AGNICO EAGLE

Memorandum

To: Sara Savoie

From: Jennifer Pyliuk, M.Eng., P.Eng. **Contact information:**

CC: Jessica Huza; Terry Ternes

Date: April 13, 2020

Subject: STP Waste Placement in WRSFs

1. Background

Currently, excess solid waste from the Meliadine Sewage Treatment Plant (STP) is being placed in a decantation facility within the footprint of the Tailings Storage Facility (TSF). However, due to numerous considerations including design constraints and health and safety concerns at the TSF, it has been strongly suggested to move placement of STP waste to within the waste rock storage facilities (WRSFs). This memorandum has been prepared to address potential stability concerns with this plan raised by the Nunavut Water Board (NWB).

2. Summary of Recent Changes to STP Operation and Expected Waste Quantities

In 2019, AEM Meliadine purchased a Sludge Dewatering System (SDS) to dewater the sludge produced by the STP. This system produces a "cake" of coagulated solids at an approximate moisture content of 16%, while water collected from the dewatering process is re-used in the STP. Commissioning of the system was completed in Q1 2020. As per representatives of AEM's Energy and Infrastructure Department, the following volumes of STP waste material are expected:

- Between 0.35 and 0.38 m3/day of sludge cake, or an annual volume of 146 m3/year (assuming 0.40 m3/day production); and
- Approximately 100 m3/year sludge liquid (produced during planned/unplanned maintenance of the dewatering system.

Additional details of the (SDS) can be located in the Meliadine STP Maintenance and Operation Manual Version 3 Draft (Agnico Eagle, 2020).

3. Summary of WRSF Design Basis and Expected Waste Quantities

All three (3) waste rock storage facilities (WRSFs) to be operated at the Meliadine Mine over the 8-year LOM were designed to accommodate the co-disposal of overburden and waste rock facilities. In other words, each facility will consist of a core of overburden encapsulated with waste rock. Mine waste material from the underground and open pits will be hauled to each facility, end-dumped, then spread into lifts with a bulldozer (2.5 m to 5.0 m high maximum lift for overburden and 5.0 m high maximum lift for waste rock). Detailed design of WRSF1 and WRSF3 has been completed, with these design reports and drawings having been approved by the NWB in November 2019 and March 2020 respectively. The detailed design of WRSF2, to be completed in 2021, will incorporate a similar design basis. Thermal analysis predicts that with the exception of an active layer that will develop at the top of each WRSF, the placed mine waste will freeze-back and remain frozen over the long term.

The expected quantities of mine waste materials to be placed in each WRSF by year is provided in the following table:

Table 1: Expected Yearly Distribution of Mine Waste in WRSFs (V11_3)

Year	WRSF1		WRSF2		WRSF3	
	Overburden	Waste Rock	Overburden	Waste Rock	Overburden	Waste Rock
2019	197,420	--	--	--	--	--
2020	147,042	129,936	--	--	342,548	1,474,604
2021	1,209,361	--	--	--	--	793,998
2022	531,840	1,396,398	483,073	--	--	122,357
2023	--	1,019,198	1,246,941	--	--	--
2024	--	932,597	56,950	2,120,825	--	21,189
2025	--	--	--	--	--	1,971,458
Total	**2,085,664**	**3,478,130**	**1,786,964**	**2,120,825**	**342,548**	**4,383,606**

4. Potential Impact of STP Waste on WRSF Stability

The addition of STP waste to the mine waste placed in the WRSFs is not expected to have an impact on the stability of the facilities.

Compared to the overall volumes of mine waste, the expected volumes of STP waste are insignificant. If all expected cake and liquid STP waste generated over a 9-year period (146 m3/year + 100 m3/year * 9 years = 2,214 m3) was placed in just one of the WRSFs, the additional volume would represent less than 1% of the total overburden volumes (0.11% WRSF1 overburden to 0.7% WRSF3 overburden) and less than 0.06% of the total waste volumes (0.03% WRSF1 to 0.06% WRSF2). It is expected that STP waste will only be placed in areas of active overburden and/or waste placement at the WRSFs, so that distribution of the material will be spread throughout the three facilities, thereby lowering the above anticipated percentages.

In addition to the very low expected quantities of STP waste, the following strategies should be employed to further reduce the potential of instabilities:

- STP waste placement should occur only within the core of the facilities;
- Placement of STP waste should only occur during active placement of mine waste material so that STP waste will immediately be encapsulated within the lifts of the mine waste;
- STP waste should be placed within the WRSFs on an as needed basis to avoid concentrated placement in any one location; and
- All volumes of STP cake and liquid waste placed within the WRSFs should be carefully maintained, tracked and reviewed regularly to ensure that the predicted volumes are not exceeding the actual volumes. If possible, Operational survey personnel should be alerted to when STP waste is to be placed within the WRSFs to provide the approximate elevation and coordinates of the dump location for additional tracking. This survey information should be added to the as-built information for each facility.

I trust the above information is sufficient for your requirements. Please do not hesitate to contact me if you have any questions or comments.

Respectfully,

Jennifer Pyliuk

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