Maps\Watersheds_LocalStudyArea.mxd

LEGEND

- ✱ Proposed Hollinger Pit Centroid
- 🟥 Study Area (Riverine and Road Boundary)
- 🟨 Study Area (Watershed Boundary)
- River or Creek
- Intermittent Watercourse
- Watershed Boundary
- General Flow Direction

0 0.5 1 2 3 4 Kilometres

NOTES:
-

Datum: NAD83
Projection: UTM Zone 17N

N
W E
S

GOLDCORP
PORCUPINE GOLD MINES

amec

HOLLINGER PROJECT

Local Study Area Watersheds

PROJECT N°: TC81525

FIGURE: 4-1

SCALE: 1:70,000

DATE: October 2010

P:\EM\Projects\2008\TC81525 Hollinger Permitting\GIS_Data\Closure_Plan\MXD_Maps\Groundwater_Monitoring_Wells_2.mxd

LEGEND

● Groundwater Monitoring Points

0 0.125 0.25 0.5 0.75 1
Kilometres

NOTES:
-

Datum: NAD83
Projection: UTM Zone 17N

N W E S

GOLDCORP
PORCUPINE GOLD MINES

amec

HOLLINGER PROJECT

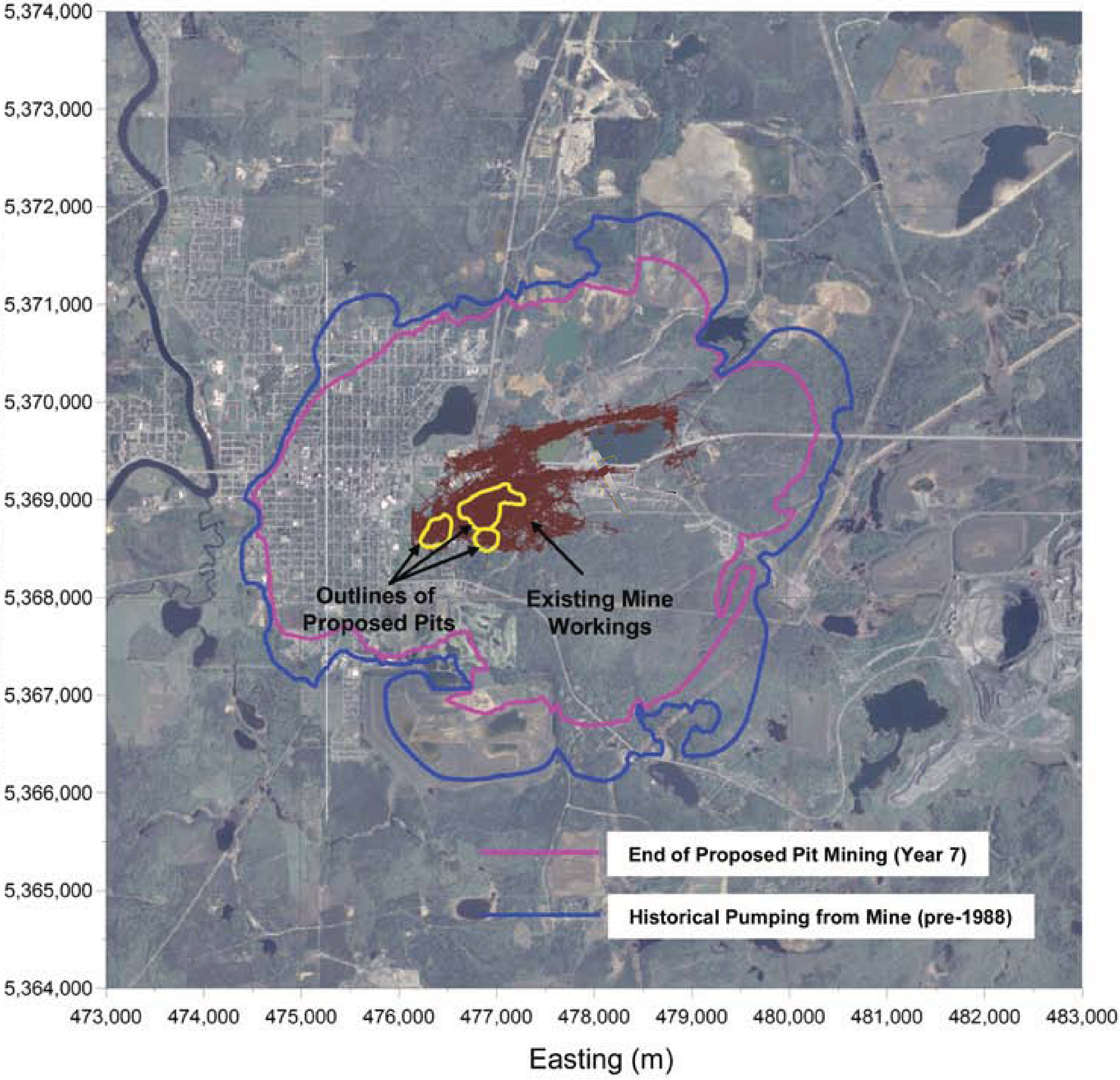
Groundwater Monitoring Points

PROJECT N°: TC81525

FIGURE: 4-2

SCALE: 1:13,000

DATE: November 2010



P:\EM\Projects\2008\TC81525 Hollinger Permitting\GIS_Data\April_May_2010\MXD_Maps\ModelPredictedDrawdown_ver2.mxd

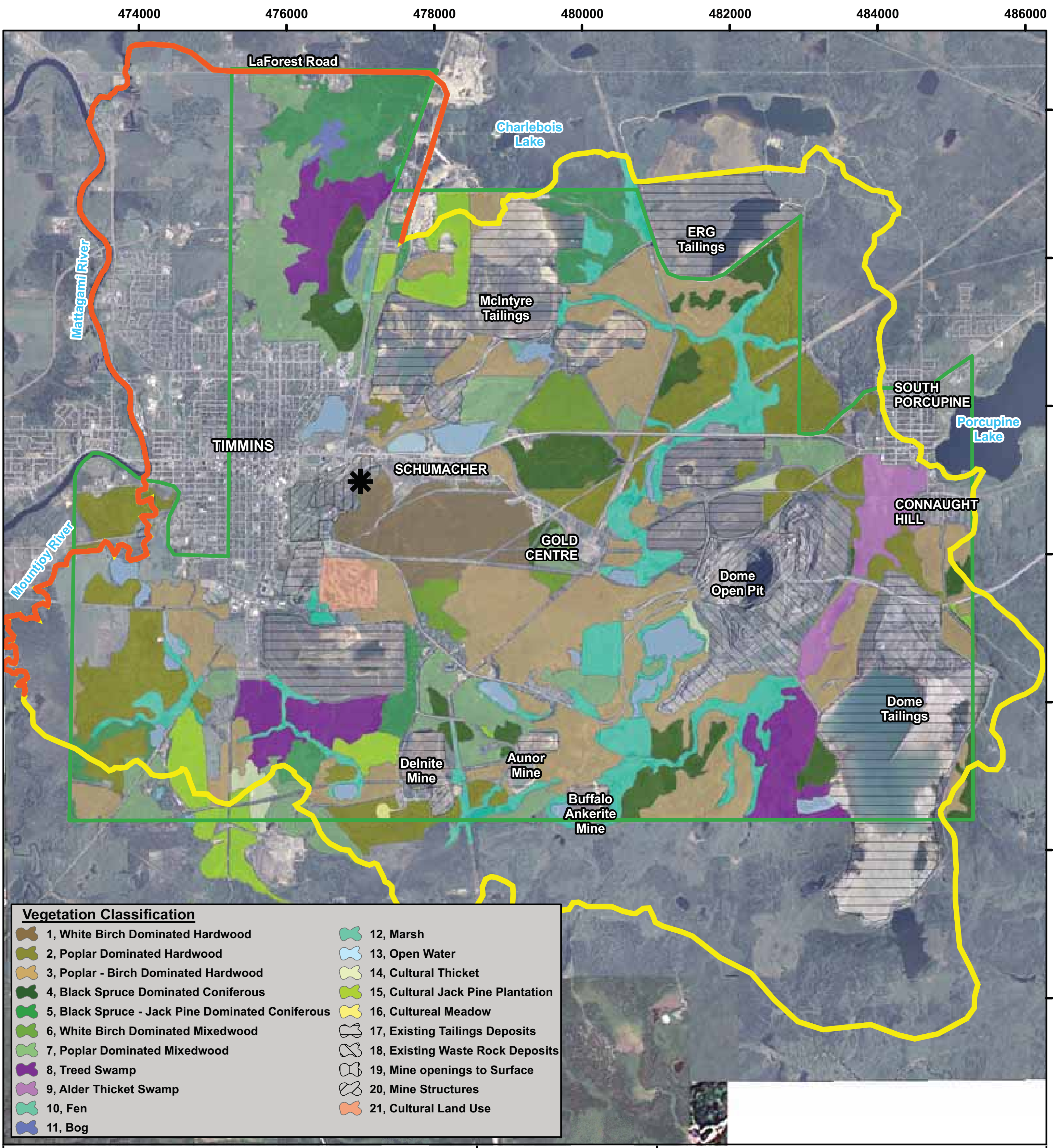
GOLDCORP
PORCUPINE GOLD MINES

amec

HOLLINGER PROJECT

Model Predicted 1 m Drawdown in Shallow Rock (Base Case)

PROJECT N^{o}: TC81525	**FIGURE: 5-2**
SCALE: As shown	DATE: October 2010



P:\EMProjects\2008\TC81525 Hollinger Permitting\GIS_Data\Closure_Plan\MXD_Maps\Vegetation.mxd

LEGEND

✱ Proposed Hollinger Pit Centroid

Study Area (Riverine and Road Boundary)

Study Area (Watershed Boundary)

Original Study Area

NOTES:
-

GOLDCORP
PORCUPINE GOLD MINES

amec

HOLLINGER PROJECT

Local Study Area Vegetation Distribution

Datum: NAD83
Projection: UTM Zone 17N

N W E S

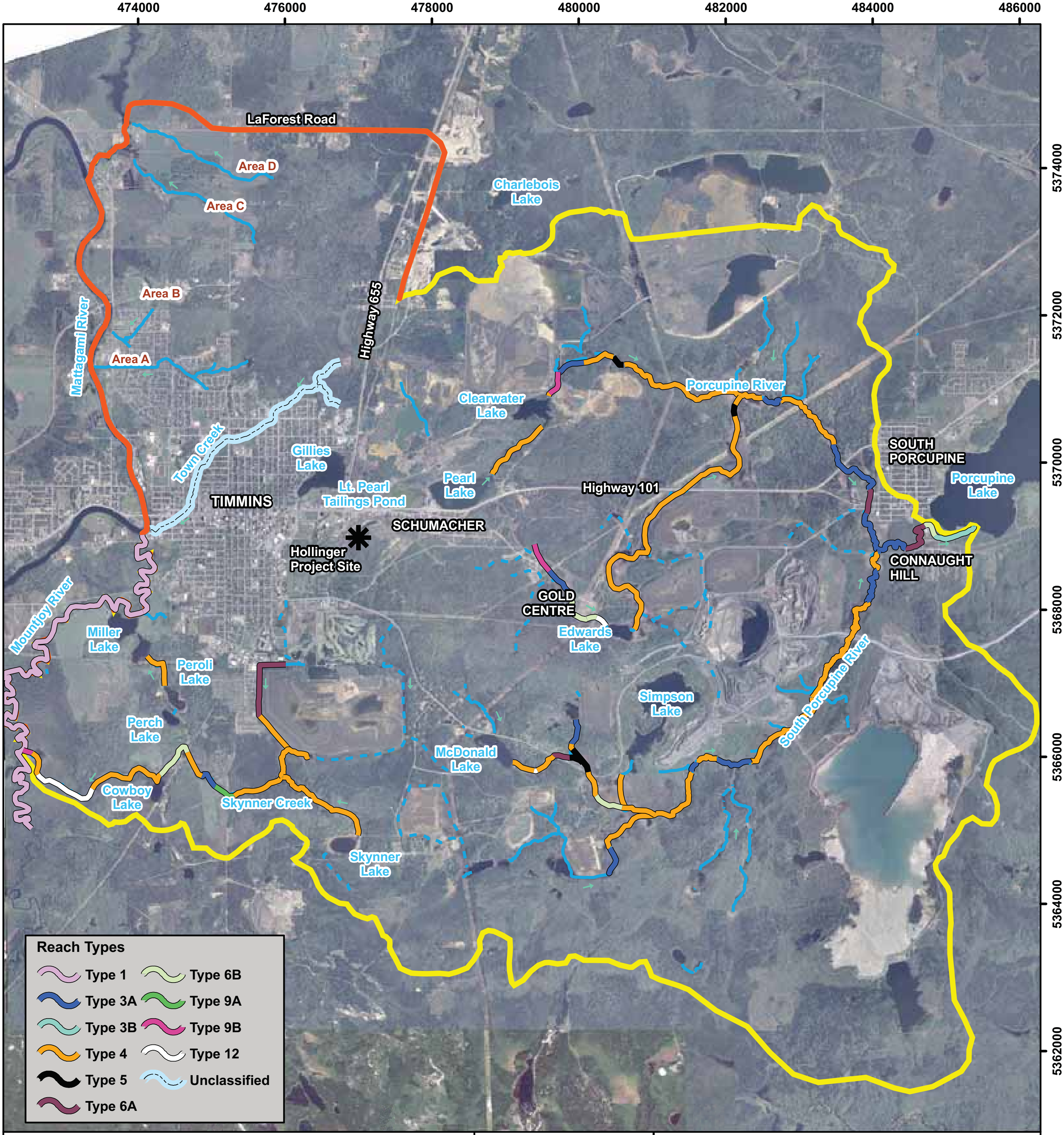
PROJECT N°: TC81525

FIGURE: 4-4

SCALE: 1:70,000

DATE: October 2010

0 0.5 1 2 3 4 Kilometres



P:\EMProjects\2008\TC81525 Hollinger Permitting\GIS_Data\Closure_Plan\MXD_Maps\Aquatic_Reach_Map.mxd

LEGEND

- ✱ Proposed Hollinger Pit Centroid
- Study Area (Riverine and Road Boundary)
- Study Area (Watershed Boundary)
- River or Creek
- Intermittent Watercourse
- General Flow Direction

0 0.5 1 2 3 4
Kilometres

NOTES:
-

Datum: NAD83
Projection: UTM Zone 17N

N
W E
S

GOLDCORP
PORCUPINE GOLD MINES

amec

HOLLINGER PROJECT

Watercourse Reach Type Characterization

PROJECT N^{o}: TC81525	**FIGURE: 4-5**
SCALE: 1:70,000	DATE: October 2010

5.0 PROJECT DESCRIPTION

5.1 Project Summary

At the time of issue of the December 2006 Closure Plan, it was assumed that there would be no resumption of mining operations at the Hollinger Site in the near future. Following from pre-feasibility studies conducted in 2007-8 and feasibility studies through 2010, however, that assumption has now changed. The following is a summary of the proposed re-development of the Hollinger Mine Site, with details provided in subsequent sub-sections.

Goldcorp, through PGM, is planning to develop the Hollinger Project by redeveloping the former Hollinger and McIntyre Mines area as a new open pit complex (Figure 3-2). The open pit complex would involve the sequential development of an open pit, through a series of phased pushbacks that would be used to access shallow ore zones within 200 to 250 mbgs.

Development of the Hollinger Project would require comparatively limited new infrastructure, as ore from the Project Site would be transported to and processed at the existing Dome Mine ore processing facility (commonly referred to as the 'Dome Mill'), with tailings from ore processing to be discharged to the existing Dome Mine tailings deposition area.

Under the current open pit design, there would be a requirement for the disposal of approximately 37,000,000 m^3 of in-situ mine rock. The majority of this mine rock (estimated at 20,000,000 to 30,000,000 m^3) would be retained on the Hollinger Project Site and would be used to backfill and overfill the initially excavated open pits. Rock will also be used to build the Environmental Control Berm and the Transportation Corridor with the remainder being stored at the Dome Mine site.

Infrastructure used and/or developed to support the Hollinger Project would include:

- At the Hollinger Project Site:
  - permanent mine rock and overburden stockpiles;
  - Site water collection and drainage systems, including the mine water holding pond;
  - portable lunch room trailer and maintenance shed;
  - electrical connections from nearby, currently in place, Hydro One infrastructure; and
  - natural gas (if required) from nearby, currently in place, Union Gas infrastructure.
- Off the Hollinger Project Site:

- the approximately 4.8 km long Transportation Corridor linking the Hollinger Project Site with the Dome Mill;
- additional mine rock stockpiles (at the Dome site) (if required); and
- mine dewatering system from McIntyre No. 11 Shaft to LPTP.

There are no plans to erect permanent buildings at the Site as all maintenance and warehousing infrastructure required to support Hollinger Site mining operations would be provided by existing facilities located at the Dome Mine. Explosives manufacturing and storage facilities required for Hollinger Site operations would also be provided by existing facilities at the Dome Mine, with explosives to be transported to the Hollinger Site on an as-required basis. Office facilities for the Hollinger Project would be provided by the existing historic Hollinger office building to the immediate north of the Hollinger Site. Portable buildings or trailers will be required for maintenance and a lunch room.

In addition, the Project would include the construction of an Environmental Control Berm around the Hollinger Project Site. This is a key feature of the Project with the main purpose of the Environmental Control Berm being to manage noise effects on nearby receptors.

Throughout the operations phase, mine rock material would be used to progressively backfill the phased mined pits. At closure, the remaining pit will be allowed to flood, and the pit discharge will be routed by gravity flow south to the Skynner Creek system, which drains to the Mountjoy River. All remaining Project infrastructure would be removed at closure, and the Project Site would be rehabilitated in accordance with established mine closure protocols, together with any additional measures developed through a Site Plan Control Agreement with the City of Timmins. In addition, closure will be carried out such that existing safety hazards would be removed. Part of the Closure Plan would be to ensure, through stakeholder input and collaboration with the City's Planning Department, that the Site would be landscaped in an aesthetically pleasing manner.

An overall layout of the proposed Hollinger Mine Site is provided in Figure 3-2. Further Details pertaining to Hollinger mining and associated infrastructure and support facilities are provided below.

It is assumed for the purposes of this Closure Plan Amendment that the Hollinger Mine will be maintained indefinitely by PGM and its successors.

5.2 Geology and Mineralogy

5.2.1 Regional Geology

No change from information provided in the 2006 Closure Plan.

5.2.2 Deposit Geology

No change from information provided in the 2006 Closure Plan.

5.2.3 Natural Overburden

No change from information provided in the 2006 Closure Plan.

5.3 Mining Activities

Details of historical mining activities are reported in the 2006 Closure Plan document and are applicable to the existing workings.

The following subsections provide details on the proposed mining activities for the proposed future open pit Project.

5.3.1 Production Rate and Mine Life

The Hollinger Project has identified open pit ore reserves of approximately 18 million tonnes, grading approximately 1.5 g/t of gold on average, with a grade cut-off of 0.6 g/t. Open pit mining, involving the development of a sequential series of pushbacks of open pits, would take place over an estimated 7 year period. Based on this, the average ore production rate is projected at approximately 8-9,000 tpd with an associated mine rock production rate of 30-40,000 tpd, yielding an average stripping ratio of 4:1.

5.3.2 Open Pit Design

The proposed pit will be mined in a series of phased pushbacks which will allow the development of the deposit in a safe and efficient manner.

The current pit design envisions a large excavation at the top of the deposit, which will eventually focus down into 4 smaller sub-pits towards the bottom of the deposit. For planning and design purposes, these sub-pits have been named according to their general location within the project area as Central Pit, 92 Pit, Millerton Pit and Vipond Pit.

When practical, as mining progresses, mined areas will be backfilled with mine rock from subsequent mining areas, allowing for the progressive rehabilitation of the property during the mine life.

Typical mining equipment used in ore and mine rock removal is expected to include Caterpillar 992 or equivalent sized loaders and Caterpillar 385 or equivalent sized hydraulic excavators, together with Caterpillar 777 or Caterpillar 785 or equivalent sized haul trucks.

Other equipment would include drills, dozers (likely D9 sized), graders, and other ancillary equipment.

Table 5-1 describes the key parameters of the four open pits.

Table 5-1
Open Pit Key Parameters

Parameter	92 Pit	Millerton Pit	Central Pit	Vipond Pit
Pit Depth	116 mbgs	175 mbgs	230 mbgs	75 mbgs
Pit Floor Elevation	226 m amsl	254 m amsl	112 m amsl	274 m amsl
Pit Slopes	62°	52-62°	49-62°	62°
Ramp Width	30 m (15 m toward the bottom)	30 m (15 m toward the bottom)	30 m (15 m toward the bottom)	30 m (15 m toward the bottom)
Ramp Slope Angles	10 to 12%	10 to 12%	10 to 12%	10 to 12%
Length (North/South)	365 m	330 m	510 m	200 m
Width (West/East)	400 m	490 m	780 m	260 m
Aerial Extent	9.9 ha	15.5 ha	28.7 ha	3.7 ha
Overburden Depth	0 to 5 m	0 to 10 m	0 to 10 m	0 to 8 m
Overburden Pit Slope	3H:1V	3H:1V	3H:1V	3H:1V
Total excavated Volume	3.6 million m^3	10.3 million m^3	21.5 million m^3	1.3 million m^3
Proposed Pit Layout	Figure 5-2	Figure 5-2	Figure 5-2	Figure 5-2
Geologic Cross Sections	Figure 5-3	Figure 5-4	Figure 5-5	Figure 5-6

Note: Figure 5-1 presents the open pit layouts.

92 Pit

92 Pit would be developed first. Existing UG workings will intersect the pit and will be mined out by the pit. The workings and the procedures used to deal with stability issues during mine operation can have a significant impact on operational safety, as well as the pit wall stability. Operational procedures to address personnel safety, equipment safety, as well as overall stability of the pit walls will be developed prior to the commencement of mining, and will be based on Goldcorp's experience with similar conditions at the Dome and Pamour Mine sites.

Mine rock from development of the Millerton Pit would be used to backfill the excavated 92 Pit, during the period of mine operations.

Millerton Pit

The Millerton Pit would be developed second. Existing UG workings will intersect the pit and will be mined out by the pit, requiring appropriate operational procedures to address safety and stability concerns.

Mine rock from development of the Central Pit would be used to backfill the excavated Millerton Pit, during the period of mine operations.

Central Pit

The Central Pit would be the third of the four pits to be developed and its development may temporally overlap with development of the Millteron Pit. As with the 92 and Millerton Pits, extensive existing UG workings will intersect the pit and will be mined out by the pit, requiring appropriate operational procedures to address safety and stability concerns.

Vipond Pit

The Vipond Pit would be the last of the four pits to be developed and its development may temporally overlap with development of the Central Pit. As with the other pit phases, extensive existing UG workings will intersect the pit and will be mined out by the pit, requiring appropriate operational procedures to address safety and stability concerns.

5.3.3 Open Pit Mining Methods

Overburden and Topsoil

Excavation of each mining phase will commence with removal of the topsoil and overburden within the phase footprint and is expected to generate approximately 2.5 million tonnes of material including organics and top soil removed for later site reclamation. The overburden is discontinuous and generally shallow (<5 m), with maximum depths of up to 10 m, and comprises mainly sand, silty sand, sandy silt and gravel materials, including historic sand and gravel fill zones.

Overburden removal will be conducted using an excavator-truck combination, and/or loader-truck combination, as appropriate. The individual pit slope benches within overburden zones will be sloped at an angle of approximately 3H:1V to maintain an adequate factor of safety with respect to shear failure. The toe of the overburden slopes will be stepped back between 5 to 10 m from the pit crest to ensure overburden does not erode into the pit. Drainage will be controlled such that there will be no ponding at the slope crest, and erosion protection will be provided where necessary.

Virtually all of the overburden stripped from the first phase of mining will be used, along with mine rock, for the perimeter Environmental Control Berm construction for noise control. Overburden stripped from the remaining phases will be variably used for progressive rehabilitation of mine rock piles and the Environmental Control Berm, and to assist with site area revegetation efforts at closure, with any remaining overburden materials to be co-mingled with mine rock stockpiles

Organic and topsoil from these areas, sufficient for later use in pit area and mine rock stockpile reclamation at Closure, would be stockpiled in the area south of 92 Pit, and east of the Fairway Village Trailer Park, with the potential for additional temporary stockpiles at other locations (Figure 5-1). The stockpiled organics and topsoil will be used for Site reclamation at closure.

Mine Rock

The proposed open pit mining operations will collectively generate a total of approximately 37,000,000 m^3 (100,000,000 tonnes) of mine rock. A portion of this mine rock will be used to construct the site perimeter Environmental Control Berm, with the balance to be used to finalize the Transportation Corridor construction and backfill the open pits. Any excess mine rock that cannot be accommodated at the Hollinger Site will be deposited at the Dome site.

ANFO, emulsion or emulsion blend explosives, delivered from the Dome site will be used for the majority of the blasting. Blast mats and other appropriate measures, such as designing small blast patterns, limiting charge size per hole, control and perimeter blasting, and using electronic detonators, will be implemented to minimize any negative effects of mining during the early development of each phase.

The average pit stripping ratio (i.e., the ratio between mine rock and ore) will be approximately 4.14:1.

See Section 5.7.2 for further details on mine rock characterization and storage.

Ore

Mineralized zones strongly vary in width. Minimizing dilution of the ore will, therefore, be a critical element of mining operations due to the characteristics of the ore body. As such, it is expected that the ore will be generally mined in 6 m lifts, or benches, to increase the accuracy of ore block identification and to minimize dilution. Blastholes, of approximately 89 to 165 millimetres (mm) (3.5 to 6.5 inches) in diameter, will be drilled in the mineralized zones on an approximate 3 m x 3 m to 5 m x 5 m staggered pattern. Drill cuttings from all blastholes will be sampled and assayed in order to provide the basis for ore grade control. The sampling requirements may dictate the spacing of the blastholes and this in turn would impact the blasthole diameter.

All material will be blasted, generally using ANFO or emulsion and emulsion blend explosives. Recovered ore will be transported along the Transportation Corridor to the existing Dome Mill for processing.

Interaction with Existing Underground Workings

Mining in the immediate vicinity of existing UG workings will be carried out in accordance with appropriate protocols to ensure the safety of workers, and in a manner that provides for overall slope stability. PGM will utilize its experience from similar circumstances encountered at its Pamour and Dome open pit operations to develop the appropriate safety protocols.

5.3.4 Underground Mine Design

UG exploration and development plans are still under investigation and are currently not part of the Hollinger Closure Plan Amendment.

5.4 Processing

Not applicable.

The 2006 Closure Plan document provides details on past processing, however, for the proposed open pit operations there will be no processing of material at the Hollinger Mine Site. All ore will be hauled off Site and processed at the Dome Mill, located approximately 5 km east of the Hollinger Site (Figure 3-2). The Dome Mill is rated at a maximum throughput of 13,000 tonnes per day.

5.5 Buildings and Infrastructure

5.5.1 Site Buildings

No change from information provided in the 2006 Closure Plan. All buildings within the mine footprint that are slated to be demolished as part of the 2006 Closure Plan that would interfere with planned mining activities will be demolished before mining begins.

The currently existing Hollinger Office building may be used as an operations office. No new permanent buildings will be erected as part of the planned activities at the Hollinger Site. Staff will use dry facilities at the Dome site. Similarly, vehicle maintenance will be carried out at the Dome facilities with the exception of occasional, minor field maintenance performed inside of a potential dome-style enclosure. A portable trailer will be used on site as a lunch room.

Other than some small areas for vehicle parking during shift changes, no yard areas are currently foreseen.

5.5.2 Electrical Services

No change to information provided in the 2006 Closure Plan document for existing electrical services.

Electric power, primarily required for dewatering will be provided by connecting to the existing nearby Hydro One infrastructure. Back-up power will be provided by diesel generators.

5.5.3 Water and Sewer Services

No change to information provided in the 2006 Closure Plan document for existing water and sewer services.

Water requirements at the Hollinger Site are essentially limited to drilling and road dust management. Water for drilling and road dust management will be drawn from the existing No. 19 Shaft, connected to the mine water management system, and will be discharged to a mine water holding pond with a capacity of approximately 1,800 – 2,200 m^3.

Employees will have access to potable water at the Hollinger Office Building and Dome facilities as well as with water coolers in the lunch room.

The Project Site is not currently serviced by municipal water except at the Hollinger Office Building. Potable water will not be required elsewhere on Site.

Domestic sewage treatment will not be required, since existing facilities at the Hollinger Office Building or Dome Mine site will be used. There will be portable toilets at the temporary lunch room trailer.

5.5.4 Transportation Corridors

5.5.4.1 Access Roads

No change to information provided in the 2006 Closure Plan document for general access to the site.

Access to the Site will be from Highway 101 to the Hollinger Office Building. There will be no uncontrolled access to the Hollinger Project Site. Vehicle access to the Site will be limited to the Transportation Corridor only between the Hollinger Site and the Dome Mine site, with fencing remaining around the property during production to restrict unauthorized access. Gated access will be provided at Vipond Road for emergency vehicles.

5.5.4.2 Site Roads

The Transportation Corridor will be developed, which will link the Hollinger Project to PGM's Dome Mine complex. The Transportation will include culvert-type overpasses at Vipond and Goldmine Road. In addition, several on-site gravel haul roads will be developed to link individual pits with the Transportation Corridor.

5.6 Tailings

No change to information provided in the 2006 Closure Plan document related to historic tailings deposits.

Tailings management will not be applicable to the proposed new operations.

As noted in Section 5.4, there will be no ore processing on the Hollinger Site and therefore no requirement for tailings disposal. Tailings from the Hollinger ore processing at the Dome Mill will be discharged to the existing Dome Mine tailings management facility, which is covered by a separate closure plan.

5.7 Material Handling

5.7.1 Overburden Removal and Storage

Overburden handling is described in Section 5.3.3, above.

5.7.2 Mine Rock Characteristics and Storage

Historic Mine Rock

The Hollinger Schumacher, Vipond and Crown Mines produced very little mine rock to surface. What little rock was brought to surface in the early days was used to build up the local terrain for construction of buildings and infrastructure. During the period of 1976 to 1988, some mine rock was generated on surface in association with the crown pillar removal projects. This mine rock was generally stockpiled along the south edge of the open pits.

Due to hazardous access conditions on the historic mine sites, existing mine rock on surface could not be safely sampled. However, rock samples of the same origin as the mine rock were collected via diamond drilling throughout the former Hollinger Mine in 2005 and 2006, and in 2006 through to 2010.

Potential for Acid Mine Drainage and Metal Leaching

In total, 161 mine rock samples were collected from the diamond drill core. Of this total 79 samples were collected during the diamond drilling carried out in 2005/2006 and the other 82 samples were collected during the 2006/2007 drilling program.

Detailed sample data for the earlier sample set are provided in Table 5-2 of the December 2006 Closure Plan. Detailed sample data for the second sample set are provided in Appendix D. Both sample sets are representative of the varying rock types that will comprise the mine rock that will be produced from the Site.

Table 5-2
Summary of Net Potential Ratio of Mine Rock Samples

Sampling Campaign	Number of Samples	NPR between 1 and 2 Potentially Acid Generating Material		NPR >2 Non- Acid Generating Material	
		Number of Sample	Percentage	Number of Sample	Percentage
2005/06 program	79	3	4	76	96
2006/07 program	79	1	5	78	99
All drilling programs	158	4	3	154	97

The samples from 2006/2007 drilling program represented the different rock lithologies including feldspar, porphyry, mafic volcanics and various sedimentary lithologies (EcoMetrix, 2008). Static testing including Acid Base Accounting (ABA), total metals and Synthetic Precipitate Leachate Procedure (SPLP with 20:1 water:solids ratio) were conducted to assess the metal leaching and acid rock drainage (ML/ARD) potential from the mine rock samples. In addition, composite mine rock representing the different rock lithologies were prepared from the 2006/2007 drill core samples; humidity cell testing was carried out on these composite samples for 20 weeks. The full results of the static and humidity cell testing on the 2006/2007 samples were presented in EcoMetrix (2008).

Acid-base accounting (ABA) analyses were conducted on 158 of the 161 samples to assess the acid mine drainage potential of the mine rock. ABA analysis consisted of measurements of sulphur species, neutralization potential (NP) and total carbon to provide an estimate of the potential of the rock to generate acid.

The threshold between potentially acid generating (PAG) and non-potentially acid generating (Non-PAG) materials is defined by the net potential ratio (NPR, or Neutralization Potential (NP)/Acid Potential (AP)). It is generally accepted for mine rock materials with NPR>2 are classified as Non-PAG (Price, 2009). Mine rock samples with NPR <1 are considered PAG whereas materials with NPR between 1 and 2 are classified as having an uncertain potential of generating acid.

Results from the ABA testing indicated that 154 of 158 samples (97%) had a NPR>2 and were classified as Non-PAG. The remaining four samples had NPR values between 1 and 2 and were classified as having an uncertain potential to generate acid. The summary of the NPR distribution of the samples is shown in Table 5-2. The 2005/2006 sample set had a medium NPR value of 56.0 and the 2006/2007 sample set had a median NPR value of 37.3, yielding an overall NPR median value for both sample sets of 46.7, demonstrating an overwhelming neutralizing to acid generating potential.

The results of geochemical tests conducted for the Hollinger Project to date indicate that the mine rock is expected to have excess capacity to neutralize any acidity produced by oxidation of the sulphides present. As such, the mine rock generated by the open pit activities is not expected to produce acid mine drainage.

The 1997 and 2009 Price guidelines recommend numbers of samples based on the expected tonnage of the mine rock that will be produced. Extrapolation of the Price data for 100,000,000 tonnes of mine rock yields a recommended sample size of 236, which is greater than the 158 samples reported herein. However, given that the median NPR value of the 158 samples tested is 46.7, and that 97.5% of the samples had an NPR value >2, the sample size in the case of the Hollinger Project is considered sufficient to demonstrate that there are no ARD concerns for the Site. Additionally, there is a long operating history with the Hollinger Mine site dating back to 1911, and there is no evidence of ARD conditions at the site.

Antimony, arsenic, and zinc were identified as the metal constituents of potential concern, based on screening criteria of the 10 times the average crustal abundances; however, leachate (SPLP) testing results suggested that most of the constituents were relatively immobile (EcoMetrix, 2008). However, arsenic and zinc had the highest concentrations relative to water quality objectives (EcoMetrix, 2008). Hollinger Main Shaft water samples collected by EcoMetrix (2008) showed average total arsenic and zinc concentrations of 0.048 and 0.034 mg/L, respectively; and dissolved arsenic and zinc concentrations of 0.021 and 0.021 mg/L, respectively. Dissolved concentrations of both metals are below currently applicable PWQO values. Average total arsenic concentrations in McIntyre No. 11 shaft water and in LPTP (which receives mine water pumped from the McIntyre Shaft) were 0.030 mg/L and 0.0018 mg/L, respectively. The latter value is less than the 0.005 mg/L interim PWQO for arsenic. Arsenic in groundwater co-precipitates with iron when pumped to surface waters. Moreover, studies conducted by Minnow Environmental (2001) indicated that the drainage from the Hollinger Mine had limited influence to the water quality at Skynner Creek. Also the water quality data from the downstream environment suggested that the metal leaching from the mine rock likely does not occur at rates that would have an effect on the downstream environment.

5.7.3 Mine Rock Handling

The total quantity of in-situ mine rock that will be produced has an estimated volume of up to 37,000,000 m^3. No special provisions are foreseen for acid mine drainage and metal leaching from this rock based on the results of mine rock geochemical testing and the downstream water quality monitoring carried out to date.

A substantial portion of this mine rock will be used to construct the site perimeter Environmental Control Berm, which will initially be constructed to a height of approximately 20 m, with overall slope angles ranging from approximately 2H:1V to 3H:1V for general safety and to facilitate development of a vegetated cover. Over time, the berm will be graded into the slope of the overall backfilling over the property, which could reach ultimate heights of 40 to 60 m above current surface in local areas. The toe of the constructed perimeter berm would follow approximately along the current property fenceline along its north, west and south margins. Mine rock not required for construction of the perimeter Environmental Control Berm would be used to backfill the open pits. Some mine rock will be deposited at the Dome Site.

5.7.4 Ore Handling

There will be no processing at the Hollinger Site. Run-of-mine ore will be transported off-site via the Transportation Corridor and processed at the Dome Mill, located approximately 5 km east of the Hollinger Site. The Dome Mill is rated at a maximum throughput of 13,000 tpd and ore from the Hollinger Project (at approximately 8,500 tpd ore) will be combined with ore from other PGM sources. There will be no crushing or screening of ore at the Hollinger Site.

5.8 Waste Management Facilities

There will be no landfills or waste storage facilities associated with the Hollinger Mine Site. All non-hazardous industrial and domestic wastes will be removed from the Site regularly and disposed of in the existing licensed Dome landfill. Any hazardous wastes generated (e.g., used oils and greases) will be removed from the Project Site to licensed facilities by licensed waste contractors.

5.9 Water Management

5.9.1 Existing Water Management Permits

No change from the December 2006 Closure Plan, with the exception that application has been made to amend the existing Permit to Take Water (PTTW) and C of A for mine water management.

The amended PTTW and C of A will continue to provide for mine dewatering from the McIntyre No. 11 Shaft with discharge to LPTP as well as dewatering from Hollinger 19 shaft to the mine water holding pond used for dust suppression on site.

5.9.2 Mine Dewatering During Active Open Pit and Underground Mining Operations

The UG workings of the existing Hollinger and McIntyre Mines are interconnected; therefore, the Hollinger Project can be dewatered by pumping from a single location. The planned mode of dewatering is to continue pumping from the McIntyre No. 11 Shaft and discharging to the LPTP. Currently, mine water is discharged from the McIntyre No. 11 Shaft to a small, silt curtain contained area on the north side of LPTP. This arrangement has been generally suitable for current conditions, but would not be suitable for conditions throughout the operations phase of the Hollinger Project.

To facilitate open pit development, it is anticipated that dewatering would have to be carried out at a rate of from approximately 10,000 to 30,000 m^3/d, with provision for a maximum upset dewatering rate of 40,000 m^3/d. A substantial portion of the dewatering effort will be required to drain the existing flooded UG workings.

In the existing condition, the principal water quality consideration is iron, wherein reduced Fe^{2+} iron in groundwater exhibiting low oxygen conditions is brought to surface, and at which point water contact with the air oxygenates the soluble Fe^{2+} iron to the insoluble Fe^{3+} form (principally as $Fe[OH]_3$), resulting in an elevated total suspended solids condition in the water column.

The existing silt curtain contained portion of the LPTP is quite small (approximately 0.08 ha), and therefore not suitable for providing the surface area required for effective precipitate settlement. The current C of A allows for TSS concentrations of 30 mg/L, as an objective. Difficulties have frequently been experienced in meeting this objective, mainly because of the small surface area.

To meet applicable TSS limits (in accordance with O. Reg. 560/94, TSS limits of 15 mg/L as a monthly average, and 30 mg/L as a daily concentration limit) for the Hollinger Project, PGM is proposing the following modifications to the design and operation of the LPTP:

- The current point of discharge to LPTP will be shifted from the north side to the northwest end of the pond (i.e., to a point furthest from the pond outflow to Pearl Lake) (Figure 5-7).
- The entire LPTP would be used for mine water treatment.
- A larger silt curtain system (or rock berm system) will be used to divide LPTP into two or more large cells to better manage the settlement of TSS (Figure 5-7).

- Provision will be made in the system to add flocculant(s) to the mine water inflow to the pond, as required, to achieve effective settlement of TSS materials;
- Provision will be made to add lime to the system to manage pH, as required, for the management of heavy metals.
- The outflow from LPTP to Pearl Lake will be changed from its current condition of a culvert connection, to one using a decant tower that will allow flows from the pond to be measured to the prescribed accuracy of ±15%, as required by O. Reg. 560/94.

Through implementation of the above measures, it is expected that PGM will be able to effectively lower TSS concentrations, and associated heavy metals, to regulated levels.

Ammonia levels will be monitored throughout the life of the project, and if necessary emulsion, or emulsion blend explosives, will be used for mining instead of ANFO explosives, as a means of more effectively controlling residual ammonia levels in LPTP.

The majority of the Site runoff from within the bermed Project area will drain internally to the open pit workings, and from there would pass through the rock and be captured by the mine dewatering system reporting to LPTP (as described above).

As a result of the above water treatment and management provisions, the existing water quality of Pearl Lake, as the mine water system receiving water, is not expected to change appreciably from its current condition.

The LPTP mine water treatment works, although comprising an integral part of the Hollinger Project, are outside of the limits of this Closure Plan Amendment, and are captured by the LPTP Closure Plan Amendment.

5.9.3 Site Runoff

A portion of the Site runoff from within the Environmental Control Berm will drain internally to the open pit workings, and from there would pass through the rock and be captured by the mine dewatering system reporting to LPTP.

Runoff from the external Environmental Control Berm face, as well as a portion of the runoff from within the bermed area, that seeps beneath the berm to areas outside of the berm, would be directed to existing external ditching bordering the Vipond Road, the Shania Twain Road, and other perimeter road systems. This ‘external runoff’ is expected to be of a quality suitable for discharge to receiving waters. However, due to potentially elevated suspended solids, in some localized areas, runoff from these localized areas may be directed to settlement ponds, as required, prior to discharge to receiving waters.

5.9.4 Water Source/Drilling and Dust Suppression

An elevated mine water holding pond will be developed within the site to provide a water supply for dust suppression and drill cooling water. This pond will have a capacity of approximately 1,800-2,200 m^3. Water to supply the pond is expected to be derived from Shaft #19.

5.10 Chemical and Fuel Storage

5.10.1 Chemical Storage

There will be no capacity to store chemicals, reagents, or any hazardous materials at the Hollinger Site. All such materials (hydraulic oils, degreasers and cleaners, etc.) will be stored at the Dome Mine and transported on an as—required basis for minor maintenance of equipment.

5.10.2 Fuel Storage

No fuel storage is expected to be required at the Hollinger Site. Equipment would be serviced by mobile trucks and haul trucks would be refuelled at the Dome Mine.

5.10.3 Designated Substances and PCBs

There are no PCBs or designated substances present on-site. There will be no future use of PCBs for the proposed operations.

5.10.4 Explosives

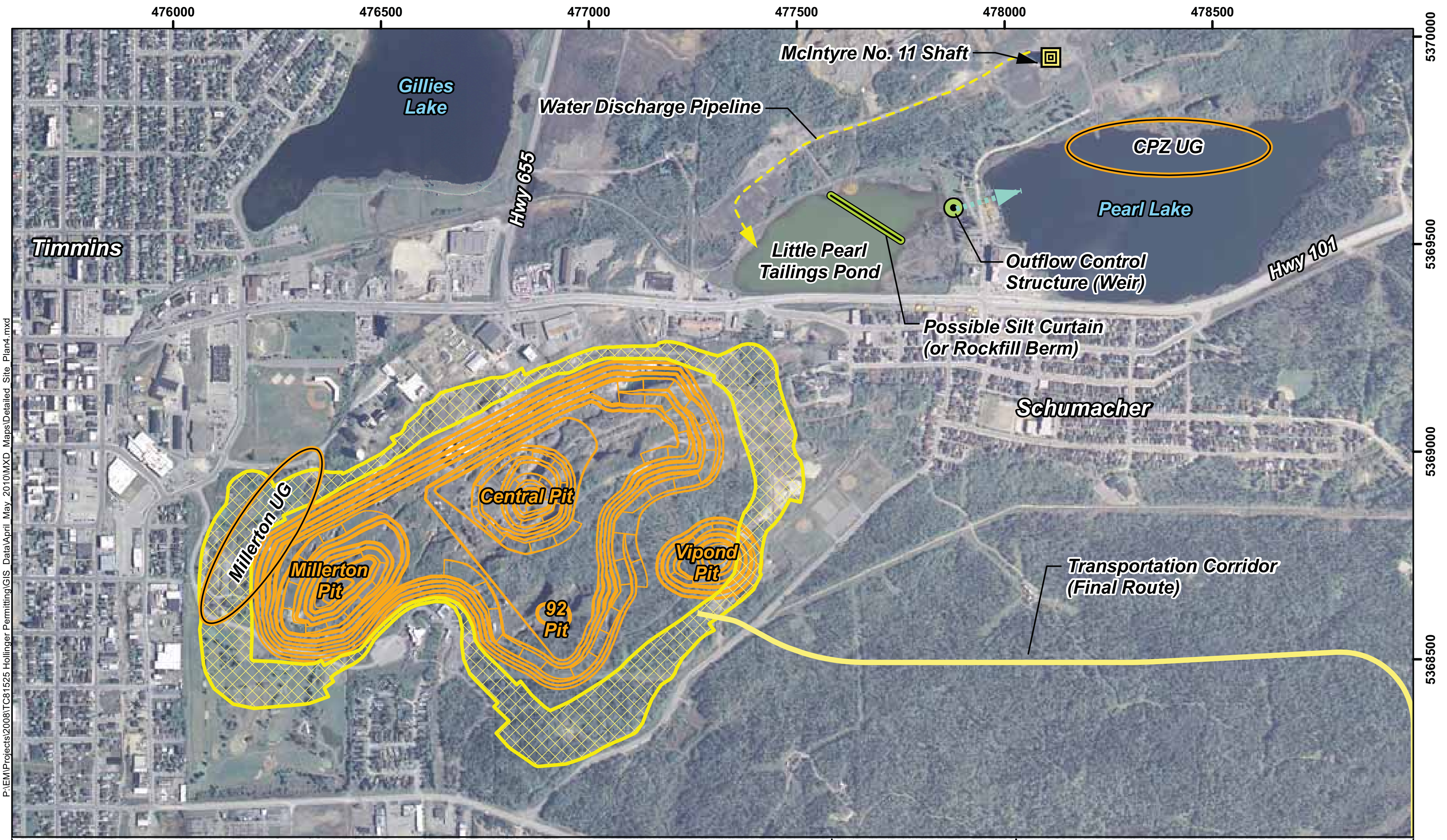
Explosives will be stored at the Dome Mine site, and will be brought to the Hollinger Site on an as required basis. There will be no explosives manufacturing or storage facilities at the Hollinger Site.

5.11 Project Schedule

The Project phases, their duration and key activities carried out at each phase are described in Table 5-3.

Table 5-3
Project Phases

Project Phase	Start	Duration	Key Activities
Pre-construction	2011	12 months	• Accelerated mine dewatering • Preparatory work for the construction phase
Construction	2011	18 – 24 months	• Overburden stripping • Environmental Control Berm construction • Transportation Corridor construction
Operations	2012	6 – 7 years	• Mining from the open pit operations • Transporting ore to the Dome Mill for processing • Progressive rehabilitation of mined out open pits
Closure	2020	1 – 3 years	• Closing and stabilizing Project infrastructure • Installing post-closure water management infrastructure • Rehabilitating the Project Site and the Transportation Corridor



LEGEND

- ▨ Environmental Control Berm Footprint
- Transportation Corridor (Final Route)
- Proposed Open Pit
- ◉ Outflow Control Sturcture (Weir)
- ▣ McIntyre #11 Shaft
- Possible Silt Curtain (or Rockfill Berm)
- Water Discharge Pipeline
- ◯ Underground Works (Approximate)

0 0.125 0.25 0.5 0.75 1
Kilometres

NOTES:
-

Datum: NAD83
Projection: UTM Zone 17N

N
W E
S

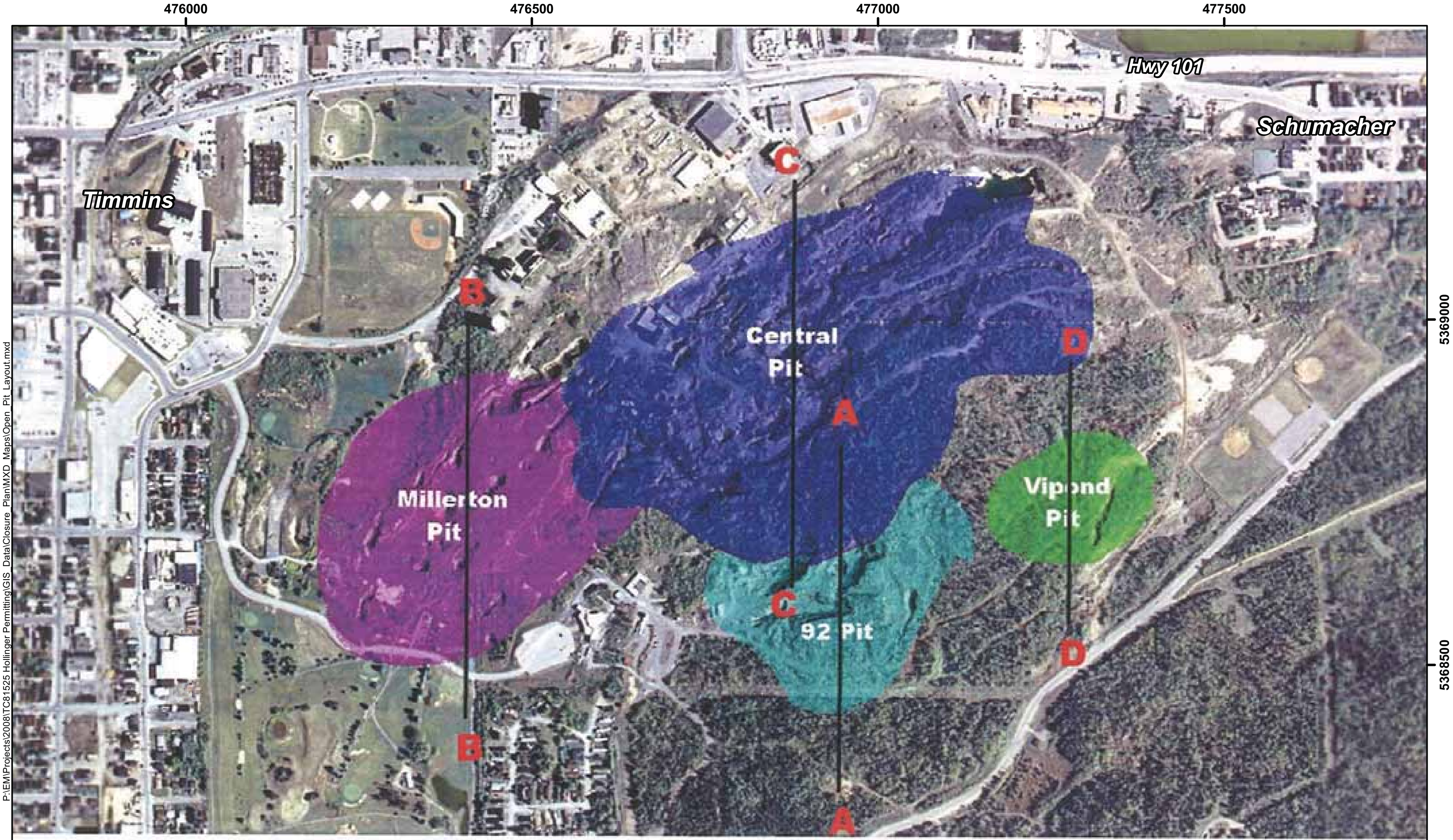
GOLDCORP
PORCUPINE GOLD MINES

amec

HOLLINGER PROJECT

Detailed Site Plan

PROJECT N^o: TC81525	**FIGURE: 5-1**
SCALE: 1:12,700	DATE: October 2010



P:\EM\Projects\2008\TC81525 Hollinger Permitting\GIS_Data\Closure_Plan\MXD_Maps\Open_Pit_Layout.mxd

LEGEND

B — B Cross-section Line

NOTES:
-

GOLDCORP
PORCUPINE GOLD MINES

amec

HOLLINGER PROJECT

Open Pit Layout

Datum: NAD83
Projection: UTM Zone 17N

N S W E

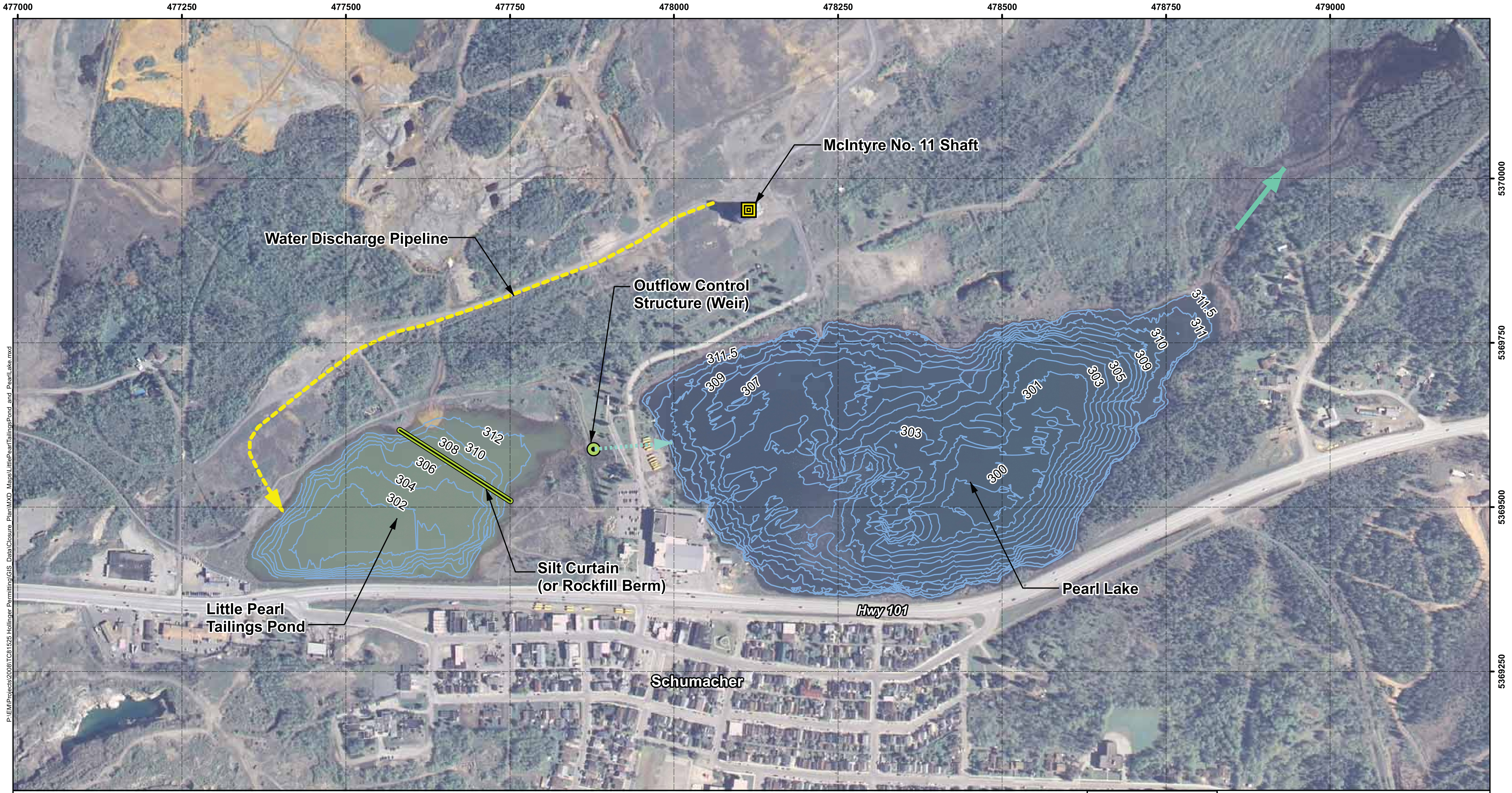
PROJECT N°: TC81525

FIGURE: 5-2

SCALE: 1:7,700

DATE: November 2010

0 0.125 0.25 0.5 0.75 1 Kilometres



P:\EM\Projects\2008\TC81525 Hollinger Permitting\GIS Data\Closure Plan\MXD Maps\LittlePearlTailingsPond and PearlLake.mxd

LEGEND

312	Bathymetry Contours - metres above sea level
↗	Flow Direction

NOTES:
- Outlines of facilities and site features are approximate.

Datum: NAD83
Projection: UTM Zone 17N

0 0.125 0.25 0.5 0.75 1 Kilometres

GOLDCORP
PORCUPINE GOLD MINES

amec

HOLLINGER PROJECT

Little Pearl Tailings Pond and Pearl Lake Water Management Plan

PROJECT N°: TC81525	**FIGURE: 5-7**
SCALE: 1:5,500	DATE: October 2010

6.0 PROGRESSIVE REHABILITATION

No change from the December 2006 Closure Plan, with the exception that specific progressive rehabilitation measures that would be taken in connection with proposed future mining activities, as described in Section 5.0 above, would include the following:

- Backfilling of crown pillars located under Environmental Control Berm (refer to Section 9.4);
- Backfilling of the 92, Millerton, and Central pit phases as part of open pit mine operations;
- Removing of mine workings identified within the Hollinger Perimeter Fence during operation;
- Removing of historic structures;
- Developing the Environmental Control Berm and rock stockpiles with 2H:1V to 3H:1V slopes to facilitate final reclamation, where practicable;
- Placing overburden stripped from the mining area on the outer face of the Environmental Control Berm and on design height mine rock stockpiles, to assist with revegetation; and
- Completion of revegetation on design height noise control berms and mine rock stockpiles.

Several mine openings that remain outside of the Environmental Control Berm/perimeter fenceline will not be removed by the open pit (see Table 4.1 to 4.4 in the 2006 Closure Plan) but have been fenced, capped or backfilled. These will continue to be monitored and investigated during operation as described in further detail in Section 10.

7.0 REHABILITATION MEASURES – TEMPORARY SUSPENSION

Following any period of suspension of mining activities, where there is the potential for mining operations to resume within a reasonably short time period, normally within one or two years, the site will be placed into a state of Temporary Suspension. A notice will be provided to the Director of the MNDMF, as per subsection 144(1) of the *Mining Act*, immediately following a decision to proceed to place the Site in Temporary Suspension, and the Site will be continuously monitored to ensure Site safety, in accordance with Mining Act requirements.

All former mining and milling operations on the Hollinger Mine and associated properties ceased in 1988. With the exception of former plant facilities that are owned by others, and lay outside of the property boundaries as described in Section 5.5, the majority of the original Hollinger, Schumacher, ACME, Vipond and Crown surface facilities have been previously demolished, leaving only scattered concrete foundations. All areas of the mine site that have not been subdivided have been fenced off from public access. All mine workings outside of the Hollinger Perimeter Fence line have been capped in accordance with the code, permanently fenced in if access to the area around the opening is deemed unsafe or backfilled.

For planned operations, as described in Section 5.0 of this Closure Plan amendment, and to address any residual elements from earlier site activities, the following procedures will be implemented during periods of Temporary Suspension.

7.1 General Site Access and Security

While in operation, the existing perimeter fence will remain in place along the crest or at the toe of the Environmental Control Berm in order to ensure inadvertent access is prevented. During a state of Temporary Suspension, the perimeter fence will continue to be monitored and maintained with gates on all road access points to the property will be closed and locked. Security personnel will be retained to provide regular patrols of the mine site including surface facilities and mine openings. Only authorized personnel will be given access to the mine site. Entrances to all surface facilities on the site will be closed and locked on a 24-hour per day basis. The keys for gate(s) will be kept at the security control centre. There are no plans to store explosives, petroleum products or hazardous chemicals on Site.

7.2 Security of Mine Openings to Surface

Historic Conditions

No change to information provided in the 2006 Closure Plan document for historical mine openings with the following exception. The No.26 and No.20 shaft have been investigated and capped with a report submitted to the MNDMF (November 2007 and January 2009, respectively). Stope C057 (Acklands) and C167 (Extendicare) continue to be routinely monitored.

Changes related to planned operations are described below.

Planned Operations

The section describing historic conditions immediately above would apply to those historic mine openings which are not displaced or altered as a result of planned new mining operations at the time of Temporary Suspension. Where displacement and/or alteration of historic mine openings has occurred, the measures described in this section would apply.

While in operation, the existing perimeter fence will remain in place along the crest or at the toe of the Environmental Control Berm in order to ensure inadvertent access is prevented. Additionally, where there are existing (or future) known mine hazards beyond the perimeter fence that are considered to be medium to high risk, these have been fenced off from public access. All such fencing currently meets (or will meet) Mine Rehabilitation Code standards for Closed Out sites (i.e., #6-gauge chain-link galvanized fencing, of at least 2 m in height, and having a barbed wire top, and with the bottom of the fence secured against access). Minimum monthly fence inspections will be carried out to identify damaged or breached fence sections, and to affect repairs.

Planned open pit phases (92, Millerton, Central and Vipond phases) are (or will be) all located within fenced areas as described in Section 7.1.

7.3 Security of Mechanical, Hydraulic and Electrical Systems

Historic Conditions

No change to information provided in the 2006 Closure Plan document for historic mechanical, hydraulic and electrical systems.

Planned Operations

During Temporary Suspension, all heavy equipment (i.e., loaders, excavators, haul trucks, dozers, graders, drills, etc.), will be removed from the open pits and stored on-site, at surface, in a no-load condition, within secured fenced areas, or removed from site.

The UG dewatering pumps (located at the McIntyre Mine site, as per Section 5.9.2) will continue to be operated to maintain a depressed water table consistent with current (2010) conditions.

All electrical systems shall be secured to prevent inadvertent access.

The following processes and services are essential during Temporary Suspension and will continue to function, as described:

- Mine dewatering systems for UG workings and open pit (part of McIntyre Site Closure Plan and amendments); and
- Effluent treatment system at LPTP (part of the LPTP Closure Plan and amendments).

7.4 Effluent Control

The only effluent requiring control during a state of Temporary Suspension will be mine water. During Temporary Suspension, mine water will continue to be pumped from the McIntyre No. 11 Shaft to the LPTP. Mine water treatment and management so conducted would be carried out in accordance with pending PTTW and C. of A. amendments.

7.5 Stabilization of Mine Rock, Ore and Overburden Piles

Historic Conditions

No change to information provided in the 2006 Closure Plan document for existing mine rock piles that will not be affected by the proposed pit operations.

Planned Operations

The planned sequence of pit operations – 92 pit phase first, Millerton pit phase second, the Central pit phase third and the Vipond pit phase last – will allow opportunity to backfill the Millerton and 92 pit phases during operations, thereby reducing the volume of mine rock stored on surface. All remaining mine rock and overburden will be stored on surface within the Property fenceline, with any excess rock that cannot be stockpiled within the property fenceline transported off-site to the Dome site for disposal.

Where mine rock and overburden are stockpiled on surface within the property fenceline, such stockpiles will have been contoured (i.e., with minimum slopes of approximately 2H:1V to 3H:1V) to minimize hazards associated with perched boulders and possible rock slides and to facilitate ultimate reclamation at Final Closure.

As discussed in Section 5, there are no concerns for the chemical stability of waste rock.

7.6 Stabilization of Tailings, Water and Other Impoundment Structures

Historic Conditions

No change to information provided in the 2006 Closure Plan document for the historic tailings impoundment.

Planned Operations

No tailings or water impoundment structures will be constructed on the Hollinger Site, as part of planned operations covered by this Closure Plan amendment, with the exception of the mine water holding ping constructed as a source for dust control and drill cooling water..

The LPTP (on the McIntyre Mine site) is a former lake that had been in-filled with tailings during the 1920's and 1930's, and then re-excavated (dredged) as part of the ERG tailings reprocessing operations during the late 1980's. The pond has the current form of a below grade water body that is not impounded. Hence, there will be no structures to maintain other than to ensure that the pond flow monitoring, weir and outlet culvert do not become blocked with debris. If such blockage were to occur, the pond water level could rise slightly. Further details are covered under the LPTP Closure Plan.

7.7 Schedule of Rehabilitation during Temporary Suspension

A schedule for the implementation of the preceding rehabilitation measures will be submitted to the MNDMF at the time that PGM provides notification of their intent to place the Hollinger Project under Temporary Suspension. In general, all measures will be implemented within six months of the notification to the Director, except security measures, which will be implemented immediately.

Essentially, the following measures will be implemented, where applicable, to comply with O.Reg. 240/00 (as amended) and the Mine Rehabilitation Code, which require the following for Temporary Suspension:

1. All reasonable measures shall be taken to restrict access to the Site, and all buildings and other structures, to authorized persons only.

2. All mine openings that are potentially dangerous shall be protected against inadvertent access.

3. All electrical systems shall be protected from inadvertent access.

4. All non-essential mechanical and hydraulic systems shall be maintained in a no-load condition or removed from site. Essential mechanical or hydraulic systems will be protected from inadvertent access.

5. All physical, chemical and biological monitoring programs shall be continued as described in Section 10.

6. All contaminated effluents shall be controlled (mine water discharge covered under LPTP Closure Plan).

7. All rock piles, overburden piles and stockpiles and all tailings, water and other impoundment structures shall be maintained in a stable and safe condition.

The above checklist will be reviewed to ensure that all necessary closure measures have been undertaken for Temporary Suspension.

8.0 REHABILITATION MEASURES – STATE OF INACTIVITY

For the purposes of this Closure Plan, the term "Inactivity" refers to the period of time after which production has been suspended indefinitely, and although protective measures are in place, the Site will no longer be monitored on a continuous 24-hour basis.

A notice will be provided to the Director of the MNDMF, as per subsection 144(1) of the *Mining Act*, immediately following a decision to proceed to place the project site in a State of Inactivity and the current mine plans and sections shall be submitted to the appropriate Resident Geologist.

As described in the preamble to Section 7.0, all former mining and milling operations on the Hollinger Mine and associated properties ceased in 1988. With the exception of former plant facilities that are owned by others, and lay outside of the property boundaries as described in Section 5.5, the majority of the original Hollinger, Schumacher, ACME, Vipond and Crown surface facilities have been previously demolished. All areas of the mine site that have not been subdivided have been fenced off from public access. All mine workings outside of the Hollinger Perimeter Fence line have been capped in accordance with the code, permanently fenced in if access to the area around the opening is deemed unsafe or backfilled.

For planned operations, as described in Section 5.0 of this Closure Plan amendment, and to address any residual elements from earlier Site activities, the following procedures will be implemented during a State of Inactivity.

8.1 General Site Security

While in operation, the existing perimeter fence will remain in place along the crest or at the toe of the Environmental Control Berm in order to ensure inadvertent access is prevented. During a State of Inactivity, gates on all road access points to the property will be locked, to prevent inadvertent access, and will be posted with “No Trespassing” signs, and only authorized personnel will be given access to the Hollinger Site. As well, all entrances to surface facilities on Site will be closed and locked. Potentially unsafe areas will also be posted with appropriate signage.

Site personnel will carry out general Site inspections on a periodic basis (at least once a month), and will maintain a record of these inspections. These inspections will review and remedy any general Site access and security protective measures, including fencing.

The names of contact persons will be provided to pertinent ministries, such as the MOL, MNDMF, MNR, and Ministry of the Environment (MOE) for their information, and to facilitate their access to the Site, if and when necessary.

8.2 Security of Mine Openings (Shafts, Raises and Open Stopes)

Historic Conditions

No change to information provided in the 2006 Closure Plan document for historical mine openings except that the No.26 and No.20 shaft have been investigated and capped with a report submitted to the MNDMF (November 2007 and January 2009, respectively). Stope C057 (Acklands) and C167 (Extendicare) continue to be routinely monitored.

Changes related to planned operations are described below.

Planned Operations

The section describing historic conditions immediately above would apply to those historic mine openings which are not displaced or altered as a result of planned new mining operations at the time of Inactivity. Where displacement and/or alteration of historic mine openings has occurred, the measures described in this section would apply.

While in operation, the existing perimeter fence will remain in place along the crest or at the toe of the Environmental Control Berm in order to ensure inadvertent access is prevented. Additionally, where there are existing (or future) known mine hazards beyond the perimeter fence that are considered to be medium to high risk, have been fenced off from public access. All such fencing currently meets (or will meet) Mine Rehabilitation Code standards for Closed Out sites (i.e., #6-gauge chain-link galvanized fencing, of at least 2 m in height, and having a barbed wire top, and with the bottom of the fence secured against access). Minimum monthly fence inspections will be carried out to identify damaged or breached fence sections, and to affect repairs.

Planned open pit phases (92, Millerton, Central and Vipond phases) would displace mine openings contained within the footprints or the four pit phases, therein reducing potential hazards formerly associated with such openings. Additionally, those shafts, raises or open stopes located within the footprint of the Environmental Control Berm will be buried removing any potential hazards associated with these backfilled and/or covered features. The long-term stability of any such remediated open stopes and unstable crown pillars will be assessed by a qualified professional engineer and a letter of certification provided to the MNDMF (refer to Section 9.4).

8.3 Security of Mine Openings (Portals, Adits and Declines)

Historic Conditions

No change to the information provided in the 2006 Closure Plan document, except that the reference to PJV is replaced with PGM.

Planned Operations

This section does not apply to planned operations.

8.4 Security of Other Mine Openings

Historic Conditions

No change to the information provided in the 2006 Closure Plan document for other mine openings that will not be displaced or altered as a result of planned new mining operations, except that the reference to PJV is replaced with PGM.

Planned Operations

As described above, planned open pit phases (92, Millerton, Central and Vipond phases) would pose a hazard until they are fully remediated (backfilled or flooded – see Section 9.2). Security of the four new pit phases will be assured by virtue of the fact that the new pit phases are (or will be) all located within fenced areas described in Section 8.1.

Additionally, where there are existing (or future) known mine hazards beyond the perimeter fence that are considered to be medium to high risk, have been fenced off from public access. All such fencing currently meets (or will meet) Mine Rehabilitation Code standards for Closed Out sites (i.e., #6-gauge chain-link galvanized fencing, of at least 2 m in height, and having a barbed wire top, and with the bottom of the fence secured against access). Minimum monthly fence inspections will be carried out to identify damaged or breached fence sections, and to affect repairs.

Where an open pit has a single vertical or near vertical drop of greater than 3 m and a bench width of less than 3 m a geotechnical study and report signed by a Professional Engineer, will be provided to state the long term stability of the structure with a letter of certification provided to the MNDMF.

8.5 Securing of Mechanical, Hydraulic, and Electrical Systems

Historic Conditions

All previously existing mechanical, hydraulic and electrical systems have been removed.

Planned Operations

During a State of Inactivity, all heavy equipment (i.e., loaders, excavators, haul trucks, dozers, graders, drills, etc.), will be removed from the open pits and stored on-site, at surface, in a no-load condition, within secured fenced areas, or removed from site.

The UG dewatering pumps (located at the McIntyre Mine site, as per Section 5.9.2) will continue to be operated to maintain a depressed water table consistent with current (2010) conditions.

All essential electrical systems shall be secured to prevent inadvertent access and non-essential systems shall be de-energized.

The following processes and services are essential during a State of Inactivity and will continue to function:

- Mine dewatering systems for UG workings and open pit (part of McIntyre Site Closure Plan and amendments); and,
- Effluent treatment system at LPTP (part of the LPTP Closure Plan and amendments).

8.6 Maintenance of Tailings Impoundment Areas

Historic Conditions

No change to information provided in the 2006 Closure Plan document for the historic tailings impoundment.

Planned Operations

Not applicable. There will be no new tailings impoundment facilities at the Hollinger Mine Site, in association with planned mining operations, as all mill processing and associated tailings disposal will occur at the Dome Mine site.

8.7 Landfill or Other Waste Management Sites

Historic Conditions

No change to information provided in the 2006 Closure Plan document for aspects related to landfills or other waste management sites.

Planned Operations

Not applicable. There will be no landfills or other waste management sites constructed at the Hollinger Mine Site.

8.8 Removal and/or Management of Petroleum Products, Chemicals, and Explosives

Any remaining explosives, detonators, and accessories, if not already removed during Temporary Suspension, will be returned to the Dome Mine site, sold for reuse, or returned to the supplier.

8.9 Stabilization of Mine Rock, Ore and Overburden Piles

Historic Conditions

No change to information provided in the 2006 Closure Plan document for existing mine rock piles that will not be displaced or altered as a result of planned new mining operations.

Planned Operations

The section describing historic conditions immediately above would apply to those historic mine rock piles which are not displaced or altered as a result of planned new mining operations at the time of a State of Inactivity. Where displacement and/or alteration of historic mine rock piles has occurred, the measures described in this section would apply.

The Environmental Control Berm will consume a portion of the mine rock and, during its construction, will be graded to a stable angle of repose.

As well, the planned sequence of pit operations – 92 pit phase first, Millerton pit phase second, the Central pit phase third and the Vipond pit phase last – will allow opportunity to backfill the Millerton and 92 pit phases during operations, thereby reducing the volume of mine rock stored on surface. All remaining mine rock and overburden will be stored on surface within the Property fenceline, with any excess rock that cannot be stockpiled within the property fenceline transported off-site to the Dome site for disposal.

Where mine rock and overburden are stockpiled on surface within the property fenceline, such stockpiles will have been contoured (i.e., with minimum slopes of approximately 2H:1V to 3H:1V) to minimize hazards associated with perched boulders and possible rock slides and to facilitate ultimate reclamation at Final Closure.

There are expected to be no ore stockpiles on-site during a State of Inactivity, as it is expected that all such ore will be processed prior to entering a State of Inactivity.

A portion of the overburden will be used to facilitate vegetation on the Site. The overburden stockpile is not expected to present any physical stability problems while the Site is in a State of

Inactivity, as overburden stockpile slopes will have been appropriately contoured to slopes generally not exceeding 2H:1V during operations.

As discussed in Section 5, there are no concerns for chemical stability of the waste rock piles.

8.10 Tailings, Water and Other Impoundment Structures

Historic Conditions

No change to information provided in the 2006 Closure Plan document for the historic tailings impoundment.

Planned Operations

No additional tailings, water or other impoundment structures are planned for the Hollinger Mine Site during future operations, with the exception of a mine water holding pond constructed as a source for dust control and drill cooling water. This surge pond will have a spillway to pass excess precipitation for when the system is not in use. The LPTP mine water treatment system will be developed off-site, as described in Section 5.9.

8.11 Site Inspection Program

Site personnel will inspect the Hollinger Site at a minimum of every six months to ensure that all rehabilitated measures are in place and remain physically stable. A report will be prepared and submitted to the Director on an annual basis (to be discussed in Section 10).

8.12 Schedule

The following activities will be carried out (if not already completed during Temporary Suspension) within approximately six months of a decision being made to place the Site in a State of Inactivity:

- The access gates to the Site will be locked.
- All buildings will be locked, and storage compounds fenced, gated and locked, to prevent inadvertent access (fencing will already be in place).
- All non-essential machinery and equipment will be removed from Site or placed in a no-load condition and secured.
- All non-essential electrical systems will be de-energized. Essential electrical systems will be secured to prevent inadvertent access.

- A contact person will be designated for authorized access to the Site.

Within one year of a decision being made to place the Site in a State of Inactivity, the following additional activities will be completed, if not already done:

- All remaining mine rock and overburden stockpiles will be contoured, if and where required; and
- During the first year while State of Inactivity, Site security will be available until all restrictive and preventative activities have been implemented. Furthermore, all physical, chemical and biological monitoring programs will continue.

9.0 REHABILITATION MEASURES – FINAL CLOSURE

Final closure of the Hollinger Mine Site will be undertaken following completion of the mining operations proposed herein. A notice will be provided to the Director of the MNDMF, as per subsection 144(1) of the *Mining Act*, immediately following a decision to proceed to close out the Site and, if not already done so, the current mine plans and sections will be submitted to the appropriate office of the Resident Geologist.

The principal thrust of Final Closure activities will be to secure the Site for safety purposes, and where appropriate to render the property suitable for other potential uses. Until the Hollinger Mine Site is rendered safe for public use, it will continue to be fenced, in whole or in part, to restrict public access to any unsafe areas that may be difficult to fully rehabilitate.

In historic areas peripheral to the Hollinger Perimeter fenceline, inspection and maintenance of fencing surrounding hazardous mine workings will continue in perpetuity to ensure their long-term stability as well as controlled access. PGM continues to make best efforts to monitor the stability of these areas through routine inspections and geotechnical investigations. However, in the event modifications to this plan are required such as rehabilitating and severing portions of the property or large scale rehabilitation/removal of hazards, an amendment to this Closure Plan will be submitted to the Ministry of Northern Development, Mines and Forestry.

Also, PGM retains ownership for only a portion of these peripheral sites, as shown in Figure 9-1. In cases where PGM is not the owner of peripheral sites, it will continue to take all reasonable measures to prevent personal injury or property damage that is reasonably foreseeable as a result of closing out the Project.

After implementation of closure and reclamation measures, it may be possible to return portions of the Hollinger property to the Province of Ontario or to the City of Timmins, depending on the condition of outstanding liabilities. Where such transfer is not desirable, or feasible, PGM will retain ownership and liability of the said properties.

The following measures will be undertaken for Final Closure of the Hollinger Mine Site.

9.1 Security of Mine Openings (Shaft, Raises and Open Stopes)

Historic Conditions

No change to information provided in the 2006 Closure Plan document for historical mine openings except that the No.26 and No.20 shaft have been investigated and capped with a report submitted to the MNDMF (November 2007 and January 2009, respectively). Stope C057 (Acklands) and C167 (Extendicare) continue to be routinely monitored.

Changes related to planned operations are described below.

Planned Operations

The section describing historic conditions immediately above applies to those historic mine openings which are not displaced or altered as a result of planned new mining operations at the time of Closed Out conditions. Where displacement and/or alteration of historic mine openings has occurred, the measures described in this section would apply.

As described in Section 8.2, planned open pit operations (92, Millerton, Central and Vipond pit phases) would displace mine openings contained within the footprints of the four pit phases, therein reducing potential hazards formerly associated with such openings.

Where existing open stopes or unstable crown pillars occur inside the property fenceline, but outside of the footprints of the four proposed open pit phases, and where such features have been backfilled by mine rock and/or covered under the Environmental Control Berm as a result of currently planned operations, the potential hazards associated with these backfilled and/or covered features will have been removed (see Appendix C). The long-term stability of any such remediated open stopes and unstable crown pillars will be assessed by a qualified professional engineer and a letter of certification provided to the MNDMF.

Where there are existing (or future) known mine hazards beyond the perimeter fence that are considered to be medium to high risk, have been fenced off from public access. All such fencing currently meets (or will meet) Mine Rehabilitation Code standards for Closed Out sites (i.e., #6-gauge chain-link galvanized fencing, of at least 2 m in height, and having a barbed wire top, and with the bottom of the fence secured against access). Minimum monthly fence inspections will be carried out to identify damaged or breached fence sections, and to affect repairs.

9.2 Security of Mine Openings (Portal, Adits and Declines)

Historic Conditions

No change to the information provided in the 2006 Closure Plan document for security of historic mine openings (portals, adits and declines), except that the reference to PJV is replaced with PGM, and except as described immediately below.

Planned Operations

This section does not apply to Planned Operations.

9.3 Security of Other Mine Openings (Open Pits)

Historic Conditions

No change to the information provided in the 2006 Closure Plan document for security of other mine openings (open pits), except that the reference to PJV is replaced with PGM, and except as described immediately below.

Planned Operations

The section describing historic conditions immediately above would apply to those historic open pits which are not displaced or altered as a result of planned new mining operations at the time of Closed Out conditions. Where displacement and/or alteration of historic open pits have occurred, the measures described in this section would apply. The measures described in this section would also apply to the four planned open pit phases, namely the 92, Millerton, Central and Vipond Pit phases.

As described in Section 8.2, planned open pit operations (92, Millerton, Central and Vipond pit phases) would displace mine openings, including historic open pits, contained within the footprints of the four planned new pit phases, therein reducing potential hazards formerly associated with such open pits. However, the new pit phases themselves would pose a hazard until they are fully remediated. The planned sequence of open pit operations would be to develop the four pit phases in sequence, with some potential overlap in pit excavations. Once the first pit has been fully mined out, it would be backfilled with mine rock generated from the second pit phase, and so on, until only one pit phase (a portion of the Central pit phase) remains. A perimeter fence will remain in place throughout operation.

Once mining operations are completed, the existing UG workings and remaining open pit space associated with the Central pit phase would be allowed to flood. The open pit water level will stabilize at an approximate level of 308 m amsl. The timeframe to achieve stable water levels is expected to be in the range of 7 to 9 years (see Appendix B). The perimeter fence will continue to remain in place until the flooded pit is no longer considered a hazard to the public.

The above pit water level of 308 m amsl assumes that surface water/ground water levels within the four pit phases, irrespective of whether or not they are backfilled, will be at the same level, because the four pit phases will be connected through open space and/or broken rock. The 308 m amsl elevation is governed by existing groundwater to surface water connections near the south side of Gillies Lake (elevation 309 m amsl) and at the Hollinger Golf Course (elevation 310 m amsl), (Figure 9-2). If surface water exit to either of the above locations is not desirable, then the alternatives would be to maintain the pit area water table at a lower level through pumping as in the predevelopment condition (possibly in perpetuity); or to construct a surface water drainage connection south to the Skynner Creek system. The latter alternative would involve enhanced ditching around the west side of the Kayorum (Hollinger) tailings, between the

Kayorum tailings stack and the Sheridan Trailer Park. Elevation constraints through this area are such that it would be possible to maintain pit area water level at a minimum of 308 m amsl (Figure 9-2). Maintaining the pit area water level at such an elevation is therefore considered an achievable and desired alternative.

The Central Pit is not anticipated to be backfilled but flooded. To alleviate safety concerns, exposed pit walls above the projected flood line will be cut back to a safe slope angle of not steeper than 3H:1V, or otherwise protected through the use of fencing consistent with the Mine Rehabilitation Code. Pit High-walls are expected along the pit crest as indicated in Figure 9-2. Boulder fencing is not proposed because of the proximity to the City of Timmins, and associated safety concerns. In addition, where flooded pits are not protected by fencing, sloped egress points will be positioned around any flooded pit perimeters, with egress point spacings of not greater than 200 m, and with such egress points being not less than 10 m in width, and having a minimum slope angle of at least 3H:1V, to allow easy egress in the event that persons, pets or wildlife should inadvertently enter the flooded pit. The long-term stability of pit walls will be assessed by a qualified professional upon closure and a letter of certification provided to the MNDMF. Any major fault structures (such as the Hollinger Fault) will be assessed during mine operations and appropriate measures will be taken to ensure wall stability during operations and for long-term closure.

Further, during the period of pit flooding, flooding pits will be protected by fencing consistent with the Mine Rehabilitation Code, until such point as conditions consistent with the preceding paragraph are in place.

9.4 Stability of Surface and Subsurface Workings

No change to the information provided in the 2006 Closure Plan document for stability of surface and subsurface workings, except as described below under planned operations.

Planned Operations

During site preparation and construction of the Environmental Control Berm, crown pillars located underneath the Control Berm will be considered rehabilitated for closure. A detailed geotechnical review of the impact of the Control Berm over the underlying stopes will be performed on a stope by stope basis and certified by a qualified professional with a letter of certification provided to the MNDMF.

Additionally, where there are existing (or future) known mine hazards beyond the perimeter fence considered to be medium to high risk, will have been fenced off from public access. All such fencing currently meets (or will meet) Mine Rehabilitation Code standards for Closed Out sites (i.e., #6-gauge chain-link galvanized fencing, of at least 2 m in height, and having a barbed wire top, and with the bottom of the fence secured against access). Minimum monthly fence inspections will be carried out to identify damaged or breached fence sections, and to affect repairs.

In the event that a geotechnical investigation shows that there is a potential stability concern with any given feature or condition, the stability concern will be remediated as appropriate. This will be addressed through amending the existing Closure Plan.

9.5 Removal of Buildings and Infrastructure

9.5.1 General

Historic Conditions

No change to the information provided in the 2006 Closure Plan document for the removal of buildings and infrastructure, except as described below under planned operations.

Planned Operations

Where displacement of historic buildings and infrastructure has occurred, as a result of proposed mining activities described in this document, the displaced buildings and infrastructure will have, by definition, been removed as part of the mining operations plans. As described in Section 6.0, any demolition wastes associated with such actions will be removed to the Dome Mine landfill.

Where new buildings and infrastructure are developed to support proposed mining operations described in this document, the measures described in this section would apply.

9.5.2 Site Buildings

Historic Conditions

The Hollinger No. 11 Shaft, hoist house and warehouse complex, and the sand backfill plant and silo (described in Section 9.5.2 of the December 2006 Closure Plan, and scheduled for demolition as part of that Closure Plan) are all located within, or immediately adjacent to, the footprint of the Central pit phase, and would necessarily be removed as part of mine preparation activities. As described in Section 6.0, materials will be disposed of at the Dome Mine landfill.

Planned Operations

No new permanent buildings will be erected as part of planned mining activities at the Hollinger Site. As described in Section 5.5, temporary buildings erected during operation will be dismantled and removed from Site.

9.5.3 Power Distribution Systems

Historic Conditions

No change to the information provided in the 2006 Closure Plan document for the removal of power distribution systems, except as described below under planned operations.

Planned Operations

All new power supplies required for planned mining operations described herein will be provided by existing, nearby Hydro One infrastructure, and will be removed on Final Closure.

9.5.4 Water and Sewage Systems

Historic Conditions

No change to the information provided in the 2006 Closure Plan document regarding water and sewage systems.

Planned Operations

As described in Section 5.5.3, water and sewage systems will be provided off-site with the exception of water that will be drawn from the No. 19 Shaft for drilling cooling water and dust suppression.

Water systems related to the provision of drill cooling water and dust suppression will be dismantled and removed from Site at closure including pipelines.

9.5.5 Storage Yards

No change to the information provided in the 2006 Closure Plan document regarding storage yards, with the exception that storage yard areas positioned where mine hazards have been safely rehabilitated may not require perimeter fencing.

9.6 Removal and Disposal of Machinery, Equipment, Storage Tanks, Scrap and Refuse

Historic Conditions

No change to the information provided in the 2006 Closure Plan document for the removal and disposal of machinery, equipment, storage tanks, scrap and refuse, except as described below under planned operations.

Planned Operations

All new machinery, equipment and associated materials brought to the Hollinger Mine Site to support planned mining operations will be dismantled and removed for possible salvage, resale, or reuse. Any remaining materials, which cannot be reused elsewhere, or sold, and which are considered non-hazardous, will be disposed of in the Dome landfill facility.

No storage tanks are anticipated to be brought to site during operation.

9.7 Transportation Corridors

Historic Conditions

Planned operations are expected to displace or bury nearly all historic transportation corridors.

Planned Operations

New on-site roads constructed to support planned mining operations will be rehabilitated or removed as described below, with exception of roads required for long-term monitoring or other potential land users:

- Grade Site roads to ensure appropriate drainage;
- Remove any existing roadside berms to prevent water from ponding on the road surface;

- Scarify the road surface and then hydro-seed with a perennial grass mix to provide a self-sustaining vegetative cover; and

- Retain gated entrances on all road access points onto the mine property where mine or other hazards remain, until such time as such hazards can be removed.

The Transportation Corridor will be rehabilitated by undertaking the following actions:

- The Environmental Control Berm bordering the road (where present) will be contoured to a slope not steeper than 3H:1V;

- The road surface will be scarified, and intermittent shallow soil cover (approximately 5 to 15 cm) will be placed in patches covering approximately 25% of the road surface, to facilitate natural revegetation of the road way, with such soil cover to be focused in areas that would be visible to the public such as at road and utility crossings;

- All culverts will be removed to restore natural drainage; and

- The arch-culvert style overpasses located at Vipond and Goldmine Road will be removed.

9.8 Concrete Structures

Historic Conditions

Planned operations are expected to remove and dispose of all known concrete structures off site as identified in the 2006 Closure Plan and as described in Section 6.0.

Planned Operations

This section does not apply to planned operations as no new concrete structures are envisioned to support planned mining activities.

9.9 Removal of Petroleum Products, Chemicals, Explosives and Wastes

Historic Conditions

No change to the information provided in the 2006 Closure Plan document regarding the removal of petroleum products, chemicals, explosives and wastes, except as described below under planned operations.

Planned Operations

This section does not apply as it is anticipated that no petroleum products, chemicals, explosives or waste will be stored on site during operation.

9.10 PCB's and PCB Contaminated Material

Historic Conditions

No change to the information provided in the 2006 Closure Plan document regarding PCB's and PCB contaminated material, except as described below under planned operations.

Planned Operations

Not applicable. PCBs will not be used for any aspect of the Hollinger Project.

9.11 Waste Management Sites

Historic Conditions

No change to the information provided in the 2006 Closure Plan document regarding waste management sites.

Planned Operations

Not applicable. There will be no waste management (landfill) facilities on the Hollinger Mine Site.

9.12 Contaminated Soil Testing and Mitigation Plan

Historic Conditions

No change to the information provided in the 2006 Closure Plan document regarding soil testing and remediation/removal of contaminated soils, except as described below under planned operations, and excepting that the reference to PJV is replaced with PGM.

Planned Operations

Any existing contaminated soils that would be displaced by planned mining, or mining related operations, would be investigated and remediated as described in the 2006 Closure Plan. Any additional soil contamination resulting from future planned operations, such as from the use/spillage of petroleum/diesel fuels, particularly near mobile re-fueling stations, would be remediated as described immediately below.

Soils which are thought to be contaminated with hydrocarbons (i.e., are likely to contain fuel residues, based on odour testing and visual inspection) will be tested according to the "Guidelines for Use at Contaminated Sites in Ontario" (MOE February 1997, or as amended) to determine total petroleum hydrocarbon content (TPH cold extractable method). Any contaminated area(s) will be cleaned up according to the appropriate cleanup criteria under these guidelines (i.e., likely Level I or Level II), where practicable.

Soil material found to exceed acceptable criteria would be segregated for appropriate disposal. If the soils greatly exceed the criteria, the contaminated material will be removed for off-site disposal by a licensed contractor; otherwise, the material will be bioremediated on-site. Bioremediation would involve placing the contaminated material on a plastic liner/membrane, spread, and covered with a second plastic liner/membrane (to restrict drainage/runoff, but allow the soil to aerate). The soil would then be retested after an appropriate period of aeration.

9.13 Closure of Tailings Facilities

Historic Conditions

No change to the information provided in the 2006 Closure Plan document relating to the closure of historic tailings facilities, except that the reference to PJV is replaced with PGM.

Planned Operations

Not applicable. No new tailing facilities will be developed at the Hollinger Mine Site.

9.14 Stabilization of Mine Rock and Other Stockpiles

Historic Conditions

No change to the information provided in the 2006 Closure Plan document regarding the stabilization of mine rock and other stockpiles, except as described below under planned operations.

Planned Operations

The section describing historic conditions immediately above would apply to those historic mine rock piles which are not displaced or altered as a result of planned new mining operations at the time of Final Closure. Where displacement and/or alteration of historic mine rock materials have occurred, the measures described in this section would apply.

The Environmental Control Berm will consume a portion of the mine rock. As well, the planned sequence of pit operations – 92 pit phase first, Millerton pit phase second, the Central pit phase third and the Vipond pit phase last – will allow opportunity to backfill the Millerton and 92 pit phases, and a portion of the Central Pit phase, during operations, thereby reducing the volume of mine rock stored on surface. All remaining mine rock and overburden will be stored on surface within the Property fenceline, with any excess rock that cannot be stockpiled within the property fenceline transported off-site to the Dome site for disposal.

Where mine rock and overburden are stockpiled on surface within the property fenceline, including the Environmental Control Berm itself, such stockpiles will have been contoured (i.e., with minimum slopes of approximately 2H:1V to 3H:1V) to minimize hazards associated with perched boulders and possible rock slides to facilitate ultimate reclamation at Final Closure.

It is expected that all such ore will be processed prior to preparations for Final Closure.

All overburden materials stockpiled on-site during operations would be used as amelioration material to facilitate vegetation growth on the mine rock stockpiles. As such, there would be no remaining overburden stockpiles on-site at Final Closure.

As discussed in Section 5, chemical stability of waste rock is not anticipated to cause concern.

9.15 Stabilization of Tailings, Water, and Other Impoundment Structures

Historic Conditions

No change to the information provided in the 2006 Closure Plan document regarding the stabilization of tailings, water and other impoundment structures, except as described below under planned operations.

Planned Operations

Once treatment of Site waters is no longer required, and there is no further use for the pumping/treatment system at the McIntyre No. 11 Shaft, the dewatering and treatment pond system will be decommissioned as per the McIntyre Mine Closure Plan (separate from this Closure Plan).

If stormwater retention ponds are constructed on-site, to manage stormwater runoff, any containment structures constructed to form the ponds will be permanently stabilized with rock fill to preclude any possible failure of the containment structures. Alternatively, if no longer required for the long-term (post Closure) management of Site runoff, the pond containment structures will be breached and contoured and the ponds will be drained, and the sites revegetated. No other impoundment structures will remain on the Hollinger Mine Site. Any mine water supply ponds constructed on-site for dust suppression water sourcing would be fully decommissioned.

9.16 Decant Structures

Historic Conditions

No change to the information provided in the 2006 Closure Plan document regarding decant structures.

Planned Operations

Not applicable. There will be no decant structures on-site as a result of planned developments.

9.17 Watercourses and Site Drainage

Historic Conditions

As per Section 9.17 of the 2006 Closure Plan, there are no watercourses, ditching, or other forms of drainage channels on the property and all surface drainage is controlled by local topography. With regard to passive mine water discharge at Final Closure, the general concept of directing mine water south towards a small tributary of Skynner Creek, by way of a buried pipeline from the Hollinger workings, as described in Section 5.9.2 of the 2006 Closure Plan, remains valid. However, the formerly proposed UG buried pipeline connection to the Hollinger Mine No. 49 Raise, within the old Hollinger Links Golf Course, would not be possible since this raise would be displaced by development of the Millerton Pit. Further details on this aspect are provided below.

Planned Operations

As described above and in Section 5.3.2, the old Hollinger Links Golf Course and the Hollinger Mine No. 49 Raise would be displaced by development of the Millerton Pit. As part of mine development and mine closure, the Millerton Pit would be backfilled and overfilled with mine rock derived from other pit phases. The passive direction of mine water south to the Skynner Creek system would therefore be possible if a surface ditch (or buried pipeline) was connected, to the backfilled pit, which in turn would be hydraulically connected to the flooded Central Pit.

To provide for such a connection, a short trench of some 20 to 30 m in length would be excavated/blasted from the south margin of the Millerton Pit during pit development to provide for a connection to the future backfilled pit. The remainder of the approximately 3.8 km flow connection (ditch or buried pipeline), connecting to the Skynner Creek system, would be installed as part of Final Closure operations. The routing of the ditch (or pipeline) is shown in

Figure 9-2. The ditch (or pipeline) invert at the Millerton Pit connection would be positioned at 308 m amsl, and at its connection with the Skynner Creek tributary invert would be positioned at 302 m amsl. The ditch would be constructed with a bottom width of 1 m, and with side slopes of 3H:1V, sufficient to pass the 100 year storm event. At Moneta Avenue a culvert would be constructed and pit overflow water would then daylight again further downstream. Alternatively a buried pipeline may be constructed, sufficient to pass the 100 year storm event.

There are no other planned ditches for Site drainage control; but if such ditches are constructed they would either be left in place and stabilized with rock fill for erosion protection at Final Closure, or they would be removed.

All culverts along Site access roads not needed for long-term runoff and drain control would be removed to allow for natural drainage.

9.18 Site Area Revegetation (and Aesthetics)

The primary aim of mine site reclamation, once infrastructure is removed, is to control erosion and accelerate the migration of native vegetation into the reclaimed area in order to establish a self-sustaining, maintenance-free vegetation cover.

Aesthetics are also of primary concern due to the operations proximity to Timmins and Schumacher.

Historic Conditions

Historic surface areas within the Hollinger fenceline would more or less be completely displaced by open pit development, Environmental Control Berm construction, and mine rock placement. As such, the concepts for revegetation presented in the 2006 Final Closure plan would apply..

Planned Operations

For Final Closure, the following measures will be implemented, as appropriate:

- Compacted heavy traffic areas, such as roads and Hollinger Mine Site yard areas, will be scarified;
- Disturbed Hollinger Mine Site areas, including ditches, will be contoured to the extent possible to mimic local topography, blend into the surrounding landscape, and improve Site drainage;
- General Site access roads (including the Transportation Corridor) will be scarified and revegetated, except where access for long-term monitoring is required; and,

- The Site area of approximately 79 ha, including the Environmental Control Berm, will be covered with a minimum 0.3 to 0.5 m of the overburden and hydroseeded.

Once initial vegetation cover is established, shrub and possibly tree species from the surrounding area are expected to invade the area, thereby restoring native plant and wildlife habitat.

The success of site revegetation will be monitored as part of the post closure monitoring program described in Section 10.0. Areas observed with insufficient plant growth would be augmented with additional seed and/or fertilizer.

In addition to basic revegetation of the Hollinger Site, PGM has committed to the City of Timmins that it will work with the city to restore the Hollinger Site to a safe, usable and aesthetically pleasing recreation area. Measures to achieve this added result are expected to include such things as:

- Clumped and dispersed tree plantings for aesthetics and shading;
- Trail networks for walking and jogging;
- Possibly sled and toboggan runs for winter activities (remote from the pit lake);
- Boat launch for non-power boats such as canoes, kayaks, and rowboats;
- Seating areas (benches); and possibly
- Weather-proof interpretive displays relating to historic mining and reclamation.

9.19 Schedule

The schedule developed in the 2006 Closure Plan is replaced with the following scheduling for Final Closure.

Within one year of a decision to commence Final Closure, the following activities will be conducted, if not undertaken during preceding closure phases:

- Undertake any necessary repairs to the perimeter fencing to ensure public safety; and
- Initiate physical, chemical and biological monitoring (Section 10).

Within two years of a decision to commence Final Closure:

- All remaining machinery, equipment, storage tanks, and related materials, not already removed, will be removed;
- Power supply systems and pipelines will be dismantled and removed;
- Any remaining ponds and associated ditching would be removed or stabilized;
- UG pumping and pit dewatering will cease;
- Any temporary structures erected will be removed and/or demolished, with those materials that are suitable for reuse or recycling to be salvaged, and those not suitable for such use to be disposed of off-site at the Dome landfill, or other certified landfill facility;
- All disturbed areas will be revegetated, with the exception of roads needed for monitoring access; and
- All other work detailed in this section of the Closure Plan will be completed.

After three years of a decision to commence Final Closure:

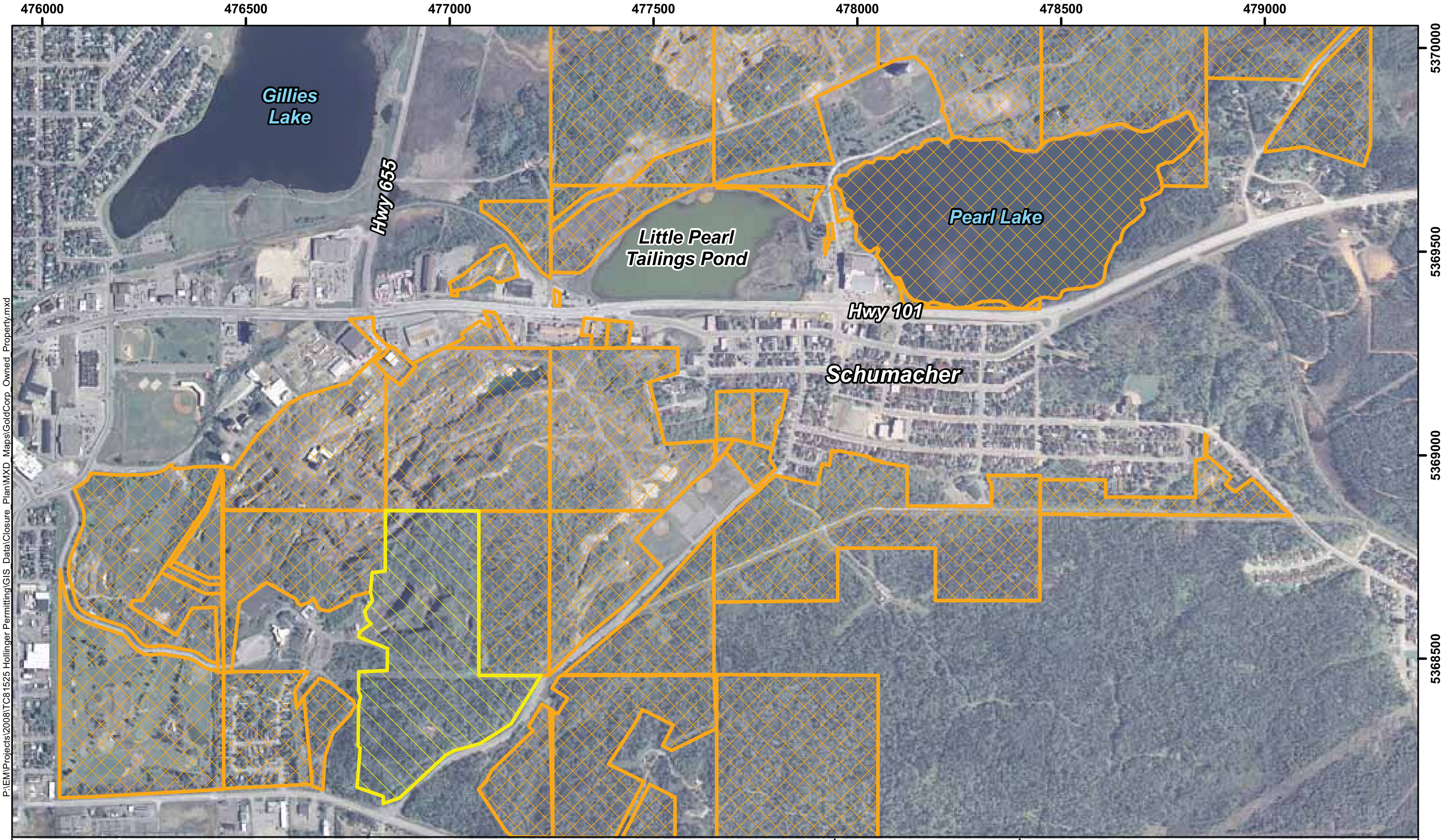
- Carry on with post-closure physical, chemical and biological monitoring.

Schedule details are provided in Table 9-1.

Table 9-1
Schedule of Rehabilitation

Task ID	Item Description	Operation/ Production	Closure Implementation	Long Term Monitoring/ Maintenance
1A	Gold Mine Tour Raise r334 (20092w7 Raise) - Engineering Design of Concrete Cap (2050)			>2042
1A	Gold Mine Tour Raise r334 (20092w7 Raise) - Foundation Investigation (2050)			>2042
1A	Gold Mine Tour Raise r334 (20092w7 Raise) - Ground Preparation for Cap Installation (2050)			>2042
1A	Gold Mine Tour Raise r334 (20092w7 Raise) - Construction of Concrete Monolithic Cap (2050)			>2042
1A	Gold Mine Tour Raise r334 (20092w7 Raise) - Backfill with Soil Cover (2050)			>2042
1B	Physical Stability Monitoring - Routine Inspections of Mine Workings Outside Control Berm (2011-2019)	2011-2019		
1B	Physical Stability Monitoring (Operation) - Geotechnical Inspections of Mine Workings Outside Control Berm (2017)	2017		
2A	Hollinger Mine Portal (Gold Mine Tour) - Engineering Design of Portal Backfill (2050)			>2042
2A	Hollinger Mine Portal (Gold Mine Tour) - Foundation Investigation (2050)			>2042
2A	Hollinger Mine Portal (Gold Mine Tour) - Backfill Portal (2050)			>2042
3A	Geotechnical Review and Certification of Long Term Pit Wall Stability (2020)		2020	
4A	Mine Workings Outside Control Berm - Installation of 6-gauge Fencing (2011-2019)	2011-2019		
4A	Mine Workings Outside Control Berm - Installation of Danger Signs on Fencing (2011-2019)	2011-2019		
4B	Geotechnical Review and Certification of Crown Pillars Covered by Environmental Control Berm (2012)	2012		
5A	Temporary Buildings - Dismantle/Salvage/Remove (2020)		2020	
5B	Power Distribution System - Removal/Salvage (2020)		2020	
6A	Machinery, Equipment and Storage Tanks - Removal/Salvage (2020)		2020	
7A	Site Roads - Regrading, Resloping and General Site Grading and Scarifying (2020)		2020	
7A	Site Roads - Surface Prep and Seeding (2020)		2020	
7B	Transportation Corridor - Regrading, Resloping and Scarifying (2020)		2020	
7B	Transportation Corridor - Surface Prep and Seeding (2020)		2020	
7B	Transportation Corridor - Apply Intermittent Soil Cover (2020)		2020	
7C	Goldmine and Vipond Road Overpasses - Excavate and Remove Rock Overpass (2020)		2020	
7D	Site Drainage Culverts - Removal (2020)		2020	
11A	Contaminated Soils - Excavation and Disposal (2020)		2020	
13A	Environmental Control Berm and Waste Rock Piles - Place, Spread and Seed biosolids (2020)		2020	
14A	Settling Pond - Dredging and Transfer of Sediments (2020)		2020	
14A	Settling Pond - Breaching and Regrading Dyke to Ground (2020)		2020	
16A	Hollinger Mine Workings Groundwater Level Control - Connection to Skynner Creek (2020)		2020	
17A	Chemical Stability Monitoring - Surface Water (2020-2022) - 9 stations quarterly		2020-2022	
17A	Chemical Stability Monitoring - Surface Water Flow Monitoring (2020-2022) - 3 stations quarterly		2020-2022	
17B	Chemical Stability Monitoring - Ground Water (2020-2022) - 13 stations quarterly		2020-2022	
17C	Chemical Stability Monitoring - Geochemical Characterization (2020)		2020	
17D	Chemical Stability Monitoring - Study of Long Term Ground Water Conditions (2020)		2020	

Task ID	Item Description	Operation/ Production	Closure Implementation	Long Term Monitoring/ Maintenance
17E	Biological Stability Monitoring - Aquatic Habitat Inventory & Characterization Study (2022)		2022	
17F	Biological Stability Monitoring - Terrestrial Habitat Inventory & Characterization Study (2022)		2022	
17G	Physical Stability Monitoring - Geotechnical Inspection of Site (2022)		2022	
17H	Annual Report Submitted to Director (2020-2022)		2020-2022	
17I	Barrier Maintenance (Fencing) - Environmental Control Berm (2020-2022)		2020-2022	
17I	Barrier Maintenance (Danger Signs) - Environmental Control Berm (2020-2022)		2020	
17J	Barrier Maintenance (Fencing) - Mine Workings Outside Control Berm (2020-2022)		2020	
17J	Barrier Maintenance (Danger Signs) - Mine Workings Outside Control Berm (2020-2022)		2020	
18A	Chemical Stability Monitoring - Surface Water (2023-2032) - 9 stations quarterly			2023-2032
18A	Chemical Stability Monitoring - Surface Water (2033-2042) - 3 stations quarterly			2033-2042
18A	Chemical Stability Monitoring - Surface Water Flow Monitoring (2023-2042) - 3 stations			2023-2042
18B	Chemical Stability Monitoring - Ground Water (2023-2032) - 13 stations quarterly			2023-2032
18C	Biological Stability Monitoring - Aquatic Habitat Inventory & Characterization Study (2025)			2025
18C	Biological Stability Monitoring - Aquatic Habitat Inventory & Characterization Study (2028)			2028
18C	Biological Stability Monitoring - Aquatic Habitat Inventory & Characterization Study Post Pit Flooding (2031)			2031
18C	Biological Stability Monitoring - Aquatic Habitat Inventory & Characterization Study Post Pit Flooding (2034)			2034
18C	Biological Stability Monitoring - Aquatic Habitat Inventory & Characterization Study Post Pit Flooding (2037)			2037
18D	Biological Stability Monitoring -Terrestrial Habitat Inventory & Characterization Study (2027)			2032
18D	Biological Stability Monitoring - Terrestrial Habitat Inventory & Characterization Study (2032)			2032
18D	Biological Stability Monitoring - Terrestrial Habitat Inventory & Characterization Study (2037)			2037
18E	Physical Stability Monitoring - Routine Inspections and field work (2023-2122)			2023-2122
18F	Physical Stability Monitoring - Geotechnical Inspection of Site (2027)			2027
18F	Physical Stability Monitoring - Geotechnical Inspection of Site (2037)			2037
18F	Physical Stability Monitoring - Geotechnical Inspection of Site (2047)			2047
18F	Physical Stability Monitoring - Geotechnical Inspection of Site (2057)			2057
18F	Physical Stability Monitoring - Geotechnical Inspection of Site (2067)			2067
18F	Physical Stability Monitoring - Geotechnical Inspection of Site(2077)			2077
18F	Physical Stability Monitoring - Geotechnical Inspection of Site (2087)			2087
18F	Physical Stability Monitoring - Geotechnical Inspection of Site (2097)			2097
18F	Physical Stability Monitoring - Geotechnical Inspection of Site (2107)			2107
18F	Physical Stability Monitoring - Geotechnical Inspection of Site (2117)			2117
18G	Barrier Maintenance - Environmental Control Berm (2023-2032)			2023-2032
18G	Barrier Maintenance - Mine Workings Outside Control Berm (2023-2122)			2023-2122
18H	Annual Reporting Submitted to Director (2023-2042)			2023-2042



LEGEND

▨ Existing Goldcorp Surface Rights

▨ Goldcorp Surface Rights (2011)

0 0.125 0.25 0.5 0.75 1 Kilometres

NOTES:
-

Datum: NAD83
Projection: UTM Zone 17N

N W E S

GOLDCORP
PORCUPINE GOLD MINES

amec

HOLLINGER PROJECT

Goldcorp Owned Property

PROJECT N^o: TC81525

FIGURE: 9-1

SCALE: 1:13,000

DATE: November 2010

LEGEND

▨	Environmental Control Berm
⁘	Rock Fill Area
⌒	Pit Outlines
🟦	Pit Lake (General approximation of lake boundary)

0 125 250 500 750 1,000 Metres

NOTES:
-

Datum: NAD83
Projection: UTM Zone 17N

N W E S

GOLDCORP
PORCUPINE GOLD MINES

amec

HOLLINGER PROJECT

Drainage Route Options

PROJECT N^{o}: TC81525	FIGURE: 9-2
SCALE: 1:8,000	DATE: November 2010

10.0 MONITORING

The following subsections summarize the proposed monitoring that will be conducted during the three phases of closure. This section replaces Section 10.0 of the 2006 Closure Plan document, which did not differentiate between the different phases of closure.

The surface and groundwater monitoring programs are certified as per Section 2.2. All annual inspection reports will be copied to the Director of the MNDMF, or to their designate, as required.

10.1 Physical Stability of Mine Hazards

The objective of physical stability monitoring will be to ensure that the property has not been compromised by changes in the state of the mine workings via natural causes and/or via the planned new mining operations.

A number of historic and new mine hazards, both inside and outside the perimeter fencing, will require periodic inspection to ensure that they remain physically stable and do not present a potential hazard to the general public or the surrounding environment. Additionally, the Old Vipond Tailings area, as well as all other revegetated areas that will not be displaced or altered as a result of planned new mining operations, will continue to require occasional inspections to ensure that the revegetation efforts are successful and that any new vegetation is self-sustaining.

Note that exceptional circumstances may require increased monitoring frequencies i.e., high precipitation events. This will be evaluated on a case by case basis.

10.1.1 Mine Hazards Beyond Extent of Project

The following paragraph describes the physical stability monitoring program for those hazards which will not be influenced by the proposed project described in Section 5 above i.e., their location is outside of the perimeter fenceline with the exception of the Gold Mine Tour portal and raise.

PGM recognizes that although the Hollinger Project will move the status of the project into ‘Operation’, all peripheral mine hazards that are not associated with the open pits will still require monitoring as though they continue to remain in a state of inactivity. That being said, routine, annual inspections will continue to take place of all surrounding hazards during the operation phase as well as all phases of closure (temporary suspension, inactivity and final closure) to ensure that access is restricted. Geotechnical investigations will be performed by a qualified professional engineer to review conditions of workings that can be safely accessed.

Actions resulting in significant modifications to the proposed closure activities will be addressed in a closure plan amendment as described in Section 9.

An annual monitoring report noting any physical stability concerns as described in Part 8 of The Code and detailing any corrective actions taken will be prepared and submitted to the manager responsible for the property within six months of the end of the calendar year being reported. Annual inspection reports will be copied to the Director of the MNDMF, or to their designate, as required.

A further aspect of physical stability includes consideration of the post-closure water table in relation to current conditions. Currently, groundwater in the general vicinity of the Hollinger Mine site is artificially depressed as a result of pumping from the McIntyre #11 Shaft. Following mine closure, the plan is to allow the water table in the open pit to flood to a level of approximately 308 m amsl, with passive drainage from the flooded pit to flow south to the Skynner Creek system. The MOE has requested that post closure groundwater levels be modeled to determine expected area post closure water levels in relation to current site area water levels. Such modeling is planned for inclusion within the next Closure Plan iteration expected in approximately 2014, in accordance with Condition 4.6.4 of Permit to Take Water 6300-8D2K9F.

The assessment would focus on predicted post closure groundwater levels in the areas of the Hollinger Golf Course, Moneta Road and Gold Mine Road, and in proximity to Gillies Lake.The assessment will be used to determine whether or not the proposed methodology of controlling the water level in the pit will be sufficient so as not to exacerbate problems currently being experienced due to a high water table along Moneta Road, and that there will be no uncontrolled discharges from subsurface openings such as was previously experienced in the vicinity of Gillies Lake.

A contingency plan with trigger mechanisms will be developed as part of the updated groundwater modeling program and post closure monitoring plan to ensure that the post-closure measures are performing adequately.

10.1.2 Mine Hazards Within Extent of Project

The following sections describe the physical stability monitoring program for those hazards which will be influenced by the proposed project described in Section 5 above.

10.1.2.1 Temporary Suspension

It is assumed that the Site would be left in a state of Temporary Suspension for not more than two years. During a period of Temporary Suspension, the following mine structures and components will be visually inspected by company personnel every 6 months, unless specified otherwise below, to ensure that the Site does not pose a potential hazard to the general public or surrounding environment:

- Integrity of perimeter fencing (on a monthly basis);
- Mine openings not displaced by the open pits (on an annual basis) (Section 61.(1) of The Code);
- Mine rock and overburden stockpiles (Section 64. of The Code);
- Site drainage systems;
- Mine dewatering systems;
- Buildings (if present) and equipment; and
- Open pit slopes (Section 63. of The Code).

Inspections will be conducted using a standardized inspection form, supported by a photographic record. An annual monitoring report noting any physical stability concerns as described in Part 8 of The Code and detailing any corrective actions taken will be prepared and submitted to the manager responsible for the property within six months of the end of the calendar year being reported. Annual inspection reports will be copied to the Director of the MNDMF, or to their designate, as required.

10.1.2.2 State of Inactivity

The proposed physical stability monitoring strategy during a State of Inactivity will be the same as that described for Temporary Suspension (Section 10.1.2.1). The simplicity of the operation does not differentiate greatly between the two phases and therefore in the event of a transition or movement directly into a State of Inactivity, the stability requirements are anticipated to be similar.

The exception is the addition of geotechnical inspections conducted by a qualified professional engineer every 10 years, which will include any historic mine hazards (e.g., crown pillars) that are not removed or eliminated during the planned open pit operations and pit slopes. The required instrumentation monitoring, including instrument lists, are included in Appendix F of the 2006 Closure Plan document and would continue to be applicable to any remaining mine hazards. The frequency of monitoring may be modified in the future if recommended by the professional engineer.

Annual inspection reports will be prepared as described above for Temporary Suspension, and retained on file. Annual reports will be copied to the Director of the MNDMF, or to their designate, as required.

10.1.3 Final Closure

During implementation of Final Closure measures, visual Site inspections will be carried out at a minimum of once every six months by a qualified person, to ensure that any remaining mine features, do not present a potential safety hazard.

Once the Final Closure measures have been implemented, a Site inspection by a qualified professional engineer will be undertaken to assess physical stability and the potential for any remaining hazards. This will include a final inspection of the mine rock stockpiles (including the Environmental Control Berm), pit slopes, the sealed portal (Gold Mine Tour), the capped vent raise (Gold Mine Tour), and other potential hazards relating to ground stability such as backfilled or capped open stopes and exposed crown pillars. A report would be prepared to document the inspection. Visual inspections by a qualified person would be conducted annually for the following 5 years after completion of Final Closure. A geotechnical inspection would be conducted 5 years after Final Closure and follow up inspections would occur every 10 years unless otherwise dictated by the report. Inspection reports would be made available to the Director of the MNDMF, or to their designate, as required, within 6 months of the period being reported.

10.2 Chemical Stability Monitoring

The chemical stability monitoring programs for each of the closure phases outlined below have been developed based on a regional approach, due to the proximity of other various PGM activities and projects in the general area, to minimize duplication of monitoring requirements between the local mine sites within a given watershed. PGM considers that adopting a regional perspective is justified, as well as proactive, based on the reality that there are a number of potential sources of contamination from its various properties, and other active and inactive mine operations, that may be contributing to existing water quality conditions in the local watersheds, including the Porcupine River, Town Creek and Skynner Creek watersheds.

Due to the presence of extensive historic mine workings and associated openings to surface, in addition to the proposed planned new mine workings, that will intercept much of the surface runoff, there will be very few defined surface drainage features on the property at closure. As such, the potential for surface water monitoring stations on the Hollinger property will be limited until the UG workings and pit(s) are fully flooded.

As described in Section 5.9.2, groundwater from the interconnected Hollinger and McIntyre UG workings will continue to be pumped to surface from the McIntyre Mine No. 11 Shaft to maintain the groundwater level at an elevation to prevent uncontrolled surface discharge from the Hollinger Mine until a permanent gravity discharge system is constructed and Final Closure of the site is completed. Until such time, monitoring of mine water quality, as well as downstream water quality in the receiving water (Porcupine River) will be carried out in accordance with Certificate of Approval #8572-4L8GYF and any subsequent amendments thereto.

Any parameters monitored will be analyzed by an accredited laboratory.

10.2.1 Temporary Suspension

During Temporary Suspension, the mine dewatering/treatment facilities will continue to be operated in the manner described in Section 5.9.2, with groundwater to continue to be pumped from the McIntyre No. 11 Shaft and discharged to the LPTP. Water quality of the treated effluent and the receiving water (Porcupine River) will be monitored in accordance with the C of A and other applicable regulations (e.g., O. Reg. 560/94 and the Metal Mining Effluent Regulations), as well as with the requirements of the McIntyre Mine and LPTP Closure Plans (and associated amendments).

The majority of surface runoff from the Hollinger Mine Site will be intercepted by the open mine workings and eventually pumped from the McIntyre No. 11 Shaft to LPTP. Water quality monitoring of the LPTP would be carried out in accordance with Amended Certificate of Approval #8572-4L8GYF, and any subsequent amendments thereto. All other surface runoff from the property perimeter zones will be captured by the City of Timmins storm sewers and/or roadside drainage ditches. Receiving water flows are currently being monitored on a continuous basis for the Porcupine and South Porcupine Rivers upstream of their confluence with each other, and for Skynner Creek at Pine Street (Figure 10-1). Flow monitoring of these three stations would continue during periods of Temporary Suspension.

Groundwater levels and quality will be measured in accordance with the applicable PTTW #6300-8D2K9F for Hollinger Mine Site dewatering and C. of A. #8572-4L8GYF for mine water discharge to LPTP, and any subsequent amendments thereto, until dewatering of the open pit is terminated. The monitoring program is proposed to be conducted at approximately 12 existing (and planned) wells (including multi-level wells) surrounding the proposed open pit, with continuous data-loggers to be downloaded on a quarterly basis (Figure 4-2). The monitoring wells extend from near urban Timmins in the west, to the western margin of Schumacher in the east, to near Moneta Avenue in the south, to near Gilles Lake and north of LPTP in the north.

During periods of Temporary Suspension groundwater samples would be collected from the aforementioned 12 wells on a quarterly basis, and analyzed for the parameters set out in Part 6 of the Mine Rehabilitation Code (or as indicated in the applicable PTTW).

Results of surface and groundwater monitoring programs would be reported to the MOE, as required by PTTW and C of A; and to the MNDMF, as required, on an annual basis, within six months of the end of the year being reported.

10.2.2 State of Inactivity

During a State of Inactivity, the mine dewatering/treatment facilities will continue to operate on a continuous basis, while dewatering of the open pit workings is required. During a State of Inactivity, all surface water flow and water quality monitoring would be undertaken as outlined above for Temporary Suspension, except that following three years of State of Inactivity water quality monitoring would be carried out quarterly. .

During the first three years of State of Inactivity monitoring, groundwater levels and samples would be collected from the aforementioned 12 wells, as described above for monitoring during Temporary Suspension. Following the first three years of State of Inactivity monitoring, groundwater levels from continuous data-loggers, would continue to be downloaded on a quarterly basis, and groundwater samples would be collected annually from a subset of six wells, with the six wells to be selected on the basis of results from the foregoing sampling periods. In cooperation with MNDMF, the list of monitored parameters would be reviewed following completion of the first three years of State of Inactivity or Final Closure monitoring, to determine if selected parameters could reasonably be removed from the monitoring list.

Results of surface and groundwater monitoring programs would be reported to the MOE, as required by PTTW and C of A; and to the MNDMF, as required, on an annual basis, within six months of the end of the year being reported.

10.2.3 Final Closure

At Final Closure, groundwater pumping from the McIntyre No. 11 Shaft will be discontinued and the existing UG workings and open pit will be allowed to flood. The Skynner Creek and Mountjoy River system will be characterized for at least three years prior to the decommissioning of the McIntyre Mine dewatering system. Construction of a long-term passive mine water discharge on the south side of the Hollinger Mine Site is required to characterize water quality prior to discharge. Surface water flows would continue to be monitored for the Porcupine and South Porcupine Rivers, and for Skynner Creek, as described under Temporary Suspension. Surface water quality monitoring would be carried out quarterly at the following locations, as shown in Figure 10-2:

- Pit Lake;
- LPTP;
- Hollinger Mine passive mine water discharge;
- Pearl Lake;
- Porcupine River upstream of its confluence with the South Porcupine River;
- Skynner Creek above Kayorum Tailings deposit;
- Skynner Creek at Pine Street crossing; and
- Mountjoy River, upstream of its confluence with the Mattagami River.

Surface water samples would be analyzed for the parameters listed in Part 5 of the Mine Rehabilitation Code, or as otherwise agreed to through discussions with MOE and MNDMF.

Groundwater levels and samples would be collected as described above for State of Inactivity monitoring; or, if Final Closure follows a period of State of Inactivity monitoring, then the three year criterion for the change in water sample collection frequency would include the preceding State of Inactivity monitoring period.

10.3 Biological Monitoring

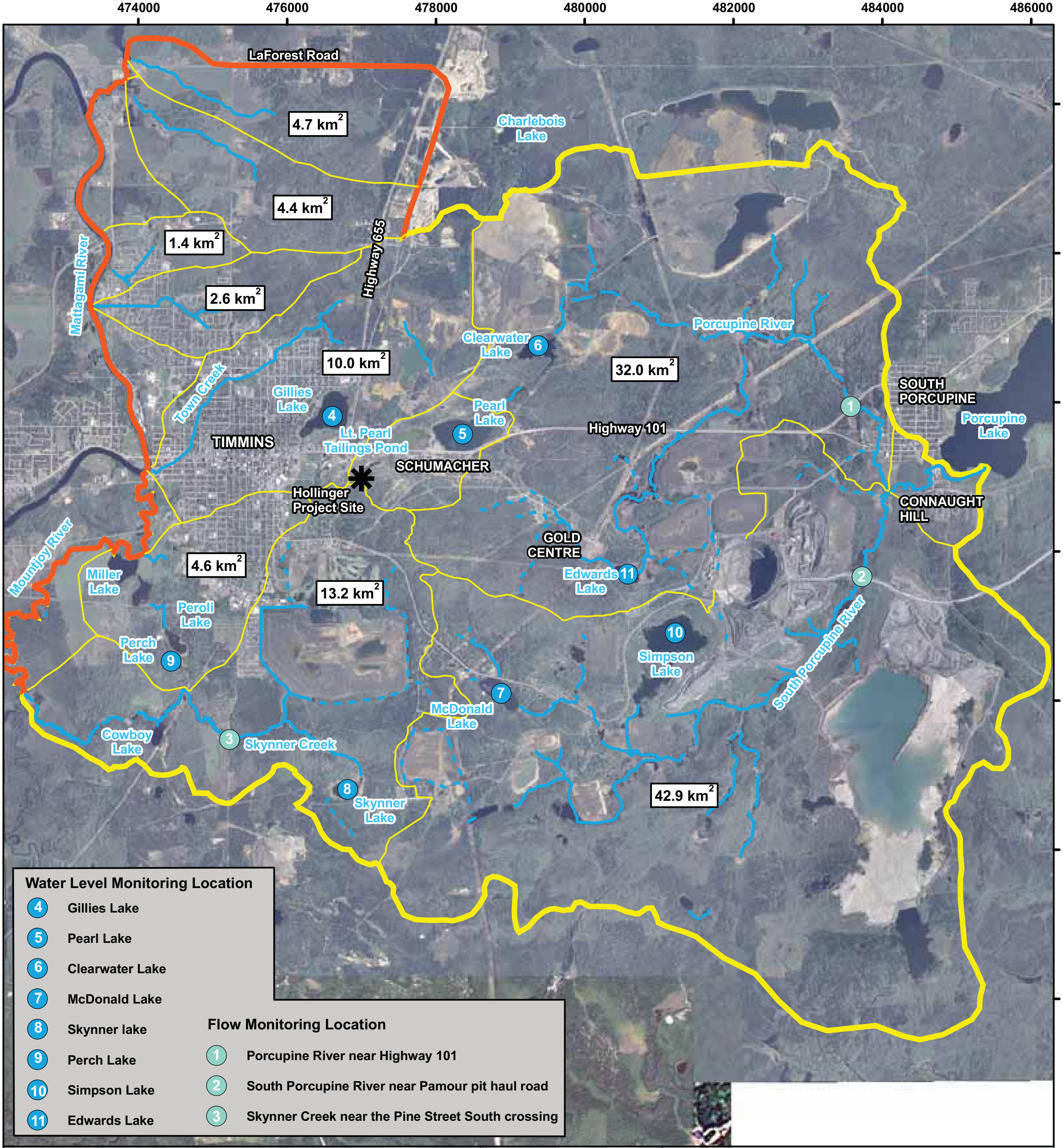
10.3.1 Aquatic Environment

Biological monitoring requirements for proposed operations will be carried out in general accordance with Environmental Effects Monitoring (EEM) protocols prescribed under the federal Metal Mining Effluent Regulations in the Skynner Creek system. As there is no applicable reference creek reach for the monitoring program, presently impacted portions of the Skynner Creek system (impacted due to historic mining and urban development conditions) will be assessed to determine background conditions approximately three years prior to the initiation of flooded open pit drainage to the Skynner Creek system, with such drainage initiation expected to occur approximately seven to nine years following the completion of open pit mining.

10.3.2 Site Revegetation

Annual monitoring of all revegetated areas will be carried out for a period of three years, to determine program success, and the need for remedial work (e.g., re-fertilizing), if any. After the three year period, inspections will be carried out at 3 to 5 year intervals. Inspections will be carried out visually and will include photographic records as outlined in Section 10.1. Photographic records will be standardized to the extent possible, to allow year-to-year comparisons of vegetation success.

Based on these surveys, areas of poor or incomplete vegetation cover will be identified and will be fertilized and/or reseeded, as required. Reseeding will be accomplished by hydro seeding, or by hand broadcasting, as appropriate. Particular attention, during monitoring, will be focused on potentially erosion-prone areas such as slopes. Signs of gullying, rilling, and/or slumping will be identified for immediate attention.



Water Level Monitoring Location

4	Gillies Lake
5	Pearl Lake
6	Clearwater Lake
7	McDonald Lake
8	Skynner lake
9	Perch Lake
10	Simpson Lake
11	Edwards Lake

Flow Monitoring Location

1	Porcupine River near Highway 101
2	South Porcupine River near Pamour pit haul road
3	Skynner Creek near the Pine Street South crossing

P:\EMProjects\2008\TC81525 Hollinger Permitting\GIS_Data\Closure_Plan\MXD_Maps\SurfaceWater_FlowMonitoringStations.mxd

LEGEND

- ✱ Proposed Hollinger Pit Centroid
- Study Area (Riverine and Road Boundary)
- Study Area (Watershed Boundary)
- River or Creek
- Intermittent Watercourse
- Watershed Boundary

0 0.5 1 2 3 4 Kilometres

NOTES:
-

Datum: NAD83
Projection: UTM Zone 17N

N
W E
S

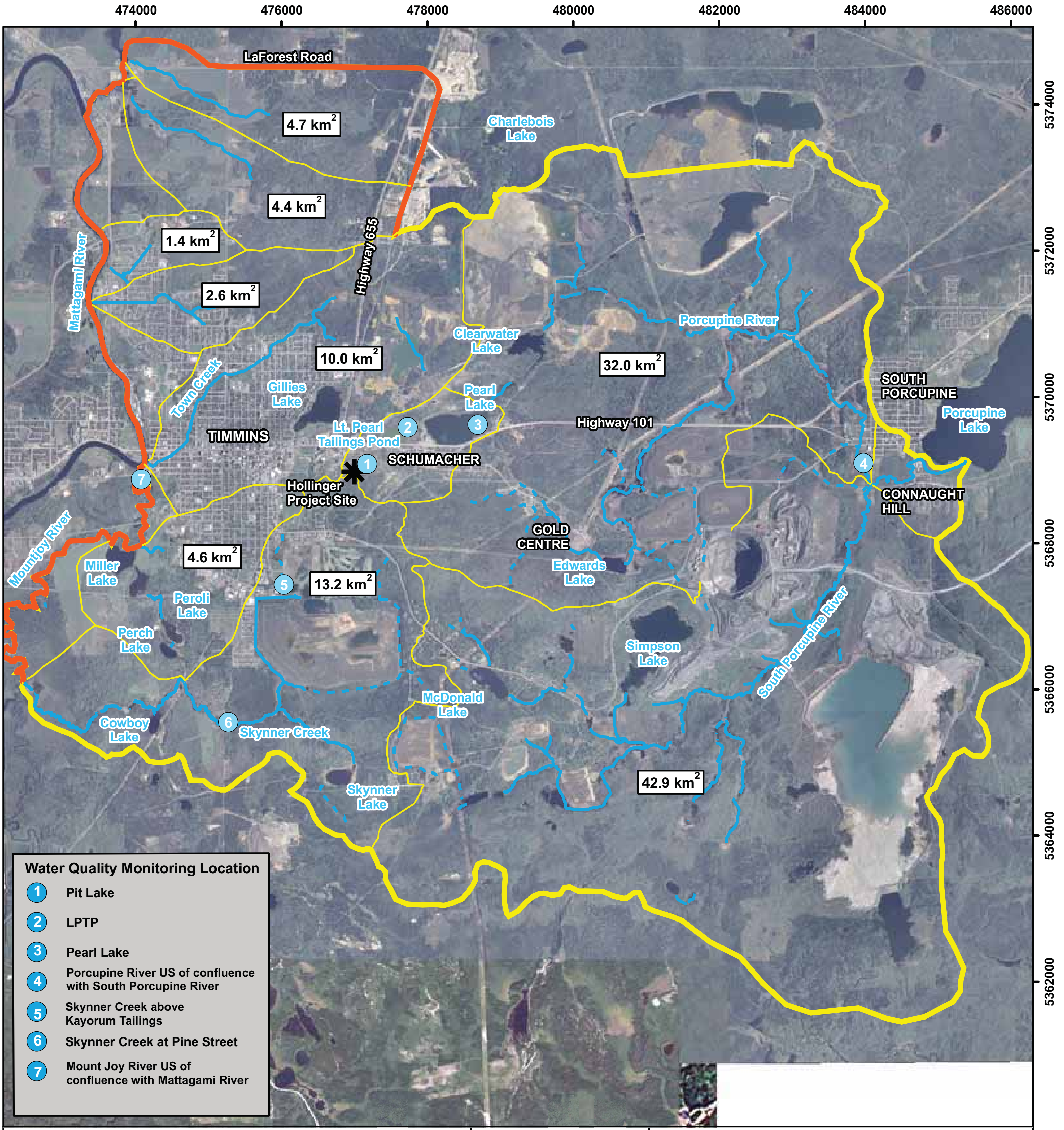
GOLDCORP
PORCUPINE GOLD MINES

amec

HOLLINGER PROJECT

Lake Level and Surface Water Flow Monitoring Stations

PROJECT Nº: TC81525	FIGURE: 10-1
SCALE: 1:70,000	DATE: October 2010



P:\EMProjects\2008\TC81525 Hollinger Permitting\GIS_Data\Closure_Plan\MXD_Maps\SurfaceWaterQuality_MonitoringStations.mxd

LEGEND

- ✱ Proposed Hollinger Pit Centroid
- 🟧 Study Area (Riverine and Road Boundary)
- 🟨 Study Area (Watershed Boundary)
- ～ River or Creek
- ╌ Intermittent Watercourse
- ～ Watershed Boundary

0 0.5 1 2 3 4 Kilometres

NOTES:
-

Datum: NAD83
Projection: UTM Zone 17N

N W E S

GOLDCORP
PORCUPINE GOLD MINES

amec

HOLLINGER PROJECT

Surface Water Quality Monitoring Stations

PROJECT N^o: TC81525	FIGURE: 10-2
SCALE: 1:70,000	DATE: October 2010

11.0 EXPECTED SITE CONDITIONS POST CLOSURE

11.1 Specified Land Uses

The Hollinger Mine Closure Plan largely comprises patented mining lands. After closure and reclamation the land will remain under the ownership of the PGM. It is not expected that PGM will seek to return this property to the Province of Ontario or the City of Timmins in the near future, although it is possible that portions of the site, if suitable, could be turned over to the city at some point in the future.

Open House sessions pertaining to the Hollinger Project and Hollinger Mine Closure concepts were held in June 2005, June 2006, March 2007, October 2008 and May 2010. Due to the proximity to the community, PGM recognizes it was in their best interest to receive input from the public, especially adjacent stakeholders.

Common themes were received from the majority of those people who attended the meetings. Rehabilitation of the mine site should be focussed on a goal of providing safe, usable and aesthetically pleasing land for parks and trail systems, and some way of preserving the history of the mines through storyboards or the like along the trail systems. This appears to be aligned to the surrounding land use including Mattagami Region Conservation Authority parklands and trail systems at Gillies Lake.

If portions of the Hollinger Mine Site cannot be safely rehabilitated due of persistent mine hazards, any such areas would remain fenced off, either in perpetuity, or until such time as they can be safely rehabilitated.

11.2 Site Topography

The existing site topography is bedrock controlled and highly irregular, varying from a high of 365 m amsl in the southeast of the property to 280 m amsl in the north central portion of the property. The existing topography is further complicated by the presence of small open pits and open stopes associated with former mining operations.

At Final Closure the site would look considerably different than it does at present, and would consist of a flooded pit lake (flooded Central Pit) surrounded by low hills to a maximum elevation of max. 70 m above exiting surface levels. The hills would be comprised of mine rock, sloped at not steeper than 2H:1V tp 3H:1V, covered with a layer of not less than 0.3 m of soil, and vegetated. An artist rendering of the site at final Closure is shown in Figure 11-1.

All Site drainages would consist of minor swales to shed runoff, with all areas positioned within the Environment Control Berm draining towards the pit lake; and areas external to the

Environment Control Berm draining to existing perimeter ditching associated with surrounding roadways.

11.3 Local Surface Waters and Site Receiver Waters

The only surface water on Site at Final Closure will be the pit lake left after mining out the Central and Vipond Pits. The surface of the pit lake will be positioned at an elevation of approximately 308 m amsl, and will measure approximately 20 ha in area. The pit lake will drain to the south, to the Skynner Creek system as described in Section 9.17.

LPTP, Pearl Lake and further downstream receiving waters on the Porcupine River system are expected to remain unchanged from current conditions in terms of water flows, water quality and fish habitat. The only exception would be that once the outlet from the pit lake is developed, the current (and planned) dewatering system using the McIntyre No. 11 Shaft would be decommissioned. This would eliminate groundwater discharge to the LPTP and to downstream waters on the Porcupine River system. This would reduce water flows in the Porcupine River system by an average of approximately 10,000 to 30,000 m^3/day form the normal operating condition. This passive flow condition is the condition that existed between approximately 1988 and 2000 when there was no active mine (groundwater) dewatering at the Hollinger and McIntyre Mine sites. Based on the above, water quality in LPTP and downstream is expected to meet PWQO values, or the current background where values already exceed PWQO

11.4 Groundwater Conditions

The pit and existing UG workings will be allowed to flood to a natural steady state elevation, which is expected to be at 308 m amsl. Groundwater flow in the bedrock is likely to return to pre-mining conditions with the exception of some interaction with the flooded UG workings and open pit.

Due to the intricacy of the existing UG workings, it is difficult to determine the rate of flooding with a high level of accuracy, however, based on the hydrogeological groundwater model, it was estimated that the mine would flood in approximately 7 to 9 years, based on the following assumptions:

- The average seepage rate of groundwater into the UG workings is estimated at about 5,000 m^3/day;
- •Precipitation inflow (less evaporation/evapotranspiration) from the pit area catchment is expected to average 1,480 m^3/day; and
- The total pit and UG void volume to be filled is estimated at approximately 15,550,000 m^3, which includes rock fill void spaces within the backfilled Millerton and 92 Pits.

Based on the above factors, the estimated time for the open pit and dewatered UG workings to rise to the point of the pit lake discharge (at elevation 308 m amsl) is 7 years. Also, given that it is not only the pit and UG workings that are to be filled, but also the surrounding under-drained overburden and bedrock aquifers, an additional contingency factor of 1.3 has been assumed, bringing the estimated total filling time to 9 years.

Based on existing groundwater quality conditions, the pit lake, once flooded and stabilized is expected to meet or approach PWQO values. Metals which are redox sensitive (i.e., metals which come into solution under low oxygen conditions), namely iron, manganese and cobalt, are expected to precipitate out of the pit lake surface waters, once these waters become naturally oxygenated

11.5 Terrestrial Plant and Wildlife Communities Following Closure

Vegetation cover on the Hollinger Site consists of second growth forest on much of the eastern portion of the property, and patchy ground cover with frequent bedrock exposures over most of the rest of the site.

Following mine closure, terrestrial portions of the site area will gradually develop a re-newed grassland cover, which if left untended will gradually revert to forest cover through the process of natural succession. The ultimate fate and form of vegetation cover on the Site will depend on agreements with the City as to the desired final form of the closed Hollinger Site parkland setting. This form could include patches of tree cover interspersed with managed grasslands. Wildlife presence on the site would therefore be expected to consist of urban tolerant bird species and a limited number of small mammals, which are adapted to parkland environments.

11.6 Aquatic Plant and Animal Communities Following Closure

There will be no alteration of watercourses associated with the proposed mining activities. Water quality discharges from the LPTP to Pearl Lake are expected to be such that current water quality conditions in Pearl Lake and in downstream waters of the Porcupine River would be unchanged from the current condition.

In terms of flooded open pit discharges to the Skynner Creek system, the mineralogy of the Hollinger deposit is such that AMD conditions and metals release are not expected to occur. Traditionally UG waters from the Hollinger McIntyre area have shown elevated iron concentrations, but this iron would be expected to precipitate within the pit lake environment when exposed to oxygen in the atmosphere.

P:\EM\Projects\2008\TC81525 Hollinger Permitting\GIS Data\April May 2010\MXD Maps\ClosureView 3D Render ver2.mxd

LEGEND

🡼 Flow Direction

NOTES:
- Outlines of facilities and site features are approximate.

GOLDCORP
PORCUPINE GOLD MINES

amec

HOLLINGER PROJECT

3D Rendering of Site at Closure

PROJECT N°: TC81525	**FIGURE: 11-1**
SCALE: Varies	DATE: October 2010

12.0 ESTIMATED CLOSURE COSTS AND FINANCIAL

Cost estimates for Final Closure of the Hollinger Mine Site are provided in Table 12-1.

For the purpose of preparing the closure costs, it was assumed that all closure activities, with the exception of Site supervision and most aspects of monitoring, would be contracted. Costs were developed mainly from unit rates that were based on Goldcorp's and AMEC's experience in the mining industry. Furthermore, no allowances were made for resale or scrap value.

Table 12-1 provides a summary per section of rehabilitation work. Table 12-2 provides a detailed breakdown of the work anticipated. The total cost estimate for this work is **$5,354,085** CDN. A discount rate of 3% per annum for long-term monitoring and maintenance has been applied.

Table 12-1
Summary of Estimated Costs

	Task Name	Total Cost
01	Shafts, Raises and Open Stopes	$110,464
02	Adits & Decline Portals	$46,861
03	Open Pits	$50,000
04	Underground Mine Workings	$704,941
05	Buildings & Infrastructure	$53,200
06	Machinery, Equipment & Storage Tanks	$43,200
07	Transportation Corridors	$475,184
08	Concrete Structures	$0
09	Chemicals & Wastes	$0
10	Waste Management Sites	$0
11	Contaminated Soils	$220,000
12	Tailings	$0
13	Waste Rock Piles	$974,160
14	Water Impoundment Structures	$17,501
15	Decant Structures	$0
16	Water Courses	$750,001
17	Site Characterization & Closure Environmental Monitoring	$718,698
18	Post Closure & Long Term Site Monitoring	$6,548,385
	Sub Total	**$10,712,596**
	Sub Total - discounted at 3%	**$5,142,046**
	Project Management (4%)	**$205,682**
	Contingency	**$6,357**
	Total	**$5,354,085**

Table 12-2
Detailed Closure Cost Summary

Task ID	Item Description	Total Cost	Operation / Production (2012-2019)	Closure Implementation (2020-2022)	Long Term Monitoring and Maintenance (2023-2122)
01A	Gold Mine Tour Raise r334 (20092w7 Raise) - Foundation Investigation (2050)	**$7,500**	$0	$0	$7,500
01A	Gold Mine Tour Raise r334 (20092w7 Raise) - Ground Preparation for Cap Installation (2050)	**$7,500**	$0	$0	$7,500
01A	Gold Mine Tour Raise r334 (20092w7 Raise) - Construction of Concrete Monolithic Cap (2050)	**$45,001**	$0	$0	$45,001
01A	Gold Mine Tour Raise r334 (20092w7 Raise) - Backfill with Soil Cover (2050)	**$300**	$0	$0	$300
01B	Physical Stability Monitoring - Routine Inspections of Mine Workings Outside Control Berm (2011-2019)	**$20,240**	$20,240	$0	$0
01B	Physical Stability Monitoring (Operation) - Geotechnical Inspections of Mine Workings Outside Control Berm (2017)	**$19,878**	$19,878	$0	$0
02A	Hollinger Mine Portal (Gold Mine Tour) - Engineering Design of Portal Backfill (2050)	**$10,045**	$0	$0	$10,045
02A	Hollinger Mine Portal (Gold Mine Tour) - Foundation Investigation (2050)	**$7,500**	$0	$0	$7,500
02A	Hollinger Mine Portal (Gold Mine Tour) - Backfill Portal (2050)	**$29,316**	$0	$0	$29,316
03A	Geotechnical Review and Certification of Long Term Pit Wall Stability (2020)	**$50,000**	$0	$50,000	$0
04A	Mine Workings Outside Control Berm - Installation of 6-gauge Fencing (2011-2019)	**$440,890**	$440,890	$0	$0
04A	Mine Workings Outside Control Berm - Installation of Danger Signs on Fencing (2011-2019)	**$4,050**	$4,050	$0	$0
04B	Geotechnical Review and Certification of Crown Pillars Covered by Environmental Control Berm (2012)	**$260,001**	$260,001	$0	$0
05A	Temporary Buildings - Dismantle/Salvage/Remove (2020)	**$43,200**	$0	$43,200	$0
05B	Power Distribution System - Removal/Salvage (2020)	**$10,000**	$0	$10,000	$0
06A	Machinery, Equipment and Storage Tanks - Removal/Salvage (2020)	**$43,200**	$0	$43,200	$0
07A	Site Roads - Regrading, Resloping and General Site Grading and Scarifying (2020)	**$3,000**	$0	$3,000	$0
07A	Site Roads - Surface Prep and Seeding (2020)	**$17,700**	$0	$17,700	$0
07B	Transportation Corridor - Regrading, Resloping and Scarifying (2020)	**$14,400**	$0	$14,400	$0
07B	Transportation Corridor - Surface Prep and Seeding (2020)	**$84,960**	$0	$84,960	$0
07B	Transportation Corridor - Apply Intermittent Soil Cover (2020)	**$4,982**	$0	$4,982	$0
07C	Goldmine and Vipond Road Overpasses - Excavate and Remove Rock Overpass (2020)	**$320,143**	$0	$320,143	$0
07D	Site Drainage Culverts - Removal (2020)	**$30,000**	$0	$30,000	$0
11A	Contaminated Soils - Excavation and Disposal (2020)	**$220,000**	$0	$220,000	$0
13A	Environmental Control Berm and Waste Rock Piles - Place, Spread and Seed biosolids (2020)	**$974,160**	$0	$974,160	$0
14A	Settling Pond - Dredging and Transfer of Sediments (2020)	**$2,501**	$0	$2,501	$0
14A	Settling Pond - Breaching and Regrading Dyke to Ground (2020)	**$15,000**	$0	$15,000	$0
16A	Hollinger Mine Workings Groundwater Level Control - Connection to Skynner Creek (2020)	**$750,001**	$0	$750,001	$0
17A	Chemical Stability Monitoring - Surface Water (2020-2022) - 9 stations quarterly	**$34,272**	$0	$34,272	$0
17A	Chemical Stability Monitoring - Surface Water Flow Monitoring (2020-2022) - 3 stations quarterly	**$3,960**	$0	$3,960	$0
17B	Chemical Stability Monitoring - Ground Water (2020-2022) - 13 stations quarterly	**$49,504**	$0	$49,504	$0
17C	Chemical Stability Monitoring - Geochemical Characterization (2020)	**$50,000**	$0	$50,000	$0
17D	Chemical Stability Monitoring - Study of Long Term Ground Water Conditions (2020)	**$50,000**	$0	$50,000	$0
17E	Biological Stability Monitoring - Aquatic Habitat Inventory & Characterization Study (2022)	**$29,975**	$0	$29,975	$0
17F	Biological Stability Monitoring - Terrestrial Habitat Inventory & Characterization Study (2022)	**$29,975**	$0	$29,975	$0
17G	Physical Stability Monitoring - Geotechnical Inspection of Site (2022)	**$19,878**	$0	$19,878	$0
17H	Annual Report Submitted to Director (2020-2022)	**$119,900**	$0	$119,900	$0
17I	Barrier Maintenance (Fencing) - Environmental Control Berm (2020-2022)	**$195,951**	$0	$195,951	$0

Task ID	Item Description	Total Cost	Operation / Production (2012-2019)	Closure Implementation (2020-2022)	Long Term Monitoring and Maintenance (2023-2122)
17I	Barrier Maintenance (Danger Signs) - Environmental Control Berm (2020-2022)	**$1,800**	$0	$1,800	$0
17J	Barrier Maintenance (Fencing) - Mine Workings Outside Control Berm (2020-2022)	**$132,267**	$0	$132,267	$0
17J	Barrier Maintenance (Danger Signs) - Mine Workings Outside Control Berm (2020-2022)	**$1,215**	$0	$1,215	$0
18A	Chemical Stability Monitoring - Surface Water (2023-2032) - 9 stations quarterly	**$114,240**	$0	$0	$114,240
18A	Chemical Stability Monitoring - Surface Water (2033-2042) - 3 stations quarterly	**$38,080**	$0	$0	$38,080
18A	Chemical Stability Monitoring - Surface Water Flow Monitoring (2023-2042) - 3 stations	**$26,400**	$0	$0	$26,400
18B	Chemical Stability Monitoring - Ground Water (2023-2032) - 13 stations quarterly	**$165,014**	$0	$0	$165,014
18C	Biological Stability Monitoring - Aquatic Habitat Inventory & Characterization Study (2025)	**$29,975**	$0	$0	$29,975
18C	Biological Stability Monitoring - Aquatic Habitat Inventory & Characterization Study (2028)	**$29,975**	$0	$0	$29,975
18C	Biological Stability Monitoring - Aquatic Habitat Inventory & Characterization Study Post Pit Flooding (2031)	**$29,975**	$0	$0	$29,975
18C	Biological Stability Monitoring - Aquatic Habitat Inventory & Characterization Study Post Pit Flooding (2034)	**$29,975**	$0	$0	$29,975
18C	Biological Stability Monitoring - Aquatic Habitat Inventory & Characterization Study Post Pit Flooding (2037)	**$29,975**	$0	$0	$29,975
18D	Biological Stability Monitoring -Terrestrial Habitat Inventory & Characterization Study (2027)	**$29,975**	$0	$0	$29,975
18D	Biological Stability Monitoring - Terrestrial Habitat Inventory & Characterization Study (2032)	**$29,975**	$0	$0	$29,975
18D	Biological Stability Monitoring - Terrestrial Habitat Inventory & Characterization Study (2037)	**$29,975**	$0	$0	$29,975
18E	Physical Stability Monitoring - Routine Inspections and field work (2023-2122)	**$352,000**	$0	$0	$352,000
18F	Physical Stability Monitoring - Geotechnical Inspection of Site (2027)	**$19,878**	$0	$0	$19,878
18F	Physical Stability Monitoring - Geotechnical Inspection of Site (2037)	**$19,878**	$0	$0	$19,878
18F	Physical Stability Monitoring - Geotechnical Inspection of Site (2047)	**$19,878**	$0	$0	$19,878
18F	Physical Stability Monitoring - Geotechnical Inspection of Site (2057)	**$19,878**	$0	$0	$19,878
18F	Physical Stability Monitoring - Geotechnical Inspection of Site (2067)	**$19,878**	$0	$0	$19,878
18F	Physical Stability Monitoring - Geotechnical Inspection of Site(2077)	**$19,878**	$0	$0	$19,878
18F	Physical Stability Monitoring - Geotechnical Inspection of Site (2087)	**$19,878**	$0	$0	$19,878
18F	Physical Stability Monitoring - Geotechnical Inspection of Site (2097)	**$19,878**	$0	$0	$19,878
18F	Physical Stability Monitoring - Geotechnical Inspection of Site (2107)	**$19,878**	$0	$0	$19,878
18F	Physical Stability Monitoring - Geotechnical Inspection of Site (2117)	**$19,878**	$0	$0	$19,878
18G	Barrier Maintenance - Environmental Control Berm (2023-2032)	**$653,170**	$0	$0	$653,170
18G	Barrier Maintenance - Mine Workings Outside Control Berm (2023-2122)	**$4,408,898**	$0	$0	$4,408,898
18H	Annual Reporting Submitted to Director (2023-2042)	**$352,000**	$0	$0	$352,000
	Sub Total	**$10,712,596**	**$745,059**	**$3,301,944**	**$6,665,592**
	Sub Total - discounted (3%)	**$5,142,046**			
	Project Management (4%)	**$205,682**			
	Contingency (balance between 2006 and 2011 costs)	**$6,357**			
	TOTAL	**$5,354,085**			

13.0 FORM OF FINANCIAL ASSURANCE

13.1 Form and Amount of Financial Assurance

Financial assurance for closure of the Hollinger Mine Site has been provided to the Crown, as represented by MNDMF, in the form of an irrevocable letter of credit for **5,354,085 $** CND under the 2006 filed Closure Plan. As this amendment has estimated closure costs equivalent to that provided in 2006 and thus no additional financial assurance will be provided.

Goldcorp recognizes that closure costs must be reassessed to determine present-time rates within the terms of the *Mining Act* Regulations. Any addition to, or refunding of, financial assurances would be undertaken following acceptance of the assessment report and discussions with the Director, MNDMF.

13.2 Financial and Commercial Information

Information for this subsection of the Closure Plan shall be provided by Goldcorp, which will include all financial and commercial information used to establish the financial assurance, and is being submitted under a separate cover, as required.

14.0 ABORIGINAL AND PUBLIC CONSULTATION

Reasonable and good faith consultation with appropriate representatives of Aboriginal communities, as well as with the public, is required for certain proposed mine expansion projects. The consultation program related to this Closure Plan Amendment entailed, among other things, providing plain language summaries of the Hollinger Project, open houses, meetings, technical documents, flyers, information on our website (www.porcupinegoldmines.ca), data and available representatives at the Hollinger Project Information Centre, and notification of availability of the foregoing sources of information, to the communities of interest.

Goldcorp continues to actively engage with the City of Timmins, Aboriginal communities, and local residents on the Hollinger Project.

14.1 City of Timmins

Consultation with municipal government agencies and councils is pivotal for any urban-based project. Since early in the Hollinger Project's inception, the City of Timmins has been consulted in an effort to obtain a positive working relationship with the community and the municipality. Various branches of the municipal government have also attended meetings and been consulted by Goldcorp. These include:

- City of Timmins and Council (January 10, 2011, January 25, 2010, September 29, 2008, July 23, 2007, March 26, 2007);
- Timmins Chamber of Commerce;
- Timmins Economic Development Council; and
- Mattagami Region Conservation Authority.

Numerous inter-agency meetings were held with municipal and provincial regulators. These meetings are summarized in the Hollinger Project Environmental Review Report submitted to the regulators in December 2010. Goldcorp has carefully considered the comments and responses it has received from municipal government agencies and councils in preparing this Closure Plan Amendment.

14.2 General Public

Throughout the planning and development of the Project, PGM has been consulting with the general public in order to solicit interest and respond to questions or concern its members may have. The newly renovated and updated Hollinger Project Information Centre will allow for people to talk with PGM's company staff on a one-to-one basis and find out more details about the Project and how it may affect them.

Goldcorp recognizes the importance of community consultation as part of its ongoing activities. To date, Goldcorp has held two rounds of public open houses on the project. Notices for these events were posted in the Timmins Daily and broadcast over the radio. These events were held on October 1, 2009 and May 19, 2010. Additional open houses are planned to provide information to the community and to support various permit requirements. As well, the Hollinger Project Information Centre and the website (www.porcupinegoldmines.ca) will continue to provide the community with other avenues to information.

During the May 19 Open House, poster displays providing details on proposed designs, anticipated environmental effects and mitigation strategies were setup around the room. Over 300 individuals attended the session. Individuals were encouraged to wander the room and ask questions of the numerous project team members that were on hand to answer any questions and to provide further detail.

Individuals were also invited to complete a questionnaire to provide feedback on the project and gather interest in participation in a CAC. Of the 282 completed questionnaires that were returned, 47% had comments in support of the Hollinger Project, 46% had no comments, and 7% had comments and/or concerns. Of the responses received, 33 individuals expressed an interested in volunteering to form a CAC.

While the returned questionnaires provided a significant response in support of the Project for the community, a summary of specific concerns and responses is provided below. The majority of the concerns related to the Project's close proximity to existing infrastructure, including residences and other such sensitive receptors. The Project design includes operational management measures, particularly for mine rock storage, aimed at the prevention of effects due to noise, vibration and dust. These measures, including setback distances, operational restrictions and the Environmental Control Berm, will allow the Project to meet MOE guidelines for dust, noise and vibration thresholds at the nearest receptors.

Concerns from the community fell into the following categories:

- Vibration: Vibration, caused by blasting, will be managed in a way to prevent damage to residential and commercial structures and so as to minimize disruptions to people. This will be achieved by limiting the amount of explosives ignited simultaneously (referred to as the 'charge size per delay') and by using electronic detonators to better control blasts. In addition, to minimize disturbance due to blasting, regular blasting will only occur during the daytime. Also, blasting during low-ceiling cloud cover will be avoided as much as practicable.

- Noise: From a noise perspective, the commencement of open pit activities is the most challenging point in time. At that point, equipment will be working at the ground surface and the Environmental Control Berm will not yet have been established. The Project has committed to a combination of working restrictions during the construction period, until the Environmental Control Berm has been built to a height so that these working restriction are no longer required, including limiting open pit activities to daytime hours only as dictated by local Noise by-laws (7:00 a.m. to 10:00 p.m.) and operational setbacks (i.e., limiting activities to areas at specified distances from receptors). An Environmental Control Berm will be established around the Hollinger Site, and potentially along portions of the Transportation Corridor, to minimize noise effects on receptors in close proximity to the Project Site. The design details are not yet final but it is anticipated that an effective berm height in the order of 20 to 30 m would be needed around the major portion of the Project Site to manage noise levels. The berm will be established early on in the construction phase of the Project. The community facing slopes will be vegetated to make the berm visually appealing.

- Dust: The predominant air emissions associated with the Project are expected to be fugitive dust. Due to the proximity of the Project Site to sensitive receptors the following dust prevention measures have been incorporated into Project design. Use of water via water trucks on haul roads or water spray systems on mine rock piles; use of MOE-approved chemical dust suppressants; roadway maintenance, including maintaining a low silt content in roadways; vehicle maintenance; and scheduling of activities.

- Schedule and lifespan:

2011-2012 (approx. 12 Months)	**Pre-construction**	**Accelerated Mine Dewatering Preparatory Work for the Construction Phase**
2011-2014 (approx. 24 months)	Construction	• Overburden stripping • Construction of the Environmental Control Berm and Transportation Corridor • Developing the ramp to the CPZ UG operation and building the supporting infrastructure
2012-2020 (approx. 8 years)	Operations	• Developing the ramp to the Millerton UG operation • Establishing the shafts if required • Mining from the open pit and UG operations • Transporting ore to the Dome Mill for processing • Progressive rehabilitation of mined out open pits
2020-2023 (approx. 3 years)	Closure	• Closing and stabilizing Project infrastructure • Installing post-closure water management infrastructure • Rehabilitating the Project Site and the Transportation Corridor

- Safety: PGM is committed to upholding the highest standards in health and safety. This means providing a safe environment for its community and employees. This also means being environmentally responsible for its actions. PGM continues to set goals that assist in restoring the past, growing the present and investing in the future of not only the company, but the environment and the local community as well.

- Closure and Future Use: The principal focus of closure activities will be to secure the Project Site for safety purposes, and, where appropriate, to render the property suitable for other potential uses focusing on local recreation opportunities. The Project intends to engage the community in end land use planning to support the return of the land to a usable, community-friendly multi-purpose space. As a means of enhancing the community's mining character at closure, a plan will be created to develop infrastructure such as a park or monument to commemorate the Hollinger legacy on the Project Site. Full reclamation of the site at closure is planned and will involve consultation with the City and the community. At closure the Project Site will be fully revegetated, with exception of the pit lake. Upon closure the Transportation Corridor would be scarified and allowed to revegetate naturally or, alternatively, it would be turned over to the City of Timmins. The site will become an urban park, complete with waterfront, walking trails, and be available for other recreational uses.

It was determined that in order to better engage the general public, a more structured forum would be beneficial. At the May 19 and 20th 2010 Open House in Timmins, Goldcorp solicited participation from the community to sit on and contribute to the Hollinger Project Community Advisory Committee (HPCAC). The initial response was very positive, with over 30 members of the community attending the first few meetings. A dedicated group of 17 individuals continue to make up this active committee, the majority of whom attended at the most recent January 20, 2011 Open House in Timmins as a separate opportunity to gather community feedback on the project. This recent Open House had very good community participation, with over 300 people attending in person.

Goldcorp has carefully considered the comments and responses it has received from the general public in preparing this Closure Plan Amendment.

14.3 Aboriginal Peoples

Goldcorp has committed, and will continue, to seek meaningful and mutually beneficial relationships with Aboriginal people in the vicinity of the Hollinger Project. Goldcorp's efforts to date, to foster these relationships are not described in this Closure Plan Amendment. Given the Crown's duty to consult Aboriginal people when the Crown has the knowledge of the potential existence of an Aboriginal right or title and contemplates conduct that might adversely affect it, and the requirements under the Mining Act, Goldcorp conducted consultation with local Aboriginal peoples, including those identified by MNDMF as communities of interest. To that end, Goldcorp has provided various notifications to the Aboriginal communities which may potentially be affected by the Hollinger Project. Discussions carried out and the notifications provided to date are summarized in the following table:

Community of Interest	Nature of Consultation	Date
Wabun Tribal Council	- Open House – Notification and Invitation	May 10, 2010
	- Open House, Timmins, Ontario	May 19 & 20, 2010
	- Delivery of Hollinger Draft Environmental Review Report for discussion	May 2010
	- Meeting and Invitation to Consultation	July 5, 2010
	- Delivery of Permit to Take Water & Certificate of Approval Amendment for discussion	November 8, 2010
	- Delivery of Hollinger Final Environmental Review Report for discussion	December 21, 2010
	- Open House – Notification and Invitation	January 12, 2011
	- Open House, Timmins, Ontario	January 20, 2011
	- Delivery of Hollinger Closure Plan Amendment for discussion	February 1, 2011
Flying Post First Nation	- Open House – Notification and Invitation	May 10, 2010
	- Meeting in Timmins and Invitation to Consultation	May 11, 2010
	- Open House, Timmins, Ontario	May 19 & 20, 2010
	- Delivery of Hollinger Draft Environmental Review Report for discussion	May 2010
	- Delivery of Permit to Take Water & Certificate of Approval Amendment for discussion	November 8, 2010
	- Delivery of Hollinger Final Environmental Review Report for discussion	December 21, 2010
	- Open House – Notification and Invitation	January 12, 2011
	- Open House, Timmins, Ontario	January 20, 2011
	- Delivery of Hollinger Closure Plan Amendment for discussion	February 1, 2011
Matachewan First Nation	- Open House – Notification and Invitation	May 10, 2010
	- Open House, Timmins, Ontario	May 19 & 20, 2010
	- Delivery of Hollinger Draft Environmental Review Report for discussion	May 2010
	- Delivery of Permit to Take Water & Certificate of Approval Amendment for discussion	November 8, 2010
	- Delivery of Hollinger Final Environmental Review Report for discussion	December 21, 2010
	- Open House – Notification and Invitation	January 12, 2011
	- Open House, Timmins, Ontario	January 20, 2011
	- Delivery of Hollinger Closure Plan Amendment for discussion	February 1, 2011
Mattagami First Nation	- Open House – Notification and Invitation	May 10, 2010
	- Open House, Timmins, Ontario	May 19 & 20, 2010
	- Visit to Community and Invitation to Consultation	May 17, 2010
	- Delivery of Hollinger Draft Environmental Review Report for discussion	May 2010
	- Delivery of Permit to Take Water & Certificate of Approval Amendment for discussion	November 8, 2010

Community of Interest	Nature of Consultation	Date
	• Delivery of Hollinger Final Environmental Review Report for discussion	December 21, 2010
	• Open House – Notification and Invitation	January 12, 2011
	• Open House, Timmins, Ontario	January 20, 2011
	• Delivery of Hollinger Closure Plan Amendment for discussion	February 1, 2011
Wahgoshig First Nation	• Open House – Notification and Invitation	May 10, 2010
	• Open House, Timmins, Ontario	May 19 & 20, 2010
	• Delivery of Hollinger Draft Environmental Review Report for discussion	May 2010
	• Visit to community and Invitation to Consultation	July 28, 2010
	• Delivery of Permit to Take Water & Certificate of Approval Amendment for discussion	November 8, 2010
	• Delivery of Hollinger Final Environmental Review Report for discussion	December 21, 2010
	• Open House – Notification and Invitation	January 12, 2011
	• Open House, Timmins, Ontario	January 20, 2011
	• Delivery of Hollinger Closure Plan Amendment for discussion	February 1, 2011
Métis Nation of Ontario	• Consultation meeting and visit to Hollinger Project	August 11, 2009
	• Goldcorp attendance at MNO Workshop	January 1, 2010
	• Open House – Notification and Invitation	May 10, 2010
	• Open House, Timmins, Ontario	May 19 & 20, 2010
	• Delivery of Hollinger Draft Environmental Review Report for discussion	May 2010
	• Delivery of Permit to Take Water & Certificate of Approval Amendment for discussion	November 8, 2010
	• Delivery of Hollinger Final Environmental Review Report for discussion	December 21, 2010
	• Open House – Notification and Invitation	January 12, 2011
	• Open House, Timmins, Ontario	January 20, 2011
	• Delivery of Hollinger Closure Plan Amendment for discussion	February 1, 2011

Please see Appendix E for copies of notifications.

To date, Goldcorp has not received any written comments or responses from the above listed Aboriginal communities of interest specific to the Hollinger Project. To the extent it received other comments or responses, Goldcorp has carefully considered these in preparing this Closure Plan Amendment.

Since the 2010 Closure Plan Amendment submission on February 4, 2011, Goldcorp has had two (2) formal meetings with Wabun Tribal Council and the four Communities of Interest. These meetings have focused on building relationships and reviewing a format for a mutual partnership Agreement