



**Permit Application for the
Department of the Army**

**Delong Mountain Regional Transportation
System Port Facility Fuel Tank Expansion**

January 4, 2018

Teck

December 28, 2017

Mr. Ryan Winn
U.S. Army Corps of Engineers
Regulatory Branch
P. O. Box 6898
Elmendorf AFB, Alaska 99506-6898

RE: Delong Mountain Regional Transportation System Port Facility Fuel Tank Expansion
Minor Modification of POA-1983-359-MOO

Dear Mr. Winn

Teck Alaska Incorporated (Teck) as the agent for the Alaska Industrial Development and Export Authority is applying for a minor modification to POA-1983-359 for the DMTS Port Facility. The attached application is requesting a modification to allow for the fill of 1.3 acres of wetlands for the expansion of the fuel tank facility for the addition of a 3 million gallon diesel fuel storage tank and the associated secondary containment for spill prevention.

Please contact Chris Eckert at (907) 754-5139 if you have questions or would like additional information.

Sincerely,

Teck Alaska Incorporated

306-f-

Henri Let:J:S
General Manager

Ecc: regpagemaster@usace.army.mil

U.S. ARMY CORPS OF ENGINEERS
APPLICATION FOR DEPARTMENT OF THE ARMY PERMIT
33 CFR 325. The proponent agency is CECW-CO-R.

Form Approved -
OMS No. 0710-0003
Expires: 30-SEPTEMBER-2015

Public reporting for this collection of information is estimated to average 11 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of the collection of information, including suggestions for reducing this burden, to Department of Defense, Washington Headquarters, Executive Services and Communications Directorate, Information Management Division and to the Office of Management and Budget, Paperwork Reduction Project (0710-0003). Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number. Please DO NOT RETURN your form to either of those addresses. Completed applications must be submitted to the District Engineer having jurisdiction over the location of the proposed activity.

PRIVACY ACT STATEMENT

Authorities: Rivers and Harbors Act, Section 10, 33 USC 403; Clean Water Act, Section 404, 33 USC 1344; Marine Protection, Research, and Sanctuaries Act, Section 103, 33 USC 1413; Regulatory Programs of the Corps of Engineers; Final Rule 33 CFR 320-332. Principal Purpose: Information provided on this form will be used in evaluating the application for a permit. Routine Uses: This information may be shared with the Department of Justice and other federal, state, and local government agencies, and the public and may be made available as part of a public notice as required by Federal law. Submission of requested information is voluntary, however, if information is not provided the permit application cannot be evaluated nor can a permit be issued. One set of original drawings or good reproducible copies which show the location and character of the proposed activity must be attached to this application (see sample drawings and/or instructions) and be submitted to the District Engineer having jurisdiction over the location of the proposed activity. An application that is not completed in full will be returned.

(ITEMS 1 THRU 4 TO BE FILLED BY THE CORPS)

1. APPLICATION NO.	2. FIELD OFFICE CODE	3. DATE RECEIVED	4. DATE APPLICATION COMPLETE
--------------------	----------------------	------------------	------------------------------

(ITEMS BELOW TO BE FILLED BY APPLICANT)

5. APPLICANT'S NAME First - Elizabeth Middle - Last - Greer Company - Alaska Industrial Development and Export Authority E-mail Address - egreer@aidea.org	8. AUTHORIZED AGENT'S NAME AND TITLE (agent is not required) First - Chris Middle - Last - Eckert Company - Teck Alaska Incorporated E-mail Address - chris.eckert@teck.com
6. APPLICANT'S ADDRESS: Address - 813 W. Northern Lights Blvd City - Anchorage State - AK Zip - 99503 Country -	9. AGENT'S ADDRESS: Address - 3105 Lakeshore Drive, Bldg A, Suite 101 City - Anchorage State - AK Zip - 99517 Country - USA
7. APPLICANT'S PHONE NOs. w/AREA CODE a. Residence b. Business c. Fax 907-771-3015	10. AGENT'S PHONE NOs. w/AREA CODE a. Residence b. Business c. Fax 907-754-5139

STATEMENT OF AUTHORIZATION

11. I hereby authorize, Teck Alaska Incorporated to act in my behalf as my agent in the processing of this application and to furnish, upon request, supplemental information in support of this permit application.

egreer@aidea.org

SIGNATURE OF APPLICANT

2017-12-26

DATE

NAME, LOCATION, AND DESCRIPTION OF PROJECT OR ACTIVITY

12. PROJECT NAME OR TITLE (see instructions) Debrg Mountain Regional Transportation System Port Facility Fuel Tank Expansion			
13. NAME OF WATERBODY, IF KNOWN (if applicable) Chukchi Sea		14. PROJECT STREET ADDRESS (if applicable) Address	
15. LOCATION OF PROJECT Latitude: *N 67.5770 Longitude: *W 164.0480		City - State - Zip -	
16. OTHER LOCATION DESCRIPTIONS, IF KNOWN (see instructions) State Tax Parcel ID Municipality Section - 10 Township - 25N Range - 24W, Katee! River Meridian			

17. DIRECTIONS TO THE SITE

The site is located at the Delong Mountain Regional Transportation System Port Facility, approximately 16 miles Southeast of Kivalina in the Northwest Arctic Borough of Alaska.

18 Nature of Activity (Description of project, include all features)

A new 3 million gallon diesel fuel tank is proposed to be built at the Delong Mountain Regional Transportation System Port Facility. The tank requires placement of fill material as a foundation for the new fuel tank as well as secondary containment in the event of a spill. The proposed pad and tank would be connected to the existing fuel storage pad.

The fill pad will impact 1.3 acres of wetlands. The fill pad will be designed to be the containment area and the fill pad, including uses for sediment and stormwater control during construction, and equipment operations. All season construction will occur.

19. Project Purpose (Describe the reason or purpose of the project, see instructions)

Planned increases in fuel consumption at the Red Dog Mine require construction of an additional 3 million gallons of diesel storage. The facility is able to receive fuel deliveries from ocean going fuel barges from approximately early July to mid-October, depending on sea and ice conditions. To meet operational needs, the facility needs to be able to store approximately 9 months of diesel usage with a sufficient buffer to schedule fuel barge deliveries to minimize impacts to local subsistence activities.

USE BLOCKS 20-23 IF DREDGED AND/OR FILL MATERIAL IS TO BE DISCHARGED

20. Reason(s) for Discharge

Expansion of the existing fuel storage facility requires discharge of fill material into wetlands adjacent to the existing facility.

21. Type(s) of Material Being Discharged and the Amount of Each Type in Cubic Yards:

Type Amount in Cubic Yards	Type Amount in Cubic Yards	Type Amount in Cubic Yards
11,460 sand/gravel fill		

22. Surface Area in Acres of Wetlands or Other Waters Filled (see instructions)

Acres 1.3
or
Linear Feet

23. Description of Avoidance, Minimization, and Compensation (see instructions)

See attached

24. Is Any Portion of the Work Already Complete? Q Yes [g] No IF YES.DESCRIBE THE COMPLETED WORK

25. Addresses of Adjoining Property Owners, Lessees, Etc., Whose Property Adjoins the Waterbody (if more than can be entered here, please attach a supplemental list).

a. Address- NANA Regional Corporation, PO Box 49

City - Kotzebue State - AK Zip - 99752

b. Address- Cape Krusenstem National Monument, PO Box 1029

City - Kotzebue State - AK Zip - 99752

c. Address-

City - State - Zip -

d. Address-

City - State - Zip -

e. Address-

City - State - Zip -

26. List of Other Certificates or Approvals/Denials received from other Federal, State, or Local Agencies for Work Described in This Application.

AGENCY	TYPE APPROVAL*	IDENTIFICATION NUMBER	DATE APPLIED	DATE APPROVED	DATE DENIED
NW Arctic Borough	Title 9	107-03-10	2009-12-09		
AK DEC	Contingency Plan	12-CP-3050	2017-12-20		

• Would include but is not restricted to zoning, building, and flood plain permits

27. Application is hereby made for permit or permits to authorize the work described in this application. I certify that this information in this application is complete and accurate. I further certify that I possess the authority to undertake the work described herein or am acting as the duly authorized agent of the applicant.

egreer@alea.org 2017-12-26 Eckert Chris RDOG g "r, s " RD00 2017-12-28
SIGNATURE OF APPLICANT DATE SIGNATURE OF AGENT DATE

The Application must be signed by the person who desires to undertake the proposed activity (applicant) or it may be signed by a duly authorized agent if the statement in block 11 has been filled out and signed.

18 U.S.C. Section 1001 provides that: Whoever, in any manner within the jurisdiction of any department or agency of the United States knowingly and willfully falsifies, conceals, or covers up any trick, scheme, or disguises a material fact or makes any false, fictitious or fraudulent statements or representations or makes or uses any false writing or document knowing same to contain any false, fictitious or fraudulent statements or entry, shall be fined not more than \$10,000 or imprisoned not more than five years or both.



Red Dog Mine Tailings Expansion, POA-1983-359-M41

Engineer Form 4345 Supplemental Information

Block 23

Avoidance

It is not practicable to avoid fill for placement of an additional fuel storage tank. The existing fuel tank farm infrastructure is surrounded by wetlands and there are no practicable upland alternatives available.

Minimization

The mine and mill must store fuel for operation from mid-October until after whaling season (typically early July) before fuel can be delivered to the port. Additional fuel is required for additional electrical generation and consumption at the mill. Only one fill pad is planned for the new 3-million-gallon diesel fuel storage tank. The tank farm expansion has been designed to tie into and use the existing fill pad and tank facility. The existing fuel facility at the port has an operational fuel delivery and containment system. The original facility was built to hold an earlier projected and required capacity. The fill was minimized to the level required to support the existing tanks. The new tank fill pad will tie into two sides of this existing fill at the tank farm. The existing tank farm has lining, piping, and connection with all manifolds, pumps, and valves. This allows a new tank to be added and plumbed in to the existing system without impacting the integrity and operation of the existing system. This design minimizes fill into wetlands using the existing permitted operational structure. No overland travel to the pad is required, and therefore no additional access roads or wetland storage will be needed. Gravel for the fill pad will be laid on geotextile fabric to reduce the fill volume and acreage, and to protect the integrity of the underlying land surface. Construction site best management practices will be followed and implemented, including a Stormwater Pollution Prevention Plan complying with the requirements of the Alaska Department of Environmental Conservation Alaska Pollutant Discharge Elimination System General Permit for Discharges from Large and Small Construction Activities (Permit Number: AKR100000).



Compensatory Mitigation Plan

**Red Dog Mine Tailings Expansion,
Red Dog Mine Waste Dump Extension, and
Delong Mountain Regional Transportation System Port
Facility Fuel Tank Expansion**

Contents

Project Description.....	1
Available Mitigation Credits.....	4
Watershed Approach.....	4
Proposed Compensatory Mitigation Plan.....	5
Goals and Objectives.....	5
Site Selection.....	5
Restoration and Enhancement.....	5
Preservation.....	5
Site Identification.....	6
Site Protection	8
Baseline Conditions	8
Project Sites.....	8
Proposed Mitigation Site.....	9
Reference Site.....	10
Determination of Credits	10
Mitigation Work Plan	11
Maintenance Plan.....	11
Performance Standards.....	11
Monitoring Requirements.....	11
Long-term Management Plan.....	11
Adaptive Management.....	11
Financial Assurances	11
References	12

Figures

Figure 1 Red Dog Creek Proposed Mitigation Site.....	7
--	---

Tables

Table 1 Project Sites Wetlands	9
Table 2 Mitigation Site HGM Classification	9
Table 3 Mitigation Site Cowardin Classification	10

Acronyms

AMSL	Above Mean Sea Level
CFR	Code of Federal Regulations
HGM	Hydrogeomorphic
ILF	In-Lieu Fee
Mitigation Rule	33 CFR Parts 325 and 332
NANA	NANA Regional Corporation
PRM	Permittee-Responsible Mitigation
USACE	United States Army Corps of Engineers
WOUS	Waters of the United States

Project Description

The ongoing operation of the Red Dog Mine by TeckAlaska requires an expanded footprint. There is a need to increase the capacity for Tailings and Main Waste Dump facilities to contain mine and mill waste. Additionally, there is a need to increase capacity for fuel storage at the port facility. The port facility is permitted to AIDEA by the United States Army Corps of Engineers (USACE) and operated through agreement by Red Dog, Teck Alaska. A wetland delineation for all three areas was completed in 2017 (WHPacific 2017) using the 2007 Alaska Regional Supplement (USACE 2007).

POA 1984-12-M49 authorized the Red Dog Tailings Facility to an elevation of 986 foot Above Mean Sea Level (AMSL). This project is proposing to increase the tailings facility from the currently approved level of 986 feet AMSL to 1006 feet AMSL. The project involves the raising of the Red Dog Tailings Main Dam (AK00201) and the Red Dog Tailings Back Dam (AK00303) from a current crest elevation of 986 feet AMSL to 1006 feet AMSL in multiple phases between 2018 and 2024. The increased operating elevation requires the relocation of the West Tailings Road and the Main Haul Road. To minimize disturbance, the realigned roads have been designed, where possible, to fall within the ultimate footprint of the expanded tailings facility and to avoid wetlands in areas outside of the tailings facility footprint. This project will require the placement of 20,104 cubic yards of fill material into 12.5 acres of wetlands.

POA-1984-12, March 2000, this modification for the Main Waste Dump Extension expired without the Main Waste dump being expanded. A portion of the Main Waste Dump South Extension was permitted by this modification. WHPacific completed a new wetland delineation for the project area in 2017. Additionally, the request for the Qanaiyaq extension has been removed from the proposed project further avoiding wetland impact. To ensure the surface water from the stockpile remains in the South Fork Red Dog Creek drainage and flows into the Red Dog Mine Tailings impoundment, the footprint of the Main Waste Dump Extension has been reduced to 32.5 acres (total) to keep it well below the drainage divide between the South Fork Red Dog Creek and Bons Creek drainages. These actions have reduced the required wetland fill for this project to 0.5 acres from the originally proposed 44 acres.

POA 1983-359-MOO authorized the expansion of the Fuel Storage Facility at the Delong Mountain Regional Transportation System Port Facility. Planned increases in fuel consumption at the Red Dog Mine require construction of an additional 3 million gallon diesel storage tank. The facility receives fuel deliveries from ocean going fuel barges from approximately early July to mid-October, depending on sea and ice conditions. To meet operational demands the facility needs to be able to store approximately 9 month's diesel supply including a sufficient buffer-volume to allow for the scheduling of fuel barge deliveries to minimize impacts to local subsistence activities. This project is for the placement of 11,460 cubic yards of fill material into 1.3 acres of wetlands for the expansion of the existing tank farm. The fill is required to provide a sound foundation for the new fuel storage tank and to provide the required secondary containment volume. The secondary containment for the new fuel storage tanks will be connected to the existing fuel storage pad, allowing for sufficient secondary containment for spill prevention while minimizing additional surface disturbance. The project is scheduled to begin in early 2018 upon issuance of the permit and to be completed mid-2019.

Available Mitigation Credits

On April 10, 2008, the USACE and the Environmental Protection Agency published regulations (33 Code of Federal Regulations (CFR) Parts 325 and 332) entitled, “Compensatory Mitigation for Losses of Aquatic Resources,” (Mitigation Rule). One of the primary goals of the regulations is to improve the quality and success of compensatory mitigation plans. The Mitigation Rule emphasizes the selection of compensatory mitigation sites on a watershed basis and established equivalent standards for all three types of compensatory mitigation mechanisms: mitigation banks, In-Lieu Fee (ILF) programs, and permittee-responsible mitigation (PRM) plans. In addition, the Mitigation Rule established a preference hierarchy for mitigation mechanisms based upon their likelihood of projects being both successful and sustainable:

1. Purchase of mitigation bank credits
2. Purchase of ILF program credits
3. PRM under a watershed approach

Compensatory mitigation provided by an approved mitigation bank or ILF program is presumed to be environmentally preferable to PRM. This mitigation involves larger, more ecologically valuable aquatic resources and normally more rigorous scientific and technical analysis. Mitigation banks and ILF programs are approved and implemented prior to the adverse impacts to aquatic resources associated with individual projects. Early implementation reduces temporal losses and uncertainty regarding the success of mitigation activities. No mitigation banks or ILF programs with service areas currently exist that include or overlap the project area. A search of the Regulatory ILF and Bank Information Tracking System on January 2, 2018 showed no available credits. Therefore, there are no mitigation bank or ILF credits available in the project watershed. Red Dog Mine must develop PRM under a watershed approach to supply wetland credits.

Watershed Approach

The goal of PRM under a watershed approach is to maintain and improve the quality and quantity of aquatic resources within the impact watershed through the selection of compensatory mitigation projects. In developing their PRM project priorities, Red Dog Mine evaluated their proposed project wetland impacts and cumulative impacts of past activities. This included reviewing potential sites within the watershed, and discussing issues with the local communities to help identify potential mitigation opportunities.

The proposed project site is located within the Wulik-Kivalina Rivers Hydrologic Unit Code 8 watershed (19050404). The Wulik-Kivalina Rivers watershed is almost entirely undisturbed and has limited development pressure. The limited development in the region restricts restoration opportunities. There is one community within the watershed, Kivalina, with an estimated 2016 population of 383 people. The watershed covers an area of approximately 1,640,315 acres of land. This compensatory mitigation plan has been developed considering the resources, uses, and people within this watershed.

Proposed Compensatory Mitigation Plan

Goals and Objectives

The goals and objectives of this plan are to mitigate for the unavoidable fill impacts to 14.3 acres of Waters of the United States (WOUS) authorized by modifications to Department of the Army permits POA-1983-359, POA-1984-12-M49, POA-1984-12-M51. Avoidance and minimization has been completed for the proposed actions to the maximum extent practicable. Compensatory mitigation will be provided through the preservation of an ecologically and socio-economically important site in proximity to the Red Dog Mine.

Preservation will be accomplished via a deed restriction on land owned by NANA Regional Corporation (NANA). Preservation is appropriate under the 2008 Mitigation Rule under the criteria of 33 CFR 332.3(h).

Site Selection

Restoration and Enhancement

The Red Dog Mine was permitted with as small as a footprint as possible to avoid and minimize impacts to Wetlands and WOUS. There were no impacts outside of those necessary to operate the mine and associated facilities (port, road, camp, airstrip, etc.). As the mine is operating and is expected to continue to operate, there are no restoration opportunities associated with the existing and past mine disturbance. Several work pads and roads were considered for removal and restoration, however, the Teck Alaska Exploration and Operations teams reviewed these areas and found them to be necessary for ongoing and future operations. The mine continues to operate, process ore, and expand operations in the watershed. The need for uplands pads is at a premium at both the port and the mine site. Additionally, there have been no other practicable aquatic resource impacts identified within the watershed that could be restored to provide PRM credits.

Preservation

The proposed mitigation site meets the following conditions:

1. The preserved site provides habitat, ground water discharge, flood flow moderation, nutrient cycling, and buffers for the watershed,
2. It contributes to the ecological sustainability of the watershed,
3. It is the most appropriate and practicable PRM project in the watershed,
4. The resources are under threat of destruction or adverse modification, and
5. The site will be protected for a period of 99 years.

The Wulik-Kivalina Rivers watershed has minimal development. There is one community and public airport within the watershed at Kivalina. The only permanent all-season road within the watershed connects Red Dog Mine to a port facility at the coast. Other travel occurs along winter trails. There are limited impacts to the watershed from tourism, primarily from sport fishing for Dolly Varden on the Wulik River.

Land ownership in the watershed is federal, state, and native. There is currently only one other proposed development in the watershed, the proposed evacuation road from the village of Kivalina to a location inland approximately seven miles to the northwest.

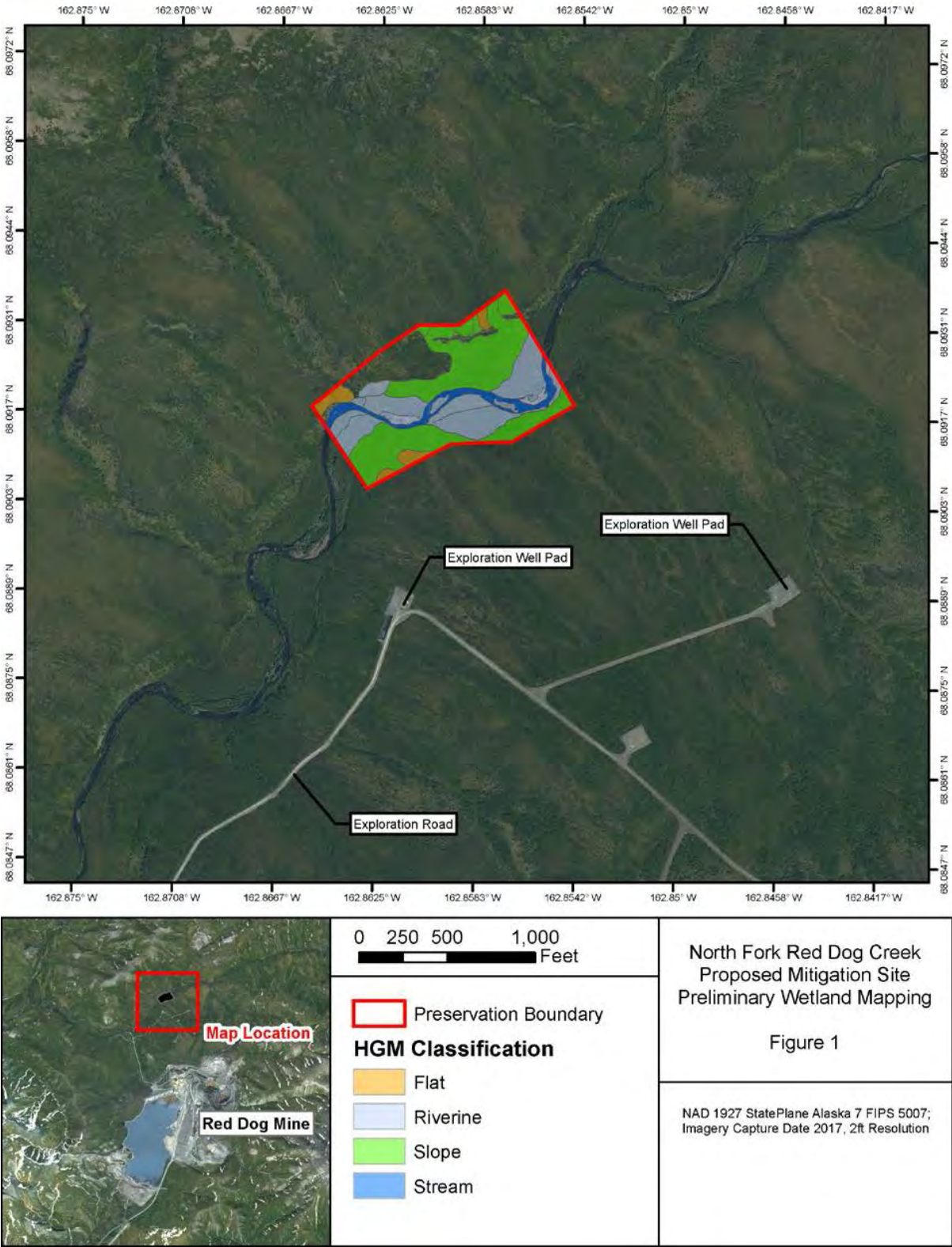
Site Identification

Teck Alaska worked with NANA to identify lands in proximity to the Red Dog Mine that have a threat of destruction or adverse modification. Along the North Fork of Red Dog Creek, there is an area that has been considered for natural gas exploration and mine development including the drilling of exploration gas wells (Figure 1). The North Fork of Red Dog Creek has a long history of fish studies and habitat inventory. This data substantiates the fish value of the area (Ott and Bradley 2017).

An area of high-value wetland riparian habitat in this exploration area is proposed to be protected with a deed restriction.

This site provides important function for the watershed by providing habitat and water quality for anadromous and resident fish, both at the site and downstream, and for terrestrial mammals and vegetative subsistence resources. Permanently protecting this area will contribute to the ecological sustainability of the watershed by helping to maintain subsistence-related aquatic resources. Additionally, the North Fork of Red Dog Creek flows to the Wulik River, which is the source of drinking water for Kivalina. The area is under potential threat of development from natural gas and mineral development. A permanent deed restriction will ensure the stream and riparian areas are buffered from any future development.

Figure 1 North Fork Red Dog Creek Proposed Mitigation Site



Site Protection

NANA owns the surface and subsurface rights to the proposed mitigation site. Teck Alaska will work with NANA to establish a deed restriction to ensure long-term protection of the site. The instrument will describe the allowed and prohibited uses of the mitigation site. Teck Alaska will provide documentation to the USACE from NANA, consenting to the restrictions on development.

Subsistence uses (including, but not limited to, hunting, fishing, trapping, egg gathering, and vegetation collection) would be allowed in the mitigation site without restriction. Reasonable access, ingress, and egress by vehicles including snowmobile, all-terrain vehicle, helicopter, and foot will continue to be allowed. Other activities, such as crossing the mitigation site for winter cross-country travel, will be determined on a case-by-case basis by the holder of the protection instrument for the parcel. The holder will have the right to enforce site protective measures associated with the instrument. The following activities will be prohibited by the site protection instrument, without prior consent from USACE:

- Dredging or excavating of any soils, sediments, and other substrates.
- Discharge of dredge or fill materials.
- Construction of durable structures, both permanent and temporary.
- Disturbance of soil, sediment, and other substrates by mechanical equipment and transportation vehicles.
- Surface or near-surface mining and related activities that adversely impact the WOUS status of the mitigation site.
- Vegetation removal, destruction, cutting, trimming, mowing, alteration, or spraying with biocides, except where allowed for subsistence activities and for control, elimination, or management of nonnative, exotic, or invasive vegetation.
- Storage, abandonment, stockpiling, or disposal of any earthen materials, debris, refuse, supplies, durable materials, or other manmade objects.
- Changing the surface hydrology of the area by ditching, pumping, damming, or other dewatering or hydrating methods.
- Mechanized snow-and ice-clearing operations and construction of snow/ice structures including ice roads and ice pads.

Baseline Conditions

Project Sites

The three project sites contain a total of 14.3 acres of wetlands. The Tailings Expansion totals 12.5 acres, the Main Waste Dump Extension totals 0.50 acres, and the Port Expansion totals 1.3 acres (Table 1). Slope and Flat Hydrogeomorphic (HGM) types were found at the project sites, and Cowardin classifications were either PSS/EM or PEM/SS (Cowardin *et al.* 1979).

Table 1 Project Sites Wetlands

Project Site	HGM Classification	Cowardin Classification	Area (Acres)
Tailings Expansion	Slope	PSS/EM	12.5
Waste Dump Extension	Slope	PSS/EM	0.5
Port Expansion	Flat	PEM/SS	1.3
Total Wetlands			14.3

Proposed Mitigation Site

The site is situated along North Fork Red Dog Creek (National Hydrography Dataset Reach Code 19050404004618) for approximately 1,732 feet and encompasses the floodplain on either side of the creek. The proposed mitigation site is 20.0 acres in size. Digital mapping of the site has been conducted using two-meter resolution orthoimagery.

Mapping of the site calculates the total wetland area in the mitigation site at 15.7 acres, in addition to 1.4 acres and 1,732 linear feet of stream preservation (Figure 1). The dominant HGM type is Riverine, with Slope wetlands at the edges of the floodplain. Organic Soil Flat wetlands occur on some of the high terraces (Table 2). Cowardin classifications of wetlands in the mitigation site are Scrub-Shrub and Emergent dominated. The creeks are classified as R3UB (Table 3).

Table 2 Mitigation Site HGM Classification

Group	HGM Classification	Area (Acres)
Wetlands	Flat	0.9
	Riverine	6.1
	Slope	8.7
	Total Wetlands	15.7
Waters	Streams	1.4
	Total Waters	1.4
Totals	Total Wetlands & Waters	17.1
	Total Uplands	2.9
	Total	20.0

Table 3 Mitigation Site Cowardin Classification

Group	Cowardin Classification	Area (Acres)
Wetlands	PEM1	1.9
	PSS1/EM1	10.6
	PSS1	3.2
	Total Wetlands	15.7
Waters	R3UB	1.4
	Total Waters	1.4
Totals	Total Wetlands & Waters	17.1
	Total Uplands	2.9
	Total	20.0

Reference Site

No restoration activities will be carried out on the proposed mitigation site; it has not been previously disturbed. Therefore, no reference sites are necessary to identify mitigation site potential or to establish performance standards. The digital mapping of the site will serve as reference and baseline.

Determination of Credits

Functions and values of wetlands in the project site and mitigation site differ based on HGM classification (Brinson 1993, NRCS 2008). Three HGM types are found on the sites: Flat, Slope, and Riverine.

- Flat HGM wetlands are supported primarily by precipitation and have vertical fluctuations of water. In the project area, they are supported by permafrost and seasonal frost acting as aquitards to restrict the downward movement of water.
- Slope HGM wetlands are supported primarily by groundwater and have unidirectional flow from discharge. In the project area, they primarily occur at slope breaks along hillsides, either on benches or at foot- and toe-slopes.
- Riverine HGM wetlands are supported by overbank flow or subsurface hydraulic connections from stream channels. They occur in floodplains and riparian corridors.

When placed in the context of the Wulik-Kivalina Rivers Watershed, the functions and values that are most important to socio-economic and ecological systems are related to sustainable management of subsistence resources. These include caribou and other terrestrial mammals, berries and other vegetative resources, and fisheries and other aquatic resources. All wetland HGM types found in the project and mitigation areas provide function for terrestrial mammals and vegetative resources, while the Riverine HGM wetlands provide the most value for aquatic resources.

Wetlands in the tailings expansion site, main waste site, and port expansion site are Slope HGM, and thus provide functionality to terrestrial subsistence resources. However, the ability of these wetlands to provide functions has been substantially limited due to their proximity to existing facilities. Access to these sites for subsistence activities has been restricted, and their contribution to downstream wetland and waters functionality and flow has been interrupted. Additionally, none of these wetlands provide any value to anadromous fish habitat support.

Wetlands in the proposed mitigation site are predominantly Riverine HGM, with some Slope and Flat HGM at the edges of the floodplain. The functions provided by the mitigation site wetlands support all types of subsistence resources important to the watershed, and are not degraded by proximity to the mine site. Dolly Varden and Arctic Grayling presence and/or rearing has been noted in North Fork Red Dog Creek in the area of the mitigation site (Ott and Bradley 2017).

The wetlands in the mitigation site provide higher value to subsistence resources than those in the project expansion sites. Mapping shows that the mitigation site provides 15.7 acres of wetlands and waters protection. Additionally, the adjacent uplands that make up the remainder of the site provide value by filtering sediment and acting as a buffer to preserve the ecological functions of the riparian system. In total, 20.0 acres of ecologically important land and water resources are being preserved to offset unavoidable impacts to 14.3 acres of wetlands.

Mitigation Work Plan

No work is proposed in the mitigation site.

Maintenance Plan

No maintenance plan is necessary, as the protection instrument provides for long-term preservation.

Performance Standards

No performance standards are necessary as the mitigation is a preservation instrument and is in undisturbed condition.

Monitoring Requirements

Monitoring is not required as the wetlands are already established and no future development will take place.

Long-term Management Plan

Teck Alaska is not proposing any performance standards, negating the need for a long-term management plan. Activities prohibited by the protection instrument will be enforced by the holder of the protection instrument.

Adaptive Management

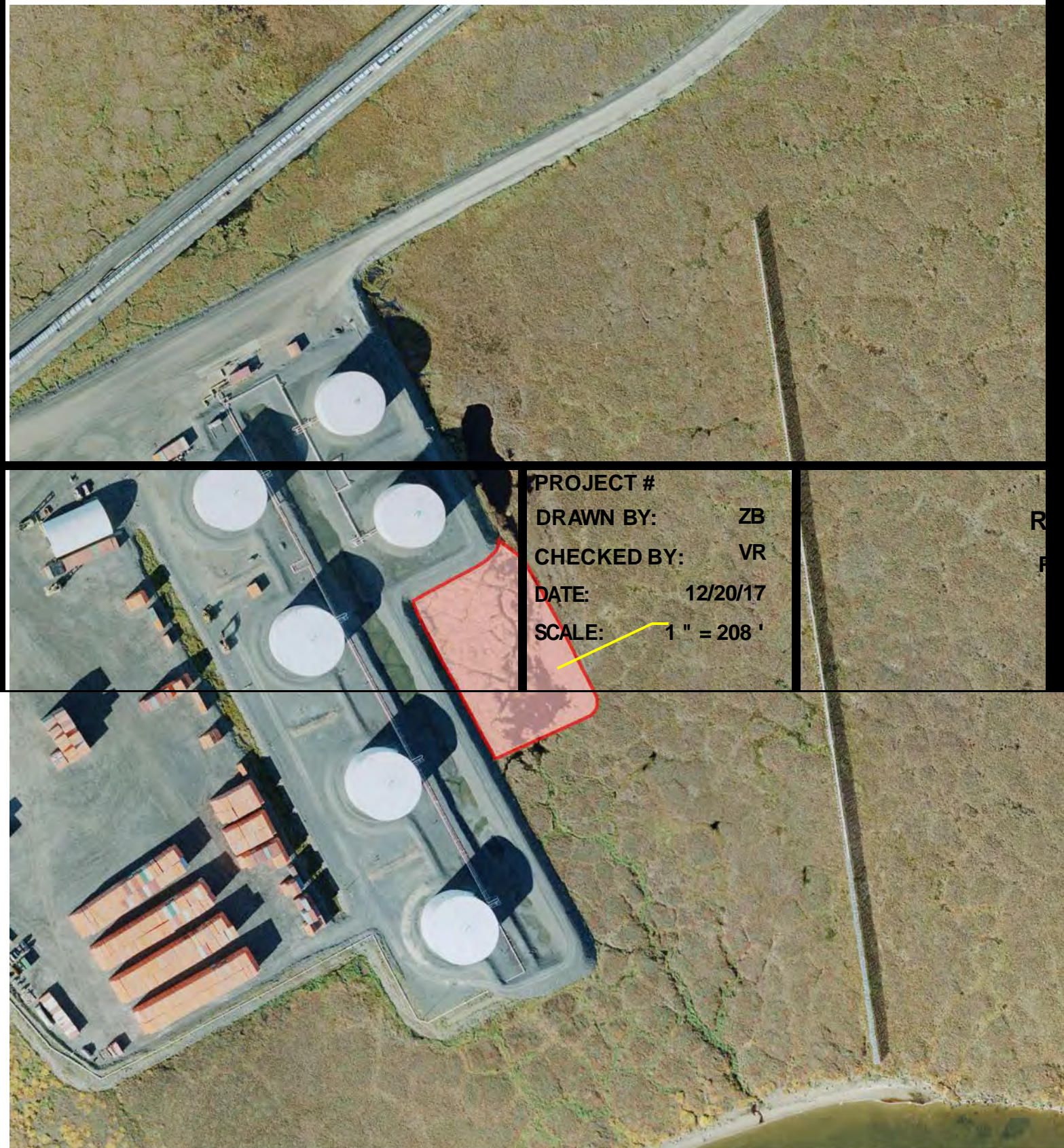
Adaptive Management is proposed for changes that occur due to human activity. Site changes are only expected to occur due to natural disturbance events. Teck Alaska is not proposing adaptive management for changes caused by natural processes.

Financial Assurances

No financial instrument is proposed.

References

- Brinson, M.M. 1993. A Hydrogeomorphic Classification for Wetlands, Technical Report WRP-DE-4, US Army Corps of Engineers Waterways Experiment Station, Vicksburg, MS.
- Cowardin, L. M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of Wetlands and Deepwater Habitats of the United States. US Department of the Interior, Fish and Wildlife Service, Office and Biological Services, Washington, DC.
- Natural Resources Conservation Service. 2008. Hydrogeomorphic Wetland Classification System: An Overview and Modification to Better Meet the Needs of the Natural Resources Conservation Service. Technical Note No. 190-8-76.
- Ott, A.G. and P.T. Bradley. 2017. Aquatic Biomonitoring at Red Dog Mine, 2016. Alaska Department of Fish and Game. Technical Report No. 17-07.
- US Army Corps of Engineers (USACE). 2017. Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Alaska Region, (Version 2.0), ed. J.S. Wakeley, R.W. Lichvar, and C.V. Noble. ERDC/EL TR-07-24. Vicksburg, MS: U.S. Army Engineer Research and Development Center.
- WHPacific. 2017. Delineation of Wetlands and Other Waters for: Red Dog Mine Tailings Pond Dam Raise, Dump Expansion, and Port Improvements. Prepared for Teck Alaska Incorporated. November 20, 2017.



PROJECT #
DRAWN BY: ZB
CHECKED BY: VR
DATE: 12/20/17
SCALE: 1" = 208'



Red Dog Operations

Teck

NANA
REGIONAL CORPORATION, INC.











SCALE: NTS



SCALE: NTS

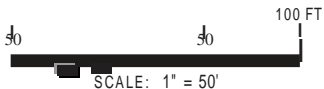
ADEC	ALASKA DEPARTMENT OF ENVIRONMENTAL CONSERVATION
CL	CENTERLINE
CS	CARBON STEEL
DEG. °	DEGREE
DIA. Ø	DIAMETER
E	EAST, ELECTRICAL
FF	FINISHED FLOOR
FG	FINISHED GRADE
FT	FEET
GAL	GALLON
GB	GRADE BREAK
HDPE	HIGH DENSITY POLYETHYLENE
INV	INVERT
LF	LINEAR FEET
MAX	MAXIMUM
ME	MATCH EXISTING
MIN	MINIMUM
N	NORTH
NTS	NOT TO SCALE
O.C.	ON CENTER
PT#	POINT NUMBER
PVC	POLYVINYL CHLORIDE
R	RADIUS
S	SOUTH
SOR	STANDARD DIMENSION RATIO
TYP	TYPICAL
VI	WEST
VI//	WITH
&:	AND
@	AT
±	PLUS OR MINUS

EXISTING	NEW	DESCRIPTION
-.....GB.....-		GRADE BREAK
---> ---> ---> --->	---> --->	DRAINAGE SWALE
-POL-		FUEL LINE
..... 204	-C(11)-	ELEVATION CONTOUR
7777777 /		STRUCTURE
-----		EDGE OF GRAVEL DRIVE
--- --		ROADWAY CENTERLINE
	124.77	SPOT ELEVATION
		LIGHT POLE
		WETLANDS
		CONTROL POINT
----TS----		THERMOSYPHON SLEEVE
		THERMISTOR SLEEVE
-----D-----		DRAIN PIPE
		ARROW INDICATES DIRECTION OF CUTTING PLANE LETTER INDICATES SECTION
		INDICATES SHEET NO. WHERE SECTION IS DRAWN INDICATES SHEET NO. WHERE SECTION IS FIRST TAKEN
		NUMBER INDICATES DETAIL INDICATES SHEET NO. WHERE DETAIL IS DRAWN INDICATES SHEET NO. WHERE DETAIL IS FIRST TAKEN

GENERAL NOTES

1. EXISTING GROUND CONTOURS SHOWN ARE FROM PHOTOGRAMMETRIC SURVEY PREPARED BY KODIAK MAPPING INC. IN 2010. VERIFY SITE CONDITIONS BEFORE BEGINNING CONSTRUCTION.
2. LOCATIONS OF EXISTING ABOVEGROUND UTILITIES ARE APPROXIMATE ONLY. VERIFY HORIZONTAL AND VERTICAL LOCATIONS OF ALL UTILITIES ENCOUNTERED DURING CONSTRUCTION. RECORD LOCATIONS AND CHANGES TO UTILITIES IN SURVEY NOTES AND ON AS-BUILT DRAWINGS.
3. VERIFY SIZE, DEPTH AND LOCATIONS OF ALL UNDERGROUND AND OVERHEAD UTILITIES PRIOR TO BEGINNING EARTHWORK. NOTIFY OWNER'S REPRESENTATIVE OF ANY DISCREPANCIES. PROTECT UTILITIES/STRUCTURES TO REMAIN, IN THE EVENT OF DAMAGE TO EXISTING UTILITIES OR STRUCTURES. IMMEDIATELY NOTIFY THE OWNER'S REPRESENTATIVE AND REPAIR ALL DAMAGE AT NO ADDITIONAL COST.
4. ELEVATIONS SHOWN ARE TO FINISH GRADE UNLESS NOTED OTHERWISE. SPOT GRADES ARE LOCATED AT GRADE BREAKS, TANGENT POINTS AND CURVE MIDPOINTS UNLESS NOTED OTHERWISE.
5. DIMENSIONS SHOWN ARE TO GRADE BREAK, FACE OF TANK, SIDEWALK CENTERLINE, OR EDGE OF PAD UNLESS NOTED OTHERWISE.
6. CONTRACTOR SHALL PROVIDE CONTROLS TO LIMIT SEDIMENT DISCHARGE FROM SITE DURING CONSTRUCTION DUE TO SOIL EROSION. THESE CONTROLS SHALL INCLUDE AN IMPLEMENTATION OF A PROJECT SPECIFIC STORMWATER POLLUTION PREVENTION PLAN (SMPPP).

GRAPHIC SCALE



ISSUED FOR APPROVAL



Q/80 J	IM10	ILSaro I	JeM
17			

T118DIWMIG18ACONCEI'1IJ.II.
 DEIMON.YTO D'INETIE
 111MRmJIRSENT&.11EF
 DEIGIWWJTAKE JTOACCOUNT
 IICIHIEIA TO118TOPLOYDE A
 RIJYFVICIIOIW.. cm;
 CGR.100'HICIJJTF.

[illegible]

PROJECT NUMBER 00016897W	DRAWING FILE NAME 4008-CF-301.DWG	DRAWING SCALE AS SHOWN
-----------------------------	--------------------------------------	---------------------------

HETNUMBBt

4008-CE-301

1. NO BURYING OF DEBRIS AND/OR WASTE MATERIALS, EXCEPT FOR MATERIALS WHICH ARE SPECIFICALLY INDICATED AS SUITABLE FOR BACKFILL, SHALL BE PERMITTED.
2. ALL FILL AND BACKFILL SHALL BE PLACED IN 12" MAXIMUM LIFTS FOR ROLLER COMPACTORS AND 6" MAXIMUM LIFTS FOR PORTABLE COMPACTORS.
3. MAXIMUM DENSITY SHALL BE DETERMINED PER ASTM D1557.
4. COMPACTION SHALL MEET THE FOLLOWING REQUIREMENTS.
 - 4.1. 95% MINIMUM FOR GENERAL FILL AREAS INCLUDING AREAS BELOW ACCESS DRIVES AND UNDER LINER.
 - 4.2. 98% MINIMUM FOR LOAD BEARING AREAS BELOW THE FUTURE TANK (TO 10' OUTSIDE TANK).
5. PROVIDE PASSING COMPACTION TESTS FOR FILL AND BACKFILL AT THE FOLLOWING RATES.
 - 5.1. TWO TESTS PER LIFT BELOW THE FUTURE TANK.
 - 5.2. ONE TEST PER LIFT PER 10,000 SF GENERAL AREAS.

1. TANK ERECTION IS TO BEGIN MORE THAN 30 DAYS AFTER FOUNDATION CONSTRUCTION IS COMPLETE, THEN THE FOUNDATION SHALL BE PROTECTED. THIS NOWDES PROVIDING A PROTECTIVE LAYER OVER THE FOUNDATION

SAND THAT WILL PREVENT EROSION AND WATER FROM ENTERING THE SAND BEDDING LAYER

THE FOLLOWING NOTES APPLY UNLESS INDICATED OTHERWISE:

1. SHALL CONTAIN NOWPMS, FROZEN MATERIAL, OIL MATTER, OR OTHER DELETERIOUS MATTER, AND SHALL BEDURABLE AND SOUND.
2. COARSE AGGREGATE MATERIAL SHALL HAVE A PERCENTAGE OF WEAR NOT TO EXCEED THIRTY (30) AFTER FIVE HUNDRED (500) REVOLUTIONS, AS DETERMINED BY ASTM C-131.
3. MATERIAL RETAINED ON THE #4 SEVE SHALL BE KNOWN AS COARSE AGGREGATE. BOTH COARSE AND FINE AGGREGATES SHALL CONFORM TO THE QUALITY REQUIREMENTS OF MSHTD M-147.
4. MATERIALS SHALL BE GRADED WITHIN THE LIMITS BELOW:

<u>U.S. STD SIEVE</u>	CUMULATIVE % PASSING
#4	100
#10	20-60
#20	0-10

COURSE

1. SHALL CONTAIN GRAVEL AND SAND CONSISTING OF CRUSHED AND NATURALLY-OCCURRING GRANULAR MATERIAL, AND SHALL BE FREE OF CLAY PARTICLES.
2. THE COARSE AGGREGATE MATERIAL SHALL HAVE A PERCENTAGE OF WEAR NOT TO EXCEED THIRTY (30) AS DETERMINED BY ASTM C-131.
3. MATERIALS SHALL BE GRADED WITHIN THE LIMITS BELOW:

US STANDARD SIEVE	CUMULATIVE % PASSING
1"	100
3/4"	70-100
#4	35-65
#200	0-10

1. SHALL CONSIST OF CRUSHED AND NATURALLY-OCCURRING GRANULAR MATERIAL, AND SHALL BE FREE OF CLAY PARTICLES.
2. SAND SHALL HAVE A MAXIMUM CHLORIDE CONTENT OF 300 PPM PER THE EPA 300.3 TEST METHOD.
3. SAND SHALL HAVE A MINIMUM RESISTIVITY OF 50,000 OHM-CM PER ASTM D 567.
4. MATERIAL SHALL BE GRADED WITHIN THE LIMITS BELOW:

U.S. STD SIEVE	CUMULATIVE PERCENT PASSING
#4	100
#200	0-10

1. INSULATION SHALL BE RIGID BOARD, HIGH DENSITY EXTRUDED POLYSTYRENE INSULATION, TYPE VI PER ASTM C578.

1. GEOME/IOIBRANE LINER SHALL BE 8130 XR-5 PETROGARD VI, coat.GUARD HRI.36 OR APPROVED SUBSTITUTION AND INSTALLED PER THE MANUFACTURER'S RECOMMENDATION UNLESS NOTED OTHERWISE.
2. GEOCUSHION SHALL BE MIRAFI 1120N, WINFAB 1200N OR APPROVED SUBSTITUTION.

1. GEOMETRIC MATERIALS SHALL BE WRAPPED FOR PROTECTION FROM DAMAGE DURING SHIPPING.
2. MATERIALS SHALL BE STORED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS AND IN LOCATIONS THAT ARE AWAY FROM POTENTIAL DAMAGE FROM EQUIPMENT.
3. MATERIALS ARE TO BE HANDLED AND TRANSPORTED ON SITE BY MEANS THAT DO NOT CAUSE DAMAGE.

1. SUBMIT A SIGNED LETTER TO THE OWNERS REPRESENTATIVE. PRIOR TO PLACING THE LINER SYSTEM, THAT STATES THE SUBGRADE WAS ADEQUATELY PREPARED PER THE LINER MANUFACTURER'S RECOMMENDATIONS.
2. INSTALL THE LINER SYSTEM TO BE LIQUID TIGHT AROUND PPE PENETRATIONS, CONCRETE FOUNDATIONS/PADS, CONDUIT PENETRATIONS, ETC.
3. WELDING, EITHER MANUAL OR AUTOMATED, SHALL BE PERFORMED BY TRAINED PERSONNEL; DOCUMENTATION OF SUCH TRAINING IS REQUIRED TO BE SUBMITTED TO THE OWNERS REPRESENTATIVE PRIOR TO START OF WELDING.
4. WELDING EQUIPMENT SET UP SHALL BE PERFORMED ON SCRAP OR DROP PIECES.
5. LINER MATERIALS SHALL BE IRMIMED BACK TO WITHIN 1' OF WEUD JOINTS.
6. INSTALLATION SHALL BE PERFORMED IN MANNER THAT MINIMIZE AREAS OF LINER OVERLAP AT WELD SEAMS, BATTEN PLATE, OR CLAMP ATTACHMENTS.
7. TESTING SHALL BE DOCUMENTED WITH THE NAME OF THE PERSON PERFORMING THE TESTS, DATE AND MEANS OF TESTING, AND LOCATION OF SEAMS TESTED.

1. WELDED SEAMS SHALL BE INSPECTED BY VACUUM BOX TESTING PER ASHRAE 156-41, AIR LANCE TESTING OR PULL TEST IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS. IT IS UNDERSTOOD THAT A COMBINATION OF THESE METHODS MAY BE NECESSARY TO ENSURE THAT SEAMS ARE TESTED.
2. PERSONNEL PERFORMING TESTING MUST HAVE COMPLETED MANUFACTURER'S TRAINING ON TESTING OF THE LINER SYSTEM BEING INSTALLED. SUBMIT A LETTER PROVIDING EVIDENCE OF THE PERSONNEL'S EXPERIENCE, TRAINING, AND LICENSING.
3. ONLY COMMERCIALLY MANUFACTURED LEAK DETECTION SOLUTION WILL BE ALLOWED FOR VACUUM BOX TESTING OF WELD SEAMS. SOAPY WATER IS PROHIBITED UNLESS A WRITTEN PROCEDURE FOR ITS USE IS SUBMITTED AND APPROVED.
4. MECHANICALLY ATTACHED SEAMS/JOINTS SHALL BE TESTED BY AIR LANCE OR PULL TESTING.
5. FOLLOWING THE SUCCESSFUL INSTALLATION AND TESTING OF THE LINER, THE CONTRACTOR SHALL SUBMIT A LETTER TO THE OWNER, FROM THE LINER MANUFACTURER, CERTIFYING THAT THE LINER INSTALLATION AND TESTING RESULTS ARE SATISFACTORY AND THAT IT MEETS THE MANUFACTURER'S QUALITY EXPECTATIONS AND WARRANTY.
6. PROVIDE A 10-YEAR WARRANTY FROM THE MANUFACTURER FOR WEATHERING AND CHEMICAL

7. PROVIDE A 10-YEAR WARRANTY FOR WORKMANSHIP.
RESISTANCE.

THIS DRAWING IS A CONCESSIONAL
DESIGN ONLY. IT DOES NOT
MINIMUM REQUIREMENTS. THE FINAL
DESIGN SHALL TAKE INTO ACCOUNT
ALL CONSIDERATIONS TO PROVIDE A
FULLY FUNCTIONAL, CODE
COMPLIANT FACILITY.



GRAPHIC SCALE

SCALE: 1• = 2'

ISSUED FOR

SCALE: 1"=

SITE AND GRADING PLAN

[illegible]

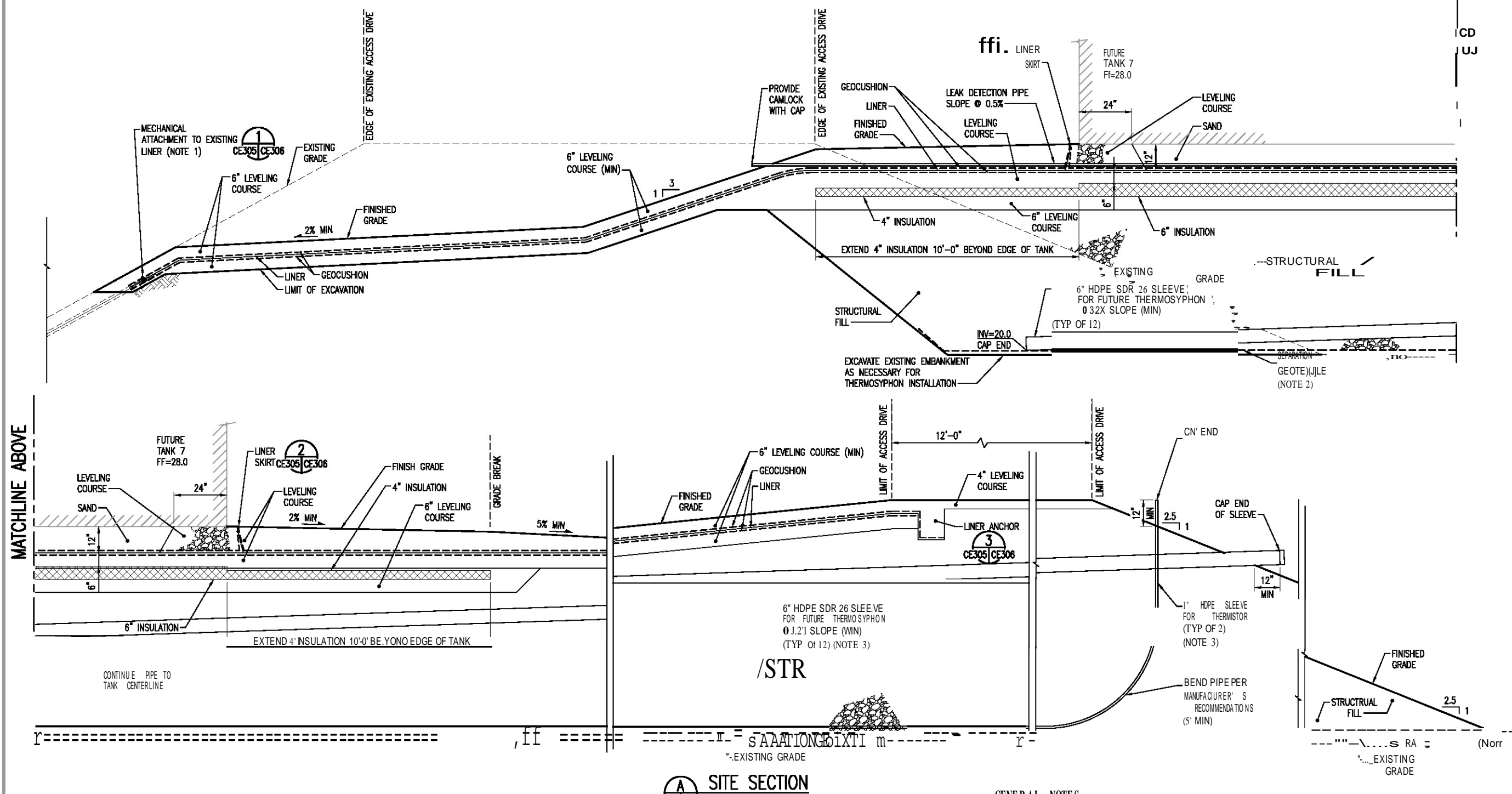
**VALUE IMPROVEMENT PROJECT 2
RED DOG MINE
TECK ALASKA INCORPORATED
SITE AND GRADING PLAN**

PROJECT NUMBER	DRAWING FILE NAME	DRAWING SCALE
P0016997W	4008-CE-304.DWG	AS SHOWN

[illegible]

VALUE IMPROVEMENT PROJECT 2 RED DOG MINE TECK ALASKA INCORPORATED SITE SECTION		DRAWING FILE NAME 4008-C-E-305.DWG
PROJECT NUMBER 001R007M	DRAWING SCALE AS SHOWN	

SHNUMBER
4008-CE-305



- ### GENERAL NOTES
1. LINER MAY BE WELDED TO EXISTING LINER IF CONNECTION CAN PASS TESTING PROCEDURES ON SHEET CE-302. LINER SHOWN IS SUITABLE FOR WELDED CONNECTION TO EXISTING LINER. CONTRACTOR SHALL SUBMIT PROCEDURE TO ATTACH NEW LINER TO EXISTING LINER.
 2. SEPARATION GEOTEXTILE SHALL BE MIRAFI 600X OR APPROVED SUBSTITUTION.
 3. OWNER TO SUPPLY AND INSTALL THERMISTORS AND THERMOPHONES.

GRAPHIC SCALES

Age	Satisfied (%)
18-24	85
25-34	75
35-44	65
45-54	55
55-64	45
65-74	35
75-84	25
85-94	15

ISSUED FOR APPROVAL

ORIGINAL SHE SI EQUALS 22", 134

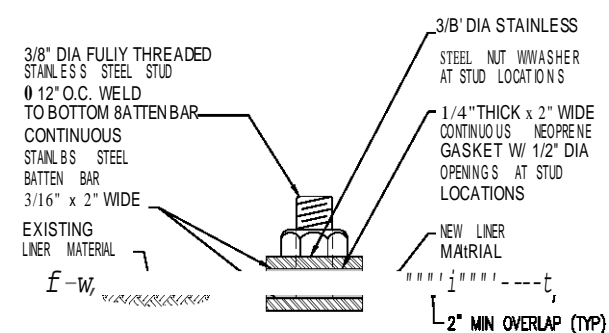
THIS DRAWING IS A CONCEP'TUAL
DESIGN ONLY TO DEFINE THE
MINIMUM REQUIREMENTS. THE FINAL
DESIGN SHALL TAKE INTO ACCOUNT
ALL CONSIDERATIONS TO PROVIDE A
FULLY FUNCTIONAL, CODE
COMPLIANT FACILITY.

[illegible]

VALUE IMPROVEMENT PROJECT 2
RED DOG MINE
TECK ALASKA INCORPORATED
SITE DETAILS

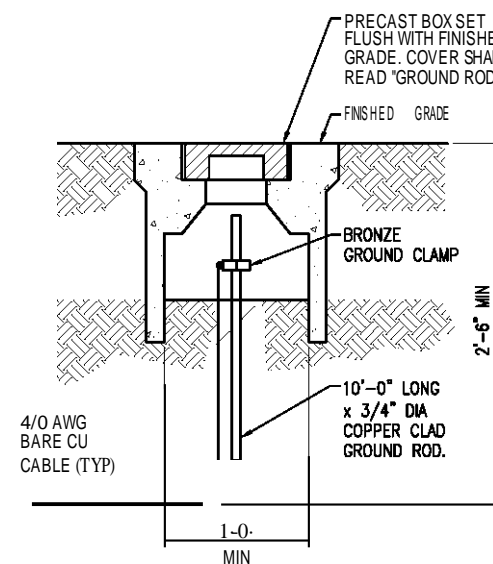
DRAWING FILE NAME	1008-C-E-306.DWG
PROJECT NUMBER	00018007M
DRAWING SCALE	AS SHOWN

SHNUMBER
4008-CE-306



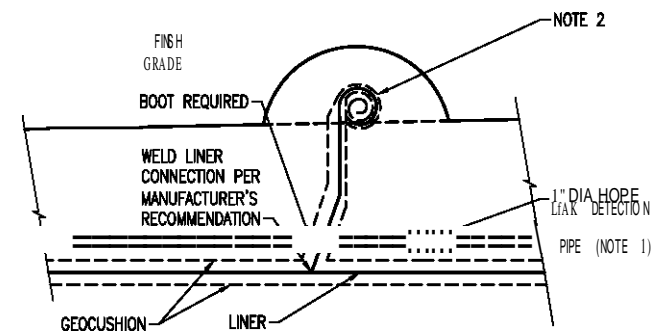
EXISTING LINER ATTACHMENT

CEJ05 C£308 SCALE: N1S



GROUND ROD BOX

C£.306 C£308 SCALE: N1S

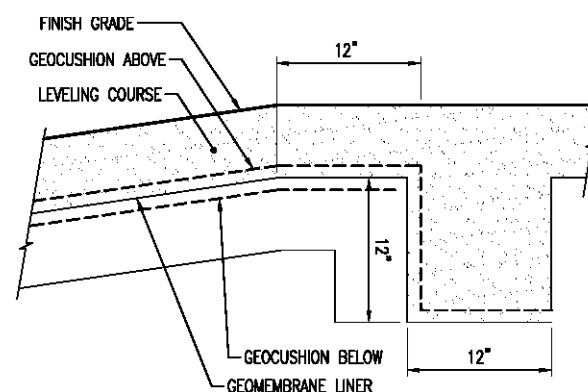


NOTES:

1. PROVIDE SOLID SOR 11 HOPE PIPE OUTSIDE LINER. PROVIDED PERFORATED SOR 11 HOPE PIPE WITHIN LINER WRAP PERFORATED PIPE WITH NONWOVEN DRAINAGE GEOTEXTILE.
2. PROVIDE SUFFICIENT LINER AND GEOCUSHION (18" NJ/T/E GRADE) FOR FUTURE TANK CONNECTION. BURY LINER AND GEOCUSHION IN PLACE.

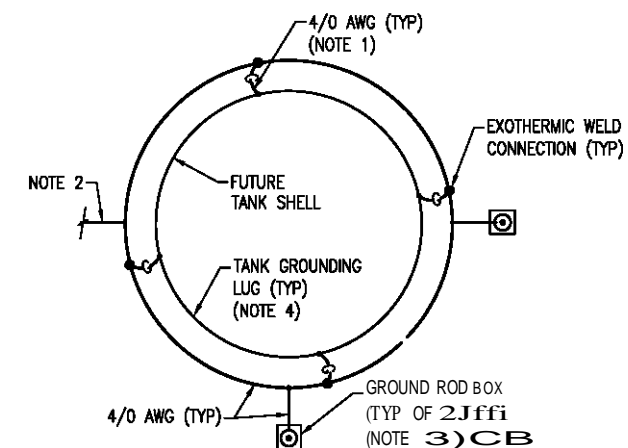
2 LINER TO TANK CONNECTION

CE305 CE306 SCALE: 1 1/2" = 1'-0"



LINER ANCHOR DETAIL

CEJ05 C£308 SCALE: N1S



NOTES:

1. COPPER WIRE LOCATED ABOVE TANK LINER SHALL BENSUATED.
INSULATION SHALL BE SUTABLE FOR WET LOCATIONS THAT MAY
HAVE FUEL EXPOSURE. PROVIDE BOOT SEAL AT LINER PENETRATION.
2. PROVIDE TWO W/AVE COPPER CONNECTION TO TANK 6 GROUNDING
- COORDINATE GROUND CONNECTION WITH TANK CONTROL
WIRING LOCATION.
3. LOCATE GROUND ROD BOXES OUTSIDE EDGE OF TANK LINER.
4. TANK GROUNDING WG TO BE PROVIDED BY TANK MANUFACTURER.
PROVIDE SUFFICIENT GROUNDING WIRE THROUGH LINER FOR
CONNECTION TO TANK.

CS **GROUNDING SYSTEM**

GRAPHIC SCALES

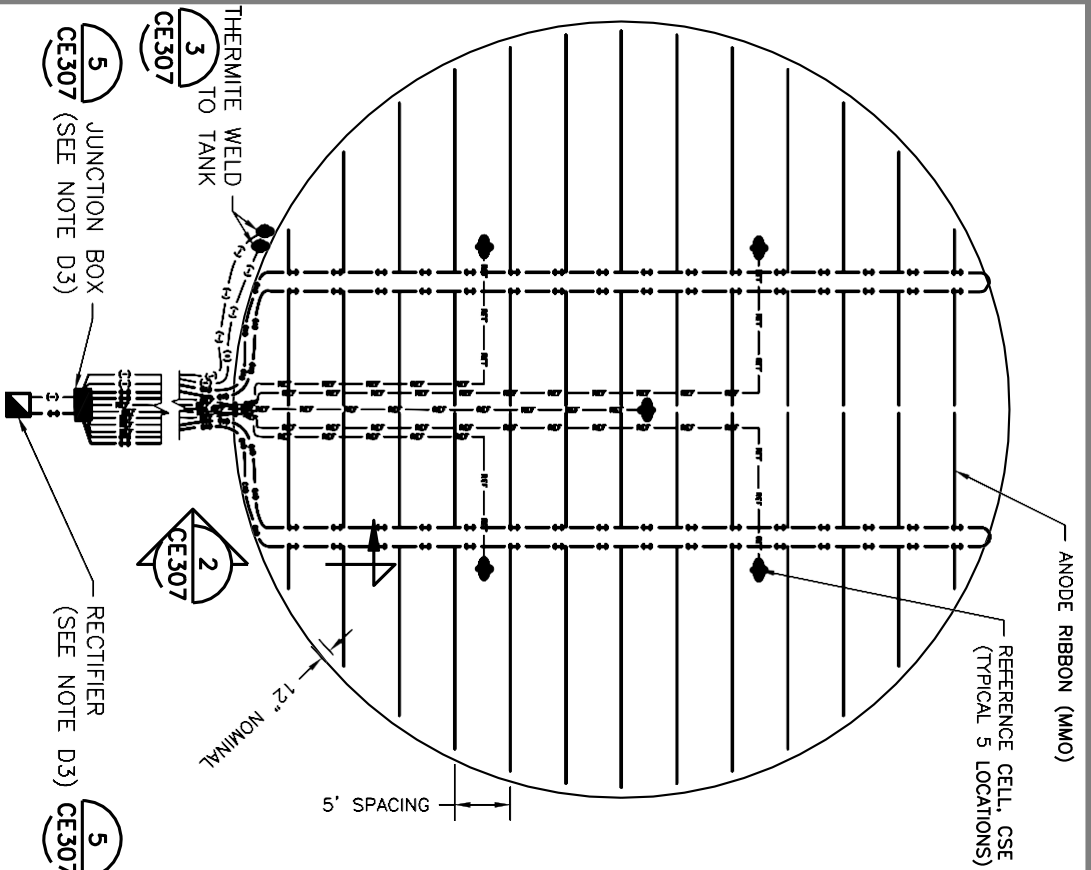
ISSUED FOR APPROVAL

4008-CE-306

growing File: P:\projects\8749\Cad\Current Dwg %\Civil\4008-CE-306.dwg Last modified by: weathersd

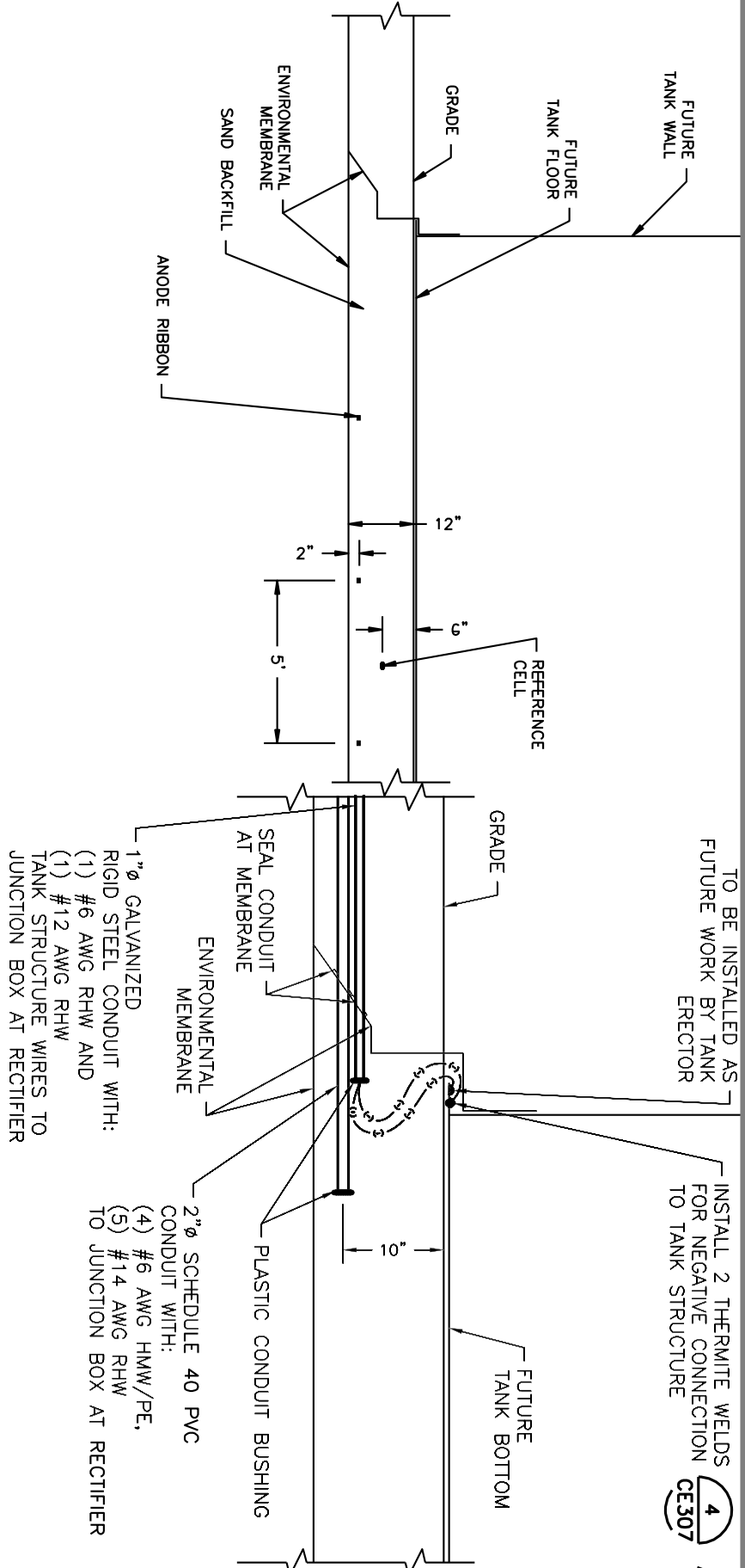
Date: May 26, 2011

f

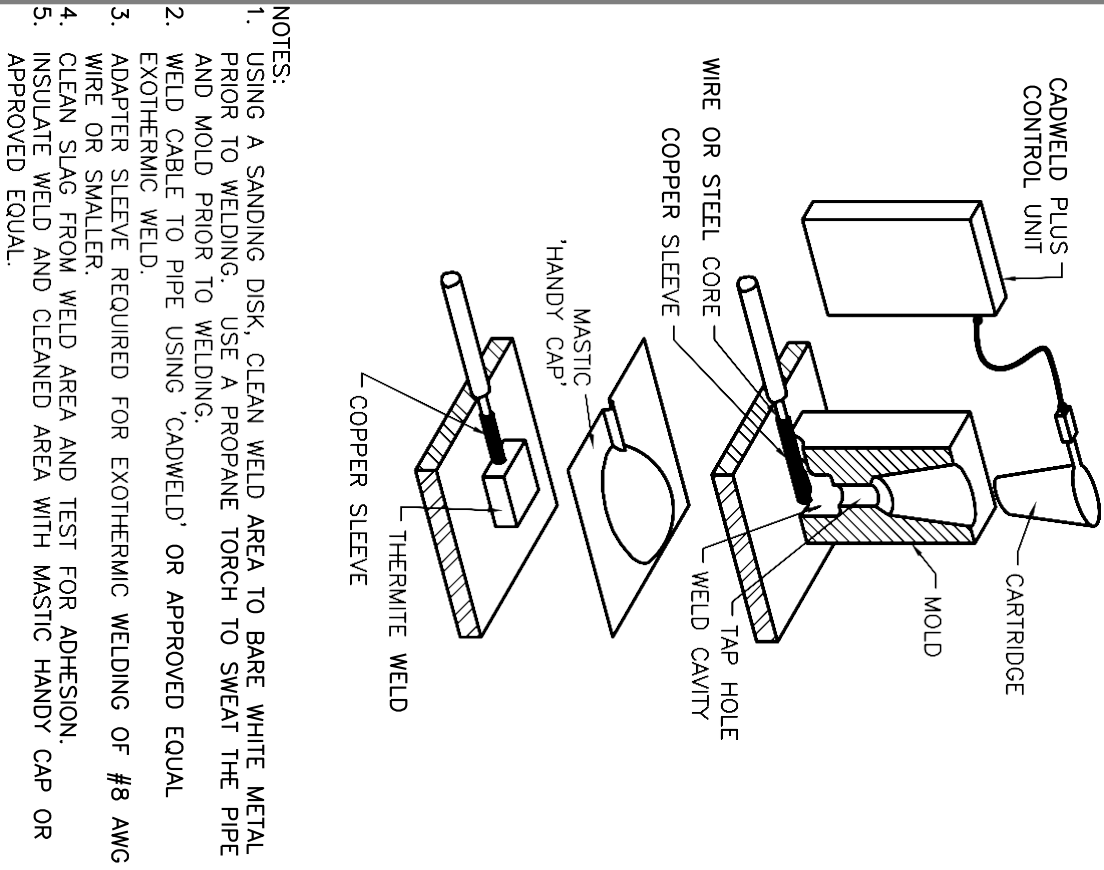


CATHODIC PROTECTION SYSTEM SCHEMATIC 1
SCALE: NONE

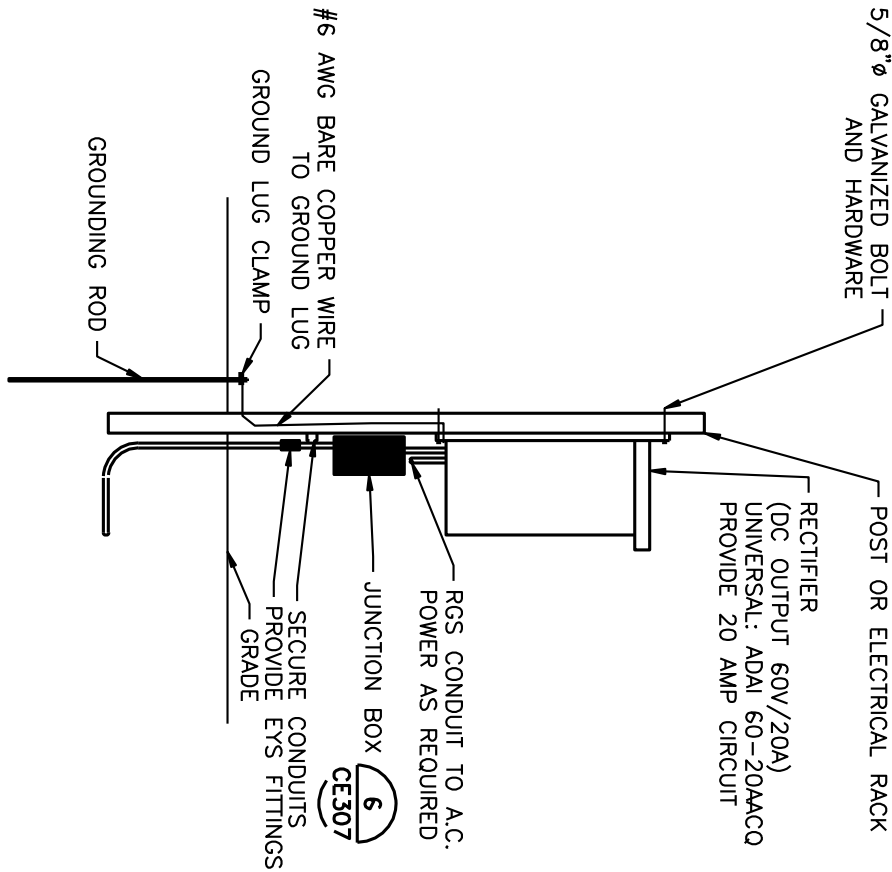
TYPICAL PARTIAL SECTION 2
SCALE: NONE



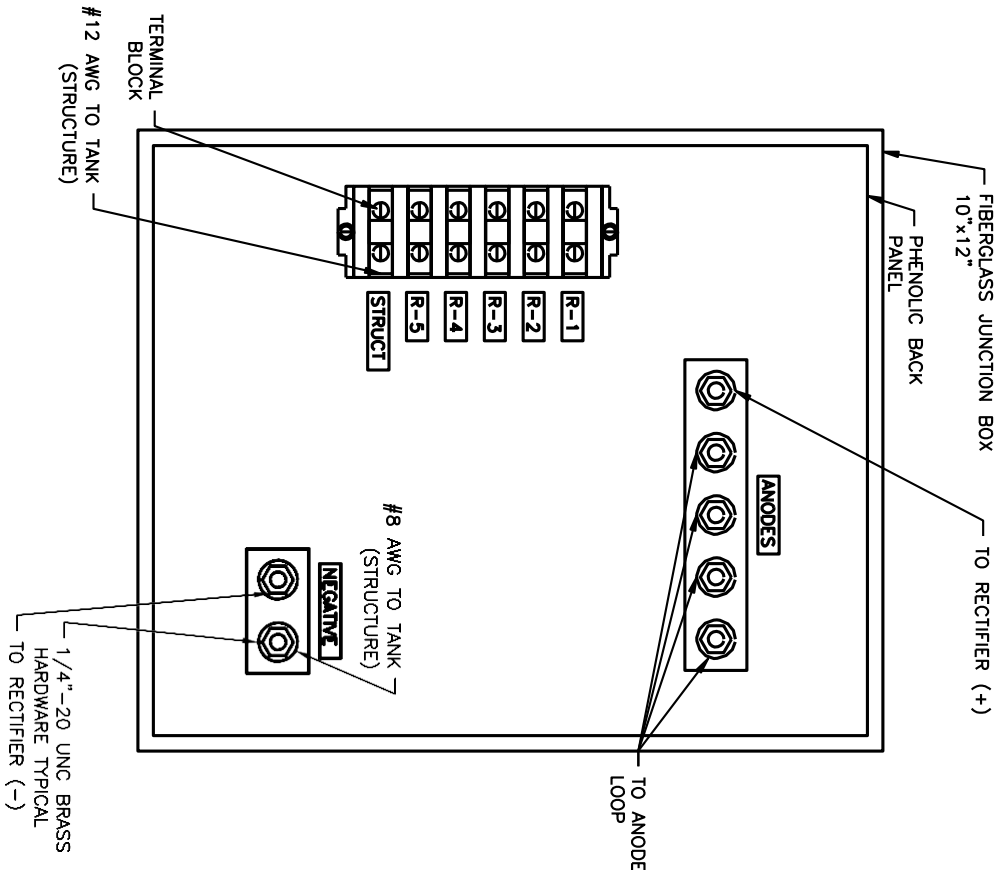
TYPICAL CONDUIT & THERMITE WELD 3
SCALE: NONE



THERMITE WELD 4
SCALE: NONE



RECTIFIER/JUNCTION BOX MOUNTING 5
SCALE: NONE



JUNCTION BOX 6
SCALE: NONE

- ABOVE GROUND STORAGE TANK CATHODIC PROTECTION INSTALLATION
- A. ANODE SYSTEM
1. INSTALL THE ELECTRICAL CONDUIT PENETRATIONS THROUGH THE ENVIRONMENTAL MEMBRANE.
 2. THE ANODES SHALL BE INSTALLED MINIMUM 10' BELOW THE TANK FLOOR. THE TANK SHALL HAVE A COMPLETE SET OF ANODES THAT MAY BE "UNROLLED" ACROSS THE AREAS OF THE TANK'S BASE. THE ANODES SHALL HAVE A MAXIMUM HORIZONTAL SPACING OF 5'. THE ANODES SHALL BE INSTALLED SO AS TO AVOID TWISTING OR LIFTING OF THE ANODE HEADER CABLE ONCE INSTALLED. ROUTE EACH END OF THE ANODE HEADER CABLE THROUGH THE CONDUIT TO THE JUNCTION BOX AT THE RECTIFIER.

B. REFERENCE CELL

1. PLACE THE REFERENCE CELLS AT THE DESIGNATED LOCATIONS ON THE APPROPRIATE LIFT OF SAND THAT KEEPS THEM A DISTANCE OF 6" FROM THE TANK FLOOR. ROUTE EACH REFERENCE CELL LEAD WIRE THROUGH THE CONDUIT TO THE JUNCTION BOX AT THE RECTIFIER. MARK THE REFERENCE CELL DESIGNATION (NUMBER) ON EACH LEAD WIRE.
2. PROVIDE ACCURATE AS-BUILT DIMENSIONS SUITABLE FOR LOCATING EACH REFERENCE CELL BELOW THE TANK FLOOR WITHIN ONE FOOT. MOISTEN EACH REFERENCE CELL IMMEDIATELY PRIOR TO INSTALLING THE FINAL LIFT OF SAND.

- C. PROTECT AND MAINTAIN THE ANODE AND REFERENCE CELL WIRES DURING TANK CONSTRUCTION UNTIL FINAL TERMINATION IN THE JUNCTION BOX CAN BE COMPLETED. ANODE LOOP RESISTANCE SHALL BE MEASURED AFTER INSTALLATION OF THE ANODE SYSTEM AND MONITORED DURING PLACEMENT OF THE TANK BOTTOM. POTENTIAL MEASUREMENTS SHALL BE MONITORED BETWEEN ANODES, REFERENCE CELLS AND TANK BOTTOM DURING CONSTRUCTION. ANY ABRUPT CHANGE IN THESE MEASUREMENTS WILL INDICATE DAMAGE TO THE SYSTEM THAT SHALL BE INVESTIGATED AND REPAIRED PRIOR TO PLACING THE STEEL FOR THE TANK BOTTOM.

D. ELECTRICAL WIRING AND COMPLETION

1. APPROPRIATE MEASURES SHOULD BE TAKEN TO SEAL THE CONDUIT AT THE ENVIRONMENTAL MEMBRANE.
2. THE BOND BOX SHALL BE FIELD LOCATED AROUND THE PERIMETER OF THE TANK TO AVOID OBSTRUCTIONS. THE BOND BOX SHALL BE MOUNTED TO THE TANK WALL. INSTALL CONDUIT AND COMPLETE CABLE INSTALLATIONS AND TERMINATIONS AS DESIGNATED.
3. THE JUNCTION BOX AND RECTIFIER TO BE FIELD LOCATED OUTSIDE THE TANK CONTAINMENT AREA. MOUNT TO A POST OR ELECTRICAL RACK. PROVIDE A DEDICATED 20 AMP BREAKER FOR RECTIFIER POWER SUPPLY.

THIS DRAWING IS A CONCEPTUAL DESIGN ONLY TO DEFINE THE MINIMUM REQUIREMENTS THE FINAL DESIGN SHALL TAKE INTO ACCOUNT ALL CONSIDERATIONS TO PROVIDE A FULLY FUNCTIONAL, CODE COMPLIANT FACILITY.

REVISIONS & ADDENDUMS	DATE	REMARKS	DRN	CHK	APP	APP	APP	APP
A	3-28-2017	ISSUED FOR REVIEW						
B	4-17-2017	ISSUED FOR APPROVAL						
C	5-26-2017	REISSUED FOR APPROVAL						

MANAGEMENT	DESIGNED	J.F.K.	DRAWN	R.H.	CHECKED	E.S.	APPROVED	J.F.K.	LAST EDIT	52517	PLOT DATE	52517	SUBMITTAL	05-25-2017
------------	----------	--------	-------	------	---------	------	----------	--------	-----------	-------	-----------	-------	-----------	------------

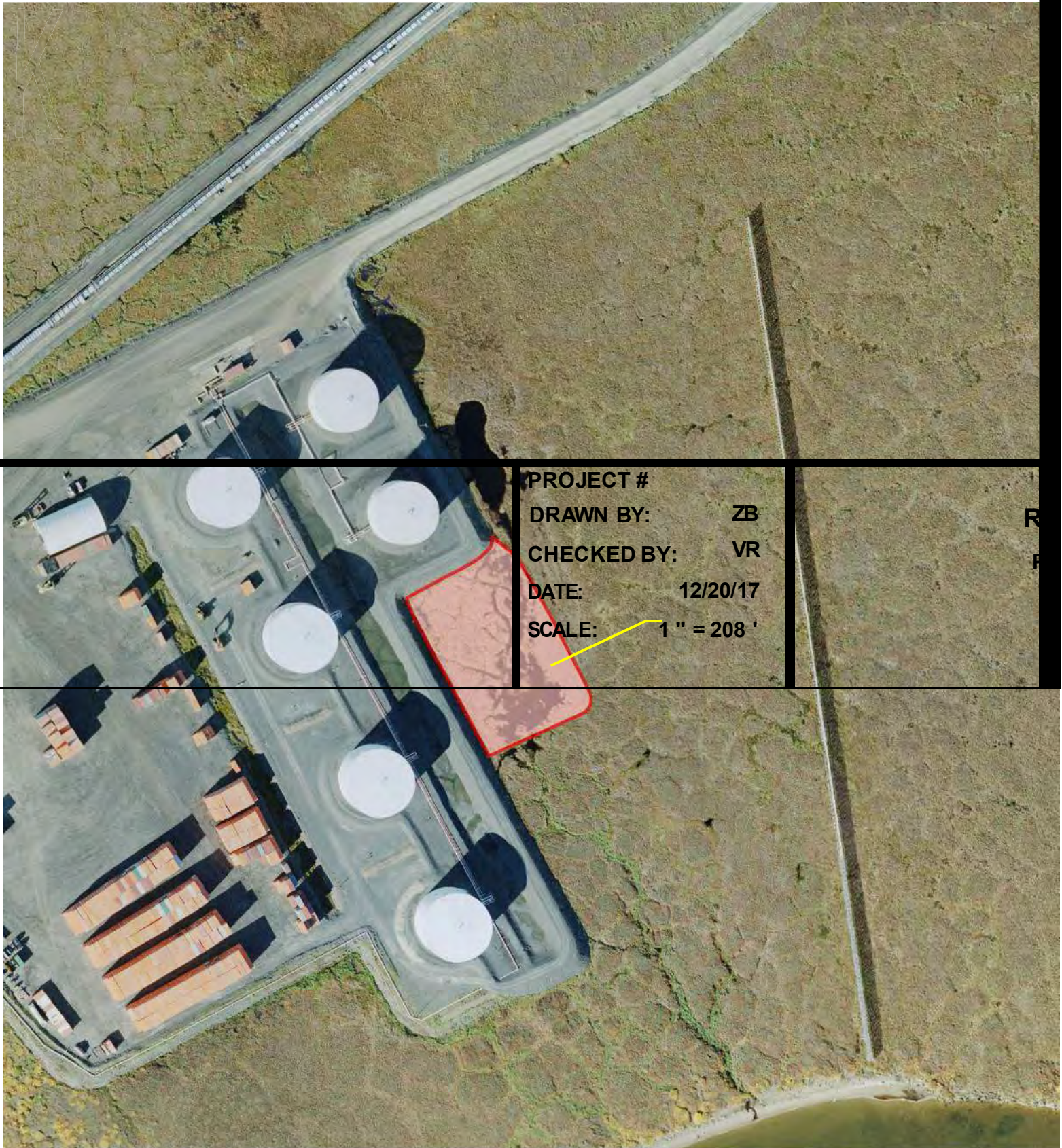
VALUE IMPROVEMENT PROJECT 2	RED DOG MINE	TECK ALASKA INCORPORATED	4008-CE-307
PROJECT NUMBER	DRAWING FILE NAME	DRAWING SCALE	AS SHOWN
P0016997W	22298-01R01.DWG		

ISSUED FOR APPROVAL

4008-CE-307

SHEET NUMBER

ORIGINAL SHEET SIZE EQUALS 22"x34"



PROJECT #

DRAWN BY: ZB

CHECKED BY: VR

DATE: 12/20/17

SCALE: 1" = 208'



Red Dog Operations

Teck

NANA
REGIONAL CORPORATION, INC.



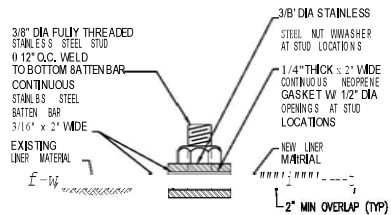
POA-1983-359

AIDEA

Chukchi Sea

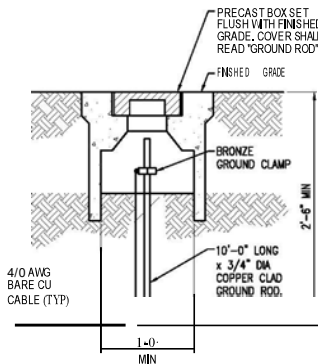
12/20/17

Page 1 of 6



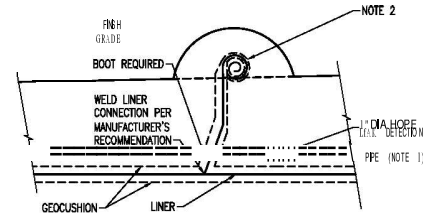
EXISTING LINER ATTACHMENT

CEJ05 CE308 SCALE: N1S



GROUND ROD BOX

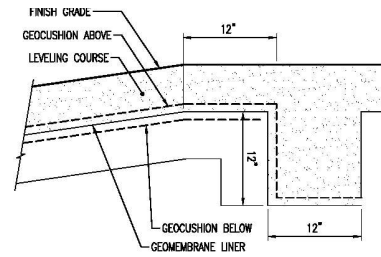
CEJ06 CE308 SCALE: N1S



- NOTES:
1. PROVIDE SOLID SDR 11 HOPE PIPE OUTSIDE LINER, PROVIDED PERFORATED SDR 11 HOPE PIPE WITHIN LINER, WRAP PERFORATED PIPE WITH NONWOVEN DRAINAGE GEOTEXTILE.
 2. PROVIDE SUFFICIENT LINER AND GEOCUSHION (18\"/>

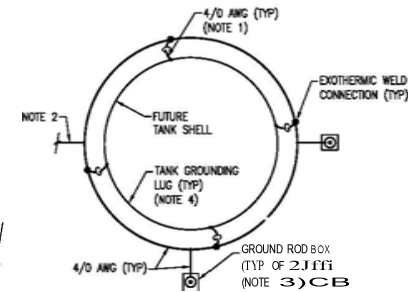
2 LINER TO TANK CONNECTION

CEJ06 CE308 SCALE: 1/4\"/>



LINER ANCHOR DETAIL

CEJ05 CE308 SCALE: N1S



- NOTES:
1. COPPER WIRE LOCATED ABOVE TANK LINER SHALL BE INSULATED. INSULATION SHALL BE SUITABLE FOR THE LOCATIONS THAT MAY HAVE FUTURE EXPOSURE. PROVIDE BOOT SEAL AT LINER PENETRATION.
 2. PROVIDE 4/0 AWG COPPER CONNECTION TO TANK'S GROUNDING WIRING LOCATION.
 3. LOCATE GROUND ROD BOXES OUTSIDE EDGE OF TANK LINER.
 4. TANK GROUNDING WIRE TO BE PROVIDED BY TANK MANUFACTURER. PROVIDE SUFFICIENT GROUNDING WIRE THROUGH LINER FOR CONNECTION TO TANK.

CS GROUNDING SYSTEM

ENTERPRISE
ENGINEERING, INC.

400 W. 10TH ST. SUITE 100
TANDEM, ALASKA 99571
TEL: (907) 486-3559
FAX: (907) 486-3553

THIS DRAWING IS A CONTRACT DOCUMENT. IT IS THE PROPERTY OF ENTERPRISE ENGINEERING, INC. AND IS NOT TO BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC OR MECHANICAL, WITHOUT THE WRITTEN PERMISSION OF ENTERPRISE ENGINEERING, INC.

REV	DATE	BY	CHK	APP	DESCRIPTION
1	12/20/17	CEJ	CEJ	CEJ	ISSUED FOR APPROVAL

VALUE IMPROVEMENT PROJECT 2
RED DOG MINE
TECK ALASKA INCORPORATED
SITE DETAILS

PROJECT NUMBER: P001657W
DRAWING FILE NAME: 4008-CE-306.DWG

ISSUED FOR APPROVAL

4008-CE-306

POA-1983-359
AIDEA
Chukchi Sea
12/20/17
Page 6 of 6



ISSUED FOR APPROVAL