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Health Impact Assessment Paper

EnvH 590/URBDP 598: Health Impact Assessment

The Red Dog Mine Extension: Aqqaluk Project

Introduction: The Red Dog Mine, owned by Teck Resources Ltd., is one of the world's largest zinc and lead mines. It is located 46 miles from the Chukchi Sea north of the Arctic Circle, in Alaska's Northwest Arctic Borough (NWAB), on lands owned by the Alaska Native Regional Corporation called NANA.[1] The open pit mine should be depleted by 2012, requiring an expansion to an adjacent site called the Aqqaluk deposit. The company is now clearing surface areas at the deposit, despite continued litigation and an ongoing dispute with the U.S. Environmental Protection Agency (EPA) regarding its federal permits.[2,3]

The mine has long been a source of litigation and contention among some Alaskan Native residents of the coastal villages of Kivalina (population 375) and Point Hope (population 674).[4] For years, they have complained of health impacts caused by fugitive dust generated by the Delang Mountain Transportation System Easement (or DMTS, the haul road from the mine to the port) and its impact on subsistence food harvested. Disruptions to caribou, a primary healthy food source for the region, have been blamed on truck traffic.[5] Coastal residents also have been concerned about contaminants, notably from total dissolved solids in treated wastewater discharged into the Wulik River from the mine site. In 2004, members of a Kivalina group sued the mine for its more than 2,400 violations of a federal discharge permit.[6] The Red Dog Mine annually has topped the EPA's Toxics Release Inventory list, which compiles toxic chemicals released by all industries in the United States.[7]

Background: With the Red Dog Mine nearing the end of its capacity, Teck sought federal regulatory approval to continue its mining activities from the EPA, the lead federal coordinating agency, and from the U.S. Army Corps of Engineers. Teck needed the EPA to reissue a U.S. Clean Water Act (CWA) National Pollutant Discharge Elimination System (NPDES) permit for the Red Dog Mine, which would also include any changes with the opening of the planned Aqqaluk deposit.[6,7] The final supplemental environmental impact statement (SEIS), completed in October 2009, updates the original environmental impact statement (EIS) from 1984. The final SEIS also encompasses federal permitting for the Aqqaluk deposit by the Corps of Engineers under the CWA, to allow mining fill material to be placed in wetlands associated with mining the deposit. The NPDES permit and the Corps' "404 permit" require compliance under National Environmental Protection Act (NEPA).[6]

The Red Dog Mine produces more than 1 million tons of concentrate annually and plays a major role in the global metals trade and in the regional economy. The zinc concentrates, used to make products like automobile parts, are among the richest in the world, making this remote Arctic mine economically profitable for year-round operations.[1]

The Red Dog Mine also has an enormous economic footprint on the remote Arctic region, which is also the historic land of the Alaskan Native Inupiat people. The area is sparsely populated. The nearest Inupiat coastal village of Kivalina is 55 miles west of the mine. The entire borough has fewer than 8,000 persons, and outside of health care and government (local, state, federal), the Red Dog Mine is the main economic driver. It employs 510 year-

round workers (local and non-local), and it is the largest employer in the NWAB in terms of annual payroll.[1]. Between 1982 and 2008, Teck Resources paid $412 million in royalties to NANA, and the mine is the single largest source of revenue for the NWAB.[8] The mine's importance to the economy were outlined as important health considerations in a health impact assessment (HIA) that was integrated in the final SEIS released in October 2009.[9,10]

Significant environmental issues identified during the scoping phase of the final SEIS are also immediate public health concerns to the workers at the mine site and to residents in the borough: (1) water quality in the Wulik River; (2) the storage capacity and stability of the tailings impoundment; (3) mine-related fugitive dust contamination of resources resulting from the DMTS haul road; and, (4) the mine's impact on subsistence resources. The final SEIS notes that fugitive dust from mine operations, discharged from haul truck traffic, has impacted the environment along the haul route to the port complex on the Chukchi Sea. Mining operations also have affected subsistence resources obtained for food and cultural livelihood, including caribou, beluga, and berries used by Kivalina residents.[6]

Regulatory Decision: The EPA had four alternatives to pursue with its regulatory decision under NEPA.[6] Those included:
1. **Alternative A, no action**: The EPA would not reissue an NPDES permit for the Red Dog Mine and no new federal permits associated with development of the Aqqaluk Project (the mine expansion).
2. **Alternative B, the applicant's proposed action**: The EPA would allow the open pit mining operation to continue until 2031 with the reissuing the Red Dog Mine NPDES permit and issuing a fill permit to develop the Aqqaluk Project.
3. **Alternative C**: The same permitting would occur and the mine would continue as proposed in Alternative B, but haul trucks carrying the zinc and lead concentrates would be replaced by a 52-mile slurry pipeline to haul the minerals to the port.
4. **Alternative D**: This would include parts of alternatives B and C, but instead have a wastewater pipeline to carry treated wastewater from the tailings impoundment to the Chukchi Sea (instead of being dumped in the Wulik River as it is now, treated). Haul trucks would take ore concentrate to the port as currently done.

In January 2010, the U.S. EPA approved Teck's wastewater discharge plan and NPDES. The approved Aqqaluk mine expansion allows the company to put treated mining wastewater directly into the Wulik River, which is used by Kivalina for drinking water. Some Native residents of Kivalina and Point Hope sued with Alaska environmental groups, claiming the permit violated the CWA.[7] Then, in March 2010, the EPA withdrew limits for allowable discharges of cyanide, zinc, selenium, lead, and total dissolved solids into the Wulik River from the new permit, placing stricter limits then were set in Red Dog's previous permit. Still, the EPA intended to allow Teck to develop Aqqaluk, despite its latest enforcement action.[11] It is not clear if a wastewater pipeline system along the DMTS will be built, as was announced in 2008, because of ongoing litigation over the approved NPDES.[1,3]

HIA Methods Used: In the final SEIS submitted for the mine expansion, health considerations are included in the form of descriptive baseline health conditions for Alaskan Natives. The narrative notes that while Alaskan Natives' health is improving, the group saw dramatic increases in chronic diseases in the last two decades. Cancer rates rose 120%, diabetes 262%, and chronic obstructive pulmonary disease 191% since 1989.[9] In subsistence communities such as those in the NWAB, the decline in subsistence food harvesting

(hunting, fishing, gathering) has a negative impact, given the reduction in consumption of micronutrient-rich foods like fish and caribou meat in favor processed foods high in simple carbohydrates and saturated fats.[9] Subsistence lifestyles among the Alaskan Inupiat are associated with protective health benefits. The HIA further notes that the rapid transition to market economies in rural communities has lead to alcohol and drug use, tobacco use, and less subsistence food consumption.[9]

Health impacts are presented as a spectrum of possible environmental health effects associated with the four alternative choices presented in the final SEIS. The HIA itself is contained as a subsection within chapter 3 of the final SEIS (Affected Environment/Environmental Consequences).[9] A supplemental section (Appendix E, Methods Used for Health Effects Analysis) describes the health analysis included in the final SEIS as an HIA modeled on a publication called Health Impact Assessment International Best Practice Principles (Quigley et al., 2006). Potential mitigation measures also are discussed that could improve positive and reduce negative health impacts.[10] The Maniilaq Association, the regional Alaska Native tribal consortium responsible for administering health in the NWAB, was a lead contributor.[10]

The inclusion of the public health chapter within the final SEIS for the mine expansion was another in a series of actions by Alaskan health and regulatory officials to provide an assessment of impacts by major resource projects on public health, specifically among Native Alaskans, the group most effected by mining and oil and gas development and exploration in Alaska. Other projects that have received similar assessments were proposed oil and gas development activities on Alaska's North Slope.[12] A lead proponent of this approach, Dr. Aaron Wernham, formerly of the Alaska Inter-Tribal council and now Director of the Health Impact Project, notes this approach to include such concerns in the EIS process offers a "systematic process and methodology to anticipate and proactively address potential health consequences of a program or policy," and potentially minimize adverse outcomes.[13]

Major Findings: The HIA found that there would be few significant new impacts from the mine expansion because those impacts from the mine already occurred. A separate 2007 DMTS assessment for the mine included a human health component (HHRA), which provides the main research findings to assess the mine's impacts on human health in the final SEIS alternatives. The HHRA looked at human exposures to metals in the environment: barium cadmium, lead, thallium, and zinc. Studies found that metals did not pose an unacceptable risk to children in the study area.[9] Nor was lead considered a health risk to workers at the facility.[9] Teck's worker safety issues also were discussed, and it was found that Teck had a strong program for worker safety measures and systems to reduce accidents, injuries, and workers' exposure to airborne pollutants (lead, cadmium, and silica). [9]

Using the HHRA and other data, the HIA found common public health impacts in all of the alternatives for the proposed expansion:[9]

- **General Health**: The HIA found that a mine closure would lead to economic dislocation and have severe health impacts in terms of lost local revenue, social problems, and community health and well-being.

- **Subsistence, Nutrition, and Diet-Related Health Problems**: A continued mine likely would still impact subsistence resources such as caribou, and lead to declines in caribou hunts, contributing to risks of diabetes in terms of less wild food consumed. A closed mine could lead to less income, which also supports subsistence activities.
- **Social and Psychological Health:** While mine work has caused disruptions among local families, the income and employment from the mine would have a positive impact to psychological and social health, and the loss of mining jobs would have a negative impact.
- **Injury**: The HIA found that the cessation of mining activities would represent the greatest risk of increased injuries, because of problems relating to economic depression associated with sudden job loss (drug and alcohol use, risk of suicide–a major health problem in rural Alaska).
- **Environmental contaminants**: The HIA found no evidence to indicate that any of the alternatives would affect cancer rates in the borough, and exposures to carcinogens from mining were deemed low, based on the HHRA findings from 2007. Air quality in the region met Clean Air Act standards. However, fugitive dust from the mine, DMTS, and port would persist for decades, though the risk of environmental contaminant exposure would still be low.
- **Mine Site/Port Site Accidents**: Accident rates with mining and milling operations would be similar under all alternatives. The mine has only had one death since it opened in 1984.

Major Recommendations: The HIA submitted in Chapter 3 of the final SEIS makes two recommendations. First, it calls for additional monitoring for specific contaminants in caribou, a keystone species in the diet of nearly all residents in the region and a source of cultural identity and micronutrient health. It is concerned over impacts by the mine to other resources used by residents of coastal Kivalina, including beluga whales and some indigenous berries.[9] The HIA also calls for the creation of a health advisory council, dubbed the "Stakeholder Participatory Monitoring and Review Committee." It would be comprised of representatives from industry (Teck and its Native business partner NANA), from the Alaska Department of Health and Social Services (ADHSS), and the Maniilaq Association. The HIA proposes that the council address any health issues that could arise during the life of the expanded mine.[9] These collaborative processes are now common in Alaska. In the case of the Red Dog Mine expansion, the Native-run NANA, which owns the land for the mine, publicly supported the EPA's conclusions that 20 more years of mining at the site would have "a substantial positive effect on public health and well-being," without harming subsistence.[14]

Strengths of this HIA: The HIA submitted within the final SEIS marks a new direction in resource development deliberations in Alaska. The state relies heavily on oil and gas production, and to a lesser extent mining, as drivers in its economy. Debates over resource development previously have focused on impacts to the environment or animal species, but less so to humans. The inclusion of the data on health impacts to humans during EIS scoping activities provides qualitative information, in the form of testimony and concerns by Native residents, which can help to shape discussions of future industrial and resource activities in rural Alaska that is inclusive of local concerns. Alaska's long history as remote quasi-colony of the United States has left a legacy of commercial exploitation by outside interests, at the expense of Native residents. As was found with HIAs prepared for oil and

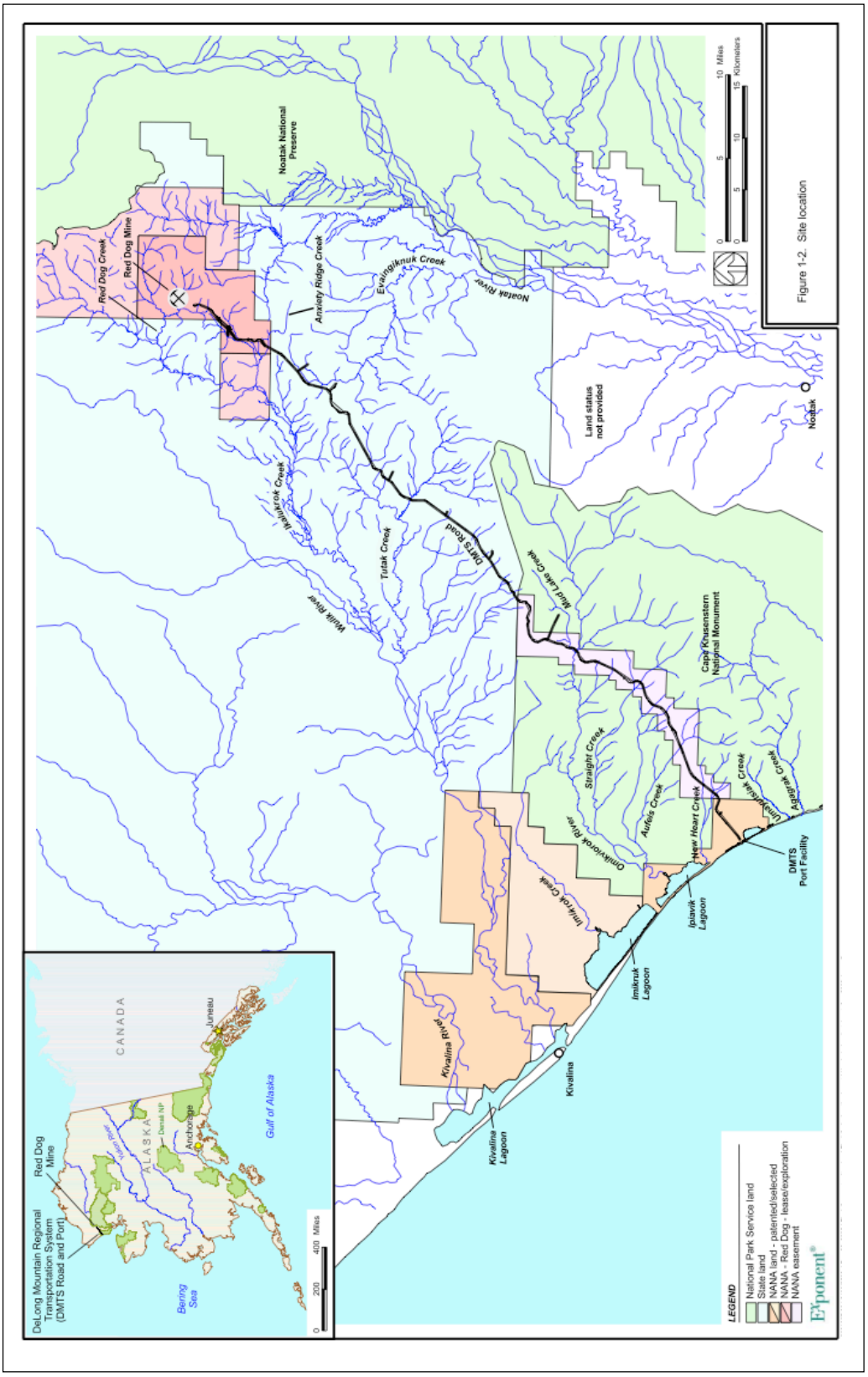
gas leasing activities in Alaska (Wernham, 2007), an HIA helped local residents develop greater unity and combined indigenous perspectives with public health data, and presented that information in a way that was informative and compelling for planners and regulators.[13] The ADHSS, which now has a designated physician working on these assessments, may continue to collaborate on HIAs with other state agencies as the state of Alaska proceeds on future resource development activities.

Weaknesses of this HIA: The continued operation of the mine, despite negative impacts, is deemed beneficial to public health. However, the ongoing dispute over the mine revealed that the HIA was not a tool that could leverage outcomes; litigation and the threat of litigation under the CWA remain the primary tools for residents who are at greatest risk to adverse health impacts by the mine. The actual HIA may have relied too heavily on industry financed research that was conducted prior to the final SEIS—the HHRA study. The HIA's inclusion of extensive baseline information on all Native Alaskans is not directly related to issues associated with a large project in a remote region of the state. As with other HIAs, this particular document does not have predictive accuracy in some of its conclusions, and this HIA like others may provide recommendations that cannot be supported by evidence.[13,15]

Specifically, the HIA's peer review notes there is a lack of data at the village and region-level on some health problems and how these changed over time during the life of the mine. There are no studies that directly looked into the potential health effects related to the mine, and because the mine had been in operation since 1989, impacts cannot be separated in the proposed alternatives. In addition, the pathogenesis of the mine's effects are multi-factoral, making it hard to demonstrate causation. Lastly, population sizes of the affected communities are too small to make statistically significant comparisons between Natives and non-Native residents of the region.[10] Finally, health concerns for humans have not been formally implemented in the regulatory mechanisms used to approve resource projects in Alaska. Short of federal or state legislation, the HIA will not have the force of law, and it may be seen as supplemental documentation that only informs a discussion, but does not steer a regulatory decision. Indeed, the final SEIS itself notes that the two major HIA recommendations, greater monitoring of contaminants in caribou in the area and a health advisory committee, likely would not be funded or implemented because there is no legal authority requiring those actions to be taken.[16]

Impact on Subsequent Decisions: Since the submission of this HIA as part of the final SEIS for the Red Dog Mine expansion, no updates have been made available if the HIA's recommendations for a health advisory council or a caribou contaminant monitoring program are moving forward. Information has not been published by the company, by the Maniilaq Association, or by the EPA. While researching this paper, efforts were made to contact Arctic health experts in Alaska who are familiar with the topic and resource development interest groups. No responses have been received. The development of Aqqaluk continues despite litigation and the lack of a final resolution to federal permitting for the expansion.

Appendix 1: Map of the Red Dog Mine, haul road, and coastal area, including Kivalina.



References:

1. Teck. *Red Dog operations*. 2011; http://www.reddogalaska.com. Accessed April 14, 2011.
2. Teck. *Red Dog Mine annual meeting: waste management permit No. 0132-BA002, reclamation plan approval*. 2010; http://dnr.alaska.gov/mlw/mining/largemine/reddog/teck2011ppt.pdf. Accessed April 13, 2011.
3. Bradner T. Win or lose, fight over Red Dog permits mean little to fish. *Alaska Journal of Commerce*. May 14, 2010; http://www.alaskajournal.com/stories/051410/loc_img9_001.shtml. Accessed April 14, 2011.
4. State of Alaska. Alaska Department of Commerce, Community, and Economic Development: Alaska Community Database. 2011; http://www.commerce.state.ak.us/home.htm. Accessed April 15, 2011.
5. McKittrick E. Red Dog Mine. 2010; http://www.groundtruthtrekking.org/Issues/MetalsMining/RedDogMine.html. Accessed April 14, 2011.
6. U.S. Environmental Protection Agency. *Red Dog Mine extension: Aqqaluk Project*: U.S. Environmental Protection Agency. October 2009; http://www.reddogseis.com/Final_SEIS.asp. Accessed April 9, 2011.
7. Pemberton M. Native villages appeal EPA permit for Red Dog Mine. *Anchorage Daily News*. January 15, 2010; http://www.adn.com.offcampus.lib.washington.edu/2010/01/15/1095100/native-villages-appeal-epa-permit.html. Accessed April 12, 2011.
8. The MacDowell Group I. *Canada's Impact on Alaska*. 2009; http://www.canadainternational.gc.ca.offcampus.lib.washington.edu/anchorage/offices-bureaux/canada_alaska.aspx?lang=eng. Accessed April 11, 2011.
9. U.S. Environmental Protection Agency. *Chapter 3: Affected Environment/Environmental Consequences: Red Dog Mine Extension: Aqqaluk Project: Final Supplemental Environmental Impact statement*. October 2009; http://www.reddogseis.com/Docs/Final/Chapter_3.pdf. Accessed April 9, 2011.
10. U.S. Environmental Protection Agency. *Red Dog Mine extension: final supplemental environmental impact statement: appendix E, methods used for health effects analysis*. October 2009; http://www.reddogseis.com/Docs/Final/Vol%202-Appendix_E.pdf. Accessed April 12, 2011.
11. Northern Alaska Environmental Center. *EPA Rescinds Key Red Dog Mine Permit Limits*. March 17, 2010; http://northern.org/news/epa-rescinds-key-red-dog-mine-permit-limits. Accessed April 12, 2011.
12. Dannenberg AL, Bhatia R, Cole BL, Heaton SK, Feldman JD, Rutt CD. Use of health impact assessment in the U.S.: 27 case studies, 1999-2007. *Am J Prev Med*. Vol 34. Netherlands2008:241-256.
13. Wernham A. Inupiat health and proposed Alaskan oil development: results of the first integrated health impact assessment/environmental impact statement for proposed oil development on Alaska's North Slope. *EcoHealth*. 2007;4:500-513.
14. Greene M. EPA study found that Red Dog Mine benefited region. *Anchorage Daily News*. 2009; http://www.adn.com.offcampus.lib.washington.edu/2009/02/07/683185/epa-study-found-that-red-dog-mine.html. Accessed April 13, 2011.
15. O'Connell E, Hurley F. A review of the strengths and weaknesses of quantitative methods used in health impact assessment. *Public Health*. Vol 123. Netherlands2009:306-310.
16. U.S. Environmental Protection Agency. *Red Dog Extension Aqqaluk Project: Final Supplemental Environmental Impact Statement: Chapter 2, Proposed Action and Alternatives*. October 2009; http://www.reddogseis.com/Final_SEIS.asp. Accessed April 15, 2011.