



AGNICO EAGLE

Meliadine Division

Potential Impacts and Mitigations from a Saline Discharge into Marine Environment

**DECEMBER 2017
VERSION 1**

Table 1: Potential Impacts and Mitigations

Project Activity	Potentially Impacted Valued Components	Effects Pathways	Environmental Design Features and Mitigation
Marine Environment			
Installation and presence of discharge pipe	Benthic Invertebrates	Change in health and survivorship of marine benthic invertebrates due to in-water works and presence of pipe.	Placement of pipe will avoid sensitive natural habitats.
	Marine Fish and Fish Habitat	Change in fish habitat quality due to in-water works and presence of pipe.	<p>Placement of pipe will avoid sensitive natural habitats.</p> <p>Construction and installation of the discharge pipe will adhere to DFO guidance practices of “Measures to Avoid Causing Harm to Fish and Fish Habitat.”^(a)</p> <p>Best management practices for erosion and sedimentation control will be used to control sediment releases during construction and installation of the discharge pipe and associated structures (e.g., silt curtains, runoff management).</p> <p>Discharge pipe placement and installation will follow DFO’s Hierarchy of Measures for Fisheries Protection.</p>
	Marine Fish and Fish Habitat	Change in health and survivorship of marine fish due to in-water works and presence of pipe.	<p>Discharge pipe placement and installation will follow DFO’s Hierarchy of Measures for Fisheries Protection.</p> <p>Placement of pipe will avoid sensitive natural habitats.</p> <p>Construction and installation of the discharge pipe will adhere to DFO guidance practices of “Measures to Avoid Causing Harm to Fish and Fish Habitat.”</p> <p>Best management practices for erosion and sedimentation control will be used to control sediment releases during construction and installation of the discharge pipe and associated structures (e.g., silt curtains, runoff management).</p> <p>Depending on timing and construction methods, the footprint area may be isolated with silt curtains and a fish-out program in the area of the discharge pipe will be conducted to remove and isolate fish prior to installation. The fish-out programs will be designed and implemented in consultation with DFO and local Inuit communities, and will follow Tyson et al. (2011).</p>

Project Activity	Potentially Impacted Valued Components	Effects Pathways	Environmental Design Features and Mitigation
	Marine birds and marine mammals	Change in marine habitat quality due to in-water works and presence of pipe.	Placement of pipe will avoid sensitive natural habitats. Best management practices for erosion and sedimentation control will be used to control sediment releases during construction and installation of the discharge pipe and associated structures (e.g., silt curtains, runoff management).
	Marine birds	Sensory disturbance from structural lighting may result in changes in health and mortality risk in marine birds due to collisions with infrastructure.	Where feasible, lights on infrastructure will be shielded and/or angled to minimize direct illumination and reflection of the sea surface. Activities will be scheduled during daylight hours whenever practical to minimize the need for staging lights. Work will occur during summer when daylight is extended, minimizing the need for site lighting.
	Marine birds	Sensory disturbance from structural lighting and in-air noise from nearshore human activities may alter marine bird behavior.	Where feasible, lights on infrastructure will be shielded and/or angled to minimize direct illumination and reflection of the sea surface. Activities will be scheduled during daylight hours whenever practical to minimize the need for staging lights. Work will occur during summer when daylight is extended, minimizing the need for site lighting.
	Sediment quality and water quality	Disturbance material from in-water construction will impact both sediment and water quality	Short in-water construction period (i.e., a few days). Installation of a diffuser to encourage mixing.
Discharging brine into marine environment	Marine fish and Fish Habitat	Change in fish habitat quality due to discharge of groundwater from the Meliadine Mine.	Discharge of effluent will meet regulatory requirements for both temperature and water quality guidelines, including Metal Mining Effluent Regulations, Canadian Council of Ministers of the Environment and/or Site Specific Water Quality Objectives. If the saline water is not suitable for discharge, it will be stored at the Meliadine Mine and treated prior to discharge. Design, construct, and install a diffuser with the discharge pipe to aid in mixing. Monitoring program will be established and adaptive management implemented if negative impacts are detected.

Project Activity	Potentially Impacted Valued Components	Effects Pathways	Environmental Design Features and Mitigation
	Marine Fish and Fish Habitat	Change in health and survivorship due to the water quality of the saline discharge	<p>Discharge of effluent will meet regulatory requirements for both temperature and water quality guidelines, including Metal Mining Effluent Regulations, Canadian Council of Ministers of the Environment and/or Site Specific Water Quality Objectives.</p> <p>Toxicity testing will be completed on the saline discharge to confirm it is acceptable for release and non-acutely toxic.</p> <p>If the saline water is not suitable for discharge, it will be stored at the Meliadine Mine and treated prior to discharge.</p> <p>Design, construct, and install a diffuser with the discharge pipe to aid in mixing.</p> <p>Monitoring program will be established and adaptive management implemented if negative impacts are detected.</p>
	Benthic Invertebrates	Change in habitat quality due to the water quality of the saline discharge	<p>Discharge of effluent will meet regulatory requirements for both temperature and water quality guidelines, including Metal Mining Effluent Regulations, Canadian Council of Ministers of the Environment and/or Site Specific Water Quality Objectives.</p> <p>If the saline water is not suitable for discharge, it will be stored at the Meliadine Mine and treated prior to discharge.</p> <p>Design, construct, and install a diffuser with the discharge pipe to aid in mixing.</p> <p>Monitoring program will be established</p>
	Benthic Invertebrates	Change in health and survivorship due to the water quality of the saline discharge	<p>Discharge of effluent will meet regulatory requirements for both temperature and water quality guidelines, including Metal Mining Effluent Regulations, Canadian Council of Ministers of the Environment and/or Site Specific Water Quality Objectives.</p> <p>Toxicity testing will be completed on the saline discharge to confirm it is acceptable for release and non-acutely toxic.</p> <p>If the saline water is not suitable for discharge, it will be stored at the Meliadine Mine and treated prior to discharge.</p>

Project Activity	Potentially Impacted Valued Components	Effects Pathways	Environmental Design Features and Mitigation
	Marine Birds and Marine Mammals	Change in habitat quality the water quality of the saline discharge	<p>Discharge of effluent will meet regulatory requirements for both temperature and water quality guidelines, including Metal Mining Effluent Regulations, Canadian Council of Ministers of the Environment and/or Site Specific Water Quality Objectives.</p> <p>If the saline water is not suitable for discharge, it will be stored at the Meliadine Mine and treated prior to discharge.</p> <p>Design, construct, and install a diffuser with the discharge pipe to aid in mixing.</p> <p>Monitoring program will be established and adaptive management implemented if negative impacts are detected.</p>
	Marine Birds and Marine Mammals	Change in health and survivorship due to the water quality of the saline discharge	<p>Discharge of effluent will meet regulatory requirements for both temperature and water quality guidelines, including Metal Mining Effluent Regulations, Canadian Council of Ministers of the Environment and/or Site Specific Water Quality Objectives.</p> <p>If the saline water is not suitable for discharge, it will be stored at the Meliadine Mine and treated prior to discharge.</p> <p>Design, construct, and install a diffuser with the discharge pipe to aid in mixing.</p> <p>Monitoring program will be established and adaptive management implemented if negative impacts are detected.</p>
	Benthic Invertebrates Marine Fish and Fish Habitat Marine birds and Marine Mammals	Accidental release of brine from an unknown location along the discharge pipe can have direct adverse effects on marine water quality and associated indirect effects on marine wildlife.	<p>Implementation of secondary containment for the heated tank within the Itivia Fuel Storage Facility.</p> <p>Implementation of a Risk Management and Emergency Response Plan (Version 4; April 2015) specific to the potential release of brine.</p> <p>Operational activities will be engineered to use handling systems to minimize the risk of accidental spills into the marine environment.</p>
	Benthic Invertebrates Marine Fish and Fish Habitat Marine birds and Marine Mammals	Reduction in sea ice thickness and or timing of seasonal freeze-up could impact habitat quality.	<p>Discharge water a temperature as close to the natural discharge as practicable.</p> <p>Discharge in the summer months only.</p>

Project Activity	Potentially Impacted Valued Components	Effects Pathways	Environmental Design Features and Mitigation
Terrestrial Environment			
Trucking of brine to discharge location	Vegetation and Wildlife	Air emissions and dust deposition can cause changes to chemical properties of vegetation, affecting wildlife habitat	Dust will be actively suppressed from roads (water and/or other dust suppressants). Potential use of chemical dust suppressants in accordance with the Environmental Guidance for Dust Suppression published by the Government of Nunavut Department of Environment.
		Dust deposition may cover vegetation and lead to physical and/or physiological damage to plants, affecting wildlife habitat	Enforcing speed limits will assist in reducing dust. Road surfaces will be maintained through grading and the addition of granular material. Equipment and vehicles will comply with relevant non-road emission criteria at that time of purchase. Regular maintenance of equipment and vehicles to meet emission standards. Adherence to the Roads Management Plan (Version 5, 6513-MPS-05; March 2017) and the Dust Management Plan (Version 3, Appendix C to Roads Management Plan, March 2017)
		Spills or accidental release of brine from trucks along the trucking route can affect vegetation and wildlife	Adherence to Spill Contingency Plan (Version 6, 6513-MPS-05; March 2017). Adherence to Risk Management and Emergency Response Plan (Version 4, 6513-RMM-01; April 2015). Ready access to an emergency spill clean-up kit for cleaning-up any spills. Hazardous materials and fuel will be stored according to regulatory requirements to protect the environment and workers (i.e., Hazardous Materials Management Plan [Version 4, 6513-MPS-12; April 2015]). Trucking equipment will be regularly maintained.

Project Activity	Potentially Impacted Valued Components	Effects Pathways	Environmental Design Features and Mitigation
Trucking of brine to discharge location (continued)	Wildlife	Collision with vehicles causing injury or mortality to individual animals, which can affect population sizes	<p>Adherence to Caribou Migration Procedure (Terrestrial Environment Management and Monitoring Plan [SD 6-4, April 2014]).</p> <p>Follow mitigation and monitoring as outlined in the Wildlife Protection and Response Plan (Appendix III to the Terrestrial Environment Management and Monitoring Plan).</p> <p>Caribou Specific mitigation: Increased awareness for traffic management during post-calving caribou movements in late June through mid-July.</p> <p>Road surveillance monitoring to determine when caribou are near including height of land surveys.</p> <p>Site roads have been designed and constructed to use finer material size that facilitate caribou crossing (i.e., coarse boulders are not used).</p> <p>Minimize outside workforce when caribou herds (i.e., >50 animals) move through the Project.</p> <p>Blasting activities will not occur when caribou herds (i.e., >50 animals) are known to be within 5 km of the Project.</p> <p>Maximum speed limit on all site roads is 50 km/h and will be reduced to a maximum of 30 km/h when caribou or other wildlife are known to be on-site.</p> <p>To reduce sensory disturbance and the possibility of vehicle collisions, traffic will cease if caribou are within 100 m of a road.</p> <p>Adhere to triggers and thresholds for operations for caribou monitoring and mitigation developed for the all-weather access road (Attachment A).</p>
Building of discharge facility including: <ul style="list-style-type: none"> • Construction of heated tank • Installation of discharge pipe 	Vegetation	Physical loss or alteration of vegetation from construction of the access road, discharge pipe and heated tank.	<p>Tank arrangement is designed to be compact and reduce the overall Project footprint and within the Itivia Fuel Storage Facility laydown area.</p> <p>Use existing roads.</p> <p>Minimize footprint of laydown area for discharge pipe and diffuser installation.</p>

Project Activity	Potentially Impacted Valued Components	Effects Pathways	Environmental Design Features and Mitigation
Heritage Record			
Trucking of brine to discharge location	Heritage Record	Activities such as regarding embankments, shoulder stabilization or new borrow sources if required; and accidents or malfunction	<p>Complete heritage assessment for the Project footprint.</p> <p>Provide awareness training and a manual for recognizing heritage resources to all staff and contractors.</p> <p>Avoid previously recorded heritage resource sites.</p> <p>Complete additional heritage assessment for any changes to the Project footprint in areas considered to have moderate to high potential to contain heritage resources.</p> <p>Complete more in-depth mitigation strategies if an avoidance mitigation strategy cannot be implemented.</p> <p>Monitor condition of known heritage resource sites near the Project footprint.</p>
Building of discharge facility	Heritage Record	Construction activity leading to ground alteration that affects physical heritage resources	<p>The heated tank will be within the Itivia Fuel Storage Facility laydown area.</p> <p>Provide awareness training and a manual for recognizing heritage resources to all staff and contractors.</p> <p>Avoid previously recorded heritage resource sites.</p> <p>Complete additional heritage assessment for any changes to the Project footprint in areas considered to have moderate to high potential to contain heritage resources.</p> <p>Complete more in-depth mitigation strategies if an avoidance mitigation strategy cannot be implemented.</p> <p>Monitor condition of known heritage resource sites near the Project footprint.</p>

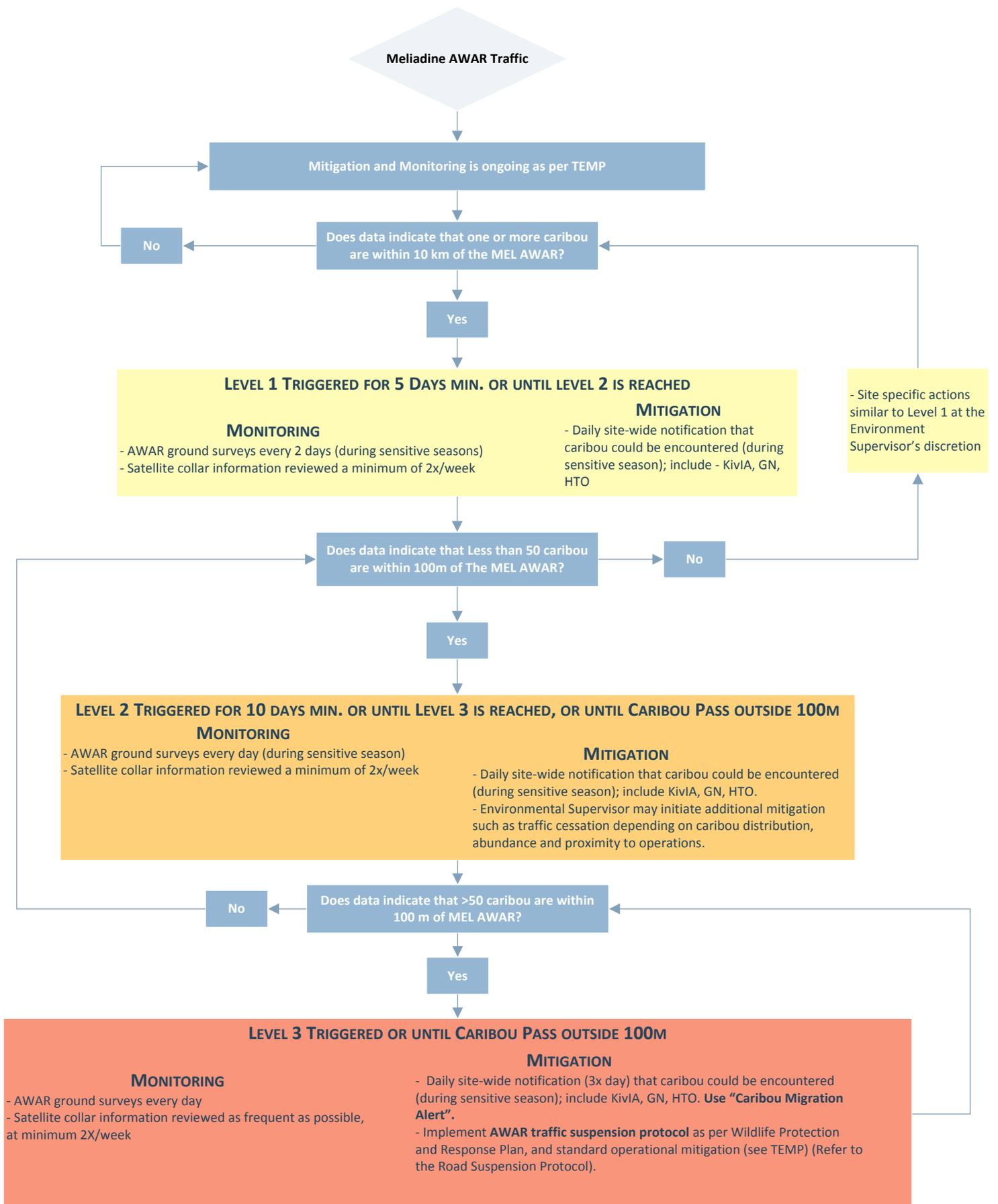
Project Activity	Potentially Impacted Valued Components	Effects Pathways	Environmental Design Features and Mitigation
Installation of discharge pipe	Heritage Record	Construction activity leading to ground alteration that affects physical heritage resources	<p>Complete heritage assessment for the Project footprint.</p> <p>Provide awareness training and a manual for recognizing heritage resources to all staff and contractors.</p> <p>Avoid previously recorded heritage resource sites.</p> <p>Complete additional heritage assessment for any changes to the Project footprint in areas considered to have moderate to high potential to contain heritage resources.</p> <p>Complete more in-depth mitigation strategies if an avoidance mitigation strategy cannot be implemented.</p> <p>Monitor condition of known heritage resource sites near the Project footprint.</p>
Socio-economics			
Discharging brine into marine environment	Employment	Diffusor and pipe construction could result in the use of local contractor and community members. Note the diffusor construction season short.	<p>Hire local labour to support with diffusor installation.</p> <p>Provide training applicable to diffusor installation.</p>
		Potential impacts to traditional use if the diffusor impacts marine wildlife and fish	<p>Monitor impacts to marine biota using local labour, where possible.</p> <p>Discharge of effluent will meet regulatory requirements for both temperature and water quality guidelines.</p> <p>Consult with communities on potential impacts.</p> <p>Communicate results of monitoring to communities and local users.</p>
		Potential perception issues that the water and fish are no longer safe for traditional use	<p>Monitor impacts to marine biota using local labour, where possible.</p> <p>Discharge of effluent will meet regulatory requirements for both temperature and water quality guidelines.</p> <p>Consult with communities on potential impacts.</p> <p>Communicate results of monitoring to communities and local users.</p>

Project Activity	Potentially Impacted Valued Components	Effects Pathways	Environmental Design Features and Mitigation
Discharging brine into marine environment	Traditional use	Location of the diffuser could impact traditional land use during the summer months. The diffuser is not expected to be operational in the winter months in ice- conditions.	<p>Place diffuser deep enough to avoid impacting travel in summer months.</p> <p>Discharge in summer season only to minimize likelihood of thinning ice, impacting traditional travel routes over the ice.</p> <p>Confirm with local communities and traditional land users that the location of the diffuser and discharge does not interfere with the traditional land use.</p> <p>Information provided in Nunami-Stantec 2010 will be taken into consideration for design and operation of the discharge (attached to Nunavut Planning Commission application as a supporting document)</p>
Trucking of brine to discharge location	Employment	Seasonal employment for local Inuit as water truck drivers.	Hire seasonal local labour to truck water.

(a) Government of Canada. 2016. Fisheries and Oceans Canada, Measures to Avoid Causing Harm to Fish and Fish Habitat including Aquatic Species at Risk. Date modified: 18 November 2016. Accessible at: <http://www.dfo-mpo.gc.ca/pnw-ppe/measures-mesures/measures-mesures-eng.html>

ATTACHMENT A

Meliadine Caribou Thresholds - AWAR



Notes: 1) Data are provided from ground surveys, observations from workers, Environmental monitoring or collaring data.
 2) Sensitive seasons = Migration Period of late June to July (until observation confirmed that migration is completed, at the discretion of Env. Coordinator).
 3) Level 1 and 2 site wide notification will be sent by email during sensitive season. The email will mention the level of migration and mention that caribou could be encountered. Level 3 site wide notification will follow the “Caribou Migration Alert” format.