

Appendix 6.7-F

*Peterson Creek Water Temperature Effects due to Pipeline
Diversion*

AJAX PROJECT

**Environmental Assessment Certificate Application / Environmental Impact Statement
for a Comprehensive Study**

July 17, 2015

File No.:VA101-246/31-A.01
Cont. No.:VA15-02023



Ms. Nettie Johnston
Senior Permitting Specialist
KGHM Ajax Mining Inc.
200 - 124 Seymour St.
Kamloops, British Columbia
Canada, V2C 2E1

Dear Nettie,

Re: Peterson Creek Water Temperature Effects due to Pipeline Diversion

Knight Piésold Ltd. (KP) has been retained to provide an assessment of water temperature effects in Peterson Creek due to the diversion of water around the Ajax Mine site. Currently, water discharges from Jacko Lake via an outlet on the southeast arm into Peterson Creek. Discharge from the lake is controlled by a flow gate operated by the Water Bailiff, although during high flows water can flow over the spillway crest. This typically occurs annually during freshet and/or autumn storms. Peterson Creek then flows east through the Mine property before bearing south towards Peterson Creek Park, the City of Kamloops and the Peterson Creek confluence with the South Thompson River. During Project construction and operations, water will be diverted around the mine site via a pipeline. Flows would be pumped through an approximately 6,300 m long, 400 mm diameter HDPE pipeline to a discharge location on Peterson Creek downstream of the Open Pit. The pipeline will typically be pumped at a constant rate during the months of May to September and will not operate between October and April (KP, 2015a). The pipeline will discharge into a pond constructed on Peterson Creek. As with current outflows from Jacko Lake, the Water Bailiff will control outflow from this new pond. The site layout is shown on Figure 1.

This water temperature impacts assessment presents the following:

1. Changes in water temperature leaving Jacko Lake due to the location and elevation of the diversion pipeline inlet structure compared to baseline lake outflow conditions.
2. Changes in water temperature in Peterson Creek between Jacko Lake and the pipeline outfall location under baseline (in stream) and operational (via pipeline) conditions.
3. Changes in water temperature within the water management pond and comparison of differences in temperature between Jacko Lake outflows and pond outflows.
4. Ultimately, the assessment aims to compare baseline and project affected stream temperatures downstream of the Mine property.

The analysis suggests that the temperatures entering the diversion pipe will be approximately the same or slightly cooler than the temperatures exiting the lake at the natural outlet, that water temperature changes in the pipeline will be slightly cooler than the natural channel during May to July and slightly warmer in August and September. Surface water temperature in the downstream pond is expected to be slightly warmer than surface water in Jacko Lake during April to June and slightly cooler during July to November. Ultimately it is expected that the temperature of water leaving the Mine site during the construction and operations period will be similar to baseline conditions. Details of the assessment are presented in the following sections.

JACKO LAKE OUTFLOWS

Water temperature in Peterson Creek could be affected by changes in water temperature leaving Jacko Lake due to the location and elevation of the diversion pipeline inlet structure. Jacko Lake has a surface area of approximately 44 ha at normal water level. Bathymetric surveys of Jacko Lake were conducted in 2014 and

show that the depth of the lake varies from a few meters in the arms, to approximately 25 meters at the deepest point. Bathymetry is shown on Figure 2.

Temperature profiles of Jacko Lake have been collected on site since 2007 as part of the water quality field program. Temperature readings were collected using a YSI multi parameter probe at one meter or half meter intervals. Due to seasonal differences in energy inputs (primarily air temperature and solar radiation) at the lake surface and how this energy is mixed within the lake (primarily density differences i.e. cooler water is denser than warmer water), different temperature profiles are typical for different times of the year. Typically, during warmer months the top layer of a lake (the epilimnion) warms up while the bottom layer (the hypolimnion) stays cooler. The temperature transition between these two layers is known as the thermocline. As fall approaches and air temperatures cool and solar radiation decreases, the water temperatures within a lake become more uniform and stratification is less pronounced. Winter profiles are typically characterized by fairly uniform temperatures within the majority of a lake with slightly cooler temperatures at the surface. Jacko Lake is typically ice covered during winter.

The temperature profiles measured in Jacko Lake were compared on a seasonal basis to assess trends in the lake temperature. The seasons are defined as follows:

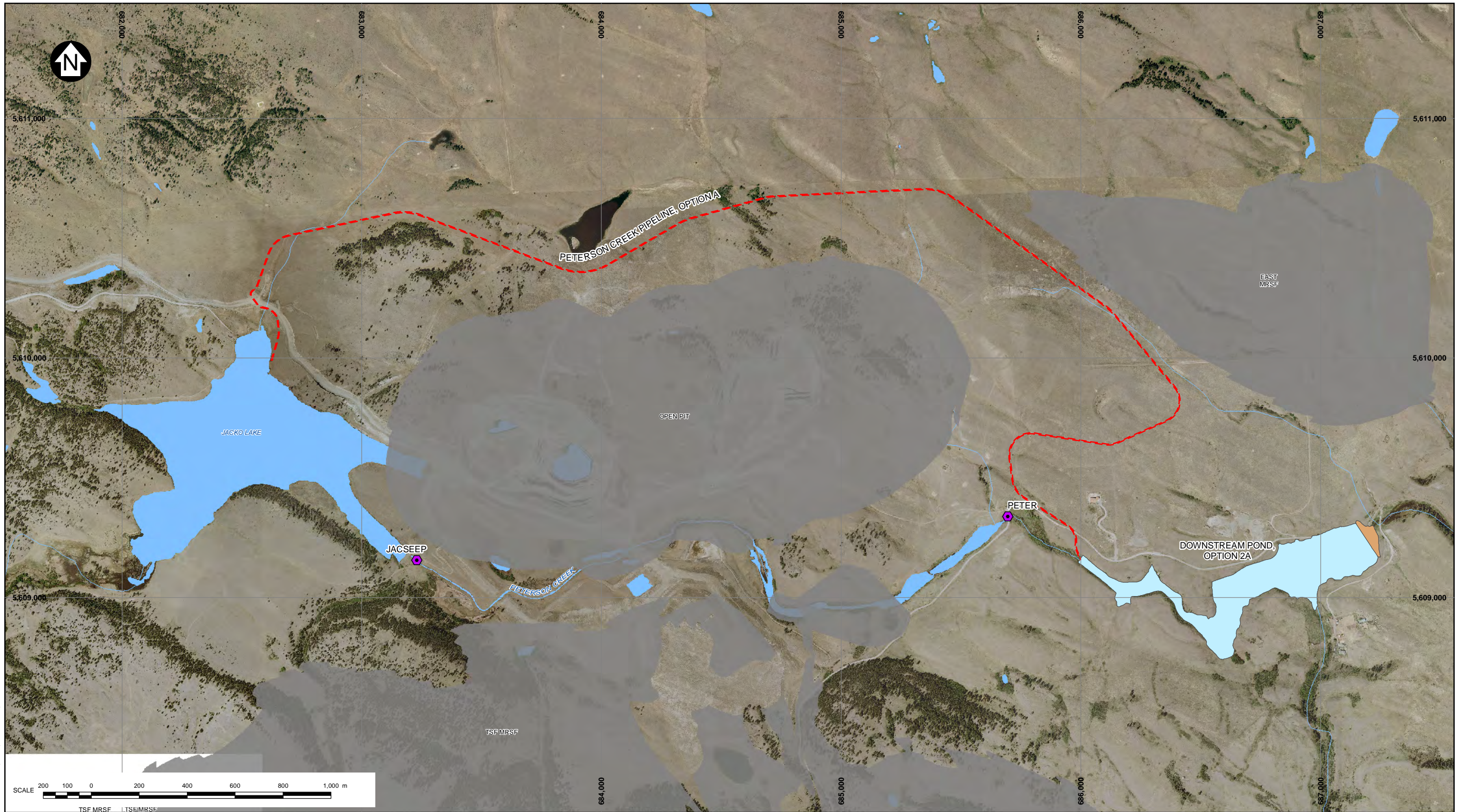
- Fall: September – November
- Winter: December – February
- Spring: March – May
- Summer: June – August

The temperature profiles for September and November are shown on Figure 3 and show that the lake is stratified in September. The epilimnion is approximately 5 m deep. However, by November the profile becomes more uniform due to cooling air temperatures and water mixing in the lake. As the air cools, the surface of the lake cools as well. This cooler water then sinks within the lake as it increases in density, revealing a new layer to be cooled. This mixing process repeats until a fairly uniform temperature profile is created as can be seen in the November 2011 and 2012 profiles.

The temperature profiles for January and February are shown on Figure 4. As can be seen, the temperature profile in winter is characterized by a relatively consistent temperature through the lake with cooler temperatures near the surface. This profile is typical of holomictic lakes in the winter where ice cover is present.

Spring temperature profiles are shown and Figure 5. As can be seen, the temperature profiles show a transition from a winter-like profile in March, to a stratified profile in May.

As can be seen on Figure 6, Jacko Lake is fully stratified during the summer months (June, July and August). This profile shape is typical of lakes during the summer. It is also evident that the epilimnion is approximately 4 m in depth.



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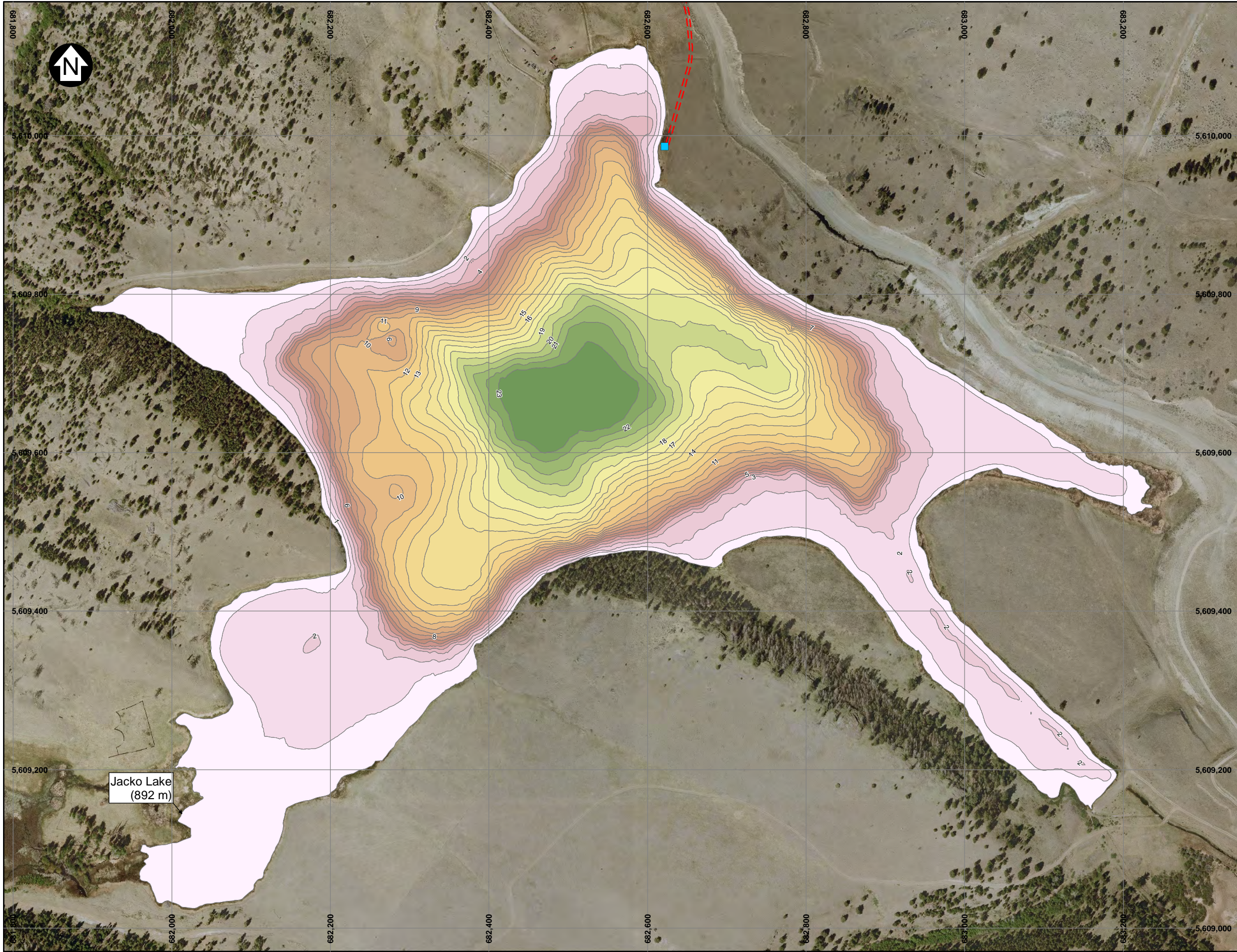
LEGEND:		PROPOSED FACILITIES		
	FLOW AND TEMPERATURE MONITORING STATIONS		PETERSON CREEK PIPELINE, OPTION A	
	RIVER		DOWNSTREAM POND, OPTION 2A	
	LAKE		BERM	
			MINE SITE FACILITIES	

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED
0	15JUL15	ISSUED WITH MEMO	TJP	CAC	TJP

NOTES:

- BASE MAP: ORTHOIMAGERY
 MINE SITE FACILITIES PROVIDED BY KGHM
 DOWNSTREAM POND PROVIDED BY NORWEST (2014)
 PETERSON CREEK PIPELINE PROVIDED BY KNIGHT PIESOLD (2015)
- COORDINATE GRID IS IN METRES.
 COORDINATE SYSTEM: NAD 1983 UTM ZONE 10N.
- THIS FIGURE IS PRODUCED AT A NOMINAL SCALE OF 1:15,000 FOR 11x17 (TABLOID) PAPER. ACTUAL SCALE MAY DIFFER ACCORDING TO CHANGES IN PRINTER SETTINGS OR PRINTED PAPER SIZE.

KGHM AJAX MINING INC.					
AJAX PROJECT					
PROPOSED PETERSON CREEK PIPELINE AND DOWNSTREAM POND					
	<table border="1" style="font-size: small;"> <tr> <td>P/A NO.</td> <td>REF NO.</td> </tr> <tr> <td>VA101-246/31</td> <td>VA15-02023</td> </tr> </table>	P/A NO.	REF NO.	VA101-246/31	VA15-02023
P/A NO.	REF NO.				
VA101-246/31	VA15-02023				
FIGURE 1					
	REV 0				



LEGEND:
PROPOSED PETERSON CREEK FACILITIES

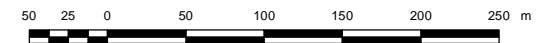
- DIVERSION INTAKE
- PETERSON CREEK PIPELINE, OPTION A

BATHYMETRIC DEPTH (METRES)



NOTES:

1. Data and Image provided by Frontier Geosciences Inc.
2. COORDINATE GRID IS IN METRES.
COORDINATE SYSTEM: NAD 1983 UTM ZONE 10N.
3. THIS FIGURE IS PRODUCED AT A NOMINAL SCALE OF 1:4,828 FOR 11x17 (TABLOID) PAPER. ACTUAL SCALE MAY DIFFER ACCORDING TO CHANGES IN PRINTER SETTINGS OR PRINTED PAPER SIZE.
4. WSC STAFF GAUGE LAKE LEVEL: 4.6 METRES



KGHM AJAX MINING INC.

AJAX PROJECT

JACKO LAKE BATHYMETRY

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REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED
0	15JUL15	ISSUED WITH MEMO	TJP	CAC	TJP

Knight Piésold CONSULTING	P/A NO. VA101-246/31	REF NO. VA15-02023
	FIGURE 2	
		REV 0

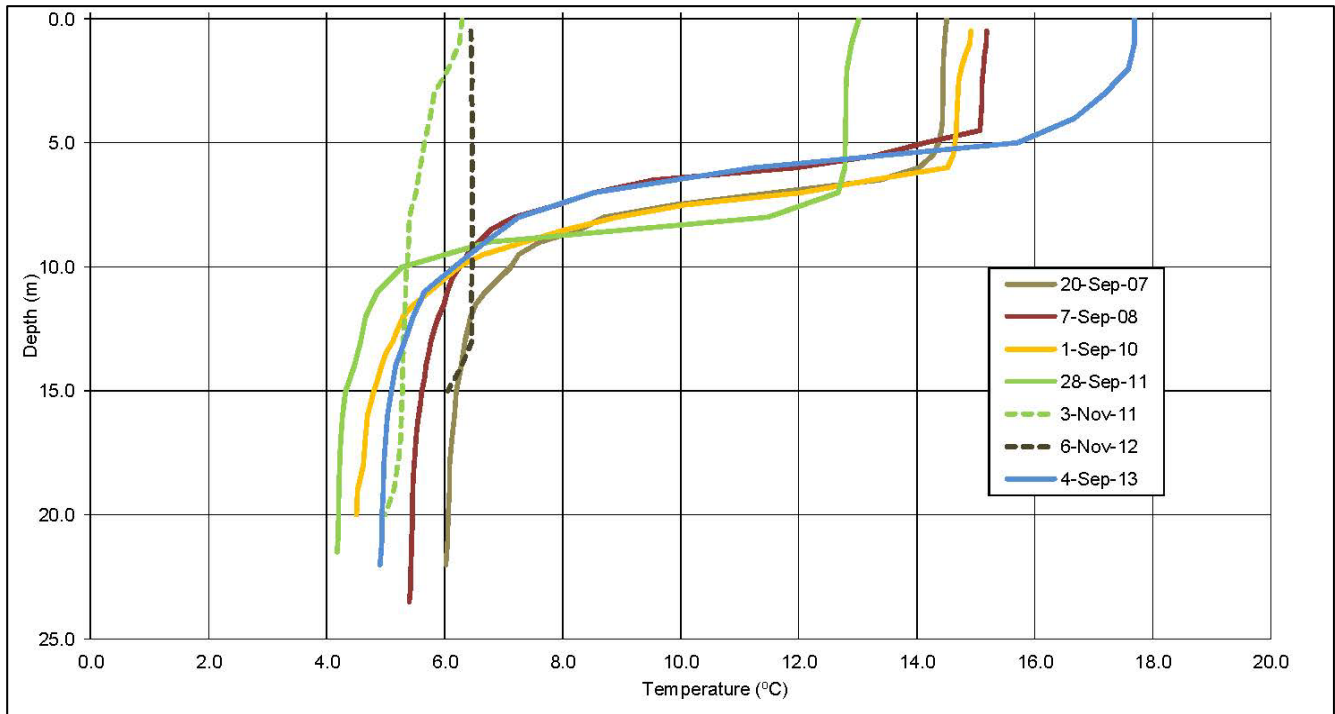


Figure 3 Jacko Lake Fall Temperature Profiles

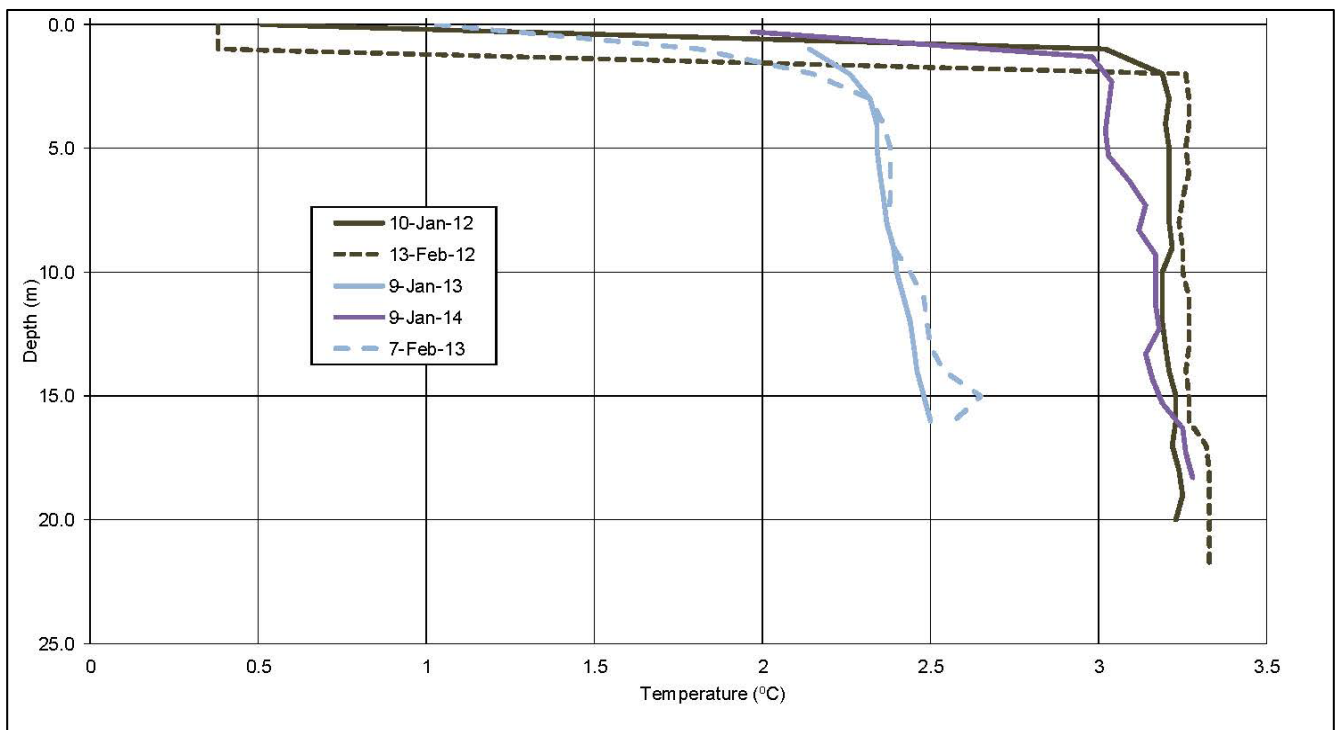


Figure 4 Jacko Lake Winter Temperature Profiles

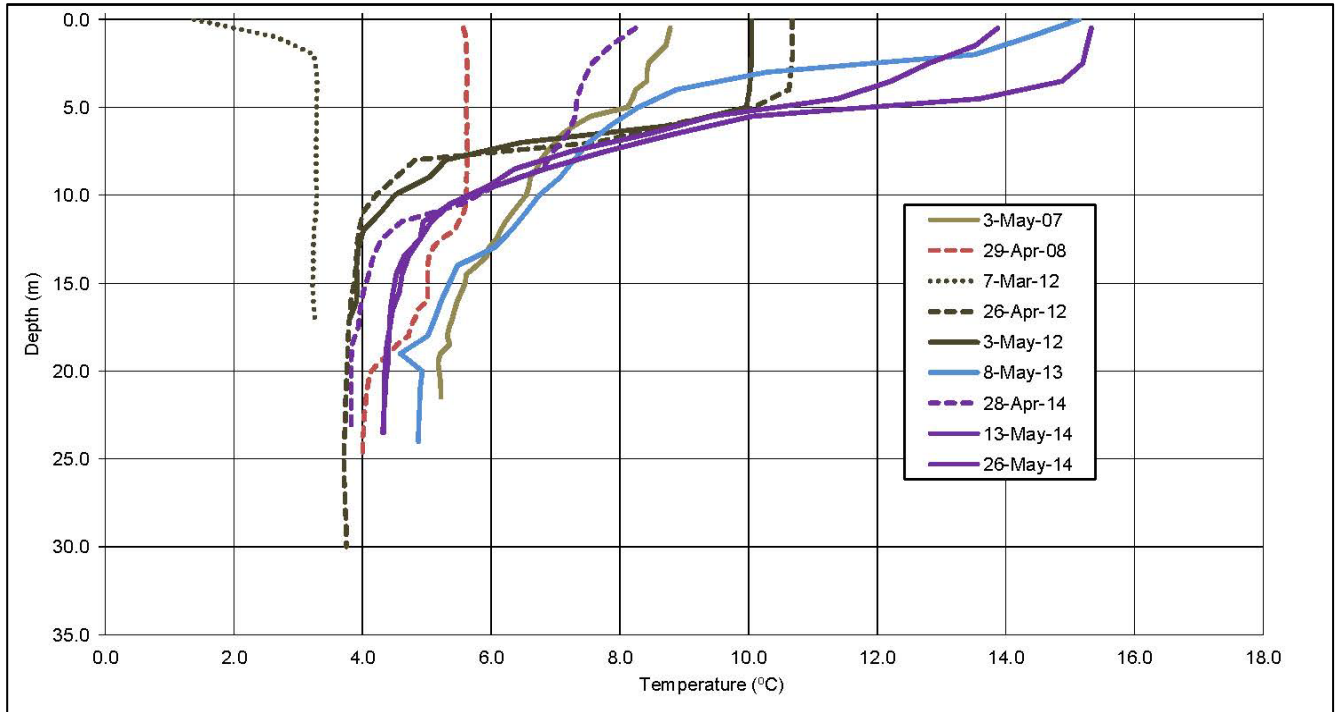


Figure 5 Jacko Lake Spring Temperature Profiles

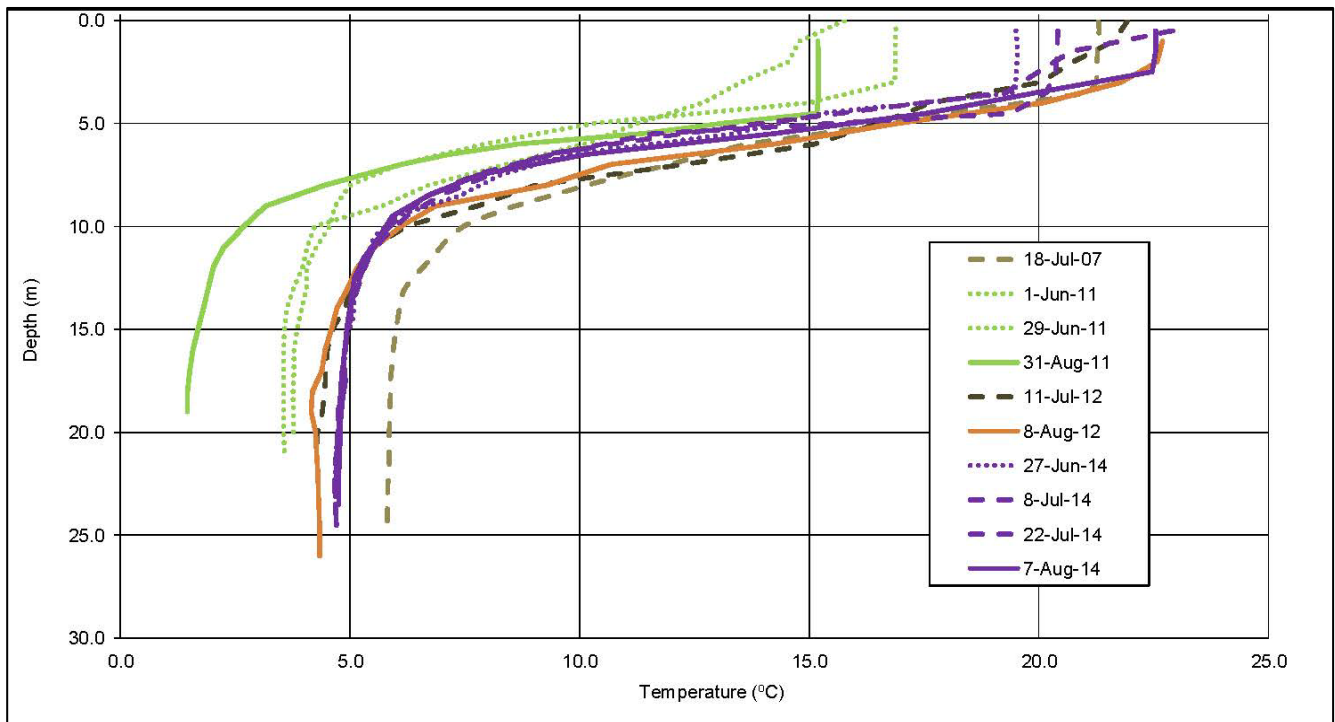


Figure 6 Jacko Lake Summer Temperature Profiles

The outlet of Jacko Lake is located on the southeast arm, and the inlet of the proposed pipeline is located at the northwest portion of the lake as shown on Figure 1. Bathymetry, shown on Figure 2, indicates that depths in the southeast arm are 1 m to 2 m deep and the existing lake outflow draws water from a gate located approximately 1 m below low water levels. This is comparable to the proposed pipeline inlet. The pipeline is designed to operate at a constant rate during May to September. During May to September the epilimnion is well developed and is typically 3 m to 5 m deep again suggesting that the temperature of water leaving the lake via the pipeline will be similar to water entering Peterson Creek via the current outflow. If the pipeline does abstract water from within the thermocline, water temperatures will be cooler than baseline outflows. In summary, it is expected that the temperatures entering the diversion pipe would be approximately the same or slightly cooler than the temperatures exiting the lake at the natural outlet.

PETERSON CREEK DIVERSION

Currently, water leaves Jacko Lake via the southeast arm of the lake and flows approximately 3 km through the Mine site via Peterson Creek. The average channel gradient in this reach is approximately 0.5% (5 m/1,000 m). The lower 1.8 km within the Mine property is currently a ponded wetland and flow is “sluggish” due to beaver activity and damming. During Project construction and operations, water will be diverted around the mine site via a pipeline. Flows would be pumped through an approximately 6,300 m long, 400 mm diameter HDPE pipeline to a discharge location on Peterson Creek downstream of the Open Pit (KP, 2015a).

Water temperature data have been collected at stations just downstream of the outlet of Jacko Lake (JACSEEP) and approximately 3 km downstream of the outlet near Goose Lake Road (PETER) as shown on Figure 1. The stations were installed in 2007 and operated sporadically until 2013. Data collected during 2014 are currently being analysed. The stations were removed for winter in 2009, 2010 and 2011, but were left in over winter in 2008 and 2012.

Unfortunately, the winter and late fall temperature data are not very reliable at either station. This is likely due to the sensors either being out of water and exposed to air temperatures, or the sensors being frozen in ice. In both cases, the recorded temperatures are not reflective of liquid water temperatures. The temperature time series data were compared to in-situ instantaneous observations collected during water quality sampling to validate the open water season (March to November) record. The raw data 15-minute time series data are shown on Figure 7. For analysis, winter data and any anomalous values (e.g. during station maintenance) were removed. Monthly mean values are shown in Tables 2 and 3.

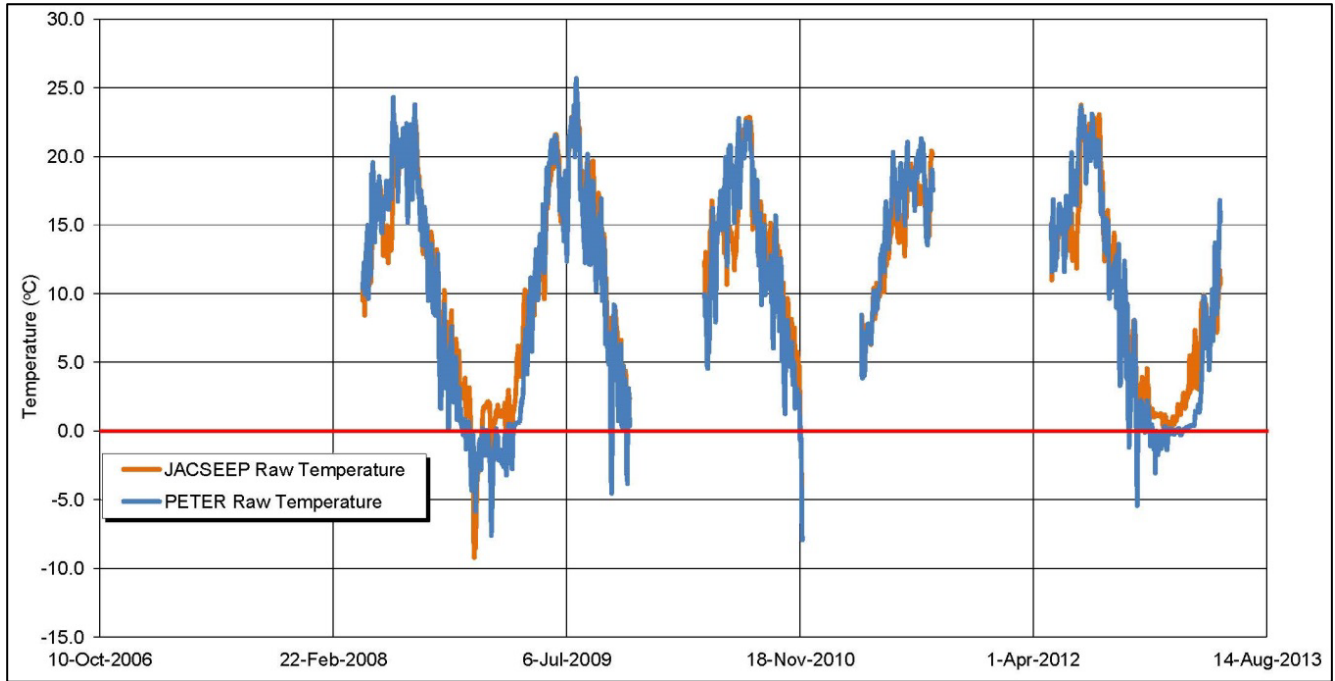


Figure 7 Raw Water Temperature Data

Table 1 JACSEEP Monthly Mean Water Temperatures (°C)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2008				-	13.41	14.86	20.22	19.02	13.00	7.98	4.61	-
2009	-	-	2.96	8.32	13.14	18.83	20.48	17.99	14.63	6.05	3.16	
2010				-	13.37	14.26	19.24	16.62	13.29	9.69	4.31	
2011			-	7.59	11.54	14.97	17.87	17.12				
2012					13.85	14.26	19.62	20.58	13.11	7.36	3.55	-
2013	-	-	5.43	8.11	-							

NOTES:

1. HIGHLIGHTED CELLS HAD LESS THAN 15 DAYS OF DATA RECORDED AND WERE REMOVED.
2. '-' INDICATES THAT DATA WERE PRESENT, BUT WERE REMOVED.

Table 2 PETER Monthly Mean Water Temperatures (°C)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2008				-	14.90	17.36	20.27	18.82	12.06	5.69	2.61	-
2009	-	-	0.56	7.13	14.25	19.00	20.36	16.68	12.75	4.39	1.78	
2010				-	11.21	17.58	20.17	16.09	11.05	7.25	2.59	
2011			-	7.08	12.96	17.63	18.60	18.00				
2012					14.43	15.95	20.88	19.32	11.93	5.57	2.11	-
2013	-	-	1.74	8.41	-							

NOTES:

1. HIGHLIGHTED CELLS HAD LESS THAN 15 DAYS OF DATA RECORDED AND WERE REMOVED.
2. '-' INDICATES THAT DATA WERE PRESENT, BUT WERE REMOVED.

The recorded changes in water temperatures within the study reach are presented in Table 4 along with the mean monthly air temperature for the Project (KP, 2015b).

Table 3 Measured (2008 to 2013) Peterson Creek water temperature change between Jacko Lake outlet and proposed pipeline outfall location

Month	Jacko Lake outflow (m ³ /s)	Air Temperature (°C)	Inlet Water Temperature (JACSEEP) (°C)	Outlet Water Temperature (PETER) (°C)	Water Temperature Change (°C)
Mar	0.02	1.5	4.2	1.1	-3.0
Apr	0.06	6.5	8.0	7.5	-0.5
May	0.14	11.1	13.1	13.6	0.5
Jun	0.08	14.7	15.4	17.5	2.1
Jul	0.01	18.7	19.5	20.1	0.6
Aug	0.00	17.8	18.3	17.8	-0.5
Sep	0.01	12.9	13.5	11.9	-1.6
Oct	0.01	5.6	7.8	5.7	-2.0
Nov	0.01	-0.1	3.9	2.3	-1.6

As water discharges from Jacko Lake, it is subject to larger temperature fluctuations than the lake itself because it is well mixed, shallow and relatively slow moving in Peterson Creek. Increases in water temperature through the study reach are the result of exposure to air temperatures higher than water temperatures and solar radiation. Decreases in temperature are the result of air temperatures lower than water temperatures and possibly an increased influence from inflows (groundwater or non-lake fed tributaries). As outflows from Jacko Lake diminish in August and September, any contributing groundwater could potentially have a larger effect on the overall stream temperature through the reach.

Due to the paucity of reliable winter water temperature data, a qualitative analysis of the expected temperature changes was conducted. Photo 1 shows the JACSEEP station in January 2013, and Photo 2 shows Peterson Creek upstream of the PETER station in February 2014.



Photo 1 JACSEEP (January 9, 2013)



Photo 2 Upstream of PETER (February 2, 2014)

The above photos show that there can be substantial snow and ice cover present during the winter months. Because of this, it is likely that the small amount of flow present would be insulated from the atmospheric changes in temperature. Furthermore, flows in the winter are likely dominated by groundwater outflows which are not sensitive to air temperature changes. As such, it is expected that any flow present during the winter within the 3 km reach would not experience a substantial change in temperature from the outlet of Jacko Lake.

An estimation of the water temperature change along the length of the diversion pipeline was made using an in-house spreadsheet model that calculates steady-state heat transfer to or from the water in a pipeline. The model considers heat transfer effects from conduction, convection and radiation, based on a constant pipeline flow, air and water temperature. It is assumed that the diversion pipeline will operate at a constant flow of $0.08 \text{ m}^3/\text{s}$ from May until September inclusive, with the pipeline to be drained outside of these months. The inputs for each

month that the pipeline is in operation are shown on Table 4, with meteorological conditions based on the average conditions over each month (KP, 2015b). It is apparent that the expected temperature change under these conditions is small, with less than 0.2°C temperature difference from inlet to outlet under these conditions. The temperature change is small in these cases due to the similarity of the average air temperatures to the average inlet water conditions in each month.

Table 4 Modelled Water Temperature Change in Pipeline between Jacko Lake inlet and Peterson Creek outfall

Month	Flow (m ³ /s)	Air Temperature (°C)	Wind Speed (m/s)	Solar Radiation (W/m ²)	Inlet Water Temperature (°C)	Outlet Water Temperature (°C)	Water Temperature Change (°C)
May	0.08	11.1	2.3	203	13.1	13.0	-0.1
Jun	0.08	14.7	2.4	208	15.4	15.5	0.0
Jul	0.08	18.7	2.3	247	19.5	19.6	0.1
Aug	0.08	17.8	2.1	202	18.3	18.2	0.0
Sept	0.08	12.9	2.3	147	13.5	13.4	-0.2

The difference in temperature between baseline (in Peterson Creek) and operational (in pipeline) conditions are compared in Table 5. It should be noted that the absolute magnitude of changes may not be reliable due to the difference in datasets (measured and modelled conditions), but the relative changes seem sensible. In May, June and July, water heats more in-stream than in the pipeline due to the increased exposure to energy inputs. As air temperatures and flows drop in late summer, water temperature in Peterson Creek is influenced by cool groundwater inflows, which decrease water temperatures more in-stream than in the pipeline. Consequently, diversion of water through the pipeline can be expected to reduce water temperatures in summer, but increase them in late-summer and autumn.

Table 5 Temperature Change Comparison between Baseline and Operations

Month	Water Temperature Change in Peterson Ck (°C)	Water Temperature Change in Pipeline (°C)	Difference (Pipeline – Peterson Ck) (°C)
Mar	-3.0	-	-
Apr	-0.5	-	-
May	0.5	-0.1	-0.6
Jun	2.1	0.0	-2.1
Jul	0.6	0.1	-0.5
Aug	-0.5	0.0	0.5
Sep	-1.6	-0.2	1.4
Oct	-2.0	-	-
Nov	-1.6	-	-

WATER MANAGEMENT POND

During operations, water diverted through the pipeline will be discharged into a water management pond. Releases from this pond will be managed by the Water Bailiff. The downstream pond will have a surface area of approximately 17 ha at normal operating level, an average depth of 6 m and maximum depth at the downstream embankment of 12 m (Option 2A, Norwest, 2014).

Just as Jacko Lake does, thermal stratification is expected within the lake and the temperature of water discharged will depend on the elevation of the outlet. Water temperature in the pond was assessed using Flake (Mironov, 2008), which is a two-layer model of heat and kinetic energy budgets for the layers in question. The structure of the thermocline is described using the concept of self-similarity (assumed shape) of the temperature-depth curve. Inputs to the model are location (which defines climatic conditions), average lake depth (which affects stratification) and turbidity (which affects energy absorption). This simple model provides a basis for assessing the temperature in the pond. The model does not account for mixing or energy advection of inflows, but if inflows are small relative to the pond, this assumption is reasonable. The inflow rate is approximately 210,000 m³/month (0.08 m³/s) and the pond volume is approximately 1 Mm³.

In order to assess the impact of the downstream pond on water temperature, two Flake models were developed: one to represent Jacko Lake and the other to represent the downstream pond. The only difference between the two models was lake depth. The model developers recommend using the average lake depth to represent conditions and 10 m and 6 m, were used for Jacko Lake and the pond, respectively. The model was compared to Jacko Lake conditions and a reasonable match was observed. During spring and summer the surface and bottom temperatures agree well with the measured data, but the thermocline is less convex in the model than observed conditions. In fall, surface temperatures were slightly over predicted by the model. Overall, the model is considered a reasonable predictor of observed conditions. Measured and modelled data are compared in Appendix A.

Temperature profiles comparing Jacko Lake and the pond are shown on Figures 8 to 11 and differences in surface water temperature are summarized in Table 6. During April to June, surface water temperatures in the pond are predicted to be warmer than Jacko Lake, but cooler in July to November. Details of the pond outlet structure are currently not known, but low level (or multi-level) outlets could be used to ensure pond outflows are comparable or cooler than Jacko Lake surface waters. Jacko Lake outflows are currently drawn from the surface.

Table 6 Comparison of Jacko Lake and Downstream Pond Surface Water Temperatures

Month	Jacko Lake Temperature (°C)	Downstream Pond Temperature (°C)	Difference (°C)
January	0.0	0.0	0.0
February	0.0	0.0	0.0
March	0.0	0.0	0.0
April	2.7	2.8	0.1
May	12.8	13.6	0.8
June	19.8	20.4	0.6
July	21.2	20.9	-0.4
August	21.3	21.1	-0.2
September	18.3	17.9	-0.3
October	11.6	10.9	-0.6
November	4.4	3.1	-1.3
December	0.0	0.0	0.0

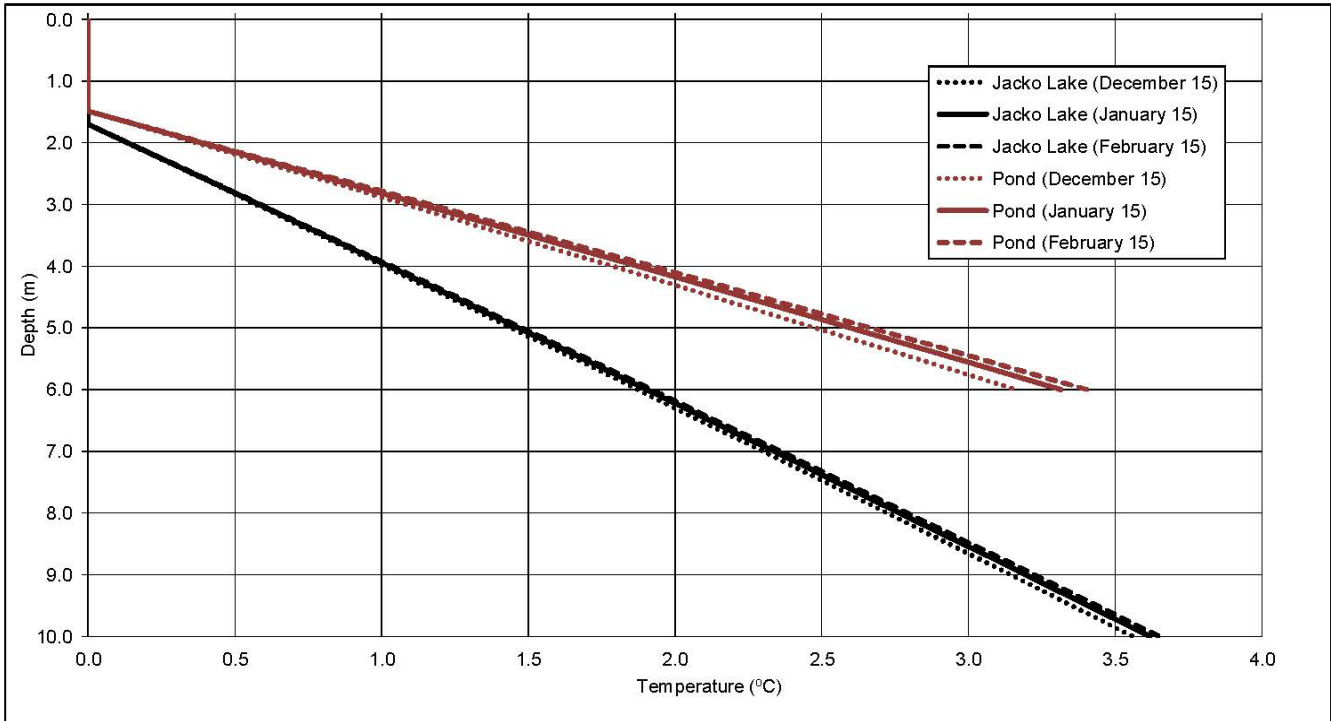


Figure 8 Jacko Lake and Downstream Pond Winter Temperature Model

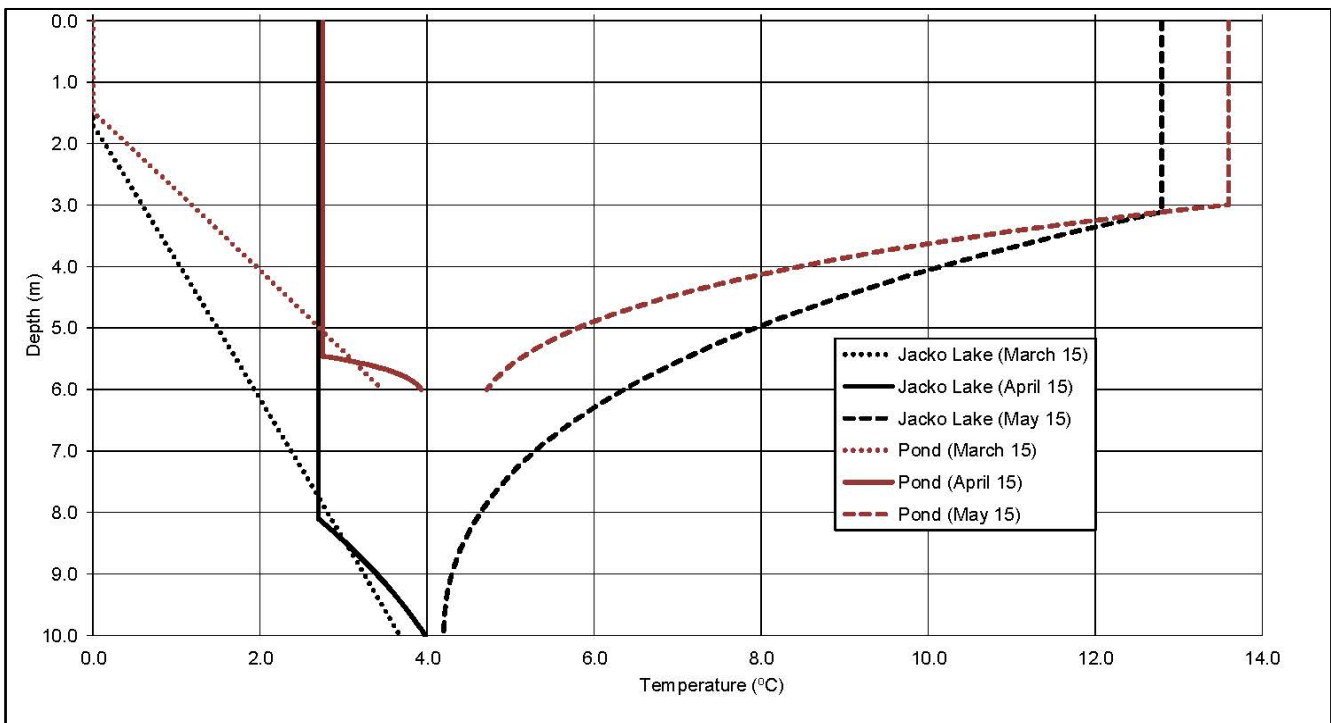


Figure 9 Jacko Lake and Downstream Pond Spring Temperature Model

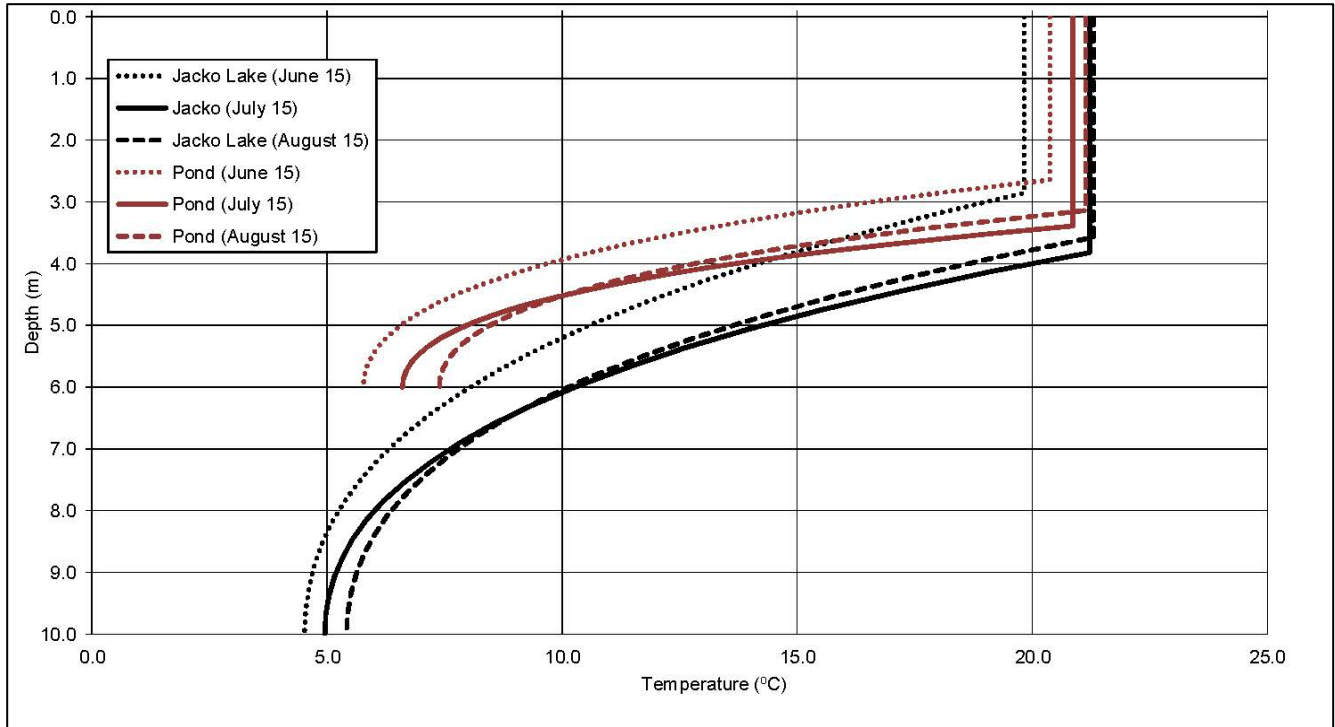


Figure 10 Jacko Lake and Downstream Pond Summer Temperature Model

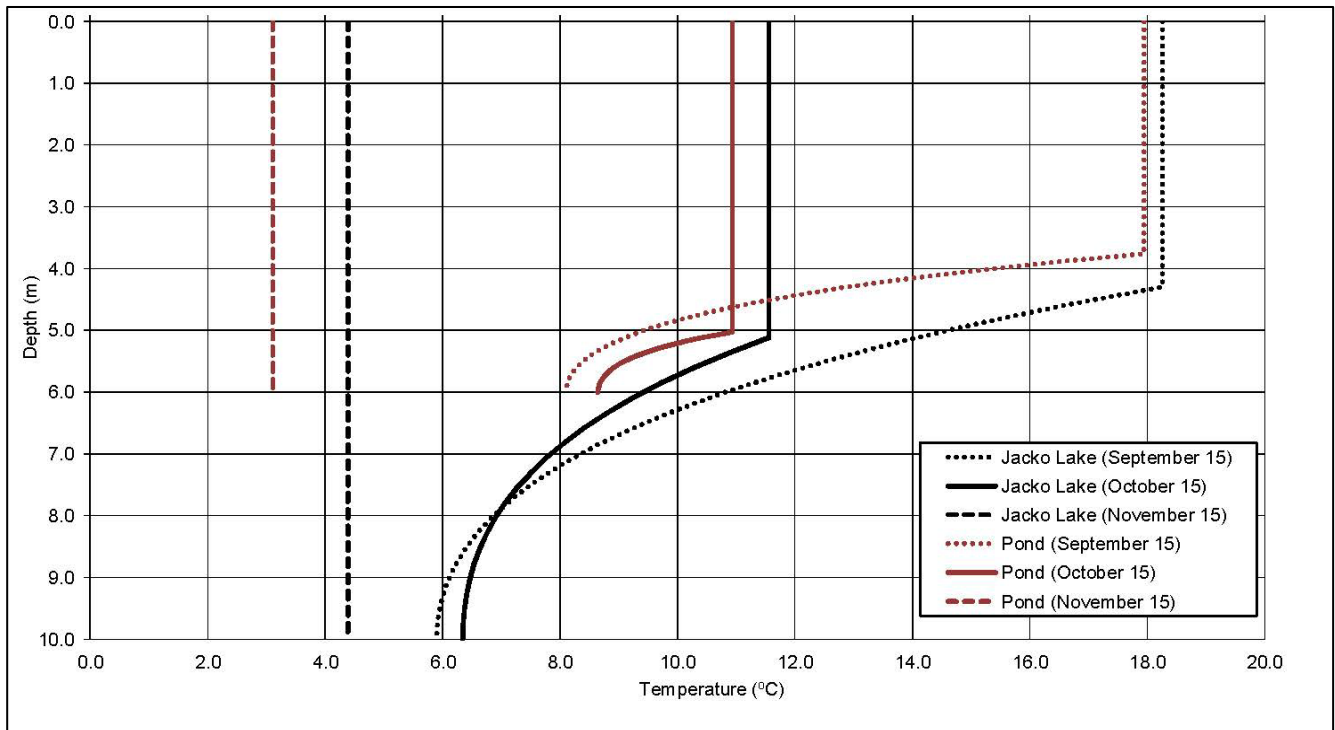


Figure 11 Jacko Lake and Downstream Pond Fall Temperature Model

CONCLUSIONS

The objectives of this assessment are to assess water temperature impacts due to the following:

1. Changes in water temperature leaving Jacko Lake due to the location and elevation of the diversion pipeline inlet structure compared to baseline outflow conditions.
2. Changes in water temperature in Peterson Creek between Jacko Lake and the pipeline outfall location under baseline (in stream) and operational (via pipeline) conditions.
3. Changes in water temperature within the water management pond and ultimately a comparison of differences in temperature between baseline and operational conditions downstream of the Mine property.

Measured data are presented to describe baseline conditions, while a reductionist analysis based on energy balance modeling was completed to assess operating conditions. With respect to the objectives, this analysis indicated that:

1. Current water discharges from Jacko Lake are from the lake surface layer (epilimnion). Water withdrawn from the lake for the pipeline will also be within the surface layer of similar temperature to baseline conditions.
2. In May, June and July, water heats more in-stream than in the pipeline due to the increased exposure to energy inputs. As air temperatures and flows drop in late summer, water temperature in Peterson Creek is influenced by cool inflows (groundwater or non-lake fed tributaries), which decrease water temperatures more in-stream than in the pipeline. Consequently, diversion of water through the pipeline can be expected to reduce water temperatures in summer, but increase them in late-summer and autumn.
3. During April to June, surface water temperatures in the downstream pond are predicted to be warmer than Jacko Lake, but cooler in July to November, assuming pipeline inflows do not significantly affect pond water temperatures. Because the temperature changes from the Lake outlet and pipeline are small, temperature in the downstream pond is considered the primary driver of water temperatures downstream of the Mine property.

If water temperature increases in Peterson Creek are a concern, temperature increases in the pipeline could be mitigated by lowering the level of the pipeline inlet to withdraw deeper, cooler water from Jacko Lake. Similarly, low level (or multi-level) outlets could be used to ensure downstream pond outflows are comparable or cooler than Jacko Lake surface waters. Jacko Lake outflows are currently drawn from the lake surface.

We trust this letter meets your current requirements. If you have any questions or comments, please contact the undersigned.


Yours truly,
Knight Piésold Ltd

ORIGINAL SIGNED


Prepared:

Toby Perkins, M.A.Sc., P.Eng.
Senior Engineer

Reviewed:


Craig Nistor, M.Sc., P.Geo.
Senior Geoscientist

Approval that this document adheres to Knight Piésold Quality Systems: 

Attachments:

Appendix A Measured and modelled temperature profiles

References

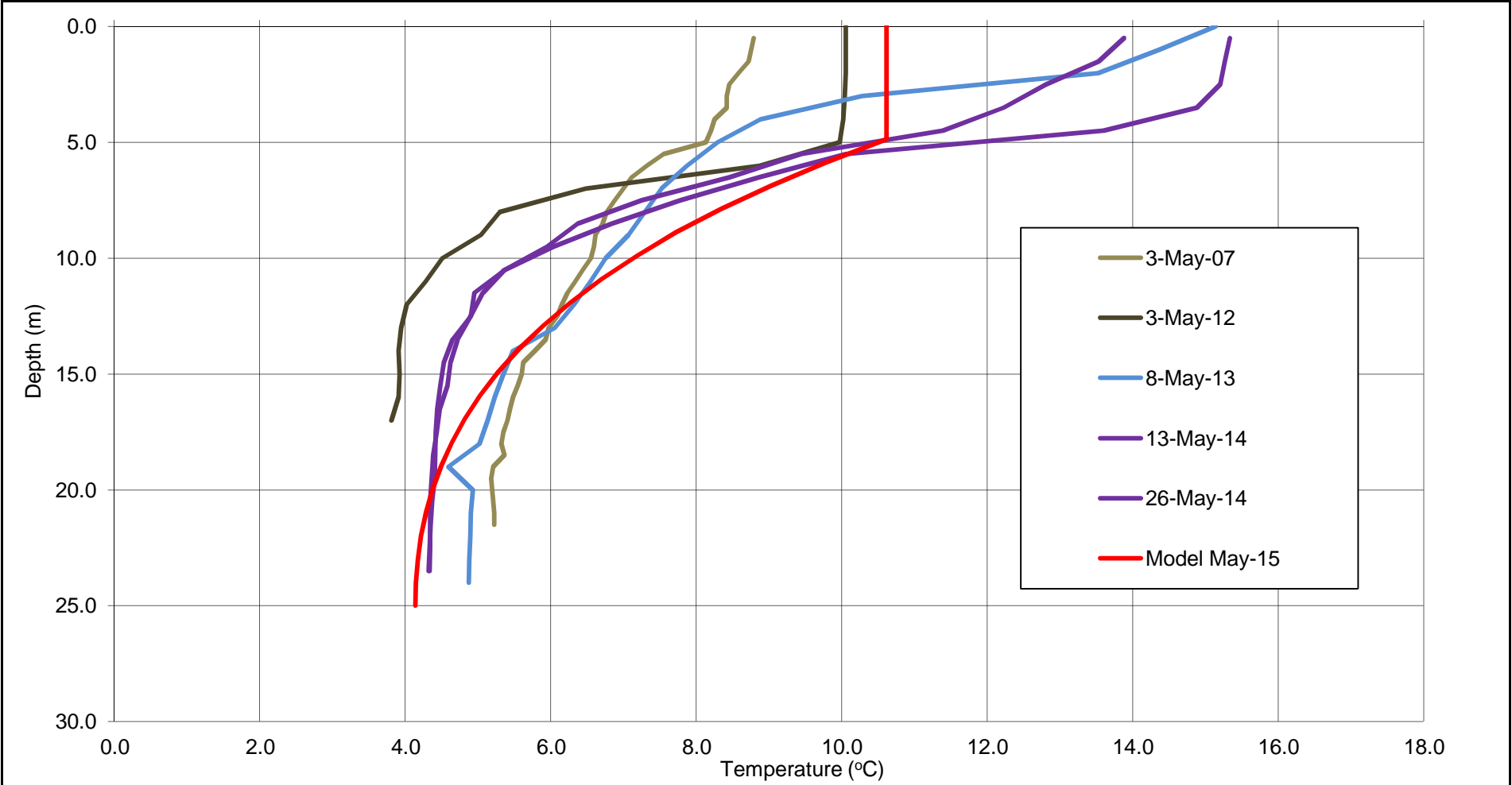
- Knight Piésold Ltd. (KP), 2015a. Peterson Creek Diversion Alternatives, Rev A, VA101-246/26-7. Knight Piésold Ltd., Vancouver, BC.
- Knight Piésold Ltd. (KP), 2015b. 2014 Climatology Report, Rev 1, VA101-246/33-3. Knight Piésold Ltd., Vancouver, BC.
- Mironov, D.V., 2008. Parameterization of Lakes in Numerical Weather Prediction. Description of a Lake Model. German Weather Service, Offenbach am Main, Germany.
- Norwest, 2014. Jacko Lake and Downstream Pond Alternatives Assessment – Rev A. 19 December 2014. Norwest Corporation, Vancouver, BC.

/tp

APPENDIX A

MEASURED AND MODELLED TEMPERATURE PROFILES

(Figures A1 to A3)

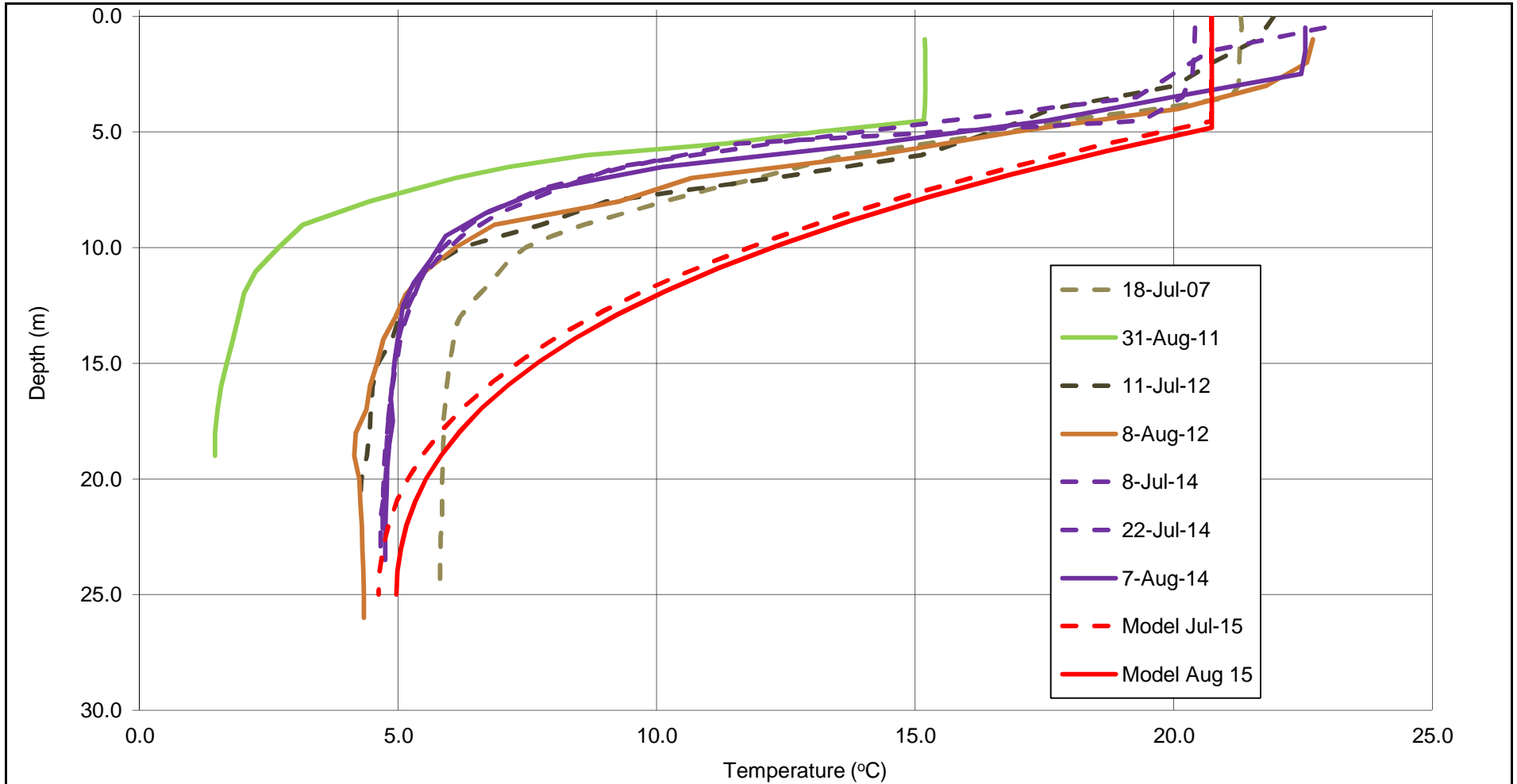


NOTES:

1. SPRING IS DEFINED FROM MARCH TO MAY.
2. LAKE SAMPLES TAKEN FROM ROUGHLY THE DEEPEST SPOT IN THE LAKE.

KGHM AJAX MINING INC.			
AJAX PROJECT			
JACKO LAKE MEASURED AND MODELED TEMPERATURE COMPARISON SPRING			
	P/A NO. VA101-00246/31	REF. NO. VA15-02023	REV 0
	FIGURE A1		

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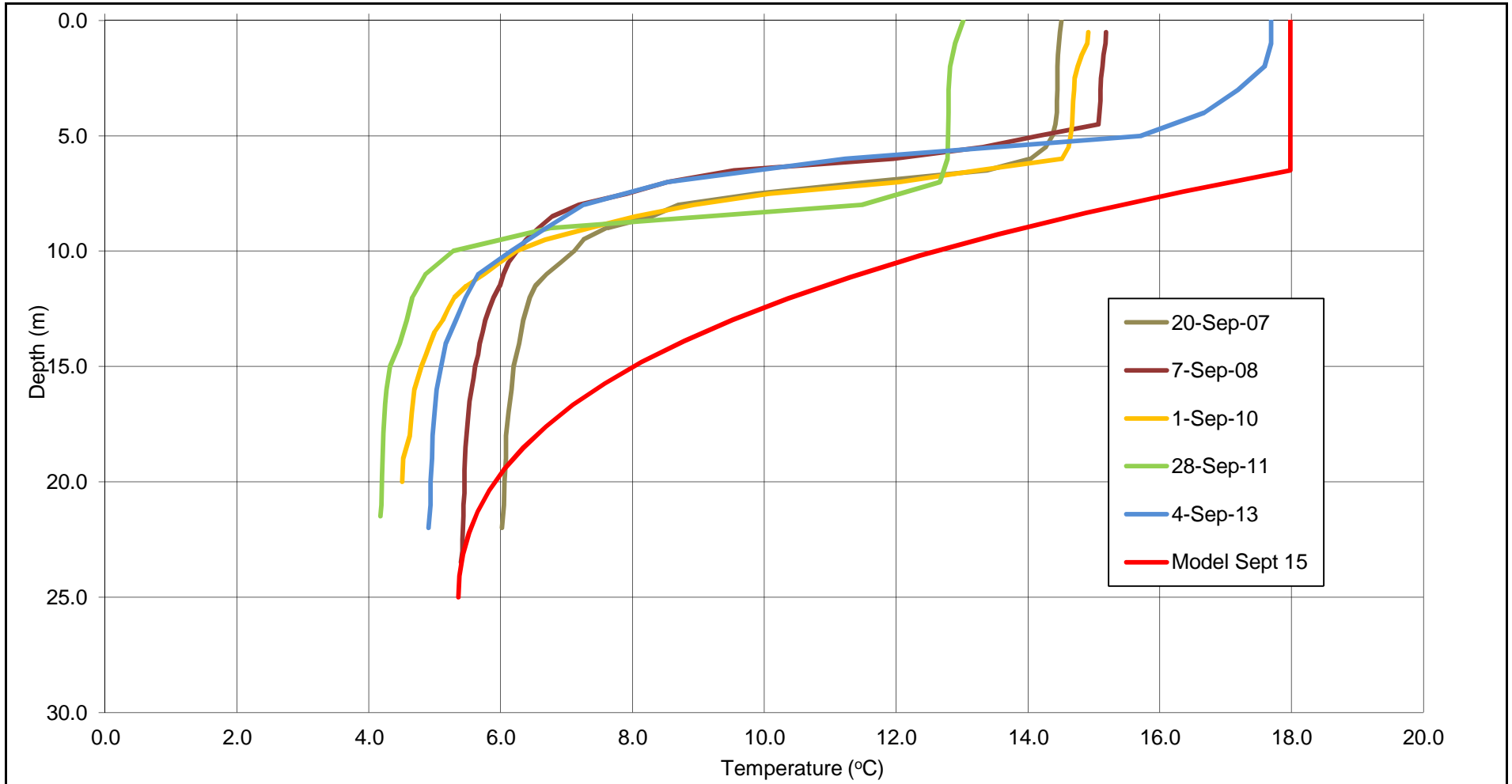


NOTES:

1. SUMMER IS DEFINED FROM JUNE TO AUGUST.
2. STRATIFICATION IN SUMMER IS VERY OBVIOUS IN ALL PROFILES.
3. LAKE SAMPLES TAKEN FROM ROUGHLY THE DEEPEST SPOT IN THE LAKE.

KGHM AJAX MINING INC.	
AJAX PROJECT	
JACKO LAKE MEASURED AND MODELED TEMPERATURE COMPARISON SUMMER	
<i>Knight Piésold</i> CONSULTING	P/A NO. VA101-00246/31 REF. NO. VA15-02023
FIGURE A2	
REV 0	

0	19FEB'15	ISSUED WITH LETTER	BW	TJP
REV	DATE	DESCRIPTION	PREP'D	REV'D



NOTES:

1. FALL DEFINED FROM SEPTEMBER TO NOVEMBER.
2. STRATIFICATION STILL EVIDENT IN SEPTEMBER.
3. LAKE SAMPLES TAKEN FROM ROUGHLY THE DEEPEST SPOT IN THE LAKE.

KGHM AJAX MINING INC.	
AJAX PROJECT	
JACKO LAKE MEASURED AND MODELED TEMPERATURE COMPARISON FALL	
<i>Knight Piésold</i> CONSULTING	P/A NO. VA101-00246/31 REF. NO. VA15-02023
FIGURE A3	
REV 0	

0	19FEB'15	ISSUED WITH LETTER	BW	TJP
REV	DATE	DESCRIPTION	PREP'D	REV'D