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Kugluktuk

Bathurst Inlet
Kingaok

Bay Chimo
Umingmaktok

Cambridge Bay
Ikaluktutiak

Gjoa Haven
Okhoktok

Taloyoak

Kugaaruk

KIA's Review of the January 2012 Windy Camp and Patch Lake Facility Final Closure Plan.

KIA has reviewed the January 2012 Windy Camp and Patch Lake Facility Final Closure Plan for Hope Bay Mining Ltd. There are four main issues and six sub-issues for consideration in response to this report with supporting observations, comments, and recommendations for further actions on the part of HBML. These issues are presented as follows:

Issue#1

Chemicals of Potential Concern (COPC) focus on Petroleum Hydrocarbons (PHC) and do not adequately address other chemical sources and metals.

Petroleum hydrocarbons (PHC) are identified as chemicals of potential concern (COPC) for both Windy Lake and Patch Lake facilities along with various metals such as chromium, copper, nickel, and zinc. Consideration has not been given to other chemicals and their sources identified previously by the KIA's consultants in their review of closure plans in 2011. These being PHC's from storage and handling facilities and equipment leaks; metals from incineration ash; solvents, hydraulic fluids, glycols and other antifreeze from storage and handling and equipment; Dioxins and furans from the incinerator ash; polycyclic aromatic hydrocarbons (PAH) from incomplete combustion; and nutrients with in soil from waste water outfall.

KIA believes that these additional COPC have not been adequately addressed by the closure plan.

Recommendations

HBML should develop a Comprehensive Conceptual Model (CSM) document clearly summarizing all COPC considered for the sites and the final disposition of these COPC through all conducted studies.

Issue #2

Remediation criteria may be inadequate for long term use by humans and wildlife.

Tier 1 guideline for coarse-grained soil under industrial land use is applied from the environmental guideline for contaminated site remediation (CSR Guideline) provided by the Department of Environment of Nunavut. This remedial criterion is less stringent than the criteria for wild land. Also the sited criteria are no longer active since they have been updated by the Nunavut CSR Guideline and CCME Canada-Wide Standards. It is not readily apparent whether the sited criteria are to apply to closure plans or operational

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remediation. If the mine site was in operation, the use of active industrial criteria for remediation would be justified.

Given that the sites are closed for an indefinite period of time and the industrial criteria being used is no longer active, the KIA believes that wild land criteria would be more appropriate for screening soil and remediation based on the accessibility of the sites to wildlife and human beings.

It has been noted by KIA's consultants that when wild land criteria is used in place of industrial land criteria, the number of samples that exceed the criteria significantly increases. The implication of this is that the volume of impacted soil would increase at both Windy Lake and Patch Lake if wild land criteria were applied. This in turn implies that the planned remedial action, volume of soil to be remediated and associated costs are inadequately planned and calculated.

Recommendations

HBML should use wild land criteria for the setting of remediation targets for these sites, the area impacted, the volume of soil to be remediated and method of remediation.

Issue #3

Closure approaches are vague and non-specific.

Issue #3a

Closure Goals, objectives and measures are non-specific.

The overall objective **(goal)** is stated to be "to establish chemically and physically stable site conditions to protect human health and the environment." The previous version of the closure plan had the stated objective **(goal)** to be "to establish chemically and physically stable site conditions, which would ensure no adverse impacts to bird, aquatic, terrestrial and human life."

This apparent change in overall objective or goal for remediation along with the use of industrial land criteria instead of wild land criteria for remediation is interpreted as a lowering of standards for site closure and remediation.

Also, the re-vegetation plan is vague and provides little information in terms of re-vegetation objectives, timelines for achieving objectives and means of monitoring to ensure objectives are being met. While re-establishing native vegetation in arctic environments without native stock is difficult, this does not prevent the establishment of clear re-vegetative objectives for soil detoxification, protection against erosion, maintenance of natural hydrology, wildlife habitat, and ecological functions.

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More detail on the primary objectives of remediation and re-vegetation for each site is required. The plan should also outline the monitoring measures and triggers required to achieve objectives and to determine whether or not corrective actions need to be taken. It is likely that more than 10 years is required to reach a climax community at the latitude of the project and additional monitoring trips may be required.

Recommendations

HBML should retain the originally stated overall objective **(goal)** for closure and reclamation in conjunction with wild land use criteria. Remediation and re-vegetation objectives aligned with the closure goal should be established for detoxification of soil, protection against erosion, maintenance of natural hydrology, wildlife habitat, and ecological functions.

Issue #3b

Remedial methodology in closure approach is vague.

Monitored Natural Attenuation (MNA) is proposed as a remedial method in areas where excavation or enhanced in situ bioremediation is difficult to apply. It is stated that MNA should be considered "assuming that there is no undue risk to wildlife." It is unclear who would make the determination that an area should be considered for MNA or that there is no undue risk to wildlife, or how this determination will be made.

Natural attenuation of petroleum hydrocarbons should not be attempted unless hydrocarbons concentrations pose no threat to wildlife through feeding or dermal contact. Also, it is not clear on how MNA can be considered a viable remedial option given that the bio-treatability study indicates that undisturbed anaerobic treatment was determined to be ineffective.

Recommendations

HBML should include KIA in the determination of the application of MNA to areas where there is difficulty in applying either excavation or enhanced in situ bioremediation. HBML should provide further justification of the application of MNA to sites if it is not fully supported by bio-treatability studies.

Issue #3c

The Planning of closure activities, scheduling, and time lines for execution are vague.

The closure schedule does not specifically identify the anticipated dates for closure activities. While defining dates for completion of some remedial activities is not possible due to uncertainty linked to remediation approaches (i.e. using Monitored Natural Attenuation (MNA)

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or in-situ bioremediation), a definite project schedule should be developed for the activities listed for the scope of work for Windy Lake and Patch Lake facilities on page 4 of the plan.

Recommendations

Project management with a project schedule and established milestones & dates should be developed for the closure of Windy Lake and Patch Lake based on the identified activities listed. This should be done with clearly stated remediation goals and objectives using the most effective remediation approach for achieving results for wild land criteria.

Issue #3d

Post Closure Monitoring is inadequate.

Post closure monitoring does not provide details on triggers for implementing remedial action or a contingency plan when remediation objectives are not being met. Also, the closure plan does not identify confirmatory sampling of the base of remedial excavations to determine if remediation objectives have been obtained. Areas of the tundra that have been disturbed should be monitored to confirm no permafrost degradation is taking place. This monitoring should be incorporated into the proposed permafrost remedial activities.

Recommendations

All areas where the tundra has been disturbed should be included in the monitoring program for permafrost degradation/reinstatement. Details of permafrost monitoring should clearly indicate if it is limited to visual inspections or includes instrumentation.

Issue #3e

Backfilled depressions may be used by denning and burrowing animals.

The decommissioning of the diversion berm is listed in the closure and remediation activities. On page 8 of the plan it states “The fuel tanks in the tank farm were decommissioned and moved to Doris Camp in 2010. The remaining containment berms will be decommissioned. The protective sand layer on top of the secondary containment facility will be used to backfill depressions around the site. This sand is below the hydrocarbon remediation standards for industrial coarse soils (EBA 2012b).”

As loose soils, sands, and eskers are a limiting feature on the tundra, there is the potential that sand used to backfill depressions will attract denning and burrowing mammals. Although the sand layer moved from the top of the secondary containment facility is below the hydrocarbon remediation standards for industrial coarse soils, it should also be examined for its suitability for

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habitat use by burrowing mammals, and monitoring should include documenting use of such habitat by denning and burrowing mammals.

Recommendations

HBML should monitor and document the use of backfilled depressions using decommissioned berm material by burrowing and denning mammals as part of on-going follow-up.

Issue #3f

Costing of Closure activities and their execution is vague.

The 2012 Final Closure Plan does not contain details on the implementation plan of remedial and closure measures. It was therefore necessary to interpret the implementation details from line items and notes in the cost estimation in Appendix B of the 2012 Closure Plan. In many cases the identified unit costs do not match the description of tasks from category labels and notes or available comments.

It is not possible to assess the magnitude of costs and whether high unit costs in some items are balanced by low unit costs in other items to produce a reasonable overall cost estimate.

The cost estimates provided are based on volumes that are estimated by applying industrial criteria for both assessment and remediation goals for soils exceeding this criteria. Should wild land criteria be applied, the volumes of soil removed would significantly increase along with costs for meeting this stricter remediation goal.

Also, the remediation cost only addresses hydrocarbon soils. The cost estimate assumes that either other COPC do not require remediation or are included in material to be removed for off-site disposal. The KIA believes that other COPC need to be included in remediation efforts and cost estimates.

Recommendations

Remediation activities and tasks should be identified in a consistent manner for remediation based on wild land criteria.

Remediation costs should be determined based on meeting wild land criteria and associated volumes of soil taking into account both petroleum hydrocarbons and other COPC.

Proper engineering economic evaluation should be used based on remediation costs to determine the most economical remediation approach.

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Issue #4

No feedback has been provided to KIA from the NIRB process on previous recommendations on the 2011 version of the closure plans.

KIA had BGC Engineering review the previous version of the closure plans as well as the 2012 version. The consultant's previous report, dated March 28th, 2011 was forwarded as part of KIA's previous comments to NIRB. It appears to the KIA that none of the recommendations were addressed in the updated version of the closure plan.

Neither the KIA nor our consultant received any feedback on recommendations provided. The KIA would like to know from NIRB what was done with recommendations made to HBML. The KIA would also like to know if HBML provided any formal feedback on which recommendations will and will not be implemented along with rational to NIRB.

Recommendations

NIRB provide feedback on which recommendations are to be implemented and which will not be implemented with rational by HBML.

HBML review previous recommendations along with recommendations made in this response and provide KIA with feedback on which recommendations will be implemented or addressed.

Yours Truly

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