APPENDIX M

HYDROLOGY TECHNICAL SUPPORT DOCUMENTS

M-1 Baseline Hydrology Report
M-2 Mine Site Water Balance
M-3 Receiver Water Balance

Receiver Water Balance Report

Springpole Gold Project

First Mining Gold Corp.

ONS2104

Prepared by:
WSP Canada Inc.

October 2024

Receiver Water Balance Report
Springpole Gold Project

Red Lake District, Northwest Ontario
Project #ONS2104

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LIST OF ACRONYMS AND ABBREVIATIONS

°C	degrees Celsius
Ausenco	Ausenco Engineering Canada Inc.
CDF	co-disposal facility
CWSP	central water storage pond
DFO	Fisheries and Oceans Canada
ECCC	Environment and Climate Change Canada
EDF	Environmental Design Flood
EIS/EA	Environmental Impact Statement / Environmental Assessment
ETP	effluent treatment plant
FMG	First Mining Gold Corp.
ha	hectares
km	kilometres
m	metres
m/s	metres per second
masl	metres above sea level
m^2	square metres
m^3	cubic metres
m^3/day	cubic metres per day
m^3/hr	cubic metres per hour
m^3/s	cubic metres per second
mm	millimetres
Mm^3/year	million cubic metres per year
NAG	non-potentially acid generating
PAG	potentially acid generating
PFS	Prefeasibility Study
Project	Springpole Gold Project
RCP	Representative Concentration Pathways
ROCs	Annual Runoff Coefficients
STP	sewage treatment plant
tpd	tonnes per day
WSP	WSP Canada Inc.
WSC	Water Survey of Canada

1.0 INTRODUCTION

First Mining Gold Corp. (FMG) proposes to develop, operate and eventually decommission / close an open pit mine and ore process plant with supporting facilities known as the Springpole Gold Project (Project). The Project is located in a remote area of northwestern Ontario, approximately 110 kilometres (km) northeast of the Municipality of Red Lake and 145 km north of the Municipality of Sioux Lookout, shown in Figure 1-1.

An environmental assessment (EA) pursuant to the *Canadian Environmental Assessment Act*, 2012 and the Ontario *Environmental Assessment Act* is required to be completed for the Project. This document is part of a series of modeling / assessment reports prepared by WSP Canada Inc. (WSP) on behalf of FMG to describe the changes in environmental conditions.

During the consultation process, Project-specific input from regulatory agencies and Indigenous communities was considered at key milestones of the EA process including baseline studies, alternatives, assessment approach, mitigation and monitoring where appropriate. An overview of the consultation input that was considered during the effects assessment in relation to this report is summarized in the final Environment Impact Statement / Environmental Assessment (EIS/EA). The updated hydrological modeling, presented in this report, includes additional simulations, outputs, and discussion based on the additional field data/information collected since the preparation of the draft EIS/EA.

The intent herein is to describe surface water modeling activities that have been conducted in support of the final EIS/EA. This report supersedes the receiver water balance report prepared for the draft EIS/EA (Wood 2022). This report is accompanied by an updated hydrology baseline conditions report Appendix M-1 of the EIS/EA), which provides a comprehensive summary of the hydrological data on which the receiver water balance model described in this report is based. This report also includes additional analyses and discussion based on feedback provided by government agencies and Indigenous communities.

1.1 Purpose and Objective of the Report

This Receiver Water Balance Report has been prepared to:

1. Model the potential changes in flow conditions (compared to existing / natural conditions) in the receiving environment considering the mine site construction, operations, active closure – pit filling period, active closure – post pit filling contingency, and post-closure phases; under average, 1:100 wet and 1:100 dry year climatic conditions; and
2. To provide the basis of the receiver water quality model and assessment.

The receiver water balance relies on information from the Hydrology Baseline Report (WSP 2023a) as well as other Project modeling exercises which are being developed concurrently, such as the hydrogeologic modeling (WSP 2023b) and the mine site water balance (WSP 2023c). The receiver water balance will provide information to the receiving environment water quality model to support the environmental assessment.

This report summarizes the methodology, inputs, assumptions, and results of the receiver water balance assessment only. The other models are presented under separate titles.

1.2 Project Overview

The ore body is located under a small portion of the north basin of Springpole Lake. To allow for the development and safe operation of the open pit mine, two dikes (west dike and east dike) will be established to facilitate controlled dewatering of the open pit basin. Ore from the open pit will be processed in an on-site process plant at approximately 30,000 tonnes per day (tpd). Tailings resulting from the processing of ore will be stored in a co-disposal facility (CDF).

The main components of the Project include:

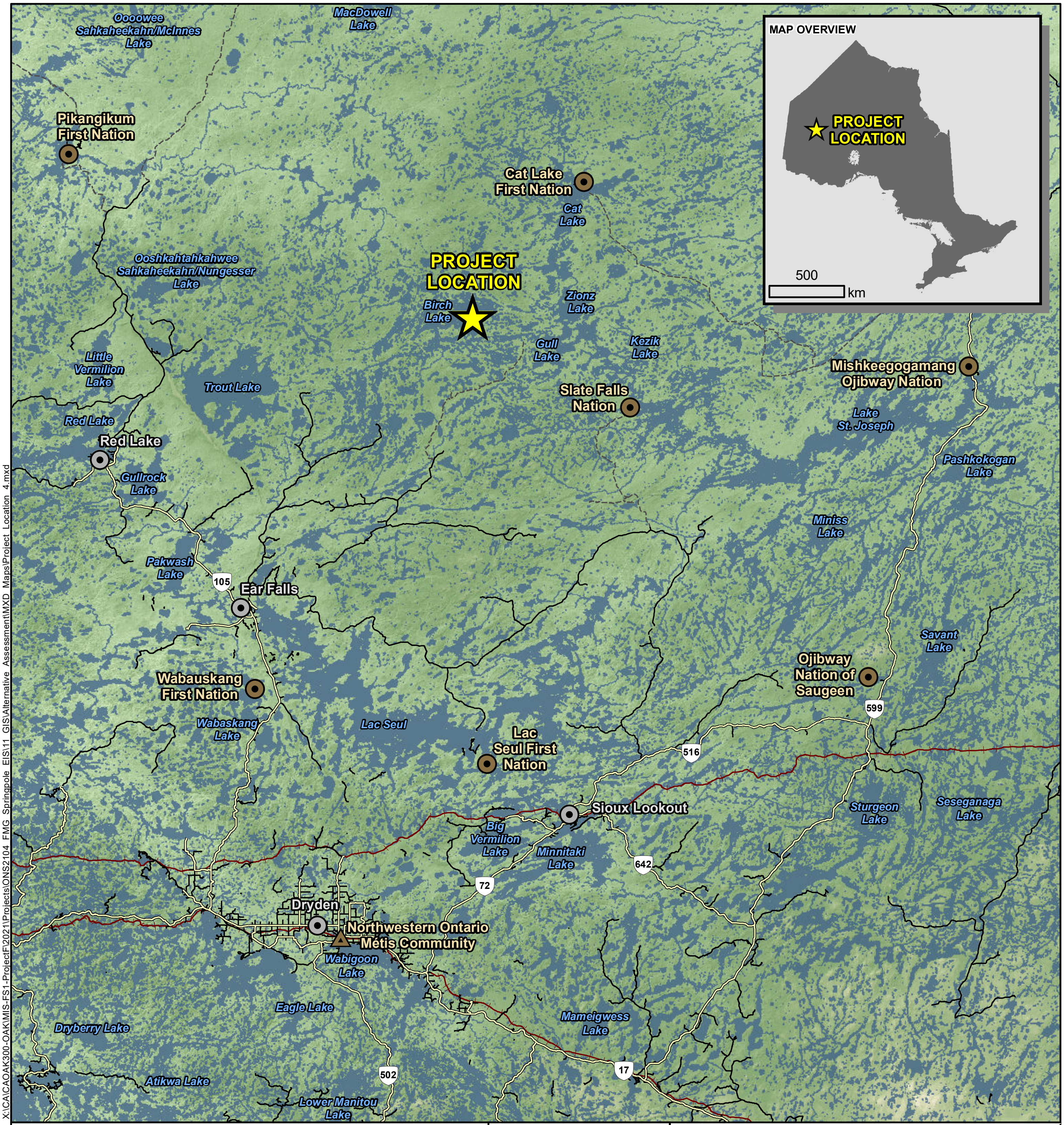
- Open pit;
- Dikes;
- CDF for waste mine rock and tailings (north cell and south cell);
- Surficial soil stockpile;
- Ore stockpiles;
- Process plant complex;
- Buildings and supporting infrastructure;
- Explosives storage facility;
- Water management and treatment facilities;
- Fish habitat development area;
- Accommodations complex;
- Aggregate and quarry operation(s);
- Transmission line; and
- Mine access road and co-located airstrip.

The Project is expected to be developed over a three year period during which two dikes will be constructed to isolate the open pit basin of Springpole Lake such that after controlled dewatering, mining of the open pit can occur. The mine will be operated for a period of approximately 10 years. Decommissioning and active closure of the site is expected to be up to approximately five years in length and will be followed by a period of post-closure environmental monitoring.

1.3 Background

The local climate and hydrologic conditions of the Project have been characterized in the Hydrology Baseline Report (WSP 2023a). The region where the Project is located is underlain by glaciated terrain, characteristic of the Canadian Shield. Land areas are generally of low relief with less than 30 metres (m) of local elevation, and with numerous lakes and watercourses. The proposed mine site is centered between Springpole Lake and Birch Lake which are both part of the regional Birch Lake watershed (Figure 1-2).

The Springpole Lake local subwatershed area is approximately 97.5 km^2, however Springpole Lake receives significant inflow from an upstream drainage area via Cromarty Lake. The total area reporting to the Springpole Lake outlet is approximately 1,372 km^2. Birch Lake is a regional lake, upstream of Springpole Lake, with a watershed area of approximately 1,054 km^2. The elevation of the surface water in Birch Lake is approximately 1.8 m to 2.3 m higher than the water in Springpole Lake, depending on the season (WSP 2023a).



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LEGEND

- Project Location
- Town
- First Nation Reserve
- Northwestern Ontario Métis Community
- Highway
- Secondary Road
- Resource / Winter Road
- Railway

0 12.5 25 50 75 100 Kilometres

NOTES:
- Topographic information extracted from LIO, MNRF.

Datum: NAD83
Projection: UTM Zone 15N

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SPRINGPOLE GOLD PROJECT

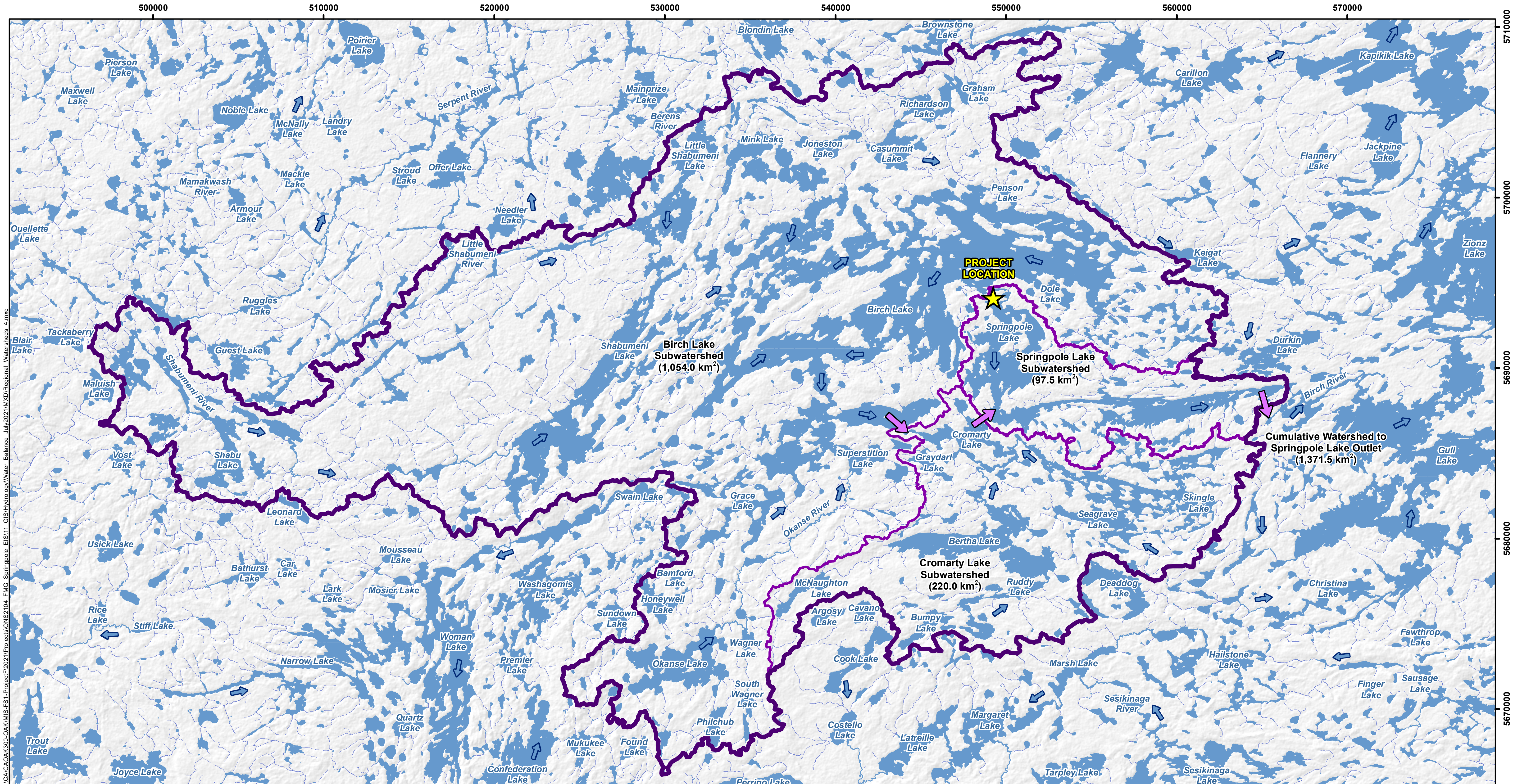
Project Location

PROJECT Nº: ONS2104

FIGURE: 1-1

SCALE: 1:1,500,000

DATE: September 2024



LEGEND

- Project Location
- Cumulative Watershed to Springpole Lake Oulet (1,371.5 km^2)
- Subwatershed (Labelled with Name and Local Area)
- Watercourse
- Waterbody
- Flow Direction
- Watershed Outlet Flow Direction

0 5 10 20 30 40 50 Kilometres

NOTES:
- Topographic information extracted from LIO, MNRF.
- Watershed delineations based on data provided by Aquaspheara, data obtained through the Ontario Flow Assessment Tool (OFAT) and LiDAR provided by First Mining Gold, 2020.

Datum: NAD83
Projection: UTM Zone 15N

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SPRINGPOLE GOLD PROJECT

Regional Watershed Areas

PROJECT N^o: ONS2104	FIGURE: 1-2
SCALE: 1:210,000	DATE: November 2023

2.0 METHODS

The receiver water balance model simulates monthly flows at various modeling nodes surrounding the mine site. These nodes were strategically placed in areas where changes to water quantity or quality may be observed as a result of the Project. These include nodes in the Birch Lake and Springpole Lake watersheds, including small inland water bodies within and adjacent to the Project footprint. A detailed description of the selection of these nodes is provided in Section 3.1. Changes to average monthly flows as a result of the various Project phases were simulated for average, wet and dry years in comparison to the existing conditions. A high-level climate change scenario was also carried out for the post-closure phase.

Each phase and climate condition has been assessed on a monthly basis, as a single-year snapshot.

2.1 Overview

Five phases were identified for calculating flow in the receiving environment over the life of the Project. These phases are:

- Construction;
- Operations;
- Active Closure - Pit Filling Period;
- Active Closure – Post Pit Filling Contingency; and
- Post-Closure.

The existing conditions, representative of the current conditions, prior to the development of the Project, have also been simulated. The Project area is considered to be natural / undisturbed.

Surface water management infrastructure such as ditching, berms and pumps are required to convey contact water to water storage facilities for re-use, or for treatment and discharge. The Project's water management system will be designed to manage the Environmental Design Flood (EDF) without discharge of untreated water to the environment. The EDF has been defined as a flood event with a 1:100 year return period for infrastructure that will exist throughout the operations and closure Project phases. A lower design event may be selected for water management features which will exist throughout the temporary construction phase only (consistent with other mining projects in Northern Ontario).

The total collection area associated with the Project site, defined by the sub-watersheds is 984.8 hectares (ha). All contact water from the Project mine site development area will be captured and managed by the water management system throughout all Project phases. This includes all haul roads but excludes the access road and effluent pipeline corridor.

The following sections describe water management during the various phases, in greater detail.

2.2 Construction Phase

Years -3 to -1 of the Project are referred to as the construction phase. This phase is representative of the period during which pre-operation activities are carried out, such as ground clearing, construction of the mine site facilities, construction of the dikes, and controlled dewatering of the open pit basin. For the purposes of supporting the EIS/EA effects assessment, this model considers a conservative year of construction during which:

- The mine site footprint has been developed to its full extent.

- Controlled dewatering of the open pit basin is in progress and discharging to the north basin of Springpole Lake, or to the Central Water Storage Pond (CWSP) at the maximum allowable rate (up to 10% of Springpole Lake inflows).
- All excess site contact water (outside of the open pit basin) is directed to the CWSP which will feed the Effluent Treatment Plant (ETP). Treated water is discharged to the southeast arm of Springpole Lake.
- Fresh water takings from Birch Lake will be equal to the demand from the accommodations complex, and Sewage Treatment Plant (STP) discharge to the southeast arm of Springpole Lake.

This combination of simulated conditions is considered conservative as it is expected to generate the greatest change to receiving environment flow conditions. It is unlikely that all the above conditions will occur at the same time. Furthermore, the need to collect and treat all water (with ETP discharge to the southeast arm of Springpole Lake) may not be necessary during the entirety of the construction phase as the site will be developed progressively.

2.3 Operations Phase

Operations represents the 10-year period during which the open pit is mined to supply ore for the process plant. This assessment used the final year of the operations phase (i.e., Year 10 of operations) for both average and wet climate conditions and the first year of the operations phase for dry climate condition. This allows for a conservative estimate for all climate conditions. During the final year, the mine site and its features are operated at their maximum extent, and freshwater withdrawals from Birch Lake are required to support the process plant and supply the water needs of the accommodations complex. The intake for fresh water supply will be screened to meet Fisheries and Oceans Canada (DFO) requirements. Site contact water is collected in local collection ponds, within each sub-watershed. All contact water from these local collection ponds, that is not required by the process plant or mine operations, is ultimately conveyed to the CWSP. From the CWSP, collected contact water is treated in the ETP prior to discharge into the southeast arm of Springpole Lake. Any domestic wastewater generated from the site is treated in the STP prior to being mixed with ETP effluent and discharged. Potential changes to groundwater baseflow are considered greatest during this phase, due to the zone of influence created by open pit mine area water management, as well as the full development of the CDF and ore stockpiles.

2.4 Decommissioning & Active Closure – Pit Filling Period

Filling of the open pit with water (i.e., the pit filling period) is expected to commence once operations and ore processing have ceased (i.e., after Year 10 of the Project). During the pit filling period, the transfer of water from the open pit mine area to the CWSP will cease. All mine site contact water will continue to be collected and discharged to the southeast arm of Springpole Lake, with the exception of water collected in the open pit mine area (including local runoff, groundwater inflows, and seepage from site facilities). Smaller quantities of fresh water will continue to be sourced from Birch Lake for the accommodations complex during the pit filling period, and the STP discharge will continue to be sent to the southeast arm of Springpole Lake.

Model results demonstrate that approximately five years are required to fill the open pit basin and fish habitat development area to the average natural elevation of Springpole Lake (391 metres above sea level [masl]). During the pit filling period, water will also be drawn from Springpole Lake in a controlled manner with monitoring to expedite filling of the open pit basin. A water taking of 10 percent (%) of the available monthly flow at the inlet of Springpole Lake (outlet of Cromarty Lake on Figure 1-2) has been assumed for the model based on federal guidelines to avoid having a detectible ecological effect on the downstream habitats (DFO 2013). Seepage rates and changes to groundwater baseflow are assumed to be the average of those from the operation and active closure phases.

2.5 Decommissioning & Active Closure – Post Pit-Filling Contingency

The active closure – post pit filling contingency was modeled to simulate a closure scenario in which the quality of the reclaimed open pit basin and the site runoff is not yet suitable for passive discharge to the environment. Therefore, during the active closure – post pit filling contingency, when the open pit basin is filled, excess water from the reclaimed open pit basin and site runoff will be directed to the ETP for treatment before discharge to the environment (at the southeast arm of Springpole Lake) if needed. If water quality of the open pit basin and site runoff is deemed suitable for passive discharge to the environment, as is predicted by the pit lake modelling (Appendix N-3 of the EIS/EA) this contingency plan would not be required, and the site would move directly from the active closure - pit filling period to the post-closure environmental monitoring. Changes to seepage rates and groundwater baseflow are simulated during this contingency phase.

2.6 Post-Closure Phase

The post-closure phase (Years 16+) represents when the site is reclaimed, and water quality of the pit lake and site runoff is acceptable for passive discharge to the environment. At this time, the reclaimed open pit basin will be connected to Springpole Lake through a partial removal of the dikes. The ETP will be decommissioned, and site runoff will passively drain to Birch Lake and Springpole Lake. Adjustments to seepage rates and groundwater baseflow are considered in the modeling. Climate change is also considered for the post-closure phase within the model at a high-level. The Mine Site Water Balance (WSP 2023c) determined that under the high carbon climate change scenario (RCP 8.5) published by Climate Atlas of Canada (Prairie Climate Centre 2019), annual precipitation and temperatures (and therefore evaporation) are expected to increase. This results in a net reduction of runoff compared to current climate conditions. The monthly changes to precipitation and temperature are detailed in the Mine Site Water Balance (WSP 2023c).

3.0 MODELING METHODS

Existing monthly flow conditions at each model node are determined by pro-rating long term flow statistics developed from a representative Water Survey Canada (WSC) station to each node's individual subwatershed area. During each subsequent phase, the mine site collection area (984.8 ha) is overlain with the existing subwatersheds and changes to the areas are determined. Runoff from the remaining natural / undisturbed portions of the subwatersheds are calculated with the same methodology used for existing conditions.

Other hydrological connections to each node are simulated, including changes to groundwater inflows / baseflow, freshwater takings and direct discharge. These are summarized in Section 4.0.

3.1 Model Nodes

To evaluate the potential effects to flow and to support water quality modeling, a total of 10 model nodes were selected within the Birch Lake and Springpole Lake watersheds. Figure 3-1 presents the location of these nodes, their existing conditions subwatershed areas and flow directions.

These nodes were strategically placed in areas where effects to water quantity or quality may be observed as a result of the Project:

- Nodes 1 to 4 simulate flow from the smaller inland water bodies adjacent to the mine site;
- Node 5 is located at the southern end of the Springpole Lake north basin at its connection to the southeast arm of Springpole Lake;
- Nodes 6, 7, and 8 are located within the Birch Lake system, upstream of its entry into Springpole Lake;
- Node 9 is located in the southeast arm of Springpole Lake and is representative of flows at the proposed effluent discharge location; and
- Node 10 is located at the outlet of Springpole Lake.

The nodes are generally located at riverine lake outlets where change in flow is most meaningful in terms of assessing potential effects on aquatic life. The exceptions are Nodes 5, 6, 7, and 8, which are located in the middle of Birch and Springpole Lakes. Flows to these nodes were evaluated to support water quality modeling, and are based on the direct drainage area. However, changes to flow at these nodes are not anticipated to have large impacts on water levels or velocities, as the lakes are outlet controlled. This means that water levels within the lakes are governed by downstream lake outlets, rather than the inflows calculated to the location of the node within the lake. Evidence of this understanding of nodes within lake bodies is provided in Attachment A, which summarizes a dynamic wave routing model developed for Node 5. Node 5 has the largest observed change in flow and as such the assessment provided in Attachment A is a conservative example of expections for the other lake nodes.

Under existing conditions, unnamed lake L-1 typically flows southeast towards Springpole Lake, although a diffuse oulet towards Birch lake indicates that periodically unnamed lake L-1 overflows to Birch Lake, likley dependent on beaver activity. Flows from L-1 will be permanently directed towards Birch Lake during the construction phase to minimize water entering the mine site. This flow direction will continue through all remaining Project phases. To simulate flow at unnamed lake L-1 throughout these phases, model Node 1 was located at the western outlet of L-1 (immediately upstream of Birch Lake).

As the Project progresses, the subwatershed areas reporting to each of the model nodes will change based on the mine site footprint and water management plan for each phase. Throughout the construction, operation, pit filling period and active closure – post pit filling contingency, excess contact water from the mine site area footprint (9.85 km^2) is removed from the existing conditions subwatersheds and is collected, treated and discharged to the southeast arm of Springpole Lake. Figure 3-2 presents the natural watershed areas reporting to each node throughout the mining phases (excluding the mine site footprint). The resulting natural areas reporting to each node during the various phases are summarized in Table 3-1.

3.2 Long-Term Flow Statistics

The nearby WSC station for the Sturgeon River at McDougall Mills (05QA004), located 145 km southeast from the mine site, was determined to be representative of flow conditions for the Project. It has a watershed area of 4,440 km^2. This station was selected based on its length and completeness of records, as well as its alignment with field monitoring data. The basis for selecting this station is described in greater detail in the Hydrology Baseline Report (WSP 2023a).

Table 3-2 presents the monthly and annual runoff statistics (mean, 1st percentile, 99th percentile) for the Sturgeon River at McDougall Mills station (catchment area 4,440 km^2). For the purposes of the receiver water balance, the monthly annualized 1st percentile and 99th percentile flow represents the 1:100 dry and wet year conditions, respectively. These runoff depths are applied to simulate runoff from natural subwatershed areas.

Table 3-1: Natural / Undisturbed Subwatershed Areas by Node

Subwatershed by Node	Existing Conditions (km^2)	Construction / Operations / Active Closure - Pit Filling Period / Active Closure – Post Pit Filling Contingency / Post-Closure (km^2)
Node 1	0.4	0.3
Node 2	0.7	0.5
Node 3	0.3	0.3
Node 4	0.9	0.4
Node 5	31.4	24.9
Node 6	3.4	2.8
Node 7	10.4	9.1
Node 8	761.7	758.3
Node 9	1318.6	1308.7
Node 10	1371.5	1361.7

Note:
Construction / Operations / Active Closure - Pit Filling Period / Active Closure – Post Pit Filling Contingency / Post-Closure areas exclude the developed area occupied by the mine site collection area.

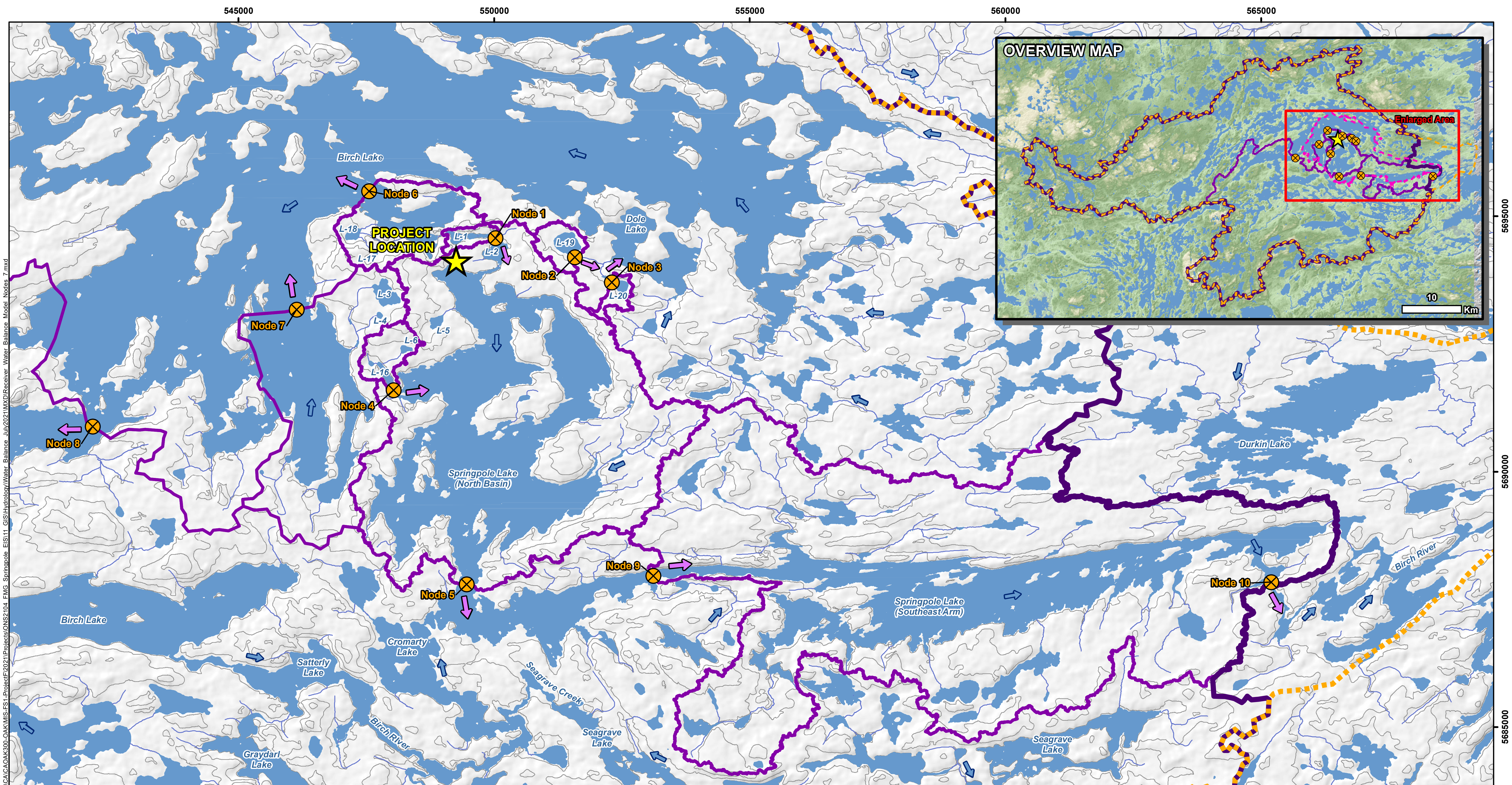
Table 3-2: Monthly and Annual Flow Statistics for Sturgeon River at McDougall Mills (WSC Station 05QA004)

Year	Flow (m^3/s)													Average Annual Runoff (mm)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean	
1961	-	-	-	-	-	-	-	-	19.4	17.3	15.2	14.6	-	-
1962	13.8	12.9	12.0	12.3	40.6	62.8	40.1	43.1	47.7	29.7	22.1	24.5	30.2	214.5
1963	21.9	17.5	14.9	19.8	33.2	60.2	52.0	43.8	27.9	17.4	12.8	13.4	28.0	198.9
1964	14.2	15.7	14.3	22.0	122.0	70.3	69.3	59.0	128.0	92.0	51.1	34.3	57.8	410.6
1965	26.6	21.3	19.9	19.5	54.5	62.9	52.5	35.1	26.9	49.5	51.4	39.6	38.4	272.8
1966	32.1	26.8	21.7	24.2	112.0	133.0	76.0	42.1	24.1	15.3	14.8	14.6	44.8	318.3
1967	14.4	14.2	14.0	24.8	71.2	81.9	51.6	44.1	28.4	17.1	15.5	15.1	32.8	233.0
1968	14.8	14.4	13.9	24.2	99.4	155.0	93.0	79.8	62.2	58.9	57.0	36.7	59.2	420.6
1969	29.4	28.1	22.5	30.9	73.2	114.0	71.0	75.7	66.6	60.8	44.7	36.5	54.5	387.2
1970	27.6	22.6	20.1	18.7	80.1	83.9	49.4	38.3	61.7	70.5	70.4	45.9	49.2	349.5
1971	37.2	30.1	23.6	34.8	77.1	81.8	51.5	30.3	25.0	71.3	134.0	67.1	55.3	392.9
1972	42.6	31.0	25.4	21.8	63.7	44.4	32.6	26.2	18.1	23.4	26.8	22.1	31.6	224.5
1973	18.2	15.8	15.9	21.2	44.8	37.9	51.6	47.3	42.7	47.8	40.4	31.3	34.7	246.5
1974	24.7	21.1	19.1	23.0	129.0	160.0	60.4	26.5	33.7	37.9	35.0	29.6	50.0	355.2
1975	26.4	23.5	20.5	28.9	81.2	60.5	38.6	25.8	18.2	16.8	21.9	18.0	31.8	225.9
1976	15.4	13.8	13.3	44.3	66.0	37.5	30.3	15.7	9.3	6.7	5.0	4.8	21.8	154.9
1977	4.8	5.0	6.5	12.0	29.0	34.7	35.4	24.3	31.9	33.9	23.1	22.4	22.0	156.3
1978	19.6	17.1	14.4	15.2	73.9	116.0	61.5	43.0	35.5	29.0	20.1	17.2	38.6	274.2
1979	14.8	13.4	14.2	21.6	82.8	57.7	38.0	31.1	46.0	32.0	50.7	35.9	36.6	260.0
1980	26.4	24.0	20.1	23.6	50.3	26.9	14.8	13.7	18.1	25.9	27.9	20.9	24.4	173.3
1981	16.8	14.7	13.8	20.5	34.2	41.8	54.9	26.3	13.6	10.4	10.0	10.4	22.4	159.1
1982	10.5	10.5	10.4	11.7	56.5	60.5	42.1	35.9	25.7	37.0	38.0	29.6	30.8	218.8
1983	23.4	19.3	17.8	17.2	29.8	43.2	47.0	32.2	18.6	14.4	15.0	17.7	24.7	175.5
1984	17.7	16.7	15.1	26.2	69.2	74.6	57.4	42.6	25.1	18.9	20.6	24.3	34.1	242.3
1985	23.5	18.8	15.5	37.6	177.0	113.0	106.0	70.2	73.9	100.0	62.5	42.4	70.5	500.9
1986	29.6	22.6	18.4	35.1	103.0	52.7	28.3	21.5	17.7	29.2	25.0	20.6	33.7	239.4
1987	16.2	13.2	11.5	16.4	20.3	19.9	13.3	12.2	12.9	11.2	12.0	12.4	14.3	101.6
1988	11.0	9.7	10.0	13.9	38.0	51.7	55.3	36.3	67.8	99.7	66.8	51.3	42.7	303.4
1989	39.1	29.1	21.8	22.5	110.0	73.4	43.6	24.8	16.4	11.2	9.2	8.8	34.2	243.0
1990	9.5	9.6	9.3	12.2	60.4	66.1	79.1	41.1	21.1	15.1	12.0	12.1	29.1	206.7

Table 3-2: Monthly and Annual Flow Statistics for Sturgeon River at McDougall Mills (WSC Station 05QA004)

Year	Flow (m^3/s)													Average Annual Runoff (mm)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean	
1991	13.0	12.4	10.9	14.9	47.7	46.8	45.2	23.7	17.8	28.0	33.3	33.9	27.4	194.7
1992	26.0	21.3	18.0	22.2	125.0	77.0	41.1	40.6	119.0	84.3	51.5	37.6	55.3	392.9
1993	28.9	22.2	17.3	16.2	30.5	35.2	36.1	34.9	98.6	76.8	49.6	34.5	40.1	284.9
1994	25.4	20.8	17.6	16.7	20.9	26.7	26.9	30.4	29.9	26.3	53.0	51.0	28.8	204.6
1995	32.5	25.8	23.1	26.5	53.1	62.1	41.2	28.8	16.9	13.1	15.2	17.0	29.6	210.3
1996	16.4	15.2	13.5	13.2	63.4	66.4	43.0	38.5	34.4	47.1	82.5	66.7	41.7	296.2
1997	43.9	32.2	26.0	32.0	87.3	61.1	37.0	22.5	17.4	15.0	19.0	18.9	34.4	244.4
1998	16.7	14.9	13.2	13.4	16.5	22.8	17.4	12.6	13.2	30.6	45.9	31.4	20.8	147.8
1999	22.6	18.8	16.4	28.5	62.1	54.0	66.9	47.0	43.6	72.0	68.0	40.8	45.2	321.1
2000	31.1	25.7	22.2	26.7	58.5	89.4	73.2	55.4	41.3	31.3	45.7	34.2	44.6	316.9
2001	25.7	22.1	19.4	29.0	103.0	93.4	62.3	58.2	38.6	32.2	52.3	42.8	48.4	343.8
2002	31.8	25.6	22.0	30.6	89.3	122.0	77.4	36.9	24.6	16.7	13.5	12.8	42.0	298.4
2003	12.9	12.0	11.3	13.9	26.0	22.3	26.3	30.8	42.4	64.2	43.7	33.5	28.4	201.8
2004	28.5	24.4	21.6	33.7	117.0	112.0	75.2	54.1	123.0	74.8	85.8	56.8	67.3	478.1
2005	41.9	32.4	26.1	66.7	90.1	85.2	111.0	46.3	29.0	22.6	24.4	29.2	50.5	358.8
2006	26.5	23.2	19.5	55.8	81.6	63.1	36.1	22.0	13.5	11.1	11.2	11.9	31.3	222.4
2007	12.5	11.8	10.6	13.9	27.8	113.0	102.0	48.7	46.4	122.0	99.9	57.7	55.7	395.7
2008	38.4	29.4	24.1	31.4	105.0	128.0	135.0	80.7	39.0	48.5	67.2	45.5	64.5	458.2
2009	32.7	26.6	23.1	31.6	121.0	102.0	71.2	102.0	75.8	36.7	38.2	34.2	58.2	413.5
2010	26.4	21.5	19.3	19.0	34.1	53.2	71.0	75.0	43.1	33.6	31.2	30.3	38.3	272.1
2011	25.4	21.4	18.8	33.1	104.0	65.0	33.9	19.6	10.6	6.8	5.5	5.1	29.2	207.4
2012	5.9	7.0	13.1	62.6	49.3	121.0	79.3	52.4	30.0	21.2	21.1	18.6	40.1	284.9
2013	17.9	18.0	16.7	15.6	98.8	134.0	77.6	62.0	85.7	59.7	42.5	36.4	55.5	394.3
2014	30.0	25.3	22.6	23.1	159.0	176.0	111.0	71.2	41.6	36.9	36.1	29.2	63.7	452.5
2015	24.2	21.4	17.7	30.3	104.0	89.1	59.4	41.4	29.1	20.8	48.8	58.1	45.5	323.2
2016	35.2	26.1	22.8	35.5	51.2	49.8	45.7	42.5	43.0	55.1	55.5	45.9	42.4	301.2
2017	35.3	27.9	26.1	51.2	83.0	91.4	53.3	29.0	19.5	27.6	22.6	20.7	40.7	289.1
2018	18.0	15.9	13.8	12.2	44.5	39.6	26.0	15.4	10.5	23.3	46.0	31.9	24.8	176.2
2019	24.2	21.2	19.0	24.2	64.5	49.3	39.1	30.1	44.2	92.6	59.4	38.5	42.3	300.5
2020	31.2	25.3	20.5	21.1	46.8	61.5	46.3	26.6	32.4	27.5	23.7	19.8	31.9	226.6
2021	17.2	15.2	12.5	19.7	38.0	43.0	21.5	12.1	16.6	35.5	23.0	18.5	22.8	162.0
2022	10.9	9.4	9.5	12.0	140.0	91.0	51.1	39.5	22.0	16.1	11.8	10.8	35.3	251.1
Average	23.5	19.8	17.3	25.1	72.5	74.2	54.7	39.7	38.0	38.9	37.7	29.5	39.4	280.1
1st Percentile	10.8	9.1	8.0	11.6	33.5	34.2	25.2	18.3	17.5	17.9	17.4	13.6	18.2	129.3
99th Percentile	40.8	34.4	30.2	43.7	126.2	129.0	95.1	69.0	66.1	67.6	65.6	51.3	68.6	487.2
Average runoff (mm)	14.2	10.8	10.5	14.7	43.8	43.3	33.0	23.9	22.2	23.5	22.0	17.8	23.3	280.1

Source: WSP 2023a.



LEGEND

- ☆ Project Location
- Local Hydrology Study Area
- Regional Hydrology Study Area
- Contour (10 m intervals)
- Watercourse
- Waterbody
- Flow Direction
- Watershed Outlet Flow Direction
- Model Nodes (Labelled with ID)
- Watershed to Springpole Lake Oulet (Node 10)
- Subwatershed

Node Watershed Areas

ID	Area (km^2)
Node 1	0.4
Node 2	0.7
Node 3	0.3
Node 4	0.9
Node 5	31.4
Node 6	3.4
Node 7	10.4
Node 8	761.6
Node 9	1318.5
Node 10	1371.5

0 1 2 4 6 8 10 Kilometres

NOTES:
- Topographic information extracted from LIO, MNRF.
- Watershed delineations based on data provided by Aquaspheara, data obtained through the Ontario Flow Assessment Tool (OFAT) and LIDAR provided by First Mining Gold, 2020.

Datum: NAD83
Projection: UTM Zone 15N

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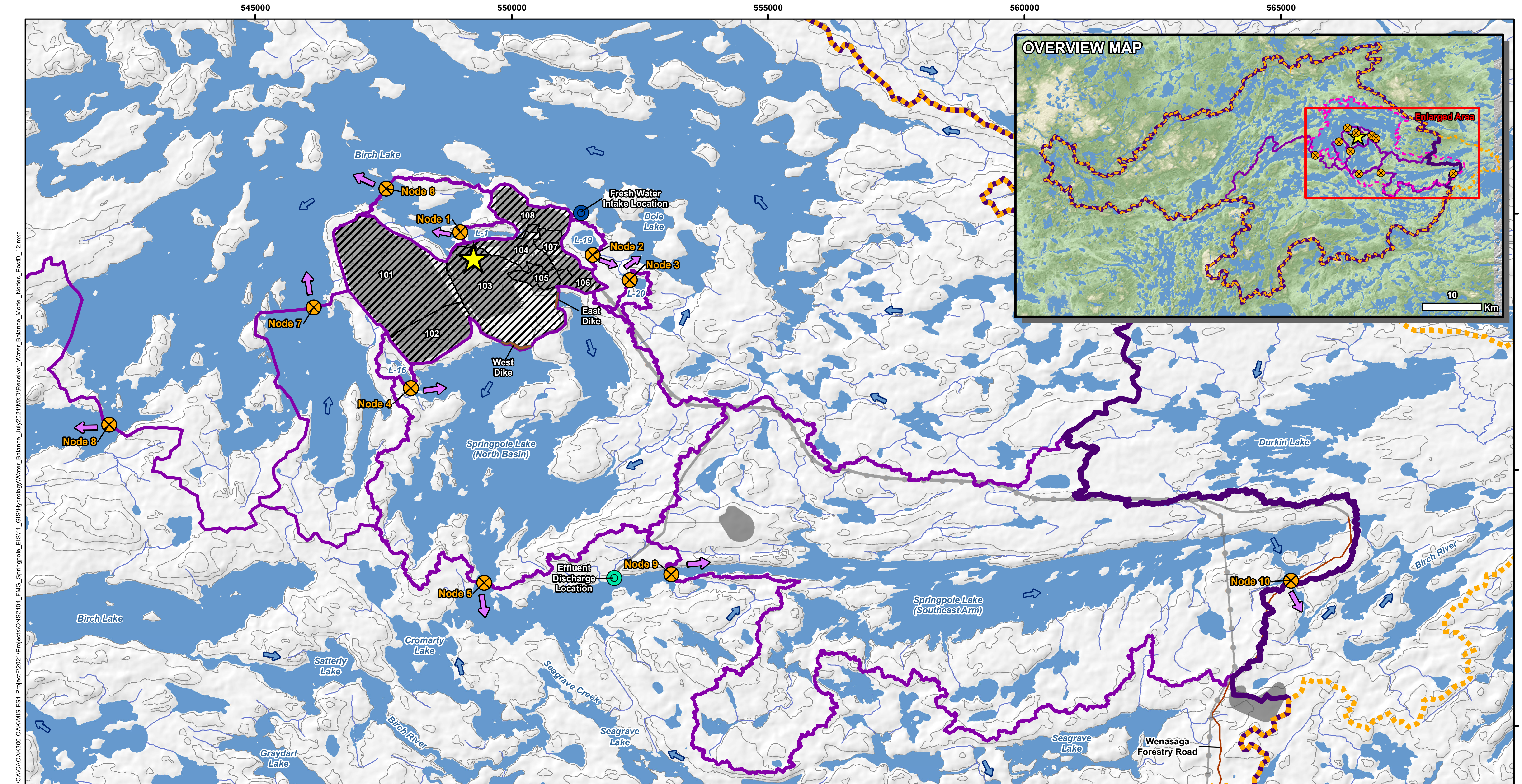
SPRINGPOLE GOLD PROJECT

Existing Conditions Sub-Watersheds

PROJECT N°: ONS2104	**FIGURE: 3-1**
SCALE: 1:70,000	DATE: October 2024



LEGEND

- Project Location
- Local Study Area for Surface Water Systems
- Regional Study Area for Surface Water Systems
- Fresh Water Intake Location
- Effluent Discharge Location
- Proposed Mine Feature
- Existing Road
- Contour (10 m intervals)
- Watercourse
- Waterbody
- Flow Direction
- Watershed Outlet Flow Direction
- Model Nodes (Labelled with ID)
- Watershed to Springpole Lake Oulet (Node 10)*
- Subwatershed*
- Project Watersheds (Labelled with ID)
- Dike

Node Watershed Areas
(natural/undisturbed watershed areas, excluding the Project footprint)

ID	Area (km^2)
Node 1	0.3
Node 2	0.5
Node 3	0.3
Node 4	0.4
Node 5	24.9
Node 6	2.8
Node 7	9.1
Node 8	758.3
Node 9	1308.7
Node 10	1361.7

0 1 2 4 6 8 10 Kilometres

NOTES:
- Topographic information extracted from LIO, MNRF.
- Watershed delineations based on data provided by Aquaspheara, data obtained through the Ontario Flow Assessment Tool (OFAT) and LiDAR provided by First Mining Gold, 2020.
- Proposed site plan provided by Ausenco, drawing number 104496-GX-03000-31344-003, Rev 1. 26 June 2023 and modified by WSP July 2023.

* Natural/undisturbed watershed areas, excluding the Project footprint

Datum: NAD83
Projection: UTM Zone 15N

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SPRINGPOLE GOLD PROJECT

Project Footprint Within The Natural Sub-Watersheds For All Development Phases

PROJECT Nº: ONS2104	**FIGURE: 3-2**
SCALE: 1:70,000	DATE: October 2024

4.0 MODEL INPUTS

4.1 Water Takings

Fresh water demands are required for the process plant and accommodations complex throughout the construction, operations and the pit filling period. These freshwater requirements are presented in Table 4-1 and are consistent with those used in the Mine Site Water Balance (WSP 2023c). Fresh water is to be supplied from Birch Lake and the intake will be screened to meet DFO's Interim code of practice: end-of-pipe fish protection screens for small water intakes in freshwater. Any fresh water requirements of the accommodations complex (or equivalent) during the active closure – post pit filling contingency accommodations are assumed to be supplied by bottled water. Fresh water is not required during the post-closure phase.

During the pit filling period, water will also be taken from the north basin of Springpole Lake (Node 5) to expedite filling of the open pit basin. The water transfer rate has been assumed as 10% of flows at the Springpole Lake inlet. Based on Fisheries and Oceans Canada guidance (DFO 2013) and Locke and Paul (2011), a 10% to 15% reduction in instantaneous flows are unlikely to have detectable ecological effects on the downstream habitats. The monthly water takings from Springpole Lake for the pit filling period under the three climatic conditions are provided in Table 4-2.

Water takings are applied to Node 5 (takings from the north basin to support pit filling) and Node 8 (Birch Lake water takings). They are observed at the downstream Nodes 9 and 10 as well.

4.2 Site Discharge

Treated effluent will be conveyed via pipeline to the southeast arm of Springpole Lake for discharge at Node 9. Discharge will occur during the construction, operations, active closure - pit filling period, and active closure –post pit filling contingency. The rate of discharge will vary throughout the phases of the Project and has been simulated by the mine site water balance (WSP 2023c).

Table 4-3 and Table 4-4 summarize the treated effluent discharge to the southeast arm of Springpole Lake for the construction, operations, active closure - pit filling period and active closure – post pit filling contingency under average, wet and dry climatic conditions for each phase. This is inclusive of ETP and STP discharge.

During the post-closure phase, the pit lake will be hydraulically connected to Springpole Lake once water quality meets regulatory requirements. Site drainage features will be decommissioned, operation of the ETP will cease, and the reclaimed mine site will be allowed to passively drain to Birch Lake or Springpole Lake, according to pre-development watersheds. The areas reporting to Birch Lake (Node 8) include the majority of the reclaimed low grade ore stockpile footprint, the northern perimeter of the reclaimed CDF, the eastern half of the remediated plant site area, and a small region north of the remediated open pit and CWSP. The remainder of the site will ultimately report to Springpole Lake (Node 5). This assumption applies to the climate change scenario as well. The rate of discharge has been simulated by the mine site water balance (WSP 2023c) and is presented in Table 4-5.

4.3 Groundwater

Under existing (i.e., pre-mining conditions) conditions, local groundwater flow in the native subsurface flow system is conceptualized to follow local topography with recharge at topographic highs into the overburden which covers most of the area, and discharge to lakes at low lying areas (WSP 2023b). Under existing conditions groundwater across the mine site will migrate mostly to Springpole Lake and Birch Lake. Given the very large size of these lakes, groundwater from the mine site will not make an appreciable contribution to the lake water balance.

During Project development, several changes to the local groundwater regime will occur. The primary effect will be the capture of local groundwater flows by the open pit mine area, reducing local groundwater discharge to nearby surface water features, as well as potential mounding of groundwater levels within the CDF as mine rock and tailings deposition progresses (WSP 2023b).

Changes to the local groundwater regime at each model node have been modeled for end of mine operations and post-closure conditions through hydrogeological modeling, as described in the Hydrogeological Modeling Report (WSP 2023b) .

Table 4-6 shows the change of groundwater flows compared with the existing conditions for each node, throughout the construction, operations, active closure - pit filling period, active closure – post pit filling contingency, and post-closure phases. In this table, positive values indicate an increase in groundwater contribution and negative values a decrease.

Table 4-1: Fresh Water Takings – Birch Lake

Month	Operations (m^3/day)			Construction and Active Closure - Pit Filling Period (m^3/day)		
	Average	**Dry**	**Wet**	**Average**	**Dry**	**Wet**
January	8,652	14,794	7,240	86.4	86.4	86.4
February	12,973	16,093	11,262	86.4	86.4	86.4
March	11,225	15,473	8,849	86.4	86.4	86.4
April	4,090	7,825	4,090	86.4	86.4	86.4
May	4,090	4,090	4,090	86.4	86.4	86.4
June	4,090	6,475	4,090	86.4	86.4	86.4
July	4,090	7,990	4,090	86.4	86.4	86.4
August	4,090	9,208	4,090	86.4	86.4	86.4
September	4,090	8,674	4,090	86.4	86.4	86.4
October	4,090	10,801	4,090	86.4	86.4	86.4
November	4,090	13,590	4,090	86.4	86.4	86.4
December	4,090	15,466	4,090	86.4	86.4	86.4
Annual Average	5,765	10,849	5,312	86.4	86.4	86.4

Note:
Water takings during the Construction and Active Closure - Pit Filling Period are only required for the accommodations complex. Source: (WSP 2023c).

Table 4-2: Water Taking at Node 5 for Active Closure - Pit Filling Period – Springpole Lake

Month	Average Condition (m^3/day)	Dry Condition (m^3/day)	Wet Condition (m^3/day)
January	58,189	26,862	101,219
February	48,979	22,611	85,199
March	43,013	19,856	74,820
April	62,302	28,760	108,373
May	179,896	83,046	312,927
June	183,930	84,908	319,945
July	135,625	62,609	235,918
August	98,332	45,393	171,047
September	94,265	43,516	163,973
October	96,400	44,501	167,687
November	93,511	43,168	162,661
December	73,123	33,756	127,198
Annual Average	97,297	44,915	169,247

Note:
Monthly flows were estimated as 10% of the average monthly flow at the Springpole Lake inlet.

Table 4-3: Discharge from the Mine Site to Springpole Lake North Basin (Node 5)

Month	Construction (m^3/day)		
	Average	Dry	Wet
January	57,888	26,784	101,088
February	49,248	22,464	85,536
March	43,200	19,872	75,168
April	62,208	28,512	108,000
May	179,712	82,944	265,060
June	184,032	84,672	9,284
July	63,432	62,208	9,016
August	4,576	45,792	7,828
September	5,322	43,200	8,481
October	4,169	44,928	6,368
November	2,588	43,200	3,564
December	1,281	33,696	1,565
Annual Average	54,755	44,985	56,777

Source: WSP 2023c.

Table 4-4: Discharge from the Mine Site to Springpole Lake Southeast Arm (Node 9)

Month	Construction (m^3/day)			Operations (m^3/day)			Active Closure – Pit Filling Period (m^3/day)			Active Closure – Post Pit Filling Contingency (m^3/day)		
	Average	**Dry**	**Wet**	**Average**	**Dry**	**Wet**	**Average**	**Dry**	**Wet**	**Average**	**Dry**	**Wet**
January	232	165	368	86	86	86	365	273	517	919	754	1,103
February	601	282	882	89	86	89	723	455	996	1,344	1,013	1,708
March	1,496	713	2,337	86	86	86	1,624	857	2,419	2,518	1,541	3,541
April	10,584	6,187	15,248	86	86	86	10,394	6,129	14,916	11,972	6,513	17,785
May	18,352	9,797	27,464	4,617	86	25,594	17,909	9,614	26,742	20,120	9,455	31,478
June	13,859	5,927	22,307	9,598	86	22,330	13,556	5,846	21,725	12,854	5,214	23,386
July	13,738	5,721	22,277	9,411	86	22,267	13,389	5,637	21,687	11,887	5,215	22,517
August	11,702	4,855	18,993	6,677	86	17,837	11,444	4,807	18,513	10,240	4,451	19,325
September	12,007	5,357	19,090	7,162	86	18,038	11,762	5,315	18,628	12,585	4,454	21,434
October	8,444	3,815	13,375	2,370	86	10,319	8,323	3,836	13,103	9,587	3,125	15,733
November	3,822	1,767	6,011	86	86	364	3,859	1,866	5,981	5,392	1,415	8,121
December	891	298	1,527	86	86	86	1,017	442	1,634	1,738	383	2,531
Annual Average	8,015	3,757	12,551	3,380	86	9,840	7,900	3,772	12,297	8,463	3,641	14,117

Source: WSP 2023c.

Table 4-5: Mine Site Runoff to the Environment at Post-Closure

	Post-Closure						Climate Change	
	Birch Lake (Node 8)			Springpole Lake (Node 5)			Birch Lake (Node 8)	Springpole Lake (Node 5)
	(m³/day)			(m³/day)			(m³/day)	(m³/day)
	Average	Dry	Wet	Average	Dry	Wet	Average	Average
January	427	382	476	1,318	1,213	1,431	448	1,366
February	329	224	440	1,516	1,274	1,775	377	1,628
March	664	384	962	2,293	1,645	2,983	753	2,499
April	2,645	1,873	3,467	7,621	3,829	12,653	2,957	8,666
May	4,110	2,601	5,717	15,971	5,928	25,705	4,476	16,840
June	3,421	2,022	4,911	9,402	3,176	18,427	3,535	8,339
July	3,451	2,038	4,957	8,404	3,162	17,512	3,341	6,897
August	3,036	1,829	4,322	7,177	2,608	14,961	2,954	5,821
September	2,967	1,794	4,216	9,592	2,647	17,179	3,080	6,387
October	2,250	1,434	3,119	7,319	1,682	12,585	2,387	6,841
November	1,338	975	1,724	4,166	1,178	6,385	1,423	4,286
December	658	221	885	1,855	654	2,390	760	2,085
Annual Average	2,117	1,320	2,946	6,412	2,423	11,215	2,217	5,996

Table 4-6: Groundwater Change Compared to Existing Conditions

Nodes	Construction (m³/day)	Operations (m³/day)	Active Closure - Pit Filling Period* (m³/day)	Active Closure – Post Pit Filling Contingency, Post-Closure and Climate Change (m³/day)
Node 1	-21	-289	-144.5	0
Node 2	-4	-58	-34.5	-11
Node 3	0	-3	-1	1
Node 4	-18	-19	-21	-23
Node 5	-720	-1707	-1066.5	-426
Node 6	-89	-525	-297.5	-70
Node 7	-72	-45	-55.5	-66
Node 8	-271	-737	-457	-177
Node 9	-991	-2444	-1523.5	-603
Node 10	-991	-2444	-1523.5	-603

Note:
Values provided for the Active Closure - Pit Filling Period are derived from the values presented in WSP 2023d.

5.0 RESULTS

The following section presents the simulated change in flow at the identified 10 model nodes for the average, 1:100 dry and 1:100 wet year conditions. The high-level impacts of climate change were also evaluated for the post-closure phase. The analysis of the three climate conditions depicts that the nodes near the Project area will generally experience a reduction in flow, however a negligible change in flow during post-closure is seen at the final monitoring points (Nodes 9 and 10).

5.1 Existing Conditions

Flows to each of the 10 model nodes have been simulated for the three climate conditions and are presented in Table 5-1. Model results indicate average flows of 11.7 cubic metres per second (m^3/s) and 12.2 m^3/s at the proposed treated effluent discharge location (southeast arm of Springpole Lake, Node 9) and at the outlet of Springpole Lake (Node 10), respectively, for average climate conditions.

5.2 Construction Phase

Flows to each model node have been simulated for the construction phase and compared to existing conditions. Table 5-2 presents the resulting monthly flows for the construction phase, as well as the simulated annual change in flow compared to existing conditions. During the construction phase, flows within Springpole Lake (Nodes 9 and 10) remain relatively unchanged. An increase in flow is predicted at Nodes 9 and 10, ranging from 3.0% to 9.5% for the three climatic conditions. This change is well within the natural variability existing flows within Springpole Lake and indicates the construction phase will have limited impact on flows and water levels.

Model results indicate a decrease in annual flow for Nodes 1, 2, 4, 6, 7 and 8. Nodes 1, 2, and 4 are the inland lake waterbodies, and Nodes 6, 7, and 8 are located within Birch Lake. The reductions are attributed to development of the mine site footprint within the existing subwatersheds. Runoff from mine site areas will be captured and managed within the mine site water management system, resulting in a reduction in area and flow reporting to the nodes representing subwatersheds in which the mine site will be developed. Model results indicate that the greatest reduction in flow (56.7%) is at Node 4 as a result of the reduction of its watershed area by 54.2%. Nodes 1, 2, and 4 are being compensated for as per the fish habitat compensation plan provided in Appendix F of the final EIS/EA. Nodes 6, 7, and 8 are located within Birch Lake, and as noted in Section 3.1 were included to support water quality modelling. The reduction in flows at theses nodes ranges from 0.4% to 16%. These flow reductions are not anticipated to have large impacts on water levels or velocities, as Birch Lake is oulet controlled (water levels are governed by the downstream lake outlet, rather than the inflows calculated to the location of the node).During the constuction phase, controlled dewatering of the open pit basin will occur which will lead to an increase of flow at Nodes 5, 9, and 10. The mine site water management system will discharge further downstream in the southeast arm of Springpole Lake (Node 9). The greatest increase in flow during the construction phase is estimated at Node 5, as the water will be transferred from the open pit basin to the north basin of Springpole Lake. Change in flow is calculated to be 203% under average climate conditions. As discussed in Section 3.1, Node 5 is located within Springpole Lake, not as a riverine lake outlet, and as such water levels at this node are sustained by the much larger drainage area entering from Cromarty Lake (not simply the flows generated by the direct drainage area to Node 5). Following consultation with regulators, it was agreed upon with the Ministry of the Environment, Conservation and Parks to use water level and velocity as indicators to assess residual effects on water quantity rather than flows at Node 5 for the final EIS/EA. Presented in Attachment A is a summary of a dynamic wave routing model developed for Node 5 to assess potential Project effects to lake level and velocity. The assessment shows that during the construction phase, the change in flow will result in an average increase in water level of 0.032 m, and an increase in velocity of 0.001 metres per second (m/s).

5.3 Operations Phase

Flows to each model node have been calculated for the operations phase and compared to existing conditions. Table 5-3 presents the resulting monthly flows simulated for the operations phase, as well as the estimated annual change in flow compared to existing conditions. During the Operations Phase flows in Springpole Lake (Nodes 9 and 10) remain relatively unchanged. At the effluent discharge location (southeast arm of Springpole Lake, Node 9), a maximum reduction of 3.6% in annual flow was modeled for all the evaluated climatic conditions, and a similar result is observed at the Springpole Lake outlet (Node 10). This change is well within the natural variability existing flows within Springpole Lake and indicates the Operations Phase will have limited impact on Springpole Lake flows and water levels.

A decrease in annual flow is indicated for all nodes, and , with more sizable reductions (greater than 10%) observed locally at Nodes 1, 2, 4, 5, 6, and 7. Nodes 1, 2, and 4 are the inland lake waterbodies, and Nodes 6, and 7 are located within Birch Lake. the reductions are largely attributed to the development of the mine site (as explained in Section 5.2). The effects of the open pit basin water management on the groundwater regime also attribute to potential flow reductions.

Model results indicate that Node 1 (inland lake) will observe an annual flow reduction of 118.5% and 75.8% for the average and wet climate conditions respectively. During dry conditions, a reduction in flow of 235.7% is estimated, indicating that unnamed lake L-1 will experience more hydrological losses than inflows. Nodes 1, 2, and 4 are being compensated for as per the fish habitat compensation plan provided in Appendix F of the final EIS/EA. Nodes 6, 7, and 8 are located within Birch Lake, and as noted in Section 3.1 were included to support water quality modelling. These flow reductions are not anticipated to have large impacts on water levels or velocities, as Birch Lake is oulet controlled (water levels are governed by the downstream lake outlet, rather than the inflows calculated to the location of the node). Node 5 is located in Springpole Lake, and is also outlet controlled, thus the reduction in flows is not anticipated to have large impacts on water level or velocity.

5.4 Active Closure - Pit Filling Period

Flows to each model node have been modeled for the open pit basin filling phase and compared to existing conditions. Table 5-4 presents the resulting monthly flows simulated for the open pit basin filling phase, as well as the annual change in flow compared to existing conditions.

At the southeast arm of Springpole Lake (Node 9) and the Springpole Lake outlet (Node 10), model results show a decrease in flow, ranging from 9.4% to 10.0%, for all climate conditions. The reduction in flow is largely a result of the water taking from the north basin to expedite filling of the reclaimed open pit basin. The water taking has been limited to 10% of available flow at the inlet of Springpole Lake for consistency with current federal guidance (DFO 2013). During the reclaimed open pit basin filling phase, effluent discharge to the southeast arm of Springpole Lake (Node 9) is reduced, as it will exclude contributions from the open pit catchment area. A reduction of flow of 10% is within the natural variation of flows, and therefore indicates that the open pit filling period will have limited impact on the flow and level of Springpole Lake and dowstream aquatic habitat.

Model results show an annual flow reduction for Nodes 1 to 10, with the largest change at Node 5. As discussed in Sections 3.1 and 5.2, Node 5 behaves as a lake (not a riverine lake outlet). Through regulator consultation, it was agreed to use water level and velocity as indicators to assess potential residual effects on water quantity rather than flows at this node for the final EIS/EA. Although the change in flow calculated at Node 5 is large, the potential effects to water level and velocity are relatively small. Attachment A provides details of a dynamic wave routing model of Springpole Lake. The model shows that under existing conditions, the north basin of Springpole Lake would generally flow southward from the north basin to the southeast arm, except in the spring (March to May) when direct inflows to the North Basin are not enough to rise with the water levels in the southeast arm of Springpole Lake. During the active closure - pit filling period, flow at Node 5 would largely be to the north, drawing water in from the southeast arm of Springpole Lake towards the dikes as a result of the pit filling process. This condition will exist through the pit filling period only and will be fully reversible once the reclaimed open pit basin has achieved its target elevation. The dynamic wave assessment indicates that during the active closure - pit filling period the reduction in flow at Node 5 will result in an average decrease in water level in Springpole Lake of 0.063 m, and a reduction in velocity of 0.002 m/s during average climate conditions. An assessment of velocity and fish swimming ability shows that there would be minimal to no effect on the ability of fish to migrate through the connecting channel during all Project phases under all climate conditions.

Model results also indicate flow reductions of 68.3%, 33.5% and 57.1% during average climate conditions at Nodes 1, 2 and 4 respectively. Potential aquatic effects of the flow reductions greater than 10% has been assessed and accounted for in Section 6.0, and compensated for in the fish habitat compensation plan in Appendix F of the final EIS/EA.

5.5 Active Closure – Post Pit Filling Contingency

Flows to each model node have been simulated for the active closure – post pit filling contingency and compared to existing conditions. Table 5-5 presents the resulting monthly flows for the active closure – post pit filling contingency, as well as the annual change in flow compared to existing conditions.

During the active closure – post pit filling contingency flows in Springpole Lake (Nodes 9 and 10) remain virtually unchanged. Simulated flows are within 0.1% of existing conditions at Nodes 9 and 10, as excess water from the filled open pit basin will be treated and discharged into the southeast arm of Springpole Lake (Node 9) if needed. This change is well within the natural variability existing flows within Springpole Lake and indicates the active closure – post pit filling contingency will have limited impact on flows and water levels within Springpole Lake and downstream.

During this phase, Nodes 1, 2, 4, 5, 6 and 7 show flow reductions, similar to previous Project phases. These reductions are between 9.8% and 61.2% considering all three climatic conditions. Nodes 1, 2, and 4 are the inland lake waterbodies, and Nodes 6, 7, and 8 are located within Birch Lake. Nodes 1, 2, and 4 are being compensated for as per the fish habitat compensation plan provided in Appendix F of the final EIS/EA. Nodes 6, 7, and 8 are located within Birch Lake, and as noted previously these flow reductions are not anticipated to have large impacts on water levels or velocities, as Birch Lake is oulet controlled (water levels are governed by the downstream lake outlet, rather than the inflows calculated to the location of the node).Node 5 is located in Springpole Lake, and is also outlet controlled, thus the reduction in flows is not anticipated to have large impacts on water level or velocity. Similarly to the other phases, Node 8 is consistent across all climate conditions. Model results show that the flowrate at Node 8 decreases slightly by approximately 0.5% during all climate conditions.

5.6 Post-Closure Phase

Flows to each node have been modeled for the post-closure phase and compared to existing conditions. Table 5-6 presents the resulting monthly flows simulated for the post-closure phase, as well as the annual change in flow compared to existing conditions.

During the post-closure phase, flows within Springpole Lake (Nodes 9 and 10) remain virtually unchanged. The downstream Nodes 9 and 10 will have a small change in flow (less than 0.1%) for all climate conditions due to the lake’s large drainage area, indicating that small change is within the natural variability of Springpole Lake flows and levels.

At post-closure, the collection and treatment of site runoff will cease, and runoff will passively drain to either Springpole Lake or Birch Lake (as described in Section 4.2). During this phase, results show that Nodes 1, 2, 4, 6 and 7 observe flow reductions, as with previous Project phases. This is largely due to the direction of drainage areas away from these nodes. These annual reductions range from 11.0% to 57.4% for average conditions. Nodes 1, 2, and 4 are the inland lake waterbodies, and Nodes 6, 7, and 8 are located within Birch Lake. Nodes 1, 2, and 4 are being compensated for as per the fish habitat compensation plan provided in Appendix F of the final EIS/EA. Nodes 6, 7, and 8 are located within Birch Lake, and as noted previously these flow reductions are not anticipated to have large impacts on water levels or velocities, as Birch Lake is oulet controlled (water levels are governed by the downstream lake outlet, rather than the inflows calculated to the location of the node).

The passive discharge of runoff results in an increase (5.1%) in flow at Node 5 for average and wet climate years, and will have a slight decrease (-2.7%) in flow during a dry climate year.

5.7 Post-Closure Phase with Climate Change

A climate change scenario was evaluated for the average climate conditions post-closure phase. The resulting monthly flows simulated for the post-closure phase, as well as the annual change in flow compared to existing conditions is presented in Table 5-7.

Model results indicate a decrease in annual flow at Nodes 1, 2, 4, 6, 7, and 8, similar to the post-closure phase results (Section 5.6), with the largest reduction being 57.4% at Node 4 as a result of the reduction in watershed area. Node 5 experiences a slight increase in flows due to site discharge, resulting in an annual increase of 2.4%. A small change in flow (less than 0.1%) compared to existing conditions is seen at Nodes 8, 9, and 10 due to Springpole Lake's large drainage area.

Table 5-1: Existing Flow Conditions

Watershed ID	Watershed/ Condition	Watershed Area (km^2)	Calculated Flow (m^3/s)													Mean Annual Runoff (mm)
			January	February	March	April	May	June	July	August	September	October	November	December	Average	
Node 1	Average Year [1]	0.38	0.0020	0.0017	0.0015	0.0021	0.0061	0.0063	0.0046	0.0034	0.0032	0.0033	0.0032	0.0025	0.0033	280
	1:100 Dry Year [2]		0.00092	0.00077	0.00068	0.00098	0.0028	0.0029	0.0021	0.0015	0.0015	0.0015	0.0015	0.0012	0.0015	129
	1:100 Wet Year [2]		0.0035	0.0029	0.0026	0.0037	0.011	0.011	0.0080	0.0058	0.0056	0.0057	0.0055	0.0043	0.0058	487
Node 2	Average Year [1]	0.67	0.0036	0.0030	0.0026	0.0038	0.011	0.011	0.0083	0.0060	0.0058	0.0059	0.0057	0.0045	0.0060	280
	1:100 Dry Year [2]		0.0016	0.0014	0.0012	0.0018	0.0051	0.0052	0.0038	0.0028	0.0027	0.0027	0.0026	0.0021	0.0028	129
	1:100 Wet Year [2]		0.0062	0.0052	0.0046	0.0066	0.019	0.020	0.0144	0.010	0.0100	0.0102	0.0099	0.0078	0.0104	487
Node 3	Average Year [1]	0.34	0.0018	0.0015	0.0013	0.0019	0.0055	0.0057	0.0042	0.0030	0.0029	0.0030	0.0029	0.0023	0.0030	280
	1:100 Dry Year [2]		0.0008	0.0007	0.0006	0.0009	0.0026	0.0026	0.0019	0.0014	0.0013	0.0014	0.0013	0.0010	0.0014	129
	1:100 Wet Year [2]		0.0031	0.0026	0.0023	0.0033	0.0096	0.0099	0.0073	0.0053	0.0051	0.0052	0.0050	0.0039	0.0052	487
Node 4	Average Year [1]	0.94	0.0050	0.0042	0.0037	0.0053	0.015	0.016	0.012	0.0084	0.0080	0.0082	0.0080	0.0062	0.0083	280
	1:100 Dry Year [2]		0.0023	0.0019	0.0017	0.0024	0.0071	0.0072	0.0053	0.0039	0.0037	0.0038	0.0037	0.0029	0.0038	129
	1:100 Wet Year [2]		0.0086	0.0072	0.0064	0.0092	0.027	0.027	0.020	0.015	0.014	0.014	0.014	0.011	0.014	487
Node 5 [3]	Average Year [1]	31	0.17	0.14	0.12	0.18	0.51	0.53	0.39	0.28	0.27	0.28	0.27	0.21	0.28	280
	1:100 Dry Year [2]		0.077	0.065	0.057	0.082	0.24	0.24	0.18	0.13	0.12	0.13	0.12	0.096	0.13	129
	1:100 Wet Year [2]		0.29	0.24	0.21	0.31	0.89	0.91	0.67	0.49	0.47	0.48	0.46	0.36	0.49	487
Node 6 [3]	Average Year [1]	3.4	0.018	0.015	0.013	0.019	0.056	0.057	0.042	0.030	0.029	0.030	0.029	0.023	0.030	280
	1:100 Dry Year [2]		0.0083	0.0070	0.0061	0.0089	0.026	0.026	0.019	0.014	0.013	0.014	0.013	0.010	0.014	129
	1:100 Wet Year [2]		0.031	0.026	0.023	0.033	0.097	0.099	0.073	0.053	0.051	0.052	0.050	0.039	0.052	487
Node 7 [3]	Average Year [1]	10	0.055	0.046	0.041	0.059	0.17	0.17	0.13	0.093	0.089	0.091	0.089	0.069	0.093	280
	1:100 Dry Year [2]		0.025	0.021	0.019	0.027	0.079	0.080	0.059	0.043	0.041	0.042	0.041	0.032	0.043	129
	1:100 Wet Year [2]		0.096	0.081	0.071	0.10	0.30	0.30	0.22	0.16	0.16	0.16	0.15	0.12	0.16	487
Node 8 [3]	Average Year [1]	762	4.0	3.4	3.0	4.3	12	13	9.4	6.8	6.5	6.7	6.5	5.1	6.8	280
	1:100 Dry Year [2]		1.9	1.6	1.4	2.0	5.7	5.9	4.3	3.1	3.0	3.1	3.0	2.3	3.1	129
	1:100 Wet Year [2]		7.0	5.9	5.2	7.5	22	22	16	12	11	12	11	8.8	12	487
Node 9	Average Year [1]	1319	7.0	5.9	5.2	7.5	22	22	16	12	11	12	11	8.8	12	280
	1:100 Dry Year [2]		3.2	2.7	2.4	3.4	9.9	10	7.5	5.4	5.2	5.3	5.2	4.0	5.4	129
	1:100 Wet Year [2]		12	10	9.0	13	37	38	28	20	20	20	19	15	20	487
Node 10	Average Year [1]	1372	7.3	6.1	5.4	7.8	22	23	17	12	12	12	12	9.1	12	280
	1:100 Dry Year [2]		3.3	2.8	2.5	3.6	10	11	7.8	5.7	5.4	5.5	5.4	4.2	5.6	129
	1:100 Wet Year [2]		13	11	9.3	14	39	40	29	21	20	21	20	16	21	487

Notes:
1. Flows are prorated from the Sturgeon River at McDdougall Mills (O5QA004).
2. The monthly annualized 1st percentile and 99th percentile flow acounts for the 1:100 year dry and wet conditions, respectively.
3. Artificial node whose flow doesn't represent a realistic change in as they are located in the middle of the lake. Lake levels are a function of downstream lake outlets, rather than inflows calculated at the node location.

Table 5-2: Results for Construction Phase - Average, Dry, and Wet Conditions

Watershed Id	Flow Condition	Scenario	Calculated Flow (m^3/s)														Change in Flow (%)
			January	February	March	April	May	June	July	August	September	October	November	December	Average	Change in Flow (m^3/s)	
Node 1	Average Year	Existing	0.0020	0.0017	0.0015	0.0021	0.0061	0.0063	0.0046	0.0034	0.0032	0.0033	0.0032	0.0025	0.0033	-	
		Construction	0.0014	0.0011	0.0010	0.0015	0.0048	0.0049	0.0036	0.0025	0.0024	0.0025	0.0024	0.0018	0.0025	-0.00084	-25
	1:100 Dry Year	Existing	0.00092	0.00077	0.00068	0.00098	0.0028	0.0029	0.0021	0.0015	0.0015	0.0015	0.0015	0.0012	0.0015	-	
		Construction	0.00051	0.00039	0.00031	0.00056	0.0021	0.0021	0.0015	0.0010	0.0010	0.0010	0.0010	0.00070	0.0010	-0.00052	-34
	1:100 Wet Year	Existing	0.0035	0.0029	0.0026	0.0037	0.011	0.011	0.0080	0.0058	0.0056	0.0057	0.0055	0.0043	0.0058	-	
		Construction	0.0026	0.0021	0.0018	0.0028	0.0085	0.0087	0.0064	0.0045	0.0043	0.0044	0.0043	0.0033	0.0045	-0.0013	-22
Node 2	Average Year	Existing	0.0036	0.0030	0.0026	0.0038	0.011	0.011	0.0083	0.0060	0.0058	0.0059	0.0057	0.0045	0.0060	-	
		Construction	0.0026	0.0021	0.0019	0.0027	0.0080	0.0082	0.0060	0.0044	0.0042	0.0043	0.0041	0.0032	0.0043	-0.0016	-28
	1:100 Dry Year	Existing	0.0016	0.0014	0.0012	0.0018	0.0051	0.0052	0.0038	0.0028	0.0027	0.0027	0.0026	0.0021	0.0028	-	
		Construction	0.0012	0.0010	0.00084	0.0012	0.0037	0.0038	0.0028	0.0020	0.0019	0.0019	0.0019	0.0015	0.0020	-0.00078	-28
	1:100 Wet Year	Existing	0.0062	0.0052	0.0046	0.0066	0.019	0.020	0.014	0.010	0.010	0.010	0.010	0.0078	0.010	-	
		Construction	0.0045	0.0038	0.0033	0.0048	0.014	0.014	0.011	0.0076	0.0073	0.0075	0.0072	0.0056	0.0075	-0.0028	-27
Node 3	Average Year	Existing	0.0018	0.0015	0.0013	0.0019	0.0055	0.0057	0.0042	0.0030	0.0029	0.0030	0.0029	0.0023	0.0030	-	
		Construction	0.0018	0.0015	0.0013	0.0019	0.0055	0.0057	0.0042	0.0030	0.0029	0.0030	0.0029	0.0023	0.0030	0	0
	1:100 Dry Year	Existing	0.00083	0.00070	0.00061	0.00089	0.0026	0.0026	0.0019	0.0014	0.0013	0.0014	0.0013	0.0010	0.0014	-	
		Construction	0.00083	0.00070	0.00061	0.00089	0.0026	0.0026	0.0019	0.0014	0.0013	0.0014	0.0013	0.0010	0.0014	0	0
	1:100 Wet Year	Existing	0.0031	0.0026	0.0023	0.0033	0.0096	0.0099	0.0073	0.0053	0.0051	0.0052	0.0050	0.0039	0.0052	-	
		Construction	0.0031	0.0026	0.0023	0.0033	0.0096	0.0099	0.0073	0.0053	0.0051	0.0052	0.0050	0.0039	0.0052	0	0
Node 4	Average Year	Existing	0.0050	0.0042	0.0037	0.0053	0.015	0.016	0.012	0.0084	0.0080	0.0082	0.0080	0.0062	0.0083	-	
		Construction	0.0021	0.0017	0.0015	0.0022	0.0068	0.0070	0.0051	0.0036	0.0035	0.0035	0.0034	0.0026	0.0036	-0.0047	-57
	1:100 Dry Year	Existing	0.0023	0.0019	0.0017	0.0024	0.0071	0.0072	0.0053	0.0039	0.0037	0.0038	0.0037	0.0029	0.0038	-	
		Construction	0.00084	0.00067	0.00057	0.00091	0.0030	0.0031	0.0022	0.0016	0.0015	0.0015	0.0015	0.0011	0.0015	-0.0023	-60
	1:100 Wet Year	Existing	0.0086	0.0072	0.0064	0.0092	0.027	0.027	0.020	0.015	0.014	0.014	0.014	0.011	0.014	-	
		Construction	0.0037	0.0031	0.0027	0.0040	0.012	0.012	0.0090	0.0065	0.0062	0.0063	0.0061	0.0047	0.0064	-0.0080	-56
Node 5[1,2]	Average Year	Existing	0.17	0.14	0.12	0.18	0.51	0.53	0.39	0.28	0.27	0.28	0.27	0.21	0.28	-	
		Construction	0.79	0.67	0.589	0.85	2.5	2.5	1.0	0.27	0.27	0.26	0.23	0.17	0.85	0.57	204
	1:100 Dry Year	Existing	0.077	0.065	0.057	0.082	0.24	0.24	0.18	0.13	0.12	0.13	0.12	0.096	0.13	-	
		Construction	0.36	0.30	0.27	0.39	1.1	1.2	0.85	0.62	0.59	0.61	0.59	0.46	0.61	0.49	378
	1:100 Wet Year	Existing	0.29	0.24	0.21	0.31	0.89	0.91	0.67	0.49	0.47	0.48	0.46	0.36	0.48	-	
		Construction	1.4	1.2	1.0	1.5	3.8	0.82	0.63	0.47	0.46	0.44	0.40	0.30	1.0	0.55	113
Node 6[1]	Average Year	Existing	0.018	0.015	0.013	0.019	0.056	0.057	0.042	0.030	0.029	0.030	0.029	0.023	0.030	-	
		Construction	0.015	0.013	0.011	0.017	0.050	0.051	0.037	0.027	0.026	0.026	0.025	0.020	0.027	-0.0035	-12
	1:100 Dry Year	Existing	0.0083	0.0070	0.0061	0.0089	0.026	0.026	0.019	0.014	0.013	0.014	0.013	0.010	0.014	-	
		Construction	0.0066	0.0054	0.0046	0.0071	0.022	0.023	0.017	0.012	0.011	0.012	0.011	0.009	0.012	-0.0022	-16
	1:100 Wet Year	Existing	0.031	0.026	0.023	0.033	0.097	0.099	0.073	0.053	0.051	0.052	0.050	0.039	0.052	-	
		Construction	0.028	0.023	0.020	0.030	0.088	0.090	0.066	0.047	0.045	0.046	0.045	0.035	0.047	-0.0054	-10.2

Table 5-2: Results for Construction Phase - Average, Dry, and Wet Conditions

Watershed Id	Flow Condition	Scenario	Calculated Flow (m^3/s)														
			January	February	March	April	May	June	July	August	September	October	November	December	Average	Change in Flow (m^3/s)	Change in Flow (%)
Node 7[1]	Average Year	Existing	0.055	0.046	0.041	0.059	0.17	0.17	0.13	0.093	0.089	0.091	0.089	0.069	0.092	-	
		Construction	0.047	0.040	0.035	0.051	0.15	0.15	0.11	0.080	0.077	0.079	0.076	0.060	0.080	-0.013	-14
	1:100 Dry Year	Existing	0.025	0.021	0.019	0.027	0.079	0.080	0.059	0.043	0.041	0.042	0.041	0.032	0.043	-	
		Construction	0.021	0.018	0.016	0.023	0.068	0.069	0.051	0.037	0.035	0.036	0.035	0.027	0.036	-0.0063	-15
	1:100 Wet Year	Existing	0.096	0.081	0.071	0.10	0.30	0.30	0.22	0.16	0.16	0.16	0.15	0.12	0.16	-	
		Construction	0.083	0.070	0.061	0.089	0.26	0.26	0.19	0.14	0.13	0.14	0.13	0.10	0.14	-0.021	-13
Node 8[1]	Average Year	Existing	4.0	3.4	3.0	4.3	12	13	9.4	6.8	6.5	6.7	6.5	5.1	6.8	-	
		Construction	4.0	3.4	3.0	4.3	12	13	9.3	6.8	6.5	6.6	6.4	5.0	6.7	-0.031	-0.46
	1:100 Dry Year	Existing	1.9	1.6	1.4	2.0	5.7	5.9	4.3	3.1	3.0	3.1	3.0	2.3	3.1	-	
		Construction	1.8	1.6	1.4	2.0	5.7	5.8	4.3	3.1	3.0	3.1	3.0	2.3	3.1	-0.017	-0.53
	1:100 Wet Year	Existing	7.0	5.9	5.2	7.5	22	22	16	12	11	12	11	8.8	12	-	
		Construction	7.0	5.9	5.2	7.5	22	22	16	12	11	12	11	8.8	12	-0.051	-0.43
Node 9	Average Year	Existing	7.0	5.9	5.2	7.5	22	22	16	12	11	12	11	8.8	12	-	
		Construction	7.6	6.4	5.6	8.2	24	24	17	12	11	12	11	8.7	12	0.63	5.4
	1:100 Dry Year	Existing	3.2	2.7	2.4	3.4	9.9	10	7.5	5.4	5.2	5.3	5.2	4.0	5.4	-	
		Construction	3.5	2.9	2.6	3.8	11	11	8.2	6.0	5.7	5.8	5.6	4.4	5.9	0.51	9.5
	1:100 Wet Year	Existing	12	10	9.0	13	37	38	28	20	20	20	19	15	20	-	
		Construction	13	11	9.8	14	41	38	28	21	20	20	19	15	21	0.64	3.1
Node 10	Average Year	Existing	7.3	6.1	5.4	7.8	22	23	17	12	12	12	12	9.1	12	-	
		Construction	7.9	6.6	5.8	8.5	25	25	18	12	12	12	12	9.1	13	0.63	5.2
	1:100 Dry Year	Existing	3.3	2.8	2.5	3.6	10	11	7.8	5.7	5.4	5.5	5.4	4.2	5.6	-	
		Construction	3.6	3.0	2.7	3.9	11	12	8.5	6.2	5.9	6.1	5.8	4.6	6.1	0.51	9.1
	1:100 Wet Year	Existing	13	11	9.3	14	39	40	29	21	20	21	20	16	21	-	
		Construction	14	12	10.1	15	42	40	30	21	21	21	20	16	22	0.64	3.0

Note:

1. Artificial node whose flow doesn't represent a realistic change in as they are located in the middle of the lake. Lake levels are a function of downstream lake outlets, rather than inflows calculated at the node location.
2. Node included for water quality purposes. Flow estimation does not represent a realistic change in flow as these nodes are located in the middle of a lake. See Appendix A for assessment of Node 5 impacts to lake level and velocity.

Table 5-3: Results for Operations Phase - Average, Dry, and Wet Conditions

Watershed Id	Flow Condition	Scenario	Calculated Flow (m^3/s)														
			January	February	March	April	May	June	July	August	September	October	November	December	Average	Change in Flow (m^3/s)	Change in Flow (%)
Node 1	Average Year	Existing	0.0020	0.0017	0.0015	0.0021	0.0061	0.0063	0.0046	0.0034	0.0032	0.0033	0.0032	0.0025	0.0033	-	
		Operations	-0.0017	-0.0020	-0.0021	-0.0016	0.0017	0.0018	0.00045	-0.00059	-0.00071	-0.00065	-0.00073	-0.0013	-0.00062	-0.0039	-119
	1:100 Dry Year	Existing	0.00092	0.00077	0.00068	0.00098	0.0028	0.0029	0.0021	0.0015	0.0015	0.0015	0.0015	0.0012	0.0015	-	
		Operations	-0.0026	-0.0027	-0.0028	-0.0025	-0.0010	-0.0010	-0.0016	-0.0021	-0.0021	-0.0021	-0.0021	-0.0024	-0.0021	-0.0036	-236
	1:100 Wet Year	Existing	0.0035	0.0029	0.0026	0.0037	0.011	0.011	0.0080	0.0058	0.0056	0.0057	0.0055	0.0043	0.0058	-	
		Operations	-0.00051	-0.0010	-0.00125	-0.0003	0.0054	0.0056	0.0033	0.0014	0.0012	0.0013	0.0012	0.0002	0.0014	-0.0044	-76
Node 2	Average Year	Existing	0.0036	0.0030	0.0026	0.0038	0.011	0.011	0.0083	0.0060	0.0058	0.0059	0.0057	0.0045	0.0060	-	
		Operations	0.0019	0.00152	0.00125	0.0021	0.0074	0.0076	0.0054	0.0037	0.0035	0.0036	0.0035	0.0026	0.0037	-0.0023	-38
	1:100 Dry Year	Existing	0.0016	0.0014	0.0012	0.0018	0.0051	0.0052	0.0038	0.0028	0.0027	0.0027	0.0026	0.0021	0.0028	-	
		Operations	0.00053	0.00034	0.00022	0.00062	0.0030	0.0031	0.0021	0.0014	0.0013	0.0013	0.0013	0.00084	0.0013	-0.0014	-51
	1:100 Wet Year	Existing	0.0062	0.0052	0.0046	0.0066	0.019	0.020	0.014	0.010	0.010	0.010	0.010	0.0078	0.010	-	
		Operations	0.0039	0.0031	0.0027	0.0042	0.013	0.014	0.010	0.0070	0.0067	0.0068	0.0066	0.0050	0.0069	-0.0034	-33
Node 3	Average Year	Existing	0.0018	0.0015	0.0013	0.0019	0.0055	0.0057	0.0042	0.0030	0.0029	0.0030	0.0029	0.0023	0.0030	-	
		Operations	0.0018	0.0015	0.0013	0.0019	0.0055	0.0056	0.0041	0.0030	0.0029	0.0029	0.0028	0.0022	0.0030	-0.000035	-1.2
	1:100 Dry Year	Existing	0.00083	0.00070	0.00061	0.00089	0.0026	0.0026	0.0019	0.0014	0.0013	0.0014	0.0013	0.0010	0.0014	-	
		Operations	0.00079	0.00066	0.00058	0.00085	0.0025	0.0026	0.0019	0.0014	0.0013	0.0013	0.0013	0.00101	0.0014	-0.000035	-2.5
	1:100 Wet Year	Existing	0.0031	0.0026	0.0023	0.0033	0.0096	0.0099	0.0073	0.0053	0.0051	0.0052	0.0050	0.0039	0.0052	-	
		Operations	0.0031	0.0026	0.0023	0.0033	0.0096	0.0098	0.0072	0.0052	0.0050	0.0051	0.0050	0.0039	0.0052	-0.000035	-0.7
Node 4	Average Year	Existing	0.0050	0.0042	0.0037	0.0053	0.015	0.016	0.012	0.0084	0.0080	0.0082	0.0080	0.0062	0.0083	-	
		Operations	0.0020	0.0017	0.0015	0.0022	0.0068	0.0069	0.0051	0.0036	0.0035	0.0035	0.0034	0.0026	0.0036	-0.0047	-57
	1:100 Dry Year	Existing	0.0023	0.0019	0.0017	0.0024	0.0071	0.0072	0.0053	0.0039	0.0037	0.0038	0.0037	0.0029	0.0038	-	
		Operations	0.0008	0.0007	0.0006	0.0009	0.0030	0.0031	0.0022	0.0015	0.0015	0.0015	0.0015	0.0011	0.0015	-0.0023	-60
	1:100 Wet Year	Existing	0.0086	0.0072	0.0064	0.0092	0.027	0.027	0.020	0.015	0.014	0.014	0.014	0.011	0.014	-	
		Operations	0.0037	0.0031	0.0027	0.0040	0.012	0.012	0.0090	0.0064	0.0062	0.0063	0.0061	0.0047	0.0064	-0.0080	-56
Node 5[1]	Average Year	Existing	0.17	0.14	0.12	0.18	0.51	0.53	0.39	0.28	0.27	0.28	0.27	0.21	0.28	-	
		Operations	0.11	0.091	0.078	0.12	0.39	0.40	0.29	0.20	0.19	0.20	0.19	0.15	0.20	-0.077	-28
	1:100 Dry Year	Existing	0.077	0.065	0.057	0.082	0.24	0.24	0.18	0.13	0.12	0.13	0.12	0.096	0.13	-	
		Operations	0.041	0.031	0.025	0.045	0.17	0.17	0.12	0.083	0.079	0.081	0.078	0.057	0.082	-0.046	-36
	1:100 Wet Year	Existing	0.29	0.24	0.21	0.31	0.89	0.91	0.67	0.49	0.47	0.48	0.46	0.36	0.48	-	
		Operations	0.21	0.17	0.15	0.23	0.69	0.70	0.51	0.37	0.35	0.36	0.35	0.27	0.36	-0.12	-25
Node 6[1]	Average Year	Existing	0.018	0.015	0.013	0.019	0.056	0.057	0.042	0.030	0.029	0.030	0.029	0.023	0.030	-	
		Operations	0.010	0.008	0.0061	0.012	0.045	0.046	0.032	0.022	0.021	0.021	0.020	0.015	0.022	-0.0086	-28
	1:100 Dry Year	Existing	0.0083	0.0070	0.0061	0.0089	0.026	0.026	0.019	0.014	0.013	0.014	0.013	0.010	0.014	-	
		Operations	0.0015	0.0003	-0.0005	0.0021	0.017	0.018	0.012	0.007	0.0062	0.0065	0.0061	0.0035	0.007	-0.0072	-52
	1:100 Wet Year	Existing	0.031	0.026	0.023	0.033	0.097	0.099	0.073	0.053	0.051	0.052	0.050	0.039	0.052	-	
		Operations	0.023	0.018	0.015	0.025	0.083	0.085	0.061	0.042	0.040	0.041	0.040	0.030	0.042	-0.0104	-20

Table 5-3: Results for Operations Phase - Average, Dry, and Wet Conditions

Watershed Id	Flow Condition	Scenario	Calculated Flow (m^3/s)														Change in Flow (%)
			January	February	March	April	May	June	July	August	September	October	November	December	Average	Change in Flow (m^3/s)	
Node 7[1]	Average Year	Existing	0.055	0.046	0.041	0.059	0.17	0.17	0.13	0.093	0.089	0.091	0.089	0.069	0.092	-	
		Operations	0.048	0.040	0.035	0.051	0.15	0.15	0.11	0.081	0.077	0.079	0.077	0.060	0.080	-0.012	-13
	1:100 Dry Year	Existing	0.025	0.021	0.019	0.027	0.079	0.080	0.059	0.043	0.041	0.042	0.041	0.032	0.043	-	
		Operations	0.022	0.018	0.016	0.023	0.068	0.070	0.051	0.037	0.035	0.036	0.035	0.027	0.037	-0.0060	-14
	1:100 Wet Year	Existing	0.096	0.081	0.071	0.10	0.30	0.30	0.22	0.16	0.16	0.16	0.15	0.12	0.16	-	
		Operations	0.083	0.070	0.061	0.089	0.26	0.26	0.19	0.14	0.13	0.14	0.13	0.10	0.14	-0.021	-13
Node 8[1]	Average Year	Existing	4.0	3.4	3.0	4.3	12	13	9.4	6.8	6.5	6.7	6.5	5.1	6.8	-	
		Operations	3.9	3.2	2.8	4.2	12	13	9.3	6.7	6.4	6.6	6.4	5.0	6.6	-0.102	-1.5
	1:100 Dry Year	Existing	1.9	1.6	1.4	2.0	5.7	5.9	4.3	3.1	3.0	3.1	3.0	2.3	3.1	-	
		Operations	1.7	1.4	1.2	1.9	5.7	5.8	4.2	3.0	2.9	2.9	2.8	2.1	3.0	-0.15	-4.7
	1:100 Wet Year	Existing	7.0	5.9	5.2	7.5	22	22	16	12	11	12	11	8.8	12	-	
		Operations	6.9	5.7	5.0	7.4	22	22	16	12	11	12	11	8.7	12	-0.12	-0.99
Node 9	Average Year	Existing	7.0	5.9	5.2	7.5	22	22	16	12	11	12	11	8.8	12	-	
		Operations	6.8	5.6	5.0	7.3	21	22	16	12	11	11	11	8.6	12	-0.14	-1.2
	1:100 Dry Year	Existing	3.2	2.7	2.4	3.4	9.9	10	7.5	5.4	5.2	5.3	5.2	4.0	5.4	-	
		Operations	3.0	2.5	2.2	3.3	9.8	10	7.3	5.3	5.0	5.1	4.9	3.8	5.2	-0.19	-3.6
	1:100 Wet Year	Existing	12	10	9.0	13	37	38	28	20	20	20	19	15	20	-	
		Operations	12	10	8.8	13	37	38	28	20	20	20	19	15	20	-0.13	-0.63
Node 10	Average Year	Existing	7.3	6.1	5.4	7.8	22	23	17	12	12	12	12	9.1	12	-	
		Operations	7.1	5.9	5.2	7.6	22	23	17	12	12	12	11	9.0	12	-0.14	-1.2
	1:100 Dry Year	Existing	3.3	2.8	2.5	3.6	10	11	7.8	5.7	5.4	5.5	5.4	4.2	5.6	-	
		Operations	3.1	2.6	2.2	3.4	10	10	7.6	5.5	5.3	5.4	5.2	4.0	5.4	-0.19	-3.4
	1:100 Wet Year	Existing	13	11	9.3	14	39	40	29	21	20	21	20	16	21	-	
		Operations	12	10	9.1	13	39	40	29	21	20	21	20	16	21	-0.13	-0.60

Note:
1. Artificial node whose flow doesn't represent a realistic change in as they are located in the middle of the lake. Lake levels are a function of downstream lake outlets, rather than inflows calculated at the node location.

Table 5-4: Results for Active Closure Pit Filling Period - Average, Dry, and Wet Conditions

Watershed Id	Flow Condition	Scenario	Calculated Flow (m^3/s)														Change in Flow (%)
			January	February	March	April	May	June	July	August	September	October	November	December	Average	Change in Flow (m^3/s)	
Node 1	Average Year	Existing	0.0020	0.0017	0.0015	0.0021	0.0061	0.0063	0.0046	0.0034	0.0032	0.0033	0.0032	0.0025	0.0033	-	
		Pit Filling	-0.000045	-0.00030	-0.00047	0.00007	0.0034	0.0035	0.0021	0.0011	0.0010	0.0010	0.0009	0.0004	0.0011	-0.0023	-68
	1:100 Dry Year	Existing	0.00092	0.00077	0.00068	0.00098	0.0028	0.0029	0.0021	0.0015	0.0015	0.0015	0.0015	0.0012	0.0015	-	
		Pit Filling	-0.00092	-0.0010	-0.0011	-0.00087	0.00065	0.00070	0.000079	-0.00040	-0.00046	-0.00043	-0.00047	-0.00073	-0.00041	-0.0019	-127
	1:100 Wet Year	Existing	0.0035	0.0029	0.0026	0.0037	0.011	0.011	0.0080	0.0058	0.0056	0.0057	0.0055	0.0043	0.0058	-	
		Pit Filling	0.0012	0.0007	0.0004	0.0014	0.0071	0.0073	0.0049	0.0031	0.0029	0.0030	0.0029	0.0019	0.0031	-0.0027	-47
Node 2	Average Year	Existing	0.0036	0.0030	0.0026	0.0038	0.011	0.011	0.0083	0.0060	0.0058	0.0059	0.0057	0.0045	0.0060	-	
		Pit Filling	0.0022	0.0018	0.0015	0.0024	0.0076	0.0078	0.0057	0.0040	0.0038	0.0039	0.0038	0.0029	0.0040	-0.0020	-33
	1:100 Dry Year	Existing	0.0016	0.0014	0.0012	0.0018	0.0051	0.0052	0.0038	0.0028	0.0027	0.0027	0.0026	0.0021	0.0028	-	
		Pit Filling	0.00080	0.00061	0.00049	0.00089	0.0033	0.0034	0.0024	0.0016	0.0015	0.0016	0.0015	0.0011	0.0016	-0.0011	-41
	1:100 Wet Year	Existing	0.0062	0.0052	0.0046	0.0066	0.019	0.020	0.014	0.010	0.010	0.010	0.010	0.0078	0.010	-	
		Pit Filling	0.0041	0.0034	0.0029	0.0044	0.014	0.014	0.010	0.0073	0.0069	0.0071	0.0069	0.0053	0.0072	-0.0032	-31
Node 3	Average Year	Existing	0.0018	0.0015	0.0013	0.0019	0.0055	0.0057	0.0042	0.0030	0.0029	0.0030	0.0029	0.0023	0.0030	-	
		Pit Filling	0.0018	0.0015	0.0013	0.0019	0.0055	0.0057	0.0042	0.0030	0.0029	0.0030	0.0029	0.0022	0.0030	-0.000012	-0.4
	1:100 Dry Year	Existing	0.00083	0.00070	0.00061	0.00089	0.0026	0.0026	0.0019	0.0014	0.0013	0.0014	0.0013	0.0010	0.0014	-	
		Pit Filling	0.00082	0.00068	0.00060	0.00087	0.0025	0.0026	0.0019	0.0014	0.0013	0.0014	0.0013	0.00103	0.0014	-0.000012	-0.8
	1:100 Wet Year	Existing	0.0031	0.0026	0.0023	0.0033	0.0096	0.0099	0.0073	0.0053	0.0051	0.0052	0.0050	0.0039	0.0052	-	
		Pit Filling	0.0031	0.0026	0.0023	0.0033	0.0096	0.0098	0.0073	0.0053	0.0050	0.0052	0.0050	0.0039	0.0052	-0.000012	-0.2
Node 4	Average Year	Existing	0.0050	0.0042	0.0037	0.0053	0.015	0.016	0.012	0.0084	0.0080	0.0082	0.0080	0.0062	0.0083	-	
		Pit Filling	0.0020	0.0017	0.0014	0.0022	0.0068	0.0069	0.0050	0.0036	0.0034	0.0035	0.0034	0.0026	0.0036	-0.0047	-57
	1:100 Dry Year	Existing	0.0023	0.0019	0.0017	0.0024	0.0071	0.0072	0.0053	0.0039	0.0037	0.0038	0.0037	0.0029	0.0038	-	
		Pit Filling	0.0008	0.0006	0.0005	0.0009	0.0030	0.0031	0.0022	0.0015	0.0015	0.0015	0.0014	0.0011	0.0015	-0.0023	-61
	1:100 Wet Year	Existing	0.0086	0.0072	0.0064	0.0092	0.027	0.027	0.020	0.015	0.014	0.014	0.014	0.011	0.014	-	
		Pit Filling	0.0037	0.0031	0.0027	0.0040	0.012	0.012	0.0089	0.0064	0.0061	0.0063	0.0061	0.0047	0.0064	-0.0081	-56
Node 5[1,2]	Average Year	Existing	0.17	0.14	0.12	0.18	0.51	0.53	0.39	0.28	0.27	0.28	0.27	0.21	0.28	-	
		Pit Filling	-0.55	-0.47	-0.41	-0.59	-1.7	-1.7	-1.3	-0.93	-0.89	-0.91	-0.88	-0.69	-0.92	-1.2	-431
	1:100 Dry Year	Existing	0.077	0.065	0.057	0.082	0.24	0.24	0.18	0.13	0.12	0.13	0.12	0.096	0.13	-	
		Pit Filling	-0.26	-0.22	-0.20	-0.28	-0.79	-0.80	-0.60	-0.43	-0.42	-0.43	-0.41	-0.33	-0.43	-0.56	-436
	1:100 Wet Year	Existing	0.29	0.24	0.21	0.31	0.89	0.91	0.67	0.49	0.47	0.48	0.46	0.36	0.48	-	
		Pit Filling	-0.95	-0.81	-0.71	-1.0	-2.9	-3.0	-2.2	-1.6	-1.5	-1.6	-1.5	-1.2	-1.6	-2.1	-429
Node 6[1]	Average Year	Existing	0.018	0.015	0.013	0.019	0.056	0.057	0.042	0.030	0.029	0.030	0.029	0.023	0.030	-	
		Pit Filling	0.013	0.010	0.009	0.014	0.047	0.049	0.035	0.024	0.023	0.024	0.023	0.017	0.024	-0.0059	-20
	1:100 Dry Year	Existing	0.0083	0.0070	0.0061	0.0089	0.026	0.026	0.019	0.014	0.013	0.014	0.013	0.010	0.014	-	
		Pit Filling	0.0042	0.0030	0.0022	0.0047	0.020	0.021	0.014	0.009	0.009	0.009	0.009	0.006	0.009	-0.0046	-33
	1:100 Wet Year	Existing	0.031	0.026	0.023	0.033	0.097	0.099	0.073	0.053	0.051	0.052	0.050	0.039	0.052	-	
		Pit Filling	0.025	0.021	0.018	0.027	0.085	0.087	0.063	0.045	0.043	0.044	0.043	0.033	0.045	-0.0078	-15

Table 5-4: Results for Active Closure Pit Filling Period - Average, Dry, and Wet Conditions

Watershed Id	Flow Condition	Scenario	Calculated Flow (m^3/s)														Change in Flow (%)
			January	February	March	April	May	June	July	August	September	October	November	December	Average	Change in Flow (m^3/s)	
Node 7[1]	Average Year	Existing	0.055	0.046	0.041	0.059	0.17	0.17	0.13	0.093	0.089	0.091	0.089	0.069	0.092	-	
		Pit Filling	0.047	0.040	0.035	0.051	0.15	0.15	0.11	0.081	0.077	0.079	0.077	0.060	0.080	-0.012	-13
	1:100 Dry Year	Existing	0.025	0.021	0.019	0.027	0.079	0.080	0.059	0.043	0.041	0.042	0.041	0.032	0.043	-	
		Pit Filling	0.022	0.018	0.016	0.023	0.068	0.069	0.051	0.037	0.035	0.036	0.035	0.027	0.037	-0.0061	-14
	1:100 Wet Year	Existing	0.096	0.081	0.071	0.10	0.30	0.30	0.22	0.16	0.16	0.16	0.15	0.12	0.16	-	
		Pit Filling	0.083	0.070	0.061	0.089	0.26	0.26	0.19	0.14	0.13	0.14	0.13	0.10	0.14	-0.021	-13
Node 8[1]	Average Year	Existing	4.0	3.4	3.0	4.3	12	13	9.4	6.8	6.5	6.7	6.5	5.1	6.8	-	
		Pit Filling	4.0	3.4	3.0	4.3	12	13	9.3	6.8	6.5	6.6	6.4	5.0	6.7	-0.033	-0.49
	1:100 Dry Year	Existing	1.9	1.6	1.4	2.0	5.7	5.9	4.3	3.1	3.0	3.1	3.0	2.3	3.1	-	
		Pit Filling	1.8	1.6	1.4	2.0	5.7	5.8	4.3	3.1	3.0	3.1	3.0	2.3	3.1	-0.019	-0.60
	1:100 Wet Year	Existing	7.0	5.9	5.2	7.5	22	22	16	12	11	12	11	8.8	12	-	
		Pit Filling	7.0	5.9	5.2	7.5	22	22	16	12	11	12	11	8.8	12	-0.053	-0.45
Node 9	Average Year	Existing	7.0	5.9	5.2	7.5	22	22	16	12	11	12	11	8.8	12	-	
		Pit Filling	6.2	5.2	4.6	6.8	19	20	15	11	10	10	10	7.8	11	-1.1	-10
	1:100 Dry Year	Existing	3.2	2.7	2.4	3.4	9.9	10	7.5	5.4	5.2	5.3	5.2	4.0	5.4	-	
		Pit Filling	2.9	2.4	2.1	3.1	9.0	9.2	6.8	4.9	4.7	4.8	4.6	3.6	4.9	-0.54	-10
	1:100 Wet Year	Existing	12	10	9.0	13	37	38	28	20	20	20	19	15	20	-	
		Pit Filling	11	9.1	8.0	12	34	35	26	19	18	18	18	14	18	-2.0	-10
Node 10	Average Year	Existing	7.3	6.1	5.4	7.8	22	23	17	12	12	12	12	9.1	12	-	
		Pit Filling	6.5	5.5	4.8	7.1	20	21	15	11	11	11	11	8.2	11	-1.1	-9.4
	1:100 Dry Year	Existing	3.3	2.8	2.5	3.6	10	11	7.8	5.7	5.4	5.5	5.4	4.2	5.6	-	
		Pit Filling	3.0	2.5	2.2	3.3	9.4	9.6	7.1	5.1	4.9	5.0	4.8	3.8	5.1	-0.54	-9.6
	1:100 Wet Year	Existing	13	11	9.3	14	39	40	29	21	20	21	20	16	21	-	
		Pit Filling	11	9.5	8.4	12	35	36	27	19	19	19	18	14	19	-2.0	-9.4

Note:

1. Artificial node whose flow doesn't represent a realistic change in as they are located in the middle of the lake. Lake levels are a function of downstream lake outlets, rather than inflows calculated at the node location.

2. Node included for water quality purposes. Flow estimation does not represent a realistic change in flow as these nodes are located in the middle of a lake. See Appendix A for assessment of Node 5 impacts to lake level and velocity.

Table 5-5: Results for Active Closure Post Pit Filling Contingency - Average, Dry, and Wet Conditions

Watershed Id	Flow Condition	Scenario	Calculated Flow (m^3/s)														
			January	February	March	April	May	June	July	August	September	October	November	December	Average	Change in Flow (m^3/s)	Change in Flow (%)
Node 1	Average Year	Existing	0.0020	0.0017	0.0015	0.0021	0.0061	0.0063	0.0046	0.0034	0.0032	0.0033	0.0032	0.0025	0.0033	-	
		Active Closure	0.0016	0.0014	0.0012	0.0017	0.0050	0.0051	0.0038	0.0028	0.0026	0.0027	0.0026	0.0020	0.0027	-0.00060	-18
	1:100 Dry Year	Existing	0.00092	0.00077	0.00068	0.00098	0.0028	0.0029	0.0021	0.0015	0.0015	0.0015	0.0015	0.0012	0.0015	-	
		Active Closure	0.00075	0.00063	0.00056	0.00080	0.0023	0.0024	0.0018	0.0013	0.0012	0.0012	0.0012	0.00094	0.0013	-0.00028	-18
	1:100 Wet Year	Existing	0.0035	0.0029	0.0026	0.0037	0.011	0.011	0.0080	0.0058	0.0056	0.0057	0.0055	0.0043	0.0058	-	
		Active Closure	0.0028	0.0024	0.0021	0.0030	0.0088	0.0089	0.0066	0.0048	0.0046	0.0047	0.0045	0.0036	0.0047	-0.0010	-18
Node 2	Average Year	Existing	0.0036	0.0030	0.0026	0.0038	0.011	0.011	0.0083	0.0060	0.0058	0.0059	0.0057	0.0045	0.0060	-	
		Active Closure	0.0025	0.0021	0.0018	0.0027	0.0079	0.0081	0.0059	0.0043	0.0041	0.0042	0.0041	0.0031	0.0042	-0.0017	-29
	1:100 Dry Year	Existing	0.0016	0.0014	0.0012	0.0018	0.0051	0.0052	0.0038	0.0028	0.0027	0.0027	0.0026	0.0021	0.0028	-	
		Active Closure	0.0011	0.00088	0.00076	0.0012	0.0036	0.0037	0.0027	0.0019	0.0018	0.0019	0.0018	0.0014	0.0019	-0.00086	-31
	1:100 Wet Year	Existing	0.0062	0.0052	0.0046	0.0066	0.019	0.020	0.014	0.010	0.010	0.010	0.010	0.0078	0.010	-	
		Active Closure	0.0044	0.0037	0.0032	0.0047	0.014	0.014	0.010	0.0075	0.0072	0.0074	0.0071	0.0056	0.0075	-0.0029	-28
Node 3	Average Year	Existing	0.0018	0.0015	0.0013	0.0019	0.0055	0.0057	0.0042	0.0030	0.0029	0.0030	0.0029	0.0023	0.0030	-	
		Active Closure	0.0018	0.0015	0.0013	0.0019	0.0056	0.0057	0.0042	0.0030	0.0029	0.0030	0.0029	0.0023	0.0030	0.000012	0.39
	1:100 Dry Year	Existing	0.00083	0.00070	0.00061	0.00089	0.0026	0.0026	0.0019	0.0014	0.0013	0.0014	0.0013	0.0010	0.0014	-	
		Active Closure	0.00084	0.00071	0.00062	0.00090	0.0026	0.0026	0.0019	0.0014	0.0014	0.0014	0.0013	0.0011	0.0014	0.000012	0.83
	1:100 Wet Year	Existing	0.0031	0.0026	0.0023	0.0033	0.0096	0.0099	0.0073	0.0053	0.0051	0.0052	0.0050	0.0039	0.0052	-	
		Active Closure	0.0031	0.0026	0.0023	0.0033	0.0097	0.0099	0.0073	0.0053	0.0051	0.0052	0.0050	0.0039	0.0052	0.000012	0.22
Node 4	Average Year	Existing	0.0050	0.0042	0.0037	0.0053	0.015	0.016	0.012	0.0084	0.0080	0.0082	0.0080	0.0062	0.0083	-	
		Active Closure	0.0020	0.0016	0.0014	0.0022	0.0067	0.0069	0.0050	0.0036	0.0034	0.0035	0.0034	0.0026	0.0035	-0.0048	-57
	1:100 Dry Year	Existing	0.0023	0.0019	0.0017	0.0024	0.0071	0.0072	0.0053	0.0039	0.0037	0.0038	0.0037	0.0029	0.0038	-	
		Active Closure	0.0008	0.0006	0.0005	0.0009	0.0030	0.0030	0.0022	0.0015	0.0014	0.0015	0.0014	0.0010	0.0015	-0.0023	-61
	1:100 Wet Year	Existing	0.0086	0.0072	0.0064	0.0092	0.027	0.027	0.020	0.015	0.014	0.014	0.014	0.011	0.014	-	
		Active Closure	0.0037	0.0031	0.0026	0.0040	0.012	0.012	0.0089	0.0064	0.0061	0.0063	0.0061	0.0047	0.0063	-0.0081	-56
Node 5[1]	Average Year	Existing	0.17	0.14	0.12	0.18	0.51	0.53	0.39	0.28	0.27	0.28	0.27	0.21	0.28	-	
		Active Closure	0.13	0.11	0.092	0.14	0.40	0.41	0.30	0.22	0.21	0.21	0.21	0.16	0.22	-0.063	-22
	1:100 Dry Year	Existing	0.077	0.065	0.057	0.082	0.24	0.24	0.18	0.13	0.12	0.13	0.12	0.096	0.13	-	
		Active Closure	0.056	0.046	0.040	0.060	0.18	0.19	0.14	0.098	0.094	0.096	0.093	0.071	0.097	-0.032	-25
	1:100 Wet Year	Existing	0.29	0.24	0.21	0.31	0.89	0.91	0.67	0.49	0.47	0.48	0.46	0.36	0.48	-	
		Active Closure	0.22	0.19	0.16	0.24	0.70	0.72	0.53	0.38	0.37	0.37	0.36	0.28	0.38	-0.11	-22
Node 6[1]	Average Year	Existing	0.018	0.015	0.013	0.019	0.056	0.057	0.042	0.030	0.029	0.030	0.029	0.023	0.030	-	
		Active Closure	0.016	0.013	0.011	0.017	0.050	0.051	0.038	0.027	0.026	0.026	0.026	0.020	0.027	-0.0033	-11
	1:100 Dry Year	Existing	0.0083	0.0070	0.0061	0.0089	0.026	0.026	0.019	0.014	0.013	0.014	0.013	0.010	0.014	-	
		Active Closure	0.0068	0.0056	0.0048	0.0073	0.023	0.023	0.017	0.012	0.012	0.012	0.011	0.009	0.012	-0.0020	-14
	1:100 Wet Year	Existing	0.031	0.026	0.023	0.033	0.097	0.099	0.073	0.053	0.051	0.052	0.050	0.039	0.052	-	
		Active Closure	0.028	0.023	0.020	0.030	0.088	0.09	0.066	0.048	0.046	0.047	0.045	0.035	0.047	-0.0051	-9.8

Table 5-5: Results for Active Closure Post Pit Filling Contingency - Average, Dry, and Wet Conditions

Watershed Id	Flow Condition	Scenario	Calculated Flow (m^3/s)														
			January	February	March	April	May	June	July	August	September	October	November	December	Average	Change in Flow (m^3/s)	Change in Flow (%)
Node 7[1]	Average Year	Existing	0.055	0.046	0.041	0.059	0.17	0.17	0.13	0.093	0.089	0.091	0.089	0.069	0.092	-	
		Active Closure	0.047	0.040	0.035	0.051	0.15	0.15	0.11	0.080	0.077	0.079	0.076	0.060	0.080	-0.013	-14
	1:100 Dry Year	Existing	0.025	0.021	0.019	0.027	0.079	0.080	0.059	0.043	0.041	0.042	0.041	0.032	0.043	-	
		Active Closure	0.021	0.018	0.016	0.023	0.068	0.069	0.051	0.037	0.035	0.036	0.035	0.027	0.036	-0.0062	-15
	1:100 Wet Year	Existing	0.096	0.081	0.071	0.10	0.30	0.30	0.22	0.16	0.16	0.16	0.15	0.12	0.16	-	
		Active Closure	0.083	0.070	0.061	0.089	0.26	0.26	0.19	0.14	0.13	0.14	0.13	0.10	0.14	-0.021	-13
Node 8[1]	Average Year	Existing	4.0	3.4	3.0	4.3	12	13	9.4	6.8	6.5	6.7	6.5	5.1	6.8	-	
		Active Closure	4.0	3.4	3.0	4.3	12	13	9.3	6.8	6.5	6.6	6.4	5.0	6.7	-0.029	-0.43
	1:100 Dry Year	Existing	1.9	1.6	1.4	2.0	5.7	5.9	4.3	3.1	3.0	3.1	3.0	2.3	3.1	-	
		Active Closure	1.8	1.6	1.4	2.0	5.7	5.8	4.3	3.1	3.0	3.1	3.0	2.3	3.1	-0.014	-0.46
	1:100 Wet Year	Existing	7.0	5.9	5.2	7.5	22	22	16	12	11	12	11	8.8	12	-	
		Active Closure	7.0	5.9	5.2	7.5	22	22	16	12	11	12	11	8.8	12	-0.049	-0.42
Node 9	Average Year	Existing	7.0	5.9	5.2	7.5	22	22	16	12	11	12	11	8.8	12	-	
		Active Closure	6.9	5.8	5.1	7.5	22	22	16	12	11	12	11	8.7	12	0.004	0.031
	1:100 Dry Year	Existing	3.2	2.7	2.4	3.4	9.9	10	7.5	5.4	5.2	5.3	5.2	4.0	5.4	-	
		Active Closure	3.2	2.7	2.4	3.5	10.0	10	7.5	5.4	5.2	5.3	5.1	4.0	5.4	-0.0051	-0.095
	1:100 Wet Year	Existing	12	10	9.0	13	37	38	28	20	20	20	19	15	20	-	
		Active Closure	12	10	8.9	13	38	38	28	21	20	20	19	15	20	0.0046	0.022
Node 10	Average Year	Existing	7.3	6.1	5.4	7.8	22	23	17	12	12	12	12	9.1	12	-	
		Active Closure	7.2	6.1	5.3	7.8	22	23	17	12	12	12	12	9.1	12	0.004	0.030
	1:100 Dry Year	Existing	3.3	2.8	2.5	3.6	10	11	7.8	5.7	5.4	5.5	5.4	4.2	5.6	-	
		Active Closure	3.3	2.8	2.5	3.6	10	11	7.8	5.7	5.4	5.5	5.3	4.2	5.6	-0.0051	-0.092
	1:100 Wet Year	Existing	13	11	9.3	14	39	40	29	21	20	21	20	16	21	-	
		Active Closure	13	11	9.3	14	39	40	29	21	21	21	20	16	21	0.0046	0.022

Notes:
1. Artificial node whose flow doesn't represent a realistic change in as they are located in the middle of the lake. Lake levels are a function of downstream lake outlets, rather than inflows calculated at the node location.

Table 5-6: Results for Post Closure Phase - Average, Dry, and Wet Conditions

Watershed Id	Flow Condition	Scenario	Calculated Flow (m^3/s)														
			January	February	March	April	May	June	July	August	September	October	November	December	Average	Change in Flow (m^3/s)	Change in Flow (%)
Node 1	Average Year	Existing	0.0020	0.0017	0.0015	0.0021	0.0061	0.0063	0.0046	0.0034	0.0032	0.0033	0.0032	0.0025	0.0033	-	
		Final Closure	0.0016	0.0014	0.0012	0.0017	0.0050	0.0051	0.0038	0.0028	0.0026	0.0027	0.0026	0.0020	0.0027	-0.00060	-18
	1:100 Dry Year	Existing	0.00092	0.00077	0.00068	0.00098	0.0028	0.0029	0.0021	0.0015	0.0015	0.0015	0.0015	0.0012	0.0015	-	
		Final Closure	0.00075	0.00063	0.00056	0.00080	0.0023	0.0024	0.0018	0.0013	0.0012	0.0012	0.0012	0.00094	0.0013	-0.00028	-18
	1:100 Wet Year	Existing	0.0035	0.0029	0.0026	0.0037	0.011	0.011	0.0080	0.0058	0.0056	0.0057	0.0055	0.0043	0.0058	-	
		Final Closure	0.0028	0.0024	0.0021	0.0030	0.0088	0.0089	0.0066	0.0048	0.0046	0.0047	0.0045	0.0036	0.0047	-0.0010	-18
Node 2	Average Year	Existing	0.0036	0.0030	0.0026	0.0038	0.011	0.011	0.0083	0.0060	0.0058	0.0059	0.0057	0.0045	0.0060	-	
		Final Closure	0.0025	0.0021	0.0018	0.0027	0.0079	0.0081	0.0059	0.0043	0.0041	0.0042	0.0041	0.0031	0.0042	-0.0017	-29
	1:100 Dry Year	Existing	0.0016	0.0014	0.0012	0.0018	0.0051	0.0052	0.0038	0.0028	0.0027	0.0027	0.0026	0.0021	0.0028	-	
		Final Closure	0.0011	0.00088	0.00076	0.0012	0.0036	0.0037	0.0027	0.0019	0.0018	0.0019	0.0018	0.0014	0.0019	-0.00086	-31
	1:100 Wet Year	Existing	0.0062	0.0052	0.0046	0.0066	0.019	0.020	0.014	0.010	0.010	0.010	0.010	0.0078	0.010	-	
		Final Closure	0.0044	0.0037	0.0032	0.0047	0.014	0.014	0.010	0.0075	0.0072	0.0074	0.0071	0.0056	0.0075	-0.0029	-28
Node 3	Average Year	Existing	0.0018	0.0015	0.0013	0.0019	0.0055	0.0057	0.0042	0.0030	0.0029	0.0030	0.0029	0.0023	0.0030	-	
		Final Closure	0.0018	0.0015	0.0013	0.0019	0.0056	0.0057	0.0042	0.0030	0.0029	0.0030	0.0029	0.0023	0.0030	0.000012	0.39
	1:100 Dry Year	Existing	0.00083	0.00070	0.00061	0.00089	0.0026	0.0026	0.0019	0.0014	0.0013	0.0014	0.0013	0.0010	0.0014	-	
		Final Closure	0.00084	0.00071	0.00062	0.00090	0.0026	0.0026	0.0019	0.0014	0.0014	0.0014	0.0013	0.0011	0.0014	0.000012	0.83
	1:100 Wet Year	Existing	0.0031	0.0026	0.0023	0.0033	0.0096	0.0099	0.0073	0.0053	0.0051	0.0052	0.0050	0.0039	0.0052	-	
		Final Closure	0.0031	0.0026	0.0023	0.0033	0.0097	0.0099	0.0073	0.0053	0.0051	0.0052	0.0050	0.0039	0.0052	0.000012	0.22
Node 4	Average Year	Existing	0.0050	0.0042	0.0037	0.0053	0.015	0.016	0.012	0.0084	0.0080	0.0082	0.0080	0.0062	0.0083	-	
		Final Closure	0.0020	0.0016	0.0014	0.0022	0.0067	0.0069	0.0050	0.0036	0.0034	0.0035	0.0034	0.0026	0.0035	-0.0048	-57
	1:100 Dry Year	Existing	0.0023	0.0019	0.0017	0.0024	0.0071	0.0072	0.0053	0.0039	0.0037	0.0038	0.0037	0.0029	0.0038	-	
		Final Closure	0.00078	0.00061	0.00051	0.00085	0.0030	0.0030	0.0022	0.0015	0.0014	0.0015	0.0014	0.0010	0.0015	-0.0023	-61
	1:100 Wet Year	Existing	0.0086	0.0072	0.0064	0.0092	0.027	0.027	0.020	0.015	0.014	0.014	0.014	0.011	0.014	-	
		Final Closure	0.0037	0.0031	0.0026	0.0040	0.012	0.012	0.0089	0.0064	0.0061	0.0063	0.0061	0.0047	0.0063	-0.0081	-56
Node 5[1]	Average Year	Existing	0.17	0.14	0.12	0.18	0.51	0.53	0.39	0.28	0.27	0.28	0.27	0.21	0.28	-	
		Final Closure	0.14	0.12	0.12	0.22	0.59	0.52	0.40	0.30	0.32	0.30	0.25	0.18	0.29	0.012	4.2
	1:100 Dry Year	Existing	0.077	0.065	0.057	0.08	0.24	0.24	0.18	0.13	0.12	0.13	0.12	0.096	0.13	-	
		Final Closure	0.070	0.061	0.059	0.10	0.25	0.22	0.17	0.13	0.12	0.12	0.11	0.079	0.13	-0.0035	-2.7
	1:100 Wet Year	Existing	0.29	0.24	0.21	0.31	0.89	0.91	0.67	0.49	0.47	0.48	0.46	0.36	0.48	-	
		Final Closure	0.24	0.21	0.20	0.39	1.0	0.93	0.73	0.56	0.57	0.52	0.44	0.31	0.51	0.024	5.1
Node 6[1]	Average Year	Existing	0.018	0.015	0.013	0.019	0.056	0.057	0.042	0.030	0.029	0.030	0.029	0.023	0.030	-	
		Final Closure	0.016	0.013	0.011	0.017	0.050	0.051	0.038	0.027	0.026	0.026	0.026	0.020	0.027	-0.0033	-11
	1:100 Dry Year	Existing	0.0083	0.0070	0.0061	0.0089	0.026	0.026	0.019	0.014	0.013	0.014	0.013	0.010	0.014	-	
		Final Closure	0.0068	0.0056	0.0048	0.0073	0.023	0.023	0.017	0.012	0.012	0.012	0.011	0.0087	0.012	-0.0020	-14
	1:100 Wet Year	Existing	0.031	0.026	0.023	0.033	0.097	0.099	0.073	0.053	0.051	0.052	0.050	0.039	0.052	-	
		Final Closure	0.028	0.023	0.020	0.030	0.088	0.09	0.066	0.048	0.046	0.047	0.045	0.035	0.047	-0.0051	-9.8

Table 5-6: Results for Post Closure Phase - Average, Dry, and Wet Conditions

Watershed Id	Flow Condition	Scenario	Calculated Flow (m^3/s)														Change in Flow (%)
			January	February	March	April	May	June	July	August	September	October	November	December	Average	Change in Flow (m^3/s)	
Node 7[1]	Average Year	Existing	0.055	0.046	0.041	0.059	0.17	0.17	0.13	0.093	0.089	0.091	0.089	0.069	0.092	-	
		Final Closure	0.047	0.040	0.035	0.051	0.15	0.15	0.11	0.080	0.077	0.079	0.076	0.060	0.080	-0.013	-14
	1:100 Dry Year	Existing	0.025	0.021	0.019	0.027	0.079	0.080	0.059	0.043	0.041	0.042	0.041	0.032	0.043	-	
		Final Closure	0.021	0.018	0.016	0.023	0.068	0.069	0.051	0.037	0.035	0.036	0.035	0.027	0.036	-0.0062	-15
	1:100 Wet Year	Existing	0.096	0.081	0.071	0.10	0.30	0.30	0.22	0.16	0.16	0.16	0.15	0.12	0.16	-	
		Final Closure	0.083	0.070	0.061	0.089	0.26	0.26	0.19	0.14	0.13	0.14	0.13	0.10	0.14	-0.021	-13
Node 8[1]	Average Year	Existing	4.0	3.4	3.0	4.3	12	13	9.4	6.8	6.5	6.7	6.5	5.1	6.8	-	
		Final Closure	4.0	3.4	3.0	4.3	12	13	9.4	6.8	6.5	6.7	6.5	5.0	6.7	-0.0044	-0.065
	1:100 Dry Year	Existing	1.9	1.6	1.4	2.0	5.7	5.9	4.3	3.1	3.0	3.1	3.0	2.3	3.1	-	
		Final Closure	1.9	1.6	1.4	2.0	5.8	5.9	4.3	3.1	3.0	3.1	3.0	2.3	3.1	0.0008	0.027
	1:100 Wet Year	Existing	7.0	5.9	5.2	7.5	22	22	16	12	11	12	11	8.8	12	-	
		Final Closure	7.0	5.9	5.2	7.5	22	22	16	12	11	12	11	8.8	12	-0.015	-0.12
Node 9	Average Year	Existing	7.0	5.9	5.2	7.5	22	22	16	12	11	12	11	8.8	12	-	
		Final Closure	6.9	5.8	5.1	7.5	22	22	16	12	11	12	11	8.7	12	0.0044	0.038
	1:100 Dry Year	Existing	3.2	2.7	2.4	3.4	9.9	10	7.5	5.4	5.2	5.3	5.2	4.0	5.4	-	
		Final Closure	3.2	2.7	2.4	3.5	10	10	7.5	5.4	5.2	5.3	5.2	4.0	5.4	-0.0040	-0.073
	1:100 Wet Year	Existing	12	10	9.0	13	37	38	28	20	20	20	19	15	20	-	
		Final Closure	12	10	8.9	13	38	38	28	21	20	20	19	15	20	0.0051	0.025
Node 10	Average Year	Existing	7.3	6.1	5.4	7.8	22	23	17	12	12	12	12	9.1	12	-	
		Final Closure	7.2	6.1	5.3	7.8	22	23	17	12	12	12	12	9.1	12	0.0044	0.037
	1:100 Dry Year	Existing	3.3	2.8	2.5	3.6	10	11	7.8	5.7	5.4	5.5	5.4	4.2	5.6	-	
		Final Closure	3.3	2.8	2.5	3.6	10	11	7.8	5.7	5.4	5.5	5.4	4.2	5.6	-0.0040	-0.071
	1:100 Wet Year	Existing	13	11	9.3	14	39	40	29	21	20	21	20	16	21	-	
		Final Closure	13	11	9.3	14	39	40	29	21	21	21	20	16	21	0.0051	0.024

Note:
1. Artificial node whose flow doesn't represent a realistic change in as they are located in the middle of the lake. Lake levels are a function of downstream lake outlets, rather than inflows calculated at the node location.

Table 5-7: Results for Post Closure Phase, Climate change Scenario - Average Conditions

Watershed Id	Flow Condition	Scenario	Calculated Flow (m^3/s)														
			January	February	March	April	May	June	July	August	September	October	November	December	Average	Change in Flow (m^3/s)	Change in Flow (%)
Node 1	Average	Existing	0.0020	0.0017	0.0015	0.0021	0.0061	0.0063	0.0046	0.0034	0.0032	0.0033	0.0032	0.0025	0.0033	-	
		Climate Change	0.0016	0.0014	0.0012	0.0017	0.0050	0.0051	0.0038	0.0028	0.0026	0.0027	0.0026	0.0020	0.0027	-0.00060	-18
Node 2	Average	Existing	0.0036	0.0030	0.0026	0.0038	0.011	0.011	0.0083	0.0060	0.0058	0.0059	0.0057	0.0045	0.0060	-	
		Climate Change	0.0025	0.0021	0.0018	0.0027	0.0079	0.0081	0.0059	0.0043	0.0041	0.0042	0.0041	0.0031	0.0042	-0.0017	-29
Node 3	Average	Existing	0.0018	0.0015	0.0013	0.0019	0.0055	0.0057	0.0042	0.0030	0.0029	0.0030	0.0029	0.0023	0.0030	-	
		Climate Change	0.0018	0.0015	0.0013	0.0019	0.0056	0.0057	0.0042	0.0030	0.0029	0.0030	0.0029	0.0023	0.0030	0.000012	0.39
Node 4	Average	Existing	0.0050	0.0042	0.0037	0.0053	0.015	0.016	0.012	0.0084	0.0080	0.0082	0.0080	0.0062	0.0083	-	
		Climate Change	0.0020	0.0016	0.0014	0.0022	0.0067	0.0069	0.0050	0.0036	0.0034	0.0035	0.0034	0.0026	0.0035	-0.0048	-57
Node 5[1]	Average	Existing	0.17	0.14	0.12	0.18	0.51	0.53	0.39	0.28	0.27	0.28	0.27	0.21	0.28	-	
		Climate Change	0.14	0.12	0.12	0.24	0.60	0.51	0.38	0.29	0.28	0.29	0.26	0.18	0.29	0.007	2.4
Node 6[1]	Average	Existing	0.018	0.015	0.013	0.019	0.056	0.057	0.042	0.030	0.029	0.030	0.029	0.023	0.030	-	
		Climate Change	0.016	0.013	0.011	0.017	0.050	0.051	0.038	0.027	0.026	0.026	0.026	0.020	0.027	-0.0033	-11
Node 7[1]	Average	Existing	0.055	0.046	0.041	0.059	0.17	0.17	0.13	0.093	0.089	0.091	0.089	0.069	0.092	-	
		Climate Change	0.047	0.040	0.035	0.051	0.15	0.15	0.11	0.080	0.077	0.079	0.076	0.060	0.080	-0.0125	-14
Node 8[1]	Average	Existing	4.0	3.4	3.0	4.3	12	13	9.4	6.8	6.5	6.7	6.5	5.1	6.8	-	
		Climate Change	4.0	3.4	3.0	4.3	12	13	9.4	6.8	6.5	6.7	6.5	5.0	6.7	-0.0032	-0.048
Node 9	Average	Existing	7.0	5.9	5.2	7.5	22	22	16	12	11	12	11	8.8	12	-	
		Climate Change	6.9	5.8	5.1	7.5	22	22	16	12	11	12	11	8.7	12	0.0008	0.007
Node 10	Average	Existing	7.3	6.1	5.4	7.8	22	23	17	12	12	12	12	9.1	12	-	
		Climate Change	7.2	6.1	5.4	7.8	22	23	17	12	12	12	12	9.1	12	0.0008	0.006

Notes:
1. Artificial node whose flow doesn't represent a realistic change in as they are located in the middle of the lake. Lake levels are a function of downstream lake outlets, rather than inflows calculated at the node location.

6.0 CONCLUSION

This receiving environment water balance was developed on a monthly time-step to support the EIS/EA for the *Springpole Gold Project*. Flows were simulated at 10 model nodes for the various Project phases (construction, operations, active closure - pit filling period, active closure – post pit filling contingency and post-closure) under average, 1:100 wet and 1:100 dry year climatic conditions. A high-level climate change scenario was also carried out for the post-closure phase. The simulated flows were compared to those determined for the existing conditions in order to quantify the change in flow resulting from each Project phase. Model results are presented in Table 5-1 to Table 5-7 and briefly summarized below.

Throughout all Project phases, areas within the existing subwatersheds for Nodes 1, 2 and 4 (unnamed lakes L-1, L-19, and L16, respectively) will be within the Project development footprint. Runoff from these areas will be captured and managed within the mine site water management system, resulting in a reduction in area and flow reporting to Nodes 1, 2 and 4. Furthermore, these nodes are also subject to some groundwater flow reductions which have a potential impact on the smaller watershed areas such as Nodes 1, 2 and 4. Losses are expected to exceed inflows to Node 1 during the operation phase. Flow from the overprinted areas will be collected and discharged to the southeast arm of Springpole Lake (Node 9).

Model results show a slight flow reduction (maximum of 2.5%) at Node 3 (unnamed lake L-20) during the operations and open pit basin filling phases as a result of changes to the groundwater conditions driven by the development and filling of the open pit.

Node 5 (Springpole Lake) will experience the greatest change in flows during the construction and active closure - pit filling periods. During the construction phase Node 5 will see an increase in flow as a result of the controlled dewatering of the open pit basin, and during filling of the open pit basin it will see a reduction in flow. The greatest potential effect (over 400% flow reduction) is estimated at Node 5 due to the water takings from Springpole Lake during the open pit basin filling phase.. Although the difference in average flowrate across Node 5 is simmulated as 1.2 m^3/s, the effect to water level and velocity are relatively small given that Node 5 behaves as a lake (not a riverine lake outlet). Attachment A provides details of a dynamic wave routing model of Springpole Lake. The dynamic wave assessment indicates that during the pit filling period the reduction in flow at Node 5 will result in an average decrease in water level of 0.063 m, and a reduction in velocity of 0.002 m/s during average climate conditions. An assessment of velocity and fish swimming ability shows that there would be minimal to no effect on the ability of fish to migrate through the connecting channel as a result of all project phases under all climate conditions (Attachment A).

Nodes 6 and 7 (Birch Lake) also show flow reductions through the Project phases as a result of the development of the mine site and capture of its surface runoff. Node 8 (Birch Lake) generally shows very little change in annual flows, less than 4.5% throughout the different phases of the Project, due to its large watershed area. The reduction in flows at nodes 6, 7, and 8 are not anticipated to have large impacts on water levels or velocities, as Birch Lake is oulet controlled (water levels are governed by the downstream lake outlet, rather than the inflows calculated to the location of the node). This is similar to Node 5, which had a much larger change in flow, however minimal change in water level or velocity.

The results of the analysis indicate that at the proposed discharge location at the Springpole Lake southeast arm (Node 9) and the Springpole Lake outlet (Node 10), the Project would have the greatest potential impact during the pit filling period where flow reductions of up to 10.0% are predicted. The change is greatest during the open pit basin filling phase due to the water takings intended to accelerate the pit filling period. The construction phase will see an increase in flow with the maximum increase of 9.5% occurring at the southeast arm of Springpole Lake (Node 9) as a result of the controlled dewatering of the open pit basin. During the other project phases, there is generally a slight reduction in flow, with the largest reduction (5.4%) also occurring at the southeast arm of Springpole Lake (Node 9).

For the climate change scenario, which was evaluated for the average condition in the post-closure phase, model results indicate an increase in flow of 0.01% at the southeast arm of Springpole Lake (Node 9) and the Springpole Lake outlet (Node 10).

Yours truly,

WSP Canada Inc.

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Wood. 2022. First Mining Gold Corp. Springpole Gold Project – Receiver Water Balance, March 2022.

Attachment A
Dynamic Wave Routing Model

TECHNICAL ATTACHMENT A

To: Steve Lines, Meghan Bertenshaw (FMG)

From: Jake Malyk, Mark Sullivan (WSP)

cc: Derrick Moggy, Loralei Premo, Mei Ling Tamkei (WSP)

Subject: **Springpole Gold Project – Springpole Lake Dynamic Wave Routing Model**

WSP File No.: ONS2104A

Date: October 2, 2024

1.0 INTRODUCTION

First Mining Gold Corp. (FMG) proposes to develop an open pit mine located approximately 110 kilometres (km) northeast of Red Lake, Ontario, known as the Springpole Gold Project (Project). The proposed open pit for the Project is located partly within the north basin of Springpole Lake. Two dikes (west dike and east dike) will be constructed to isolate a portion of the north basin of Springpole Lake (referred to as the isolated open pit basin area) to facilitate the controlled dewatering of the open pit basin to enable mining. Following the completion of open pit mining, the open pit basin area filling phase will commence in order to return the area to productive fish habitat. During the pit filling phase, water will be taken from the north basin of Springpole Lake to expedite filling of the reclaimed open pit basin.

The draft Environmental Impact Statement / Environmental Assessment (EIS/EA) assessed flow changes through several nodes around the Project site. Model results indicated a large percent change in flow during the pit filling phase at Node 5, which is located in the connection channel between the north basin and southeast arm of Springpole Lake (Figure A-1). Baseline monitoring of the north basin demonstrated that Node 5 behaves as a lake, not as a riverine lake outlet, and as such Springpole Lake levels are sustained by the much larger drainage area entering from Cromarty Lake (not simply the small drainage area to Node 5). Through regulator consultation, it was agreed to use water level and velocity as indicators to assess residual effects on water quantity rather than flows at this node for the final EIS/EA. The purpose of this Technical Attachment is to quantify the changes in level and velocity at Node 5 as a result of Project development.

A dynamic wave routing model of Springpole Lake was developed to assess the potential impacts of all phases of development on Springpole Lake. The model also helps to improve the understanding of the hydrologic baseline conditions, such as the seasonal direction and velocity of flows within it. This Technical Attachment documents the development of the dynamic wave routing model and the resulting changes in velocities and lake level.

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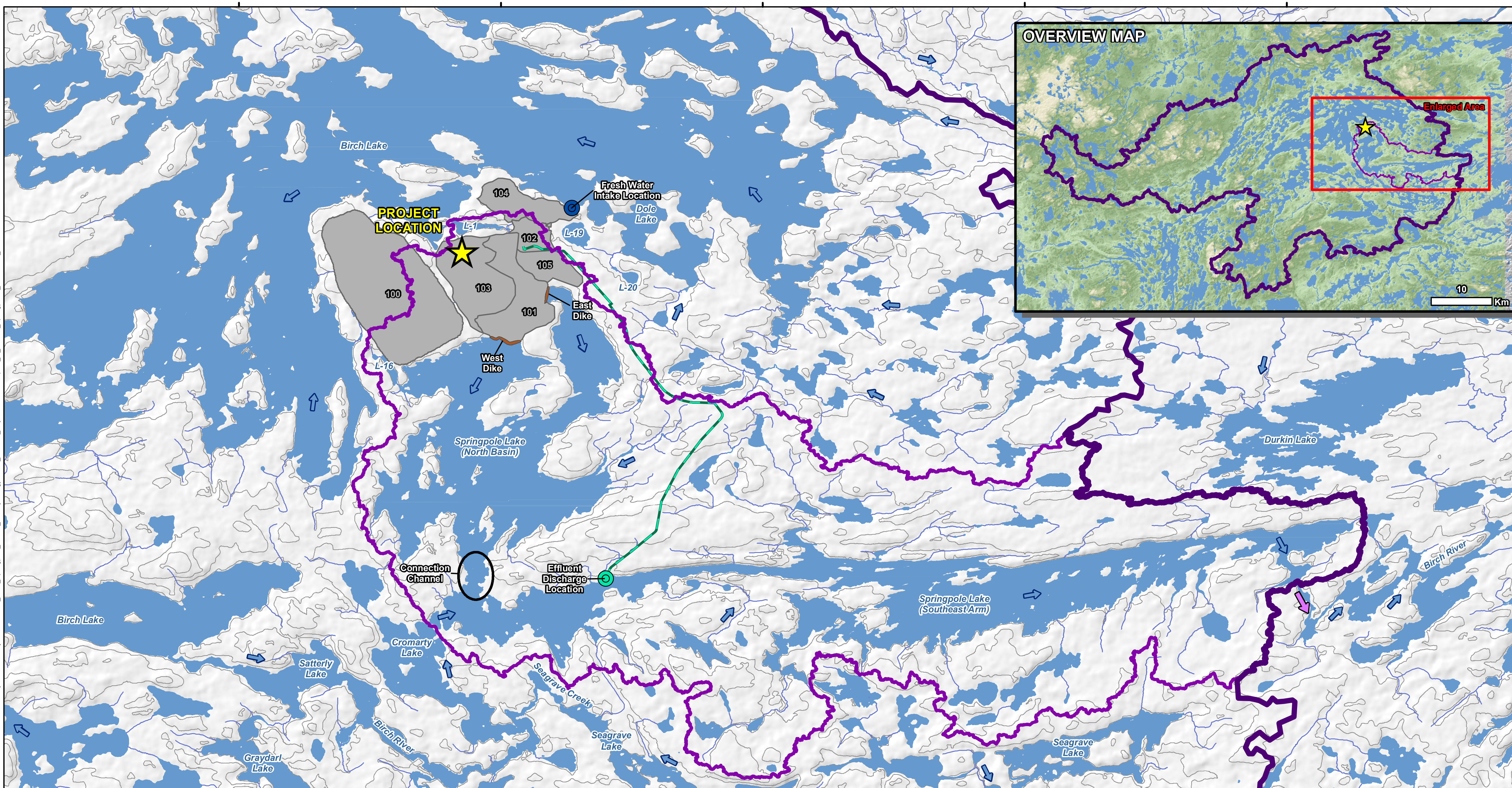

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LEGEND

- Project Location
- Fresh Water Intake Location
- Effluent Discharge Location
- Effluent Discharge Pipeline
- Contour (10 m intervals)
- Watercourse
- Waterbody
- Connection Channel Between Springpole Lake North Basin and Southeast Arm of Springpole Lake
- Flow Direction
- Watershed Outlet Flow Direction
- Cumulative Watershed to Springpole Lake Oulet
- Pre-developement Springpole Lake Subwatershed
- Project Watersheds (Labelled with ID)
- Dike

0 1 2 4 6 8 10 Kilometres

NOTES:
- Topographic information extracted from LIO, MNRF.
- Watershed delineations based on data provided by Aquaspheara, data obtained through the Ontario Flow Assessment Tool (OFAT) and LiDAR provided by First Mining Gold, 2020.

Datum: NAD83
Projection: UTM Zone 15N

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SPRINGPOLE GOLD PROJECT

Project Footprint (Ultimate Conditions) Within the Springpole Lake Watershed

PROJECT Nº: ONS2104	**FIGURE: A-1**
SCALE: 1:70,000	DATE: October 2024

2.0 BACKGROUND

Springpole Lake has a surface area of 25.6 square kilometres at 391.00 metres above mean sea level (m amsl), a predominantly rocky heterogeneous shoreline, and contains numerous islands and rocky shoals. There are a number of small tributary streams flowing into Springpole Lake. Birch River is the largest tributary and enters at the southwest end of Springpole Lake through a short section of rapids below Cromarty Lake. The outflow of Springpole Lake is also through Birch River, at the east end, into Gull Lake where it exists as the Cat River and continues to flow south to Lake St. Joseph. Springpole Lake has a maximum depth of 35.1 metres (m) and an average depth of 6.3 m. It is estimated to have a volume of approximately 190 million cubic metres (m^3). Springpole Lake has a large, generally circular, north basin connected to the long, narrow east arm of the lake (referred to as the Springpole southeast arm). The north basin is 4.5 km wide and 6.5 km long. It is generally deeper and more open than the southeast arm and has large areas exceeding 30 m in depth. The southeast arm is 17.7 km long. Much of that length is a narrow channel bound by a steep bedrock wall along the north shore. The more open areas of the southeast arm extend to the south where the slope of the topography is gentler. There is also a deep portion in the southeast arm, reaching 26 m in depth. The north basin is a backwater storage area that feeds into the southeast arm and flows through Springpole Lake generally all enter and exit the system through the southeast arm.

Numerous water level monitoring stations have been established within Springpole Lake, including stations in the north basin, southeast arm, and at the outflow. A comparison of geodetic water level data from these stations demonstrates that the water levels across Springpole Lake remains relatively consistent throughout the entire water body. For almost the entirety of the period of record (2020 to 2023), these water levels are functionally the same. As such, Springpole Lake levels are outlet controlled, with no difference in hydraulic head across the lake under all observed water levels. Water levels in Springpole Lake varied by approximately 2.1 m during the period of record, with a peak water elevation of approximately 392.8 - (m amsl), and a minimum water level of approximately 390.7 m amsl.

3.0 MODEL INPUTS AND METHODOLOGY

A dynamic wave routing model of Springpole Lake was developed to simulate the interactions between the north basin and southeast arm of Springpole Lake (Node 5). Almost all the flow of Springpole Lake enters and exits the southeast arm, and it has generally been understood that the north basin is primarily a backwater storage area, with the entire lake controlled by the outflow from Springpole Lake.

The dynamic wave routing model of Springpole Lake was established in EPA SWMM. Two storage nodes, representing the north basin and southeast arm were included to represent Springpole Lake. A connecting channel between these two storage nodes was also included (Node 5), to allow water to flow freely between the storage nodes. Flow scenarios for all climate conditions (average, 1:100 dry and 1:100 wet year) were modeled during all phases of the Project. Average monthly flows from the receiver water balance were input to each of the storage nodes, along with the outflow rating curve for Springpole Lake. The inputs to the model are described below.

3.1 Stage Storage Curves

Stage storage curves were generated for the north basin and southeast arm of Springpole Lake, based on the bathymetric survey conducted by Storey Environmental in 2019 (SEI, 2020). The upper elevation of each slice and the corresponding area were used to create storage curves for each basin (Figure A-2). The existing north basin has a minimum lake bottom elevation of 353.0 m amsl. At the initial water elevation of 391.0 m amsl, the north basin holds approximately 117 million cubic metres (Mm^3) of water. The southeast arm has a minimum lake bottom elevation of 363.0 m amsl, with a volume of 73 Mm^3 at 391.0 m amsl.

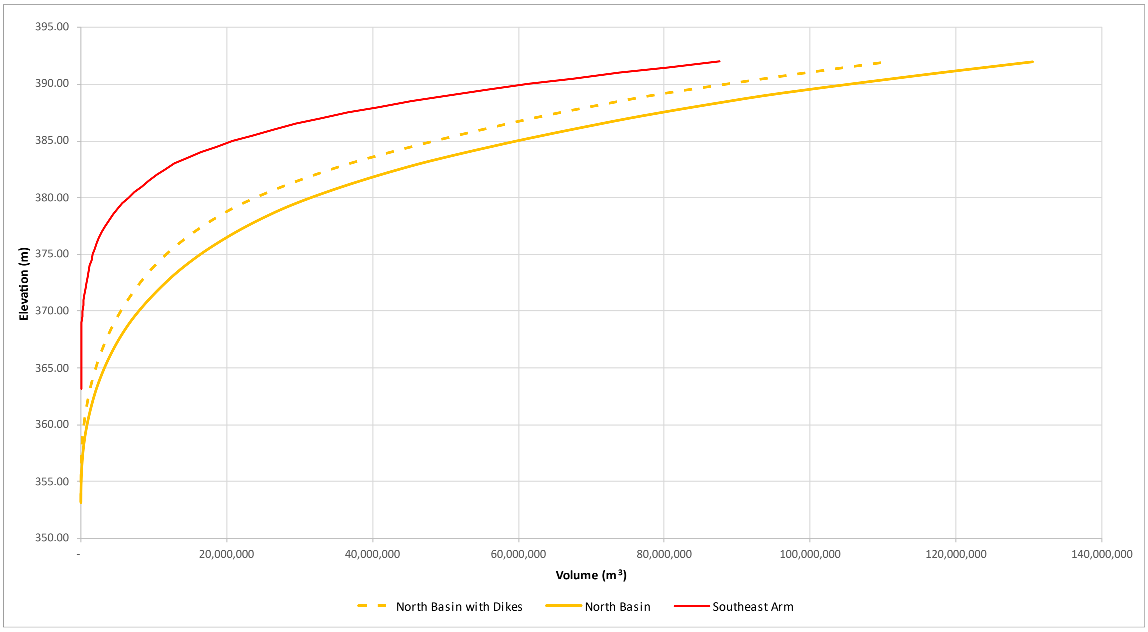


Figure A-2: Stage-Storage Curves – Springpole Lake

Prior to the development of the Project, the storage in the north basin of Springpole Lake will be greater than during the active mining phases. Following the construction of the dikes and dewatering a portion of the north basin, the storage capacity in the north basin will be reduced by 18 Mm^3. The reduced north basin stage storage curve has a volume of 99 Mm^3 at 391.0 m amsl. During the post-closure phase, the north basin will return to the pre-mine stage storage curve.

3.2 Connecting Channel Geometry

A connecting channel (Node 5) was used to represent the narrow portion of Springpole Lake that connects the north basin and southeast arm (Node 5, Figure A-4). The connecting channel is approximately 160 m wide, with an elevation of 392 m amsl on either bank and a maximum depth of 5 m. Transect data from a 2022 acoustic doppler current profiler study was used to develop the shape of the connecting channel in the model (Figure A-3). A Manning's n of 0.025 was applied, representative of the roughness of a clean straight gravel channel. The connecting channel has a very large flow capacity as a result of the large width and cross-sectional area as small changes in water surface elevation between the north basin and the southeast arm are able to produce relatively large flow rates through the channel.

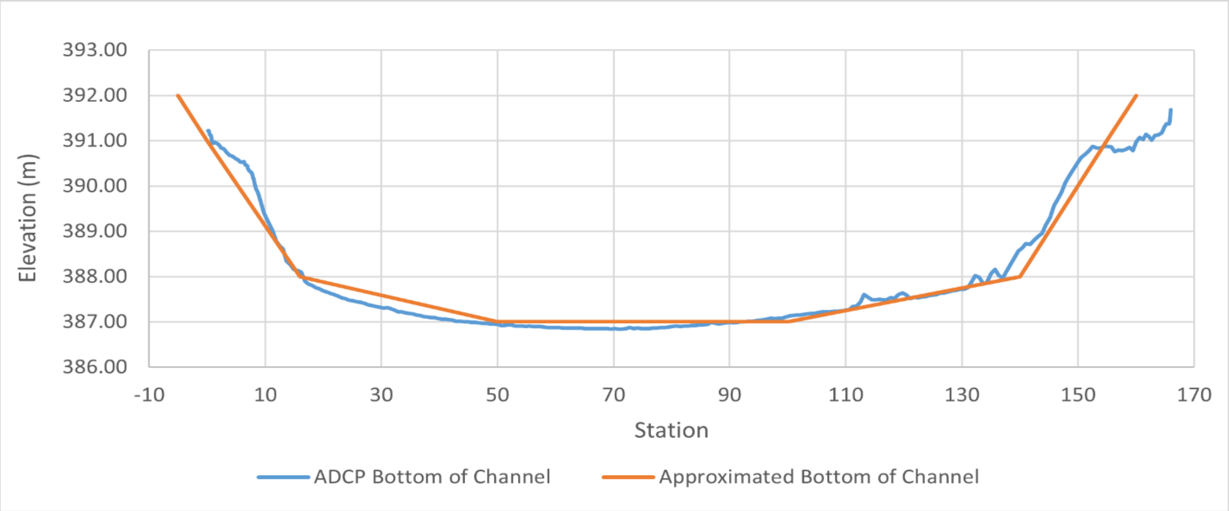
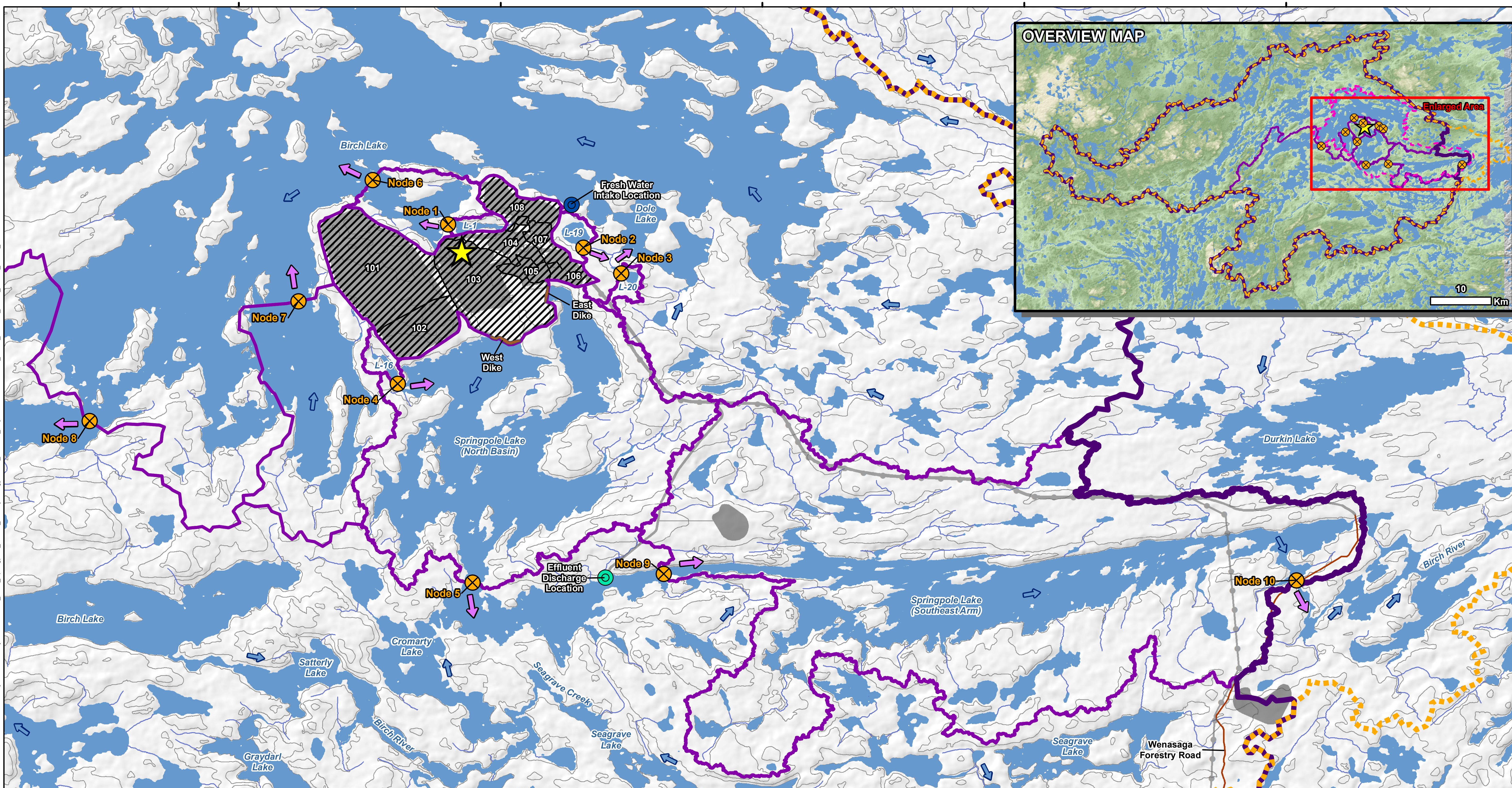


Figure A-3: Geometry of Connecting Channel (Node 5)



LEGEND

- Project Location
- Local Study Area for Surface Water Systems
- Regional Study Area for Surface Water Systems
- Fresh Water Intake Location
- Effluent Discharge Location
- Proposed Mine Feature
- Existing Road
- Contour (10 m intervals)
- Watercourse
- Waterbody
- Flow Direction
- Watershed Outlet Flow Direction
- Model Nodes (Labelled with ID)
- Watershed to Springpole Lake Oulet (Node 10)*
- Subwatershed*
- Project Watersheds (Labelled with ID)
- Dike

Node Watershed Areas (natural/undisturbed watershed areas, excluding the Project footprint)

ID	Area (km^2)
Node 1	0.3
Node 2	0.5
Node 3	0.3
Node 4	0.4
Node 5	24.9
Node 6	2.8
Node 7	9.1
Node 8	758.3
Node 9	1308.7
Node 10	1361.7

0 1 2 4 6 8 10 Kilometres

NOTES:
- Topographic information extracted from LIO, MNRF.
- Watershed delineations based on data provided by Aquaspheara, data obtained through the Ontario Flow Assessment Tool (OFAT) and LiDAR provided by First Mining Gold, 2020.
- Proposed site plan provided by Ausenco, drawing number 104496-GX-03000-31344-003, Rev 1. 26 June 2023 and modified by WSP July 2023.

* Natural/undisturbed watershed areas, excluding the Project footprint

Datum: NAD83
Projection: UTM Zone 15N

N E S W

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SPRINGPOLE GOLD PROJECT

Project Footprint Within The Natural Sub-Watersheds For All Development Phases

PROJECT N°: ONS2104	**FIGURE: A-4**
SCALE: 1:70,000	DATE: October 2024

3.3 Springpole Lake Stage – Discharge Curve

Springpole Lake levels are outflow controlled, with no difference in hydraulic head across the lake under all observed water levels. The baseline program (WSP, 2023) included the development of a rating curve for the outlet of Springpole Lake over a range of flow conditions (Figure A-5). Using the provided stage-discharge equation, a tabular rating curve was developed from measured elevations between 390.8 m amsl to 392.0 m amsl. The maximum outflow is 65.77 cubic metres per second (m^3/s) at an elevation of 393.0 m amsl.

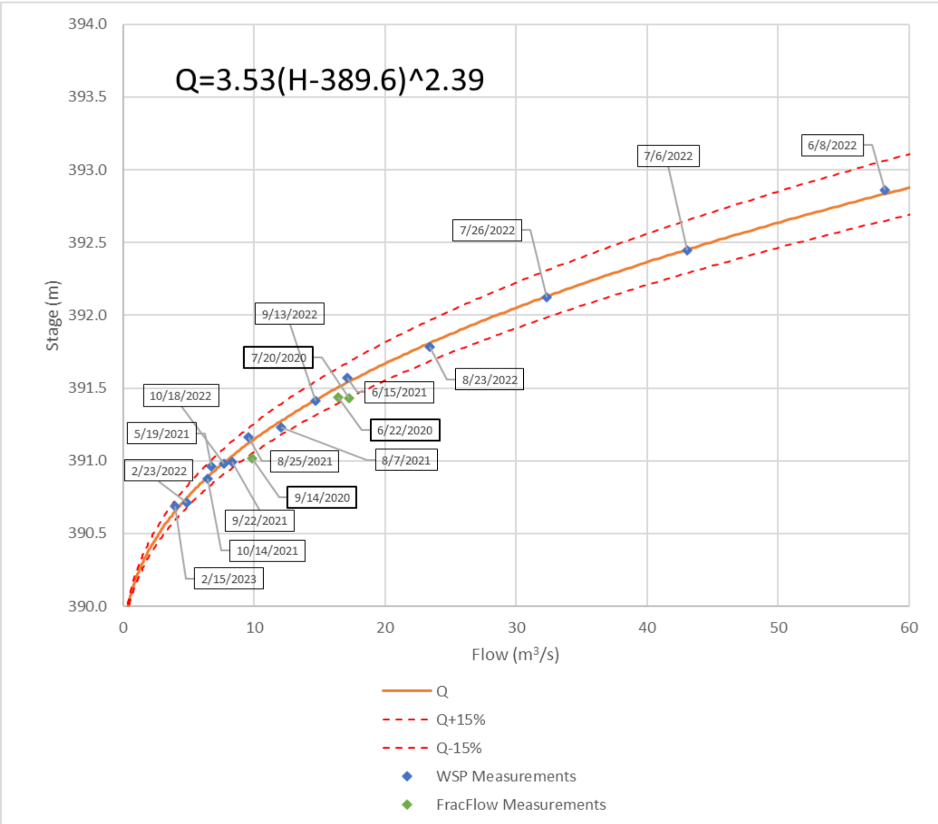


Figure A-5: Springpole Lake Outflow Rating Curve

3.4 Monthly Flow Rates

Under all climate conditions, monthly flow rates from the receiver water balance model were added to the north basin and the southeast arm storage nodes. By simulating the flow interaction between the north basin and southeast arm of Springpole Lake, impacts to velocity and water level during each phase of the Project are simulated (including existing conditions).

4.0 MODEL RESULTS

The following section presents the results of the dynamic wave routing model at the connection channel between the north basin and the southeast arm of Springpole Lake (Node 5) for the average, 1:100 dry and 1:100 wet year conditions. Tables A-1 to A-3 show the resulting flow rate and velocity through the connecting channel, and Springpole Lake water level from the analysis.

Table A-1: Springpole Lake North Basin Outflow Flowrate

Watershed ID	Flow Condition	Scenario	Connecting Channel Flowrate (m^3/s)													
			January	February	March	April	May	June	July	August	September	October	November	December	Average	Change in Flowrate (m^3/s)
Node 5	Average Year	Existing	0.51	0.50	-0.074	-2.35	-0.99	1.1	1.4	0.85	0.37	0.32	0.68	0.80	0.26	-
		Construction	0.94	0.93	0.46	-0.93	1.2	2.5	1.8	0.81	0.35	0.30	0.61	0.94	0.83	0.57
		Operations	0.49	0.42	-0.13	-2.2	-0.91	0.92	1.2	0.69	0.28	0.25	0.57	0.69	0.19	-0.069
		Pit Filling	-0.0030	-0.088	-0.70	-3.4	-3.0	-0.96	-0.17	-0.43	-0.82	-0.84	-0.41	-0.10	-0.91	-1.2
		Active Closure	0.46	0.42	-0.12	-2.2	-0.87	0.95	1.2	0.70	0.29	0.26	0.59	0.70	0.20	-0.057
		Post-Closure	0.50	0.48	-0.067	-2.3	-0.95	1.1	1.4	0.87	0.41	0.34	0.66	0.78	0.27	0.012
	1:100 Dry Year	Existing	1.4	0.68	0.17	-1.2	-0.96	0.37	0.81	0.56	0.26	0.18	0.36	0.48	0.26	-
		Construction	1.5	0.81	0.36	-0.64	0.068	1.2	1.37	1.0	0.71	0.65	0.77	0.78	0.72	0.46
		Operations	1.4	0.60	0.10	-1.2	-0.90	0.32	0.71	0.47	0.20	0.14	0.31	0.41	0.21	-0.050
		Pit Filling	1.1	0.36	-0.15	-1.7	-1.8	-0.55	0.045	-0.058	-0.31	-0.37	-0.15	0.038	-0.30	-0.56
		Active Closure	1.3	0.59	0.11	-1.2	-0.86	0.34	0.72	0.48	0.21	0.15	0.32	0.41	0.22	-0.042
		Post-Closure	1.4	0.68	0.17	-1.2	-0.96	0.36	0.81	0.56	0.26	0.17	0.35	0.46	0.25	-0.0030
	1:100 Wet Year	Existing	-0.60	0.44	-0.23	-3.4	-0.67	1.9	2.1	1.1	0.53	0.53	1.1	1.2	0.32	-
		Construction	0.27	1.3	0.75	-1.1	1.2	1.8	1.8	1.0	0.50	0.50	0.95	1.4	0.88	0.55
		Operations	-0.55	0.38	-0.27	-3.1	-0.62	1.6	1.7	0.91	0.40	0.43	0.90	0.98	0.23	-0.097
		Pit Filling	-1.4	-0.53	-1.3	-5.4	-4.3	-1.7	-0.66	-1.0	-1.5	-1.5	-0.80	-0.37	-1.7	-2.0
		Active Closure	-0.56	0.38	-0.27	-3.1	-0.59	1.6	1.8	0.92	0.41	0.44	0.92	1.0	0.24	-0.084
		Post-Closure	-0.62	0.41	-0.22	-3.3	-0.59	1.9	2.1	1.2	0.60	0.55	1.0	1.1	0.35	0.026

Table A-2: Springpole Lake North Basin Outflow Velocity

Watershed ID	Flow Condition	Scenario	Connecting Channel Velocity (m/s)													
			January	February	March	April	May	June	July	August	September	October	November	December	Average	Change in Velocity (m/s)
Node 5	Average Year	Existing	0.0010	0.0010	-0.00015	-0.0044	-0.0017	0.0018	0.0024	0.0015	0.00067	0.00058	0.0013	0.0015	0.00046	-
		Construction	0.0019	0.0019	0.00093	-0.0017	0.0019	0.0040	0.0030	0.0014	0.00064	0.00056	0.0011	0.0018	0.0015	0.0010
		Operations	0.0010	0.00087	-0.00026	-0.0042	-0.0015	0.0015	0.0021	0.0012	0.00051	0.00046	0.0011	0.0013	0.00034	-0.00012
		Pit Filling	0.00	-0.00019	-0.0015	-0.0066	-0.0050	-0.0016	-0.00029	-0.00079	-0.0015	-0.0016	-0.00076	-0.00020	-0.0017	-0.0021
		Initial Closure	0.00093	0.00086	-0.00025	-0.0041	-0.0014	0.0015	0.0021	0.0013	0.00053	0.00047	0.0011	0.0013	0.00036	-0.00010
		Post-Closure	0.0010	0.0010	-0.00013	-0.0043	-0.0016	0.0018	0.0025	0.0016	0.00074	0.00060	0.0012	0.0015	0.00048	0.000023
	1:100 Dry Year	Existing	0.0030	0.0015	0.00038	-0.0027	-0.0019	0.00071	0.0016	0.0012	0.00054	0.00040	0.00077	0.0010	0.00054	-
		Construction	0.0032	0.0018	0.00081	-0.0014	0.00012	0.0023	0.0027	0.0020	0.0015	0.0014	0.0016	0.0017	0.0015	0.00093
		Operations	0.0028	0.0014	0.00024	-0.0026	-0.0018	0.00060	0.0014	0.0010	0.00042	0.00030	0.00066	0.00090	0.00044	-0.00010
		Pit Filling	0.0023	0.00081	-0.00035	-0.0038	-0.0036	-0.0011	0.000090	-0.00013	-0.00065	-0.00080	-0.00032	0.000083	-0.00062	-0.0012
		Initial Closure	0.0027	0.0013	0.00025	-0.0026	-0.0017	0.00065	0.0014	0.0010	0.00043	0.00030	0.00067	0.00090	0.00045	-0.000086
		Post-Closure	0.0030	0.0015	0.00038	-0.0027	-0.0019	0.00068	0.0016	0.0012	0.00054	0.00040	0.00074	0.00100	0.00053	-0.0000028
	1:100 Wet Year	Existing	-0.0012	0.00083	-0.00042	-0.0056	-0.0010	0.0028	0.0031	0.0018	0.00085	0.00085	0.0018	0.0020	0.00049	-
		Construction	0.00047	0.0024	0.0014	-0.0017	0.0019	0.0027	0.0028	0.0016	0.00081	0.00080	0.0016	0.0025	0.0014	0.00095
		Operations	-0.0011	0.00071	-0.00051	-0.0052	-0.00094	0.0024	0.0026	0.0015	0.00065	0.00070	0.0015	0.0017	0.00033	-0.00015
		Pit Filling	-0.0028	-0.0010	-0.0025	-0.0091	-0.0064	-0.0025	-0.0010	-0.0017	-0.0025	-0.0025	-0.0014	-0.00064	-0.0028	-0.0033
		Active Closure	-0.0011	0.00071	-0.00051	-0.0051	-0.00088	0.0024	0.0027	0.0015	0.00066	0.00072	0.0015	0.0017	0.00036	-0.00013
		Post-Closure	-0.0012	0.00078	-0.00041	-0.0054	-0.00089	0.0029	0.0032	0.0019	0.0010	0.00088	0.0017	0.0019	0.00052	0.000040

Table A-3: Springpole Lake Southeast Arm Elevation

Watershed ID	Flow Condition	Scenario	Springpole Lake Elevation (m amsl)													
			January	February	March	April	May	June	July	August	September	October	November	December	Average	Change in Elevation (m)
Node 5	Average Year	Existing	390.96	390.89	390.86	391.13	391.65	391.71	391.52	391.33	391.27	391.26	391.22	391.11	391.24	-
		Construction	390.98	390.92	390.90	391.20	391.75	391.78	391.55	391.34	391.28	391.27	391.22	391.11	391.27	0.032
		Operations	390.95	390.87	390.84	391.12	391.65	391.71	391.51	391.32	391.27	391.26	391.21	391.09	391.23	-0.0089
		Pit Filling	390.93	390.84	390.81	391.07	391.57	391.63	391.44	391.26	391.21	391.20	391.15	391.04	391.18	-0.063
		Active Closure	390.96	390.88	390.86	391.14	391.66	391.71	391.51	391.33	391.27	391.27	391.22	391.10	391.24	-0.000012
		Post-Closure	390.96	390.89	390.86	391.13	391.65	391.71	391.52	391.34	391.28	391.27	391.22	391.11	391.24	0.000009
	1:100 Dry Year	Existing	390.83	390.64	390.56	390.68	391.01	391.11	391.01	390.88	390.83	390.81	390.78	390.71	390.82	-
		Construction	390.83	390.65	390.58	390.72	391.08	391.17	391.06	390.92	390.87	390.85	390.82	390.75	390.86	0.039
		Operations	390.81	390.61	390.53	390.66	391.01	391.10	390.99	390.87	390.81	390.79	390.76	390.69	390.80	-0.018
		Pit Filling	390.81	390.61	390.53	390.64	390.95	391.05	390.95	390.83	390.78	390.76	390.73	390.66	390.77	-0.046
		Active Closure	390.82	390.63	390.56	390.68	391.02	391.12	391.01	390.88	390.82	390.81	390.78	390.71	390.82	-0.0022
		Post-Closure	390.83	390.64	390.56	390.68	391.01	391.11	391.01	390.88	390.83	390.81	390.78	390.71	390.82	-0.00028
	1:100 Wet Year	Existing	391.14	391.17	391.18	391.58	392.25	392.26	391.99	391.76	391.70	391.70	391.64	391.48	391.65	-
		Construction	391.17	391.22	391.23	391.68	392.33	392.27	391.98	391.76	391.70	391.70	391.63	391.48	391.68	0.028
		Operations	391.13	391.16	391.16	391.59	392.25	392.26	391.98	391.75	391.70	391.69	391.63	391.46	391.65	-0.0053
		Pit Filling	391.10	391.11	391.11	391.51	392.14	392.15	391.89	391.67	391.62	391.61	391.55	391.40	391.57	-0.081
		Active Closure	391.14	391.17	391.18	391.60	392.26	392.26	391.98	391.76	391.70	391.70	391.63	391.47	391.65	0.00060
		Post-Closure	391.13	391.17	391.17	391.58	392.25	392.26	391.99	391.76	391.70	391.70	391.63	391.47	391.65	-0.000025

4.1 Existing Conditions

The average flow through the connecting channel is 0.26 m^3/s. Throughout most of the year, water drains from the north basin to the southeast arm through the connecting channel, with flows peaking in July. Reversal of flow occurs from March to May, as direct inflows to the north basin are too low to rise with water levels in the southeast arm during this time. As a result, water from the southeast arm flows into the north basin. Reverse flow to the north basin is indicated by negative flow values, while flow to the southeast arm is indicated by positive values. The maximum flow from the southeast arm to the north basin is -2.35 m^3/s (Table A-1), occurring in April.

Velocities through the connecting channel are extremely low and follow a similar monthly trend, with an average velocity of 0.00046 metres per second (m/s) from the north basin to the southeast arm. In the spring, when the flow in the connecting channel is reversed, the velocity from the southeast arm to the north basin reaches a maximum of -0.0044 m/s. For the remainder of the year, the north basin drains to the southeast arm with a maximum velocity of 0.0024 m/s. The existing conditions model confirms that the velocities within the north basin are extremely low (as would be expected in a lake) and reverse seasonally in the spring.

Modeled water elevations in the north basin and southeast arm fluctuate between 390.9 m amsl and 391.7 m amsl under average climate conditions. The greatest water levels occur in June, with lowest levels in the winter. These results generally align with the mean water levels estimated in the 2023 Hydrology Baseline Study (WSP, 2023). No observable difference is noted between the water elevations in both basins as a result of the large flow capacity of the connecting channel (Node 5).

4.2 Construction

During the construction phase, the average flow through the connecting channel will increase to 0.83 m^3/s (from 0.26 m^3/s during existing conditions). Results from the dynamic wave routing model show that this will result in an average annual increase in the Springpole Lake water level of 0.032 m (Table A-3), and an average annual increase in velocity of 0.0010 m/s (Table A-2) during the construction phase of the Project. These minor increases in water level and velocity during construction are the result of controlled dewatering of the open pit basin where water is discharged into the north basin. The changes in velocity and water level are minor as a result of the relatively wide connection channel, and are within the same order of magnitude and scale as existing conditions. Furthermore, this increase is mainly due to the controlled dewatering of the open pit basin area which is only expected to have a duration of approximately 6 months.

4.3 Operations

During operations, the results of the model show that there will be slight reduction in flow conditions at Node 5, less than 0.0002 m/s change in velocity and less than a 0.01 m change in water level. The changes in velocity and water level are within the same order of magnitude and scale of existing conditions, as a result of the relatively wide connection channel.

4.4 Pit Filling

The maximum change in flow at Node 5 will occur during the pit filling phase, however the changes in velocity and water level are within the same order of magnitude and scale of existing conditions, as a result of the relatively wide connection channel.

Model results simulate a reversal of flow direction in the connecting channel as a result of the pit filling phase, with water moving from the southeast arm to the north basin in all months of the year. The average annual flow is -0.91 m^3/s (from 0.26 m^3/s during existing conditions). Similar to under existing conditions, the reversal of flow directions is estimated to peak in April and May.

Similarly, modeled velocities during the pit filling stage show direction of flow from the southeast arm to the north basin, with highest velocities occurring in the spring. The average change in velocity is 0.002 m/s. The maximum simulated velocity is -0.0091 m/s (April in 1:100 wet year), the maximum difference in annual velocity is 0.0033 m/s compared to existing conditions.

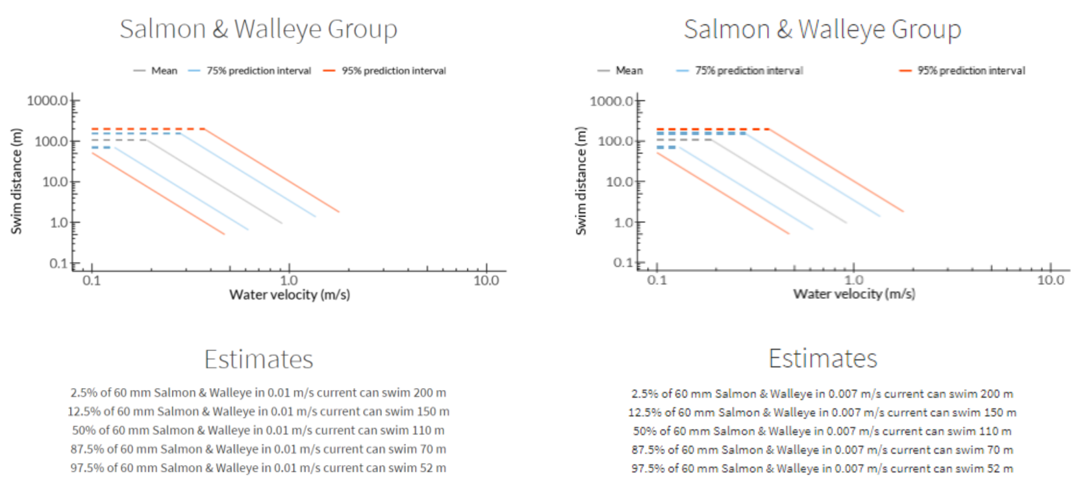
The water surface of Springpole Lake will be lowered during the pit filling stage, with a maximum difference in elevation of 0.108 m (June of a 1:100 wet year), when compared to existing seasonal conditions. Under average conditions, an average annual reduction of 0.063 m in the Springpole Lake water level is predicted. For context, the maximum 0.108 m and average 0.063 m differences represent 5% and 3% respectively of the observed natural 2.1 m range in water elevation.

4.5 Active and Post-Closure

During the active and post-closure phases, the results of the model show that there will be slight change in flow conditions at Node 5, less than 0.0001 m/s change in velocity and a 2 mm change in water level (0.09% of the observed natural range). The changes in velocity and water level are within the same order of magnitude and scale of existing conditions, as a result of the relatively wide connection channel.

5.0 FISH SWIMMING SPEEDS

The majority of fish species in Springpole Lake fall within the Salmon and Walleye swimming group mode (Katopodis, C, and R Gervais. 2016; and Di Rocco, R, and R. Gervais. 2023). To assess the potential implications of the maximum simulated velocity (0.0091 m/s) on the small fish population (cyprinids and juvenile fish), the online Swim Distance & Water Velocity Tool (Di Rocco, R, and R. Gervais. 2023) was used to predict the swimming ability of a 6 cm (60 mm) fish such as an Emerald Shiner, Spottail Shiner or young of the year Walleye. Swim performance is shown in Figure A-6 and shows that the difference in maximum velocity between existing conditions and the pit filling phase does not result in a difference in the distance small body fish can swim without rest. The assessment shows that there would be minimal to no effect on the ability of fish to migrate through the connecting channel during the pit filling phase.



Source: Results from online SPOT analysis Di Rocco, R, and R. Gervais. 2023

Figure A-6: Predicted Swimming Distance of 60 mm Fish under Existing and Proposed Maximum Water Velocities through Connecting Channel

6.0 CONCLUSIONS

A dynamic wave routing model of Springpole Lake was developed to better understand the interactions between the north basin and the southeast arm (Node 5) during existing conditions, as well as all phases of development.

The existing conditions model confirms that the velocities across the connecting channel between the north basin and southeast arm are extremely low (as would be expected in a lake). Throughout the majority of the year, flows generally travel from the north basin to the southeast arm. However, these flows naturally reverse seasonally in the spring, traveling from the southeast arm into the north basin. During average climate conditions it is predicted that velocities in the connecting channel will range from 0.0024 m/s flowing to the southeast arm to -0.004 m/s flowing to the north basin.

During the construction phase, water from the controlled dewatering of the open pit basin will be discharged to the north basin, resulting in an increase in flows through the connecting channel. As a result, the Springpole Lake water level will increase by approximately 0.032 m, and the velocity through the connecting channel will increase by 0.001 m/s. This condition will persist during the controlled dewatering which is expected to be approximately 6 months in duration.

During the pit filling phase, water will be taken from the north basin of Springpole Lake to expedite filling of the open pit basin. As a result of the water taking (proposed as 10% of available flow measured at the inlet to Springpole Lake from Cromarty Lake), water will flow from the southeast arm to the north basin year-round. The water surface elevation of Springpole Lake will be temporarily lowered as a result of water taking, with a maximum change of 0.108 m predicted. Velocities within the connecting channel will range from 0 to -0.0091 m/s, which represents a maximum change in velocity of 0.005 m/s compared to existing conditions.

This analysis demonstrates that the changes in velocity and water level are minor , as a result of the relatively wide connection channel, and on the same scale as existing conditions. An assessment of velocity and fish swimming ability shows that there would be minimal to no effect on the ability of fish to migrate through the connecting channel during all Project phases under all climate conditions.

7.0 REFERENCES

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