HESL Review of Madrid Advanced Exploration Program, Hope Bay Belt, Kitikmeot Region					
Authorities	**TC #**	**Reference to Comments. All comments are based on "Type B Water Licence Application Supplemental Information Report" unless otherwise noted.**	**Subject**	**Issue / Concern or Information Deficiency and Rationale:**	**Technical Comment/ Information Request:**
KitIA	1	Section 4.0, Page 4-2	Use of Doris North Mill to Process Bulk Samples	Approximately 800 tonnes of ore/day will be generated from each of Madrid South and Madrid North which will be milled and processed at Doris North. The TIA is not yet completed and the Supplemental Report states that "There are plans to construct a dam at the south end of Tail Lake (South Dam) to increase the capacity of the impoundment area to meet the needs for the Doris North Project. Once fully constructed, the TIA will have the capacity to process the ore from the currently permitted Doris North Project mine and process the bulk sample ore from the Madrid Advanced Exploration Program."	Please discuss how the increased milling needs will affect the required water for the Doris North Mill operating under the Hope Bay Phase 1 Water License. Please confirm that the TIA will be expanded to meet the needs of the currently permitted Doris North Project mine and process the bulk sample ore from the Madrid Advanced Exploration Program.
KitIA	2	Section 4.2.7, 4.3.7. Appendix 4-A, Appendix 8A Section 4.1.1 and 4.1.2 and 5.2	Pollution Control Pond Capacity	The pollution control pond (PCP) at Madrid North is designed to capture flow from the overall drainage area plus 25% of the annual snow coverage and 100-year 24 hour storm event. This is collectively a 15,100 m^3 capacity. We are concerned that the pond has not been built to accommodate 100% of the annual snow coverage in conjunction with other water inputs. This may result in insufficient capacity should a large storm event occur during freshet. This is despite some removal of water for use in the brine mixing facility, the 50 m^3 holding tank, etc. A similar design is used for the primary and secondary PCPs at Madrid South. We understand that water is transported from the PCP to the TIA when >10% capacity is reached. However, it is unclear from Appendix A Table 1 if all sources of contact water and other inputs are accounted for in the contact water volumes reporting to the PCP.	TMAC should provide rationale why the pond is build to handle 25% of the annual snow coverage rather than 100%. This rationale should be accompanied with a discussion of the Doris North TIA treatment capacity.
KitIA	3	Section 4.2.10.3	Holding capacity design for 25% annual snow coverage	TMAC indicates that a double-walled fuel storage tank at each location will be placed into a lined containment facility and designed to accommodate 110% of the tank volumes plus 10% of the fuel transport truck a 1 in 100 year 24 hour storm event and 25% of the annual snow coverage. TMAC has designed the holding capacity for 25% of the annual snow coverage rather than 100% similar to the PCPs.	See KitIA-2. TMAC should provide rationale why the pond is build to handle 25% of the annual snow coverage rather than 100%.
KitIA	4	Section 4.4.1	Documentation of Diamond Drilling Chemicals	In 2011, drilling at the Boston site released large quantities of brine to the environment that were only detected by an AANDC inspector. Chemicals used during drilling activities include calcium chloride (salt) used to prevent freezing of the water in the hole, Visco which is used as a lubricant in the hole, linseed soap for cleaning of drill string components, and heavy grease to prevent seizure of drill rods to each other. TMAC reports that small quantities of each will be stored with each drill.	Please provide details on monitoring and management of drilling chemicals during operations in all seasons. These details should include a spill response plan applicable to exploration drilling activities. These may be included in an update to the Doris North Type A License Spill Contingency Plan as indicated in Table 8.1-1.
KitIA	5	Section 6.3.2, Section 7.3, Section 10.4.3, Appendix 7-A	Groundwater Chemistry Assumptions and Lack of groundwater data	There is no site-specific Madrid baseline for groundwater quality or quantity. Groundwater on site is stated to be saline with TDS similar to seawater. This has not been confirmed with site specific groundwater samples and is important at the South Madrid Site where a talik is thought to be present (Sec. 10.4.3). The absence of a site-specific baseline prevents accurate estimates of mine water effluent quality and quantity. TMAC states (Sec. 10.4.3.) "The rate of inflow into mine workings is dependent on the location and extent to which bulk sample mining within these zones occurs. Potential effects to the quality of groundwater are introduced by mining within these unfrozen zones." The absence of a baseline does not provide a means to test for chnages in the future. The statement that *"Groundwater quality for this area is assumed based on data from Doris and Boston areas. Both areas have saline groundwater at relatively shallow depths in the respective taliks. There is no reason to believe these areas are any different than the Madrid South Bulk Sample.* (App 7-A, Sec 2.3)" does not provide adequate evidence water quality in the Doris and Boston areas are applicable to Madrid South.	Please collect groundwater samples to confirm groundwater chemistry in the Madrid area. Alternatively, please provide evidence showing that groundwater data from the Doris and Boston areas are applicable to the salinity and mineralogy of the Madrid site.
KitIA	6	Section 6.3.2, Section 7.3, Section 10.4.3, Appendix 7b Section 2.1	Unsubstantiated Groundwater Inflow Assumptions and Lack of thermal data	TMAC has provided estimates of groundwater inflow between 16 to 1073 m3 / day but has chosen to use 500 m3 / day as input into the water balance (Appendix 7-A Table 2). Water management will require an accurate water balance and the ability to manage worst case scenarios. Use of an intermediate value as input into the water license may underestimate the quantity of groundwater requiring management on site (if 500 m3/day is too low) or, alternatively, underestimate the amount of freshwater make up needed (if 500 m3/day is too high), thus challenging the 300 m3/day threshold for a Type B Water Licence . This concern is further highlighted by the lack of site specific permafrost information for Patch 14 and the Wolverine deposits and the likelihood of taliks adjacent to Wolverine Lake (p. 5-2 " It is anticipated that the Madrid South underground activities will intercept groundwater when operating in areas of taliks." This deficiency will make it impossible to assess if project related changes to groundwater flow regimes occur or have been mitigated (10.4.3).	Please provide a discussion of the variance in estimated groundwater inflows to the site and implications to the water balance and subsequent requirement for freshwater. This is critical given how close TMAC's estimate of freshwater use is to the NWB Type A threshold of 300 m^3/day. Please commit to confirming groundwater quality and quantity at the Madrid South site prior to any further development. AND Please collect thermal data for the Madrid site prior to development activities. This will be used to inform the presence of taliks in the area and assist in modeling groundwater flow regimes.

Authorities	TC #	Reference to Comments. All comments are based on "Type B Water Licence Application Supplemental Information Report" unless otherwise noted.	Subject	Issue / Concern or Information Deficiency and Rationale:	Technical Comment/ Information Request:
KitIA	7	Section 6.1	Type A Threshold Water Use	Water use is estimated to peak at 295 m^3/day, which is within 2% of the threshold for a Type A water license as per the NWB. TMAC has estimated daily peak water use very close to the threshold; yearly freshwater use is also provided. The NWB does not use yearly water use as the threshold and so we are concerned TMAC will view the estimated peak freshwater use as a mean value rather than an absolute value. We are further concerned that 295 m^3/day will be sufficient to meet TMACs needs. Further to this point, we are concerned with the accuracy of the freshwater use estimate given the absence of groundwater data.	Please provide an estimate of how frequently freshwater use will reach the peak value and how often it will exceed it. We do not see an occasional exceedance as need for a Type A license, but TMAC should discuss implications of exceeding their peak value and the accuracy of their estimate in the absence of groundwater data. Continued exceedances of the 300 m^3/day may necessitate a Type A License for Madrid North and South including formal NWB hearings. AND Please confirm the demand for make up water by providing a) the total water use including a discussion of uncertainty b) the amount to be made up of contact water or reused water and c) the amount to be made up by freshwater takings.
KitIA	8	Section 6.4.3	Fate of Drill Brines	TMAC states *"Excess brine generated during the drilling process will be removed from the drill site and deposited onto waste rock piles, into Pollution Control Ponds, or discharged to the TIA."* This does not outline the conditions under which each fate would be used.	Please provide details on the decision rules to be used to determine the three alternatives for disposal of drill brines.
KitIA	9	Section 7.2	Fate of Non-compliant Quarry Water	TMAC states that non-compliant quarry water would be sent to the Doris North TIA for treatment or reused through the PCP. We are concerned addition of non-compliant water contaminated by an unknown source (pending investigation as outlined in Section 7.2) may overwhelm the dilution capacity of the PCP requiring shipment of a greater quantity of water to the Doris North TIA for treatment. Similarly, what is the response time for laboratory analysis needed to make a decision as to treat the quarry water at the TIA or add it to the PCP.	Please provide details on the fate of drill brines under differing conditions. Specifically we request details that would precede TMACs three stated potential fates for drill brines - the waste rock piles, PCPs and the TIA and how decisions would be influenced by laboratory response times . AND Please provide a discussion of how much truck traffic would be required to transport effluent from the PCPs to the TIA.
KitIA	10	Section 7.3	Fate of excess inflowing groundwater	TMAC states excess ground water will be transported to the PCP where it will presumably be spread to the tundra as per Section 7.2. Application of saline contact water to the tundra may increase the potential for permafrost degradation, alter vegetation communities and create channelized flows to adjacent surface waters.	Please provide decision rules and criteria for disposal of PCP water to the tundra or the TIA that will ensure protection of the tundra.
KitIA	11	Section 8.1, Table 8.1-1	Updated Plans	We note that several management plans currently in implemented under the Doris North Type A license will be updated to accommodate activities associated with Madrid North and South. Specific examples of updates include 1) an Updated Wildlife Monitoring and Management Plan to accommodate increased truck traffic between the two project footprints, 2) Updates to the Water Management Plan to accommodate treatment of non-compliant water from the Madrid PCPs and quarries, 3) Updated Spill Contingency Plan as per KIA-4, etc.	We request an additional review period prior to *"60 days prior to the commencement of construction"* or after the next annual plan update to assess the adequacy of TMACs changes to the varied plans to accommodate activities at Madrid North and South.
KitIA	12	Section 9.2	Outdated Reclaim Model	Costs for closure and reclamation have been estimated using a NWB approved Microsoft Excel spreadsheet consistent with the principles of the RECLAIM 6.1 model. We note that this is not the most recent version of RECLAIM and may provide a more or less conservative estimate than what is currently accepted.	Please provide a discussion of how assumptions have changed between RECLAIM 6.1 and 7.0. Costs should be adjusted to reflect any more conservative assumptions present in version 7.0 that were not incorporated into the Microsoft Excel spreadsheet.
KitIA	13	Section 6.1.2, Section 6.1.3, Section 6.3.2, Table 7.1-1, Appendix 7b Section 2.2	Inconsistencies in water balances	Groundwater is not expected to contribute to the Madrid North water budget (6.1.1) as the excavation is in permafrost (6.3.2). TMAC then states that contact water will be reused for makeup water. Alternatively Madrid South underground activities may intercept groundwater (6.3.2) but is not mentioned in the water balance (6.1.2). TMAC states that the remaining water requirements will be made up by the same sources as from Madrid North. The *"Water Balance Summary"* in Appendix 7b section 2.2 does not provide sufficient detail to assess if the water requirements will be sufficiently addressed without violating the 300 m3 / day threshold for a Type A license.	TMAC should explicitly state how inflowing groundwater will contribute to the water balance in Madrid South beyond outlining differences in wastewater generation (Table 7.1-1).
KitIA	14	Section 7.4, Table 7.4-1, Appendix 7-A Table 1, Appendix 8-A	Application of Contact Water to Tundra	Table 7.4-1 outlines effluent quality limits for discharge to the tundra based on MMER and the Doris Mining and Milling Licence 2AM-DOH1323 for discharges to the tundra. We note that these limits do not include salinity which may be of concern due to unsubstantiated groundwater inflow predictions. Further to this, MMER effluent quality criteria are designed to be protective of aquatic life when discharged through an engineered structure to surface water where dilution will occur. TMAC has not provided sufficient detail to provide assurance aquatic life will not be impacted through PCP discharges from the Madrid project. Application of effluent to tundra may create preferential flow paths resulting in degradation of the tundra and a reduction in terrestrial based mitigation prior to contact water reaching the productive nearshore area of surface waters 31 m away.	Please provide: 1) Effluent discharge quality limits for salinity as part of Table 7.4-1. Specifically limits for TDS and chloride as they are shown to be elevated in Appendix 7-A Table 1. 2) More information regarding how and where effluent will be applied to the tundra. For example, will it be through an engineered diffuser structure to prevent creation of preferential flow paths? 3) Establish nearshore monitoring stations to ensure application of compliant PCP effluent to the tundra is protective of aquatic life. These monitoring stations should take into account the application method and natural flow regimes of the area. Specific stations should be established to capture the influence of the Primary Madrid North PCP and the Primary and Secondary PCPs at Madrid South. 4) Outline the monitoring program to track any changes to permafrost resulting from application of contact water to the tundra. Insufficient detail is provided for monitoring in Appendix 8-A Sections 6 and 7.
KitIA	15	Appendix 7-B	Pollution Control Pond Water Quality Predictions	TMAC has not provided water quality predictions for the PCPs. This information is necessary to assess the volume that will be compliant for discharge to the tundra and non-compliant that will be shipped to the TIA for treatment.	Please provide monthly modeled water quality for each of the three PCPs over the duration of project life.

Authorities	TC #	Reference to Comments. All comments are based on "Type B Water Licence Application Supplemental Information Report" unless otherwise noted.	Subject	Issue / Concern or Information Deficiency and Rationale:	Technical Comment/ Information Request:
KitIA	16	Section 8.1, Table 8.1-2	Pollution Control Pond Sampling Frequency	We note that TMAC has proposed monthly water quality sampling for the pollution control ponds during discharge. This may be too infrequent to detect changes in PCP water quality or to discontinue tundra application prior to excessive non-compliant discharge to the receiving environment.	Please increase the sampling frequency of PCP water quality during discharge to once weekly. Results of PCP water quality should be compared with nearshore water quality monitoring results as recommended in KIA-14. TMAC should also provide PCP water quality trigger values that would cease discharge to the tundra as well as a trigger to cease based on channelization or development of preferential flow paths in the tundra to surface water.
KitIA	17	Section 10, Memo Directed to NIRB	Exemption from NIRB Screening	TMAC has indicated in their memo to the NIRB and in Section 10 of the Supporting Document that the project is not predicted to have to have any longterm adverse impacts to the environment. For this reason and *"pursuant to NLCA Schedule 12-1(5)...Section 13.7.3"* are exempt from public hearings.	HESL's review on behalf of the KitIA has identified significant uncertainty in the predictions associated with the Madrid Project. We advise that the KitIA withhold their approval of the Type B Water License until the NIRB has issued their decision regarding screening. This uncertainty may also be sufficient to elevate TMACs application from a Type B to a Type A water license as per the NWBs license threshold criteria.