

Appendix 6.7-E

Thompson River Hydrologic and Hydraulic Impacts

AJAX PROJECT

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

MEMORANDUM

To: Stephanie Eagen Date: July 20, 2015
File No.: VA101-246/35-A.01
From: Toby Perkins Cont. No.: VA15-02874
Re: Ajax Project - Thompson River Hydrologic and Hydraulic Impacts

The purpose of this memorandum is present the results of assessment of potential changes in hydrology and hydraulics on the Thompson River downstream from the outlet of Kamloops Lake due to the proposed Ajax Project. Flow reductions, particularly during low flow periods, have the potential to impact fish habitat.

The Project will affect Thompson River flows due to a water withdrawal of 1505 m³/hr (0.42 m³/s) from Kamloops Lake and flow reductions in Peterson Creek due to mine activities. This memorandum is a revision of the work completed by Knight Piésold Ltd. (KP) on March 18, 2013 (KP cont. no. VA13-00493), which assessed the effects of a Kamloops lake water withdrawal of 2000 m³/hr (0.56 m³/s).

Hydrology

The Project is located in the Thompson River Valley on the south side of Kamloops Lake. The hydrology of the Thompson River was assessed based on Water Survey of Canada (WSC) data available for the Thompson River. The Project location and the locations of relevant WSC gauging stations are shown on Figure 1. Details of these WSC stations are summarized in Table 1.

The WSC operated a gauge on the Thompson River near Savona (08LF033), near the outlet of Kamloops Lake, between 1926 and 1966. The annual hydrograph of mean monthly flows is plotted on Figure 2. Mean monthly flows are highest in May through July due to melting of the winter snowpack from high-elevation terrain. Flows gradually decrease from late summer onward. Minimum monthly flows occur in late winter (February through April), prior to the onset of spring freshet.

The WSC gauge near Savona (08LF033) was only active for 10 complete years within the overall period of record. The relatively short and old record from this gauging station might not accurately represent extreme low flow conditions under the current climatic and water-use regime at this location. Therefore, a secondary record was constructed using data from the gauging stations on the North Thompson River at McLure (08LB064) and the South Thompson River at Chase (08LE031), for which 41 years of complete record are available between 1971 and 2011. The recorded daily flows from these two gauging stations were added to construct the secondary Thompson River record. Both of these stations are upstream of station 08LF033 and the outlet of Kamloops Lake, but no adjustments were made for the incremental inflow from the drainage area between these two gauging stations and the outlet of Kamloops Lake, or for water withdrawals in the same area, because of the uncertainty and relative insignificance of such adjustments, and because direct use of these station's flows is considered to be a conservative approach from the perspective of assessing project withdrawals.

The ungauged area between the North and South Thompson River gauging stations and station 08LF033 is 3,700 km², which is less than 10% of the 39,100 km² area for station 08LF033. Furthermore, although tributaries draining upland areas do contribute runoff to the Thompson River system in this area, the existence of freestanding alkali ponds with no outlet features indicates that no runoff occurs from some areas on lower elevation terrain. Licenced water withdrawals from the North, South and main Thompson Rivers downstream of the gauges, and from Kamloops Lake, are on the order of 5 m³/s when expressed as an annual average rate (BC MOE, 2013a). Actual withdrawals are assumed to be much less than the annual average rate during the period of lowest river flows in late winter. On an annual basis, net inflow to the Thompson River system between the North and South Thompson River gauges and the outlet of Kamloops Lake would have to average 5 m³/s, or

1.4 l/s/km², to balance the licenced withdrawals if the two tributary gauges are to be considered representative of the Thompson River at the outlet of Kamloops Lake. The net annual inflow is likely greater than 1.4 l/s/km², so the two tributary gauges likely underestimate flows in the Thompson River. It is worth noting that the combined average flows for stations 08LB064 and 08LE031 for the 1971-2011 period (730 m³/s) are greater than the average flows measured at station 08LF033 (696 m³/s), albeit for a different period (1926-1966).

Mean monthly flows and extreme low flows at the Thompson River near Savona gauging station (08LF033), and from the combined records of the North and South Thompson River gauging stations (08LB064 and 08LE031, respectively), are presented in Table 2. At the Thompson River near Savona station, the lowest mean monthly flow (183 m³/s) was recorded in March. The lowest daily flow and the lowest 7-day flow in the 10 years of complete record were both 121 m³/s, and they occurred in the month of February. In the combined records of the North and South Thompson Rivers, the lowest mean monthly flow (193 m³/s) was recorded in February. The lowest daily flow and the lowest 7-day low flow in the 41 years of complete record were 108 m³/s and 110 m³/s, respectively, and they also occurred in the month of February.

The predicted flow reduction (Kamloops Lake withdrawal and Peterson Creek reductions) was compared to the mean monthly flows at the Thompson River near Savona gauging station, and the results are presented in Table 3. The proposed flow reduction equates to a 0.2% reduction of the mean monthly river flow in the months of December through April, and 0.1% or less in the months of May to November. The predicted flow reductions are also compared to the minimum 7-day discharge recorded in each month at the Thompson River near Savona gauging station, in Table 3. The predicted reduction equates to a maximum of 0.3% of the minimum 7-day discharge during November to April. Finally, the most conservative assessment is made by comparing the predicted flow reduction to the minimum daily discharge obtained from the combined records of the North and South Thompson River gauging stations (108 m³/s). The predicted flow reduction in February is 0.4 m³/s, which equates to 0.4% of this minimum daily discharge value.

Hydraulics

In order to assess changes to water depths and velocities in the Thompson River due to changes in flow, a one-dimensional (1D) hydraulic model was developed using the HEC-RAS modelling software. HEC-RAS (Hydrologic Engineering Center River Analysis System) is a 1D hydrodynamic model developed by the US Army Corps of Engineers. The model covers approximately 2.5 km of the Thompson River channel extending downstream from Kamloops Lake. The model is based on cross-sections surveyed for the BC Ministry of Environment (BC MoE, 2013b). The locations of model transects are shown on Figure 3.

The transects were surveyed during two periods: late September 2000 and early April 2001. Water surface elevation data were also collected during the transect surveys. Flow conditions during the surveys were estimated from the WSC gauging stations on the North and South Thompson Rivers. The flows were estimated to be approximately 445 m³/s in late September 2000 and 185 m³/s in early April 2001. The model was calibrated to these two flow conditions and a Manning's resistance coefficient of 0.04 was found to provide appropriate results. Modelled and measured water surface elevations in the 185 m³/s model run agreed to within +/-0.05 m, on average. Measured and modelled water surface elevations agreed less well in the 445 m³/s model run (within +/-0.10 m, on average). The model was developed primarily for investigating low flow hydraulics, so the better calibration at the lower flow condition was considered appropriate.

Water level data were not available to define the downstream boundary condition in the model at flow conditions other than those that were surveyed in 2000 and 2001. Therefore, downstream water levels were estimated for other flow conditions and the sensitivity of model results to these estimates was tested. The model was run at a minimum flow of 80 m³/s and the downstream boundary water level was varied from 334.42 m (the surveyed level at 185 m³/s) to 334.00 m. This change resulted in less than 0.03 m difference in water surface elevation upstream of XS-20, which is at a riffle that provides a hydraulic control to the upstream section of the river channel in the model. Consequently, an intermediary downstream boundary elevation of 334.2 m was selected for all low flow model runs, and only the results upstream of XS-20 are reported.

The model was run for flows ranging from 80 m³/s to 150 m³/s in order to assess how wetted width, average velocity, and maximum depth change with discharge during low flow conditions. The results are presented for five transects on Figures 4 through 8. These transects were selected as they were generally the shallowest and widest transects in the model and therefore are expected to show the most change in wetted width due to flow changes. These figures indicate that channel hydraulic parameters change by the following amounts, as indicated by the slopes of the lines on Figures 4 through 8:

- Change in wetted width: 11 cm to 35 cm per 1 m³/s change in discharge.
- Change in average cross-section velocity: 0.003 m/s to 0.006 m/s per 1 m³/s change in discharge.
- Change in water surface elevation and maximum depth: 4 mm to 8 mm per 1 m³/s change in discharge.

A flow of 110 m³/s was selected to represent an extreme low flow under pre-Project conditions. This is the lowest recorded 7-day low flow in the 41 years of record from the combined North and South Thompson River records, and is lower than the lowest daily flow recorded in 10 years at the Thompson River gauging station near Savona (08LF033). Looking at transect XS-8 (Figure 5), for example, the approximate values of the channel hydraulic parameters at the 110 m³/s flow condition are as follows:

- Wetted width: 64 m.
- Average cross-section velocity: 1.06 m/s.
- Maximum depth: 3.4 m.
- Average depth (discharge divided by width and velocity): 1.6 m.

During Project operations, the representative low flow condition would be reduced by around 0.4 m³/s, to 109.6 m³/s. The predicted changes in channel hydraulic parameters at the same five transects presented on Figures 4 through 8, due to the Project-related flow reduction, are presented in Table 4 and summarized below:

- Reduction in wetted width: 6 cm to 21 cm.
- Reduction in average cross-section velocity: 0.001 m/s to 0.003 m/s.
- Reduction in water surface elevation and maximum depth: 2 mm to 4 mm.

These are relatively small changes in hydraulic conditions and they would be difficult to detect even with an intensive monitoring program employed at the instant that the water withdrawal started.

The flow modelling indicates that potential changes in hydrology and hydraulics on the Thompson River downstream from the outlet of Kamloops Lake, due to the proposed Ajax Project, would be negligible. Please contact the undersigned if you have any questions.

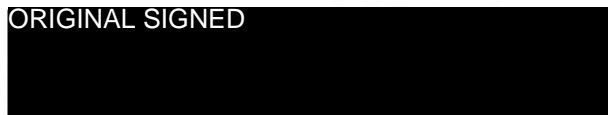
ORIGINAL SIGNED



Prepared:


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ORIGINAL SIGNED



Reviewed:

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

Approval that this document adheres to Knight Piésold Quality Systems: 

References:

- British Columbia Ministry of Environment (BC MOE), 2013a. BC Water Resources Atlas, www.env.gov.bc.ca/wsd/data_searches/wrbc/index.html, accessed online February 2013.
- British Columbia Ministry of Environment (BC MOE), 2013b. EcoCat: The Ecological Reports Catalogue. Report: Thompson River at outlet of Kamloops Lake Channel Surveys, <http://a100.gov.bc.ca/pub/acat/public/viewReport.do?reportId=9480>, accessed online January 2013.

Attachments:

Table 1 Rev 0	Summary of Regional Water Survey of Canada Stations
Table 2 Rev 0	Mean and Extreme Low Monthly Flows – Thompson River near Kamloops Lake Outlet
Table 3 Rev 0	Project-Related Flow Reductions – Thompson River near Savona (WSC 08LF033)
Table 4 Rev 0	Project-Related Changes in Low-Flow Channel Hydraulics – Thompson River near Kamloops Lake Outlet
Figure 1 Rev 0	Regional Hydrology Stations
Figure 2 Rev 0	Mean Monthly Flows – Thompson River near Savona (WSC 08LF033)
Figure 3 Rev 0	HEC-RAS Transects at Outlet of Kamloops Lake
Figure 4 Rev 0	Thompson River Hydraulic Geometry, Cross Section XS-3
Figure 5 Rev 0	Thompson River Hydraulic Geometry, Cross Section XS-8
Figure 6 Rev 0	Thompson River Hydraulic Geometry, Cross Section XS-9
Figure 7 Rev 0	Thompson River Hydraulic Geometry, Cross Section XS-16
Figure 8 Rev 0	Thompson River Hydraulic Geometry, Cross Section XS-20
Appendix A	HEC-RAS Cross Section Plots – 80 m ³ /s and 150 m ³ /s Water Surfaces

/tjp

TABLE 1

**KGHM AJAX MINING INC.
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SUMMARY OF REGIONAL WATER SURVEY OF CANADA STATIONS

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WSC Station Name	Station ID	Total Years of Record	Complete Years of Record	Start Year	End Year	Latitude	Longitude	Drainage Area (km ²)	Mean Annual Discharge (m ³ /s)	Equivalent Average Annual Unit Runoff (l/s/km ²)
Thompson River at Kamloops	08LF023	4	1	1911	1914	50°40'53" N	120°20'56" W	37800	623.0	16.5
North Thompson River at McLure	08LB064	53	52	1958	2010	51°02'29" N	120°14'28" W	19600	425.9	21.7
South Thompson River at Chase	08LE031	88	81	1911	2010	50°45'54" N	119°57'34" W	15800	291.5	18.4
South Thompson River at Monte Creek	08LE069	14	12	1958	1971	50°39'12" N	119°57'34" W	16600	299.3	18.0
Thompson River near Savona	08LF033	14	10	1926	1966	50°45'30" N	120°52'00" W	39100	696.1	17.8
Thompson River near Walhachin	08LF043	17	15	1932	1948	50°45'52" N	121°01'56" W	40900	673.4	16.5
Thompson River at Spences Bridge	08LF022	40	36	1911	1951	50°25'15" N	121°20'30" W	54600	743.4	13.6
Thompson River near Spences Bridge	08LF051	60	59	1951	2010	50°21'25" N	121°23'38" W	55400	771.2	13.9

M:\1\01\00246\35\A\Data\Update Thompson River hydraulics assessment\[Summary of Regional Stations.xlsx]WSC Summary Table

NOTES:

1. THE VALUES PRESENTED ABOVE WERE PROVIDED BY THE WATER SURVEY OF CANADA OR WERE CALCULATED FROM DATA PROVIDED BY THE WATER SURVEY OF CANADA.
2. MEAN ANNUAL DISCHARGE CALCULATED USING ONLY COMPLETE YEARS OF RECORD.

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TABLE 2

**KGHM AJAX MINING INC.
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**MEAN AND EXTREME LOW MONTHLY FLOWS
THOMPSON RIVER NEAR KAMLOOPS LAKE OUTLET**

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River	Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
North and South Thompson	Mean Monthly Discharge (m ³ /s)	213	193	207	420	1391	2160	1618	910	566	424	367	264
	Minimum Daily Discharge (m ³ /s)	114	108	108	116	285	1170	748	410	268	175	148	142
	Min. 7-day Avg. Discharge (m ³ /s)	116	110	119	121	354	1276	811	432	281	178	168	146
Thompson River near Savona	Mean Monthly Discharge (m ³ /s)	206	188	183	296	1070	2166	1566	925	603	500	394	263
	Minimum Daily Discharge (m ³ /s)	123	121	123	128	166	1180	875	530	309	238	161	129
	Min. 7-day Avg. Discharge (m ³ /s)	124	121	124	129	222	1328	957	583	348	242	166	131

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NOTES:

1. THE VALUES PRESENTED ABOVE FOR NORTH AND SOUTH THOMPSON ARE BASED ON THE WATER SURVEY OF CANADA GAUGES 08LB064 (NORTH THOMPSON RIVER AT MCLURE) AND 08LE031 (SOUTH THOMPSON RIVER AT CHASE).
2. NORTH AND SOUTH THOMPSON VALUES BASED ON DATA FROM ALL COMPLETE YEARS BETWEEN 1971 AND 2011.
3. THE VALUES PRESENTED ABOVE FOR THOMPSON RIVER NEAR SAVONA ARE BASED ON WSC GAUGE 08LF033.
4. THOMPSON RIVER NEAR SAVONA VALUES BASED ON DATA FROM ALL COMPLETE YEARS BETWEEN 1926 AND 1966.

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TABLE 3

**KGHM - AJAX MINING INC.
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**PROJECT-RELATED FLOW REDUCTIONS
THOMPSON RIVER NEAR SAVONA (WSC 08LF033)**

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Month	Predicted Flow Reduction (m ³ /s)	Mean Monthly Discharge (m ³ /s)	Reduction in Mean Monthly Discharge (%)	Minimum 7-day Discharge (m ³ /s)	Reduction of Minimum 7-day Discharge (%)
January	0.42	206	0.2%	124	0.3%
February	0.42	188	0.2%	121	0.3%
March	0.43	183	0.2%	124	0.3%
April	0.45	296	0.2%	129	0.3%
May	0.48	1070	0.0%	222	0.2%
June	0.44	2166	0.0%	1328	0.0%
July	0.42	1566	0.0%	957	0.0%
August	0.42	925	0.0%	583	0.1%
September	0.42	603	0.1%	348	0.1%
October	0.42	500	0.1%	242	0.2%
November	0.42	394	0.1%	166	0.3%
December	0.42	263	0.2%	131	0.3%

M:\1\01\00246\35\A\Data\Update Thompson River hydraulics assessment\[Thompson River near Savona.xlsx]Reduction in Mean Monthly Disch

NOTES:

1. THE VALUES PRESENTED ABOVE WERE PROVIDED BY THE WATER SURVEY OF CANADA OR WERE CALCULATED FROM DATA PROVIDED BY THE WATER SURVEY OF CANADA.
2. MEAN MONTHLY DISCHARGE CALCULATED USING ONLY COMPLETE YEARS OF RECORD.
3. MINIMUM 7-DAY DISCHARGE IS THE MINIMUM FROM THE PERIOD OF RECORD.
4. PREDICTED FLOW REDUCTION INCLUDES 1505 CUBIC METRES PER HOUR WITHDRAWAL FROM KAMLOOPS LAKE AND PETERSON CREEK FLOW REDUCTIONS.

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TABLE 4

KGHM AJAX MINING INC.
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PROJECT-RELATED CHANGES IN LOW-FLOW CHANNEL HYDRAULICS
THOMPSON RIVER NEAR KAMLOOPS LAKE OUTLET

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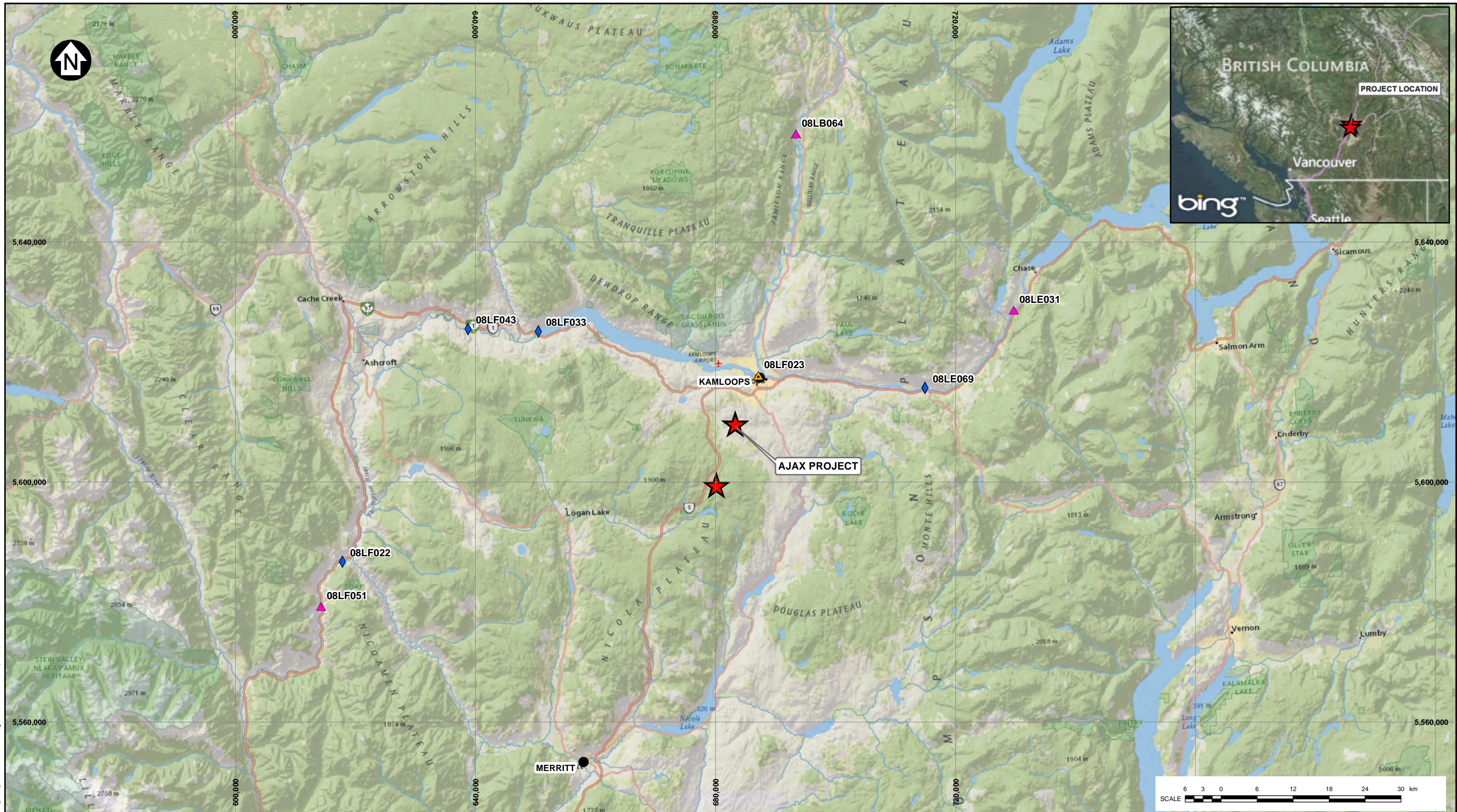
Cross Section	Wetted Width (m)			Average Velocity (m/s)			Maximim Depth (m)		
	Pre-Project	Project	Difference	Pre-Project	Project	Difference	Pre-Project	Project	Difference
XS-3	95.51	95.42	0.09	0.60	0.60	0.001	4.30	4.30	0.004
XS-8	63.63	63.42	0.21	1.06	1.06	0.002	3.42	3.42	0.003
XS-9	56.18	56.07	0.11	1.19	1.19	0.003	4.09	4.09	0.003
XS-16	58.81	58.75	0.06	0.65	0.65	0.002	5.30	5.30	0.002
XS-20	127.52	127.43	0.09	1.40	1.40	0.002	1.09	1.09	0.002

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NOTES:

1. PRE-PROJECT RESULTS ARE PRESENTED FOR 110 m³/s, WHICH WAS SELECTED TO REPRESENT AN EXTREME LOW FLOW CONDITION.
2. PROJECT RESULTS ARE PRESENTED FOR 109.6 m³/s.

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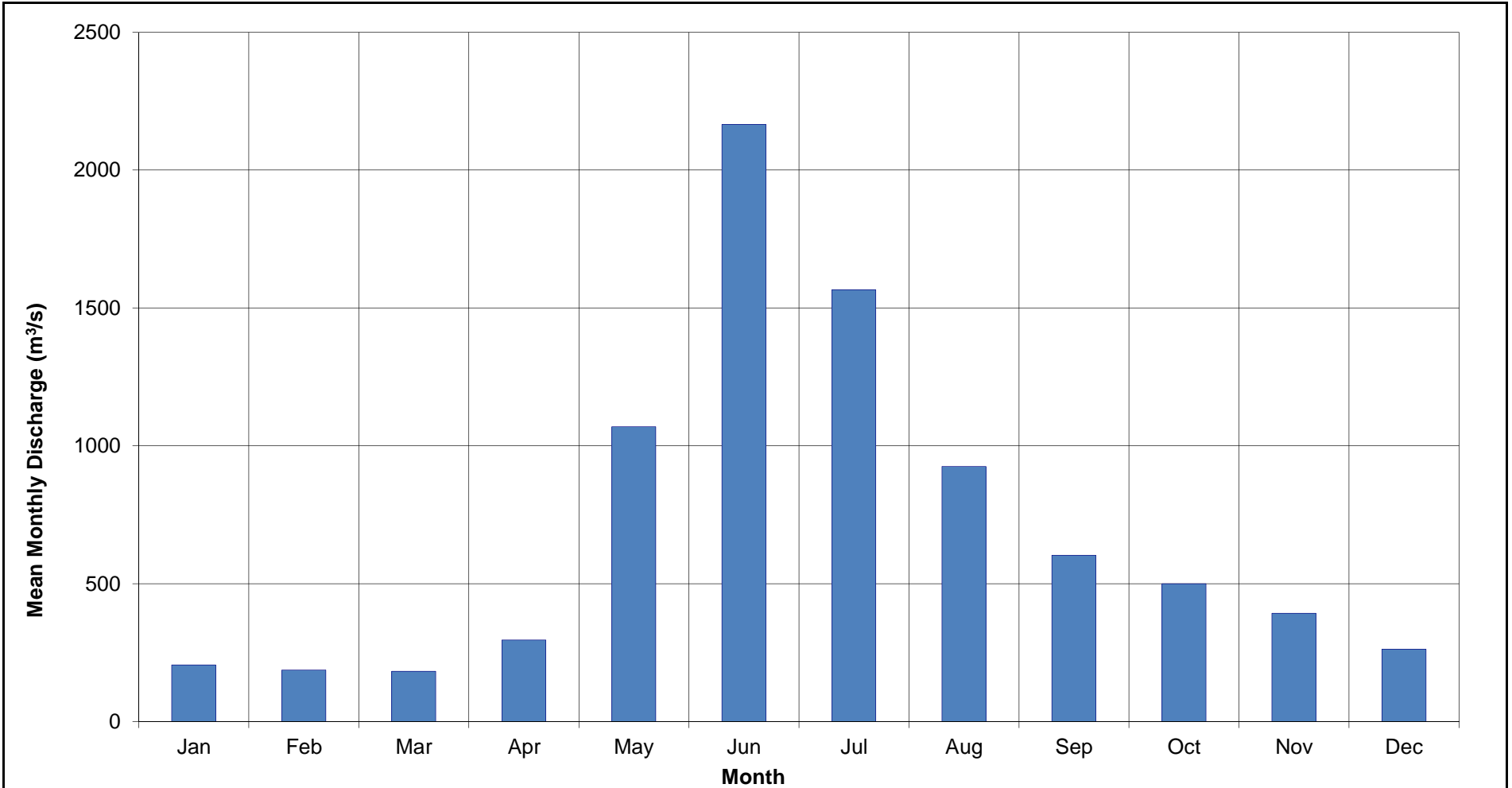
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- ★ PROJECT LOCATION
 - ▲ WATER SURVEY OF CANADA (WSC) ACTIVE GAUGING STATION
 - ◆ WATER SURVEY OF CANADA (WSC) INACTIVE GAUGING STATION
 - ▲ WATER SURVEY OF CANADA (WSC) ACTIVE WATER LEVEL STATION
 - COMMUNITY

- NOTES:**
1. BASE MAP: ESRI ONLINE MAPS.
 2. COORDINATE GRID IS IN METRES.
COORDINATE SYSTEM: NAD 1983 UTM ZONE 10N.
 3. THIS FIGURE IS PRODUCED AT A NOMINAL SCALE OF 1:600,000 FOR 11X17 (TABLOID) PAPER. ACTUAL SCALE MAY DIFFER ACCORDING TO CHANGES IN PRINTER SETTINGS OR PRINTED PAPER SIZE.

KGHM - AJAX MINING INC.	
AJAX PROJECT	
REGIONAL HYDROLOGY STATIONS	
<i>Knight Piésold</i> CONSULTING	<small>PIA NO.</small> VA101-246/35 <small>REF NO.</small> VA15-02874 FIGURE 1 <small>REV</small> 0

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NOTE:

1. MONTHLY VALUES WERE CALCULATED BASED ON COMPLETE YEARS OF RECORD (10 YEARS BETWEEN 1926 AND 1966).

KGHM AJAX MINING INC.	
AJAX MINE	
MEAN MONTHLY FLOWS THOMPSON RIVER NEAR SAVONA (WSC 08LF033)	
<i>Knight Piésold</i> CONSULTING	P/A NO. VA101-246/35
	REF. NO. VA15-02874
FIGURE 2	
	REV 0

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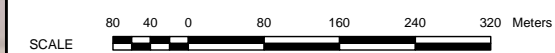


LEGEND:

— TRANSECT

NOTES:

1. BASE MAP: ESRI ONLINE BING MAPS.
3. COORDINATE GRID IS IN METRES.
COORDINATE SYSTEM: NAD 1983 UTM ZONE 10N.
4. THIS FIGURE IS PRODUCED AT A NOMINAL SCALE OF 1:8,000 FOR 11X17 (TABLOID) PAPER. ACTUAL SCALE MAY DIFFER ACCORDING TO CHANGES IN PRINTER SETTINGS OR PRINTED PAPER SIZE.



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AJAX PROJECT

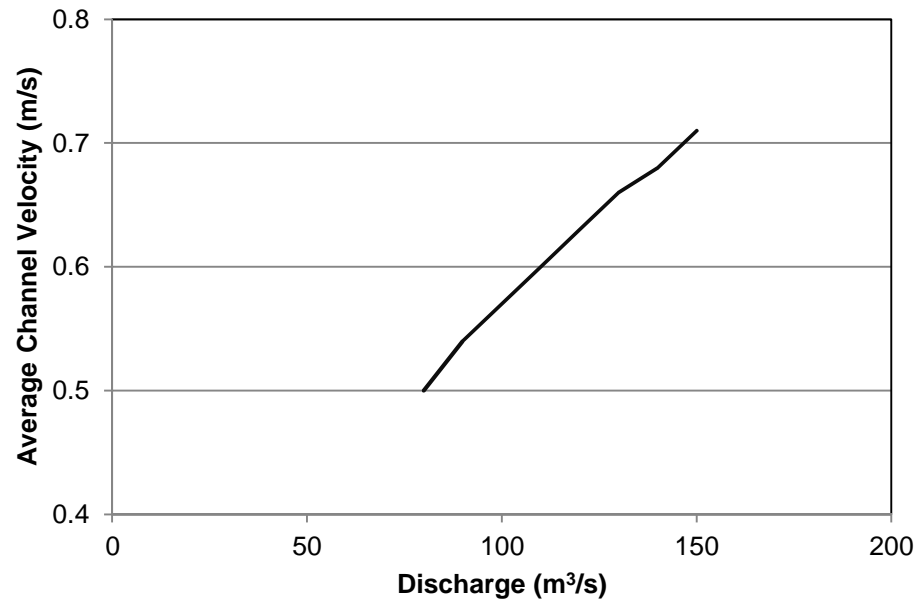
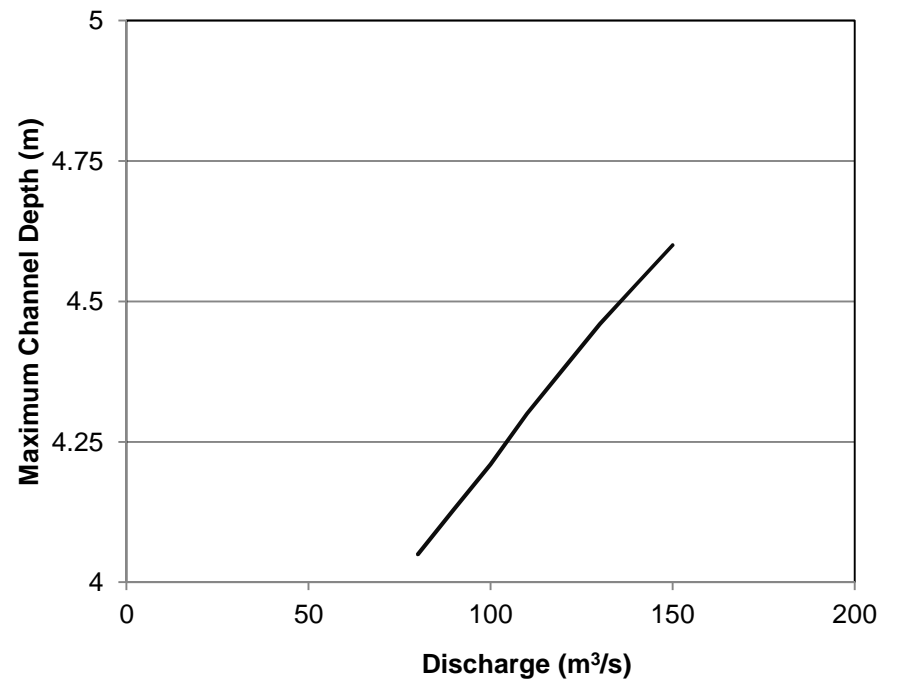
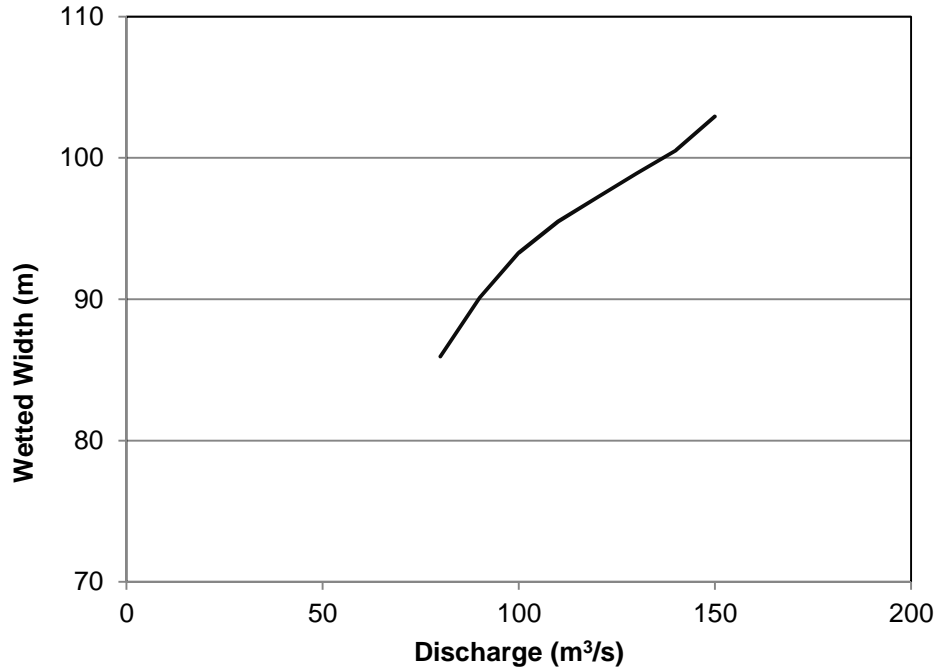
HEC-RAS TRANSECTS AT OUTLET OF KAMLOOPS LAKE

Knight Piésold
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FIGURE 3
REV 0

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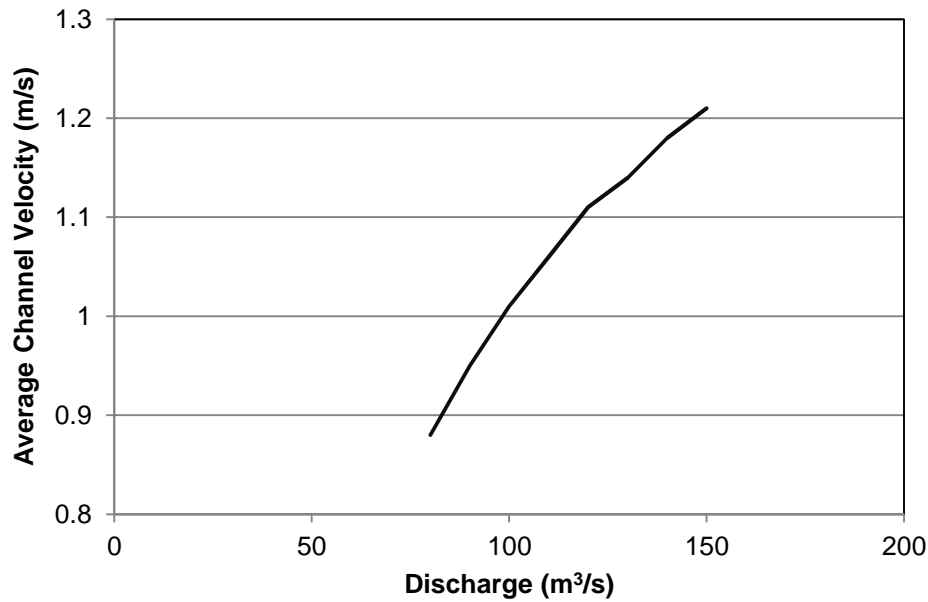
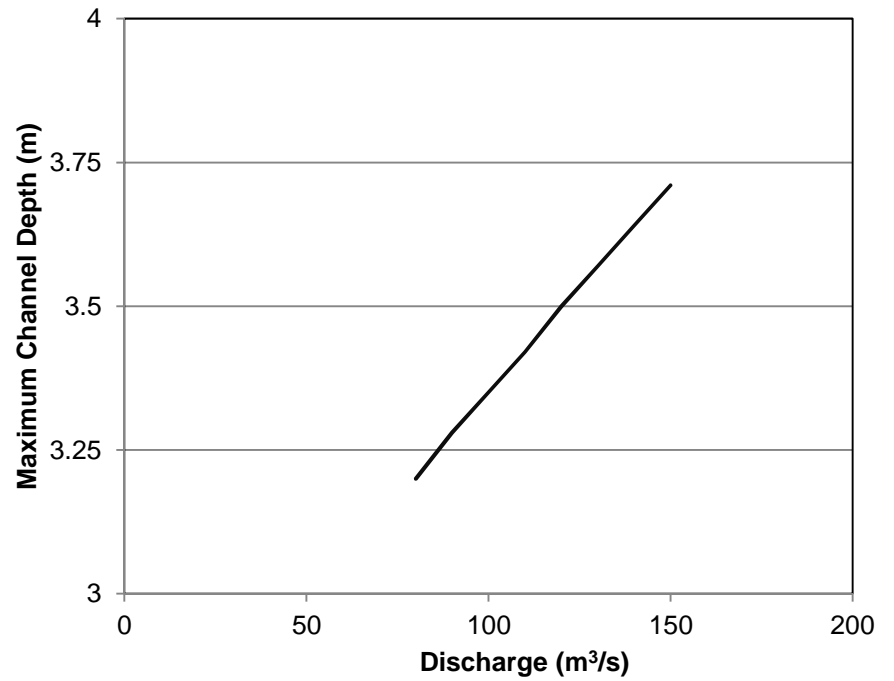
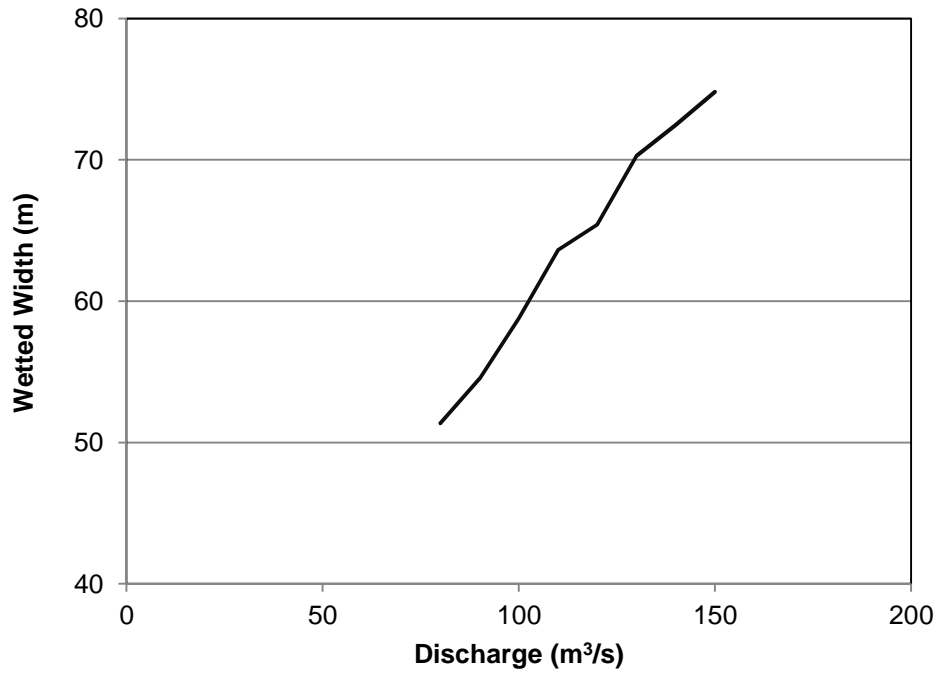
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NOTE:
1. RESULTS FROM HEC-RAS MODEL.

KGHM AJAX MINING INC.	
AJAX MINE	
THOMPSON RIVER HYDRAULIC GEOMETRY CROSS SECTION XS-3	
Knight Piésold CONSULTING	P/A NO. VA101-246/35
	REF. NO. VA15-02874
FIGURE 4	
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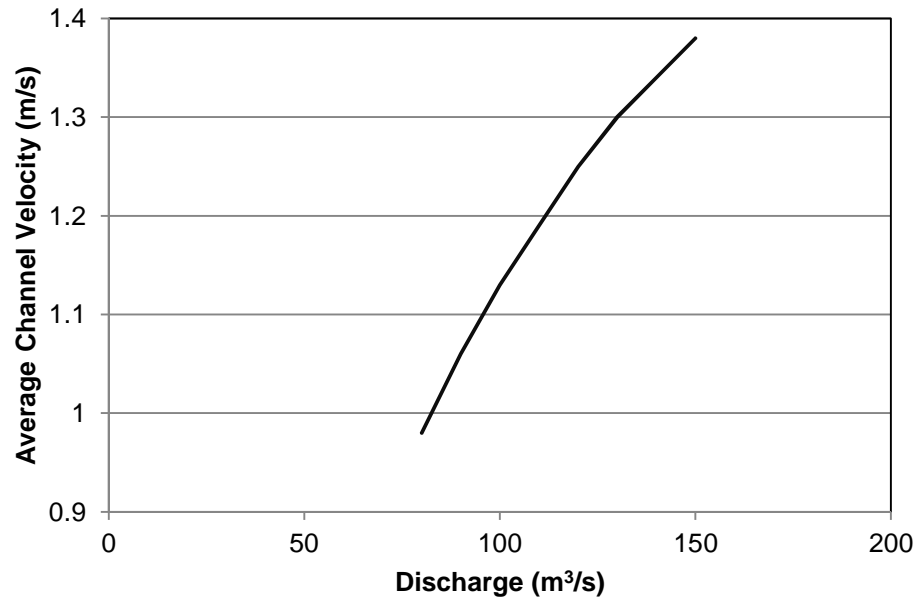
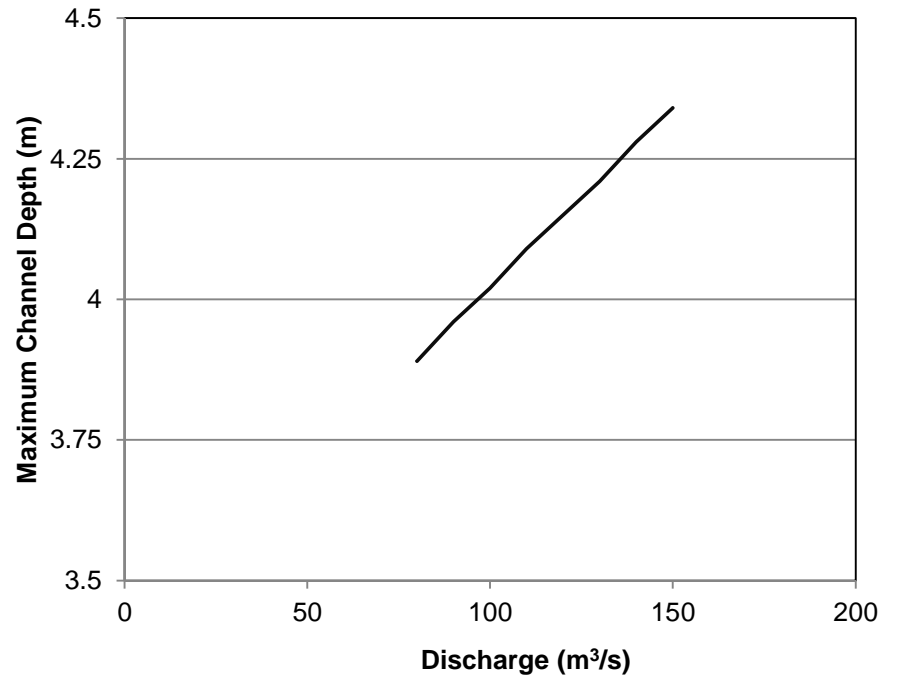
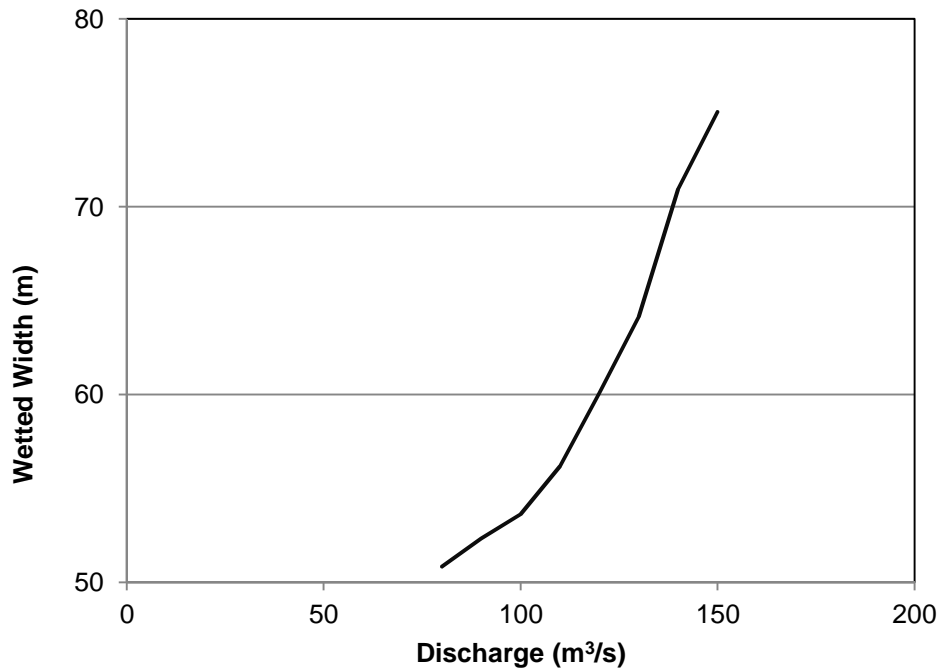
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NOTE:
1. RESULTS FROM HEC-RAS MODEL.

KGHM AJAX MINING INC.	
AJAX MINE	
THOMPSON RIVER HYDRAULIC GEOMETRY CROSS SECTION XS-8	
Knight Piésold CONSULTING	P/A NO. VA101-246/35
	REF. NO. VA15-02874
FIGURE 5	REV 0

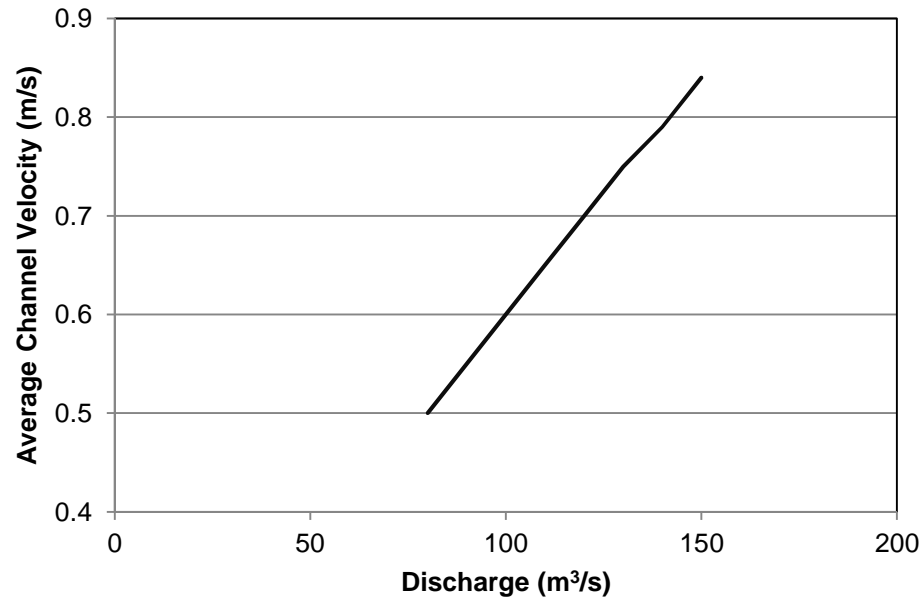
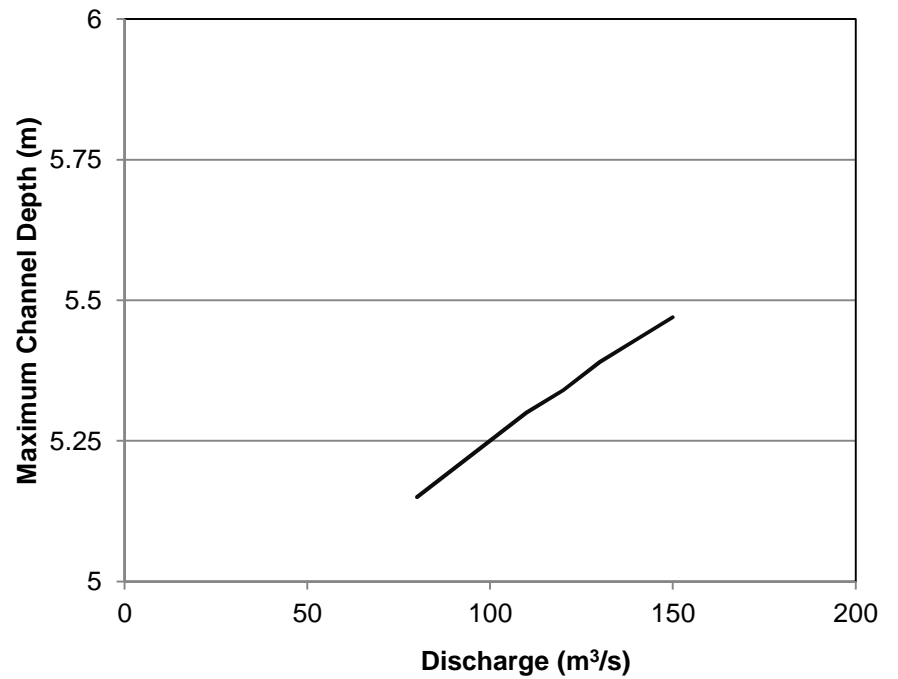
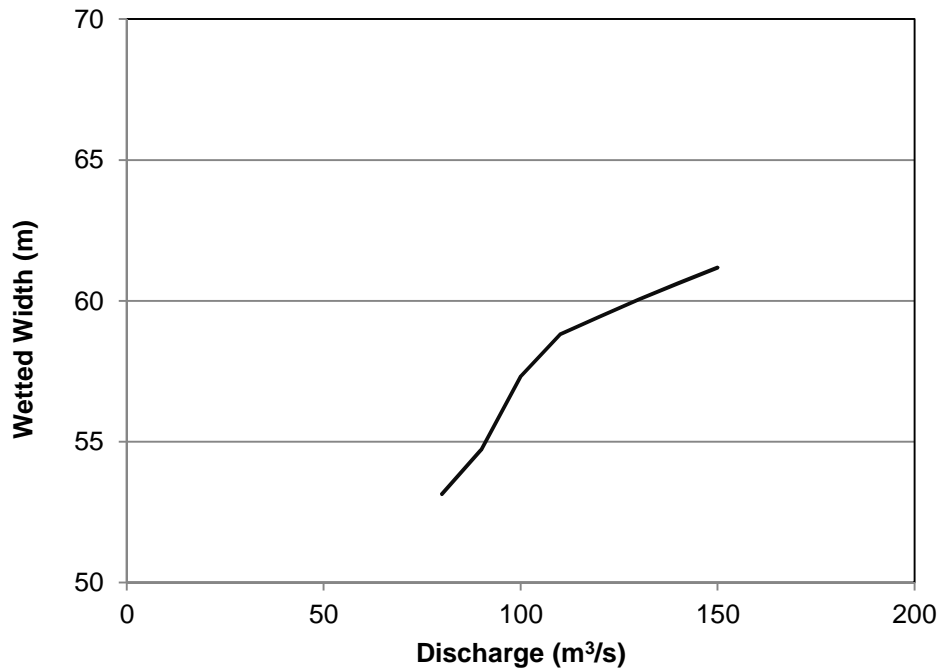
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NOTE:
1. RESULTS FROM HEC-RAS MODEL.

KGHM AJAX MINING INC.		
AJAX MINE		
THOMPSON RIVER HYDRAULIC GEOMETRY CROSS SECTION XS-9		
<i>Knight Piésold</i> CONSULTING	P/A NO. VA101-246/35	REF. NO. VA15-02874
	FIGURE 6	
		REV 0

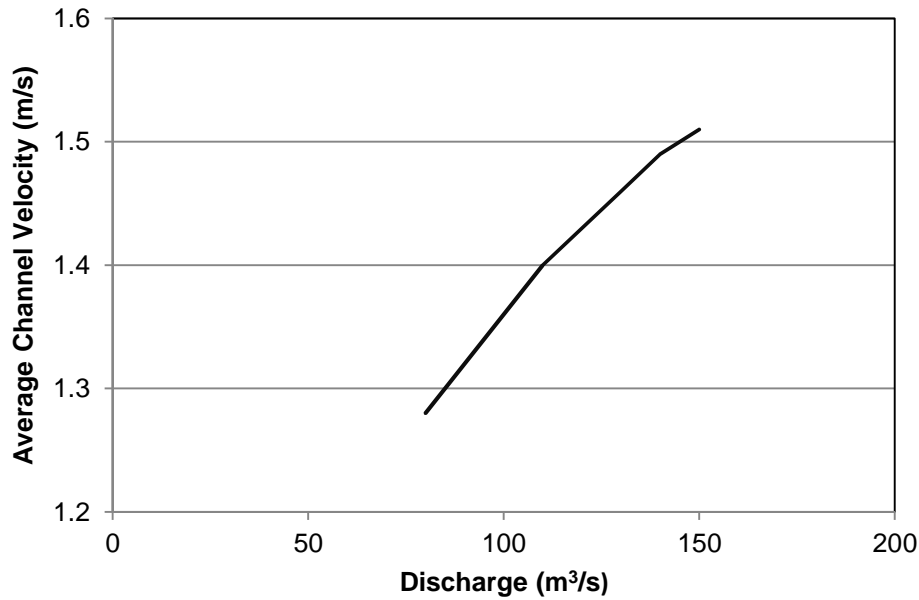
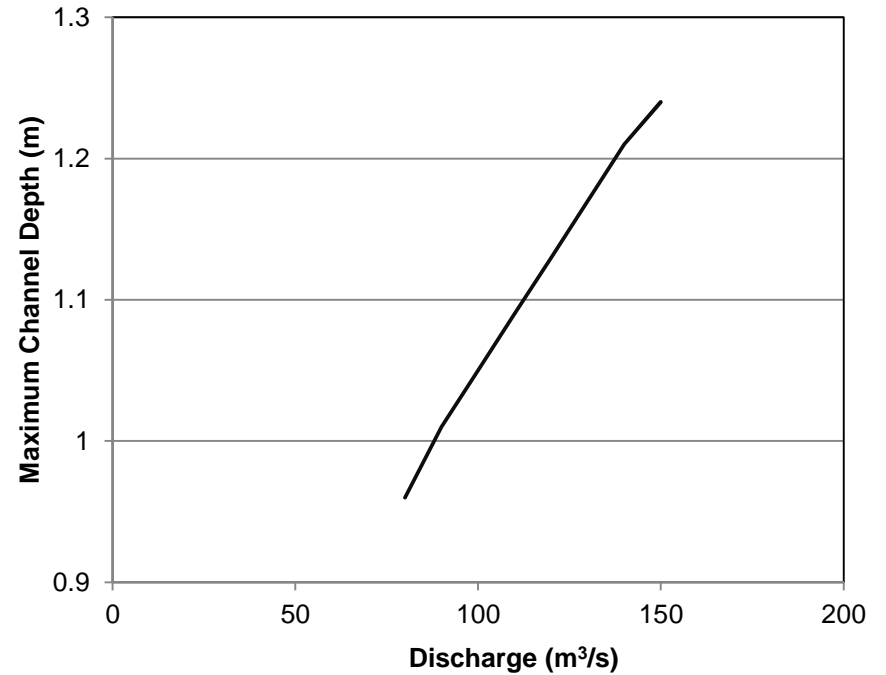
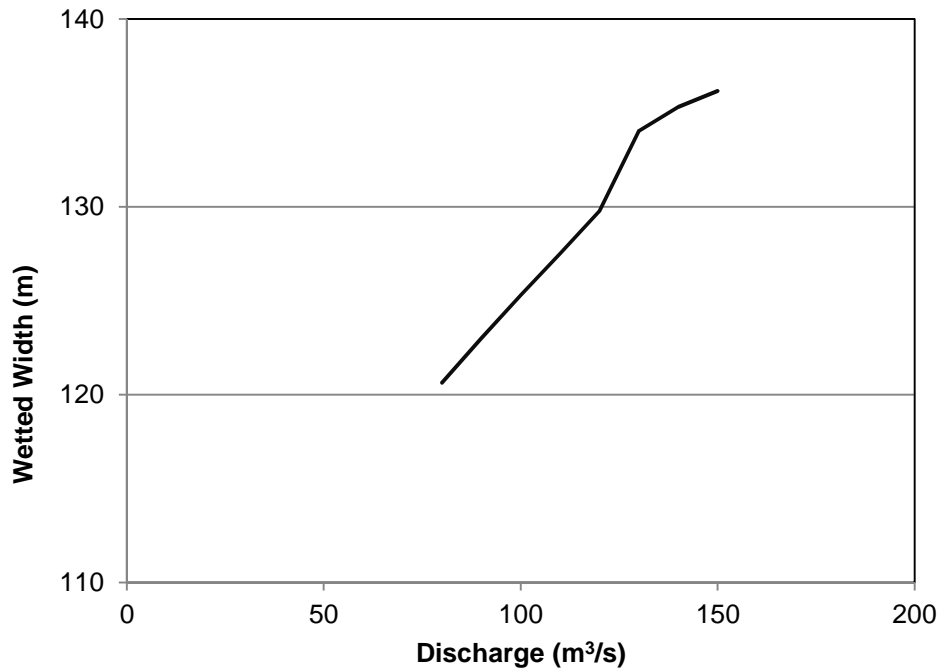
0	15JUL'15	ISSUED WITH MEMO	AMD	TJP
REV	DATE	DESCRIPTION	PREP'D	REVV'D



NOTE:
1. RESULTS FROM HEC-RAS MODEL.

KGHM AJAX MINING INC.		
AJAX MINE		
THOMPSON RIVER HYDRAULIC GEOMETRY CROSS SECTION XS-16		
<i>Knight Piésold</i> CONSULTING	P/A NO. VA101-246/35	REF. NO. VA15-02874
	FIGURE 7	
		REV 0

0	15JUL'15	ISSUED WITH MEMO	AMD	TJP
REV	DATE	DESCRIPTION	PREP'D	REVW'D



NOTE:
1. RESULTS FROM HEC-RAS MODEL.

KGHM AJAX MINING INC.		
AJAX MINE		
THOMPSON RIVER HYDRAULIC GEOMETRY CROSS SECTION XS-20		
<i>Knight Piésold</i> CONSULTING	P/A NO. VA101-246/35	REF. NO. VA15-02874
	FIGURE 8	
		REV 0

REV	DATE	DESCRIPTION	PREP'D	REVW'D
0	15JUL'15	ISSUED WITH MEMO	AMD	TJP

APPENDIX A

HEC-RAS CROSS SECTION PLOTS – 80 M³/S AND 150 M³/S WATER SURFACES

(Pages A-1 to A-3)

TABLE A1

**KGHM - AJAX MINING INC.
AJAX MINE**

CROSS SECTION IDENTIFICATION

Print: 05/03/2013 11:46

Report XS Label	HEC-RAS XS Label
XS-1	XS-1001
XS-2	XS-902
XS-3	XS-803
XS-4	XS-704
XS-5	XS-605
XS-6	XS-506
XS-7	XS-407
XS-8	XS-308
XS-9	XS-209
XS-9.1	XS-208.90
XS-10	XS-207.10
XS-10.1	XS-207.0101
XS-11	XS-206.11
XS-11.1	XS-205.1011
XS-12	XS-112
XS-13	XS-111.13
XS-14	XS-110.14
XS-15	XS-109.15
XS-16	XS-108.16
XS-17	XS-107.17
XS-18	XS-106.18
XS-19	XS-105.19
XS-20	XS-104.20
XS-21	XS-103.21
XS-22	XS-102.22
XS-23	XS-101.23
XS-24	XS-100.24
XS-25	XS-99.25

M:\1\01\00246\08\A\Correspondence\VA13-00493_

0	05MAR'13	ISSUED WITH MEMO VA13-00493	HS	TJP	KJB
REV	DATE	DESCRIPTION	PREPD	CHK'D	APP'D

