

# DELONG MOUNTAIN TRANSPORTATION SYSTEM

## Asset Management Review



December 2017

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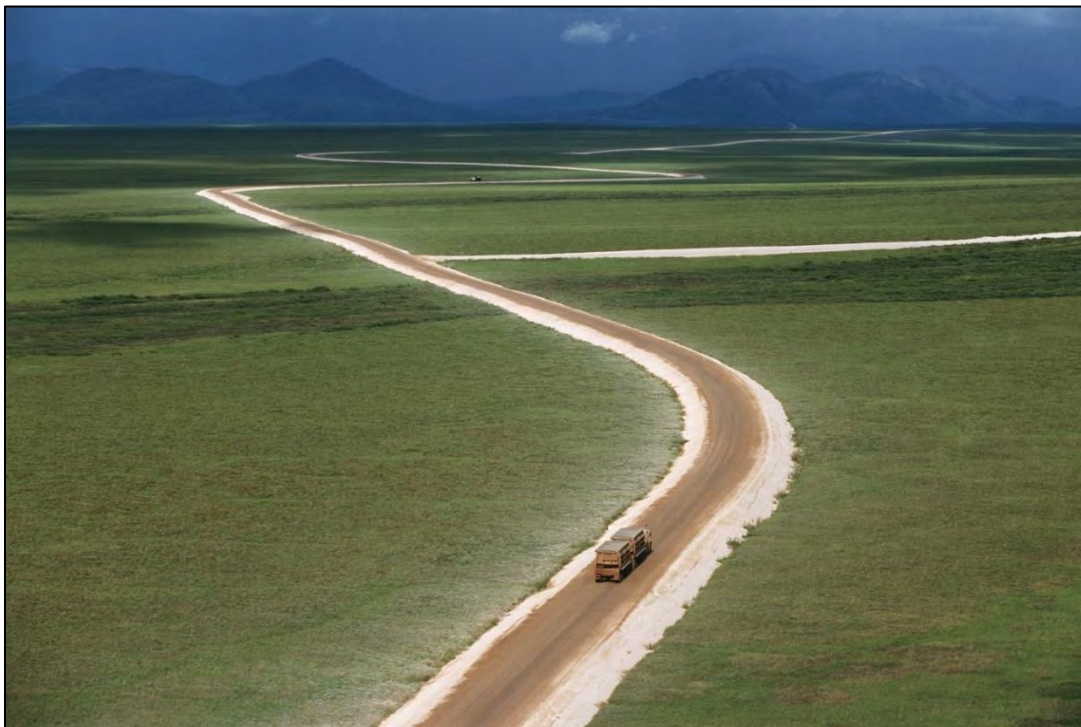
## EXECUTIVE SUMMARY

### INTRODUCTION AND PURPOSE

Alaska Industrial Development and Export Authority's (AIDEA) involvement in the Red Dog Mine and the DeLong Mountain Transportation System (DMTS) began over 30 years ago. The intent of this report is to:

- Summarize the DMTS project history, project agreements, key milestones, and key stakeholders
- Identify key takeaways/project elements to be applied to this and other AIDEA projects
- Understand and articulate potential project related expansion or other associated economic development opportunities
- Understand the project risks and opportunities in a changing external environment
- Identify areas in the existing project agreements that may require modification or adjustment to reflect current operational and/or management practices
- Outline key risks and potential action scenarios related to the on-going operation and future for the DMTS

This report is not intended to recommend any particular course of future action, but rather to identify future risks and management scenarios that may apply to the DMTS and AIDEA's continued ownership of this asset. The summarized key factors of success for the DMTS may also be considered for any future AIDEA projects.



## BACKGROUND AND HISTORY

Incidental discovery of the original Red Dog zinc deposit occurred in the mid 1950s with the official discovery announced in 1975 after the US Bureau of Mines (USBM) completed exploration activities in the area. The passage of Alaska Native Claims Settlement Act (ANCSA) in 1971 created a rush by the newly established regional native corporations to select lands with potential future economic value. However, the area around Red Dog was designated as a potential set aside for a national park or wilderness area, pending the outcome of the USBM exploration activities. NANA,



the regional Alaska Native Corporation (ANC) for northwest Alaska, selected the lands around the future mine as part of its settlement lands. Due to disputes with existing mining claims, land transfer for the Red Dog area (to NANA) was officially settled through the passage of Alaska National Interest Lands Conservation Act (ANILCA) in 1981. Anticipating the transfer, NANA began soliciting offers from several mining companies for the potential development of the mine.

NANA reached an agreement with Cominco (now Teck) for the construction and operations of the Red Dog Mine in 1982. Seeking administrative and financial support for the project, NANA and Cominco reached out to Governor Sheffield's administration and the Alaska Legislature for potential economic assistance, including the state's ownership of the project's road and port facilities, in a similar manner as other state-owned transportation infrastructure. Recognizing the unique nature of the project's remote and semi-dedicated transportation system, the Alaska Legislature passed legislation to ultimately provide significant new tools to AIDEA to enable its financial support of the project. The DMTS project also fit AIDEA's mission of promoting economic development and job creation in Alaska. AIDEA's participation was facilitated through bills passed by the 13<sup>th</sup> and 14<sup>th</sup> Alaska Legislatures to create AIDEA's economic development account, seed the account, provide AIDEA bonding capability, and provide distinct procurement capabilities to match the project requirements.

AIDEA signed the project financing and operations agreement with Cominco (now Teck) in 1986 and sold \$103M of bonds in 1987 to support the project's construction. The AIDEA-Cominco Agreement provided for the financing of the DMTS via a 50-year lease arrangement (1990-2040) with an interest rate essentially equivalent to the market rate at the time of the financing (6.5%). Importantly, the projected mine life at the time of the project financing only extended to 2020, or twenty years short of the agreement/financing term. As a partial compensation for this risk, the Agreement included reasonable payments for AIDEA based on high road/port throughputs (the contingent tonnage fee "CTF") and/or elevated zinc prices (the contingent escalator for zinc price increases fee, "CEZ"). Following standard accounting practices, these additional upside payments are internally booked by AIDEA as additional payments on the lease, shortening the payback period on AIDEA's project financing. While Teck will continue making the agreement required payments through 2040, current estimates indicate that AIDEA will begin recognizing these upside payments as net income in 2023-2024.



AIDEA invested approximately \$160 million in the original project, spending about \$90 million for the road construction and \$70 million for port infrastructure. This included spending for the initial development of the financing and its administrative costs (bond insurance, capitalized interest, etc.). The complete infrastructure of the DMTS at that time included:

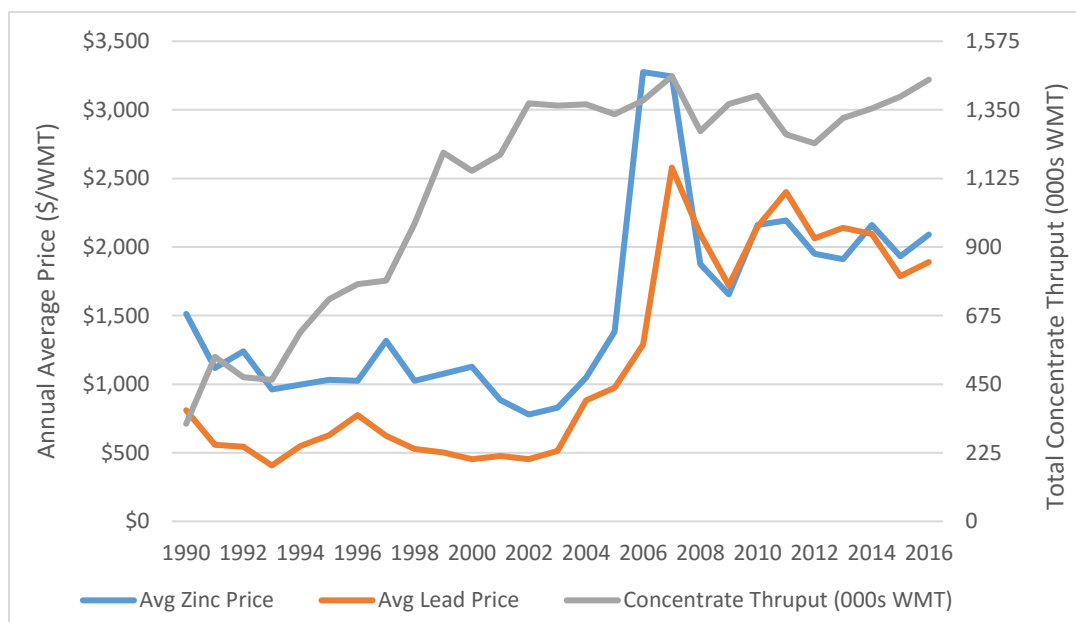
- A 52-mile double-lane gravel road to connect the port and mine
- A concentrate storage building (CSB) with capacity for approximately 535,000 tons of stored concentrate, including appropriate receipt and loadout conveyors and shiploader
- A dock facility to include a shallow-water barge dock
- A bulk fuel storage facility with approximately 10 million gallons of fuel storage capacity
- A 40-bed mancamp including all necessary utilities and other supporting infrastructure to support continuous concentrate storage and port operations



*Project Location Map*

Recognizing the extension of the DMTS road from the port to the mine site would require crossing through the newly established Cape Krusenstern National Monument, NANA and Cominco both began working with the National Park Service (NPS) to obtain an easement for the road right-of-way (ROW) through the monument according to provisions contained within ANILCA. However, to expedite (and ultimately avoid) this process, both companies also worked with the Alaska Congressional delegation to introduce and encourage the passage of legislation in 1985 authorizing a land exchange between the NPS and NANA for the ROW. Subsequently, in 1986 AIDEA signed a 99-year lease with NANA enabling the construction of the DMTS road and port on the NANA and NPS ROW lands.

The mine began initial operations in 1989 and the first loads of ore concentrate were shipped from the DMTS port in 1990. Unfortunately, commodity prices began a multi-year decline in 1990, challenging the economics of the project. Despite increasing mine production, the low zinc and lead prices necessitated the evaluation of options to increase the project's economic resiliency and ensure its on-going profitability. An expansion of mine throughputs by roughly 75% proved to be the most viable option. Although there were significant risks from uncertainty in the commodity price and on the extent of available future ore reserves, AIDEA moved forward with the execution of a new/restated agreement with Cominco to provide \$85M of additional financing for port expansion and modifications. Major elements of the expansion included a new/additional CSB, a modified truck unloading building (TUB), a new/replacement personnel accommodations complex (PAC) mancamp (96-bed), additional fuel storage, improvements to the conveyor systems, and additional/new utilities.



**Figure ES-1. Graph of historical lead and zinc prices and Red Dog concentrate production**

Following the mill and port expansion, concentrate production continued to increase. Since 2001, production has consistently exceeded 1.1 million tons per year. Recognizing additional ore reserves were required to enable the continuation of mine operations, especially at the now higher mining rates, Teck continued significant exploration and delineation activities in the area around the mill. The Aqqaluk ore body was sufficiently delineated by the mid-2000s to enable the preparation and filing of a Supplemental Environmental Impact Statement (SEIS) in 2007. The SEIS would be used to support potential permit decision-making associated with the opening of the Aqqaluk deposit. The Record of Decision (ROD) for the SEIS was issued in 2010 in conjunction with the renewed mine and mill wastewater discharge permit. These permits enabled Teck to begin mining of the Aqqaluk deposit. The original Red Dog deposit was closed in 2012, after mining over 65 million tons of ore, at an average grade of approximately 20% zinc.

Teck currently projects mining from the Aqqaluk deposit to continue through 2031 and is evaluating several options to potentially extend the overall project's life beyond that date through mining of other nearby ore bodies. Some of these ore bodies are located at depth, requiring underground mining practices which would significantly increase operational costs and decrease potential throughputs. Recent announcements provide significant promise for the development of a new deposit and the continuation of operations at Red Dog.

## ECONOMIC IMPACTS

The on-going operations of the Red Dog mine/mill and the DMTS provide significant positive economic impacts for the Northwest Arctic Borough (NWAB) and the State. Table ES-1 provides a summary of these impacts. Teck, through its payment-in-lieu of taxes (PILT) agreement with the NWAB, provides more than 80% of the borough's on-going operation funding. The new PILT agreement, authorized in April 2017, will continue the borough's relationship with Teck and fund community infrastructure projects, through a village infrastructure fund. Teck also provides significant contributions to local charities and other organizations.

**Table ES-1. Summary of Red Dog/DMTS Related Economic Impacts (thru 2016)**

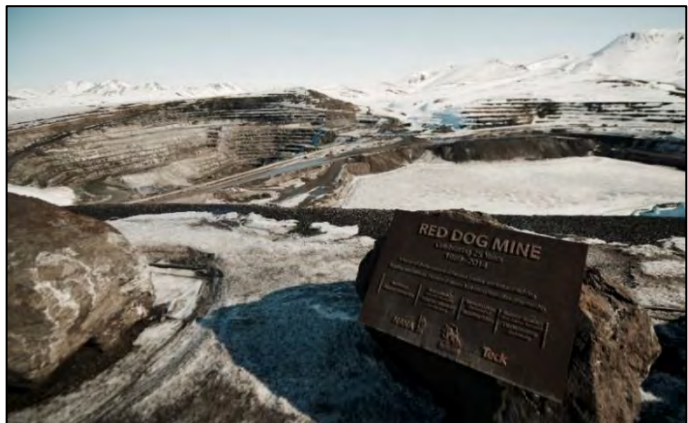
Description	Impact
Annual average number of jobs (includes on-site contractors)	550
Average Salary of a Red Dog Mine Employee	\$99,000
Red Dog Wage Impact in NWAB	\$65 Million
Red Dog Annual Payroll Spending	\$75 Million
Spending on goods and services within the State of Alaska (2015)	\$158 Million
NANA Royalty Payments (since inception)	>\$1.3 Billion
NANA 7(i) payments from Red Dog's >\$1.3B royalties	\$860 Million
Community investment and donations in the region (2010-2015)	\$2.8 Million



## KEY FACTORS OF SUCCESS

Red Dog Mine is now one of the largest zinc and lead mines in the world. Utilizing the DMTS, the mine consistently exports more than 1 million tons of zinc concentrate annually, representing roughly 4-6% of the world's total annual zinc production. In reaching its current level of success, the project has overcome many challenges over its 30+ year history. Its ability to overcome these challenges can be attributed to several key factors, including:

- 1. *Solid enterprise business case.*** The Red Dog Mine and DMTS infrastructure now represent an enterprise that is economically self-sufficient and capable of achieving positive returns for all involved. Red Dog produces zinc and lead concentrates ultimately used for the manufacture and construction of basic infrastructure and other essential products worldwide. While long-term risks to the continued growth in demand for both metals exists, nearly all projections do not anticipate near-term significant demand changes. Red Dog's expansion in the mid-1990s enabled it to achieve economic resiliency and at current production rates it is one of the lowest cost producers worldwide.
- 2. *Long-term planning and coordination.*** The initial go-ahead for Red Dog required significant early coordination and planning. Early-on, NANA and Teck cooperatively established key relationships with the Alaska Legislature, Governor Sheffield's administration, and federal representatives/stakeholders. These relationships supported the project and helped secure important elements of the project's financing and other authorizations/permits. The Alaska Legislature's creation of AIDEA's financing tools, such as the Economic Development Fund, and its ability to own and bond for project investments is an example of one of the early project elements supported through these relationships. Similarly, NANA's consolidation of the village corporations in its region also facilitated early project approvals by minimizing potential non-supportive factions. Both companies also exhibited patience in these pursuits, exemplified through the AIDEA tool development process, which required several years and two Legislative sessions.
- 3. *Sound agreements.*** The Red Dog project is governed by numerous agreements as described in this report. The agreements between NANA, Teck, and AIDEA have each proven





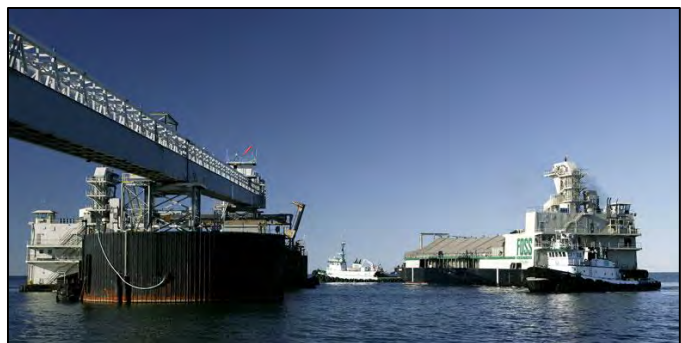
to be fair and yet flexible to enable continued operations without necessitating significant modifications or amendments. The AIDEA-Teck agreement, structured as a lease agreement, provides a consistent paydown (with return) on AIDEA's capital investment for the project, while also providing appropriate upsides based on the project's success and its relative risk sharing.

Similarly, the NANA-Teck agreement facilitated overall project success via its patient approach to providing project returns, only increasing NANA's royalty payments after the mine capital investment was repaid and then on a graduating scale for future years. NANA also benefits through shareholder employment opportunities and subcontracting preference opportunities for NANA subsidiaries. The long-term nature of these agreements also minimizes risks from short-term commodity price cycles.

4. ***Patient and reasonable capital.*** The original AIDEA-Teck Agreement stands as an example of patient financing and risk sharing, with the stated intent to assure the completion and success of the project, while also promoting AIDEA's mission of economic development in an under-developed area of the state. The 50-year term of this agreement exceeded the initial anticipated life of the mine and provided a reasonable financing rate which was equivalent to market conditions at the time of the financing. It included both credit enhancements and reasonable payments intended to offset some of these risks. AIDEA's further investment (\$85 million), in the 1996 expansion, exhibited these same elements of risk sharing and patient capital. At the time of that Agreement (1997), zinc markets were consistently low for several years with an unclear future; the mine had lost money since its opening; and the future life of the mine (via the existing/main deposit) only provided certainty for operations through 2020, which was 20 years short of the agreement's term. Despite these risks, AIDEA moved forward with the additional financing, maintaining the term through 2040. Importantly, the long-term nature of the agreement also provides a stable cash flow to AIDEA, supporting its current bond rating and ability to perform or finance other projects.



5. ***Strong partnerships and willingness to take risks.*** The collaborative working arrangements between AIDEA, Teck, and NANA have contributed to the project's success. Each party understands the long-term nature of the project and is willing to provide support to ensure its overall success. As described above, for



AIDEA, this was most acutely demonstrated through the additional financing provided in the mid-1990s for the port expansion. Given the uncertainty in the future mine reserves at the time and an on-going downturn in commodity prices, the long-term success of the project was not assured. Despite these risks, AIDEA still invested \$85 million in the expansion. AIDEA exhibited patience through the early years of the project, working with Teck through financial, environmental, safety, and other issues that confronted the project through the 1990s and 2000s.

6. ***Stable political and regulatory environment.*** The predictable laws governing the DMTS/Red Dog project provide assurance that helps support Teck's investment into the project. Even though laws and regulations can change, their change process is typically manageable and incremental; this is especially favorable for multi-national corporations like Teck, when compared to operations in less developed and less stable countries.

## FUTURE RISKS AND OPPORTUNITIES

The Red Dog Mine and DMTS have operated successfully for 27 years. The continued success of the project requires an understanding of potential risks and opportunities facing the project into the future.

### Risks

- ***Potential Closure.*** Currently, Teck anticipates mining to continue through 2031. Extension opportunities primarily revolve around the continued evaluation of other nearby ore bodies/deposits. Current information indicates the most likely reserves are located either at depth or a few miles from the existing mine/mill site.



Underground mining would significantly increase costs and reduce potential output. Surface mining of deposits located a few miles away would potentially require relocation of the mill complex, construction of new tailings facilities, and/or new agreements with NANA and the State (these deposits are primarily located on State lands). Teck is currently performing additional exploration and delineation activities to accompany on-going feasibility studies for the mining of these deposits. Initial planning, permitting, and agreement development/negotiation will be necessary in the upcoming years to ensure continuous mill and DMTS operations post-2031.

- ***Increasing Operational Costs.*** Increasingly stringent environmental requirements, increasing taxes or PILT agreements, and increasing personnel costs all reduce the overall economic resiliency of the project. Managing these costs is crucial to planning the future of the project.
- ***Commodity risks.*** Red Dog produces zinc and lead concentrates which are used for products worldwide. Zinc's primary use is for galvanizing steel to protect it from rust; lead is primarily used in lead-acid batteries. Substitution of these products with new alternatives is a long-term risk to the continued demand growth for both metals. Demand and pricing for zinc and lead generally follows world economic cycles. Teck anticipates future demand support for zinc to be

largely driven by increasing rates of galvanizing in countries such as China. The current high prices for zinc and lead are largely believed to be due to supply constraints from recent mine closures; the potential opening of new mines may impact future prices.

- *Environmental Risks and DR&R.*

Operating a mine and road/port come with inherent environmental risks. The potential future closure of the mine is managed through the state-required mine closure and reclamation plan and its associated dismantlement, removal, and rehabilitation (DR&R) bonding. However, the closure plan and DR&R funding do not include the DMTS port



and road. As a result, the level of potential financial impacts to AIDEA from a potential future closure of the mine (and port) are unknown. Port and road infrastructure will be needed to support post-mine closure environmental activities, however without a user, the full DMTS port infrastructure will not be needed (such as the bulk fuel tanks, mancamp, CSBs, and conveyors/shiploader). The current agreements do not indicate the responsibility for any of the potential DMTS related DR&R. Further, the current agreements do not indicate the status of the Reserve Account at the end of the term or if this account can be used for these purposes. Depending upon the nature of any new future development, the closure plan and DR&R amount will likely be renegotiated.

## Opportunities

The DMTS infrastructure can provide support to numerous opportunities into the future. Some of these include:

- *Regional fuel distribution.* The bulk fuel tank farm at the DMTS port could provide fuel for some of the local communities and potentially reduce their current high-cost of fuel for both heating and electrical production.
- *The “Opening of the Arctic”.* The potential for increased shipping traffic for the northwest passage route (US West Coast to Europe or Asia to US East Coast/Europe) may also provide opportunities for DMTS to support these shipping activities.
- *Regional material receipt and staging.* The port provides a potential location for receipt and staging of bulk goods necessary for arctic projects located along the North Slope and/or interior of northwest Alaska.

- *On-going mining activities.* The area around Red Dog and Northwest Alaska is generally unexplored and provides numerous potential opportunities for the development of other mines that could potentially utilize the DMTS road and port. Teck recently approved the VIP2 project, which is anticipated to increase mill throughput at Red Dog by up to 15%; this production rate increase will help aid in maintaining overall concentrate production levels despite anticipated decreases in raw ore grades over the remaining life of the Aqqaluk deposit. Teck is also pursuing an exploratory drilling program at the nearby Aktigiruk deposit to potentially provide a new source of ores once the Aqqaluk deposit is exhausted.

## SUMMARY

The DMTS is one of AIDEA's watershed projects and provides a key example of how State support, combined with AIDEA's resources and capabilities, can be deployed for successful economic development activities.

The DMTS provides a significant portion of AIDEA's on-going annual revenues while also supporting the largest economic engine for northwest Alaska and providing much needed jobs for residents of the region. The agreements which structure the full Red Dog project, exemplify a successful public-private partnership. Continued future planning and engagement by all stakeholders, coupled with an understanding of the project's history, will ensure its continued success.



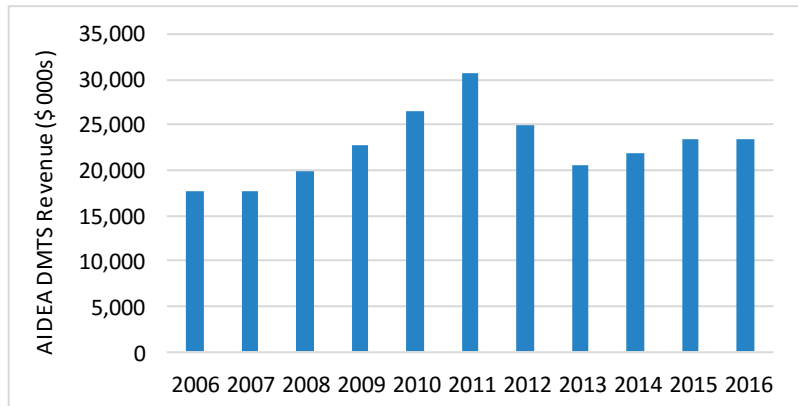


## INTRODUCTION

This Delong Mountain Transportation System (DMTS) Asset Management Review report is intended to serve as an AIDEA briefing report to achieve the following objectives:

- Summarize DMTS project history, project agreements, key milestones, and stakeholders
- Identify and leverage lessons learned, key takeaways, and best practices that may continue to be applied to this and other AIDEA projects
- Understand potential project related expansion or other associated economic development opportunities
- Better understand project risks and opportunities in a changing external environment
- Identify areas in the existing project agreements that may require modification or adjustment to reflect current operational and/or management practices
- Identify key risks and develop potential action scenarios related to DMTS on-going operations
- Set the course moving forward, including recommendations for improved project management or further analyses

AIDEA accounts for its DMTS investment as a direct (capital) financing lease. The size and length of this lease makes up a significant portion of AIDEA's annual revenues, providing between \$15 – 30 million annually before debt service, depending upon annual throughputs and zinc prices. This consistent, long-term revenue is a key support for AIDEA's bonding abilities. DMTS provides an on-going revenue stream for the



**Figure 1: DMTS provides a long-term, stable, and significant revenue source to AIDEA.**

Authority, allowing it to support its mission to promote, develop and advance economic growth and diversification in Alaska. The revenues from DMTS also comprise a significant portion of AIDEA's annual net income and its dividend to the state general fund.

### **Key metrics/benefits**

- Project Value/Investment: \$265M (current lease balance of \$136 M as of June 30, 2017)
- Total AIDEA development project assets (as of June 30, 2017): \$448 M
- 2016 DMTS AIDEA Revenues: \$24 M
- IRR (inception to 2015): 4.61%

## PROJECT DESCRIPTION

AIDEA's initial development project, the Delong Mountain Transportation System (DMTS) opened in 1989 to support the development of the Red Dog mine in Northwest Alaska, the state's only arctic hard rock mine. The Red Dog mine is owned by NANA Regional Corporation, Inc. (NANA), who has an agreement with Teck Alaska, Inc. (formerly Cominco; further referred to as "Teck") for its operations. Red Dog is one of the world's largest producing zinc mines, providing 4-6% of the world's zinc ore supply (2016).<sup>1</sup> Red Dog has processed 78.3 million metric tons of ore averaging 19.6 percent zinc and 5.3 percent lead over 27 years (thru 2016).<sup>2</sup>



*Red Dog Mine and Mill Facilities*

### PROJECT GOALS/PURPOSE

The DMTS is constructed as a "public" facility/system and is "open" for use by other mines or users. As the first user, Teck has priority for the current capacity and DMTS operations. Since its inception, Teck has been the only user for the DMTS infrastructure/facilities. DMTS' sustainability is therefore currently dependent upon the success of the Red Dog Mine. The DMTS provides the only means for shipment (to market) of Red Dog's mined zinc and lead concentrates. Red Dog is the most significant private industry and employer in the Northwest Arctic Borough (NWAB). The partnership between NANA, Teck, and AIDEA was formed to facilitate the Red Dog Mine and the DMTS construction and operations, which continues to provide economic development in this remote, arctic region of Alaska.

### PROJECT OVERVIEW

The DMTS consists of public port facilities constructed on the Chukchi Sea shore, and a 52-mile haul road that enables the transport of fuel and other bulk supplies to the Red Dog mine/mill and the transport of concentrates from the mine/mill to the port. The port facilities and the mine/mill sites are located on lands selected by NANA under the Alaska Native Claims Settlement Act (ANCSA). The road crosses national monument lands (Cape Krusenstern) where NANA has a long-term access agreement (with the National Park Service [NPS]); AIDEA's lease with NANA covers both the NANA and NPS lands.



*Aerial view of the DMTS port facility*

The DMTS and Red Dog mine construction activities were largely completed in 1989, and the first concentrates were shipped in August 1990. The mine and mill have undergone two significant projects to increase their throughput since opening: the Production Rate Increase (PRI) project in the mid to late 1990s and the Value Improvement Project (VIP) in the late 1990s. The PRI project also incorporated a significant port facilities expansion to enable total potential concentrate throughput to increase from roughly 800,000 tons per year (tpy) to 1.3 to 1.4 million tpy.<sup>3</sup> Other projects at both the port and mine/mill have improved operational safety, decreased environmental impacts, minimized energy consumption, and increased zinc and lead recoveries from the mined ores. As an example, a recent project involved the installation of a lime slacking process to minimize operational costs related to the mill's water treatment requirements. The new slacking facility enables the on-site production of calcium hydroxide.



2014 Satellite Image of Red Dog Mine

Similar to the port, the Red Dog Mine exists on lands selected/owned by NANA (through ANCSA). Teck Alaska Inc., a wholly owned subsidiary of Teck Resources, Ltd. of Vancouver, British Columbia, operates the mine under an agreement with NANA. Cominco, the original mine developer, was purchased by Teck in 2001. Teck is one of the largest lead-zinc mining and smelting companies in the world.

The full DMTS includes the following infrastructure:

- A 52-mile, 30-foot wide all-weather gravel industrial haul road, constructed primarily over permafrost with a 5-foot minimum gravel depth, from the mine site to the port facility (see Figure 2); the road includes 9 bridges for creek crossings as depicted in Figure 5
- A shallow water dock to receive supplies, fuel, equipment, and personnel
- An offshore conveyor system to load zinc and lead concentrate to lightering vessels (barges) that can convey the concentrate to larger ships further offshore
- A fuel distribution facility including 6 bulk tanks capable of storing approximately 15 million gallons of fuel for port and mine use
- Storage facilities, including two Concentrate Storage Buildings (CSBs) with approximately 1.2 million tons of ore storage capacity
- On-site power production, other utilities (water and wastewater treatment) and residential quarters for up to 96 workers
- Port site lay down yards, exterior storage areas, and stormwater/runoff water treatment facilities
- New lime slacking facility to allow on-site production of calcium hydroxide



## PROJECT LOCATION

As described previously, the Red Dog mine is a world-class, open-pit zinc-lead mine located 90 miles north of Kotzebue, Alaska in the southwestern portion of the Brooks Mountain Range. The DMTS port site is approximately 16 miles southeast of Kivalina, a small coastal community. The port site is connected to the mine/mill site by the two-lane DMTS industrial access road that extends roughly 52 miles. Due to arctic sea ice, the shipping season for the port is typically limited to four-months (July – October).



**Figure 2: Project Location Map**

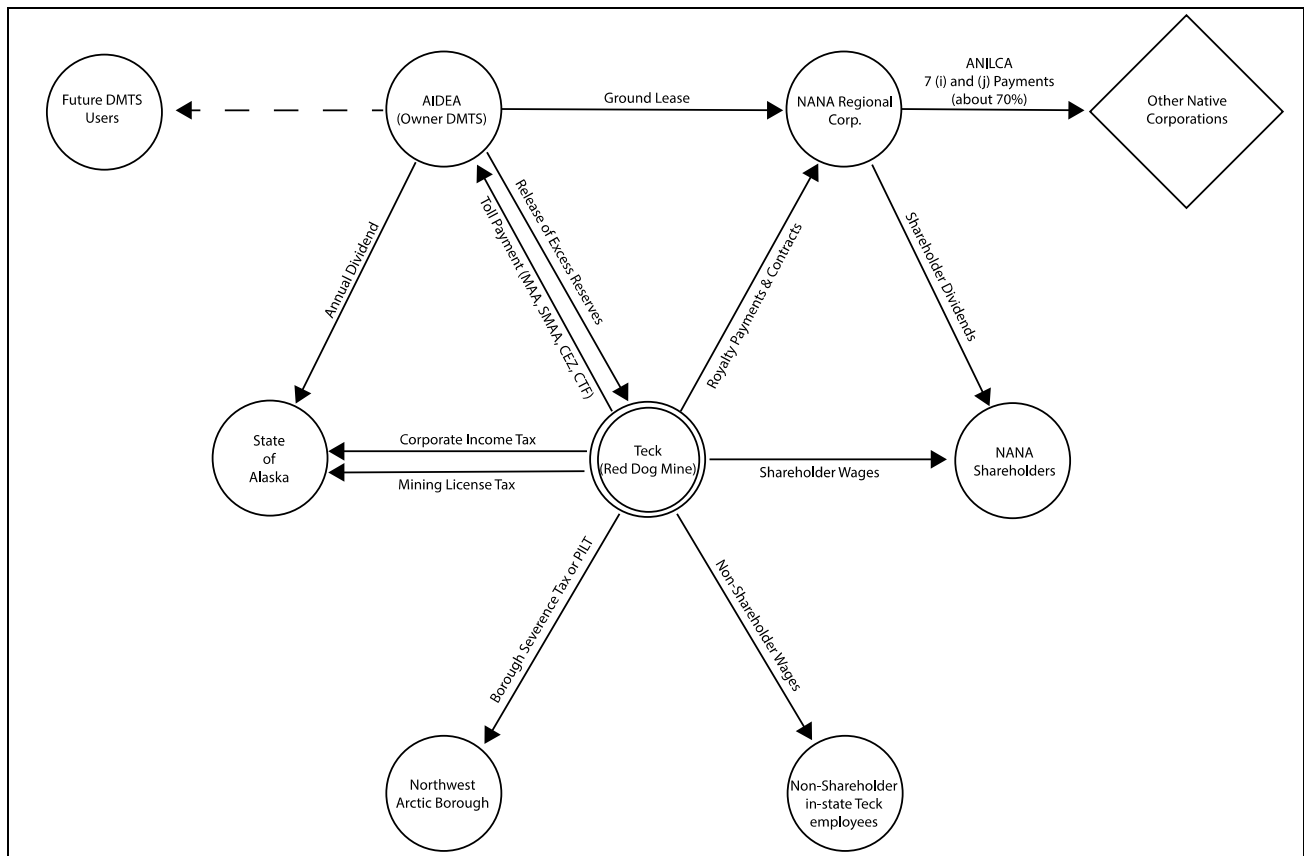
## KEY PLAYERS/STAKEHOLDERS

Stakeholders in the DMTS project include the entities as listed below. Figure 3 depicts their relationships.

- *AIDEA*. AIDEA owns the DMTS assets as described above.
- *Teck Alaska Inc.* Teck Alaska Inc. (Teck) is a wholly owned subsidiary of the Canadian mining company, Teck Resources Ltd., and is the primary operator and preferential user of the DMTS facility/infrastructure. Teck operates/uses the DMTS through its agreement with AIDEA.



- *NANA*. The port facility and the road connecting the Red Dog Mine to the port were developed on land owned or leased (from the NPS) by the NANA Regional Native Corporation and then subsequently leased by/to AIDEA. NANA also owns the land and mineral rights for the areas in which the mine and mill exist; Teck operates the mine for the benefit of and through its agreements with NANA. Later sections in this report provide key historical information on NANA and its land claims related to Red Dog/DMTS.
- *NWAB*. Both the port/road and the mine/mill sites exist within the NWAB boundary, the local government with jurisdiction. The Borough was formed in 1986, justified by the support of the upcoming mine development (further historical information is provided later in this report).



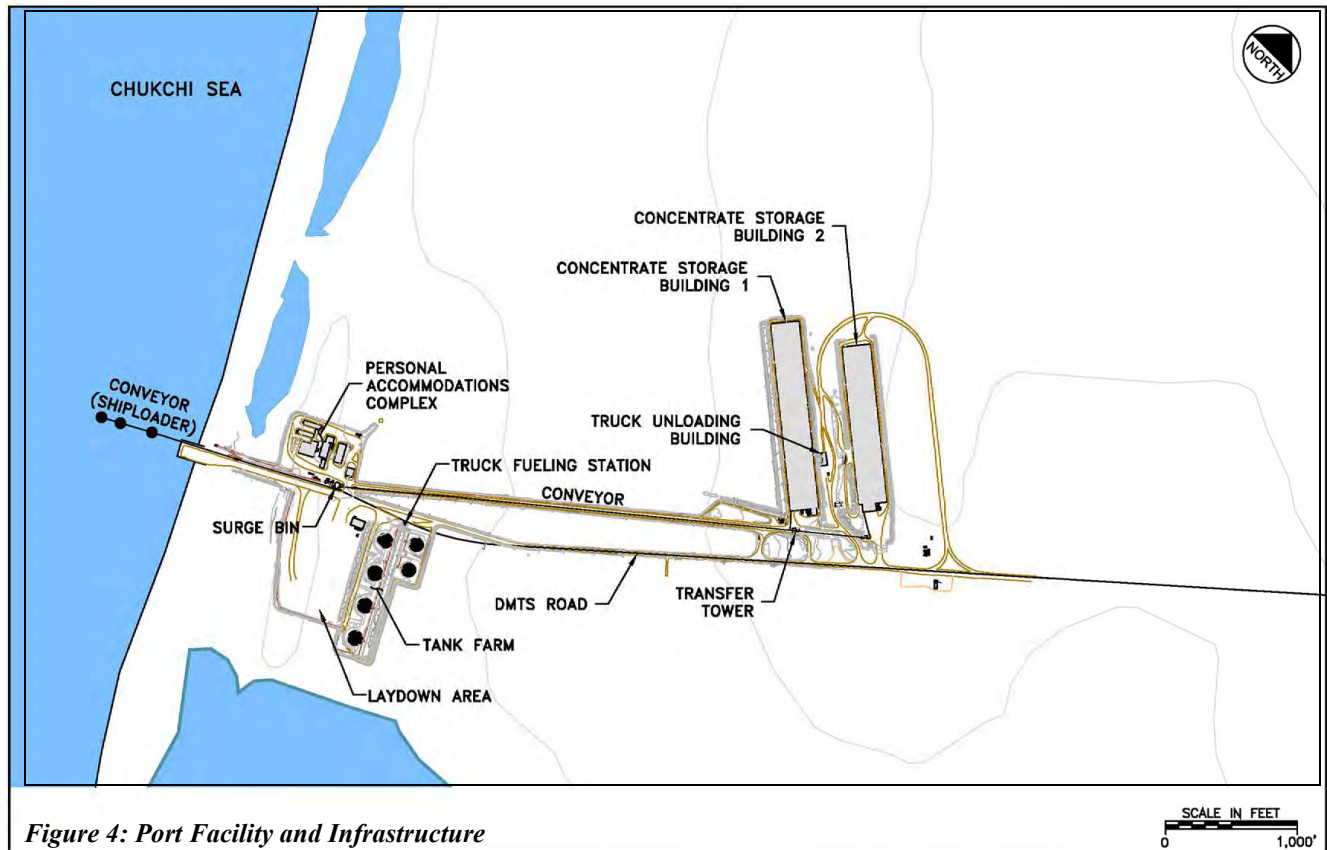
**Figure 3: DMTS Stakeholders**

## OVERVIEW OF DMTS OPERATIONS



*DMTS Port and CSB facilities*

The primary DMTS operations include the receipt and storage of concentrates produced from the mine and then the subsequent loadout/shipping of these concentrates during the roughly 4-month ice-free shipping season window. The concentrates, transported via dedicated trucks (trailers) for either zinc or lead, are received continuously throughout the year on a 24/7 basis. Various pictures throughout this report show the many elements of the DMTS infrastructure and logistics process, including the concentrate receiving, storage, and loadout processes. Figure 4 graphically depicts the major infrastructure at the DMTS port.



**Figure 4: Port Facility and Infrastructure**

**FIGURE 2.2  
DELONG MOUNTAIN REGIONAL TRANSPORTATION SYSTEM PORT SITE**

Standard receiving operations for the DMTS involve the following:

- Each concentrate truck/trailer is loaded at the mill site through the overhead loading system present at the mill CSB; the capacity of each truck (both trailers) is roughly 132 – 134 wet metric tons (WMT).
- Each truck takes roughly 1.5 hours to travel the 52 miles from the mill to port site (maximum speed, 45 miles per hour). The road includes several areas where stopping for breaks and/or safe passing is possible. Nine bridges, as shown by the map in Figure 5, are located along the route/road.<sup>4</sup> Each truck maintains communication contact, via regular check-ins, with other road users and the road monitoring personnel at the truck unloading building (TUB) (aka, “the hopper”) during their travel to (or from) the port.
- Trucks enter the TUB to empty each trailer (side-dump) into the hopper which receives the concentrates and using various conveyors, moves the concentrates to the appropriate stockpiles within either of the port CSBs. Unloading of each truck (both trailers) takes approximately 10 minutes. As noted in later subsections of this report, since its original construction, Teck has provided significant safety and environmental upgrades to the truck unloading process that have also improved the efficiency of this system. Unloaded concentrates are carried by the overhead conveyors to the dumping systems located at the crest of both CSB roofs. CSB#1, the larger and original CSB, is used only for zinc storage; CSB#2 is used for both zinc and lead storage.



*Concentrate haul truck approaching the TUB*



*Unloading of a concentrate haul truck*



*DMTS shiploader conveyor system*



Weather was sunny and clear the first day, sunny and clear the second day, and foggy the third day, which delayed inspection the third day until the afternoon. Work consisted of evaluating the all bridge components including the approaches, bridge structures, and drainage channels.

December 2017



*Figure 5: Bridge locations*

**FIGURE 1. ROUTE MAP**

Port loadout (export) operations, which are restricted to summer/ice-free months, are complicated due to the Chukchi Sea's shallow nature in the area around the DMTS port (and nearly all of northwestern Alaska). Loadout operations require a multiple step process:

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1. Concentrates are loaded (via bulldozer and front-end loaders) from the CSB stockpiles to the conveyor systems located along the west wall of each CSB.
2. The conveyor system carries the concentrates to the shiploader; a surge bin is located midway to maintain consistent flows.
3. The shiploader is used to "fill" each lightering barge; the telescoping and shiploader's pivoting ability enables it to fill and spread the concentrate around each barge. A front-end loader in each barge also aids the filling of the barge. Teck contracts with Foss Maritime Services for the use/operation of two specialized shallow water barges, the MS Noatak and the MS Kivalina. Each barge takes roughly 3 hours to fill to their capacity of roughly 5,400 WMT. Foss also provides the tugs that tow the barges.
4. Barges are towed (via tugboat) to the ocean-going vessel, just over three nautical miles offshore (dependent upon the vessel draft and size).



*Tug pulling lightering barge*



5. Concentrates are off-loaded from the lightering barge to the receiving ocean-going vessel, using the barge's loader/conveying system; the two front-end loaders in the barge are used to "fill" the conveyor system that mechanically conveys the concentrate from the barge to the ocean-going vessel. The roundtrip travel time to the ocean-going vessel and the unloading time for each barge is roughly six to seven hours. The loading of each ocean-going vessel, with capacities ranging from 35,000 to 70,000 WMT of concentrates (7 - 14 barges), can take approximately two to four days of continuous lightering operations.<sup>5</sup>

The DMTS port is the sole means of receipt for bulk materials, equipment, and supplies for the mine and port, including food, chemicals, grinding media, explosives, and other goods. All fuel for the mine and mill, for both vehicle and electrical production, is received and stored at the port. The port typically receives roughly 20 million gallons of fuel annually via 2 or more bulk shipments. The port's shallow water dock is used to receive both the bulk fuel barges and the container barges with the supplies, materials, and equipment for the mine, mill, and port. Port staff regularly perform seasonal dredging around the shallow water dock and the shiploader to safely permit the docking of the various tugs and barges. Dredged materials are managed according to the port's permits with the U.S. Army Corps of Engineers (USACE).



*Loading of an ocean-going vessel from the lightering barge*

To enable the continuous receipt of concentrates (24 hours per day, 7 days per week) from the mine, the port includes appropriate mancamp/lodging and utilities support infrastructure. During the winter, non-shipping season, port staff include only those individuals that support the continuous receipt of the concentrates, appropriate facilities maintenance personnel, and facilities support personnel (cooks, housekeeping, etc.). During the shipping season, port staffing includes additional Teck or contracted staff to support the loadout and receiving operations, additional facilities support personnel, summer construction project personnel, the lightering barge and tugboat (Foss) personnel, and individuals with the contracted ocean-going cargo vessel company. U.S. Coast Guard and other regulatory personnel also frequently perform various inspections during the loadout operations.



*DMTS Concentrate Storage Buildings #1 (left) and #2 (right)*



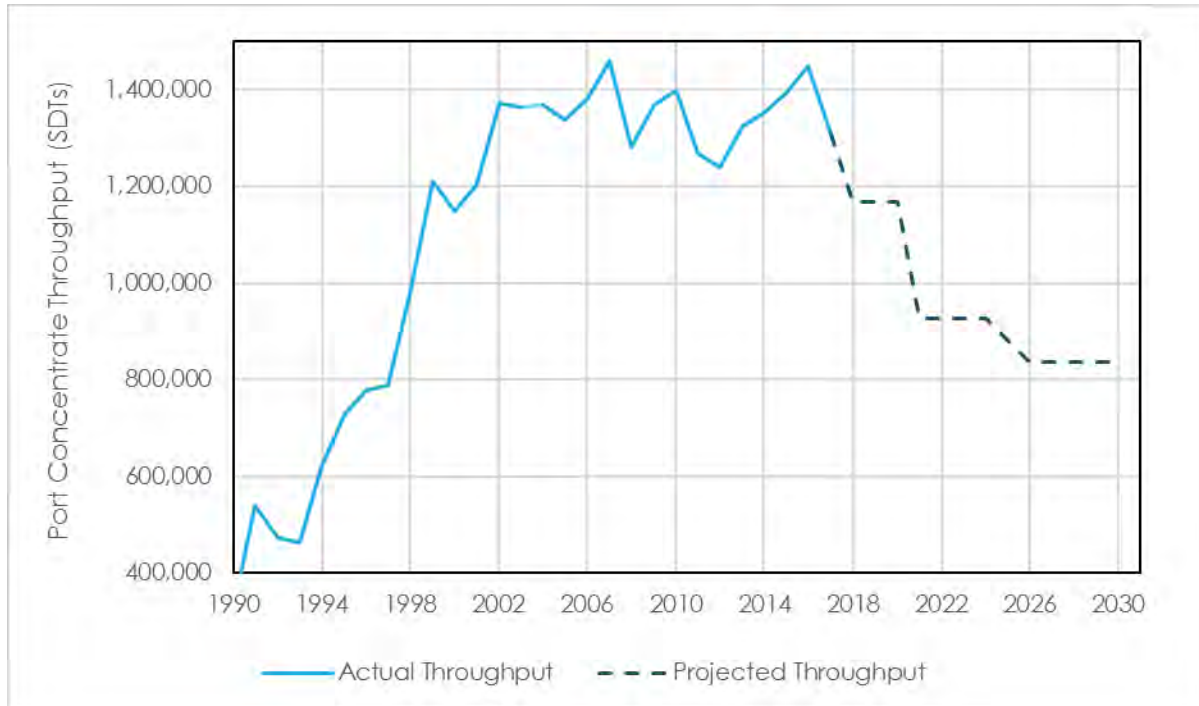
*Concentrate Truck and Trailers*

Concentrate trucks are received continually throughout the year, pausing only due to road/weather conditions and/or caribou near or crossing the road. Fuel shipments from the port's bulk tank farm to the mine/mill bulk tanks are performed via multiple roundtrips daily during the majority of the year. Teck also employs a team of heavy equipment operators and others that are responsible for the DMTS road maintenance, including snow removal during the winter and grading, road repair, and dust suppression during the summer.

Table 1 provides a summary of key traffic and throughput metrics for the DMTS. Figure 6 shows the system's historical and projected future total ore throughputs, updated through 2016.

**Table 1. Typical DMTS Operational Throughputs and Capacities <sup>6</sup>**

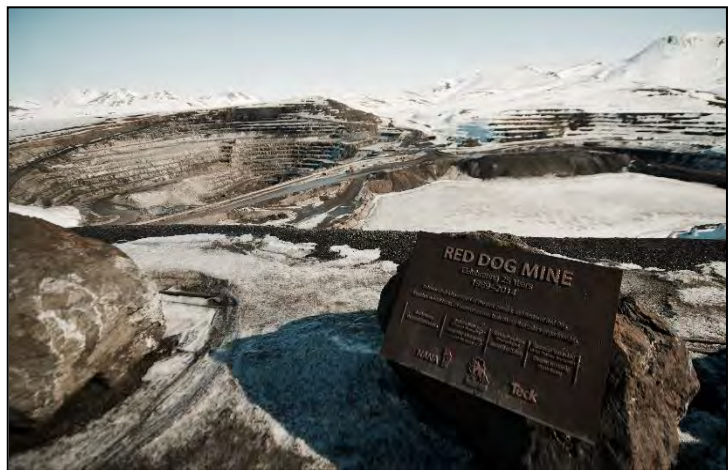
Description	Annual Average/Range (units)
Zinc and Lead Concentrates (output)	1.1 – 1.4 million wet metric tons
Port Container Traffic	>3,000 containers received/shipped out (empty) annually
Lime Receipt/Usage	8,400 tons/year
Port Fuel Storage	19 – 21 million gallons annually (diesel) 2 – 3 bulk shipments received annually
Daily Road Traffic: – Misc. vehicles/supply trucks – Concentrate trucks	8 – 20 vehicles/trucks, seasonal dependent 15 – 36 trucks per day, seasonal dependent
Port Staffing (Teck + Contractors)	18 – 22 (non-shipping season; Nov – May) 70-90+ (shipping season; June – Oct)
Port Fuel Usage	3,000 – 4,000 gallons/day annual average
Ocean Vessel Loadouts	22 – 26 annually
Concentrate Barge Loadings	250 – 300 annually



**Figure 6: DMTS Concentrate Throughput, historical and projected <sup>7</sup>**

## MAJOR DEPOSITS OF THE RED DOG DISTRICT

Currently, the only DMTS user is the Red Dog Mine operated by Teck. Red Dog Mine produces ore via open pit mining, and is primarily extracting ore from the Aqqaluk deposit, which is adjacent to the now closed original Red Dog (main) deposit. The original Red Dog (main) deposit was mined from the mine's opening through 2012, producing over 8 million tons of zinc and 1.5 million tons of lead. Some ore has also been produced recently from the nearby Qanaiyaq deposit; this ore is periodically added to the Aqqaluk ores as conditions permit. During the first quarter of 2017, ore from Qanaiyaq pit was introduced to supplement declining grade ore from the Aqqaluk pit. Changes in mine sequencing and improved metallurgical recoveries, allowed Teck to increase production to finish 2017 with 550,000 metric tons of ore.<sup>8</sup>



*Red Dog Mine Aqqaluk (background/left) and original deposit (foreground)*



Based on current mining rates and known ore body reserves, mining of these two deposits is anticipated to continue through 2031. Implementation of the VIP2 project over the next few years will result in an increase of mill processing capacity, potentially increasing the mine life slightly beyond 2031.

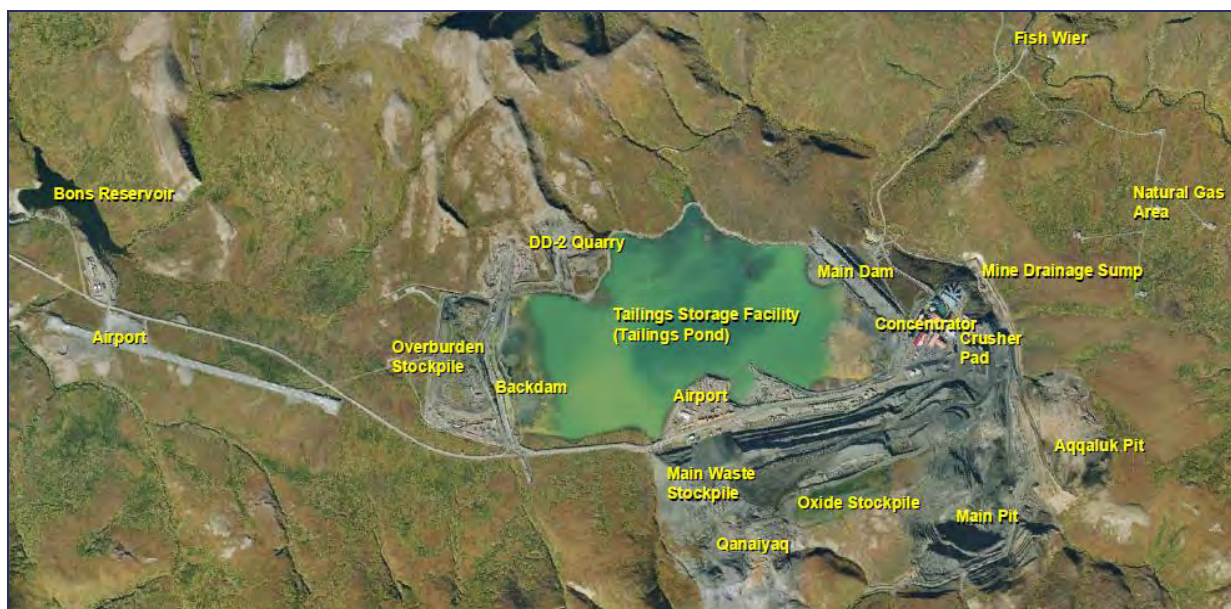
Teck has performed significant exploration activities in the Red Dog region over the past several years, intending to identify and “prove-up” significant new ore reserves, both within the Aqqaluk deposit and within other nearby deposits. Depending upon the size, location, environmental factors, economics, and other arrangements necessary for developing these potential ore bodies, the existing mill and supporting DMTS operations may be extended beyond 2031. However, since the timing for achieving all necessary approvals to develop a new ore body will likely take ten years or more, significant planning efforts must be started within the next few years to ensure continuous project operations. Later sections in this report provide greater detail on the potential future of the project.

In the 2015 shipping season, Red Dog Mine produced roughly 1.1 million wet metric tons of zinc concentrate and 230,000 wet metric tons of lead concentrate.<sup>9</sup> Output for 2016 and 2017 was similar to 2015, as shown in Figure 6.<sup>10</sup>

**Table 2. Major Deposits of the Red Dog District <sup>11</sup>**

Deposit	Ore (tons)	Years of Operation	Mine Type	Zinc (%)
Red Dog Main Pit	>65,000,000	1990 – 2012	Open pit	20.6
Aqqaluk	55,600,000	2010 – 2031	Open pit	16.4
Qanaiyaq	4,800,000	2016 – 2025	Open pit	23.4
Lik <sup>12</sup>	18,110,000	N/A	Open pit	8.10

*Note: Other deposits are known to exist in the area; Teck is currently exploring/delineating some of these deposits.*



**Figure 7: Red Dog Mine/Mill Area Overview Map**

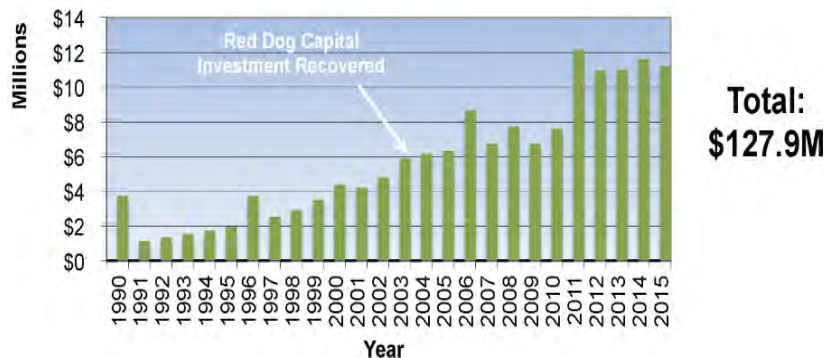


## ECONOMIC IMPACTS

The Red Dog Mine and in conjunction, the DMTS, are key contributors to the regional and state economy, providing significant direct and indirect economic benefits to Alaskans, the region's villages and Native communities. In 1986, the promise of the mine's construction led to the NWAB's establishment.

With an annual direct and contracted payroll of more than \$70 million, more than 700 jobs are provided through the mine and DMTS operations. These jobs also provide an annual average wage of \$99,000, which is more than \$30,000 higher than the median wage for NWAB households.<sup>13</sup> The majority (61%) of these jobs are held by NWAB residents or NANA shareholders. Since 1989, Teck has employed 1,541 NANA shareholders, with many families now having two generations working at the mine.<sup>14</sup> This does not account for the NANA shareholders employed by NANA or its subsidiaries at the mine/mill. Roughly

20% of the jobs in the NWAB are directly attributed to Teck/Red Dog and its on-site contractors.<sup>15</sup>



**Figure 8: Northwest Arctic Borough Payments In Lieu of Taxes (PILT)**

For over 25 years, Red Dog Mine has made contributions to the Borough through multiple Payment in Lieu of Taxes (PILT) agreements. Under the 2011-2015 PILT, total payments averaged \$11.5 million per year. Since mining began, Teck has provided more

than \$125 million to the Borough, with additional taxes and fees paid to the State of Alaska.<sup>16</sup> A new PILT agreement was authorized in April 2017 and will carry through 2026. The new PILT agreement included an increase of Teck's payments to between \$20 and \$26 million each year, based on the mine's fixed asset values and a percentage of the mine's net income.<sup>17</sup> The agreement includes two payments: (1) a payment to the Borough for aiding on-going Borough and school district operations, and (2) a payment into a Village Improvement Fund to support community programs, services, and infrastructure. This new PILT agreement supersedes the Borough's severance tax, which was increased in 2015. The severance tax is applicable to mine profits if the mine does not have a superseding PILT agreement.<sup>18</sup> As a buildup to this agreement and lacking progress on the negotiations for a new PILT, Teck filed suit with the Borough in January 2016 regarding the constitutionality of the severance tax. This suit was dropped by Teck as a result of the recently approved PILT agreement.<sup>19</sup>

Teck historically provides 80% or more of the NWAB's funding for municipal government services.<sup>20</sup> In addition to the direct Borough payments, Teck has helped facilitate the purchase of lower cost heating oil for local villages and residents over the past several years. Teck is also a large supporter of local non-profit organizations with donations and other direct involvement. Royalty payments to NANA, the mine landowner, average more than \$100 million annually, and are currently set at 35% of the net production

proceeds, per the escalating scale given in the NANA-Teck agreement (the percentage recently increased in October 2017 by 5% according to the agreement).

The 2016 payment was nearly \$109 million. Under Section 7(i) of the Alaska Native Claims Settlement Act (ANCSA), 70 percent of NANA's royalty receipts must be shared with the other Alaska Native Corporations (both regional and village).<sup>21</sup> Through 2017, Teck estimates its total royalty payments at more than \$1.8 billion since the mine's opening, with about \$860 million of that shared with the other (non-NANA) regional and village native corporations.<sup>22</sup> For both NANA and the other regional/village corporations, this funding has been a critical element in the funding of shareholder dividends and providing capital and opportunities for the development of other business endeavors. A greater description of the NANA-Teck agreement is provided later in this report.

**Table 3. Summary of Red Dog Mine Economic Contributions** <sup>23</sup>

Description	Contribution
Annual average jobs (includes on-site, year-round contractors)	550
Average salary of a Red Dog mine employee	\$99,000
Total annual wage impact in NWAB	\$65 Million
Average annual wage spending	\$75 Million
Spending on goods and services within the State of Alaska	\$158 Million
NANA 7(i) payments (to other ANCs) from Red Dog royalties	>\$800 Million
Community investment and donations in the region <sup>24</sup> (2010-2015)	\$2.8 Million

Through its agreement with Teck, NANA also receives preferential consideration for contracting opportunities at Red Dog. Importantly, NANA has leveraged this preference to support several of its other business units. An example of this is its hospitality services business, NANA Management Services (NMS). While NMS was established prior to the startup of Red Dog, NMS has consistently supported the Red Dog project with hospitality, catering, and related management services. On an annual average basis, NMS employs more than 75 individuals through its contracts with Teck at Red Dog. Similarly, NANA's engineering services and construction companies, including WHPacific, NANA-WorleyParsons, and GIS Construction, have performed or supported much of the on-going engineering, studies, and construction projects performed at the mine and port. NANA has and continues to leverage experience from its Red Dog contracts to build these businesses inside and outside of Alaska.

Teck also provides significant payments to the State, via its payment of the Mining License Tax (MLT) and state corporate income taxes. As one of the state's largest mines, Teck provides one of the largest MLT contributions. MLT payments are calculated as a percentage of net mine income and are thus dependent upon commodity prices, mine production, and operating expenses.<sup>25</sup>

Importantly, Teck's payments to AIDEA also can be considered an important contribution to statewide economic development. As described previously, the long-term stable nature of the Teck-AIDEA agreement and its cash flows provide AIDEA significant bonding capacity to support other projects. The regular income has also helped build AIDEA's economic development account, further enabling the support of AIDEA's mission.

## PROJECT BACKGROUND

### **AIDEA'S ROLE IN DMTS/RED DOG DEVELOPMENT**

AIDEA's DMTS ownership dates back to the beginning of the overall Red Dog project and can be described through several key periods of the project's history as outlined in the following subsections. The timelines provided in the following pages also highlight many important events in the project's history.

#### Initial DMTS Construction and Financing

Following Cominco's successful exploration efforts in 1981, the company began developing the initial mine plans, designs, and cost estimates. Early on, both Cominco and NANA approached the State about assistance in the overall enterprise development. Importantly, both entities coordinated their efforts, to include reaching out to important state politicians, industry groups, and the executive/regulatory agencies. This assistance primarily centered on state ownership of the transportation system that would be necessary for the project, much like other State transportation assets.<sup>26</sup> Governor Sheffield's administration supported the concept and authorized a formal analysis through the production of a Department of Commerce, Community, and Economic Development (DCCED) led report that confirmed the mine and transportation system's potential finances and the economic development benefits from state ownership of the road/port.<sup>27</sup>



*Aerial of Red Dog Mine Airstrip (with contractor camp in background right)*

The report, with support from key legislators, the Governor, and NANA, led to the passage of Senate Bill (SB) 347 by the 13<sup>th</sup> Legislature in the spring of 1984. SB 347 developed into AIDEA's participation in the project.<sup>28, 29</sup> This legislation created AIDEA's development finance program and provided seed money (\$3.4 million) for the early studies of the DMTS road and port financing. The legislation stipulated that only after preparation of an acceptable financing plan would the Legislature authorize the construction financing

for the project. In the summer of 1984, the Department of Transportation and Public Facilities (DOT&PF) and the Department of Administration (DOA) modified the state procurement regulations to enable other state agencies, such as AIDEA, to have separate procurement authority. This permitted AIDEA to enter into sole-source contracts for the pre-design and purchase of previously conducted pre-design work by Cominco for the DMTS (using the seed funds). In addition, AIDEA used the seed funds to solicit for and then selected SRI International (SRI) to perform due diligence on the project and its potential economics. SRI completed drafts of their report prior to the completion of the 1985 Legislative session and delivered their final report in July 1985.

SRI based their analyses on Teck's exploration and delineation drilling data estimating total ore reserves for the mine of more than 60 million metric tons, grading roughly 18% zinc and 5.5% lead. The SRI report provided a positive review on the potential project under the current (1985) zinc prices and the project's anticipated concentrate production rates of roughly 600,000 wet metric tons/year of concentrates (zinc and lead) through the projected mine life of 30 years (to 2018).<sup>30</sup> The report's economic model anticipated future and rising market prices for zinc; it also anticipated other port users that would share in the costs and receipts of fuel and other goods/cargoes. Unfortunately, as later described in this report, neither of these assumptions proved true upon opening of the mine.

AIDEA solicited a separate contract with R&M Consultants in 1985 to review the design and cost estimates for the DMTS plans. R&M validated the design and cost estimates for the full system (\$160 million). The estimated road costs were \$90 million, with the port infrastructure estimated to cost \$70 million.

Based on these positive reports, the 1<sup>st</sup> Regular Session of the 14<sup>th</sup> Alaska Legislature passed Senate Bill 280 that provided the following components enabling AIDEA to move forward with the DMTS financing and construction:<sup>31</sup>

- Receipt of a loan portfolio (from the Department of Revenue) and a state appropriation, totaling \$132 million
- Transfer of \$12 million from AIDEA's multi-family housing fund to the Economic Development Fund. The Economic Development Fund was established as a new fund to enable the financing of the DMTS; this fund was separate from AIDEA's other primary fund at the time
- Authorization for AIDEA to issue bonds up to \$175 million for the DMTS project. The funds and loans authorized above provided a portion of the security for these bonds

In June 1985, AIDEA and Cominco executed a Memorandum of Understanding (MOU) that laid the groundwork for the formal negotiations and the eventual project agreement, signed in June 1986.<sup>32</sup>

According to AIDEA statutes (AS 44.88.095(e) and 44.88.174), the approval of local communities must be received prior to AIDEA's bonding for projects. In early 1986, lacking an area government for northwest Alaska (the NWAB was in the process of official formation), Governor Sheffield appointed a Regional Resource Advisory Council to provide the local approval for the project and AIDEA's financing/bonding of it. This council subsequently passed Resolutions D-86-1 and D-86-2 in April 1986 supporting the project.<sup>33</sup> Simultaneous to the on-going efforts to form the NWAB, the North Slope Borough (NSB) was also attempting to annex the area around the mine. In support of this effort, in May 1986, the NSB also issued a resolution of support (Resolution 12-86).<sup>34</sup> Later report sections provide further details on the NWAB's formation that ultimately superseded the NSB's annexation attempts. NANA's support also provided a key driver for the NWAB's formation.

Pursuant to the legislative approval received in 1986 and the approvals of the local communities, AIDEA's Board passed several resolutions related to the project and subsequently sold \$103 million of bonds for the project in March 1987. Further details on this bonding are provided later in this report. Some of the financing was used to repay Teck for early DMTS development costs, including design and environmental permitting/environmental impact statement (EIS) costs.



Construction on the port and road began in 1986 and continued through the early 1990s. The official port opening occurred in 1989 when the first mill modules were received and transported to the mine/mill site. The initial mill construction consisted of seven modules, with the largest being more than 130 feet long, 60 feet wide, and 6 stories tall. These modules were moved across the port and road in summer 1989. The first loads of concentrates were shipped from the port in 1990. Additional financing, secured by Teck from outside sources, enabled continued working improvements to the DMTS through the early 1990s.<sup>35</sup>

Details on the port facilities as initially constructed are provided in Table 4. Importantly, for the first several years after opening, the DMTS port facility was not occupied year-round; rather, port operations personnel traveled from the mine each day.

**Table 4. Summary of Initial DMTS Infrastructure**

Description	Capacity/Capability
Capacity of Concentrate Storage Building #1	535,000 WMT
Shiploader maximum throughput rate	2,200 WMT/hour
Fuel Storage Capacity	(4) 2.5 million gallon tanks
Initial mancamp size/capacity	40 beds

As a state-owned asset, the DMTS construction was subject to state procurement regulations. As mentioned above, these regulations were modified through the 1984 and 1985 legislation to provide greater flexibility for AIDEA's contracting of the project's construction. However, included with the procurement code changes enacted in 1986 were requirements for state-funded projects to preferentially hire local residents for projects in economically disadvantaged areas. Alleging that Ensearch Alaska Construction, Inc., the primary contractor for the DMTS road construction, did not adequately follow these preference requirements, a lawsuit was brought by a local Alaskan construction company. This suit eventually led to a 1989 decision by the State Supreme Court that upheld a prior Superior Court decision to strike-down the local-hire preference requirements.

In 1994, AIDEA repaid the State of Alaska for the loan portfolio that provided security/collateral in the initial DMTS financing. The AIDEA Board approved a \$60 million transfer from the Authority's Revolving Fund to the State's general fund.<sup>36</sup>

### Red Dog Mine Startup and Debottlenecking

Following the initial phase of Red Dog construction completion in 1990, Teck began achieving roughly 350,000 tons/year of ore throughput with increases in each subsequent year of operations. Unfortunately, zinc prices peaked in 1990 and continued to fall through much of the early 1990s, reaching a low point in 1994. Figure 13A, provided later in this report, depicts zinc prices since the DMTS opening. The falling and sustained low prices during 1990-1994 challenged the economics for the overall project. As a result, Teck initiated numerous projects



*Red Dog Mine Conveyor and Crusher*

to debottleneck the milling processes and continue to increase total ore throughputs and thus provide lower unit production costs. Capital projects were also conducted at the port to properly manage these increased throughputs, mitigate environmental concerns, and improve process safety. By 1994, Teck had achieved throughputs of 550,000 tons/year, nearly the mill's full capacity as originally designed. Unfortunately, these throughputs were still insufficient to achieve robust economic returns at the on-going and sustained lower zinc and lead prices.<sup>37</sup> In order to strengthen the project through improved economies of scale, Teck evaluated potential throughput expansion opportunities, including mill and port facilities expansion.

### DMTS Port Expansion

The original financing plan for the Red Dog mine anticipated steady to rising zinc prices after the mine's opening. However, as described above, the opposite occurred. During the early 1990s, both zinc and lead prices fell, resulting in significant economic stress on the project. While Teck did not miss any payments to AIDEA, numerous rumors circulated regarding the potential mine closure. Teck utilized funds from other projects to assist in maintaining on-going operations at Red Dog. Cost efficiencies were implemented in almost every area of the new project. Teck also implemented numerous projects to increase



*New PAC under construction, with old mancamp at bottom right, 1997*

throughput and lower unit costs, however it was realized that a significant mill and port expansion would be necessary to provide long-term economic resiliency. In cooperation with Teck, in 1993 AIDEA contracted with SRI International to update their 1986 Economic Evaluation Report for the DMTS to

evaluate the potential financing of an expansion of the port facilities.<sup>38</sup> SRI noted in their report that several factors were affecting the overall finances of Red Dog at the time:

- The project was not meeting the original projected throughput rates
- Operational costs were higher than originally projected
- Market/commodity prices for both zinc and lead had decreased versus the 1986 projections

Additionally, it was noted that other port users, who intended to share in its operational costs, had not materialized as projected in 1986. SRI concluded that the potential expansion project financing would yield improved project economics, with the degree of the positive returns dependent upon future commodity prices. Anticipated improvements in the commodity markets supported SRI's conclusions. In fact, the prolonged slump in zinc and lead prices was partly attributed to the "new" supply provided by Red Dog starting in the early 1990s. However, numerous mines were believed to be operating at near loss conditions (such as Red Dog) and the additional supply that would be provided by the proposed Red Dog expansion could ultimately lead to the closure of those mines. This would result in the removal of zinc/lead sources and subsequently longer term price increases. As mentioned, the project would also improve Red Dog's economies of scale, improving its overall cost efficiency.

Key to the due diligence surrounding the expansion agreement was the continued delineation of the Aqqaluk deposit that provided significant additional ore reserves and at grades similar to the Red Dog main deposit. This provided reassurance that the increased mine output would not sacrifice the long-term project operations and the ability to provide long-term jobs to area residents and NANA shareholders. The NANA Board approved the expansion through its November 29, 1995 meeting.<sup>39</sup>



*New Personnel Accommodations Complex (1998)*

The mill expansion project, officially named the Production Rate Increase (PRI) project, included the addition of numerous new equipment to the mill complex to increase overall throughput up to 3.5 million tons per year of (raw) ore. port facilities expansion, through the PRI Project, would enable the port facilities to match this new processing capacity and increase total concentrate output to roughly 1.3 million tons per year (both lead and zinc).<sup>40</sup> Expansion of the port facilities included the construction of an additional CSB, conveyor improvements, improved truck unloading facilities, a new Personnel Accommodations Complex (PAC), and appropriate new utilities. The financing plan for these improvements included \$80 million of new capital investment by AIDEA. In November of 1995, through Board Resolution G95-21, AIDEA moved forward with the expenditure of up to \$2.5 million for the due diligence and finance plan development for the potential expansion.



In 1996, Alaska House Bill 596 authorized AIDEA to issue new bonding for the proposed DMTS improvements and to contract with Teck for their construction. To facilitate this expansion, AIDEA negotiated a new agreement with Teck that “restated” the initial (1986) agreement and included the terms and conditions for the expansion and its financing (further details on this agreement are provided later in this report). This agreement was signed on March 12, 1997.<sup>41</sup> Ahead of this agreement and to comply with AIDEA statutes, the NWAB approved Resolution 97-06 on February 25, 1997 consenting to the project location and supporting its financing by AIDEA.<sup>42</sup> Later that month, AIDEA issued \$70 million of bonds for financing the DMTS expansion. Table 5 provides the details on the improvements included in the 1997 expansion project.



*CSB#2 under construction (August 1997)*

**Table 5. Summary of DMTS Expansion Infrastructure**<sup>43</sup>

Description	Capacity/Capability
Capacity of Concentrate Storage Building #2	497,000 WMT
Additional Fuel Storage Tank Capacity	(2) at 2.5 million gallons each (1 added in 1997, 1 in 2001)
New Personnel Accommodations Complex Capacity	96 persons (or more based on bunking arrangements)
Improved Truck Unloading Capacity	300 tons per hour
Current (2015) Electrical Generating Capability <sup>44</sup>	(1) 1,250 kW generator (1997 construction) (3) 650 kW generators (1988 construction)
Heat Recovery System	Powerhouse glycol heat recovery system with supplemental 500kW glycol heater

### Post Expansion and Current Operations

The PRI project completion and subsequent Value Improvement Project (VIP) in the late 1990s enabled Teck to continue to increase mine throughput, with significant increases experienced throughout the period of 1994-2001. Teck announced in September 2017 they are moving forward with a \$110 million VIP2 mill upgrade project, which will result in a 15% increase in average throughput and offset challenges of processing lower grade and harder ore from the Aqqaluk pit.<sup>45</sup> It is anticipated this will enable the mine to maintain overall concentrate production levels at rates similar to today’s and potentially extend the life of the Aqqaluk deposit slightly beyond 2031.

Teck has not completed significant DMTS modifications since the port expansion project in the late 1990s. However, several smaller optimization, environmental, and efficiency improvement projects have been performed, including:

- Improvements to the conveyors to mitigate safety concerns, improve performance, and prevent dust generation
- Improvements to the truck unloading operations, including improved monitoring and dust controls
- Improvements to the drainages around the CSBs to enable the increased collection and treatment of area runoff
- Modifications to the sewage treatment plant (STP) to improve and enable on-site management of the solids
- Replacement of electrical generators (as necessary) and installation of new emission control systems to meet current regulatory requirements
- Replacement and upgrades to the cathodic protection system for the shiploader and associated infrastructure
- Installation of new/additional food storage/freezers for the PAC
- Continued expansion via the installation of new monitoring and control hardware, linked to the overall port computerized control system.




*Zinc concentrate piles in the CSB*

Based on current throughputs and the identified reserves in the current ore bodies (Aqqaluk and Qanaiyaq), Teck anticipates typical mine and port operations to continue through 2031. Due to anticipated decreases in the zinc and lead concentration in the raw ore, the throughput of concentrates is projected to decrease somewhat over the remainder of the mine's life (see Figure 6). As described previously, Teck continues to explore and delineate both additional ore within the current deposits and potential ore deposits nearby. As realized in the mid-1990s, maintaining mine/mill outputs and concentrate exports near 1,000,000 tons/year is crucial to assure robust project economics.

### Other DMTS Studies/Activities

Throughout the nearly 30-year DMTS history, several other studies relating to its operations and potential opportunities for its use have been explored. These include:

- *DMTS Additional Use Study, Phases 1 and 2* (1993 and 1994).<sup>46, 47</sup> Seeking to increase the DMTS use, AIDEA conducted a two-phase study to evaluate opportunities for its use by others. Identified potential uses included the loadout of western arctic coal, regional bulk fuel management, and the receipt/distribution of other bulk commodities for the northwest Alaska region. While the reports prepared to evaluate these opportunities provided valuable information, ultimately none of these opportunities moved forward.
- 
- DMTS Port Facility*
- *Chukchi Power Program* (1999).<sup>48</sup> Through Teck's VIP project, the engineering firm of H.A. Simons with representatives from Teck, NANA, and ASRC, performed an evaluation on the potential requirements for a regional power facility/utility. This project was envisioned to provide up to 300MW of power for the Red Dog mine, the DMTS port, and surrounding communities. The evaluation only identified the steps necessary to begin further feasibility studies into the potential project; further steps for the program were not carried out.
  - *DMTS Regional Airport Study* (2001).<sup>49</sup> Following the DMTS port facilities expansion and due to the continued delineation of additional zinc reserves in the Red Dog area, several forecasts indicated an uptick in potential activity at the DMTS port. On this basis, and utilizing a grant from the Federal Highways Administration (FHWA), AIDEA contracted for a feasibility study to understand how and if port operations could be improved through the addition of a dedicated airport. This potential project did not move forward due to a lack of demand and capital funding.
  - *Deep Draft Port Feasibility Study* (2005).<sup>50</sup> Following the expansion of the DMTS port facilities and the mill complex, Teck sought to understand the costs and additional port and loadout efficiencies that may be gained through the development of a deep-draft style port (and elimination of concentrate lightering requirements). This effort coincided with the Deep Draft Port EIS activities described in further detail later in the report.



- *Mineral and Coal Resources Study* (2007).<sup>51</sup> AIDEA contracted with the Division of Geological and Geophysical Surveys of the Alaska Department of Natural Resources (DNR) to produce a report to understand the potential of the available opportunities for the DMTS to support mines in the northwest Alaska area. This report identified numerous opportunities for extensions to the DMTS to reach future potential mines.



*View of Red Dog mill complex from impoundment/tailings pond*

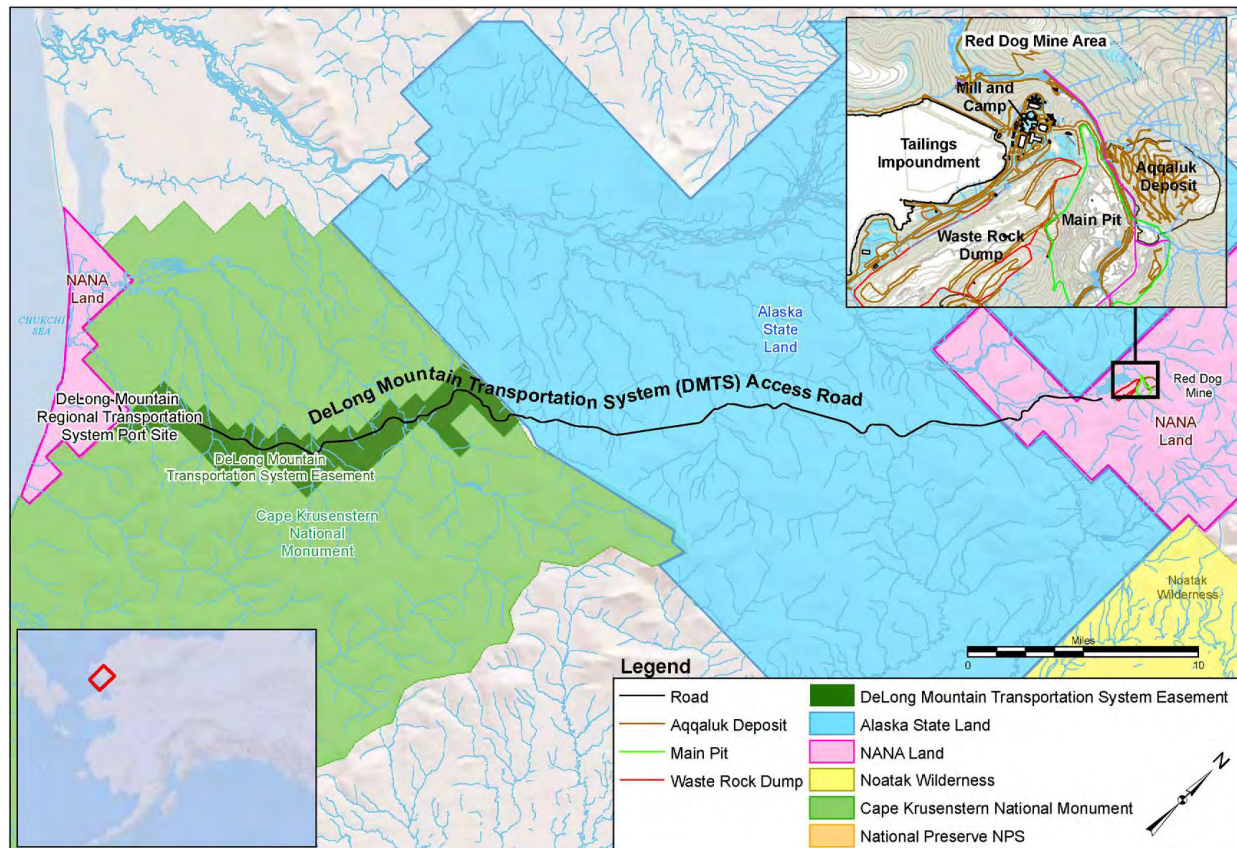
## ENVIRONMENTAL BACKGROUND, PERMITS, AND RELATED ISSUES

A listing of the various environmental permits and approvals that Teck manages for the DMTS operations is provided in Appendix A.<sup>52</sup> The following subsections provide a brief description of each of the key environmental issues and/or permits that have shaped the project history and/or guide its on-going activities.

### Original Project EIS

In 1983, Teck (at the time, Cominco) began the environmental permitting process for the overall Red Dog project, including the DMTS. One of the key elements was the filing of the original Notice of Intent (NOI) for the Environmental Impact Statement (EIS) in 1983. Both the U.S. Environmental Protection Agency (EPA) and the U.S. Department of Interior were the lead agencies for this EIS. This EIS covered the full range of the project's activities, including the mine, mill operations, road, and port. The EIS provided necessary analysis for both the issuance of the mine wastewater discharge permit under the National Pollutant Discharge Elimination System (NPDES) requirements and the impacts to wetlands under Section 404 of the Clean Water Act. The EIS also included the analysis of the impacts upon Cape Krusenstern National Monument, through which the DMTS road crosses. The analysis was consistent with the requirements for the application that Teck filed with the Department of the Interior (DOI) under Title XI of the Alaska National Interest Lands Conservation Act (ANILCA) for receiving a right-of-way for the DMTS road. Teck's application was the first attempted use of the ANILCA right-of-way provisions. However, in lieu of testing the legal ability to grant this right-of-way through the national monument under ANILCA, NANA and Teck worked with the NPS to receive a special easement (outside

of ANILCA) through a land exchange for the 23 miles of the DMTS road that passes through Cape Krusenstern.<sup>53</sup> This easement and exchange was granted under a Congressional bill passed in 1984 (43 USC 1629). According to the land exchange agreement, a Plan of Development and Operations must be prepared and provided to the NPS with each construction project conducted within the easement area.<sup>54</sup> Figure 9 shows the easement area granted through Cape Krusenstern National Monument and other land ownership areas along the DMTS. Following the publication of the project's EIS and issuance of the Record of Decision (ROD) in 1984, the EPA issued the original NPDES permit in 1985 (Permit No. AK-003865). Issuance of the ROD was supported by NANA and its significant outreach activities, including coordination within its region and the state. The following subsections provide greater information about the mine's wastewater permits and other environmental issues over its history.



**Figure 9: Easement area granted through Cape Krusenstern National Monument**

### Aqqaluk Permitting and Expansion

In 2007, the USACE published the NOI regarding the planned preparation of the Supplemental EIS (SEIS) covering the proposed Aqqaluk deposit development and its required wastewater discharge permit (a renewal permit). However, efforts related to the SEIS were formally started by Teck several years ahead of the NOI publication, including their cooperation for the issuance of an Environmental Assessment (EA) by the EPA in 2006 in conjunction with the on-going renewal of the mine's NPDES wastewater discharge permit.<sup>55</sup> Following a thorough public engagement process, including the evaluation of several potential alternatives for mine wastewater treatment, the SEIS was issued on September 24, 2009. Using the SEIS, the final renewed NPDES permit for the discharge of treated wastewaters from mine operations (including the proposed Aqqaluk deposit), in conjunction with the ROD for the EIS, was issued by the EPA on January 8, 2010.<sup>56</sup>

Coordinating with the Aqqaluk SEIS and renewed mill site wastewater discharge permit, the Alaska Department of Natural Resources (ADNR) issued the updated approval for the Mine Reclamation and Closure Plan that included the Aqqaluk deposit.<sup>57</sup> This reclamation plan was subsequently updated in 2016.<sup>58</sup> This mine plan also contains plans for increasing the tailings impoundment/dam height over the remaining mine life to enable the appropriate storage of tailings, runoff, and process waters.

The approval/issuance of the NPDES permit and the new mine closure plan enabled Teck to continue mine and mill operations without interruption as the main (original) Red Dog deposit was depleted. Initial mining from the Aqqaluk deposit was started in 2010-2011.

### Borough Master Plan Permit

Title 9, Section 20 of the NWAB code requires the application and permitting of a NWAB Resource Development (RD) district master plan for major developments.<sup>59</sup> The Red Dog project is considered a major RD district, and the only RD district in the Borough, for purposes of this permitting. In 2009, Teck submitted a permit application for the Red Dog master plan that included the expansion for the Aqqaluk deposit. The Borough granted the permit on December 9, 2009.<sup>60</sup> This permit includes several requirements and regular submittals, the most significant of which is an annual report on the project's overall environmental status.

### Dust Management

A primary concern over the 25-plus years of Red Dog and DMTS operations has centered on the management of fugitive dusts that contain lead and zinc. For DMTS, the dry powder-like nature of the lead and zinc concentrates enables these materials to become easily airborne and spread (via wind) to environmentally susceptible areas. Due to lead concentrate's particularly hazardous nature, for many years, restrictions were in-place for visitors to the mine and port facilities to minimize potential exposure risks.<sup>61</sup> With



*Former truck dumping method at TUB*



the mill and port expansion in the mid-1990s, Teck has continued to develop and deploy numerous industry-leading practices specific to the minimization of metals-containing dust generation for the road and port facilities:

- All trucks are covered upon being filled at the mine site (prior to their trip down the road to the port). In the early years, covers employed on the trucks were not secured, were cloth-style, and were sometimes not used (or blew off during transit), which resulted in the production of dust during concentrate transport. The trucks now use hard-top covers that are pneumatically opened/closed and provide a tighter seal. These covers greatly reduce the potential for concentrate dust generation during transport. The trailers are also side-dumped, further reducing the potential for dust generation, due to the tighter sealing capability of the hard tops.
- Teck has developed a unique truck unloading process, utilizing vibratory shaking (of the side-dumped trailers) and a slight vacuum to collect any fugitive dust generated during truck dump operations. The process is also a significant safety improvement as compared to prior operations (see picture this page).
- The many conveyors that carry the concentrates from the CSBs to the shiploader are now covered/fully-enclosed. Initially portions of these were uncovered and dust was generated during loadout operations.
- Teck collects fugitive dust samples at various points along the DMTS road and away from the road to monitor cumulative dust generation and for potential environmental impacts. In the past, Teck has also sampled and analyzed caribou tissues for metals content to ensure that these levels are not exceeding safe levels for either the caribou or for human consumption.

Moss/tundra vegetation sampling and analysis for lead and zinc by the NPS in 2000 noted elevated concentrations of both metals, leading to the “metals in the moss” period for the DMTS. Following this discovery, numerous actions were taken by Teck to better understand the noted concentrations. Additional sampling in 2001 along the DMTS road indicated higher concentrations on/near the road and at the road ends. This led to the hypothesis that the lead and zinc concentrates were being “tracked” to these areas by the trucks. The transport trucks were picking up the dust (i.e. concentrate powders) as they were loaded/unloaded, then subsequently depositing this on the road.<sup>62</sup> To mitigate the noted areas of high lead concentrations, in 2002 Teck removed materials (gravel plus subbase) from the road and port site (with high lead concentrations), recycling these materials through the mill. Teck also improved loading and unloading practices, as described previously in this report, which have significantly decreased the tracking of metals and their subsequent concentrations in moss, road, and soil in and around the DMTS. As outlined above, Teck now performs regular sampling and monitoring of dust and metals concentrations. Analysis results and trends are summarized in an annual report.<sup>63</sup> Recent analyses have demonstrated the positive effects of the improved concentrate handling practices via decreased impacts and metals concentrations in local vegetation and soils. Sampling of soils/vegetation along the DMTS performed in 2006, following the adoption of many of the practices outlined above, indicates concentrations at roughly 50% less than those detected in 2000/2001. The NPS performed additional sampling in the summer of 2017.

In 2004 Teck published a formal Operations and Maintenance Plan for the DMTS Road, with specific procedures identified to minimize dust/concentrate generation”.<sup>64</sup> This plan was approved by the NPS and Teck continues to follow its guidelines.

### Mine/Mill Wastewater Management

Although not directly applicable to DMTS operations, management of the mine/mill’s wastewater and stormwater provide permit compliance challenges that have affected the overall Red Dog since its start. Current mine operations require the removal of groundwater (dewatering) of the mine area and appropriate management of stormwater/runoff around the mine face/pit. This water, in combination with the various process waters (from mill operations) require treatment prior to discharge to the Red Dog Creek. To ensure appropriate mixing of the native Red Dog Creek waters and treated mine discharges, discharges to the creek are effectively not permitted during winter months. Rather, these waters are accumulated in the Tailings Storage Facility (TSF) (aka tailings pond). Their discharge, following appropriate treatment, then occurs during summer months. To assure the continued safety and environmental performance of the tailings pond, Teck performs regular monitoring of the pond’s water elevation and maintains appropriate dam heights as regulated by the ADNIR.<sup>65</sup> Teck has also redirected the natural flow of Red Dog Creek around the active mine site, containing it in culverts where necessary to protect it from potential mine influences.



*Lightering of concentrates to the ocean transport vessel*

The TSF discharges are regulated through the NPDES and now the Alaska Pollutant Discharge Elimination System (APDES) permit process.<sup>66</sup> As noted through numerous studies, the original pre-mine water quality of Red Dog Creek has improved with the mine development and the treatment of the mine-related discharges.<sup>67</sup> In fact, in June 2007, Red Dog Creek was removed from a listing of state polluted waters due to the improved water quality following mine development.<sup>68</sup> A further demonstration of this improved water quality is through the ability of the creek to support aquatic life that was not present prior to mine operations due to the acidity and naturally high metals concentrations. A weir is now installed on the creek (see Figure 7) to prevent fish migration up to the mine area.

The original mine/mill NPDES wastewater permit was issued by the EPA in 1985 with an expiration in 1990. The EPA reissued this permit in 1998 and planned to modify it in 2003, however the 2003 amendment was appealed. The EPA attempted to re-issue the permit in 2007, however, the Village of Kivilina appealed the EPA’s permit reissuance due to continued concerns over the mine’s impacts upon the Wulik River, for which Red Dog Creek is a tributary of. Several individuals from the village also filed a lawsuit in 2004 over these discharges. The lawsuit was settled in 2008 through a decision to study the possibility for the installation of 52-mile pipeline that would enable the discharge of the treated mine discharge directly into the ocean, bypassing the Wulik River. After spending >\$1.5 million studying the potential pipeline, Teck could not justify the >\$250 million capital price tag for the pipeline and paid an \$8 million fine in 2014 to closeout the settlement.<sup>69</sup>

Following completion of the Aqqaluk Supplemental EIS in 2010, Region 10 of the EPA finally re-issued the mill/mine discharge permit (Permit Number AK0038652) on March 1, 2010. Following approval of the Alaska Department of Environmental Conservation's (ADEC) wastewater discharge permit program in 2012, the ADEC issued a permit modification on April 8, 2014. The modified permit expired on February 28, 2015. The renewal application has been submitted and the ADEC is currently drafting the new permit. Until the renewal permit is issued, Teck will continue to operate under the existing permit. A public notice for the proposed draft renewal permit were issued in April 2017; the renewal permit is currently pending ADEC issuance.<sup>70</sup>

### Port Wastewater Management and Discharges

The port discharges its treated wastewaters to the Chukchi Sea in accordance with APDES permit #AK0040649, issued on April 8, 2014. Discharges occur primarily from four sources:

1. The ion exchange system that treats runoff (internal and external) and wash water from the area around the Concentrate Storage Buildings (CSBs)
2. The sewage treatment plant (STP) that treats wastewater from the PAC
3. The backwash water from the reverse osmosis (RO) drinking water treatment plant
4. Various stormwater runoffs from the port area (not treated through the ion exchange system)

In general, over the history of the port's operations, limited issues have arisen over these discharges and/or their permit requirements or limitations. Teck has generally maintained continuous compliance with the permit limits, including specific discharge limits for lead and/or zinc.

The largest spill (fuel) related to port operations occurred on July 31, 1993, when an estimated 5,000-8,000 gallons of fuel from the bulk storage tanks at the port was released into the impoundment/dike area surrounding the tanks. None of the fuel escaped the impoundment and did not percolate into the subsurface as the dike is appropriately lined.<sup>71</sup>

Port facility staff have engineered and are successfully operating a small-scale sewage treatment plant/facility (e.g., the STP) which involves several steps. The system utilizes a membrane bioreactor in combination with a small activated sludge reactor to produce an effluent discharge which meets the permit requirements. Removed solids are then dewatered through disposable filter socks that are then burned in the port incinerator. Sludge/solids handling concerns may arise if the port incinerator is shutdown due to pending incinerator air emission requirements (see Port Air Quality Management and Permitting below).

### Port Air Quality Management and Permitting

Air emissions from port operations are regulated via the port's Title V air permit, #AQ0289TVP03, which was issued by the ADEC on November 18, 2016.<sup>72</sup> Several recently promulgated regulations have increased the burden on operations at the port. These include the following:

- Over the past ten years, the EPA has gradually implemented tighter rules related to the emission of nitrogen oxides (NOx) and hazardous air pollutants (HAPs) from stationary reciprocating internal combustion engines (RICE).<sup>73</sup> RICE units are used for the generation of electricity at both the port and mine/mill sites. These new regulations, as contained in the current port facility



air permit, require the use of additional chemicals and filters to facilitate the reduction of the NO<sub>x</sub> (to nitrogen) and filter out the small particulate matter that contains HAPs. The chemical injection requirements have increased the operational costs for the generators (e.g., purchase/storage of chemical) and increased the handling requirements for potentially toxic chemicals. The new filters have also increased operational costs and decreased overall fuel efficiency for the generators.

- Over the past 5 years, the EPA has finalized new HAP emission rules applicable to small incinerators such as the unit operated by Teck at the DMTS port.<sup>74</sup> As it currently stands, Teck is evaluating compliance of the incinerator unit with the new rules. If it is determined that it cannot comply with the rules, then it may be necessary to close the port incinerator and truck the port wastes to the mine/mill site (where the incinerator would potentially be upgraded with new emission control equipment to comply with the new rules). This potential additional handling step for port wastes will further increase port operational costs and introduce new handling, safety, and environmental risks.

### DMTS Deep Draft Port Studies and EIS

In the late 1990s and early 2000s, following the expansion of the port/mine and enthusiasm building due to continued Aqqaluk delineation activities, Teck sought to evaluate opportunities to further streamline port operations.

The primary option included the construction of a deep-water port that would negate the use of the lightering barges for transport of the concentrates to the larger, international shipping vessels.



*Freight Barge at Port, with the PAC and CSB in background*

To start these evaluations, AIDEA entered into a Cost Reimbursement Agreement (CRA) with Teck in 1998 via AIDEA Board Resolution G98-05. This agreement was expanded in 1999 via Resolution G99-11 and in 2000 AIDEA signed a CRA with the USACE for the preparation of an EIS and a Feasibility Report for the proposed project. In 2000, the USACE published the NOI for the EIS.<sup>75</sup> The draft EIS and draft Interim Feasibility Report (DIFR) were subsequently issued in September 2005.<sup>76</sup>

The DIFR concluded that the potential benefits for the expansion of the port to provide direct concentrate loadout via an extended shiploader and harbor dredging outweighed the disadvantages and costs. Significant cost savings over current operations were calculated. However, following an independent analysis by the Center for Sustainable Economy, the benefit-cost ratio for the potential port expansion was recalculated to be significantly lower.<sup>77</sup> This outcome, coupled with a lack of funding for the project continuation, led to the cessation of further work in May 2007.<sup>78</sup>

### Caribou and Wildlife Monitoring and Management

The original decision by NANA to develop the Red Dog Mine included an analysis on the potential impacts to the Northwest Arctic caribou herd, the largest caribou herd in North America and the largest source of protein for local subsistence hunters.<sup>79</sup> This analysis was updated and was a crucial element of the SEIS for the Aqqaluk Deposit. Both Teck and NANA, in cooperation with the Alaska Department of Fish and Game (ADF&G), continue to fund and participate in various studies, monitoring, and sampling of this herd to identify the potential impacts of mine operations or development.<sup>80</sup> Importantly, long-standing DMTS operating policies prevent the free-flow of traffic on the DMTS road whenever caribou are crossing or are in the area. During times of significant herd movement, this can result in the closure of the road for several consecutive days. When this occurs, Teck personnel monitor caribou movement and maintain a log of herd movement records. This log has provided key information for the on-going management of the Northwest Arctic herd.

Teck and NANA also participate in the local subsistence advisory councils to help manage the caribou herd and the timing for local harvests.

From 1998 to 2005, Teck performed a formal wildlife monitoring program at the DMTS port. Through this program, wildlife observers observed, identified, and counted instances of both land and water based wildlife. This program provided data that was used in the Deep Draft Port Studies/EIS. Annual reports documenting the observations were prepared each year.<sup>81</sup>



*Red fox near DMTS port facilities*

### Port Safety Management

The management and handling of the zinc and lead concentrates through the DMTS presents numerous inherent worker safety risks. The port facilities include many operating conveyors and other hazardous equipment. Unfortunately, this equipment and the port operations have resulted in both worker injuries and fatalities over the facility's 27-year operational history. In March 2000, a worker at the port was killed after falling into the unloading hopper and conveyor system while unloading his truck. As a result of this incident, the conveyor and hopper system have since been modified/improved to reduce the risk of similar accidents re-occurring. One of these modifications included the conversion of the truck dump system from the floor tilting system originally installed to a system that simply relies on the side-dumping trailers (see prior photos). Workers are no longer required to get into the trailers to assist during the dumping/unloading process.



*Snowfence being installed along DMTS road, 2007*

In August 2000, a Foss tugboat employee was killed after being struck in the head by one of the pull lines (ropes) connecting the tug to the MS Noatak concentrate barge while the barge was coming in for loading. The investigation was not able to determine what caused the line to break, though Foss is now employing numerous safety measures around the tug lines.

Teck's "Courageous Safety Leadership" program currently promotes the early identification of safety risks and risky behaviors to help ensure the overall safety of each employee. This program helps ensure that safety and operational practices around the port are continuously modified and improved to reduce the potential for worker injuries.

### Spill Incidents and Prevention

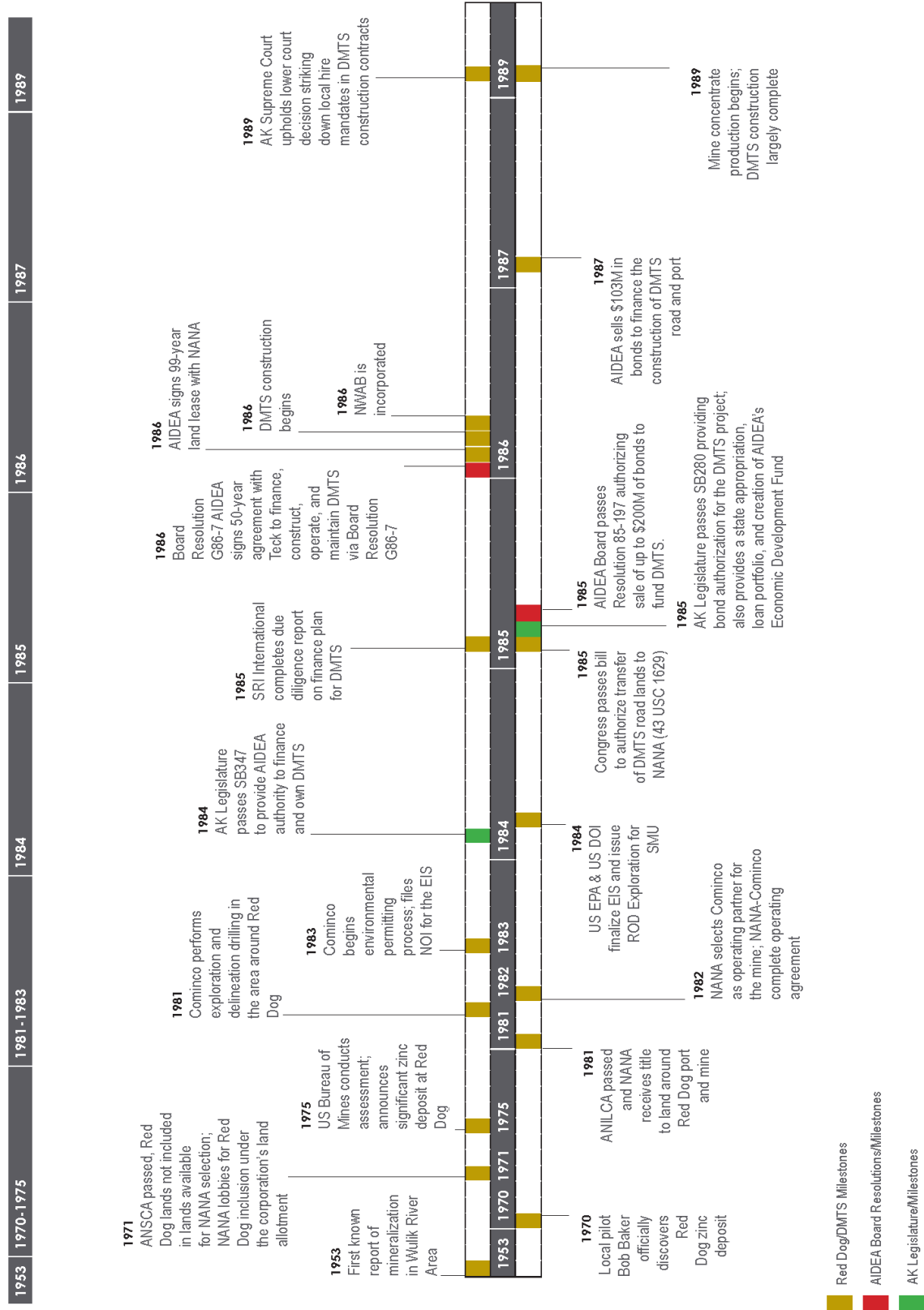
Environmental risks from spill incidents are inherent to the DMTS road and port operations. To minimize the risk of spills of fuels and/or other hazardous materials, Teck is required under both federal and state regulations to maintain a Spill Prevention Control and Countermeasures (SPCC) Plan. In Alaska, this plan is also called the Oil Discharge Prevention and Contingency Plan (ODPCP). Teck maintains a single ODPCP for both the mine/mill and port facilities.<sup>82</sup> Under the state and federal regulations and the approved plan, significant spill cleanup equipment and materials are maintained at the port. Additionally, port staff are required to be trained in appropriate spill response procedures and the use of the response/cleanup equipment. Spill drills are periodically performed and witnessed by appropriate EPA, DEC, and/or Coast Guard personnel. Some of the most significant historical spill related discharges are documented in the prior section.

Teck also maintains appropriate materials for the cleanup of concentrate spills along the DMTS road. While significant safety measures have been employed over the years for the concentrate hauling trucks, truck accidents and trailer overturns/spills can still occur on an infrequent basis. In these incidents, all affected soil, vegetation, and snow is collected for appropriate disposal or recycling through the mill process.



## PROJECT HISTORY TIMELINE

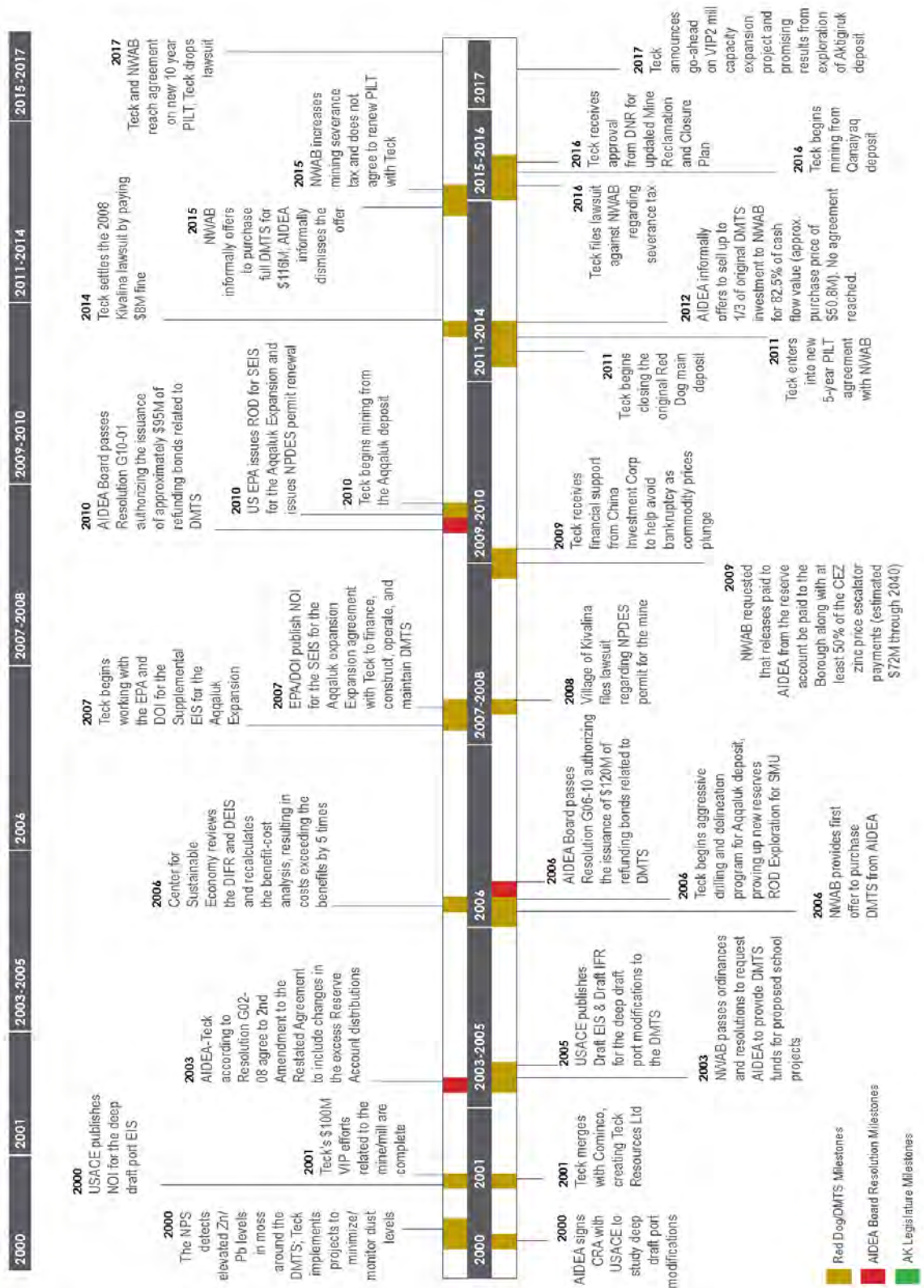
# Delong Mountain Transportation System Milestones 1953 – 1989



# Delong Mountain Transportation System Milestones 1990 – 1999



# Delong Mountain Transportation System Milestones 2000 – 2017



## PROJECT AGREEMENTS AND FINANCING

As outlined in Figure 3, AIDEA's financing and operations of the DMTS primarily follow two agreements: (1) a land lease with NANA for the DMTS port and road, and (2) a multi-faceted agreement with Teck for the DMTS financing and operations. Summaries and analyses of both agreements are contained within the following subsections. Table 6 lists each of the project related agreements and their amendments.

**Table 6. List and summary of AIDEA DMTS agreements**

Date	Parties	Title	Description
6/30/1986	AIDEA, Cominco	Agreement for the Financing, Construction, Use, Operation, and Maintenance of the DeLong Mountain Transportation System	AIDEA-Cominco original agreement
7/1/1986	AIDEA, NANA	Leasing Lands and Interest for the Construction, Operation, Maintenance, and Reclamation of the DeLong Mountain Transportation System and the Sale of Sand, Gravel, and Related Construction Materials	AIDEA-NANA land lease
1/1/1987	AIDEA, Cominco	Construction Management Services Contract	Original contract between Cominco-DOT&PF, later transferred to AIDEA
11/14/1989	AIDEA, NANA	Amendment #1 to Land Lease	Lease modifications due to as-built conditions
3/27/1993	AIDEA, NANA	Supplemental Agreement	Cost sharing agreement for Neil S. Seldon services
3/12/1997	AIDEA, NANA	Amendment #2 to Land Lease	Lease modifications to permit port expansion
3/12/1997	AIDEA, Cominco	DeLong Mountain Transportation System - Amended and Restated Agreement for the Financing, Construction, Use, Operation, and Maintenance ("Agreement")	Expansion agreement (supersedes original agreement)
3/12/1997	AIDEA, Cominco	Project Management Agreement - DMTS Expansion Project	Project Management Agreement for Expansion (i.e., construction contract)
1/5/1999	AIDEA, Cominco	Amendment #1 to Agreement	Modification to include additional scope improvements (\$11M) in the Expansion Project
7/18/2003	AIDEA, Teck	Amendment #2 to Agreement	Revision to Reserve Account distributions



## AIDEA – NANA LEASE AGREEMENT

As described previously in this report, in lieu of pursuing and executing an ANILCA based ROW through the Cape Krusenstern National Monument, NANA and Teck worked with the NPS to receive a 100-year easement from the NPS for the portions of the DMTS road that pass through the monument.<sup>83</sup> Through a subsequent 99-year lease agreement, NANA then leased this land and the other land on which the DMTS road and port exist to AIDEA.<sup>84</sup> Under that agreement, dated August 7, 1986, AIDEA's payments were made up-front, without the requirement for continued or other regular payments.

According to the lease, AIDEA is responsible for all operations and maintenance of the road, any environmental damage, and the reclamation/closure of the road and port site upon its closure. As described in greater detail below, these responsibilities are then passed onto the road and port site operator (Teck).

In 1993, AIDEA and NANA signed a supplemental agreement that provided for AIDEA's reimbursement of up to \$1,100 per month to NANA for zinc and lead market consulting and pricing services provided by Neil S. Seldon Associates.<sup>85</sup> AIDEA has used these services in the past to provide a greater level of understanding about the current status of the zinc market. Typically, AIDEA receives periodic email correspondence from Neil Seldon with updates on zinc and lead pricing or other related market activities.



*Moon over Chukchi Sea, with DMTS shiploader at left*

## AIDEA – TECK AGREEMENTS

Construction of the DMTS facilities was accomplished with an initial AIDEA investment of approximately \$160 million in both cash and Legislature authorized bond financing. The 1996 expansion involved approximately \$80 million of additional capital funding provided by AIDEA through cash and bond receipts. These investments, AIDEA's repayment, and the operations of the DMTS, were governed by two agreements:

- The “Agreement for the Financing, Construction, Use, Operation, and Maintenance of the DeLong Mountain Transportation System” signed on 30 June 1986 between AIDEA and Teck (formerly Cominco); and
- The “Amended and Restated Agreement for the Financing, Construction, Use, Operation, and Maintenance of the DeLong Mountain Transportation System” signed on 12 March 1997 between AIDEA and Teck (formerly Cominco).

The 1997 Agreement supersedes the original 1986 Agreement. The structure of both agreements essentially provides for the repayment of AIDEA's investment through a toll structure from the DMTS users. As described previously, Teck has been and is presently the only user for the DMTS. Importantly,

the agreements also include a guaranty of payment from Teck for AIDEA's investment (capital expense plus agreement stated interest/financing returns).

The 1997 Agreement provides for four (4) tolls, or fee payments; namely:

1. Minimum Annual Assessment (MAA) which includes a Tonnage Sensitive adjustment;
2. Supplemental Minimum Annual Assessment (SMAA);
3. Contingent Tonnage Fee (CTF); and
4. Contingent Escalator for Zinc Price Increases (CEZ)

Figure 10 provides a graphical depiction of how each of these fees contributes to the overall repayment of AIDEA's investment.

The Original (1986) Agreement established ownership and administrative processes for the DMTS and includes many of the key provisions that contributed to the financial and operational performance the project has demonstrated to-date. The 1997 Restated Agreement (hereafter referred to as the "Agreement"), comprises fifteen articles and a series of exhibits (A through J). Both the 1986 and 1997 Agreements provided for the repayment of AIDEA expenses incurred through the development of the agreements and pre-agreement engineering/design expenses.

The 1997 Agreement has since been amended twice: (1) initially to include additional scope improvements as part of the expansion project with the associated capital costs to be included with the Supplemental Minimum Annual Assessments (executed on January 5, 1999), and (2) to modify distributions of excess funds from the reserve account (executed on July 18, 2003). The latter modification (Amendment 2) enabled Teck to provide additional funding to the NWAB for increased school construction and operations. The 2<sup>nd</sup> Amendment was justified based on solid projections for the Reserve Account balances and continued strong project economics based on the anticipated high and increasing port throughputs.

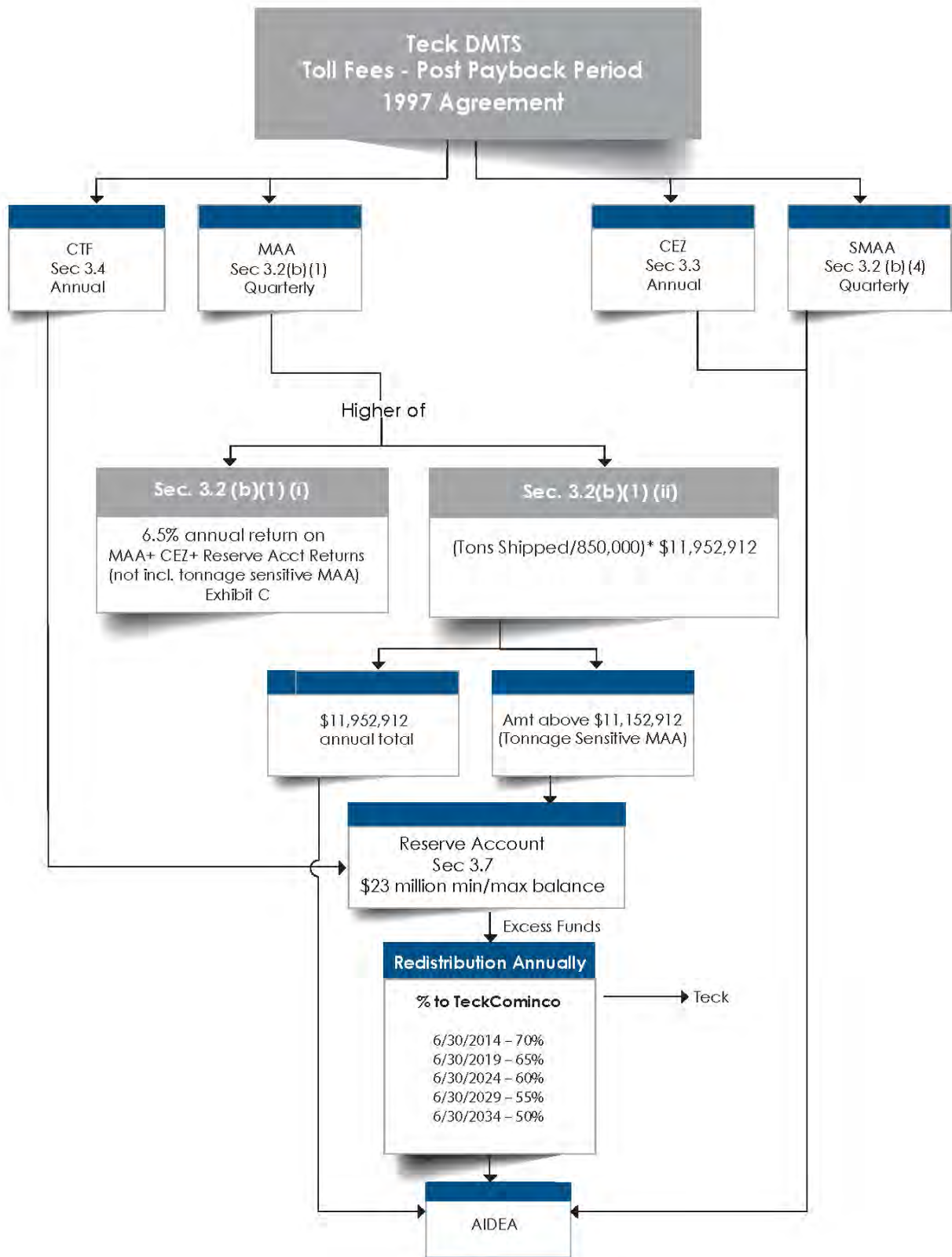


Figure 10: Teck Toll Fees Diagram

Article 2 of the Agreement contains the provisions for the Operation and Maintenance of the DMTS and Article 3 defines the tolls and fees payable under the Agreement. These articles established the basic structure of the Agreement and include provisions for dealing with the primary economic and business risks involved in the project. The balance of the Agreement articles deal with how the Expansion Project was to be implemented (Articles 4 – 6) and with standard legal provisions or administrative procedures (Articles 7 – 15). Article 13 addresses environmental liabilities and requires the annual preparation of an Environmental Report.

The following subsections describe the basic payment provisions in the Agreement.

### Financing and Payments

Article 3 establishes the financial structuring of the Agreement. AIDEA's financing and ownership of the DMTS was established through two phases of project development; namely, (1) the Original Project, and (2) the Expansion Project. The Agreement identifies the Investment Base as having two components, the Original Investment Base of \$180,188,238 (stipulated in Article 1) and the Supplemental Investment Base (identified as \$85,000,000 in Exhibit D to the Agreement). The financing of the two projects is defined as follows:

1. *Original Project* – The Original Investment Base is amortized over a 50-year term (1990 – 2040) at a nominal annual rate of 6.5%. This rate represents roughly a 1.5-2% discount as compared to the rates for a 30-year U.S. treasury bond at the time of the financing (1987).<sup>86</sup>
2. *Expansion Project* – The Supplemental Investment Base is amortized from the Supplemental In-service Date (01/01/1999) through the Initial Term (ending 6/30/2040) at the Applicable Annual Rate (actual true interest cost of Supplemental AIDEA debt issues plus 25 basis points).

The financing under both agreements included all costs for the project, including the capital construction, owner oversight, any bond issuance costs, bond insurance, and the capitalization of both principal and interest payments during the construction period. As listed above, the fees AIDEA receives for the original and supplemental investments are comprised of the following payment streams:

- **Minimum Annual Assessment (MAA)** – The MAA payment is set to provide both a minimum payment and a payment based on port throughput. The MAA payment amount essentially utilizes a repayment schedule that fully amortizes the Original Investment Base at a 6.5% annual return (annual payments are constant at \$11,952,912). When throughputs exceed 850,000 short dry tons per year, the MAA payment includes a Tonnage Sensitive adjustment for the amount above this threshold. The Tonnage Sensitive revenues from the MAA are required to flow into the Reserve Account. Importantly, while the Original Agreement contained the Tonnage Sensitive payment stream, the threshold included at that time (850,000) was greater than the maximum potential output of the mine/mill at that time. Exceeding the 850,000 threshold was only possible after the completion of the expansion project.
- **Supplemental Minimum Annual Assessment (SMAA)** – The SMAA fully amortizes the investment for the \$85,000,000 DMTS expansion over the remaining agreement term at 6.33% (1999-2040), with annual repayment constant at \$5,716,376. The rate for the SMAA was roughly equal to the rates for a 30-year U.S. treasury bond at the time of the financing (April 1997). The SMAA is comprised of two payment streams due to differences in financing amortization



periods: (1) \$75 million financed for the original expansion project with payments starting July 1, 1999 and (2) \$10 million financed for the P-8 conveyor replacement with payments starting October 1, 2000. The second portion of the project was confirmed as part of the overall expansion project through the 2<sup>nd</sup> Amendment to the 1997 Agreement, which was signed on January 5, 1999.

- **Contingent Tonnage Fee (CTF) for Shipments Exceeding Allowable Base** – The CTF provides a method to calculate an additional fee for tonnage shipped greater than the Allowable Base (850,000 tons/year) plus 85,000 tons, plus cumulative carryover allowances, if any. Any paid CTF fees flow into the Reserve Account. Similar to the Tonnage Sensitive portion of the MAA, the CTF threshold amount (935,000 tons as contained in the Original Agreement), was greater than the maximum mill throughput after the original construction. The mine/mill expansion in the late 1990s achieved potential throughputs greater than the CTF threshold, however the Supplemental and Revised Agreement did not modify the threshold value. As a result, CTF fees have regularly been received since 2003.
- **Contingent Escalator for Zinc Price Increases (CEZ)** – The CEZ provides a mechanism for upside revenues (to AIDEA) reflecting potential zinc market escalations. The CEZ is calculated and, if applicable, paid to AIDEA by the 120<sup>th</sup> day following the end of the year. Essentially the calculation of the CEZ takes the 5-year moving average market price (London Metal Exchange, or LME) for zinc minus \$0.50 per pound of zinc shipped times 5%. The \$0.50 per pound subtraction roughly represents the price of zinc at the time of the original agreement (1986). The CEZ is capped at 50% of the MAA payable for the year. The average market price is also adjusted based on the implicit price deflator (inflation adjustment) as published by the U.S. Department of Commerce (now the Bureau of Economic Analysis) for 1985.<sup>87</sup> The CEZ payment does not flow through the Reserve Account. An analysis in 2015 did not anticipate further revenue payments from the CEZ in upcoming years due to weak anticipated zinc prices. However, zinc prices have recovered from market lows in early 2016, and are producing CEZ payments for 2017 and/or future years. Under the Agreement, the calculation of the CEZ requires the use of the LME monthly average zinc settlement price.

A following subsection provides a more detailed description of the current status of each of these payments. For the MAA and SMAA payments, AIDEA receives an annual estimate (by December 1<sup>st</sup>) from Teck that provides the anticipated throughputs and payment amounts for the upcoming year. This estimate also contains a “true-up” calculation of the prior year’s estimated throughput payments as compared to the actual throughputs for the year. Similarly, AIDEA receives an annual calculation of the CEZ payment within the 4 months following the end of each calendar year and the CEZ payment (if applicable) is due within 120 days of the end of the calendar year (for the calculated amount from the prior year). The CTF payment calculation is also provided with the CEZ calculation, and the CTF payment is due within 120 days of the end of the calendar year.

## AIDEA Bonding

Utilizing AIDEA’s bonding authority as authorized by the Alaska Legislature for both the original and expansion projects, the financing of the DMTS has involved 5 sets of bond issuances: 1 original issuance (1987), 1 original plus refunding issuance (1997), and 3 refunding issuances (2007, 2008, and 2010). The table below describes each of these issuances. Importantly, each of the bond issuances has qualified for tax-exempt status according to federal tax guidelines.<sup>88</sup> As noted in the table below, the outstanding bonds (Series 2010A), are anticipated to be paid down in 2027. Bond insurance, to minimize payment risk, was included with the original bonding and each of the subsequent issuances, except for the past two (2008 and 2010). The 2008 issuance included a letter of credit to provide additional security through the early years of the bond for the bondholders. The 2010 issuance did not include any form of credit enhancements. Importantly, the financing of the original bond issuance was closely linked to the project timeline, with payments not starting until after the project was in-service, or roughly 3 years after bond issuance (1990). Both the interest and principal payments during this construction period were capitalized into the overall project costs. A similar but modified structure was used for the expansion project, where AIDEA used both capital funds from the bond and AIDEA internal funding to cover bond principal and interest payments until the in-service date of the expansion project (called the “Supplemental In-service Date”).

**Table 6. Summary of AIDEA bond issues related to DMTS financing <sup>89</sup>**

Bond Issue Date	Amount	Rate	Term	Description	Payoff Date
1987	\$103.25M	5.4 - 7.3%	1992-2017	Series 1987A bonds: original project revenue bonds; bonds included sinking fund principal payments and bond insurance	1997
1997	\$150M	5 - 6.15%	1997-2027	Series 1997A refunding bonds; expansion project and refunding bonds, AIDEA general obligation with bond insurance	2006
2007	\$114.115M	Variable	2008-2027	Series 2007A & B refunding bonds; AIDEA general obligation with bond insurance	2008
2008	\$107.385M	Variable	2009-2027	Series 2008A & B refunding bonds; AIDEA general obligation with letter of credit	2010
2010	\$95M	0.78 - 4.6%	2011-2027	Series 2010A refunding bonds, AIDEA general obligation	2027

### Reserve Account and Sustaining Capital Fund

The Agreement includes the establishment of a Reserve Account to be used for any payment shortfalls or to enable AIDEA to fund any required maintenance for the DMTS infrastructure. The Reserve Account was not included in the original agreement and was added via the Restated Agreement to provide additional security against commodity price fluctuations, which was one of the primary risks for the project as identified in the SRI 1993 report. As described above, the Reserve Account is funded through excess MAA payments and excess CTF payments. The Reserve Account is considered “full” once it has a consistent balance of \$23,000,000. The strong performance of the project has enabled the account to be maintained “full” since 2002. The funds maintained in the Reserve Account are not actively managed, and as a result they earn minimal interest. However, any earned interest, along with the excess payments, is distributed according to the release schedule.

As described above, Amendment 2 of the Agreement established a slightly revised (delayed) schedule for AIDEA’s increases on the release of Excess Funds (the amount in the Reserve Account exceeding the “full” balance) on a graduated schedule between Teck and AIDEA. Per the Amendment 2 schedule, Teck received 100% of excess funds up to June 30, 2009; 85.5% the following year; 75% for four years commencing June 30, 2010; 70% for five years commencing June 30, 2014; then 5% less each five-year period until a Teck/AIDEA distribution ratio of 50/50 is reached as of June 30, 2034 and continuing through the remainder of the Initial Term (2040). Currently (2014-2018), Teck is receiving 70% of the excess funds. For 2015, this equated to roughly \$11.5 million. The Amendment 2 changes were negotiated to enable Teck to increase their PILT contributions with the NWAB and specifically to support school construction activities in the Borough. The increased PILT amounts were supported by the anticipated high production/throughput rates Teck was achieving and anticipated to continue achieving at the time of the amendment (2003). The agreement does not specify how the funds in the Reserve Account should be managed at the end of the Initial Term.

AIDEA can apply Reserve Account funds to satisfy any obligations of the Agreement not met by Teck, or to fund agreed upon capital projects/improvements. If this is necessary, then repayment shall occur quarterly using an amortization schedule that is consistent with the anticipated service life of the project and the Agreement stipulated interest rate. To date, the Reserve Account has not been utilized.

Following receipt of Teck’s annual statement of throughputs and projections (described above), AIDEA then provides an annual calculation and statement on the Reserve Account receipts and distributions. This statement is then used to determine the amount of any distributions from the Reserve Account. The distributions occur semi-annually, on May 15<sup>th</sup> and November 15<sup>th</sup>.



*CSB#2 and concentrate conveyor to shiploader*

Under Section 2.4(d) of the Agreement, AIDEA maintains a separate fund, the Sustaining Capital Fund (SCF) to provide additional financing for up to \$15 million of any mutually agreed-upon capital project related to the DMTS. The SCF also covered up to

\$10 million of potential cost overruns on the expansion project (i.e., beyond the \$85 million budgeted for that project). If used, the fund is repaid via quarterly payments based on the withdrawal amount amortized over the useful life of the particular project at a per annum rate of 6.5%. This fund has been utilized 3 times over the course of the project, as documented in Table 7. As of 2013, each of the 3 withdrawals have been repaid. An evaluation over the continued need for this fund may be warranted given the current stage/maturity of the project.

**Table 7. Summary of Sustaining Capital Fund Draws**

Draw No.	Date	Loan Description	Amount	Date Repaid
1	10/5/1993	Conveyor systems improvements	\$ 2,091,810.42	1/1/2013
2	4/12/1994	Shiploader construction and modifications	\$ 476,075.10	4/1/2014
3	12/31/2001	Port sewage treatment plant upgrades	\$ 1,596,548.63	1/1/2012

#### AIDEA Accounting of DMTS Agreement

AIDEA accounts for the DMTS and the Agreement as a direct (capital) financing lease, inclusive of both the projected interest and capital/principal costs for the project. On AIDEA's books, the full value of the lease (aka, investment base) is established at \$372,835,000. This includes both the principal (capital) costs and interest costs for the original and expansion projects. Following standard accounting principles for direct financing leases and in accordance with provisions of the original agreement, all income received for the project is applied to the investment base, with excess payments/fees (i.e., the CTF and CEZ fees) applied to reduce the investment base. Through June 30, 2017, roughly \$136 million was remaining to be paid on the lease. Based on current projections using the zinc prices as given through the most recent CHR report (see following subsections) and the Teck provided mining projections (see Figure 6), the lease (full investment base) is anticipated to be paid-down by roughly 2023-2024. Once both the lease and bonds are paid down, all of the DMTS receipts will be directly applied to AIDEA's net income. Currently, only the investment principal and interest (from the MAA and SMAA), net of the outstanding debt service, is applied to AIDEA's net income and therefore subject to AIDEA's dividend to the state general fund.

AIDEA regularly re-runs the project's amortization schedule to determine the paydown dates and the amount outstanding on the lease. Regardless of the lease paydown status, AIDEA will continue to receive the 4 payment streams as given in the Agreement through the Initial Term (2040).

#### Operations and Maintenance Assessment

As described previously, through the initial term of the Agreement (to 2040), Teck holds a non-exclusive, priority-right to use the DMTS. This means that Teck has a first-priority for its shipment of up to 1,500,000 tons annually through the port and to supply the mining operations at Red Dog through the DMTS. However, because Teck's rights are non-exclusive, other users must be accommodated, should capacity exist. Should other users seek to utilize the DMTS, the Teck-AIDEA Agreement includes provisions for distributing the Operations and Maintenance (O&M) costs proportionately among the users.



Section 2.3 of the Agreement stipulates that AIDEA is responsible for all O&M of the DMTS. However, as the sole user to-date and under Section 2.3(c), Teck shall “operate and maintain” the DMTS at a commercially reasonable rate of compensation. AIDEA has historically interpreted this section to provide Teck the full operational and financial responsibility for DMTS operations, maintenance, and management. As a result, AIDEA does not provide active “day-to-day” management of the facilities/infrastructure. Following Section 2.4, AIDEA is permitted to charge Teck with its applicable direct general and administrative (G&A) expenses. Under these provisions, AIDEA generally invoices Teck on a quarterly or semi-annual basis for any direct expenses associated with DMTS; AIDEA’s management personnel/labor expenses are not included. Any future revisions to the Agreement may aim to revise the O&M language contained within Section 2 to more clearly describe the responsibilities and invoicing procedures for the DMTS O&M.

Importantly, as the DMTS facilities and infrastructure continue to age and approach their design life, greater attention to maintenance requirements may be necessary. For AIDEA, more frequent and more detailed inspections may be warranted. This will be even more critical if future ore deposits and subsequent mine operations (post-2031) are not secured by Teck or another facility user is not identified over the next 5-10 years (i.e., permitting for the mining of new deposits will require significant lead time). A future potential closure of the mine/mill will decrease available funds and motivation for continued O&M (by Teck), especially for long-term O&M projects.

#### Environmental, Insurance, and Closure Provisions

The Agreement covers numerous elements of environmental and operational risks. In general, environmental risks are described in Section 13 of the Agreement; AIDEA is largely indemnified from nearly all environmental requirements and liabilities. All permits and any other regulatory approvals necessary for DMTS operations are the responsibility of Teck. However, an analysis of the Agreement reveals that it does not include provisions for post-mine life operations. Considerations for how the road and port facilities will be utilized and/or demolished (if necessary) once the mine ceases operations are not described. The Red Dog Mine Reclamation and Closure Plan, and associated closure bond, also does not address the closure of the port and/or road. As the post-2031 future of the mine becomes more certain, the Agreement may require amendment/modification to include post-mine closure requirements for the port and road. Potential dismantlement, removal, and rehabilitation (DR&R) costs for the road and port site may be significant. For example, for the mill/mine site, the DNR has required that Teck post a closure/reclamation bond in the amount of \$558 million.

Under the AIDEA-Teck Agreement, Teck must provide various forms of insurance, including pollution insurance, primary and general liability insurance, automobile liability insurance, worker’s compensation insurance, wharfingers/terminal liability insurance, operators’/stevedores liability insurance, watercraft liability insurance, towers liability insurance, and all risk property including business interruption insurance. This insurance must name AIDEA as an additionally insured party.

## TECK – NANA AGREEMENT

Though not directly related to the DMTS Agreements, the Teck – NANA Agreement from 1982 provides the cornerstone for the overall development and operations of the mine. The following sections describe the history of this agreement, important provisions of the agreement, and its current status as it may potentially affect the DMTS.

### NANA – Teck History and Red Dog History

The first report of mineralization in the Red Dog area was recorded in 1953 via geologists that noted significant mineral staining of local surface rocks. In 1968, a USGS geologist, Irving Tailleir, was made aware of the mineralization by the local bush pilot, Bob Baker. Mr. Tailleir later visited the site, collected some rock samples and published an open report with the USGS on the noted mineralization. Despite the potential for significant mineral resources, the area around Red Dog was an area designated for potential inclusion in national parks or wilderness areas according to the Alaska Native Claims Settlement Act (ANCSA) in 1971. Following the act's provisions, the land was withdrawn from potential mineral claims staking and a mineral survey was performed. In 1975, the U.S. Bureau of Mines (USBM) issued the findings of the mineral survey in the Red Dog area. Following that survey, several companies, including Cominco staked thousands of mineral claims in the area. Simultaneously, NANA also filed claim to the Red Dog area under ANCSA provisions. NANA's claim was strengthened through its prior consolidation of the NANA-region village corporations into the single regional Native Corporation. Under a "single-voice", the local residents were more effective in their ability to successfully lobby at both the state and national/Congressional level for NANA's claim to the Red Dog lands versus the competing claims. This case was ultimately settled via provisions included in the Alaska National Interest Lands Conservation Act (ANILCA) in 1981, which titled the Red Dog lands to NANA. The village corporation consolidation also simplified the marketing and negotiations necessary for the development of the eventual NANA-Cominco agreement.

Despite the competing land/mineral claims, several mining companies, including Cominco performed exploration work in the region up to the passage of ANILCA and even after its passage. In 1981, Cominco drilled 39 exploration/delineation holes in the area around Red Dog, defining an estimated 85 million ton zinc deposit.

From 1975 to 1981, while NANA awaited resolution of its land ownership dispute, the corporation also wrestled with the decision to pursue a potential mine development and its ensuing impacts upon native culture. After determining that appropriate and responsible development could be achieved, NANA entertained offers from several mining companies, including Cominco which had already invested the most in area exploration and building relationships with key NANA shareholders and directors.<sup>90</sup> Additionally, Cominco was an experienced mine operator, including several mines in similar arctic conditions.<sup>91</sup> Cominco's Trail, BC smelting/refining facility also provided an internal customer for much of the Red Dog concentrates.

In 1982, NANA reached an agreement with Cominco, the Cominco-NANA Red Dog Development and Operating Agreement ("NANA-Teck Agreement"), for the development of the Red Dog mine.<sup>92</sup>

### NANA-Cominco (Teck) Agreement

The NANA-Teck Agreement is considered progressive based on numerous aspects. It includes provisions to protect the environment, native lifestyle, and operate the mine collaboratively with Cominco. It also provides financial benefits for both parties. Key provisions of the agreement include the following:

- **Financial.** The NANA-Teck Agreement provides for NANA royalty payments that were a fixed amount (4.5% of net smelter returns) until the capital costs for the mine were repaid (which occurred in 2007) and were then structured as a royalty percentage of net mine proceeds that increase 5% every five years, until reaching 50% in 2032. Currently, it specifies that the royalty rate is 35% (it recently increased to 35% this past October (2017)). According to ANCSA, NANA must share 70% of these revenues back to the other ANCSA corporations (regional and village).
- **Contracting and Services.** The agreement requires that for any contracted services, Teck must provide bidding preference to NANA-owned entities (NANA/Lynden, Tuuq Drilling, Paa-River Construction, WHPacific, etc.). NANA has successfully used this provision to seed the startup or provide a solid contractual foundation for several business units, including NANA Management Services (NMS) that provides contract hospitality and security services. NMS utilizes its experience and long history at Red Dog to provide similar services to numerous other businesses/projects around the world.
- **Shareholder Employment.** As described previously, nearly 1,500 NANA shareholders have been or currently are employed at Red Dog. NANA shareholders receive a hiring preference. Many families now have two generations employed at the mine. Jobs at the mine provide important employment opportunities and income to local residents, enabling individuals to stay in their home villages. Under the agreement, Teck provides transportation to/from these villages to the mine for the local employees.
- **Subsistence Protections.** The agreement requires the establishment of a Subsistence Committee that is comprised of local NANA shareholders and Teck representatives. The committee is responsible for coordinating with Teck for the opening of the shipping season to avoid potential conflicts with the on-going spring whale hunts carried out by individuals within the village of Kivalina. The committee is involved with the caribou monitoring program.
- **Education Assistance.** In the spirit of the agreement, Teck conducts numerous educational programs with the cooperation of local communities and the NWAB school district to promote shareholder career opportunities. Teck also provides numerous scholarships to local residents and provides assistance with local sporting events and teams.
- **Stakeholder Engagement.** Teck employs a NANA shareholder liaison at the mine to coordinate shareholder concerns and facilitate communications between Teck and NANA. Teck is also committed to regular mine update meetings at each of the region's villages.

Teck and NANA continue to cooperate on numerous aspects of their agreement, including planning for the future of the mine and mill (post-2031). This cooperation is crucial to ensure the continuation of jobs and the overall economic base in the NWAB and NANA region. This planning includes potential considerations for the development of nearby deposits that may not exist on NANA lands.

## NWAB-TECK AGREEMENTS



*Sunset over the Chukchi Sea from the DMTS Port*

As described previously, the development of the Red Dog mine precipitated the formation of the Northwest Arctic Borough (NWAB). The NWAB encompasses the northwestern area of the State of Alaska, with government centered in Kotzebue. The Borough includes Kotzebue and 10 other rural village communities. Importantly, formation of the NWAB was initially opposed by the North Slope Borough (NSB), as the NSB sought to annex/add the Red Dog area to its boundaries such that the Borough could receive property taxes from the

mine infrastructure. A local NWAB resident-led petition effort in 1985 denied this potential annexation and resulted in the formation of the NWAB in 1986. The state approved the petition on the basis of future tax revenues from the mine. From the mine's opening to present however, the Borough has not levied any property taxes, but has received funds from the mine in the form of various PILT agreements. The amounts of these PILT agreements have steadily increased. As noted previously, the 2003 Amendment (#2) in the AIDEA-Teck Agreement modified the distributions from the Reserve Account (delaying AIDEA's increases in the releases), which provided additional funding to Teck to enable an increase in the Teck PILT. This increase was used to provide additional contributions for the NWAB school district.

In 2009, the Borough instituted a Mining Severance Tax, via the promulgation of Chapter 7.10 of the Borough Code. This tax is only enforced for companies that do not have a PILT agreement in-place with the Borough.<sup>93</sup> At the time, Teck had a PILT agreement in-place and was negotiating for a new/replacement agreement. In 2011, the most recent PILT was completed, which provided for payments of roughly \$9.1 million per year to the Borough and \$2.4 million per year to the school district.<sup>94</sup> The Borough did not assess any other taxes until its recent provision for a tobacco tax (started in 2016).<sup>95</sup> The Teck-NWAB PILT agreement for 2011-2015 avoided the Borough severance tax requirement, per §6.08.010 of the Borough code.

As noted, the Teck payments to the Borough provided a source of revenues to fund Borough governance/services and to enable the Borough/school district to provide its statutorily required contributions for local schools.<sup>96</sup> The funds from the Teck PILT, coupled with state matching funds, have also enabled the Borough to bond for several school construction projects.

In 2015, the NWAB revisited its mining severance tax rate, increasing it to 4.5% of the gross production value (from 3%).<sup>97</sup> Due to the lack of a PILT agreement for 2016, this tax applied to Teck. However, in early 2016, Teck filed a lawsuit over the constitutionality of the severance tax. While the case was under consideration by the court, Teck agreed to provide a payment in June (2016) of an amount similar to the amount provided in 2015 (\$11.2 million, which included the \$2.4 million for the school district). For the remainder of 2016, the court continued considerations of the lawsuit while Teck and the NWAB continued negotiations over a potential new PILT agreement.



In April 2017, both parties announced the successful negotiation of a new PILT agreement, effective for ten years (2016-2025). The agreement required that Teck also drop their on-going lawsuit and it included an increase of Teck's total payments, to between \$20 and \$26 million each year, based on the mine's fixed asset values and a percentage of the mine's net income. The agreement includes two primary payments: (1) to the Borough for aiding on-going Borough and school district operations, and (2) a payment into a Village Improvement Fund to support community programs, services, and infrastructure. As described previously, under Borough code, the PILT supersedes the severance tax, providing greater financial stability to Teck for continued mine operations. The 10-year length of the agreement further exemplifies this stability.

## STRATEGIC ANALYSIS

This section presents a pertinent summary of the current status of the project and an analysis of factors that will affect the on-going and future success of the DMTS.

### CURRENT PROJECT STATUS

A total of 1,448,896 wet metric tons (WMT) of both zinc and lead concentrates shipped through the DMTS in 2016, with zinc encompassing roughly 82% of this amount. This throughput was the 2<sup>nd</sup> highest in DMTS history (the highest was 1,460,303 WMT in 2007). The following provides highlights of the current status of DMTS operations, encompassing primarily 2016 activities:

- Teck continues to plan for the replacement of the roof on CSB #1. Roof patching activities performed in 2015 proved to be beneficial, greatly minimizing the leaks and water infiltration into the concentrate, however a longer term replacement is necessary. This project will require significant coordination due to the unique equipment/material requirements, impacts upon on-going concentrate storage and operations, and the need for additional construction worker accommodations. Teck is also simultaneously evaluating the potential installation of an additional bulk fuel tank to be located at the port and other port utility system upgrades or replacements.



*Concentrate Storage Buildings 1 and 2*

- Teck continued their exploration and delineation activities in the area around the existing mill site to identify the next potential ore body that might permit the extension of the entire Red Dog project beyond the current anticipated end-date of 2030-2031. Over 11 kilometers of drilling was performed in 2016.<sup>98</sup> Several known ore bodies exist in the area and require further delineation to determine the economic and technical feasibility of their development. It is necessary to start the pre-permitting process for one or more of these ore bodies in the upcoming years to ensure the continued and uninterrupted operation of the mill post-2030-31. The announcement of positive

findings from 2017 drilling around the Aktigiruk deposit provide promise for these continued operations and future development.

- Although throughputs for 2017 maintained levels from prior years, Teck continues to anticipate a gradual decline in the raw grade of the ore from the remainder of the Aqqaluk deposit. This will likely result in decreased DMTS throughputs in upcoming years. Teck continues to research and implement methods to increase zinc and lead recovery rates from the raw ore; these efforts minimize the overall production rate decline.
- Teck continues to implement programs to reduce the energy intensity of their operations, such as the replacement of lights with LED fixtures throughout their facilities. Various studies have been performed to evaluate the potential development of wind power to offset overall diesel demand.
- In 2017, Teck employed an average of more than 600 individuals (including contractors) related to the mine, with an annual wage impact to the Northwest Arctic Borough of more than \$65 million. At Red Dog's peak, approximately 65% of employees were NANA shareholders hire (from May through November 2017).
- Teck managed the 2015-2016 decline in zinc prices through increased scrutiny of outside contracting, decreasing its Red Dog and DMTS capital expenditure budgets, and tighter management of personnel costs. The steep decline in fuel prices since 2014 softened the impacts from the decreased zinc prices over this timeframe. Since spring 2016, zinc prices have recovered significantly, and are now averaging over \$1.20 per pound. Lead prices have also recovered from lows experienced in early 2016. Further discussions of current and future zinc and lead prices are provided later in this report.
- As described previously, both Teck and the NWAB have announced their decision on a new PILT agreement for the period of 2016 to 2025. This agreement provides increased economic certainty to on-going mine operations and plans. The agreement also resulted in Teck dropping their lawsuit regarding the constitutionality of the Borough's severance tax.



*Sign at DMTS port facility*

## RED DOG OPERATIONS AND PRODUCTION ANALYSIS

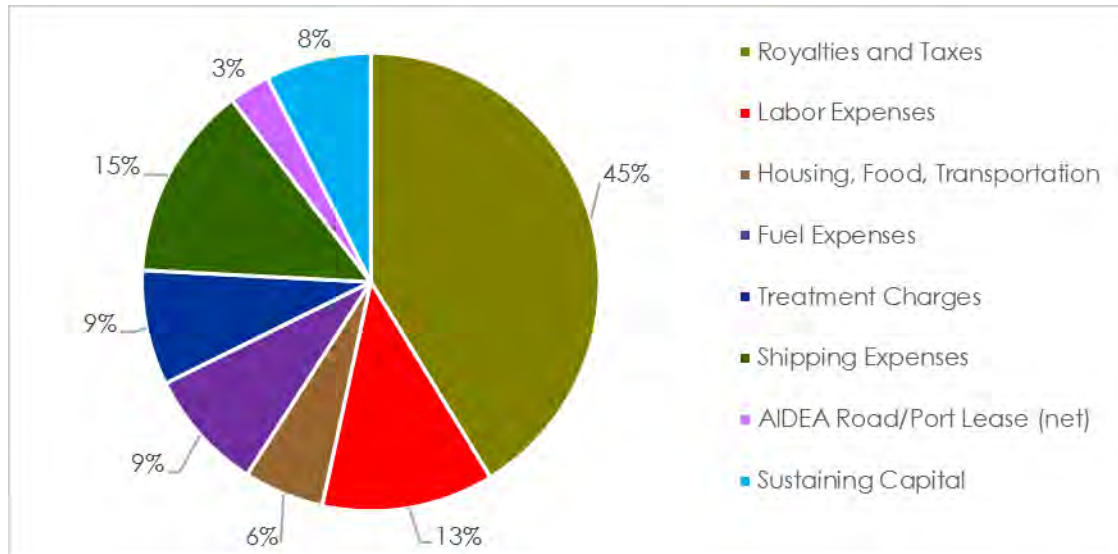
The original Red Dog ore deposit was considered a “world-class” ore deposit. Over the life of that deposit, “raw” ore grades for zinc averaged up to 20%, which is nearly double or more of the grade of most other large-scale zinc mines worldwide. The Aqqaluk deposit, the current focus of mining for the project, continues to average high zinc grades in the 16-18% range over the past 5 years. These high grades enable the mine to process less ore and minimize the amount of ore milling and treatment necessary to produce the high-quality concentrate that is saleable to worldwide smelters. The lower milling/treatment requirements, in combination with the scale of the deposit and its ensuing high production rate (throughputs), place Red Dog among the lowest cost zinc producers worldwide. As given through Teck's recent financial statements, total annual operations costs average roughly \$600-700

million per year with total zinc production costs of roughly \$350-450/ton, which includes the operations and maintenance costs for the DMTS road and port.<sup>99</sup>

These operation costs are summarized into the following categories:

- **Royalties and Taxes.** As described previously, Teck operates the mine, which exists on NANA lands, through a long-term agreement with NANA. The agreement provides numerous benefits to NANA, including the provision for a royalty share of the net proceeds. According to the agreement, the current royalty share is 35% of net proceeds and will increase by 5% every 5 years to a maximum of 50%. The next adjustment will occur in 2022 (to 40%). In 2016 the royalty amount was \$213 million. In 2016, Teck also paid \$11.2 million to the NWAB in conjunction with the on-going PILT agreement negotiations. Other significant taxes/fees that Teck pays include the State of Alaska mining license tax (MLT) and state corporate income taxes.
- **AIDEA Road/Port Lease.** The net expenses to Teck for their use of the DMTS road and port averages roughly \$18 million annually.
- **Labor.** Teck recently estimated that wages paid to Red Dog employees and direct contractors are roughly \$65 million annually (wages for workers both inside NWAB and outside NWAB).
- **Housing, Food, and Personnel Transportation.** Based on a constant employee population of 550 for the mine and port and using a gross estimate of \$150/person/day, the total estimated costs for this category are \$25 – 35 million annually.
- **Fuel.** Total fuel usage by the mine is roughly 21 million gallons per year. At an estimated delivered price of \$2.50 per gallon (for 2016), this equates to approximately \$53 million per year.
- **Mining/Milling Materials, Chemicals and Supplies.** According to CHR, typical zinc mine treatment charges averaged roughly \$40-60/tonne (of concentrate produced), which corresponds to approximately \$45 million for 2016.
- **Shipping.** The 2014 Preliminary Economic Assessment (PEA) report for the potential Lik Mine, a proposed mine near the Red Dog mine that would possibly use the DMTS for concentrate shipment, estimated ocean freight, mine to port transportation, and port fees is a total of roughly \$100/tonne. Using these numbers for 2016 for Red Dog, this would equate to approximately \$85 million. This would include the costs for DMTS road maintenance and port operations.
- **Sustaining Capital.** For 2016, Teck reported spending roughly \$46 million on capital projects related to the mine, mill, and port.

The annual estimated expenditures (2016), based on the categories described above, is provided in Figure 11. Importantly, this does not include closure bond funding or expenditures related to continued exploration/delineation activities. As demonstrated via the cost categories described above, many of the mine's operational costs are "fixed" and do not vary significantly with throughput variations. Maintaining high concentrate production levels therefore provides economic resiliency for the project and directly results in its low unit production costs.

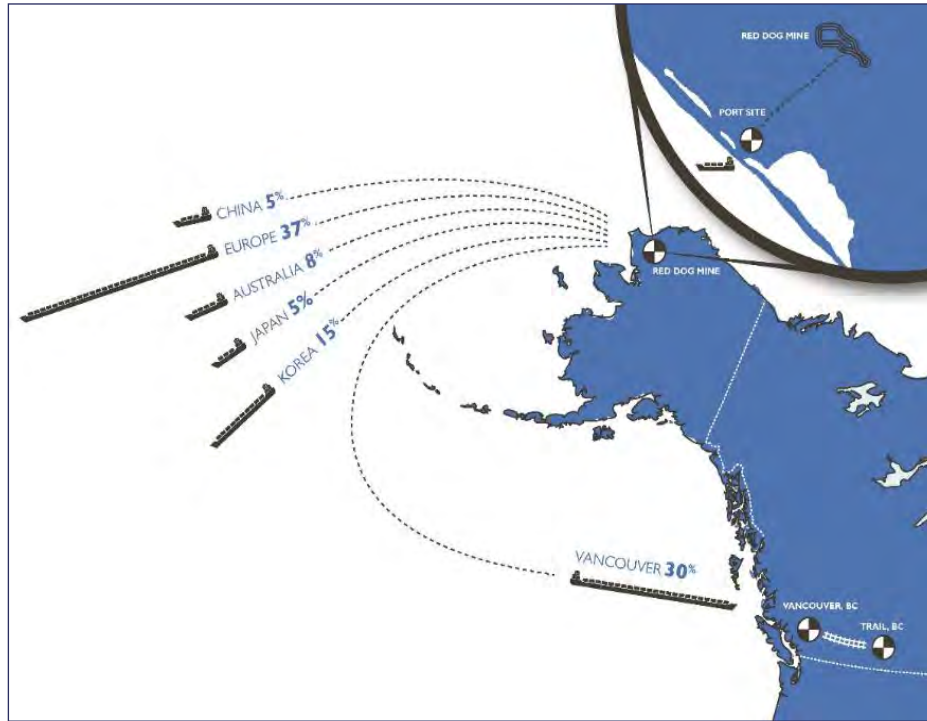


**Figure 11: Estimated expenditure breakdowns by category for the Red Dog Mine in 2016**



## ZINC AND LEAD MARKET OVERVIEW

The Red Dog mine is the only DMTS user; thus the success of the DMTS is directly related to the mine's success. Success for the mine is from the profitable sale of its two primary products: zinc and lead concentrates.



**Figure 12: Destinations of Red Dog Mine Lead and Zinc (provided by NANA)**

The destinations of the lead and zinc concentrates are shown in Figure 12.<sup>100</sup> Red Dog concentrates are sold worldwide, with most zinc concentrates sold under long-term contracts and the lead concentrates sold under “spot” contracts. Importantly, Teck reports that Red Dog zinc concentrates are generally not shipped to China due to Chinese smelter trace metal content restrictions; however, the majority of Red Dog lead concentrate is received by Chinese smelters. Receiving smelters then refine the concentrates and convert it to the various end-use metal products. Ultimately, the demand for the lead and zinc metals drives the pricing of the Red Dog concentrates. The top five uses of both lead and zinc demand/consume more than 90% of the production for both of these metals. Table 8 provides a listing of the primary uses for both metals.

Additional financial stability is provided to the project as one-third of the produced zinc concentrate is processed/refined at Teck's Trail, BC smelter, which represents about half of that facility's zinc concentrates input. Teck's Pend Oreille mine, in eastern Washington, restarted operations in 2014 and also provides zinc concentrates to the Trail smelter. Alaska's other zinc producer, the Greens Creek mine on Admiralty Island, also exports to the Trail smelter. These primary uses for lead and zinc have largely remained unchanged over the past few decades. The strengths, weakness, opportunity and threat (SWOT) analysis in this report identifies risks to the future markets/uses for both lead and zinc. During 2015 and 2016, the markets for both lead and zinc experienced significant volatility, largely attributed to global

growth concerns and Chinese market issues. This was followed by market tightening due to anticipated mine closures, and a voluntary removal of supply by a large producer. An analysis on the future of zinc and lead prices is provided in greater detail in the following subsection.

**Table 8. Primary Uses for Lead and Zinc**

Use Rank	Lead	Zinc
1	Lead acid batteries	Galvanizing (steel)
2	Lead ammunition	Alloys (primarily steel-based)
3	Pigments	Brass/bronze production
4	Lead weights	Health based uses, including sunscreens and dietary supplements
5	Lead casts (for metal molds)	Rubber (tire) vulcanization

According to the USGS, worldwide zinc production was roughly 13.4 million metric tons in 2015. Red Dog’s 2015 production of approximately 567,000 metric tons represents about 4% of the worldwide output and over 70% of the U.S. output. Worldwide lead output was 4.71 million metric tons in 2015; the lead output from Red Dog for 2015 was 112,500 metric tons, or roughly 2.4% of the worldwide output. Worldwide demand for both metals is only slightly decreased from 2014 levels, likely a contributing factor to the rapid recovery in pricing for the two metals from their 2016 lows.

## ZINC AND LEAD MINE PRODUCTION

As described previously, on an annual basis, the Red Dog Mine produces roughly 4% of the world’s zinc supply and 2-3% of the world’s lead supply. The expansion projects during the 1990s enabled the mine to significantly increase its production, and since 2001, Red Dog has consistently output more than 1,000,000 wet metric tons (WMT) of zinc concentrate annually (Figure 6). Figure 6 also provides the projected total concentrate production/throughput for Red Dog for the next several years, as taken from Teck’s 2007 NI 43-101 report, a publicly available document.

Other large mines and their zinc production levels are outlined in Table 9.

**Table 9. Worldwide Zinc and Lead Mines.<sup>101</sup>**

Mine Name	Country / Company	2015 Zinc Production (metric tonnes)
Red Dog Mine	U.S. (Teck)	567,000
Rampura Agucha	India (Vedanta)	510,000
Mount Isa	Australia (Glencore)	478,000
Century	Australia (MMG)	393,000
McArthur River	Australia (Glencore)	272,000
Antamina	Peru (Glencore/BHP Billiton)	191,000

The Century mine ceased operations in 2016, and another large mine, the Lisheen mine, operated by Vedanta Resources, Ltd. in Ireland, also ceased operations in 2016. The outputs from these mines, in combination with voluntary supply cuts by Glencore during 2016, are now contributing to the recovery in zinc prices from their early 2016 lows.<sup>102</sup> Of this group of large zinc mines, Red Dog possesses some of the richest ores, with the Aqqaq deposit providing average zinc grades at 16% or higher; while the Rampura Agucha mine operates with average ore grades of 13-15%.<sup>103</sup> The Rampura Agucha mine is one of the largest open pit mines in the world, however, it is anticipated to move into partial underground extraction techniques in the next few years, which will likely decrease its production levels.



*Concentrate truck heading back to mine/mill, with CSB#2 in background*

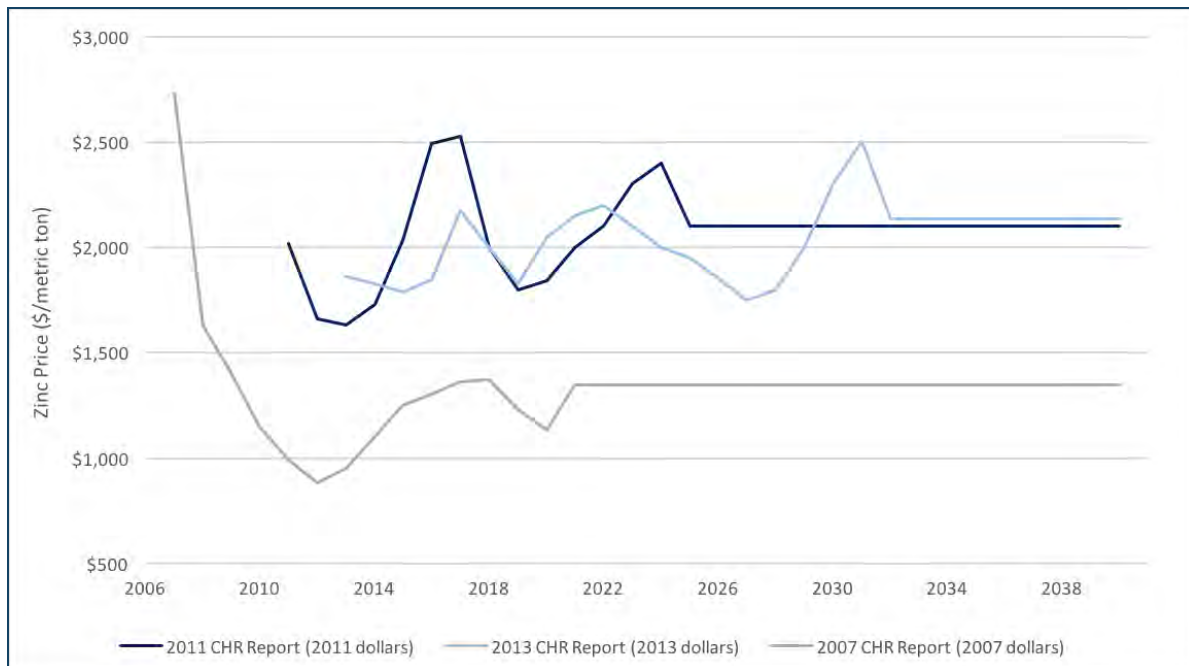
### Zinc Market Outlook

As described through this report, the long-term market for zinc and lead metals provides the key to the DMTS financial success. The market overview contained within this section (for zinc) is compiled from the review of various reports prepared by third parties on behalf of AIDEA or through references to other published information. The timing of these reports, while somewhat dated, still provide general conclusions that are still believed to be largely valid.

AIDEA contracted with CHR Metals, Ltd. in 2007, 2009, 2011, and 2013 to produce comprehensive reports on the “Prospects for the Global Zinc Market to 2040”.<sup>104 105 106 107</sup> The figures on the following page provide both the historical lead and zinc prices (Figure 13A) and the projected zinc prices (Figure 13B) from the 2007, 2011, and 2013 reports.



**Figure 13A Price of zinc and lead (historical)**<sup>108</sup>



**Figure 13 B: Price of zinc (forecasted)**<sup>109</sup>

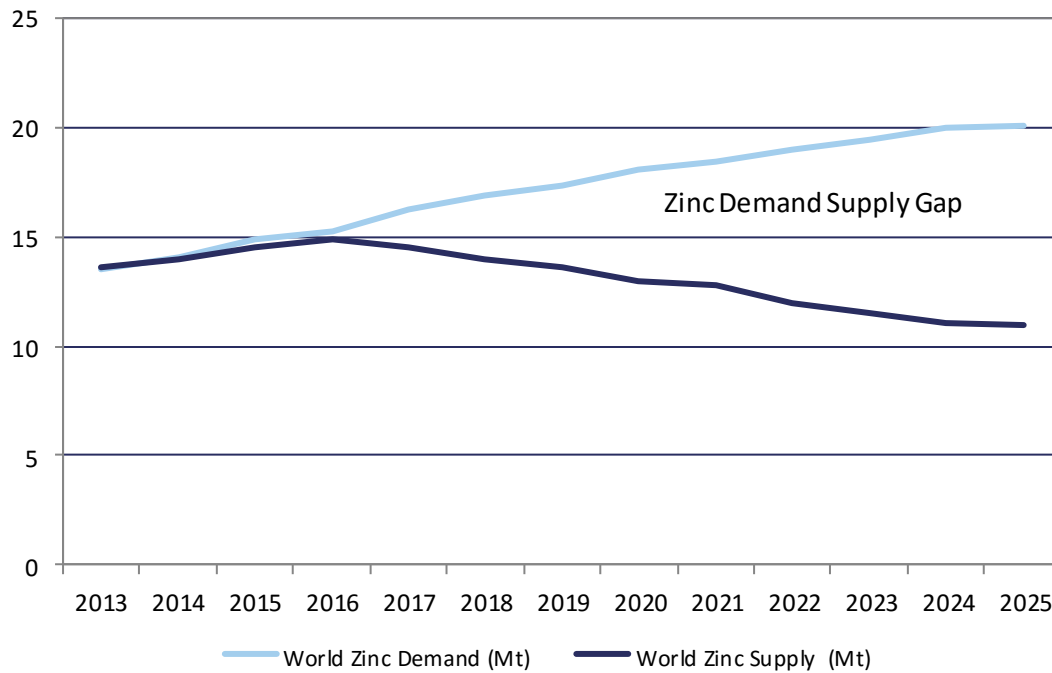


While the CHR zinc projections have improved in accuracy since the first one (2007), they have generally not predicted actual market prices (Figure 13A). As shown, zinc and lead prices have risen significantly since 2004, with a spike between 2005 and 2007.<sup>110</sup> This spike largely tracked increases in many other commodities during this period, which followed rapidly increasing consumption/demand levels in developing countries such as China, Brazil, and Russia. This commodity price increase became generally known as the “super cycle”. The elevated prices were not sustainable, and the financial collapse in 2007-2008 resulted in a global recession with commodity prices rapidly declining commensurate with the overall world economy and prior price increases. Since 2009, prices have recovered to an average of near \$2,000/metric ton for both metals. A decline in late 2015 and through early 2016 also tracked declines in other commodities, largely attributed to a slowdown in the Chinese economy during this period. Prices have been recovering since early 2016 due to mine closures and voluntary supply cutbacks as discussed further above and below. 2017 zinc and lead prices have been increasing substantially, with the average zinc price approximately 65% higher from January 2016 to November 2017. Recent prices have averaged over \$1.40 per pound this past fall (2017).

The most recent CHR projection, from 2013, anticipates roughly 15% swings in zinc prices on an every two-year cycle due to zinc supply and demand balances. For 2016, CHR predicted a rise in zinc prices due to the closure of several large mines worldwide. These closures (primarily the Century and Lisheen mines) have occurred. However, CHR believes that the ensuing price escalation would then provide support for increased production from small mine operators (primarily in China) that would relieve the supply shortfall in following years. CHR predicted a repeat in this cycle near the end of the decade. A flat price (in current dollars) is then predicted in out-years due to model uncertainties.

It is important to note that through their 2011 and 2013 reports, CHR generally predicted the current market swings. However, it is too early to tell if the current level of higher prices will result in the production of new supply (and subsequent price decreases) as they further predict. Further, the announcement in May 2016 by Glencore, that it would reduce output at its zinc mines by up to 500,000 tonnes/year, has aided in the overall price recovery. It is uncertain when or if Glencore will restore this supply to the market and thereby decreasing/reversing the current price upswing.

AIDEA also employed HDR to provide some analysis on the zinc market in 2014. This analysis confirmed many of the CHR projections, while also developing independent supply and demand forecasts based on public mining operation announcements available in 2014. See Figure 14 below. The supply shortfall as predicted in 2014 by HDR has started to materialize as indicated by numerous sources (and described above), and evidenced by the current price upswing. It is uncertain if this shortfall, and the current price recovery, will provide sufficient long-term support for the development of new large-scale mines to alleviate the supply shortfall.



**Figure 14: HDR zinc supply and demand forecasts (as of 2014)**

CHR believes increased demand from Africa and India will be necessary to produce sustained demand growth over the next decade or longer. Growth in these and other developing markets may only offset declining or stable zinc consumption in the U.S., Europe, and East Asia (Japan/China). CHR is skeptical that the galvanized steel demand will experience the growth seen in the early and mid-2000s, which was largely driven by significant infrastructure development in China and other developing countries.<sup>111</sup> CHR also commented that improved galvanizing techniques are reducing the amount of zinc necessary for galvanized steel production.

Through a recent investors’ call, Teck reported that the zinc concentrate market continues to be at a deficit (concentrate production is not meeting refinery demands). This is resulting in decreased smelter production and declining world inventories. Additionally, new zinc mine projects are increasingly being delayed and the new production is therefore not available to the market until later dates. Teck projects existing world zinc inventories will be fully utilized near the end of 2017 and a true supply deficit will grow over the next few years, exacerbated by growing demand.<sup>112</sup> However, a recent announcement by a private consortium, including Iran’s Mobin Mining and Construction Company, on their planned opening of a new large zinc mine in Iran, capable of up to 800,000 tpy of zinc concentrate production, may dampen future price increases and alleviate future supply shortfalls.<sup>113</sup>



*Tug and concentrate barge unloading to an ocean-going vessel*

In early 2017, Wood Mackenzie documented the decline in Chinese refined zinc production, linking

it to constraints in mine production.<sup>114</sup> Similar data is also reported by the International Lead and Zinc Study Group (ILZSG), an inter-governmental organization, under the auspices of the United Nations and comprised of representatives of industry, both producing and consuming entities. In their June 2017 press release, they document declining worldwide zinc metal inventories and increased Chinese imports.<sup>115</sup> This information, combined with Teck's analyses and documentation of decreasing zinc treatment charges (i.e., refining costs), leads to a conclusion that presently zinc prices are being primarily driven by supply constraints. However, as noted by both CHR, HDR, and Wood Mackenzie, it is likely these supply shortfalls will be alleviated in the future by both increased Chinese mining activity and increased activity by junior mining companies worldwide. Historically, the zinc market has seen a series of cycles, with above average prices over a one or two-year timeframe, stimulating mine production resulting in a similar timeframe of depressed prices with periods of relatively stable prices around long-term expectations in between such timeframes.

### Lead Market Outlook

As described above, lead comprises roughly 16% of the total concentrate output for Red Dog and typically about 15% of the mine's revenue. Further, as shown in the graphs above, lead prices typically track those of zinc, and are influenced by the larger metals commodity market. Many mines, like Red Dog, co-produce zinc and lead.

Metals market analysts, including Wood Mackenzie and the ILZSG, document that the lead market in 2017 is currently being driven primarily by increased demand not being met by mine production. Although production was increased in China in the first half of 2016, mine production fell elsewhere, including Australia. Further, lead usage exceeded supply during this period, providing support for the price increases experienced thus far in 2017.

The lead market is dominated by its use in lead-acid batteries, primarily for vehicles. Although AIDEA has not contracted with CHR for lead price forecasting, informal discussions with them in 2016 revealed concerns that are identified in the project SWOT analysis. Despite these risks, CHR anticipates the lead market (demand) will remain relatively stable over the next three to five years. In the long-run, CHR believes risks from lead substitutes may lead to downward pressure on lead demand, which may cause a decline in prices. Concerns about the toxicity of lead for humans and animals and lead's presence in the environment are driving the development and increasing use of lead substitutes.

## **AIDEA FINANCIAL ASSESSMENT RELATIVE TO DMTS**

DMTS represents AIDEA's largest single investment and owned asset. Numerous other metrics also demonstrate the importance of DMTS to AIDEA's overall financial position:

- Over the past ten years, with concentrate throughput exceeding 1.1 million metric tons annually, AIDEA received total tolls and fees averaging more than \$17 million annually (thru 2016). AIDEA's bond payments related to the project are roughly \$10-11 million annually. AIDEA "nets" roughly \$6 million annually from the project. As indicated previously, only the interest income from the original and expansion investments is counted towards AIDEA's net income. The remaining revenues are used to decrease the investment base of Teck's capital lease. Once the lease is fully repaid (estimated at 2023-2024), all of the received funds will contribute to AIDEA's net income and thus its base for calculation of its dividend to the state general fund.

- Standard and Poor's provided a "AA+" rating for AIDEA's Revolving Fund in 2015. This is the fund through which the majority of AIDEA's business occurs. This rating is partially supported by the long-term and stable nature of the DMTS agreement and financing. This rating provides AIDEA the opportunity to utilize general obligation Revolving Fund bond financing to support potential future project investments, while still achieving net returns that match the project's risk and AIDEA's investment/opportunity costs.

## SWOT ANALYSIS

To further understand AIDEA's on-going involvement in the DMTS, a Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis was conducted. A summary of the identified SWOT attributes is provided below.

### Strengths

- The DMTS port/road services a world-class zinc deposit and ore body district; Red Dog ore has some of the highest zinc concentrations in the world, resulting in a relatively small mine footprint and lower operating costs
- Red Dog and the DMTS are located in a geopolitically stable location, with a strong rule of law
- The remote location of Red Dog and the DMTS limits NIMBY (not in my backyard) influences
- Port and associated mine provide significant Alaska/regional employment with jobs at sustainable wages that are significantly higher than the local median; for 2017, over 50% of the 550+ employees are NANA shareholders
- As a company, Teck provides long-term mining and operational experience, coupled with a sole corporate focus on natural resource extraction and production; Teck is also a leader in worldwide zinc production and refining
- The relationship between Teck and NANA is strong, minimizing conflicts that could affect the DMTS port and road; NANA's support was/is critical to continued mine operations and development
- NANA is a stable corporation supportive of responsible resource development
- The road and port operations comply with environmental regulations and have provided good outcomes (better water quality and improved fish habitat versus pre-mine)
- The DMTS road and port are well-maintained and in good condition



*Aerial view of the DMTS port in the winter*



- Teck's ownership of the Trail, BC smelter provides a stable customer base for the Red Dog concentrates; conversely, the Trail smelter relies upon Red Dog concentrates for continued operations
- Red Dog zinc concentrate is marketed and sold to a wide variety of worldwide smelters
- Red Dog has contributed significant revenues to the NWAB and local school district, providing nearly all of the Borough's required school contributions according to state funding formulas
- DMTS provides a significant and stable return for AIDEA; positively contributing to AIDEA's bond rating and AIDEA's net income/dividend base
- AIDEA's ownership of the DMTS enables potential participation/use of the facilities by other users, providing the opportunity for other development in the region
- A strong U.S. dollar provides "extra" margin contribution (from Red Dog revenues) to foreign-based companies (like Teck)
- The existing agreements with Teck extend to 2040 and provide a framework for further extensions
- Long-term use of the port/road will be necessary to support the on-going environmental monitoring necessary for the mine post-closure
- Worldwide zinc demand is stable and generally tracks world economic growth; the risk of substitution is low
- If sustained, the current strong zinc and lead prices may result in CEZ payments in upcoming years, providing further upside payments to AIDEA

### Weaknesses

- Teck's required preference to hire NANA shareholders means that it pulls from a relatively small potential worker population
- The NWAB relies nearly exclusively on Red Dog for the majority of its revenues
- The NWAB is not party to the existing DMTS agreements; formal communication channels are not present between AIDEA and NWAB
- The shallow depth of the port necessitates lightering of the concentrates to the larger ocean-going export vessels; this adds significant operational costs
- The aging port and mine/mill infrastructure will begin to require significant maintenance/repairs
- Typical O&M for the port and road are costly and seasonally limited compared to other mines
- The DMTS road and port services only one mine with only two products (lead and zinc concentrates) making the business case vulnerable to commodity market and price risks
- Red Dog lead concentrate sales are heavily reliant upon Chinese smelters; 90% of 2015's lead production was sold to China, representing roughly 20% of Red Dog's revenue

- The two ore deposits currently being mined (Aqqaluk and Qanaiyaq) are anticipated to be mined only thru 2031; future ore deposits are locally available but the economic, environmental, and technical feasibility for their development is currently unknown and underground deposits will have lower economic margins
- The Red Dog mine and DMTS are distant from most markets/smelters, making shipping costs high
- In comparison to third world countries, drilling costs for exploration and mine delineation activities are high; permitting of new mines is also costly and lengthy
- Red Dog concentrate is not universally marketable due to the presence of trace materials/elements
- Existing concentrate storage buildings (CSBs) are potentially oversized based on future mining projections (Red Dog anticipates lower throughput in the 2020-2030+ period)

### Opportunities

- The VIP2 project is anticipated to increase mill throughput by up to 15%; Teck is also pursuing an exploratory drilling program at the nearby Aktigiruk deposit
- Local geology presents opportunities for continued use of the DMTS port/road due to potential future mine/ore body prospects in the nearby area; existing agreements could be modified to enhance long-term opportunities
- Use of the DMTS port and road infrastructure presents the opportunity to mitigate the locally high cost of living by sharing fuel or other bulk good imports; local communities such as Kivalina or Noatak may be able to capitalize on the preferential pricing provided to Teck through its bulk fuel purchases
- AIDEA's ownership of the DMTS port and road present opportunities to create new jobs through the development of other new mines in the area; several potential ore bodies are known to exist regionally
- AIDEA's ownership of the DMTS port/road enable other industries to use the port, its laydown area, support facilities, and/or CSBs; the port could support Arctic shipping, tourism, and supporting activities (oil spill response, salvage, etc.)

- Port operational costs may be lowered via use of wind power/turbines, LNG, or other alternative energy technologies
- The DMTS road presents an opportunity to extend to Noatak and/or Kivalina to facilitate regional development/economic activity
- The DMTS can provide support to on-going research and other state/federal missions in the Arctic (USCG, NOAA, USF&WS)
- The use of ice-rated concentrate export vessels could facilitate an extension to the shipping season (incoming and outgoing materials and ore)
- Climate change and warming in the arctic may result in extended shipping seasons and/or new shipping routes (i.e., the Northwest Passage)



**Figure 15: Arctic Shipping Routes (<http://library.arcticportal.org/>)**

## Threats

- The mining industry has a generally negative public perception
- Continued NWAB reliance on Red Dog for its primary revenue base
- Environmental regulations for mining and its related support activities continues to tighten
- Improved galvanizing/zinc application methodologies are decreasing the amount of zinc required for corrosion resistance
- Concerns over lead toxicity may result in the continued phaseout of its use in many products
- Unknown impacts from climate change; larger storms may lead to greater potential for erosion and logistic/cost impacts (inability to lighter ore due to persistent rough sea conditions)
- Fluctuating fuel prices impact port and mine economics
- Slower world growth may lead to declining zinc and/or lead markets and prices
- Significant declines in Teck's stock value jeopardize mine/port investments by the company
- State economic situation may lead to increased taxes (Alaska Mining License Tax; corporate income tax; fuel taxes; Borough taxes)
- Global shipping is changing; EU is considering classifying lead concentrates as hazardous materials, increasing the rules and regulations that impact its shipping
- The EU has passed regulations aimed to phase-out lead acid batteries which could cause a worldwide decline in lead use
- Competing Teck projects could take precedent over the exploration of new deposits at Red Dog (to provide new mine/mill lifetime and extension of port/road use)
- The National Park Service (Cape Krusenstern) may press environmental concerns related to road/port operations



*Looking at original Red Dog deposit in 2011 from newly started Aqqaluk deposit (left); mill is in background with impoundment*



## RISK ANALYSIS



*DMTS shiploader in winter*

Building on the above SWOT analysis, a more detailed risk analysis is provided to describe the potential risks and threats to the project's long-term viability. Where appropriate, mitigation measures are also identified.

2016 marked the beginning of the second-half of the initial term of the AIDEA-Teck DMTS Agreement. By nearly every measure, the project has been a success economically and operationally. The project overall provides significant revenues to

AIDEA, the NWAB, Teck, NANA, and the other Alaska Native Corporations (regional and village). Hundreds of new jobs and other economic development opportunities have been realized since the mine's inception. With 25 years of project operations under its belt, risks associated with construction and operation have been successfully avoided or mitigated. Going forward, the project will continue to encounter internal and external risks; however, the relative scale and nature of these risks will be different than those for a new project.

Both the original and the restated/amended AIDEA-Teck Agreements established provisions intended to mitigate a wide range of the potential risks associated with constructing, expanding and operating the DMTS. These can be classified into Economic, Business, Environmental, Social and Political risks. The following subsections describe some of the potential on-going/future risks and potential mitigation strategies.

### Economic Risks

Economic risks associated with the DMTS largely relate to the continued viability of the mine and Teck. Relative to AIDEA's payments required under its agreement with Teck, through its life to 2040, a corporate guarantee of payment is provided, regardless of mine operations or ore prices. Teck's large balance sheet and capital resources minimize this risk going forward, however these risks are not zero. In 2009, Teck experienced financial difficulties that may have led to potential project economic risks had the company not received new outside investment support. As described previously, estimates of market demand for zinc and Teck's mining projections indicate that Red Dog operations will remain economic and on-going through at least 2031. The recent VIP2 project announcement by Teck strengthens these projections. Teck is currently exploring additional nearby ore deposits that may extend the mine/mill's lifetime. Teck's recent announcement regarding the promising results of exploration at the nearby Aktigiruk deposit provide further evidence for the potential project life extension. The development of Aktigiruk or other prospects may be contingent upon market conditions, timing, negotiation of the necessary agreements, and receipt of the appropriate environmental permits/approvals. The Aktigiruk deposit is located on State lands, which would require negotiation of new agreements related to the existing mill site and would result in the cessation of the existing NANA royalties.

AIDEA also faces potential economic risks related to the potential future mine closure. If a decision to close the mine is reached ahead of 2031 or upon deposit depletion, then Teck will likely be reluctant to expend significant funds for on-going maintenance of the DMTS infrastructure. This would result in a deterioration of their value upon their turnover at the end of the lease. However, the Reserve Account can be used to enforce the payment of any maintenance requirements. Similarly, as noted previously, if the mine is closed, significant infrastructure at the port will no longer be required. Currently, the AIDEA-Teck agreement does not specify dismantlement, removal, and/or rehabilitation (DR&R) requirement responsibilities. Costs for these requirements may be significant and exceed the value of the Reserve Account. As noted previously, the agreement also does not specify how the Reserve Account is to be managed at the end of the agreement.

As described above, Teck is currently exploring for new ore reserves in nearby/adjacent areas to Red Dog. Ore body size, economic, and environmental factors will affect the decision to develop any of these new deposits. Importantly though, many of these ore bodies exist at depth, which will require underground mining for their extraction. Typical underground mining costs are an order of magnitude more than those of surface mining operations and high continuous throughputs are difficult to achieve.

#### Business Risks

Business risks from AIDEA's continued ownership of the DMTS are largely mitigated through the provisions in the AIDEA-Teck agreement. As noted previously, the Guaranty Agreement provided by Teck ensures the payment of the obligations in the AIDEA-Teck agreement, regardless of operations or market conditions. Teck's strong balance sheet, as given in their current financial statements, provides assurance of their capability to meet these payment requirements.

AIDEA's practice of applying excess fees received from Teck to the early paydown of its booked investment value for DMTS de-risks the out-years of the project. Currently, the project anticipates investment base paydown (i.e., lease repayment) in 2023-2024. Thus, any/all received funds, after making the necessary bond payments, will then be directly accounted by AIDEA as income.

The Reserve Account provides ready resources against unforeseen economic or external disruption to the operation of Red Dog Mine, and can be used to address any short-term suspension of use or other maintenance requirements.

The NWAB's future enactment of a severance tax or insistence on even higher PILT payments, introduces business risks to Teck – effectively reducing the project's net revenues. Similarly, any changes/increases in the state's MLT or other taxes would also decrease the project's net revenues and potentially dis-incentivize Teck from pursuing future operations for the mine/mill (and DMTS).

#### Environmental Risks

Environmental risks associated with the initial construction and operations of the DMTS were largely addressed and mitigated through the various permitting processes, leaving the Agreement to focus on compliance with permit conditions and to provide processes and remedies for violations or disruptive events. Over the project's history, a number of environmental issues arose, all of which were successfully mitigated. These are largely described through the prior subsections of this report.

The Agreement places the liability for any environmental issues, including hazardous material spills, upon Teck. Insurance coverages and indemnities contained in Articles 7 and 8 provide mitigations against calamities and force majeure events. Should such disruptive events occur, deferral and abatement provisions exist in the Agreement to enable recovery of normal operations. The Reserve Account provides further capacity to assist in project recovery.

As described previously, the Agreement does not outline provisions for post-closure requirements, such as DR&R. DR&R requirements should be negotiated as part of any future modifications to the Agreement. Importantly, the Red Dog Mine Reclamation and Closure Plan also does not contain any specific State mandated requirements for the DR&R of the port facilities/infrastructure.



*Sign at hill overlooking Red Dog Mine*

### Social Risks

Social risks related to the Red Dog project and the DMTS are managed by an active engagement process between Teck and local stakeholders. Teck regularly meets with local village residents and provides updates on the current mine operations. For local environmental concerns, Teck regularly engages residents through the local subsistence councils. Social risks are mitigated through the village meetings and through Teck's relationship with NANA. The high rates of NWAB resident employment provides direct connections between Teck/NANA and many of the NWAB communities. As owners of the DMTS and Red Dog mine lands, NANA shareholders primarily benefit through the royalties from the mining operations. Through 2016, NANA had received more than \$400 million in royalties from Teck and shared more than \$800 million with other Alaska Native Regional Corporations. Nearly 60% of the mine or contract employees are NANA shareholders. Through these direct payments, Teck's commitment to local hiring/employment, and Teck's other local commercial and philanthropic activities, Teck largely enjoys a positive working relationship with the northwest Alaska community.

### Political Risks

The political risks related to the Red Dog project are increasing, largely as a result of the project's success and its high profile within the region and state. However, the recent completion of a new longer-term (10-year) PILT agreement with the NWAB will provide improved economic stability for the project's future. Continued tightening of environmental regulations and/or other tax modifications (state and/or federal) potentially reduce the future certainty for the project.

## **DMTS EXTENSION OPPORTUNITIES**

AIDEA's mission is to promote economic development in the state and its ownership of the DMTS is a direct fulfillment of that mission. This section explores potential opportunities for further DMTS utilization to foster additional economic development in the region.

### **MINING OPPORTUNITIES**

As described previously, Teck's current forecasts anticipate an end of mine life at 2031, when the ores in the Aqqaluk and Qannayiaq deposits are effectively depleted to levels not economic to support further mining. However, the area surrounding the Red Dog mine at the western end of the Brooks Range mountains is a rich mineralogical region with a high potential for deposits similar to Red Dog.<sup>116</sup> Teck is forecasting annual zinc production at Red Dog to range between 475,000 and 550,000 metric tons over the next five years. Three year projections (2018-2020) currently estimate 525,000 – 550,000 metric tons per year of zinc production.

This information, coupled with exploratory drilling performed to-date by Teck and other mining companies suggest that other nearby ore deposits could enable the extension of mining operations beyond 2031. Some of the known nearby deposits exist at depth and may require underground mining operations, while others are a few miles from the existing mill site. In either situation, development of these deposits may increase operating costs and potentially decrease throughputs. Economic studies are underway to determine the feasibility of mining these deposits. Increased environmental costs and taxes/fees are a part of these considerations. The DMTS provides the infrastructure backbone for the continued exploration and potential development of any identified and feasible new ore deposits.

Teck recently approved the \$110 million VIP2 mill upgrade project, which is anticipated to increase mill throughput at Red Dog by up to 15%; this production rate increase will help in maintaining overall concentrate production levels despite anticipated decreases in raw ore grades over the remaining life of the Aqqaluk deposit. The VIP2 mill improvements are expected to be complete by end of 2019. Teck is also pursuing an exploratory drilling program at the nearby Aktigiruk deposit to potentially provide a new source of ores once the Aqqaluk deposit is exhausted.<sup>117</sup>

Other known mineral resources in northwestern Alaska could potentially make use of the DMTS facilities. The Arctic Slope Regional Corporation (ASRC) has identified 175 million tons of high-grade bituminous coal in the Kuchiak mine area, roughly 90 miles north from Red Dog.<sup>118</sup> In addition, more than two billion tons of coal reserves are estimated to be in the Western Arctic Coal District.<sup>119</sup> DMTS represents the closest existing marine shipping point for these coal resources. Similarly, the 2003 Draft Feasibility Report for the potential DMTS deep-draft port expansion identified numerous other zinc, lead, and copper deposits in Northwest Alaska that could use the DMTS for their development.

The 2014 Lik Deposit System Transportation System Feasibility Study identified that capacity likely exists at the DMTS for use by other mining companies, such as the potential development of the Lik Deposit. Utilization of this capacity, and the sharing of the DMTS operational costs by other companies will also enhance the economics of any continuation of Red Dog operations.



## POTENTIAL PORT INFRASTRUCTURE USES

The DMTS port facilities, including the vessel loading/conveyor system, CSBs, bulk fuel tanks, utilities, and worker accommodations, can accommodate users other than Teck to the extent the use by others is consistent with Teck's preferential use of the facilities. As an example, over the past decade, the DMTS facility has hosted teams of biologists and other researchers to conduct research on the Chukchi polar bears during winter months. This program may be continued and expanded as interest in the Arctic increases.

Maritime operations involving the DMTS are constrained by the shallow water depth of the area, minimal docking structures, and the short ice-free operating season. Even with these constraints, other logistic services and staging of equipment and materials for project, national defense, and oil spill response opportunities are conceivable. In January 2017, the U.S. Committee on the Marine Transportation System, under direction of the U.S. Department of Transportation, issued a report that identified recommendations to develop, improve, and maintain infrastructure in support of Federal maritime arctic activities, national security, navigation safety, and the stewardship of natural resources. The report identified opportunities for public-private partnerships (P3) that would support potential Arctic maritime operations.<sup>120</sup> The DMTS is a successful P3 that may be used for supporting arctic operations, logistics, and other activities.

One near-term DMTS extension opportunity would involve the use of the DMTS tank farm and bulk fuel purchases to provide heating fuel price relief to local villages. Piggy-backing off the favorable pricing received by Teck for their bulk fuel purchases of No. 2 ultra-low sulfur diesel (#2 ULSD), fuel for the village of Noatak could conceivably be offloaded at the DMTS and trucked to the mine site where it could then be air-shipped to the village. Currently the village's fuel is air-shipped from Fairbanks or Kotzebue and does not receive the significant bulk pricing discounts that Teck is able to negotiate. Importantly, Teck currently provides #2 ULSD to Noatak and Kivalina residents on a bi-weekly and seasonal basis where residents can fill 55-gal drums in sleds towed by their snowmachines. Residents are charged roughly 25-40% less than their local market rate for this fuel. These alternative uses of the DMTS facilities would help contribute to the utilization of the DMTS to the greatest possible extent and foster local economic development, satisfying AIDEA's mission.



*Noatak residents picking up fuel from Teck*

## DMTS SUCCESSES AND CONCLUSIONS

AIDEA's more than 30 years of involvement in the DMTS have provided numerous lessons learned and other key takeaways that can be used as guides for future projects or other AIDEA endeavors. These takeaways are summarized from information provided through the prior sections of this report.

### DMTS FACTORS OF SUCCESS

The DMTS stands as a successful example of a P3 supporting substantial overall economic benefit to the immediate northwest Alaska region and the greater state as-a-whole. This success and the project was recognized by the International Economic Development Council (IEDC) in 2016 as a first place award winner in its P3 category.<sup>121</sup>

Through the production of this report and its review of the greater than 30-year history of the project, several key factors have contributed to its success:



*Sun over Chukchi Sea ice*

- ***Solid enterprise business case.*** The Red Dog Mine and DMTS infrastructure represent an enterprise that is economically self-sufficient and capable of achieving positive returns for all involved. Red Dog produces zinc and lead concentrates that are commodity metals necessary for the manufacture of basic infrastructure and other products worldwide. Pricing for these metals largely follows worldwide economic cycles; the increased development of former third world countries has resulted in a rising demand for both metals over the past 30 years. While long-term risks to the continued growth in demand for both zinc and lead exist, nearly all projections do not anticipate significant demand changes (decreases) in the short to mid-term. In fact, as described previously, Teck's internal analysts expect modest tightening in the zinc market over the next few years due to decreased supplies. As a low-cost producer with significant remaining reserves, Red Dog can maintain output through typical commodity pricing cycles. The expansion of the mill and port facilities in the mid-to-late 1990s, despite an uncertain future for the project at that time, directly contributed to the project's economic resiliency. This expansion proved that with robust production and throughputs, the project can now economically withstand short-term pricing downturns.
- ***Long-term planning and coordination.*** The initial go-ahead for Red Dog required significant early coordination and planning. Early-on, NANA and Teck cooperatively established key relationships with the Alaska Legislature, Governor Sheffield's administration, and federal representatives/stakeholders. These relationships supported the project and helped secure important elements of the project's financing and other authorizations/permits. The Alaska Legislature's creation of AIDEA's financing tools, such as the Economic Development Fund and its ability to own and bond for project investments is an example of one of the early project

elements supported through these relationships. Similarly, NANA's consolidation of the village corporations in its region also facilitated early project approvals through minimizing potential non-supportive factions. Both companies also exhibited patience in these pursuits, exemplified through the AIDEA tool development process, which required several years and two Legislative sessions.

- ***Sound agreements.*** The Red Dog project is governed by numerous agreements as described in this report. The agreements between NANA, Teck, and AIDEA have each proven to be fair and yet flexible to enable continued operations without necessitating significant modifications or amendments. The AIDEA-Teck agreement provides a consistent pay down (with return) on AIDEA's capital investment for the project, while also providing appropriate upsides based on the project's success and its relative risk sharing (see further below). The agreement also includes several mechanisms to enhance financial security, including the required Reserve Account.

Similarly, the NANA-Teck agreement facilitated overall project success via its patient approach to providing project returns, only increasing NANA's royalty payments after the mine capital investment was repaid and then on a graduating scale for future years. Their agreement also benefits NANA through facilitating shareholder employment opportunities and subcontracting opportunities for NANA subsidiaries. The long-term nature of the agreements also minimizes risks from short-term commodity price cycles.

- ***Patient and reasonable capital.*** The original AIDEA-Teck Agreement stands as an example of patient financing and risk sharing with the stated intent to assure the completion and success of the project, while also promoting AIDEA's mission of economic development. The 50-year term of this agreement exceeded the initial anticipated life of the mine and also provided a reasonable financing rate that was discounted relative to market conditions at the time of the financing. It included both credit enhancements and reasonable upsides intended to potentially offset some of these risks. AIDEA's further investment (approximately \$85 million), through the 1997 expansion, also exhibited these same elements of risk sharing and patient capital. At the time of that agreement (1997), zinc markets had been consistently low for several years, with an unclear future; the mine had been losing money since its opening; and the future life of the mine (via the existing/main deposit) still only provided certainty for operations through 2020, which was 20 years short of the life of the agreement. Despite these risks, AIDEA moved forward with the additional financing, maintaining the agreement term through 2040. AIDEA's patience provides for overall repayment terms that increase the economic resiliency of the mine. Importantly, the long-term nature of the agreement also provides a stable cash flow to AIDEA, which supports its bond rating and ability to perform or finance other projects throughout the state.

- ***Strong partnerships and willingness to take risks.*** The collaborative working arrangements between AIDEA, Teck, and NANA have contributed to the project's success. Each party understands the long-term nature of the project and is willing to provide support as necessary to ensure its overall success. As described above, for AIDEA, this was most acutely demonstrated through the additional financing provided in the mid-1990s for the port expansion. Given the uncertainty in the future mine reserves at the time and the on-going/prolonged downturn in commodity prices, the long-term success of the project was not assured. However, despite these risks, AIDEA still invested \$85 million in the expansion. AIDEA also provided patience and cooperation in working with Teck through the early years of the project, working through environmental, safety, and other issues that confronted the project through the 1990s and early 2000s.
- ***Stable political and regulatory environment.*** The predictable laws governing the DMTS/Red Dog project provide assurance that helps support Teck's investment into the project. Even though laws and regulations can change, their change process is typically manageable/predictable; this is especially favorable for multi-national corporations like Teck, when compared to operations in less developed and less stable countries.

## ASSET MANAGEMENT REVIEW CONCLUSIONS

This report provides a summary of the DMTS's history, the agreements and financing for the project, a review of the project's on-going status, and the potential future for the project. Recent inspections document the overall "good" status of the DMTS infrastructure. Several significant maintenance projects are currently being planned to address the aging of the DMTS facilities, including the replacement of the CSB#1 roof and updates to various port utility systems. At present, Teck continues to utilize the full capacity of the DMTS facilities, with zinc and lead concentrate exports exceeding 1 million tons annually since 1999. However, current Red Dog projections indicate concentrate



*CSB #2 under construction, summer 1997*

production and resulting exports will begin decreasing, with the deposit anticipated to be depleted in 2031. The recent approval for the VIP2 project will help sustain concentrate production by increasing the mill capacity, enabling the processing of the lower grade Aqqaluk ore. The project may also potentially provide a few additional years of production from the existing deposits. Teck is also currently exploring and evaluating nearby opportunities for long-term extensions of the project and the continued utilization of the port, including the recently announced results around the Aktigiruk deposit, located on State lands a few miles from the existing mill site. The development of these deposits will be contingent upon the success of these activities, the negotiation of associated development agreements, and the economics associated with any potential development.



Teck's recent agreement with the NWAB for a new PILT for a ten-year period mitigates risks related to local taxation uncertainty. The new PILT also includes funds that will be deposited into a village improvement fund to assist with potential utility or other infrastructure projects in the borough's 11 communities. These capital investments will also help maintain strong local support for the mine.

Current zinc and lead prices provide strong market conditions for the continued operations of Red Dog and the evaluation of other potential future deposits. The pricing for these metals largely follows worldwide economic and commodity cycles. Current elevated prices are largely believed to be the result of supply shortfalls due to recent mine closures while demand has remained strong. In the short run, the potential for zinc or lead substitution or replacement by other materials is also low.

The condition and location and the DMTS infrastructure presents opportunities for its use by other mines in the region or for its support of other industries.

The DMTS financing structure provides a model that can potentially be used for other mining or related infrastructure projects within Alaska. Importantly, those agreements and projects should recognize and build their agreements with an understanding of the key takeaways as identified in this report.

## APPENDICES

### A. DMTS PORT AND ENVIRONMENTAL PERMITS

<b>Current Port &amp; Road Environmental Permits</b>		
<b>Permit Description</b>	<b>Effective Date</b>	<b>Expiration Date</b>
Air Quality Permit to Operate (Port) - No. AQ0289TVP02	19-Apr-11	19-Apr-16
Air Quality Minor General Permit 9 – No. AQ0289MG902 (General Permit for Portable Rock Crusher on the Road)	01-May-09	None
AK Public Water System - PWS ID#340646 (Port)	26-May-99	None
C-Plan -- AK Plan #12-CP- 3050	6-Jan-14	5-Jan-19
Fish Habitat Permits- Bridge and Culvert Maintenance: FG-99-III-0034 (Anxiety Ridge Creek)	25-Feb-99	12-May-31
Fish Habitat Permits- Bridge Maintenance: FG-99-III-0229 (Little Creek)	17-Feb-99	None
Fish Habitat Permits- Bridge Maintenance: FG-99-III-0232 (Mud Lake Creek)	18-Feb-99	None
Fish Habitat Permits- Bridge Maintenance: FG-99-III-0233 (Omikviorok Creek)	18-Feb-99	None
Fish Habitat Permits- Bridge Maintenance: FG-99-III-0235 (Straight Creek)	18-Feb-99	None
Fish Habitat Permits- Bridge Maintenance: FG-99-III-0237 (Aufeis Creek)	20-Feb-99	None
Fish Habitat Permits- Bridge Maintenance: FG-99-III-0239 (New Heart Creek)	20-Feb-99	None
Fish Habitat Permits- Bridge/Culvert Maintenance: FG-99-III-0230 (Tutak Creek)	17-Feb-99	None
Fish Habitat Permits- Bridge/Culvert Maintenance: FG-99-III-0231 (Ailuuraq Creek)	17-Feb-99	None
Fish Habitat Permits- Culvert Maintenance: FG-99-III-0228 (Evaingiknuk Creek)	17-Dec-99	None
Fish Habitat Permits- Culvert Maintenance: FG-99-III-0234 (East Fork Straight Creek)	18-Feb-99	None
Fish Habitat Permits- Culvert Maintenance: FG-99-III-0236 (Deadman Creek)	20-Feb-99	None
Fish Habitat Permits- Culvert Maintenance: FG-99-III-0238 (East Fork New Heart Creek)	20-Feb-99	None
Fish Habitat Permits- Culvert Maintenance: FG-99-III-0240 (West Fork New Heart Creek)	20-Feb-99	None
Fish Habitat Permits-Instream Equipment Work for Removal of Snow and Ice from Anadromous Waterbodies: FG-90-III-0098-3 (Snow/Ice Cleanout in Spring)	24-Feb-99	None
Fish Habitat Permits- Cross Country Travel with ARGO: FG-98-III-0135 (Stream Crossings)	13-Jun-98	31-Dec-15
Food Service Permit - #324750115 - Port	renewed annually	

**Current  
Port & Road Environmental Permits**

<b>Permit Description</b>	<b>Effective Date</b>	<b>Expiration Date</b>
RCRA ID #AKD983073388	17-Oct-89	Indefinite
APDES AK0040649 (Port)	1-Jun-14	31-May-19
Solid Waste Disposal Permit - #SW3A011-16(Camp)	01-May-11	1-May-16
State Land Use -ADL409515 Amendment II - Haul Road Right-of-Way including snow fences	2-Dec-86	31-Dec-31
State Land Use -ADL412501 - Tidelands Lease to AIDEA	18-Apr-86	18-Apr-41
Material Site 9 Material Sale Contract. ADL 419795	08-Apr-13	07-Apr-18
Wetland Permit – 830359 – Mod 39 Annual Port Dredging	12-Dec-12	31-Dec-20
Wetland Permit – 830359 – Mod 38 Appl/Dock Dredge	08-Jun-10	30-Jun-20
Northwest Arctic Borough (NAB) Title 9 Master Plan Permit No. 107-03-10	09-Dec-09	31-Dec-31
Public Safety Permit, Wildlife Hazing Renewed annually	renewed annually	

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ADF&G .....	Alaska Department of Fish and Game
ADEC .....	Alaska Department of Environmental Conservation
AIDEA.....	Alaska Industrial Development and Export Authority
ANC .....	Alaska Native Corporation
ANCSA .....	Alaska Native Claims Settlement Act
ANILCA.....	Alaska National Interest Lands Conservation Act
APDES .....	Alaska Pollutant Discharge Elimination System
ASRC.....	Arctic Slope Regional Corporation
CEZ .....	Contingent Escalator for Zinc Price Increase
CRA.....	Cost Reimbursement Agreement
CSB .....	Concentrate Storage Building
CTF.....	Contingent Tonnage Fee
DIFR.....	Draft Interim Feasibility Report
DMTS .....	Delong Mountain Transportation System
DNR .....	Alaska Department of Natural Resources
DOA .....	Alaska Department of Administration
DOI.....	Alaska Department of Interior
DOT&PF .....	Alaska Department of Transportation and Public Facilities
DR&R.....	Dismantlement Removal and Rehabilitation
EA.....	Environmental Assessment
EAB.....	Environmental Appeals Board
EIS .....	Environmental Impact Statement
EPA .....	Environmental Protection Agency
HAPs .....	Hazardous Air Pollutants
IEDC.....	Economic Development Council
MLT .....	Mining License Tax
MAA.....	Minimum Annual Assessment
MOU.....	Memorandum of Understanding
NANA .....	NANA Regional Corporation
NANA .....	Northwest Arctic Native Association (NANA's predecessor)
NIMBY.....	Not In My Backyard
NMS .....	NANA Management Services

NOAA .....	National Oceanic and Atmospheric Administration
NOI.....	Notice of Intent
NPDES .....	National Pollutant Discharge Elimination System
NPS.....	National Park Service
NSB .....	North Slope Borough
NWAB.....	Northwest Arctic Borough
O&M .....	Operations and Maintenance
P3.....	Public-Private Partnership
PAC .....	Personnel Accommodations Complex
PILT .....	Payment in Lieu of Taxes
PRI.....	Production Rate Increase
RICE.....	Reciprocating Internal Combustion Engines
RO .....	Reverse Osmosis
ROD .....	Record of Decision
ROW.....	Right of Way
SDT .....	Short Dry Ton
SEIS.....	Supplemental Environmental Impact Statement
SMAA .....	Supplemental Minimum Annual Assessment
SRI.....	SRI International
STP .....	Sewage Treatment Plant
SWOT.....	Strengths Weaknesses Opportunities Threats
TSF .....	Tailings Storage Facility
TUB.....	Truck Unloading Building
USBM.....	US Bureau of Mines
USCG .....	US Coast Guard
USF&WS.....	US Fish and Wildlife Service
USGS.....	US Geological Service
VIP .....	Value Improvement Project
WMT .....	Wet Metric Tons (tonne)

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