



TECHNICAL MEMORANDUM

DATE 19 April 2023

Reference No. 22524250-974-TM-Rev1

TO Colleen Prather
Agnico Eagle Mines Limited

CC

FROM Marvin Yang; Julien Lacrampe

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IMPACT ASSESSMENT OF THE DIVERSION OF SITE RUNOFF TO ITIVIA HARBOUR ON THE FLOW AND WATER REGIMES OF THE DIANA RIVER

1.0 INTRODUCTION

1.1 Background

Agnico Eagle Mines Limited (Agnico Eagle) owns and operates the Meliadine Gold Project (the Project) located in the A and B sub-watersheds of the Meliadine Lake watershed in Nunavut. Meliadine Lake drains through two outlets, including the Main Outlet which discharges to the Hudson Bay via the Meliadine River, and the West Outlet which discharges to the Hudson Bay via Peter Lake, Diana Lake, and Diana River.

The Main Outlet is the Meliadine Lake's primary outlet, draining most (i.e., 70% to 80%) of the lake's total annual outflow to the Meliadine River watershed. The West Outlet is the lake's secondary outlet, draining the remaining (i.e., 20% to 30%) annual outflow (AEE 1998a, 1998b, and 1999) to the Diana River watershed.

The flow regimes of the Diana River near its outlet at the Hudson Bay are characterized in the Project's Final Environmental Impact Statement (FEIS; Agnico Eagle 2014) based on hydrometric data available from i) the Water Survey of Canada Station 06NC001 from 1989 to 1995, and ii) monitored by AGRA Earth & Environmental at the same location from 1997 to 1999 (AEE 1998a, 1998b, and 1999).

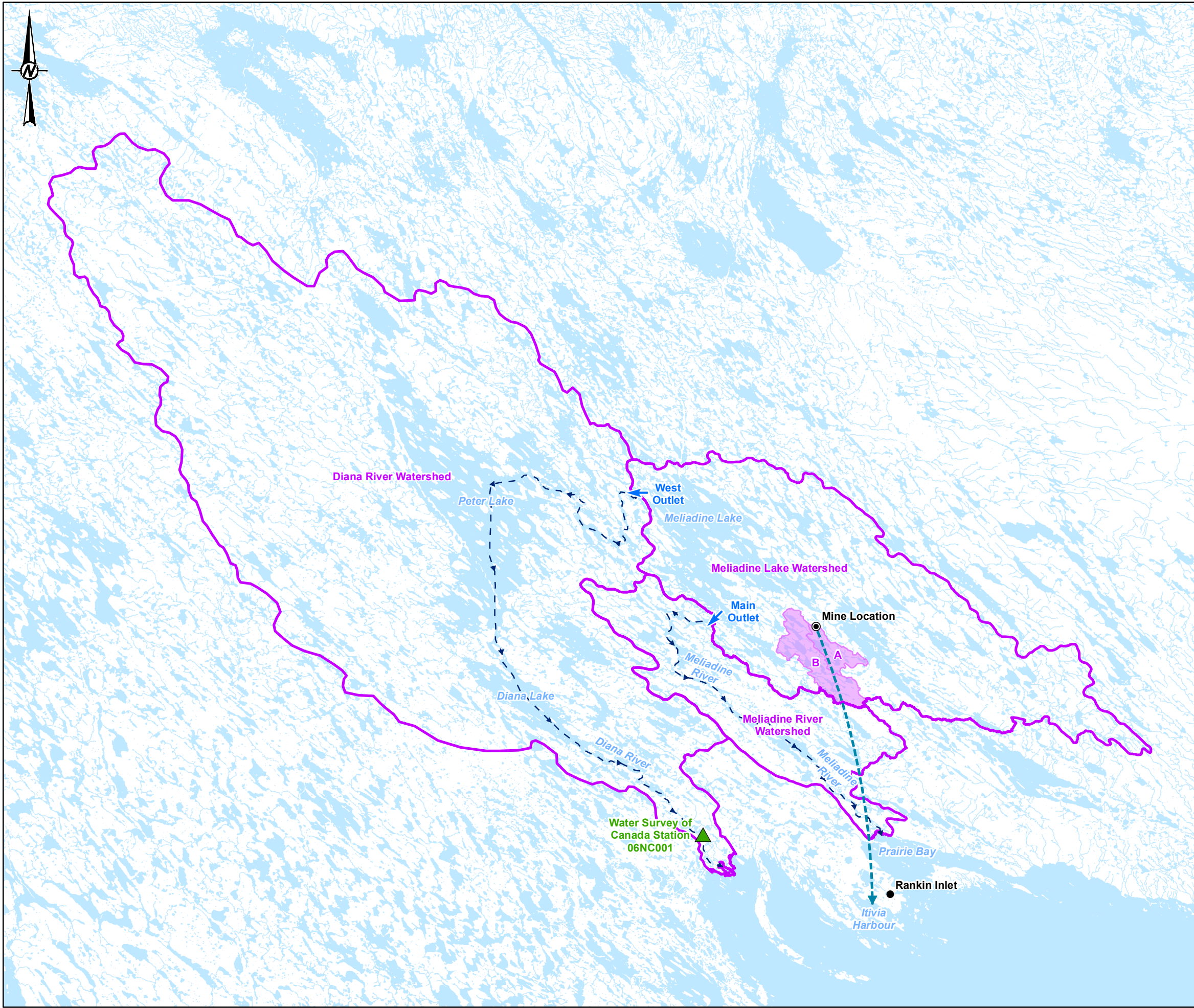
The Project location and general drainage patterns described above are shown in Figure 1. Additional baseline details can be found in the Project's FEIS (Agnico Eagle 2014).

1.2 Scope of Work

Agnico Eagle requested a semi-quantitative analysis from WSP Canada Inc. (WSP) to assess the potential impacts (at a high level) of diverting the Project site runoff away from Meliadine Lake to Itivia Harbour (Figure 1), on the flow and water level regimes of the Diana River.

This technical memorandum presents the methods and results of the impact assessment.

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LEGEND

- ▲ WATER SURVEY OF CANADA STATION
- ➡ CONCEPTUAL DIVERSION
- ➡➡ FLOW DIRECTION
- ➡ OUTLET
- DIVERTED WATERSHED BOUNDARY
- WATERSHED BOUNDARY
- WATERCOURSE
- WATERBODY

0 7 14
1:350,000 KILOMETRES

REFERENCE(S)

1. WATERBODIES AND WATERCOURSES OBTAINED FROM GEOGRATIS, © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
DATUM: NAD 83 PROJECTION: UTM ZONE 15

CLIENT

AGNICO EAGLE MINES LIMITED

AGNICO EAGLE

PROJECT
**MELIADINE GOLD MINE
NUNAVUT**

TITLE
PROJECT SETTING AND DIVERSION TO ITIVIA HARBOUR

	CONSULTANT	YYYY-MM-DD	2023-04-19
	DESIGNED	MY	
	PREPARED	CDB	
	REVIEWED	JL	
	APPROVED	JL	

PROJECT NO. 22524250	CONTROL 9000/9001	REV. 1	FIGURE 1
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2.0 METHODS

The assessment was completed as follows:

- Baseline flow and water level regimes of the Diana River were characterized based on hydrometric data available from i) the Water Survey of Canada Station 06NC001 from 1989 to 1995, and ii) monitored by AGRA Earth & Environmental at the same location from 1997 to 1999 (AEE 1998a, 1998b, and 1999).
- Meliadine Lake's Main Outlet is the primary outlet, draining an assumed 70% of the lake's total annual outflow. The West Outlet was assumed for the purpose of this assessment to drain the remaining (30%) of the annual outflow to the Diana River watershed.
- The Project's footprint was conservatively assumed for the purpose of this assessment to correspond to the entire A and B sub-watershed areas (i.e., 32 km² as documented in the Project's FEIS [Agnico Eagle 2014]). The actual Project area was documented as 2,201 ha (i.e., 22.0 km²) in the FEIS (Agnico Eagle 2014), and recently as 2,156 ha (i.e., 21.6 km²) in consideration of the Meliadine Extension (Agnico Eagle 2023).
- Impacted flow regimes of the Diana River were derived based on the baseline flow regimes characterized as described above, adjusted by the proportion of the Diana River watershed diverted to Itivia Harbour. In other words, the baseline flow regimes of the Diana River were reduced by 0.66% which corresponds to the diverted A and B sub-watershed area (i.e., 32 km²) multiplied by the proportion of Meliadine Lake draining to the Diana River watershed via the West Outlet (i.e., 30%), divided by the Diana River watershed area (i.e., 1,460 km² as reported by the Water Survey of Canada). This condition is referred to hereinafter as the "Model Scenario".
- Impacted water level regimes of the Diana River were derived based on the stage-discharge rating curve (i.e., water level and flow relationship) available from hydrometric data from the Water Survey of Canada and from AGRA Earth & Environmental study (AEE 1998a, 1998b, and 1999).
- The baseline and impacted results were compared to quantify the potential impacts of the Project on the flow and water level regimes of the Diana River.

3.0 RESULTS

3.1 Drainage Areas

The effective drainage of the Diana River is provided in Table 1 under baseline conditions, and the Model Scenario (i.e., diversion conditions). The Model Scenario (i.e., diversion conditions) results in a reduction of 0.66% in drainage area relative to baseline conditions.

Table 1: Effective Drainage Areas of the Diana River under Baseline Conditions and the Model Scenario (i.e., Diversion Conditions)

Effective Drainage Area	Baseline Conditions	Model Scenario (Diversion Conditions)
Total Area (km ²)	1,460	1,450

3.2 Flow and Water Level Regimes

The derived potential impacts from the diversion on the flow and water level of Diana River are summarized below in Table 2, Figure 1 and Figure 2. The derived impacts are summarized as follows:

- Discharges: changes in discharge regimes are expected to be proportional to the change in effective drainage area. Thus, a reduction in effective drainage area of 0.66% results in a reduction of 0.66% in discharge regimes, inclusive of mean monthly discharges, flood discharges, and low flows.
- Water Levels: the reduction in discharges is expected to correspond to a reduction in water level regimes of less than 1 cm for mean monthly, flood, and low water levels. Overall, these changes in water levels are negligible and not expected to be measurable.

Table 2: Changes in Flow and Water Level Regimes of Diana River from the Diversion (Average Flow Conditions)

Parameter	Peak Daily		Mean Monthly				
	2-Year	100-Year	June	July	August	September	October
Discharge (%)	-0.66	-0.66	-0.66	-0.66	-0.66	-0.66	-0.66
Water Level (m)	< -0.01	< -0.01	< -0.01	< -0.01	< -0.01	< -0.01	< -0.01

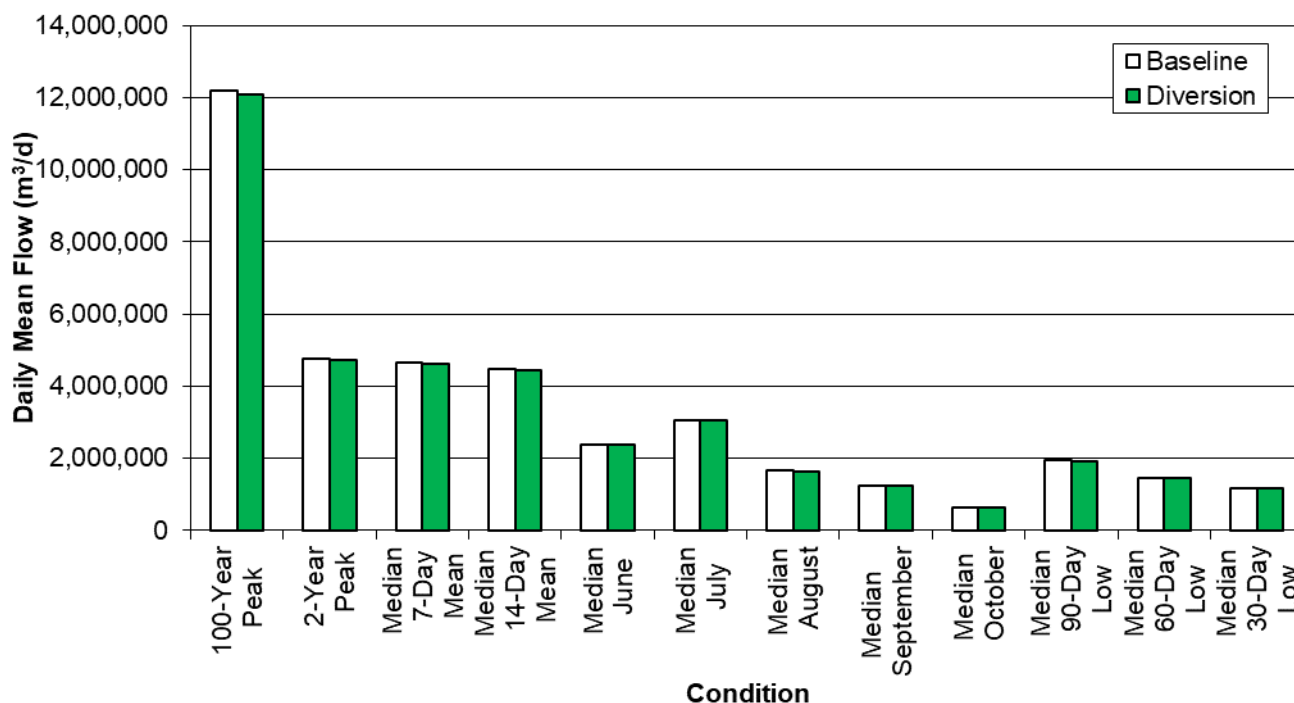


Figure 1: Derived Flow Regimes at Diana River during Baseline Conditions and the Model Scenario

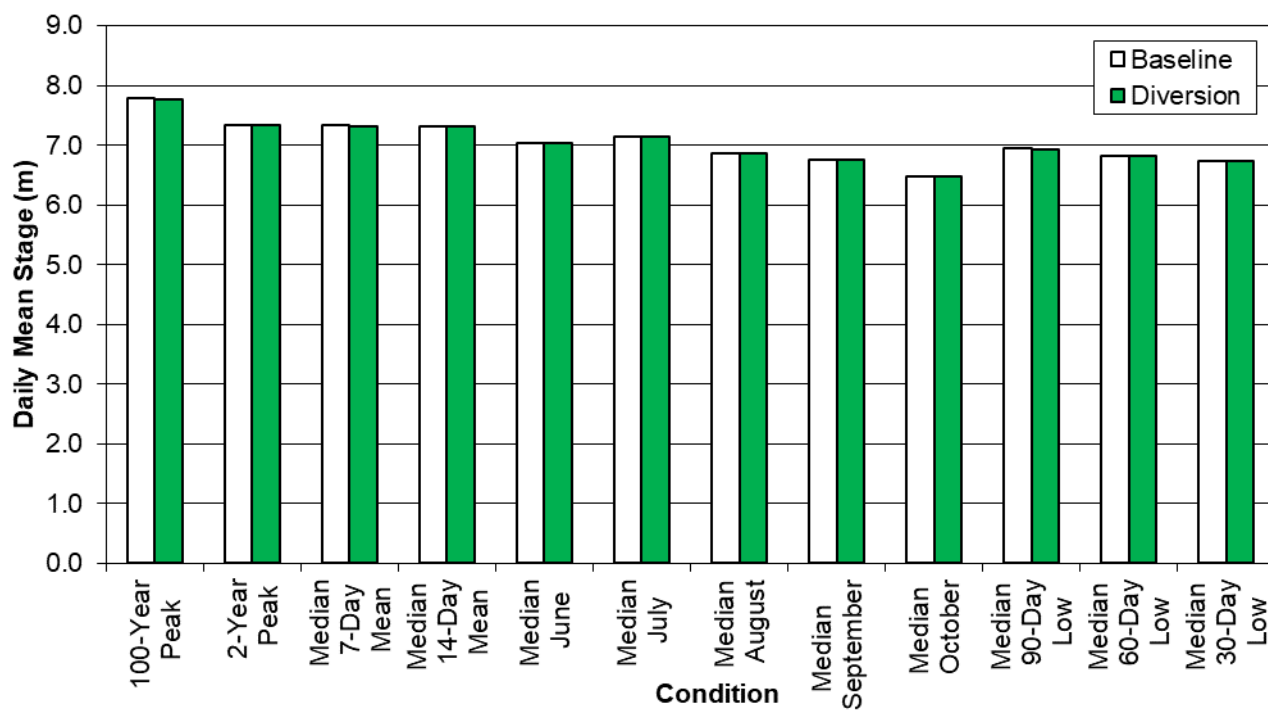


Figure 2: Derived Water Level Regimes at Diana River during Baseline Conditions and the Model Scenario

4.0 CONCLUSIONS AND CLOSURE

This technical memorandum presents the methods and results of the potential impacts of diverting the Project Site runoff from Meliadine Lake to Itivia Harbour, on the flow and water level regimes of the Diana River. The assessment was completed using conservative assumptions and concluded that the diversion will result in a small reduction in overall discharges (inclusive of mean monthly discharges, flood discharges, and low flows), and negligible effects on the levels of Diana River which are not expected to be measurable.

This technical memorandum was prepared and reviewed for Agnico Eagle by the undersigned. Please contact the undersigned with any questions or concerns about this memorandum.

WSP Canada Inc.

ORIGINALLY SIGNED AND SEALED

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Water Resources Specialist

ORIGINALLY SIGNED AND SEALED

Julien Lacrampe, P.Eng.
Principal Water Resources Engineer

References

- Agnico Eagle Mines Ltd. (Agnico Eagle). Final Environmental Impact Statement (FEIS) – Meliadine Gold Project. April 2014.
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