

Mertarvik Bulk Fuel & Rural Power System

Conceptual Design Report



Typical Alaska Energy Authority Power Plant Module (Recent Installation in Perryville, AK Pictured)

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August 2017

EXECUTIVE SUMMARY

This Conceptual Design Report (CDR) has been prepared for the Alaska Energy Authority and its partners to develop recommendations for bulk fuel and rural power system upgrades in the new community of Mertarvik.

The rapid rate of riverbank erosion in the neighboring village of Newtok is threatening the community and efforts are underway to plan and facilitate relocation of the village to the nearby undeveloped area of Mertarvik. The relocation of Newtok to Mertarvik is expected to be performed over six phases (Phase 1, 2A, 2B, 3A, 3B, and 4), as described in the Newtok/Mertarvik Relocation Energy Master Plan (EMP) prepared by HDL Engineering Consultants, LLC in May 2017.

This CDR is based on the discussions and conclusions presented in the EMP. The purpose of the EMP was to plan the phased implementation of the new bulk fuel and power infrastructure in Mertarvik. The EMP provided a detailed description of the phased relocation of the village of Newtok to Mertarvik and outlined the expected fuel and power demands for the new community during each phase of the community relocation. Phase 1 of the relocation effort is complete and Phase 2A is currently underway. This report presents preferred alternatives for power plant and tank farm upgrades to meet the near-term power demand (Phase 2B) and bulk fuel demand (Phase 3B) in Mertarvik. The power plant module described in this CDR will be designed to provide power for approximately 17 homes and the Mertarvik Evacuation Center (MEC) described in Phase 2B of the EMP. Nine of these homes and the MEC building are planned to be occupied by the fall of 2018. The power plant module will be sized to accommodate the installation of larger generators in the future to meet the power demands from the subsequent phases of the community relocation.

The project is designed such that power and bulk fuel capacity can be increased to meet the final build out (Phase 4) demand by upsizing the generators in the new power plant module and adding tankage inside the new tank farm containment.

The purpose of this CDR is to provide conceptual designs for rural power system upgrades (RPSU) and Bulk Fuel Upgrades (BFU) in Mertarvik. Additionally, the report provides construction scheduling and order-of-magnitude cost estimates for the proposed designs. Following the development of the EMP and discussions with project stakeholders, a single recommendation was developed consisting of construction of a new power plant module, tank farm, electrical distribution upgrades, and recovered heat system for the near-term community that can be scaled to meet future demand. HDL Engineering Consultants, LLC teamed with Gray Stassel Engineering, Inc. (GSE) for the power plant, recovered heat, and electrical distribution engineering; and EDC, Inc. for the bulk fuel electrical engineering to prepare the content of this report.

David Cooper, PE, of HDL Engineering Consultants LLC (HDL), Steven Stassel, PE, of Gray Stassel Engineering, Inc. (GSE), and David Lockard, PE, of the Alaska Energy Authority (AEA) traveled to Newtok with other stakeholders on March 21, 2017 to meet with residents and community leaders and inspect the existing power plant and tank farm infrastructure. The project team evaluated the condition of the existing power plant, power distribution system, fuel pipelines,

and nine existing tank farms. The majority of the existing tanks and equipment were at or near the end of their useful life and only five tanks were identified for potential reuse in the new bulk fuel facilities in Mertarvik. The other facilities should be decommissioned and demolished as they reach end-of-life, are taken out of service due to reduced demand, or are threatened by riverbank erosion. The project team held a community meeting to discuss the new RPSU and BFU improvements. Residents voiced general agreement with the proposed upgrades described in this CDR.

In general, the following bulk fuel and energy improvements are recommended in Mertarvik:

- **RPSU Project:** The power plant will consist of a pre-fabricated module with a segregated generator room and control room/office. The module will include three new Tier-2 and Tier-3 marine diesel engine-generators, new automatic start/stop/paralleling switchgear, a new heat loop for generator heat recovery with community buildings, remote radiators with variable speed fan control, a fire suppression system, critical grade exhaust silencers and associated engine coolant piping and ventilation equipment. The power plant will connect to a new intermediate fuel storage tank via an automated fuel transfer pipeline; automated load balancing; new switchgear; and a supervisory control and data acquisition (SCADA) system.
- **BFU Project:** The new tank farm will consist of two gravel containment cells lined with a fuel resistant liner. New single-wall, horizontal, fuel tanks will be installed inside the containment including: (8) 27,000-gallon bulk tanks, (2) 20,000-gallon bulk tanks, (1) 12,000-gallon intermediate tank, and (1) 20,000/8,000 gallon dual compartment tank for a gross fuel capacity of 214,000 gallons of diesel fuel and 82,000 gallons of gasoline. The tank farm will also include two marine header fill points and associated piping; truck fill; retail sales dispensing tank and dispensers at the new Mertarvik community store; and fuel conveyance piping between the tank farm, retail sale dispensing tank, and power plant intermediate tank.
- **Electrical Distribution Upgrades:** The electrical distribution will be a pole-mounted, 12.47/7.2 kV, 3-phase overhead system.
- **Recovered Heat Upgrades:** Pre-insulated supply and return arctic pipelines from a heat exchanger in the new power plant and connecting to the heating systems of nearby community buildings.

A preliminary cost estimate was prepared for the construction of the bulk fuel, power plant, electrical distribution, and recovered heat systems. The preliminary construction cost estimate for this project is \$12,719,751. See Appendix H for a breakdown of the preliminary costs.

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ABBREVIATIONS

%	percent
ADEC	Alaska Department of Environmental Conservation
ADFG	Alaska Department of Fish and Game
ADOT&PF	State of Alaska Department of Transportation and Public Facilities
AEA	Alaska Energy Authority
AHFC	Alaska Housing Finance Corporation
ANTHC	Alaska Native Tribal Health Consortium
AVCP-RHA	Association of Village Council Presidents-Regional Housing Authority
AVEC	Alaska Village Electric Cooperative
BIA	Bureau of Indian Affairs
BTU	British thermal unit
CCHRC	Cold Climate Housing Research Center
CDR	Concept Design Report
CPCN	Certificate of Public Convenience and Necessity
CRW	CRW Engineering Group
DCRA	State of Alaska, DCCED, Division of Community and Regional Affairs
DOWL	DOWL LLC
EA/FONSI	Environmental Assessment/Finding of No Significant Impact
EIS	Environmental Impact Statement
EMP	Energy Master Plan
EPA	Environmental Protection Agency
ESD	Emergency Shut Down
FAA	Federal Aviation Administration
FRP	Facility Response Plan
GNE	Great Northern Engineering, LLC
HDL	HDL Engineering Consultants, LLC
HP	Horsepower
IBC	International Building Code
IFC	International Fire Code
kV	kilo-volt
kVA	kilo-volt-ampere
kW	kilo-watt
kWh	kilo-watt-hours
LKSD	Lower Kuskokwim School District
MEC	Mertarvik Evacuation Center
NEC	National Electric Code
NEPA	National Environmental Policy Act
NESC	National Electric Safety Code
NFPA	National Fire Protection Association
NFS	Non-Frost Susceptible
NMFS	National Marine Fisheries Service
NNC	Newtok Native Corporation

NOAA	National Oceanic and Atmospheric Administration
NVC	Newtok Village Council
PCE	Power Cost Equalization
PV	photovoltaic
RCA	Regulatory Commission of Alaska
rpm	revolutions per minute
SCADA	Supervisory Control and Data Acquisition
SCH	schedule
UL	Underwriters Laboratories
UPC	Ungusraq Power Company
U.S.	United States
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
V	volt

1.0 INTRODUCTION

This Conceptual Design Report (CDR) has been prepared for the Alaska Energy Authority (AEA), the Denali Commission, and the Newtok Village Council (s) for the development of a bulk fuel and rural power project in Mertarvik, Alaska. This energy project is one part of a larger effort to construct new roads, residential homes, community buildings, utilities, and an airport in order to relocate the existing village of Newtok to the new site of Mertarvik.

This CDR is based on the discussions and conclusions presented in the Newtok/Mertarvik Relocation Energy Master Plan (EMP) prepared by HDL Engineering Consultants in May 2017 (HDL 2017). The purpose of the EMP was to plan the phased implementation of the new bulk fuel and power infrastructure in Mertarvik. The EMP provided a detailed description of the phased relocation of the village community to Mertarvik and outlined the expected fuel and power demands for the new community during each phase of the community relocation. The power plant module described in this CDR will be designed to provide power for approximately 17 homes and the Mertarvik Evacuation Center (MEC) described in Phase 2B of the EMP. Nine of these homes and the MEC building are planned to be occupied by the fall of 2018. The power plant module will be sized to accommodate the installation of larger generators in the future to meet the power demands from the subsequent phases of the community relocation.

The new tank farm will be designed to include sufficient storage capacity to accommodate the electrical and heating loads for Mertarvik from intermediate Phase 3B of the village relocation, as described in the EMP. The tank farm design will provide sufficient space within the new containment to install an additional fuel tank for the new school in Mertarvik that is planned for construction during the final phase (Phase 4) of the village relocation.

Users of this report are encouraged to read the EMP for relevant background and planning information. A copy of the EMP is available upon request from AEA.

1.1 Contacts

The following individuals contributed information for this report:

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Grant Kashatok	Newtok Ayaprun School Principal
David Lockard	Alaska Energy Authority Project Manager
Ryan Butte	LKSD Capital Projects Manager
Jack Hebert	Cold Climate Housing Research Corporation (CCHRC) Chief Executive Officer
Abraham Palacios "Bubba"	AVCP RHA Development Director

1.2 Applicable Codes & Regulations

The design/operation of fuel and power systems is controlled by the following State and Federal regulations:

- State of Alaska Fire and Life Safety Regulations (13 AAC 50);
- 2012 International Fire Code as adopted by 13 AAC 50;
- 2013 Alaska Energy Authority and Alaska State Fire Marshal Memorandum of Agreement;
- 2012 International Building Code as adopted by 13 AAC 50;
- 2015 NFPA 30, Flammable and Combustible Liquids Code;
- 2015 NFPA 30A, Code for Motor Fuel Dispensing Facilities and Repair Garages;
- 2014 NFPA 70, National Electrical Code;
- 2014 NFPA 77, Recommended Practice on Static Electricity;
- ANSI/IESNA RP-7-01, The Lighting Handbook, 10th Edition;
- 2012 International Mechanical Code as adopted by 13 AAC 50;
- 2012 International Fuel Gas Code as adopted by 13 AAC 50;
- 2012 Electrical Code as adopted by 13 AAC 70;
- 2012 National Electrical Safety Code as adopted by 13 AAC;
- State of Alaska Oil and Hazardous Substances Pollution Control Regulations (18 AAC 75);
- State of Alaska DEC Class 2 Facilities Regulations (18 AAC 75.835 – 18 AAC 75.849)
- EPA Oil Pollution Prevention Regulations (40 CFR Part 112);
- US Coast Guard Facilities Transferring Oil or Hazardous Material in Bulk Regulations (33 CFR Part 154).

The Denali Commission has adopted policies to establish guidelines for rural energy projects. Guidelines affecting this project include:

- Design capacity is to be based on useable capacity projected for not more than 10 years.
- Design capacity shall account for 10-year population trends, historical power production trends, and proposed infrastructure projects impacting energy demand.
- In communities that receive barge deliveries of fuel, 13-months of fuel storage shall be incorporated into the design capacity.
- Allow future expansion to meet the 20-year need.

The State of Alaska Department of Fire and Life Safety adopted the 2012 edition of the International Fire Code (IFC) and the International Building Code (IBC) in May of 2017. The provisions set forth in the IFC establish the primary design requirements for new facilities.

The US Environmental Protection Agency (EPA) requires two sets of regulatory submittals for fuel facilities from which a discharge could impact navigable water or adjoining shorelines. The Spill Prevention Control and Countermeasures (SPCC) Plan identifies requirements for facilities which have a minimum aggregate storage capacity of 1,320 gallons. The SPCC Plan must address every container 55 gallons and larger, and must be certified by a Professional Engineer. Facility Response Plans (FRPs) are required for facilities which are filled by marine vessels and which have a storage capacity of more than 42,000 gallons.

The US Coast Guard Facilities Transferring Oil or Hazardous Material in Bulk Regulations apply to fuel facilities capable of transferring fuel to or from a vessel with a capacity of 10,500 gallons or more. This regulation requires a Facility Response Plan and an Operations Manual. The FRP is similar to the EPA FRP and outlines spill planning requirements for the Coast Guard regulated portion of the facility. The Operations Manual addresses the procedures and equipment required for receiving fuel at the facility. Additionally, the Coast Guard requires that a Letter of Intent to Operate be submitted to the Captain of the port for approval prior to delivery of fuel.

2.0 COMMUNITY DESCRIPTION

2.1 Newtok

A. Location and Access

Newtok is located 94 miles northwest of Bethel at the confluence of the Newtok and Ninglick Rivers, north of Nelson Island in the Yukon-Kuskokwim region of Alaska. Newtok is located at 60.9369° North Latitude and 164.6294° West Longitude (Sec. 24, T010N, R087W, Seward Meridian). The community is within the Bethel Recording District and is surrounded by the Yukon Delta National Wildlife Refuge (DCRA 2017a).

Newtok is accessed by air and water but there are no roads connecting the village to any other communities. Passenger, cargo, and private aircraft access the village via a 2,180-foot long gravel airstrip owned by the Alaska Department of Transportation & Public Facilities (ADOT&PF). There is barge access via the Ninglick River during ice-free conditions. The Newtok River is only navigable by smaller boats and skiffs. In the winter, snow machines are used for local transportation throughout the community and between nearby villages.

B. Climate

Newtok is located within the transitional climate zone of Alaska, exhibiting characteristics of subarctic, arctic, and maritime climates. Winters are long and cold and summers are short and mild. Average summer temperatures range from 40°F to 60°F and winter temperatures range from 0°F to 20°F. Temperatures range from -48°F in the winter to 87°F in the summer. Annual precipitation is 16 inches, with 53 inches of snowfall.

C. History and Culture

The Nelson Island region has been inhabited by the Qaluyaarmiut, or “dip net people”, for the last 2,000 years, with communities maintaining a traditional nomadic, subsistence lifestyle as late as 1936. The village of Newtok was established in its present location in 1949 when the community moved from the winter camp at the Old Kealavik site to escape flooding. Newtok was selected as the furthest point up the Ninglick River that a barge could safely navigate at the time. As recently as the 1960s, the majority of the population migrated to ca24mps on the coast of the Bering Sea to harvest fish, marine mammals, and waterfowl during the summer months. By the 1970s, residents had transitioned from traditional sod houses heated with seal oil to more modern timber buildings. Today, modern means of travel such as snow machines and boats allow villagers to access subsistence sites and return to Newtok on a daily basis, making Newtok a year-round home for the community (DCRA 2017a and DCRA 2017b).

According to U.S. Census data, the population of Newtok was 354 in 2010, with 96% of the residents reported to be American Indian/Alaska Native. A total of 72 households in Newtok were occupied in 2010 (Census 2010).

2.2 Mertarvik

A. Location and Access

Mertarvik is located approximately 9 miles southeast of Newtok on Nelson Island at approximately 60.8099° North Latitude and 164.5004° West Longitude. Figure 1 below shows the Mertarvik village location in relation to Newtok.

There are no existing roads or runways that provide air or road vehicle access to Mertarvik, and the area is primarily accessed by small boats in the summer, by snow machine in the winter, or by helicopter. During the summer barge season, barge access is available to the recently constructed shallow-draft and deep-water barge landings. The shallow-draft barge landing is only accessible during high tide.

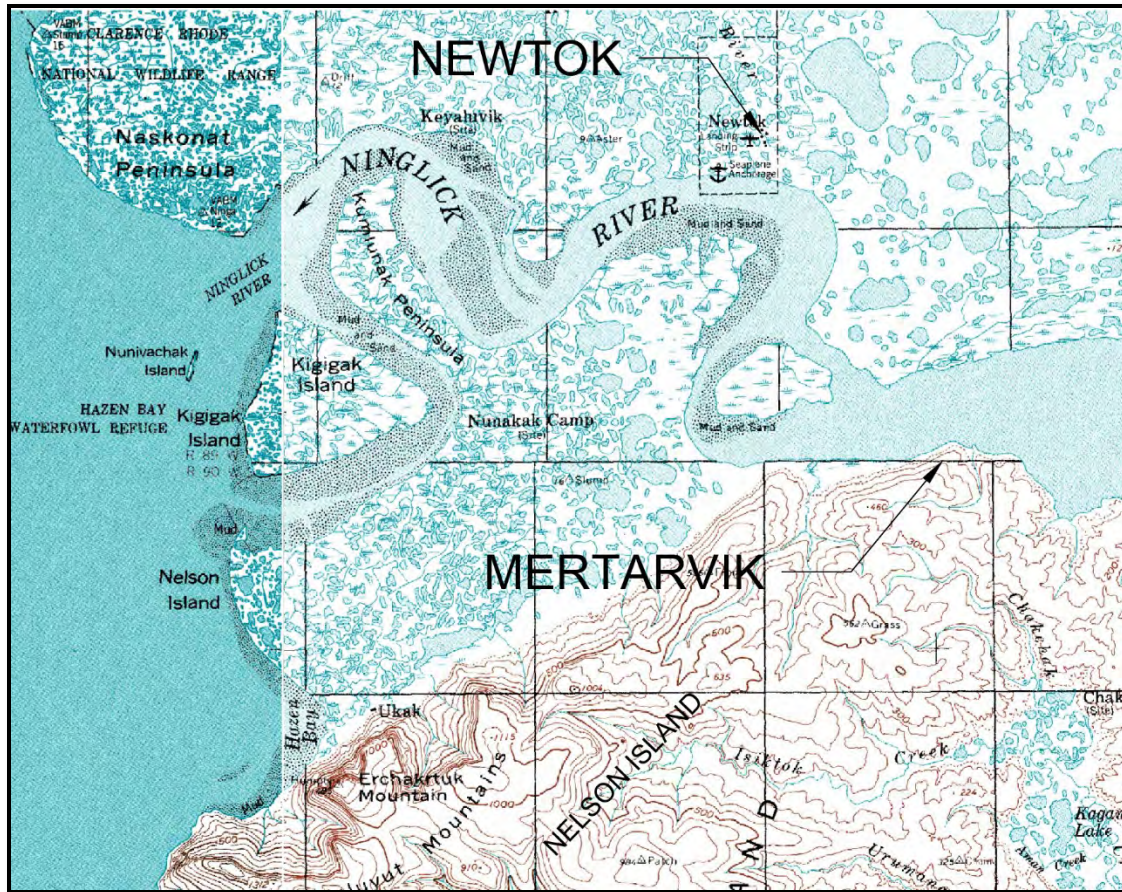


Figure 1: Location Map

3.0 EXISTING INFRASTRUCTURE

3.1 Newtok Infrastructure

A. Prime Power Generation

The Ungusraq Power Company (UPC) is owned and operated by NVC operating under Certificate of Public Convenience and Necessity (CPCN No. 375). The community has an isolated, above ground electrical power grid with no outside interties. A diesel electric plant provides community electric power.

The UPC power plant is located adjacent to the community water plant, about 300 feet northwest of the school and about 900 feet from the eroding shoreline. The power plant is a single story, wood frame structure, constructed in the 1980s on a post and pad foundation. The west side of the timber pad foundation has sunk into the tundra causing the floor of the power plant to tilt considerably. See Figure 2 below.



Figure 2: UPC Newtok Power Plant

The power plant has two 480-volt (V), three-phase John Deere generators. Unit #1 is a model 6068AFM75, Tier 2 marine engine, rated 150 kilo-watt (kW) Prime. Unit #3 is an older 6081AF001, non-certified engine, rated 120 kW Continuous. Unit #2 is vacant. See Table 1. In early August, UPC completed a cooling system renovation project that replaced the existing cooling system, including all new cooling manifold, heat exchanger, amot thermostatic valve, and premium core radiator with variable speed drive. Unit #1 is a low hour engine in good operating condition. Unit #3 overheated, has a cracked cylinder head and metal shavings in the oil pan, and needs to be replaced.

Table 1: UPC Generators

GEN	kW	MAKE	MODEL	EPA	DATE	S/N
1	150	John Deere	6068AFM75	Tier 2 Marine	8/23/2011	PE6068G841045
2	--	--	--	--	--	--
3	120	John Deere	6081AF001	Tier 0	2/7/2003	RG6081A161323

The power plant has automatic paralleling switchgear, but it is operated in manual mode. The switchgear is equipped with one master and three generator sections. The master section contains the auto-synchronization/paralleling controls and demand meters in the upper cabinet, and the main community distribution and airport feeder breakers in the lower cabinet. Each generator section is equipped with metering, low voltage controls, indicator lights, and synchronization controls located in the upper cabinet, and the generator feeder breaker in the lower cabinet. The bus totalizer and station service meters are mounted on the wall adjacent to the switchgear.

Engine cooling is accomplished through a two-inch copper, common cooling system connected to a remote radiator attached to the exterior of the building. Each engine is equipped with a separate expansion tank and a shell and tube heat exchanger to recover engine jacket water heat. Recovered heat is piped approximately 60 feet to the adjacent water plant.

The power plant fuel system consists of a 300-gallon, single-wall intermediate tank mounted on a wooden stand outside the plant. The intermediate tank feeds a 75-gallon Simplx autofill day tank inside the plant. The day tank is equipped with a Racor filter, float switches, and pump. Threaded steel pipe fuel oil supply and return piping is routed from the day tank along the perimeter of the plant to each generator.

Diesel fuel is transferred daily from the UPC bulk tank farm to the power plant intermediate tank. The power plant operator fills two 55-gallon drums daily and transports them via snow machine and sled in the winter and four-wheeler and trailer during the summer.

B. Electrical Distribution

A 400-amp main feeder breaker provides 480 V, three-phase power from the switchgear to the overhead electric distribution system. Electric power is distributed throughout the community at 480 V, three-phase. A separate, 40-amp feeder breaker provides single-phase power to the airport via a 25 kilo-volt-ampere (kVA), 240 V/7.2 kV pole-mounted transformer located adjacent to the power plant. The electrical distribution system is unique in that electricity is distributed at 480 V generation power, rather than the more conventional 7.2/12.47 kV power.

The existing electrical distribution system is in poor condition. The poles are direct-bury construction, and many are leaning due to the poor soil conditions. Many of the guy wires are loose and do not support the poles. The airport step-up transformer pole at the power plant is leaning at a 25 to 30-degree angle, and the conductor is hanging dangerously close to the ground, as is shown in Figure 3. A temporary support has been strung between the power plant and adjacent building to elevate the conductor.



Figure 3: Newtok Electrical Distribution Pole

Pole-mounted, dry pack transformers are located throughout the distribution system and stepdown the distribution voltage to 120/240 V power. As many as nine services are fed by one 10 to 15 kVA transformer. Due to limitations with transformer sizing and electrical distribution capacity, residents customarily coordinate with their neighbors to avoid simultaneously using high-demand electrical devices, such as electric clothes dryers, to prevent tripping a transformer fuse or knocking the power plant offline.

Residential customers use AMPY prepay electric meters. The prepay meters allow the utility to be paid in advance of energy consumption, which eliminates overdue accounts. Consumers receive real time feedback on electricity consumption, which helps with energy conservation and reduces the monthly cost of electricity.

C. School Power Generation

The Lower Kuskokwim School District (LKSD) Ayaprun School generates its own prime power. The school power plant consists of two 1,800-revolutions per minute (rpm), 480 V, three-phase Cummins generators in a 40-foot insulated shipping container. The power plant is located about 350 feet from the eroding shoreline. The plant is set on wooden piles about five feet above grade. The generators are equipped with skid-mounted radiators, and each has its own day tank. Unit #1 is a 100 kW generator which was recently replaced in May 2016. Unit #2 is a 125-kW generator. Engine hours are unknown, but Unit #1 appears to have over 4,000 hours and Unit #2 over 11,500 hours. See Table 2 below. The power plant switchgear is manually operated and equipped with a non-auto transfer switch to transfer load between the generators. There is no recovered heat system.

Table 2: Newtok LKSD Generators

GEN	kW	MAKE	MODEL	EPA	DATE	S/N
1	100	Cummins	100DGDB	Replacement	10/30/2014	Engine: 6B: 60279357
2	125	Cummins	100DGDB	Tier 3	12/19/2013	Engine: QSB 60275265

The power plant fuel system consists of a 2,000-gallon, double-wall, skid-mounted, intermediate tank located adjacent to the power plant. The intermediate tank feeds two day tanks inside the plant. During the March 2017 site visit, the Unit #1 day tank was disassembled and inoperable. Unit #2 has a Simplx SST 50-gallon autofill day tank, equipped with filter, float switches, and pump. Fuel oil supply and return piping is routed from the day tank to both generators. Diesel fuel is transferred from the school tank farm to the power plant intermediate tank via a two-inch steel pipe.

D. Renewable Energy

Current use of renewable energy in Newtok is limited to driftwood used to heat steam houses and for some home heating. The only other evidence of renewable energy identified in Newtok was an old, out of service Jacobs wind turbine thought to have been installed in the 1980s.

E. Electrical Equipment Suitable for Reuse

Due to age and condition, there is little existing energy-related infrastructure that is suitable for reuse at Mertarvik or elsewhere. The power plant has a newer 150 kW John Deere 6068AFM75 marine generator that is in good condition. However, by the time Newtok relocates to Mertarvik, it is expected the engine could have 40,000 hours of runtime and be at or near the end of its useful life. There are two 25 kVA pole-mounted 480V/7.2kV transformers that feed the airport that could be reused. The residential AMPY pre-pay meters should be removed from abandoned houses and reinstalled at Mertarvik, or placed into inventory for future use.

It is expected the LKSD will recover useable infrastructure for use at other LKSD schools, or return it to Bethel for storage.

F. Heat Recovery

The UPC power plant provides recovered heat to the adjacent water plant. Recovered heat is transferred from the power plant via a shell and tube heat exchanger, and piped through an at-grade utilidor approximately 60 feet to the water plant. The heat recovery piping is two-inch copper. A shell and tube heat exchanger is located in the water plant, along with the heat recovery circulating pump and expansion tank. The pump is a Grundfos UMC 65-40, operating on speed 2. The heat recovery system is equipped with isolation valves and pressure gauges. During the HDL/GSE March 2017 site visit, the heat recovery system pressure gauge displayed 0 pounds per square inch at the pump inlet, indicating the heat recovery system requires additional antifreeze to pressurize the system for proper operation.

The water plant operator reported the heat recovery system is the sole source of heat for the water plant, and diesel fuel has not been used for many years. During past power outages that lasted several days, the water plant froze due to lack of recovered heat.

G. Bulk Fuel Storage and Dispensing

Newtok Bulk Fuel Assessment Reports prepared for AEA by CRW Engineering Group, LLC (CRW) in 2015 and Great Northern Engineering, LLC (GNE) in 2016 identified eight existing bulk fuel storage facilities (tank farms) in Newtok (TF1 – TF8) (CRW 2015 & GNE 2016). An additional tank farm, TF9, was identified at Tom's Store during HDL Engineering Consultant LLC's (HDL) March 21, 2017 site inspection and community meeting (HDL 2017).

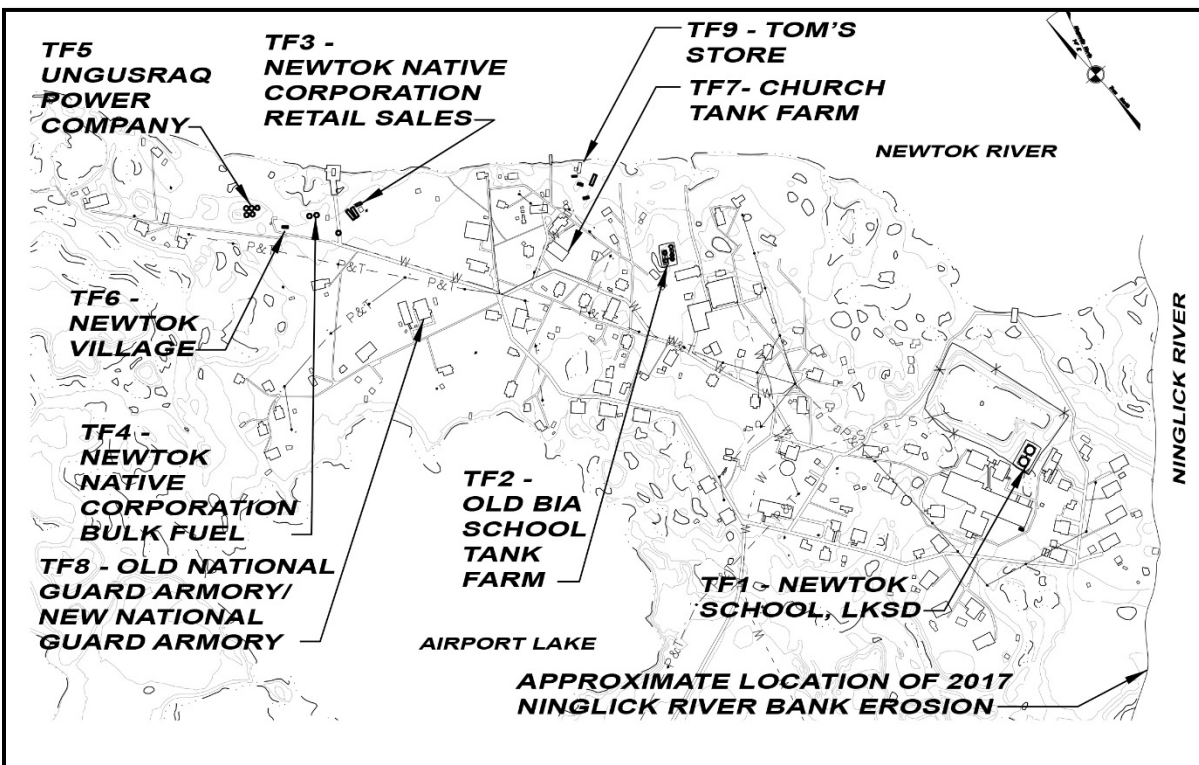


Figure 4: Location of Existing Tank Farms in Newtok

The following bulk fuel facilities exist in Newtok, as shown on Figure 4.

- TF1 - Newtok School, LKSD*
- TF2 - Old BIA School Tank Farm
- TF3 - Newtok Native Corporation (NNC), Retail Sales*
- TF4 - NNC, Bulk Fuel*
- TF5 - UPC*
- TF6 - NVC*
- TF7 - Church Tank Farm
- TF8 - Old National Guard Armory / New National Guard Armory *

- TF9 - Tom's Store
*= active and currently in use

Tank farms TF1, TF3, TF4, TF5, TF6, & TF8 are active and currently used for bulk fuel storage and/or dispensing. The bulk fuel storage tank farms in Newtok provide 237,500 gallons of gross diesel storage and 33,025 gallons of gross gasoline storage in the community. Approximately 58,000 gallons of diesel tank storage and 11,125 gallons of gasoline tank storage are either abandoned or currently not in use. In general, the existing tank farms are old, deteriorating, non-code compliant, and nearing the end of their useful life. A detailed narrative describing the existing size and condition of each bulk fuel facility in Newtok is included in Appendix A. Private residences, community buildings, and commercial buildings use small tanks for on-site heating fuel storage. Residents generally store heating fuel in 55-gallon drums, while the fuel tank sizes for public buildings range between 300 and 500 gallons.

H. Fuel Pipelines

TF1, TF3, TF5, TF6, and TF9 are filled by temporary or permanent connection to the approximate 2,600-foot long, three-inch, above ground, Schedule (SCH) 40 steel, common barge header pipeline. The header pipeline was reconstructed in 2008 and is in fair condition. The header begins on the bank of the Ninglick River near the school's teacher housing units and terminates at the UPC tank farm. The header consists of a single shared pipeline for gasoline and diesel barge filling operations. The header pipeline route is shown in Figure 5.

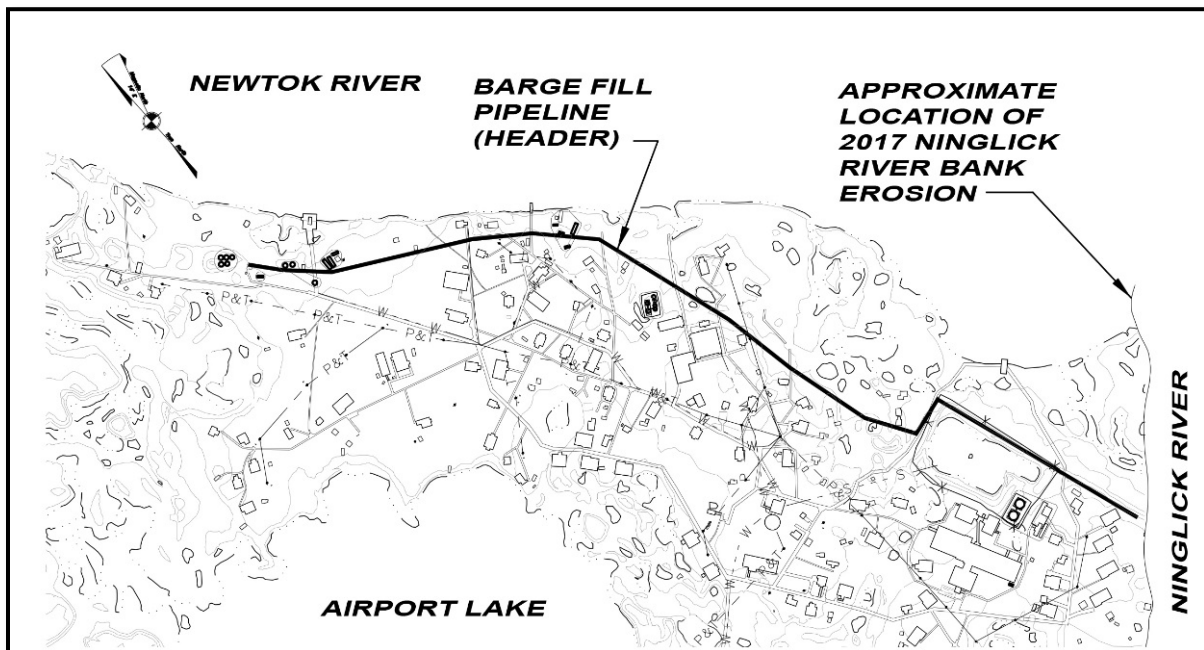


Figure 5: Marine Header Pipeline Route

3.2 Mertarvik Infrastructure

A. Existing Fuel Storage in Mertarvik

At the start of the 2017 construction season, two temporary bulk fuel storage tank containment berms were constructed as part of the NVC quarry road construction project. See Figures 6 and 8 below. One tank farm is reported to include one 12,000-gallon single wall diesel fuel tank and one 20,000-gallon single-wall diesel tank installed in a separate gravel containment berm with a fuel resistant liner. A second tank farm consists of one 6,000-gallon single-wall tank installed in a separate gravel containment berm with a fuel resistant liner. Also, one 5,000-gallon double-wall tank is currently located near the MEC foundation and is used for diesel storage for the NVC man-camp. See Figure 7. The Newtok / Mertarvik Relocation Energy Master Plan assumes the 6,000-gallon single-wall fuel tank in the construction tank farm will be used for diesel fuel storage after 2018 and the 5,000-gallon double-wall tank will be relocated next to the gravel containment areas and be used for gasoline fuel storage.

There is also an existing riveted tank that is likely over 40 years old and not code compliant. This tank is not currently being used and should be permanently decommissioned. The tanks, their capacities, and condition are shown in Table 3 below.

Table 3: Existing Fuel Tanks in Mertarvik

Tank No.	Dia.	Height/Length	Orientation	Tank Type	Active/Inactive	Product	Tank Function	Gross Capacity (Gallons)
1	7'-0"	20'-0"	Horizontal	Single-Wall	Active	Gasoline	Dispensing	6,000
2	8'-0"	32'-0"	Horizontal	Single-Wall	Active	Diesel 1	Dispensing	12,000
3			Horizontal	Double-Wall	Active	Diesel 1	Dispensing	5,000
4	12'-0"	23'-8"	Horizontal	Single-Wall	Active	Diesel 1	Bulk Storage	20,000
5	7'-0"	32'-0"	Horizontal	Single-Wall	Inactive	Unknown	Unknown	9,200
Total Gallons								43,000



Figure 6: Gasoline Fuel Tank in Shallow-Draft Barge Landing Laydown Area



Figure 7: 5,000-Gallon Double-Wall Tank near the MEC Foundation



Figure 8: Diesel Fuel 12,000 and 20,000 gallon Tanks in Shallow-Draft Barge Landing Laydown Area

B. Existing Power Generation in Mertarvik

During the 2017 summer construction season, as part of the NVC road project, a construction man-camp was installed. The man-camp will be equipped with a 150 kW Perkins generator to provide power and electric heat to the camp, washeteria, and kitchen.

A larger, 370 kW Doosan trailer-mounted electric generator was mobilized to Mertarvik in 2017 with the construction equipment and will be used for crushing rock at the quarry. This generator is part of the heavy equipment spread and is not expected to be used for future village prime power.

4.0 POWER PLANT AND BULK FUEL TANK FARM SITE SELECTION & CONTROL

4.1 Power Plant and Bulk Fuel Tank Farm Site selection

The Alaska Native Tribal Health Consortium (ANTHC) is charged with developing the final layout plan for the new community in Mertarvik. This includes working with NVC to determine the most suitable location for the school, housing subdivisions, roads, community buildings, water treatment plant, power plant, and other necessary infrastructure. A final version of the Mertarvik

community layout plan is included in Appendix B. ANTHC requested assistance from AEA to evaluate possible locations for the new power plant and community tank farm. AEA and ANTHC worked together to identify alternative sites for the new Mertarvik power plant and bulk fuel facilities considering the siting criteria discussed below.

Power Generation Siting Criteria:

Code Required Setbacks: The power plant will be located a minimum of 10 feet from the nearest property line which can be built upon, and a minimum of 20 feet from the nearest building on the same property. The International Building Code (IBC) requires a 10-foot minimum clearance from the new power plant to the nearest property line which is, or can be, built upon (refer to Table 4-Code Analysis).

The International Fire Code (IFC) requires a fire apparatus roadway to provide access to within 150 feet of every portion of the new power plant (IFC 2012).

The proposed 10,000-gallon double-wall intermediate fuel tank will be located a minimum of 30 feet from the nearest property line which can be built upon. The IFC requires 30 feet of clearance from 751 to 12,000-gallon bulk storage tanks to the nearest property line, which is, or can be, built upon.

The proposed 10,000-gallon double-wall intermediate fuel tank will be located a minimum of 5 feet from the nearest side of the road ROW and from the power plant. The IFC requires 5 feet of clearance from 751 to 12,000-gallon bulk storage tanks to the nearest side of a public way and the nearest important building on the same property.

Table 4: Power Plant Building Code Analysis - 2012 Edition International Building Code

Section	Requirements	IBC Code Reference
Occupancy Classification	Group F-1 Factory Industrial Moderate Hazard - Generation Plant	Sec. 306.2
Type of Construction	Type V-B (Non-Rated)	Table 601 and Sec. 602.5
Building Heights and Areas	Allowed: 40'-0" 1 story 8500 S.F. Provided: 16'-0" 1 story 750 S.F.	Table 503
Fire Resistance Rating Requirements for Building Elements	Structural Frame: 0 HR Bearing Walls: 0 HR Interior Partitions: 0 HR Floor: 0 HR Roof: 0 HR	Table 601
Fire Resistance Rating Requirements for Exterior Walls	Exterior Walls $10' \leq x \leq 30'$: 0 HR	Table 602
Fire Protection System	Fire Protection Not Required. Water Fire Suppression System Provided	Sec. 903.2.4
Occupant Load	Mechanical/Storage = 300 S.F./Person 750 S.F./300 S.F. Per Occupant = 2 Occupants	Table 1004.1.2
Means of Egress - Travel Distance	Required 200' Provided 30'	Table 1016.2

Noise Abatement: The power plant will be equipped with critical grade mufflers to minimize exhaust noise. The power plant structure will be insulated and ventilation ducts will be sound lined to minimize noise transmission from the plant to the surrounding environment.

Recovered Heat Utilization: The Mertarvik power plant module will initially be equipped with two 67 kW and one 100 kW generators, to meet the projected electric loads through Phase 3B. The final generator configuration will include two 210 kW and one 100 kW marine generators. The power plant will provide recovered heat to serve the MEC and other nearby community buildings.

Power Plant Site Selection: The two sites considered for the power plant during the planning with ANTHC and NVC were located west and east of the existing MEC building foundation, respectively. Both of these locations allow recovered heat to be provided to the MEC, washeteria, water plant, village office, and other village community buildings that are planned for construction east of the MEC. The setback requirements from the existing MEC water well determined that the best location for the power plant would be west of the MEC building.

Bulk Fuel Siting Criteria:

General Considerations: The following information was considered during evaluation of potential sites for a new bulk fuel facility in Mertarvik:

- Parcel of land large enough to accommodate the size and setback requirements of the new tank farm
- Fuel barge pumping limitations and proximity of the tank farm to the barge landing
- Transfer pumping limitations and the proximity of the tank farm to the power plant intermediate tank, store dispensing tank, and school tank
- Other potential conflicting land uses at the proposed tank farm sites
- Anticipated soil conditions
- Susceptibility of the site to flooding
- Relatively level site

Code Required Setbacks: The tank farm will include three functions: bulk storage, bulk transfer, and dispensing. All tanks will be installed above-ground, comply with the following setback requirements of the 2012 IFC, National Fire Protection Association (NFPA) publications NFPA 30 and NFPA 30A, the AEA/State of Alaska Division of Fire Prevention memorandum of agreement, and Federal Environmental Protection Agency (EPA) and Alaska Department of Environmental Conservation (ADEC) requirements. All protected above-ground tanks need to be listed and labeled in accordance with UL 2085 and unprotected above-ground tanks need to be listed and labeled in accordance with UL 142. The Setback/Separation Requirements are shown in Table 5 below.

Table 5: Setback/Separation

Minimum Clearance Notes:	Code Reference:
No minimum distance from dispensing tank to dispenser required so long as the dispenser is used for fleet vehicle motor fueling	IFC 2306.2.3
15' from protected above-ground dispensing tank with less than or equal to 6,000 gallon capacity to nearest property line which is or can be built upon	IFC 2306.2.3
5' from protected above-ground dispensing tank with less than or equal to 6,000 gallon capacity to the nearest side of any public way	IFC 2306.2.3
25' from dispenser to fixed sources of ignition	IFC 2303.1
50' from the dispenser to all unprotected tanks	IFC 2306.2.3
3' minimum clearance between tanks	NFPA 30 22.4.2.1
40' from the bulk storage tanks to the nearest property line which can be built upon	NFPA 30 22.4.1.1
5' from the interior dike wall to tank	NFPA 30 4.3.2.3.2
10' from the outside base of dike to property line that can be built on	NFPA 30 4.3.2.3.2
10' from bulk storage tanks to nearest side of a public way	NFPA 30 22.4.1.1
25' from loading facility to property line that can be built upon	NFPA 30 28.4.1
25' from loading facility to above-ground tanks	NFPA 30 28.4.1
25' from dispenser to protected above-ground dispensing tank with less than or equal to 6,000 gallon capacity	IFC 2306.2.3
10' from dispenser to all property lines	NFPA 30A 6.2.1
50' from unprotected above-ground tank to nearest important building on same property	IFC 2306.2.3
5' from protected above-ground tank of less than or equal to 6,000 gallon capacity to nearest important building on same property	IFC 2306.2.3
100' from unprotected above-ground dispensing tank to the nearest property line which is or can be built upon	IFC 2306.2.3
Where firefighting access is not possible due to terrain, or firefighting equipment is not available, allow for placement of fills up to the property line	Memorandum of agreement #01-13 between the Division of Fire and Life Safety, and the Alaska Energy Authority
Allow installation of tank-mounted dispensers when the entire system is a listed assembly or is comprised of listed components installed on a listed tank	

Site Selection and Preferred Alternative: The tank farm site will require approximately a 300-foot by 200-foot level area for containment and operations. The ANTHC, NNC, and Newtok residents expressed a desire to locate the tank farm close to the barge landings and away from homes and community buildings. The design team reviewed the available land near the barge landings and determined the existing military base camp area is the preferred tank farm location. This site is approximately 310 feet south from the riverbank and 30 feet above normal water and threats to the facility from erosion and flooding should be minimal. The site is located on a mostly flat area south of the deep-water barge landing and west of the shallow-draft barge landing. The site is relatively level and previously disturbed from its use as the military base camp area, a staging area, and CCHRC house construction. Currently the site is covered with Dura-Base mats that will need to be removed prior to construction.

The site locations were included in the community layout plans that ANTHC presented to the village for consideration. In March 2017, the village approved the ANTHC's Community Layout Plan and the preferred locations for the power plant and bulk fuel facilities. A final version of the Community Layout Plan is included in Appendix B.

Figure 9 shows the preferred location for the Mertarvik Power Generation and Bulk Fuel facilities.

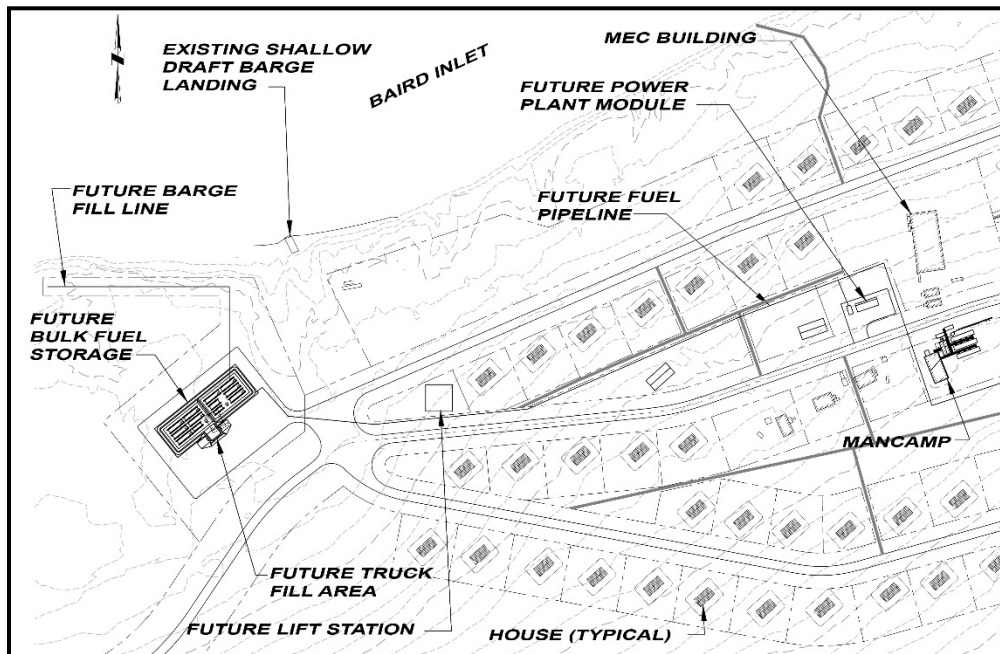


Figure 9: Proposed Power Plant and Tank Farm Location

4.2 Site Control

The Mertarvik town site was conveyed to NNC by an Act of Congress in November 2003. The Act authorized the exchange of land between the Department of the Interior and the Newtok Native Corporation (NNC). A copy of the Act and boundary map of the exchanged land is included in Appendix C. NNC owns the property for the power plant and bulk fuel tank farm site.

A Separate Master Site Control Agreement with NNC and NVC provides the necessary authority for NVC to temporarily license lands to NVC's contractors for infrastructure design and construction and will subsequently provide NVC long-term site control for the purposes of owning, operating and maintaining the new infrastructure in Mertarvik. The Master Site Control agreement specifically leases to NVC the surface estate of the area identified as the Bulk Fuel Storage area and the Power Facility site in the Mertarvik Community Layout Plan. A copy of the Master Site Control Agreement and resolutions authorizing the agreement are included in Appendix D.

A boundary survey of the town site will be completed by ANTHC during the 2017 summer construction season. Corner monuments will be installed to define the proposed property lines

for all lots identified in the Mertarvik Community Layout plan. The final plat is anticipated to be recorded in the fall of 2017.

5.0 NEWTOK CURRENT AND MERTARVIK FUTURE POWER DEMAND

5.1 Current Newtok Power Demand

Prime Power is provided to the Newtok community by UPC's power plant and electrical distribution system. Current power demand for the UPC facilities was obtained from AEA's PCE (Power Cost Equalization) program reports for fiscal years 2011 to 2016, included in Appendix E (AEA 2011-2016). These reports identify peak and average load data on a yearly basis. Power consumption data for the Newtok LKSD power plant was not available, but electric loads are estimated to be between 50 and 75 kW. Table 6 shows Newtok's Power Demand.

Table 6: Newtok Power Demand

Fiscal Year	2011	2012	2013	2014	2015	2016
Ungusraq Power Company (kWh)	409,595	439,069	451,968	431,224	430,272	427,010

5.2 Estimated Future Community Power Demand

During the phases of the relocation from Newtok to Mertarvik, the community's power generation and electrical distribution system will be upgraded and expanded to support the power demands of the expanding community. The Village of Newtok currently includes 78 homes, the school, eight community buildings, two stores, and four commercial utility buildings. Per the 2010 Census, the village of Newtok currently has 354 full-time residents, with an average of 5.9 people in each household. The February 2017 CCHRC Mertarvik Housing Master Plan concluded that 105 new housing units will be needed in Mertarvik to house the current village residents (CCHRC 2017). The ANTHC Community Layout Plan included in Appendix B includes 103 residential lots, four elder housing/four-plex lots, nine community building lots, the school, the MEC building, the man-camp, and the water treatment plant.

The Mertarvik power and fuel demand is based on the final build-out of the proposed houses and infrastructure shown on ANTHC's Community Layout Plan. For sizing the power generation and fuel capacity needs, Mertarvik's estimated population and number of electric customers was compared to other communities of similar population, geographic region, and customer base (Akiak, Kwigillingok, and Tununak). This provided actual historical operating data from which to size the power generation capacity.

The power plant will be capable of providing power to all of the proposed residential lots and structures identified on the ANTHC Community Layout Plan, the proposed LKSD School and the proposed final airport. The estimated power plant generator efficiency will be about 13.5 kW/gallon with an annual fuel consumption of 82,000 gallons/year.

5.3 Estimated Recovered Heat Demand

During the initial phase of prime power, Phase 2B, the average electric load is estimated to be about 15 kW. The estimated available recovered heat, based on marine generators and an average load of 15 kW, will displace up to 2,000 gallons of heating fuel per year. As the electric load grows, available recovered heat will increase. During Phase 4, final buildout, average loads are expected to exceed 150 kW. Full utilization of recovered heat will displace up to 20,000 gallons of heating fuel per year.

6.0 POWER PLANT PROPOSED DESIGN

It was proposed in the Energy Master Plan to integrate an oil-fired boiler system within the power plant module to provide a primary heat source for nearby community facilities. However, due to power plant funding restrictions, lack of detailed design information for future community facilities, and the need to complete the power plant design for 2017/2018 construction, the boiler bay has been removed from the modular power plant. However, the power plant heat recovery system will be designed to accommodate the fully anticipated future recovered heat availability as well as a future standalone boiler module, should the community desire to provide prime heat to community facilities.

6.1 Temporary Power Plant Integration

The diesel power plant will be the primary source of power generation for the community, and will be located west of the MEC. The power plant will be a fabricated steel module with separate control and generation/heat recovery rooms as shown on sheet M3.1 in Appendix J. The module will be constructed in Anchorage and shipped to Mertarvik by barge. The power plant will be designed to meet the projected power generation needs of the final Mertarvik buildout, but will initially be equipped with smaller generators that will be replaced with larger generators as loads increase. The new plant will include the following features:

- Field installed roof system
- Insulated foam building shell construction and sound lined ventilation ducts
- Interior critical grade disc silencers on all generators
- Sound insulated control room and separate generation room
- John Deere Marine, electronic, marine generators
- Programmable automatic paralleling switchgear with remote Supervisory Control and Data Acquisition (SCADA) capability and equipped for integration of renewable energy sources
- Heat exchanger, pumps and equipment for district heating system
- Water mist fire suppression system

6.2 Geotechnical Analysis

Golder Associates evaluated the subsurface conditions in six test holes near the proposed power plant area in July of 2017. The location of the test holes and test-hole logs are included in

Appendix F. Preliminary findings indicate that the power plant area was generally underlain by tundra/peat, then ice poor sands and gravels, and then bedrock. The tundra was typically 1 foot to 3 feet thick. The sands and gravels were present to depths of approximately 30 feet to more than 40 feet (the boring termination depth). Bedrock was encountered in at least one boring at a depth of 30 feet. Discontinuous permafrost was encountered from depths of approximately 10 feet to 35 feet; the actual depths and thicknesses of the permafrost varied in each boring. A final geotechnical report from Golder Associates is scheduled to be completed in September.

6.3 Power Plant Foundation Design

HDL anticipates the new module will be installed on a gravel pad and be supported by concrete grade beams or pads with an adjustable connection to account for minor settlement. The design is similar to foundations used on previous AEA projects in Ruby and Perryville. Helical piers may be required to limit settlement of the concrete foundation due to thawing of the discontinuous permafrost near the power plant area. The final geotechnical report to be provided by Golder Associates will include recommendations for the power plant foundation.

6.4 New Power Plant Module

An AEA-style modular power plant will be provided to meet Mertarvik's long-term power generation needs. The modular power plant will be a modular steel building constructed and tested in Anchorage and shipped to Mertarvik. For reliability and increased recovered heat, the proposed engines will be EPA Tier 2 and Tier 3 compliant marine engines. The steel module will have sound insulated construction and the engines will be equipped with critical grade disc silencers to reduce noise.

The following features are proposed for the new power plant:

- Three engine-generator sets. The module cooling system, generation feeders, and switchgear will be designed to accommodate up to three 210 kW generators to meet the full projected community load
- Three-phase 277/480V generation
- Programmable automatic paralleling switchgear with remote SCADA, capable of integrating with renewable energy sources
- New pad-mount step up transformer and community feeder connection to the overhead distribution system
- Heat recovery system to provide recovered heat to community buildings
- Water mist fire suppression system
- New 160-gallon interior day tank. Fuel system to include automatic fuel transfer from the power plant double-wall intermediate tank to the day tank. Fuel system to include redundant overfill prevention systems
- A used oil blending system to allow used engine lube oil to be filtered, blended, and burned in the engines

6.5 Engine Generation Selection

The power plant will include three engine-generator sets with either new or fully remanufactured John Deere engines. The module will be initially equipped with two 67 kW and one 100 kW generators, which will meet the projected electric loads through Phase 3B (as described in the Newtok-Mertarvik Relocation Energy Master Plan). The module will be designed to accommodate up to three future 210 kW generators to meet the projected community loads of Phase 4 also described in the Plan. The proposed generator engines have a good record of reliable performance, provide good fuel efficiency, and are equipped with marine jackets to increase heat available for recovery.

6.6 Power Plant Switchgear & Controls

The new switchgear will have a total of 5 sections: one for each diesel generator; one for the master control and metering; and one for the distribution feeder breaker, radiator variable frequency drive controllers and the station service breaker. The switchgear will be fully automatic with paralleling capability and will utilize a programmable logic controller to automatically match the running generator(s) to the community load. The load control system will monitor the electrical demand on the generators and automatically select the generating unit(s) required to meet the demand. The switchgear will automatically start the most suitable engine, bring it up to speed, automatically synchronize the unit, and close the engine circuit breaker. When a unit is taken off line, either for maintenance or due to a reduction in electric load, the switchgear will automatically remove the unit from the bus and allow the engine to cool down before shutdown. Generator controls and relaying will provide complete protection and monitoring of each engine generator and the feeder. The switchgear controls will be fully capable of supporting and integrating with renewable energy sources, including solar and wind energy.

The new switchgear will include a SCADA system for remote generation and distribution monitoring. A desktop PC will be provided in the new plant control room to allow operator access and control of the different systems. The SCADA system will provide data required for PCE reporting.

6.7 Solar Power Generation

Alaska's high latitude presents the challenge of low solar energy corresponding to long, cold winter months when energy demand is greatest. On an annual basis, average solar insolation for Western Alaska is approximately 3.1 kilowatt-hours/square meter/day (kWh/m²/day), which is roughly one-half that of Southern California. Newtok residents have also reported that the Mertarvik area is frequently foggy, which would further decrease available solar energy (ASCG, January 2004). The Energy Master Plan concluded the simple payback for solar photovoltaic (PV) in Mertarvik exceeded the useful life of the equipment.

6.8 Wind Power Generation

The Energy Master Plan concluded wind power could offset about one-third of Mertarvik's future annual electric generation needs. To assess the potential for a wind project, wind monitoring

equipment should be installed, and a detailed analysis performed of the cost/benefits of a wind project.

6.9 Renewable Energy Integration

The MEC preliminary design shows 40 kW of solar panels, and additional solar PV arrays and wind turbines are proposed at the community water plant. Integrating high penetration renewables requires careful coordination and control to assure reliable grid power. It is recommended that dispatch of the MEC solar energy, as well as other renewable energy sources greater than 5 kW, be controlled at the diesel power plant. The power plant module design includes a 100 kW secondary load controller (electric boiler) to stabilize frequency anomalies caused by renewables. However, sufficient funding should be allocated with large scale renewable energy projects to support full integration with the diesel generation system to ensure stable, reliable grid power.

6.10 Generation Heat Recovery

The new power plant module will be designed to provide recovered heat to the MEC, Man Camp and nearby community buildings. Recovered heat will be captured from the marine generators, and transferred via arctic piping to the end-user buildings. The objective is to reduce the consumption of expensive heating fuel by utilizing available recovered heat. Although heat recovery is an effective method of reducing heating fuel consumption, recovered heat is supplementary and end-user heating systems must be operational at all times.

The heat recovery system will include the following components:

- Heat exchanger, pumps, and associated equipment in the modular power plant.
- An electric boiler to convert excess wind and solar generated power into usable heat for the district heating system.
- Heat exchanger, energy meter and associated equipment in end-user buildings.
- Alarms for loss of flow, loss of pressure, and no load/back-feed condition with annunciation in the power plant switchgear.

Based on the heat recovery analysis in Appendix G, during Phase 4 the proposed generation heat recovery system is estimated to displace 19,700 of the estimated 25,450 gallons of diesel fuel required to heat the thirteen candidate end-users. Heat will be metered via utility grade BTU meters installed in end-user buildings. The cost charged for each BTU will be set forth in a Heat Sales Agreement between UPC and the end-users prior to installation of heat recovery equipment.

6.11 Heat Recovery Pipeline

The district heat system will provide recovered heat initially only to the MEC and man-camp facilities. As the community expands, and electric loads increase, the available recovered heat will also increase. At final buildout approximately 4,000 feet of preinsulated supply and return arctic pipe will be installed from the power plant to end-user buildings.

6.12 Power Plant Fuel System

A new 160-gallon fuel oil day tank will be installed inside the power plant module, and be configured to fill automatically from the 10,000-gallon intermediate tank. The day tank will be equipped with a gear pump, redundant overfill protection and alarm systems, a hand priming pump, and a totalizing meter. A used oil blending system will also be provided to allow used engine oil to be burned as fuel. Used engine oil will be pumped into a hopper during oil changes. Each time the day tank fills, used oil will be filtered and mixed at a ratio of 0.5% with virgin diesel fuel. The blended diesel/oil mixture will then be burned in the engines. Utilization of blended/used oil not only improves the utility efficiency, but also eliminates the cost of transporting used oil from the community, and reduces the risk of spills.

6.13 10,000 Gallon Intermediate Tank

The proposed power plant design includes an intermediate tank adjacent to the power plant with sufficient capacity to meet the power generation fuel needs. The average monthly fuel use during Phase 4 is estimated to be 6,800 gallons per month. The future peak monthly fuel consumption is estimated to be 8,500 gallons per month. A 10,000-gallon intermediate tank will provide adequate fuel storage for a full month of operation.

The intermediate tank will be set up for both truck fill and for fuel transfer from the tank farm. The tank fill line will be equipped with an overfill protection valve. The intermediate tank will be equipped with a fuel transfer meter to record all fuel transfers from the tank farm to the power plant intermediate tank.

The intermediate tank will have one outlet connection for the power plant that will be equipped with a normally closed actuated ball valve that opens when the day tank is filling. The power day tank will be equipped with a fuel transfer meter to record all fuel use.

6.14 Power Distribution

The electrical distribution system will be 12.47/7.2 kV, 3-phase overhead construction to minimize line losses, and meet the long term needs of the community. Pole-mounted transformers will stepdown the 7200 V distribution voltage and provide 120/240 V single-phase power to residential services. For larger customers, 208 V and 480 V 3-phase power will be provided, as required. The type of pole foundations, direct buried or pile, will be determined based on the outcome of the geotechnical investigation. Following are major features of the proposed distribution system:

- A. Construction will be in accordance with Rural Utility Service Bulletin 1728F-804, Specifications and Drawings for 12.47/7.2 kV Line Construction.
- B. In general, the system will be three-phase, four-wire. Single-phase taps will be provided where serving individual locations or for limited loads.
- C. The primary overhead conductor used will be No. 2 AWG Aluminum Conductor Steel Reinforced (ACSR), with 7/1 stranding.

- D. Secondary conductors will be as follows:
1. All secondary overhead service conductors will be overhead service drop, multiplex, aluminum, 600 volt, 75 C rating, polyethylene insulated conductors. For each assembly, an ACSR concentrically stranded neutral messenger will be provided. Duplex, triplex, or quadruplex conduit will be installed as required.
 2. All secondary underground service conductors will be 600 volt, aluminum conductor, Cross-linked Polyethylene (XLP) Insulation. Neutral conductors will have a triple yellow extruded stripe. Triplex or quadruplex conduit will be installed as required.
- E. Three-phase, gang operated switches will be provided at locations that will sectionalize the electrical distribution system, if required to restore power to the community after a power outage.
- F. All transformers will be provided with the following features:
1. Stainless steel enclosure. In a marine environment, standard metal enclosures for transformers and sectionalizing enclosures cannot stand up to the salt laden air. The stainless steel enclosures will provide long term maintenance free service.
 2. Overhead Transformers:
 - a. Dual Bushing.
 - b. No load tap changer, +/- 2.5% and +/-5%.
 3. Padmount Transformers:
 - a. Dual Bushing.
 - b. Full H0 and X0 bushings on three-phase wye-wye transformers.
 - c. Bayonet and current limiting fusing.
 - d. No load tap changer, +/- 2.5% and +/-5%.
 - e. Bushing inserts.
 - f. Thermometer(3ph).
 - g. Oil Level gauge(3ph).
 - h. Pressure gauge(3ph).
 - i. Seismic anchoring provisions.
 - j. Nameplate and dimensional drawing and factory test data will be provided with the shipped unit.
- G. Distribution poles will be Douglas Fir treated with pentachlorophenol preservative. In general, poles will be 40 foot, Class 4 type. Smaller poles will be used for secondary services as required. Taller poles may be required based on the on-site conditions.

H. Where the electrical distribution system is required be underground, such as at or around the airport, the following standards will apply:

1. The underground distribution system will be constructed in accordance with Rural Utility Service Bulletin 1728F-806, Specifications and Drawings for Underground Electric Distribution.
2. Underground primary cable will be Polyethylene jacketed concentric neutral with ethylene propylene (EPR) insulation, 15 kV, 133% MV105. All primary terminations will be through load break elbows. All connections will be above-grade in sectionalizing cabinets. No buried or below grade connections will be made. No in-line splices will be made in the cables.
3. Primary and secondary cables will be installed in 2" HDPE conduit. This will better protect the conductors from damage and allow easy future replacement of the cable in the case of a failure.
4. Primary sectionalizing enclosures or secondary pedestals will be of fiberglass construction and installed on fiberglass ground sleeves. All metal products in the sectionalizing enclosures or secondary pedestals will be stainless steel.
5. Primary load break elbows and other connectors will be provided with seals and covers to provide a long lasting and reliable distribution system.

I. Design Criteria:

The overhead electrical distribution system will be designed in accordance with the following criteria.

1. NESC 250B: Combined ice and wind district loading: Heavy Loading; 4 psf wind, ½ inch radial ice (57 lb/ft³), 0°F.
2. NESC 250C: Extreme wind loading typically applies when there are structures 60 feet above ground level or higher. However, due to the location of the community, and as a conservative design approach, the design will be for an extreme wind condition of 42.2 psf (130 mph) at 40°F, with no overload factors.
3. The system will be designed for an extreme low temperature of -50°F.
4. Overload/Strength Factors and Construction Grade:
 - a. The distribution line will be designed to meet NESC Grade "B" construction.

- b. The following table indicates the overload and strength factors for NESC Grade “B” construction.

Table 7: Overload/Strength Factors

Overload Capacity Factor/Strength Factor					
Equipment	Wind	Wire Tension	Vertical	Longitudinal	
				Non-Deadend	Deadend
Hardware, Anchors	2.5	1.65	1.5	1.1	1.65
Guys	2.5	1.65	1.5	1.1	1.65
Wood	4.0	2.0	2.2	1.33	2.0

5. Conductor Loading Limits:

- a. Initial Tension: 15% of Conductor Tensile Strength.
- b. Final Tension: 25% of Conductor Tensile Strength.
- c. Maximum Tension: 50% of Conductor Tensile Strength.

6. Clearances:

- a. Clearances to ground and other installations will meet or exceed the requirements of the latest adopted edition of the National Electrical Safety Code (NESC).
- b. Additional clearance requirements that may be required by the State of Alaska, such as 17 AAC 15.201, Overhead clearances.

6.15 Regulatory Commission of Alaska (RCA) Requirements

The UPC currently operates under RCA CPCN Certificate number 375. This certificate enables and requires UPC to provide power to Newtok residents within its service territory. This certificate is also a prerequisite to eligibility for the PCE program. The PCE program currently credits eligible UPC customers \$0.4275/kWh.

One of the highest priorities for community migration is expansion of UPC’s service territory so that “Pioneering” Newtok residents will continue to receive PCE upon arrival in Mertarvik. Additionally, as Mertarvik community buildings are constructed, applications for PCE Community Facility Certification and Eligibility Determination Requests should be filed.

To expand its service territory, UPC must demonstrate it is fit, willing, and able to provide service. An Application for an Amended Certificate must be filed with RCA. The application requires a public notice, service area maps, financial information, and other information detailing UPC’s plans and capability. UPC’s existing and new service territories need not overlap. An application must be reviewed by the RCA within 180 days per statute. To ensure the service territory has

been expanded to include Mertarvik prior to Phase 2A (Fall 2018), the RCA application should be filed no later than Fall 2017.

As noted above, UPC is economically unregulated, and could therefore sell power at a different price in Newtok versus Mertarvik. UPC may find it useful to use electric prices to cue different phases. Indeed, such pricing may become necessary as the cost of providing service in both places fluctuates.

However, it is unlikely that UPC will be able to relinquish its obligation to serve customers who remain behind in Newtok. Nonetheless, the threat and realization of erosion is somewhat unprecedented, and the RCA may be amenable to UPC's request to cease providing service if it is no longer viable to do so.

6.16 Power Plant Project Construction Cost Estimate

A preliminary construction cost estimate has been prepared for the power plant, electrical distribution, and recovered heat project as presented on the 35% conceptual design drawings. The estimate is based on historical construction costs for recent power projects in western Alaska. The estimate includes providing an AEA-style power plant module with recovered heat to the MEC and man-camp and associated electrical distribution upgrades, including site civil, mechanical, electrical work, as described in Phase 2B of the EMP. The preliminary estimate for this work is \$4,309,532. Detailed cost estimates are presented in Appendix H.

7.0 MERTARVIK FUTURE FUEL DEMAND

7.1 Current Newtok Fuel Demand

In 2015 and 2016 three fuel barge companies delivered fuel to Newtok: Crowley Fuels, Vitus Marine, and Delta Western (Delta). The quantities of diesel and gasoline sold to each entity in the community are detailed in the table below. Upon delivery, NNC sold its fuel to the church, National Gard, and NVC tank farms.

Table 8: 2015 and 2016 Newtok Fuel Deliveries

Entity	2015		2016	
	Diesel (Gal/Year)	Gasoline (Gal/Year)	Diesel (Gal/Year)	Gasoline (Gal/Year)
Ungusraq Power Company (UPC)	35,000	0	39,500	0
Newtok Native Corporation (NNC)	26,000	21,000	23,000	21,000
Lower Kuskokwim School District (LKSD)	62,274	0	49,583	0
Total	123,274	21,000	112,083	21,000

In 2012 and 2013 Delta was the sole provider of fuel to the community. Delta reported delivering 144,000 gallons of diesel and 55,000 gallons of gasoline in 2012, and 170,000 gallons of diesel and 30,000 gallons of gasoline in 2013. Delta did not track the quantity of fuel sold to each entity in the community.

The four years of available delivery data (2012, 2013, 2015, & 2016) show an average of 127,000 gallons of diesel and 31,000 gallons of gasoline delivered to Newtok each year. The Newtok PCE reports show a 3% decrease in fuel use for power generation from 2013 to 2016. Vitus Marine also reported a 15% decrease in diesel sales to the Lower Kuskokwim Region over the last two years. The fuel consumption may not reflect long-term trends and is likely a result of recent warm temperatures experienced during the last two winters.

7.2 Estimated Future Mertarvik Community Fuel Demand

The Village of Newtok currently includes 72 homes, the school, eight community buildings, two stores, and four commercial utility buildings. Per the 2010 Census, the village of Newtok currently has 354 full-time residents, with an average of 5.9 people in each household. The February 2017 CCHRC Mertarvik Housing Master Plan concluded that 105 new housing units will be needed in Mertarvik to house the current village residents. The ANTHC Community Layout Plan included in Appendix B includes 103 residential lots, four elder housing/four-plex lots, nine community building lots, the school, the MEC building, the man-camp, and the water treatment plant.

Residential Heating Fuel Demand: The prime heating source for the new homes will be direct vent oil fired heaters and the heating demand for the new homes will vary based on the home's construction. The CCHRC homes are designed to a six-star Alaska Housing Finance Corporation (AHFC) energy rating and are expected to use approximately 160 gallons of fuel per year. The AVCP-RHA homes are designed to a five-star AHFC energy rating and are expected to use approximately 255 gallons of fuel per year (CCHRC 2017). If the homes include a direct vent oil fired domestic hot water heater, the houses could burn an additional 150 gallons of fuel per year. For planning purposes, the fuel demand per house is estimated to be 450 gallons per year. The CCHRC and AVCP-RHA home designs will also include wood stoves as a secondary heating source. The average fuel demand per house may be as low as 250 gallons per year depending on the utilization of wood stoves and domestic hot water heaters.

Man-Camp Heating Fuel Demand: The man-camp may be used in the future as visitor housing, community kitchen/meeting room and washeteria during construction of additional phases of community development. The man-camp's separate sleeping units are reported to have electric unit heaters. The kitchen and dining hall is reported to have an oil-fired boiler. The man-camp facility is estimated to require 1,500 gallons/year of fuel to heat the building year-round.

MEC Heating Fuel Demand: The MEC building is planned to house a temporary school and village offices. The washeteria and post office may also be temporarily located in the MEC until separate buildings can be constructed during a future phase. LKSD has stated that a minimum 2,000-square foot area is required inside the MEC for the temporary school. The heating fuel demand for the MEC building is expected to change over time, depending on the use of the facility and availability of recovered heat from the new power plant. For planning purposes, an estimated 4,000 gallons/year of diesel will be required to heat the MEC, based on the initial reported heating design load of 140,000 Btu/hour.

School Heating Fuel Demand: Planning for the new school in Mertarvik is still in the development stage with the LKSD. The final size of the new school is estimated to be approximately 30,000 square foot. The LKSD is expecting to rely on prime power from the village for the new school's

electric power demands. Therefore, the school's fuel demand is only expected to meet the heating demand for the school building. Based on fuel estimates provided by LKSD for current school designs, the annual fuel demand for the new school in Mertarvik is estimated to be approximately 32,000 gallons/year. The tank farm layout will allow space for a LKSD owned 27,000-gallon bulk tank to be installed in the new containment. The remaining school fuel storage capacity will need to be met by double-wall tanks at the school site.

Power Plant Fuel Demand: The power plant will be capable of providing power to all of the proposed residential lots and structures identified on the ANTHC Community Layout Plan and the proposed final airport. The estimated power plant generator efficiency will have an estimated generator efficiency of 13.5 kW/gallon with an annual fuel consumption of 82,000 gallons/year.

The estimated diesel fuel demand, based on the previously stated generator efficiency and for each structure in the new community is detailed in the table below.

Table 9: Mertarvik Phase 4 Estimated Annual Fuel Demand

Building Type	#	Estimated Annual Demand	
		Diesel (gal/building)	Diesel Subtotal (Gal)
Village Home	103	450	46,350
Teacher Housing	1	450	450
Four-Plex	2	2,000	4,000
VPSO Living Quarters	1	450	450
Elder Housing	2	2,000	4,000
Man-Camp	1	1,500	1,500
MEC Building	1	4,000	4,000
Power Plant	1	82,000	82,000
Corporation Office	1	1,500	1,500
CVRF Shop	1	1,500	1,500
Store	1	2,000	2,000
School	1	27,000	27,000
Post Office	1	450	450
Tribal Office	1	1,500	1,500
Clinic	1	2,000	2,000
Washeteria	1	3,000	3,000
Total Estimated Consumption			181,700

Gasoline Demand: Historical gasoline fuel deliveries to Newtok in the past five years have ranged from a high of 55,000 gallons to a low of 21,000 gallons. The average annual gasoline demand in Newtok is estimated to be approximately 31,000 gallons per year. Assuming that the 72 existing homes in Newtok use a similar amount of gasoline per year, the gasoline demand for each household ranges between 430 and 765 gallons/year. For planning purposes, the gasoline fuel demand per household is estimated to be 600 gallons/year. Based on 103 occupied homes in Mertarvik the expected gasoline demand in Mertarvik is 61,800 gallons/year.

7.3 Tank Farm Capacity

The Denali Commission requires that a bulk fuel facility receiving fuel by barge be designed with 13-months of storage, and the net capacity of the tanks is assumed to be 90% of the gross capacity. The proposed 13-month gross storage requirements to meet the projected yearly fuel demand for Mertarvik are shown in the table below.

Table 10: Proposed Capacity Requirements for Phase 4

	Gasoline (Gal)	Diesel (Gal)		
Annual Fuel Demand	61,800	181,700		
Required 13 Month Net Capacity (Useable equal to 90% of shell capacity)	66,950	196,800	Total Net Capacity	263,750
Required 13 Month Gross Capacity (Required shell capacity)	74,400	218,700	Total Gross Capacity	293,100

Utilizing the projected fuel demand above and standard tank sizes, the design gross capacity for the final build-out of Mertarvik is 296,000 gallons and the net capacity is 266,400 gallons. The recommended tank farm storage capacity is designed to meet the expected community size based on the ANTHC's approved Community Layout Plan.

8.0 BULK FUEL TANK FARM DESIGN

8.1 Tank Farm Layout

The tank farm will be constructed on an approximately 300-foot wide by 200-foot long gravel pad. An approximately 225-foot wide by 65-foot long gravel fuel containment berm with a fuel resistant liner will be installed on approximately one half of the pad. An 18" high intermediate dike wall will be installed to separate the containment into two cells to meet code requirements. A drive-through fuel transfer spill containment will be installed adjacent to the tank farm for truck fill operations. The western cell of the fuel containment will include five (5) 27,000-gallon bulk tanks and one (1) 12,000-gallon intermediate tank. The eastern cell of the containment will include three (3) 27,000-gallon tanks, one (1) 20,000-gallon intermediate tank, and (1) 20,000/8,000 gallon dual compartment tank. The eastern cell also has room for an additional 20,000-gallon spare tank to accommodate future expansion. The gross (near term and future) fuel capacity of the tank farm is 214,000 gallons of diesel fuel and 82,000 gallons of gasoline. A plan view of the tank farm layout and secondary containment area is shown in the conceptual drawings in Appendix J.

A 6-foot chain link fence with a barbed wire top will surround the tank farm pad to secure the area. Tank farm construction will include mining, placement, and compaction of local fill material for pad construction; gravel, or timber containment dikes; fuel resistant geomembrane liner; new bulk, intermediate, and dispensing fuel tanks; manifold and distribution piping; fencing; lighting; and other related improvements.

8.2 Secondary Containment

The 2012 IFC defines secondary containment requirements for bulk fuel storage facilities. Secondary containment will be provided with a 30-inch gravel dike around the tank farm perimeter. An intermediate dike wall will be constructed to separate the containment into two cells, each with a maximum of 150,000 gallons of fuel storage capacity. The intermediate dike will be approximately 18 inches in height. The intent of the intermediate dike is to contain minor spills from the individual storage tanks in each containment cell.

The secondary containment area shall be designed to contain the volume of the largest tank in the containment area (27,000 gallons) and the volume of water accumulated from a 25-year, 12-hour rainfall event. According to the National Oceanic and Atmospheric Administration's (NOAA) Atlas rainfall data, the 25-year, 12-hour rainfall event in Mertarvik is .5 inches. The containment will also provide sufficient freeboard volume to accommodate snow and rainwater accumulation between periodic removals by pumping.

8.3 Retail Fuel Sales

The Mertarvik Community Layout Plan calls for a community store to be located on the lot next to the power plant. The retail fuel sales tank and distribution equipment for the village will be located next to the community store building and will be operated by NNC. The retail fuel storage tank will include a protected above-ground dual product fuel storage tank that is listed and labeled in accordance with UL 2085. The use of a protected above-ground tank at the store location will allow the tank head dispenser to be installed to the minimum fleet dispensing operation setback requirements.

The protected above-ground tank will require a minimum 5-foot separation from the store building and a 15-foot minimum separation from the nearest property line. A dual product fuel dispenser will be installed next to the retail sales fuel tank. A memorandum of agreement between AEA and the State Fire Marshal allows the village retail fuel sales operations to be governed by the same setback requirements as a fleet fuel sales facility that does not require a minimum setback requirement distance between the fuel dispenser and the protected fuel storage tank. The fuel dispenser will be installed in an enclosure with a metal roof and chain link sides and gate.

The retail fuel storage tank will be set up for truck fill or fuel transfer from the tank farm. The tank fill line will be equipped with an overfill protection valve. The retail fuel storage tank will be equipped with a gasoline and diesel fuel transfer meter to record all fuel transfers from the tank farm to the retail fuel storage tank.

A surplus 5,000-gallon, protected, dual-product tank is currently available in the AEA Anchorage yard. This tank could be available at a reduced rate to the project.

Fuel transfer from the tank farm to the retail fuel storage tanks is described in Section 8.8 Tank Farm Controls.

8.4 Truck Fill Dispensing

A truck fill dispenser will be located next to the tank farm fuel containment dike and will include a spill containment sump and truck fill rack. The spill containment sump will be installed on an elevated gravel pad to allow the containment sump to drain into one side of the tank farm fuel containment area. Wood timbers will be installed across the open sump to allow wheeled or tracked vehicles to access the truck fill fuel dispenser. Bulk diesel fuel transfer operations will be provided for service deliveries for construction equipment, the power plant intermediate tank, the retail fuel sales tank, and other large volume diesel fuel storage tanks in the village.

8.5 Marine Header and Distribution Pipelines

A marine header pipeline is required to transfer fuel from the fuel barge to the new tank farm. The marine header connection will be located at the edge of the tank farm containment dike. The marine header connection will include camlock connections, flanged ball valves, flanged check valves, and a spill containment box. The header piping will be installed above-ground on wood cribbing pipe supports.

The project will include fuel transfer piping between the tank farm and the powerhouse intermediate tank and the retail sales tank. Approximately 1900 feet of diesel fuel piping and 1700 feet of gasoline fuel piping will be installed above-ground on timber cribbing or helical anchor pipe supports alongside the community trail within a dedicated utility easement. A flange connection will be provided near the powerhouse intermediate tank to allow for a future extension of the fuel transfer pipe to the school fuel storage tank.

The design for the transfer fuel pipe was evaluated based on pipe size, pipe wall thickness, pipe material cost, pump size, pump power requirements and flow rates. A 3-inch fuel transfer pipe system will provide faster fuel transfer time but the installation cost will be approximately double the 2-inch pipe system installation cost. Based on providing a fuel transfer system that will provide an approximately 50-gpm flow rate, either a 2 HP centrifugal pump or a 1.5 HP submersible pump with a 3-inch Schedule 80 fuel transfer line is recommended.

8.6 Tank Farm Power

All electrical service equipment and power distribution will be installed in accordance with the 2014 edition of the National Electrical Code, NFPA 70.

A single new overhead electrical power service is anticipated for the bulk fuel farm. It is anticipated that it will be 240/120V, 100A, single-phase, NEMA 3R rated. The service will consist of a meter/main combination device that will be pole or post-mounted.

The meter/main device will be the source of power distribution for all equipment at the bulk fuel farm. It will have branch circuit breakers that provide power to separate circuits for the control panel(s), transfer pumps, area lights, and convenience receptacles. An additional 25% spare space will also be provided for circuits for future equipment.

Power shall be maintained at all times to the control panels and dispensers except in the case of an Emergency Shutdown (ESD) condition. This will allow the motorized valve, dispenser and control panel heaters to be operational at all times. Provisions shall be provided to allow the operator to lock out the dispenser and transfer pumps to allow maintenance and to avoid unauthorized use.

Motor protection devices commonly called 'motor-minders' will be installed in the control panels for each of the transfer pumps. These devices will shut down and protect the pumps in the event of the pump running dry or dead-heading.

8.7 Tank Farm Lighting

Area lighting will be designed to meet ANSI / IESNA RP-7-01, Table 30.2 guidelines for petroleum tank fields which recommend 0.6 foot candles at ladders and stairs, and 1.0 foot candles at tank gauging. A minimum of 0.6 foot candles will also be provided at all catwalks, entrance gates and access areas.

Area lighting shall be LED floodlights and in general will be located outside any hazardous location boundaries. LED lights provide an efficient and long lasting light source with good visual acuity and instant-on capability. Where lighting is required inside hazardous locations, it shall be appropriately rated.

Area lighting shall be provided only with manual ON/OFF controls. A manual switch shall be located outside the bulk fuel area so that the lights can be turned on before entering. The switch shall be lockable to prevent nuisance operation. Photoelectric controls were rejected as a control means since it is anticipated that fueling operations will be infrequent and it is not energy efficient to operate the lights when not necessary.

8.8 Tank Farm Controls

Bulk Tanks:

The bulk tanks are filled from one of the two barge headers. Filling of the bulk tanks is strictly a manual operation and the operator needs to open the selected bulk tank manual fill valve and monitor the fill level by a mechanical clock gauge. Each tank will also be provided with a whistle vent to alert the operator of a full tank. There are no electrical controls associated with the bulk tank fill operation.

Intermediate Tanks:

There are two intermediate tanks at the tank farm (one 12,000 gallon diesel tank and one 8,000 gallon gasoline tank) and a separate diesel intermediate tank at the powerhouse. There will also be a dual-product dispensing tank at the store. The diesel and gas intermediate tanks at the tank farm will be filled from the appropriate bulk storage tanks via a transfer pump located at the bulk fuel farm.

The diesel tank farm intermediate tank will be used to fill the powerhouse intermediate tank, the diesel side of the dual product tank at the store, and the diesel truck fill station at the tank farm via a submersible pump in the intermediate tank. The gasoline intermediate tank will supply fuel to the gasoline side of the dual product-dispensing tank at the store via a submersible pump in the intermediate tank.

The general operational scheme for filling either the diesel or gasoline intermediate tanks at the tank farm is identical. The operator will manually open the supply valve on the appropriate bulk tank to be used to fill the intermediate tank. Once open, the operator will press the start pushbutton for the appropriate diesel or gas transfer pump on the bulk fuel farm control panel. The motor operated valve on the discharge of the transfer pump will open, the transfer pump will start and a maximum run timer will begin timing. The transfer pump will run until the 'Tank Full' level is reached, the transfer pump stop pushbutton is pressed, the maximum run timer times out or an Emergency Shutdown (ESD) pushbutton is pressed. When any of these occurs, the transfer pump stops and the motorized valve closes.

The operational scheme for filling one of the remote intermediate tanks at the powerhouse or store is as follows:

- The operator will open the manual fill valve at the intermediate tank to be filled and then proceed to its adjacent local control panel.
- The 'Valve Open' status should be indicated on the control panel for the valve that was just opened. As long as no other remote intermediate valve is open, the operator can press the start button at the local control panel and a signal will be sent calling for the diesel (gas) submersible transfer pump at the bulk farm to start. If any other valve on the line is indicating an 'Open' condition, the submersible transfer pump cannot be started. This will remove the possibility of filling two tanks simultaneously.
- When the submersible transfer pump starts, a maximum run timer will also begin timing. The pump will run until either the level in the remote intermediate tank reaches the 'Full' level, the stop button is pressed, the maximum run timer times out, an 'ESD' is pressed or the 'Critical High' level is reached (should the 'Full' level switch fail).
- Once the intermediate tank is full, the operator will then return to the intermediate tank and close the valve.

Each remote intermediate tank will be provided with a 'Valve Open' limit switch on the manual fill ball-valve and a level transducer with 'Low', 'Full' and 'Critical High' level setpoints. A local control panel will also be provided at each remote intermediate tank. The local control panel will have an 'ESD' shutdown pushbutton, transfer pump start/stop pushbuttons, valve open status lights and tank level indication with 'Critical High' and 'Low Level' alarms. The 'ESD' and 'Critical High' switches will be wired in series. The 'Valve Open', 'ESD' and 'Critical High' switches will all be normally closed for fail safe operation. All of the switch closures will be monitored at the bulk fuel control panel.

The truck fill station at the tank farm allows filling trucks with diesel fuel only. The station will have a diesel stop/start pushbutton station and an ESD. When the start button is pressed, the truck fill station motorized valve will open, the submersible diesel transfer pump will start and a maximum run timer will begin timing provided no other diesel intermediate tank valves are open. Once started, the pump will run until either the stop or ESD pushbuttons are pressed, or the maximum run timer times out.

The tank farm control panel will have LED, push-to-test type pilot lights indicating:

- a. 'Control Power On' – (Amber)
- b. 'Emergency Shutdown Activated' – (Red)
- c. 'Diesel Transfer Pump On' – (Green)
- d. 'Diesel Transfer Pump Fault' – (Red)
- e. 'Diesel Transfer Pump Time-Out' – (Red)
- f. 'Diesel Motorized Valve Open' – (Amber)
- g. 'Gas Transfer Pump On' – (Green)
- h. 'Gas Transfer Pump Fault' – (Red)
- i. 'Gas Transfer Pump Time-Out' – (Red)
- j. 'Gas Motorized Valve Open' – (Amber)
- k. 'Diesel Submersible Transfer Pump On' – (Green)
- l. 'Diesel Submersible Transfer Pump Fault' – (Red)
- m. 'Diesel Submersible Transfer Pump Time-Out' – (Red)
- n. 'Gas Submersible Transfer Pump On' – (Green)
- o. 'Gas Submersible Transfer Pump Fault' – (Red)
- p. 'Gas Submersible Transfer Pump Time-Out' – (Red)
- q. 'Truck Fill Diesel Motorized Valve Open' – (Amber)
- r. 'Powerhouse Intermediate Diesel Tank Valve Open' – (Amber)
- s. 'Store Dual Product Tank Diesel Valve Open' – (Amber)
- t. 'Store Dual Product Tank Gas Valve Open' – (Amber)

The control panel will also display the level for both of the bulk farm intermediate tanks with 'Critical High', 'Full' and 'Low' level indications. The control panel will have stop/start pushbuttons for each transfer pump and a common 'ESD' pushbutton. The pilot lights and operator controls shall be NEMA 4 rated, mounted on the outside of the control panel and protected by a hinged, NEMA 4 rated, lockable, plexiglass cover.

To aid in troubleshooting, the bulk fuel control panel will be provided with:

- Push-to-test pilot lights or a common lamp test pushbutton.
- An alarm test pushbutton.
- Relays with indicating flags or pilot lights.

8.9 Emergency Shutdowns (ESD's)

Emergency shutdown pushbuttons will be provided for each dispenser as required by code. They shall be located more than 20 feet but less than 100 feet from the dispensers and shall disconnect all power from the dispensers.

Although not required by code, an ESD will be provided at the bulk fuel farm. It will be located near the access gate to the bulk fuel tanks. Operation of the ESD shall immediately shut down the transfer pumps and will disconnect power to the motorized valves after a time delay which allows the valve time to close.

ESD's will also be provided at each of the intermediate tanks as a safety shutdown.

8.10 Tank Farm Grounding and Bonding

Grounding and bonding of electrical circuits serving equipment within the tank farm shall be in accordance with Article 515 of the NEC.

Grounding and bonding shall be provided for the bulk fuel tanks, pump boxes, fencing and other metallic components to minimize any potential hazards from static electricity and lightning.

8.11 Tank Farm Hazardous Locations

Hazardous locations exist around the gasoline bulk storage tanks, transfer pumps, intermediate tanks and dispensers. Both Class 1, Division 1 and Class 1, Division 2 areas exist and will be defined on the drawings.

The electrical equipment (pumps, motorized valves, switches, etc.) within the classified areas is required to be explosion-proof rated (Class 1, Division 1 or Class 1, Division 2). As such, the electrical equipment associated with the diesel tanks and piping will be located where possible outside of the hazardous location boundaries defined by the gasoline systems. This will allow the use of non-hazardous location rated electrical equipment for the diesel systems, which is much cheaper.

8.12 Tank Farm Components and Devices

The level transducers in the intermediate fuel tanks shall be the magnetostrictive type with floats on the riser stem. Intrinsically safe barriers shall be provided on circuits to the transducers in the gasoline tanks.

Emergency Shutdown pushbuttons shall be the mushroom head type, colored red with push-pull operation.

8.13 Geotechnical Analysis

Golder Associates evaluated the subsurface conditions in six test holes near the proposed tank farm area in July of 2017. The location of the test holes and test-hole logs are included in Appendix F. Preliminary findings indicate that the tank farm area was generally underlain by

tundra/peat, then ice rich fine grained soils, and then bedrock. The tundra was typically 2 feet to 3 feet thick. The ice rich silts and sands were typically present to depths of approximately 18 feet to 25 feet. Bedrock was encountered at depths of approximately 19 feet to more than 40 feet. Permafrost was encountered from depths of approximately 2 feet to 22 feet; the actual depths and thicknesses of the permafrost varied in each boring. A final geotechnical report from Golder Associates is scheduled to be completed in September.

8.14 Tank Farm Foundation

The fuel tank foundations will likely consist of concrete grade beams to support the horizontal tanks. The concrete grade beams will support the entire length of the tank skids and extend approximately 1-foot beyond each end of the tanks.

The foundation for the tank farm and truck fill containment area is anticipated to consist of a gravel pad that is passively refrigerated with thermo-syphons and flat-loop evaporators. The thermo-syphons will be required to provide a stable foundation over the permafrost. HDL anticipates the foundation will require the removal of the organic layer and the installation of the flat-loop evaporators in the constructed fill embankment. The evaporators will be covered with a minimum 1.5-foot layer of non-frost susceptible (NFS) structural fill, ridged insulation, and then an approximate 2-foot layer of NFS structural fill material will be placed over the insulation. HDL anticipates that the construction of the foundation will be scheduled such that thermosyphon installation occurs during frozen conditions. The Golder Associates report will provide final foundation design recommendations for the tank farm and truck fill containment area foundation.

The construction of a gravel “working” pad and driveway around the tank farm and truck fill containment foundation area is recommended to support tank farm construction and maintenance operations. Construction of the working pad area will include the installation of a geotextile separation fabric over the existing organic layer that is covered with a 3-foot minimum layer of NFS structural fill material. Settlement in the working pad and driveway areas is anticipated over time due to thawing of the underlying permafrost layer in the area. Fill and grading maintenance of the working pad and driveway areas will be required. The Golder Associates report will provide design recommendations for the tank farm gravel pad and driveway.

8.15 Flood Data

Due to the recent development of Mertarvik, a history of flood data in the community was not available. However, the tank farm will be located approximately 30 feet above Baird Inlet and the powerhouse will be located approximately 70 feet above Baird Inlet. Flooding is not anticipated to affect these structures.

8.16 Local Fill Material

A material site is currently being developed on “Hill 460” approximately two miles southwest of the new community. The material source is anticipated to produce large quantities of borrow

material for village development. Gravel material from the quarry site is planned for construction of community roads and gravel pads.

In the summer of 2011, a contractor was able to drill and blast the rock at Hill 460, generating approximately 100,000 cubic yards usable material. During the 2017 construction, NVC plans to complete the quarry access road and construct part of the village road system using crushed rock mined from the quarry.

8.17 Future Expansion

The tank farm containment area layout will be designed to accommodate the future installation of one additional 20,000-gallon diesel storage tank. This space will be available to the LKSD to install their own diesel tank once the school is constructed. There is also sufficient space available to the west of the new tank farm to construct an additional containment cell should additional capacity be required in the future.

8.18 Bulk Fuel Tank Farm Project Construction Cost Estimate

A preliminary cost estimate has been prepared for the bulk fuel tank farm project as presented on the 35% conceptual design drawings. The estimate was generated using historical construction costs for recent tank farm projects in western Alaska. The overall cost was based on 296,000 gallons of fuel storage for the Mertarvik tank farm, including site civil, mechanical and electrical work and was determined to be \$8,410,219. The detailed cost estimate is presented in Appendix H.

9.0 ENVIRONMENTAL PERMITTING REQUIREMENTS

HDL conducted preliminary research using the most current available data from state and federal agencies to identify environmental resources that may be affected by the proposed project. The purpose of the research was to identify permitting and regulatory requirements, and to ensure environmental considerations are adequately addressed during development of the project.

9.1 National Environmental Policy Act Review

The Denali Commission, in cooperation with NVC and the U.S. Army Corps of Engineers (USACE) is preparing an Environmental Impact Statement (EIS) for the Mertarvik Infrastructure Development Project. This EIS will address all activities associated with relocation of the community and the potential environmental impacts of reconstructing all required village infrastructure at the new village site of Mertarvik on Nelson Island. All impact assessment, consultation with federal and state agencies, public involvement, and permitting required for the proposed energy infrastructure described in this document will be addressed in the EIS.

9.2 Waters of the U.S., Navigable Waters, and Wetlands

Section 404 of the Clean Water Act requires any person, firm, or agency planning to place structures or conduct work in navigable waters of the U.S., or dump, place, or deposit dredged or fill material in waters of the U.S., including wetlands, to apply for and obtain a permit from

USACE. A review of the USACE 2008 *Revised Environmental Assessment/Finding of No Significant Impact for Newtok Evacuation Center Mertarvik, Nelson Island, Alaska* (EA/FONSI), indicates wetlands are present throughout most of the project site (USACE 2008). The project should be designed to avoid and minimize impacts to wetlands to the maximum extent practicable. A review of the USACE list of Navigable Waters indicates the Ninglick River, located adjacent to the project area, is not currently regulated by USACE as a navigable water.

Pollutants entering waters of the U.S. as storm water discharges from construction sites are regulated under Section 402 of the Clean Water act and the Alaska Pollutant Discharge Elimination System. Construction of the project will involve discharge of construction storm water to waters of the U.S., including wetlands. Coverage under the ADEC Construction General Permit will be required.

9.3 Cultural, Historic, Pre-Historic, and Archaeological Resources

Consultation with the State Historic Preservation Officer pursuant to Section 106 of the National Historic Preservation Act will be required. Although unlikely, should historic sites that are listed or eligible for listing on the National Register of Historic Places be identified in the project's area of direct, indirect, or visual impacts, the project should be designed to avoid or minimize potential impacts to historic properties.

According to USACE's 2008 EA/FONSI, "Archaeological work in the Nelson Island area has been limited to a few sites outside the project vicinity...and to a few recent archaeological surveys near Nightmute and Toksook Bay mentioned in the Nelson Island Natural and Cultural Knowledge Project. The USACE Alaska District and U.S. Fish and Wildlife Service (USFWS) archaeologists surveyed the Mertarvik area, including the project site, in 2002...They identified several archaeological sites near the mouth of Takikchak Creek, but did not find any sites that would be affected by the project described in the EA/FONSI. The site nearest to the proposed project area consists of several shallow pits that were excavated for clay used in making pottery...The site is located approximately 1-mile northeast of the barge landing..."

9.4 Fish and Wildlife

A. Migratory Birds

Under the Migratory Bird Treaty Act, it is illegal for anyone to "take" migratory birds, their eggs, feathers, or nests. In order to avoid impacts to migratory bird species, USFWS recommends avoiding vegetation clearing activities from April 20 through July 25 in the area proposed for development.

B. Bald Eagles

Bald Eagles are protected under the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act, whereby the "taking" of bald eagles, their nests, or eggs is prohibited. The Acts define "take" to include any disturbance that causes, or is likely to cause, injury to an eagle, a decrease in productivity, or nest abandonment caused by interference with normal breeding, feeding, or sheltering behavior. According to the USFWS's National Bald Eagle Guidelines, a

minimum buffer of 660 feet, or as close as similar existing activities that are tolerated, should be maintained between the construction activity and the nest. Should eagles' nests be identified within these zones, USFWS should be consulted on how to proceed.

C. Marine Mammals

Marine mammals are protected under the Marine Mammal Protection Act, which prohibits the "take" of marine mammals in U.S. waters, including the intentional or negligent release of toxic material and resultant exposure to marine mammals. The National Marine Fisheries Service (NMFS) Marine Mammal Protection Act interactive map indicates there are several species under NMFS jurisdiction found in marine waters adjacent to the project area. Mitigation measures such as constructing the tank farm in a secondary containment structure and implementing a Spill Prevention Control and Countermeasure Plan may be recommended.

9.5 Threatened and Endangered Species

Consultation with USFWS and/or NMFS under Section 7 of the Endangered Species Act will be required. Initial project scoping conducted using USFWS's Information, Planning, and Conservation System tool indicated that one species listed as threatened, the Spectacled Eider (*Somateria fischeri*), is present in the vicinity of the project site. The project site is not within designated critical habitat. Measures to minimize impacts to Eiders would be developed in consultation with USFWS.

The NMFS threatened and endangered species interactive map indicates there are several Endangered Species Act-listed species under NMFS jurisdiction found in the vicinity of the project site. However, no designated critical habitat has been identified. The risk of adverse impacts to marine mammals from rural energy projects is primarily from the accidental release of fuel into the environment during dispensing and transfer operations. No adverse impacts to threatened or endangered species, or their critical habitat, are expected as a result of this project; however, measures to reduce the likelihood of accidental releases will be required and incorporated into the final design.

9.6 Land Ownership, Management, and Special Use Areas

The entire Mertarvik village site is owned by NNC, an acquired site through a land exchange with USFWS, which was approved by the U.S. Congress in 2003.

9.7 Material and Disposal Sites

Should any dedicated material sites be developed for this project, they would need to be assessed in the Mertarvik Infrastructure Development Project EIS and included in state and federal permit applications.

9.8 Environmental Categories without Project Imposed Consequences

Environmental resource categories where no resources have been identified within the project vicinity, no impacts are foreseeable, or will not require mitigation include the following:

- Anadromous and resident fish streams: A review of the Alaska Department of Fish and Game's (ADFG) Anadromous Waters Catalog indicates there are no fish-bearing streams at the project site. However, the Takikchak River is an anadromous water, and any future hydropower project involving this stream would require coordination and permitting with ADFG.
- Air quality: A review of the Environmental Protection Agency website indicates the project is not within an air quality non-attainment area.
- Water quality: A review of ADEC's impaired water bodies mapper indicated that none of the receiving waters for the proposed project are impaired.
- Floodplains: A review of Federal Emergency Management Agency flood maps indicate there are no mapped floodplains at the project site.
- Contaminated sites: A review of ADEC's Contaminated Sites Database indicates there are no active sites at the project site.

9.9 Federal Aviation Administration

In accordance with Code of Federal Regulations Title 14 Part 77, FAA regulations require an airspace study and filing form 7460-1 for proposed wind towers to determine if there is a hazard to air navigation. Coordination with FAA and ADOT&PF is recommended to coordinate published traffic procedures at the new airport to keep patterning aircraft away from any proposed towers.

9.10 Permits and Approvals

The Denali Commission and USACE are leading the development of National Environmental Policy Act (NEPA) documentation for the relocation of Newtok to Mertarvik. The Denali Commission and USACE will also be the agencies in responsible charge of obtaining all permits, agency authorizations, and consultation with local, state, and other federal agencies. Consultation with federal agencies under Section 7 of the Endangered Species Act and Section 106 of the National Historic Preservation Act is required. Required permits include a Section 404 wetlands permit from USACE and coverage under the ADEC Construction General Permit. Table 11 below summarizes the anticipated approval requirements for the proposed project.

Table 11: Permits

Regulatory Action	Authority	Regulatory Agency	Project Activity	Responsibility
Federal Agency Approvals				
NEPA Document	NEPA	Denali Commission (Lead Agency)	Project is federally funded and requires federal permit	Denali Commission (Lead Agency) USACE
Wetlands Permit	Clean Water Act Section 404	USACE	Discharge of fill or dredged material into waters of the U.S.	Denali Commission USACE
Threatened and Endangered Species Consultation	Endangered Species Act Section 7	USFWS NMFS	Work potentially affecting threatened or endangered species or their habitat	Denali Commission USACE
State Agency Approvals				
Water Quality Certification	Clean Water Act Section 401	ADEC	Storm water Discharge review of USACE wetlands permit	Denali Commission USACE
Section 106 Review	National Historic Preservation Act Section 106	State Historic Preservation Officer	Work potentially affecting significant cultural, historic, pre-historic, or archaeological resources	Denali Commission USACE
Construction General Permit	Clean Water Act Alaska Pollutant Discharge Elimination System	ADEC	Storm water discharges to waters of the U.S. from construction site	AEA/Contractor

10.0 CONSTRUCTION AND OWNERSHIP

10.1 Construction Method

This project is anticipated to be constructed through a public bid. Due to a number of other projects anticipated in Mertarvik in the next few construction seasons, the power and bulk fuel tank farm project could coordinate construction scheduling with other projects to take advantage of barge deliveries and reduced material costs from increased economies of scale.

10.2 Local Equipment

A list of equipment available for rent in Mertarvik is presented in Table 12. The Contractor will have to coordinate with the NVC to determine rental rates and the availability of this equipment for construction.

Table 12: Equipment for Rent

Equipment	Type/Model	Owner	2017 Purchase Hours
Loader	Cat 980H	NVC	unknown
Loader	Cat 966H	NVC	unknown
Dozer	Cat D8R	NVC	unknown
Dozer	John Deere 450 LGP	NVC	unknown
Excavator	Cat 345 CL	NVC	unknown
Skid Steer	Cat 257 B	NVC	unknown
Dump Truck	Cat 725	NVC	unknown
Generator	Cat XQ400	NVC	unknown
Rock Crusher	I-Rock 150 RDS	NVC	unknown
Light Duty Flatbed Mechanic Truck		NVC	unknown
Wheel Loader	Doosan DL450	NVC	187
Wheel Loader	Doosan DL420	NVC	615
Excavator	Doosan DX490	NVC	420
Mini Excavator	Bobcat E85	NVC	220
Articulated Dump Truck	Doosan DA30	NVC	927
Articulated Dump Truck	Doosan DA30	NVC	1216
Compact Track Loader (with attachments)	Bobcat T550	NVC	208
Dozer	Komatsu D39PX-22	NVC	1,069
Dozer	Cat D8R	NVC	16,663
Trailered Generator	Doosan G450	NVC	0
Generac Generator, Trailer Mounted		NVC	unknown
Diesel Generator	Perkins 150 kW	NVC	unknown
Loader	Volvo Michigan L190	NVC	unknown
Squirt Boom	Gradall 534D9-45W	NVC	unknown

The equipment is owned by NVC. Photos and descriptions of the local equipment is included in Appendix I.

10.3 Schedule

The following design and construction schedule assumes that materials will be delivered by barge from Seattle and Anchorage to Mertarvik. Additionally, fill material will be mined from the existing rock quarry in Mertarvik. The proposed schedule is dependent upon many inter-related factors, project funding, project design NTP, construction project start time, material availability, and weather. Procurement or shipping delays could cause the project to run longer than anticipated. An anticipated project schedule is presented in Table 13.

Table 13: Anticipated Project Schedule

Work Description	Approximate Time
Mertarvik Power Plant Module 65% Design	September 1, 2017
Mertarvik Power Plant Module 100% Design and Bid Package	October 31, 2017
Mertarvik Power Plant Module ITB	November 1, 2017
Construct Mertarvik Power Plant Module	December 2017 – June 2018
Power Plant and Foundation and Site Work 65% Design	October 31, 2017
Bulk Fuel, and Retail Store Dispensing 65% Design	October 31, 2017
Power Plant and Foundation and Site Work 100% Design and Bid Package	January 31, 2018
Bulk Fuel and Retail Store Dispensing 100% Design and Bid Package	January 31, 2018
Construct Site Work and Install Power Plant Module	June 2018 - October 2018
Construct Bulk Fuel and Retail Store Dispensing	TBD based on funding availability

10.4 Ownership and Operation

NVC is anticipated to be the recipient of the grant for the construction of the bulk fuel tank farm and power plant. In The Real Property Master Site Control Agreement (included in Appendix D), NNC and NVC agree to within two years to negotiate to sell or transfer at no cost the ownership and operation of the bulk fuel facility from NVC to NNC. NNC will eventually be responsible for the storage, transfer, and retail sales of diesel and gasoline fuel in Mertarvik.

The UPC manages and operates the NVC-owned power utility in Newtok and currently is planning to manage and operate the new power utility in Mertarvik. NVC has expressed an interest to have the Alaska Village Electric Cooperative (AVEC) manage and operate the new power utility in Mertarvik. At this time, no agreements have been made between NVC and AVEC.

11.0 CONCLUSIONS AND RECOMMENDATIONS

Development of easy to maintain power and bulk fuel systems in Mertarvik will be a major step in the effort to relocate Newtok residents to the Mertarvik village site. Construction and installation of the power plant module described in this report will allow for the phased development of the new village power systems. The power plant will be designed and constructed to allow the generation capacity of the new plant to increase as the number of occupied buildings in Mertarvik increases. The power plant will be connected to recovered heat and electrical distribution systems that can be expanded to serve a greater number of community buildings as the generator capacity is increased and other renewable sources of energy are developed. Construction of the bulk fuel improvements described herein will provide safe, code compliant storage transfer and sales of diesel fuel and gasoline, and meet the estimated fuel storage needs for the community.

12.0 REFERENCES

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APPENDIX A

Newtok Bulk Fuel Facilities Description, Size and Condition

Newtok Bulk Fuel Facilities Description, Size and Condition

TF1 - Newtok School, Lower Kuskokwim School District

TF1 (Tank Farm 1) is owned and operated by LKSD. The tank farm provides fuel for power generation to the school power plant and heating fuel to the Ayaprun School building, school water and wastewater treatment plant, and eight teacher housing units. The tank farm is supplied with fuel from the common marine barge header pipeline. The tank farm consists of two 40,600-gallon, single-wall, vertical storage tanks supported on wood cribbing inside of a containment dike. The dike walls have experienced differential settlement and the containment is no longer liquid-tight. The vertical tanks provide fuel to a double-wall, horizontal intermediate tank at the school power plant and a double-wall, horizontal day tank at the school building. The school building's day tank is equipped with a hose dispenser and used to fill the tanks at the teacher housing units. The tank farm fuel tank descriptions and gross capacities are located in the table below.

Tank Farm 1 - School Tank Farm

Tank No.	Dia.	Height/ Length	Orientation	Tank Type	Active / Inactive	Reuse / Decommission	Product	Tank Function	Gross Capacity (Gallons)
1	23'-6"	12'-0"	Vertical	Single-Wall	Active	Decommission	Diesel 1	Bulk	40,600
2	23'-6"	12'-0"	Vertical	Single-Wall	Active	Decommission	Diesel 1	Bulk	40,600
3	5'-4"	12'-3"	Horizontal	Double - Wall	Active	Modify/Reuse	Diesel 1	Interm. Tank	2,000
4	4'-9"	10'-6"	Horizontal	Double - Wall	Active	Modify/Reuse	Diesel 1	Day Tank	1,500
Total Gallons									84,700



Photo: May 2015 Bulk Fuel Assessment Report - Newtok

TF1 - School Tank Farm

TF2 - Old BIA School Tank Farm

TF2 is also owned by LKSD. The tank farm is currently out of service and in poor condition. It contains six BIA-style, single-wall, 14-foot tall vertical bulk fuel storage tanks ranging from 8 to 11 feet in diameter. The tanks are supported on wood cribbing inside of a failed fuel containment dike. The tank farm is connected to the common marine barge header pipeline. The tank descriptions and gross capacities are shown in the table below. All tanks are in poor condition, are unusable, and should be decommissioned.

TF2 - Old School Tank Farm

Tank No.	Dia.	Height/Length	Orientation	Tank Type	Active/Inactive	Reuse / Decommission	Product	Tank Function	Gross Capacity (Gallons)
1	8'-0"	14	Vertical	Single-Wall	Inactive	Decommission	Diesel	Bulk	5,200
2	8'-0"	14	Vertical	Single-Wall	Inactive	Decommission	Diesel	Bulk	5,200
3	8'-6"	14	Vertical	Single-Wall	Inactive	Decommission	Diesel	Bulk	5,900
4	9'-0"	14	Vertical	Single-Wall	Inactive	Decommission	Diesel	Bulk	6,600
5	10'-0"	14	Vertical	Single-Wall	Inactive	Decommission	Diesel	Bulk	8,200
6	11'-0"	14	Vertical	Single-Wall	Inactive	Decommission	Diesel	Bulk	9,900
Total Gallons									41,000



TF2 - Old School Tank Farm

TF3- Newtok Native Corporation, Retail Sales

TF3 is owned by NNC and contains three single-wall, skid-mounted, horizontal tanks for diesel and gasoline storage and dispensing. The tank farm consists of one gasoline bulk storage tank, one gasoline dispensing tank, and one diesel dispensing tank. The tanks are installed in a lined containment with timber supported dike walls. The dike is not level and does not appear structurally sound. The tank skids are installed directly on the ground inside the containment. The fuel dispensers consist of "fill-rite style" pumps plumbed to the bottom tank penetrations

with threaded piping and a short length of dispensing hose. The dispensing equipment is enclosed within plywood structures built on the ends of the tanks. A temporary fuel hose connected to the common marine header pipeline during barge deliveries fills the tanks. Tank descriptions and gross capacities are shown in the table below. According to the previous bulk fuel assessment reports, the gasoline and diesel fuel dispensing tanks are Underwriters Laboratories (UL) listed. These two tanks are in fair condition but are not equipped with code-compliant venting, fill control, or fuel level monitoring appurtenances. If code compliant appurtenances are installed, these tanks could be relocated to a lined containment in Mertarvik to provide temporary bulk fuel storage.

TF3 - Newtok Native Corporation Retail Sales Tank Farm

Tank No.	Dia.	Height/Length	Orientation	Tank Type	Active/Inactive	Reuse / Decommission	Product	Tank Function	Gross Capacity (Gallons)
1	7'-9"	13'-9"	Horizontal	Single-Wall	Active	Modify/Reuse	Gasoline	Dispensing	4,500
2	7'-9"	27'-9"	Horizontal	Single-Wall	Active	Decommission	Gasoline	Bulk	9,000
3	7'-9"	27'-9"	Horizontal	Single-Wall	Active	Modify/Reuse	Diesel 1	Dispensing	9,000
Total Gallons									22,500



Photo: May 2016 Bulk Fuel Assessment Report - Newtok

TF3 - Newtok Native Corporation Retail Sales Tank Farm

TF4 - Newtok Native Corporation Bulk Storage Tank Farm

TF4 is also owned and operated by NNC for diesel and gasoline bulk storage. The tank farm consists of one gasoline bulk storage tank and two diesel bulk storage tanks. All of the tanks are single-wall vertical tanks supported on wood cribbing inside a lined timber containment with timber supported dike walls. The tanks are filled by a temporary fuel hose connected to the common marine header pipeline during barge deliveries. This hose is also used to transfer fuel between TF3 and TF4. The tanks are at the end of their useful life and should be decommissioned when no longer in service. Tank descriptions and gross capacities are shown in the table below.

TF4 - Newtok Native Corporation Bulk Storage Tank Farm

Tank No.	Dia.	Height/Length	Orientation	Tank Type	Active/Inactive	Reuse / Decommission	Product	Tank Function	Gross Capacity (Gallons)
1	11'-0"	13'-10"	Vertical	Single-Wall	Active	Decommission	Gasoline	Bulk	8,400
2	10'-10"	13'-10"	Vertical	Single-Wall	Active	Decommission	Diesel 1	Bulk	8,100
3	10'-0"	13'-10"	Vertical	Single-Wall	Active	Decommission	Diesel 1	Bulk	6,900
Total Gallons									22,400



TF4 - Newtok Native Corporation Bulk Storage Tank Farm

TF5 - Ungusraq Power Company

TF5 consists of five vertical, single-wall tanks and one horizontal, single-wall tank for diesel storage for power generation. The vertical tanks are supported on wood cribbing inside of a lined containment dike with timber supported dike walls. The skid mounted horizontal tank is placed directly on the tundra outside of the containment. Fuel is drawn from the tanks via a flexible hose connected to the bottom penetrations. The hose connects to a transfer pump housed in a plywood shed within the diked area. The operator uses the pump to transfer from the tanks into a fuel trailer, which is then trucked to the power plant and transferred to the power plant day tank. The horizontal tank serves as additional diesel fuel storage. Fuel is transferred from the horizontal tank to the vertical tanks on an as-needed basis using a portable pump and flexible hose. The tanks are filled by a temporary fuel hose connected to the common marine header pipeline during barge deliveries. All tanks are nearing the end of their useful life and should be decommissioned when no longer in service. Tank descriptions and gross capacities are shown in the table below.

T5 - Ungusraq Power Company Tank Farm

Tank No.	Dia.	Height/Length	Orientation	Tank Type	Active/Inactive	Reuse / Decommission	Product	Tank Function	Gross Capacity (Gallons)
1	12'-0"	12'-0"	Vertical	Single-Wall	Active	Decommission	Diesel 1	Bulk	8,500
2	11'-9"	18'-0"	Vertical	Single-Wall	Active	Decommission	Diesel 1	Bulk	13,000
3	12'-0"	17'-0"	Vertical	Single-Wall	Active	Decommission	Diesel 1	Bulk	12,600
4	11'-9"	17'-0"	Vertical	Single-Wall	Active	Decommission	Diesel 1	Bulk	12,100
5	11'-9"	12'-0"	Vertical	Single-Wall	Active	Decommission	Diesel 1	Bulk	8,100
6	8'-0"	30'-0"	Horizontal	Single-Wall	Active	Decommission	Diesel 1	Bulk	7,500
Total Gallons									61,800



Photo: May 2016 Bulk Fuel Assessment Report - Newtok

TF5 - Ungusraq Power Company Tank Farm

TF6 - Newtok Village Council

TF6 is owned and operated by NVC. The tank farm consists of one 3,000-gallon, horizontal, single-wall diesel storage tank. The tank is supported by timber blocking and is located adjacent to the power plant tank farm. There is a liner spread beneath the tank, but the liner does not provide fuel containment. The tank is equipped with a "fill-rite" type pump and a dispensing hose. The dispensing system is used to fill portable fuel containers that are transported to village-owned buildings for heating oil. The tank is filled by a temporary fuel hose connected to the common marine header pipeline during barge deliveries. The tank description is shown in the table below. This tank should be decommissioned as soon as practical.

TF6 - Newtok Village Council Tank Farm

Tank No.	Dia.	Height/Length	Orientation	Tank Type	Active/Inactive	Reuse / Decommission	Product	Tank Function	Gross Capacity (Gallons)
1	6'-4"	15'-0"	Horizontal	Single-Wall	Active	Decommission	Diesel 1	Bulk & Dispensing	3,000
Total Gallons									3,000



Photo: May 2016 Bulk Fuel Assessment Report – Newtok

TF6 - Newtok Village Council Tank Farm

TF7 – Agayuvik Holy Family Church Tank

TF7 is one single-wall, 3000-gallon, horizontal diesel tank located next to the church building on elevated wood cribbing with no fuel containment. The tank is not API 650 or UL 142 labeled and is not code compliant. The tank is hard piped to the building heating system day tank. The tank should be decommissioned as soon as practical. The tank description is shown in the table below.

TF7 - Agayuvik Holy Family Church Tank Farm

Tank No.	Dia.	Height/Length	Orientation	Tank Type	Active/Inactive	Reuse / Decommission	Product	Tank Function	Gross Capacity (Gallons)
1	6'-4"	15'-0"	Horizontal	Single-Wall	Active	Decommission	Diesel 1	Bulk	3,000
Total Gallons									3,000

TF8 - National Guard Armory

TF8 consists of one 1500-gallon, horizontal, single-wall tank located adjacent to the old armory building and one 1500-gallon, horizontal, self-diked tank located adjacent to the new armory building. The old National Guard Armory building is currently not in use. The new National Guard Armory building is constructed adjacent to the old armory. The new building is currently used to house the village administrative offices. The single-wall tank appears to be in fair condition, but has been inactive for many years and reuse is not recommended. The self-diked tank was constructed in 2003, is UL 142 listed, and is in good condition. This tank could be relocated to Mertarvik to provide fuel storage for community buildings. Tank descriptions and gross capacities are shown in the table below.

TF8 - National Guard Armory Tank Farm

Tank No.	Dia.	Height/Length	Orientation	Tank Type	Active/Inactive	Reuse / Decommission	Product	Tank Function	Gross Capacity (Gallons)
1	5'-4"	9'-0"	Horizontal	Single-Wall	Inactive	Decommission	Diesel 1	Bulk	1,500
2	5'-4"	9'-0"	Horizontal	Self-Diked	Active	Modify/Reuse	Diesel 1	Bulk	1,500
Total Gallons									3,000



TF8 - Old National Guard Armory Fuel Tank



TF8 - New National Guard Armory Fuel Tank

TF9 – Tom’s Store

The Tom’s Store tank farm consists of five horizontal, single-wall tanks and two horizontal, double-wall tanks. Three of the single-wall tanks are supported on wood cribbing with no fuel containment. The other two single-wall tanks appear to be small, 500-gallon tanks that are stored at the site and not used for fuel storage. The two skid-mounted, double wall, horizontal tanks are placed directly on the ground. One of the single-wall tanks and one of the double-wall tanks have top mounted suction pumps for fuel dispensing. The tank is filled by a temporary fuel hose connected to the common marine header pipeline during barge deliveries. The community reported that the tank farm has not received a fuel delivery in the past three years and is currently not in use. The product historically stored in each tank could not be verified at the time of inspection. However, it is assumed that at least one of the double-walled tanks was used for diesel storage.

The two double-wall tanks were constructed in 2001, are UL listed, and appear to be in fair condition. These tanks could be relocated to Mertarvik and temporarily used for bulk fuel storage or as the power plant intermediate tank until a new tank farm is constructed. The single-wall tanks are old and should be permanently taken out of service and decommissioned.

TF9 - Tom's Store Tank Farm

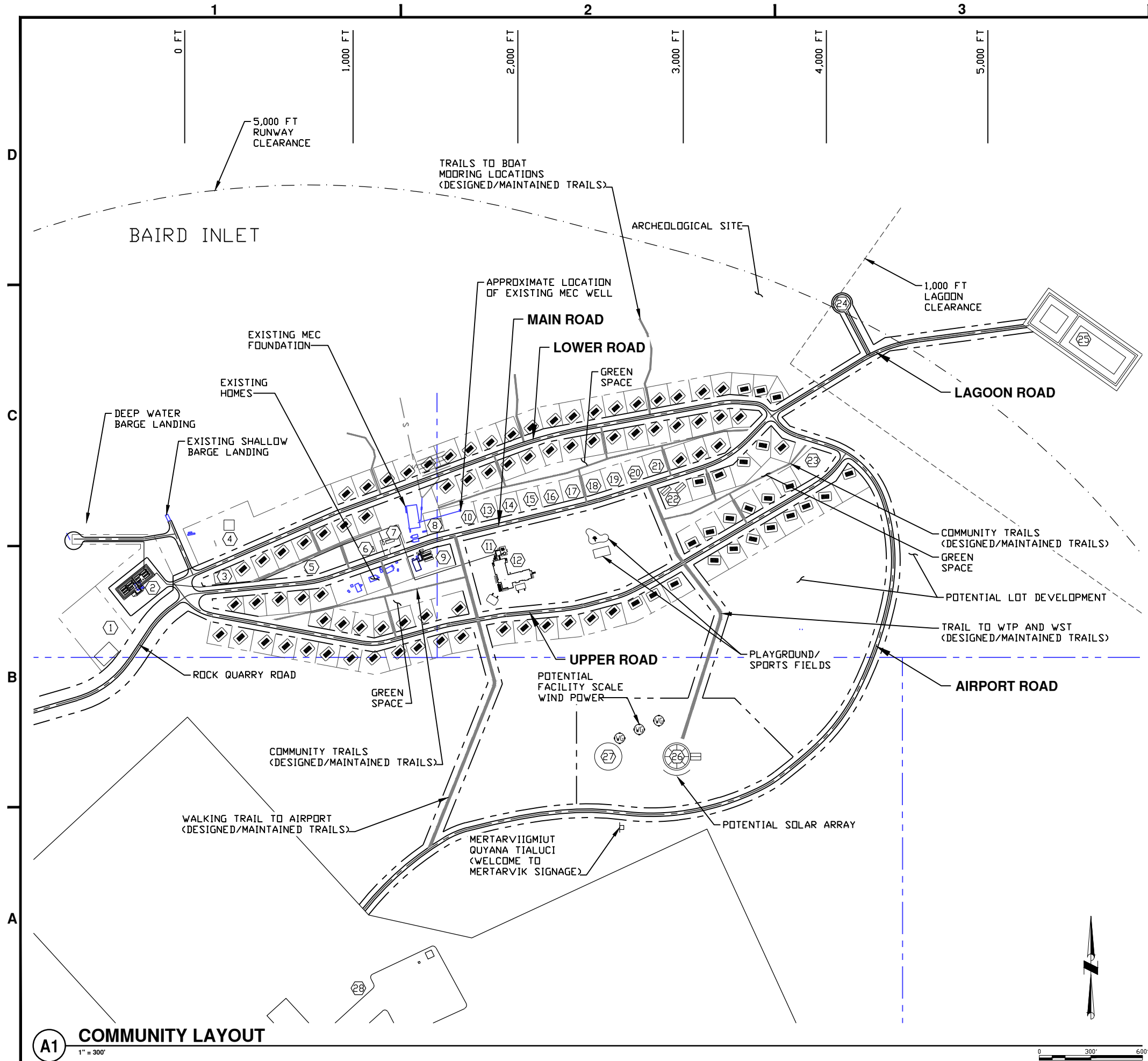
Tank No.	Dia.	Height/Length	Orientation	Tank Type	Active/Inactive	Reuse / Decommission	Product	Tank Function	Gross Capacity (Gallons)
1	4'-0"	12'-0"	Horizontal	Single-Wall	Inactive	Decommission	Gasoline	BF/D	1,125
2	6'-0"	12'-0"	Horizontal	Single-Wall	Inactive	Decommission	Unknown	BF	3,000
3	6'-0"	12'-0"	Horizontal	Single-Wall	Inactive	Decommission	Unknown	BF/D	3,000
4	4'-0"	6'-0"	Horizontal	Single-Wall	Inactive	Decommission	Unknown	BF	500
5	4'-0"	6'-0"	Horizontal	Single-Wall	Inactive	Decommission	Unknown	BF	500
6	8'-0"	28'-0"	Horizontal	Double-Wall	Inactive	Modify/Reuse	Gasoline	BF	10,000
7	8'-0"	28'-0"	Horizontal	Double-Wall	Inactive	Modify/Reuse	Diesel 1	BF/D	10,000
Total Gallons									28,125



TF9 - Tom’s Store 10,000-Gallon Double Wall Fuel Tank

APPENDIX B

ANTHC Mertarvik Community Layout Plan



INFRASTRUCTURE KEY		
#	DESCRIPTION	LOT SIZE (ACRES)
1	COMMUNITY EQUIPMENT SHOP AND DRY STORAGE	2 3/8
2	BULK FUEL STORAGE	3 3/4
3	LIFT STATION	1/4
4	BARGE UNLOADING AREA AND BOAT STORAGE FISHERIES SUPPORT CENTER	3 1/2
5	CORPORATION OFFICE	3/4
6	STORE AND FUEL STATION	1/2
7	POWER FACILITY	1/2
8	CVRF SHOP	1/4
9	MAN CAMP AND WST	3/4
10	TOM'S STORE	1/2
11	SCHOOL	12
12	SCHOOL BULK FUEL STORAGE	-
13	WASHETERIA	3/8
14	CHURCH	3/8
15	CLINIC	3/8
16	ELDER HOUSING	3/8
17	ELDER HOUSING	3/8
18	TRIBAL OFFICE	3/8
19	POST OFFICE	3/8
20	FOUR-PLEXES	3/8
21	FOUR-PLEXES	3/8
22	TEACHER HOUSING	1/2
23	VPSO OFFICE, GARAGE, AND LIVING QUARTERS	3/4
24	TELECOMMUNICATION BUILDING	1 1/4
25	LAGOON	5
26	WTP AND WST	14
27	WELL FIELD	-
28	RUNWAY AND APRON	-
[Symbol]	RESIDENTIAL HOME	3/8

ROAD LENGTHS	
MAIN ROAD	3,625 LF
AIRPORT ROAD	5,300 LF
LOWER ROAD	3,685 LF
UPPER ROAD	4,150 LF
LAGOON ACCESS	1,625 LF
DESIGNED/MAINTAINED TRAILS	12,750 LF
WTP AND WST TRAIL	1,600 LF
ROCK QUARRY	9,600 LF
LIGHTING SHALL BE PROVIDED FOR PRIMARY ROADS	

NEWTOK DISTANCE COMPARISONS			
FROM	TO	DISTANCE IN NEWTOK	DISTANCE IN MERTARVIK
SCHOOL	STORE	1,700 FEET	500 FEET
SCHOOL	CLINIC	740 FEET	400 FEET
SCHOOL	COMMUNITY HALL	1,350 FEET	800 FEET
SCHOOL	AIRPORT	1,100 FEET	7,000 FEET
SCHOOL	POST OFFICE	870 FEET	930 FEET
DISTANCE ACROSS MAIN COMMUNITY		3,000 FEET	3,625 FEET
DISTANCES IN MERTARVIK ARE TAKEN BY NAVIGATING A COMBINATION OF ROAD AND TRAILS			

COLOR LEGEND	
[Blue Line]	EXISTING INFRASTRUCTURE

Division of Environmental Health and Engineering
4500 Diplomacy Drive
Anchorage, Alaska 99508
(907) 729-3600

0 1'

BAR IS ONE INCH ON ORIGINAL DRAWING, IF NOT ADJUST SCALES ACCORDINGLY

MERTARVIK, AK
COMMUNITY LAYOUT
FINAL

INIT	DESCRIPTION	DATE	MRK

PLAN SET: MTV-17-000

PROJ MGR: GND

PROJ ENG: JEH

DRUMS ENG: ----

DRAWN BY: ----

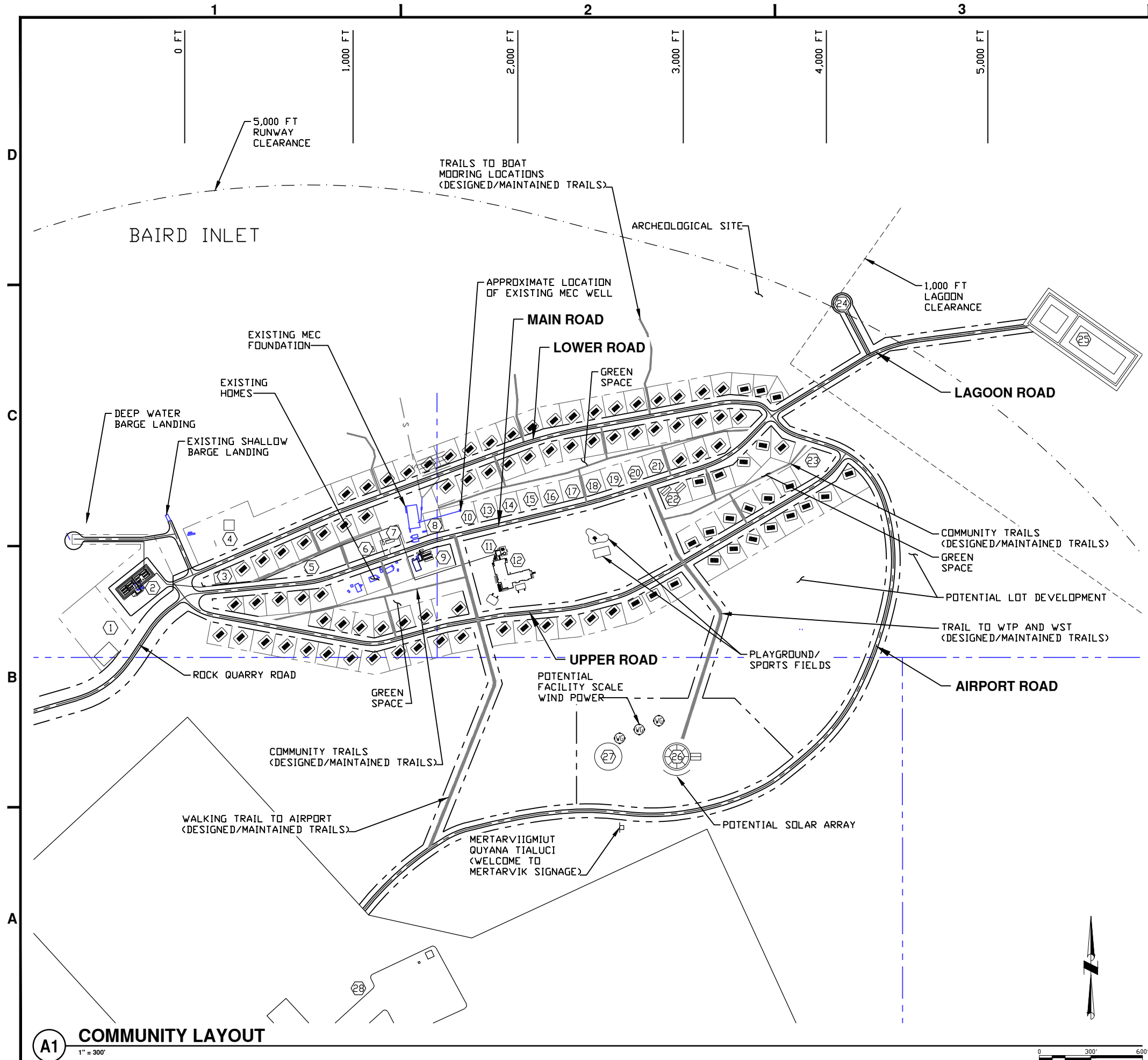
SHEET TITLE

HOUSING AND INFRASTRUCTURE LAYOUT PLAN

C-101

SHEET 2 OF 2

2 OF 2 TOTAL SHEETS



INFRASTRUCTURE KEY		
#	DESCRIPTION	LOT SIZE (ACRES)
1	COMMUNITY EQUIPMENT SHOP AND DRY STORAGE	2 3/8
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5	CORPORATION OFFICE	3/4
6	STORE AND FUEL STATION	1/2
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8	CVRF SHOP	1/4
9	MAN CAMP AND WST	3/4
10	TOM'S STORE	1/2
11	SCHOOL	12
12	SCHOOL BULK FUEL STORAGE	-
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14	CHURCH	3/8
15	CLINIC	3/8
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DISTANCES IN MERTARVIK ARE TAKEN BY NAVIGATING A COMBINATION OF ROAD AND TRAILS			

COLOR LEGEND	
	EXISTING INFRASTRUCTURE



Division of Environmental Health and Engineering
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(907) 729-3600

0 1'
BAR IS ONE INCH ON ORIGINAL DRAWING, IF NOT ADJUST SCALES ACCORDINGLY

MERTARVIK, AK
COMMUNITY LAYOUT
FINAL

INIT	DESCRIPTION	DATE	MRK

PLAN SET: MTV-17-000
PROJ MGR: GND
PROJ ENG: JEH
DRUMS ENG: ----
DRAWN BY: ----

SHEET TITLE
HOUSING AND INFRASTRUCTURE LAYOUT PLAN

C-101
SHEET 2 OF 2

APPENDIX C

Mertarvik Town Site Land Exchange Act

PUBLIC LAW 108-129—NOV. 17, 2003

ALASKAN NATIVE VILLAGE AND THE
INTERIOR DEPARTMENT LAND EXCHANGE

Public Law 108-129
108th Congress

An Act

Nov. 17, 2003
[S. 924]

To authorize the exchange of lands between an Alaska Native Village Corporation and the Department of the Interior, and for other purposes.

16 USC 668dd
note.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

SECTION 1. DEFINITIONS.

For the purposes of this Act, the term—

(1) “ANCSA” means the Alaska Native Claims Settlement Act (43 U.S.C. 1601 et seq.);

(2) “ANILCA” means the Alaska National Interest Lands Conservation Act (16 U.S.C. 3101 et seq.);

(3) “Calista” means the Calista Corporation, an Alaska Native Regional Corporation established pursuant to ANCSA;

(4) “Identified Lands” means approximately 10,943 acres of lands (including surface and subsurface estates) designated as “Proposed Village Site” on a map entitled “Proposed Newtok Exchange,” dated September, 2002, and available for inspection in the Anchorage office of the United States Fish and Wildlife Service;

(5) “limited warranty deed” means a warranty deed which is, with respect to its warranties, limited to that portion of the chain of title from the moment of conveyance from the United States to Newtok to and including the moment at which such title is validly reconveyed to the United States;

(6) “Newtok” means the Newtok Native Corporation, an Alaska Native Village Corporation established pursuant to ANCSA;

(7) “Newtok lands” means approximately 12,101 acres of surface estate comprising conveyed lands and selected lands identified as Aknerkochik on the map referred to in paragraph (4) and that surface estate selected by Newtok on Baird Inlet Island as shown on the map; and

(8) “Secretary” means the Secretary of the Interior.

SEC. 2. LANDS TO BE EXCHANGED.

(a) LANDS EXCHANGED TO THE UNITED STATES.—If, within 180 days after the date of enactment of this Act, Newtok expresses to the Secretary in writing its intent to enter into a land exchange with the United States, the Secretary shall accept from Newtok a valid, unencumbered conveyance, by limited warranty deed, of the Newtok lands previously conveyed to Newtok. The Secretary shall also accept from Newtok a relinquishment of irrevocable prioritized selections for approximately 4,956 acres for those validly selected lands not yet conveyed to Newtok.

(b) **LANDS EXCHANGED TO NEWTOK.**—In exchange for the Newtok lands conveyed and selections relinquished under subsection (a), the Secretary shall, subject to valid existing rights and notwithstanding section 14(f) of ANCSA, convey to Newtok the surface and subsurface estates of the Identified Lands. The conveyance shall be by interim conveyance. Subsequent to the interim conveyance, the Secretary shall survey Identified Lands at no cost to Newtok and issue a patent to the Identified Lands subject to the provisions of ANCSA and this Act.

SEC. 3. CONVEYANCE.

(a) **TIMING.**—The Secretary shall issue interim conveyances pursuant to subsection 2(b) at the earliest possible time after acceptance of the Newtok conveyance and relinquishment of selections under subsection 2(a).

(b) **RELATIONSHIP TO ANCSA.**—Lands conveyed to Newtok under this Act shall be treated as having been conveyed under the provisions of ANCSA, except that the provisions of 14(c) and 22g of ANCSA shall not apply to these lands. Consistent with section 103(c) of ANILCA, these lands shall not be included as a portion of the Yukon Delta National Wildlife Refuge and shall not be subject to regulations applicable solely to public lands within this Conservation System Unit.

(c) **EFFECT ON ENTITLEMENT.**—Except as otherwise provided, nothing in this Act shall be construed to change the total acreage of land to which Newtok is entitled under ANCSA.

(d) **EFFECT ON NEWTOK LANDS.**—The Newtok Lands shall be included in the Yukon Delta National Wildlife Refuge as of the date of acceptance of the conveyance of those lands from Newtok, except that residents of the Village of Newtok, Alaska, shall retain access rights to subsistence resources on those Newtok lands as guaranteed under section 811 of ANILCA (16 U.S.C. 3121), and to subsistence uses, such as traditional subsistence fishing, hunting and gathering, consistent with section 803 of ANILCA (16 U.S.C. 3113).

(e) **ADJUSTMENT TO CALISTA CORPORATION ANCSA ENTITLEMENT FOR RELINQUISHED NEWTOK SELECTIONS.**—To the extent that Calista subsurface rights are affected by this Act, Calista shall be entitled to an equivalent acreage of in lieu subsurface entitlement for the Newtok selections relinquished in the exchange as set forth in subsection 2(a) of this Act. This equivalent entitlement shall come from subsurface lands already selected by Calista, but which have not been conveyed. If Calista does not have sufficient subsurface selections to accommodate this additional entitlement, Calista Corporation is hereby authorized to make an additional in lieu selection for the deficient acreage from lands within the region but outside any conservation system unit.

(f) ADJUSTMENT TO EXCHANGE.—If requested by Newtok, the Secretary may consider and make adjustments to the exchange to meet the purposes of this Act, subject to all the same terms and conditions of this Act.

Approved November 17, 2003.

LEGISLATIVE HISTORY—S. 924:

HOUSE REPORTS: No. 108-345 (Comm. on Resources).

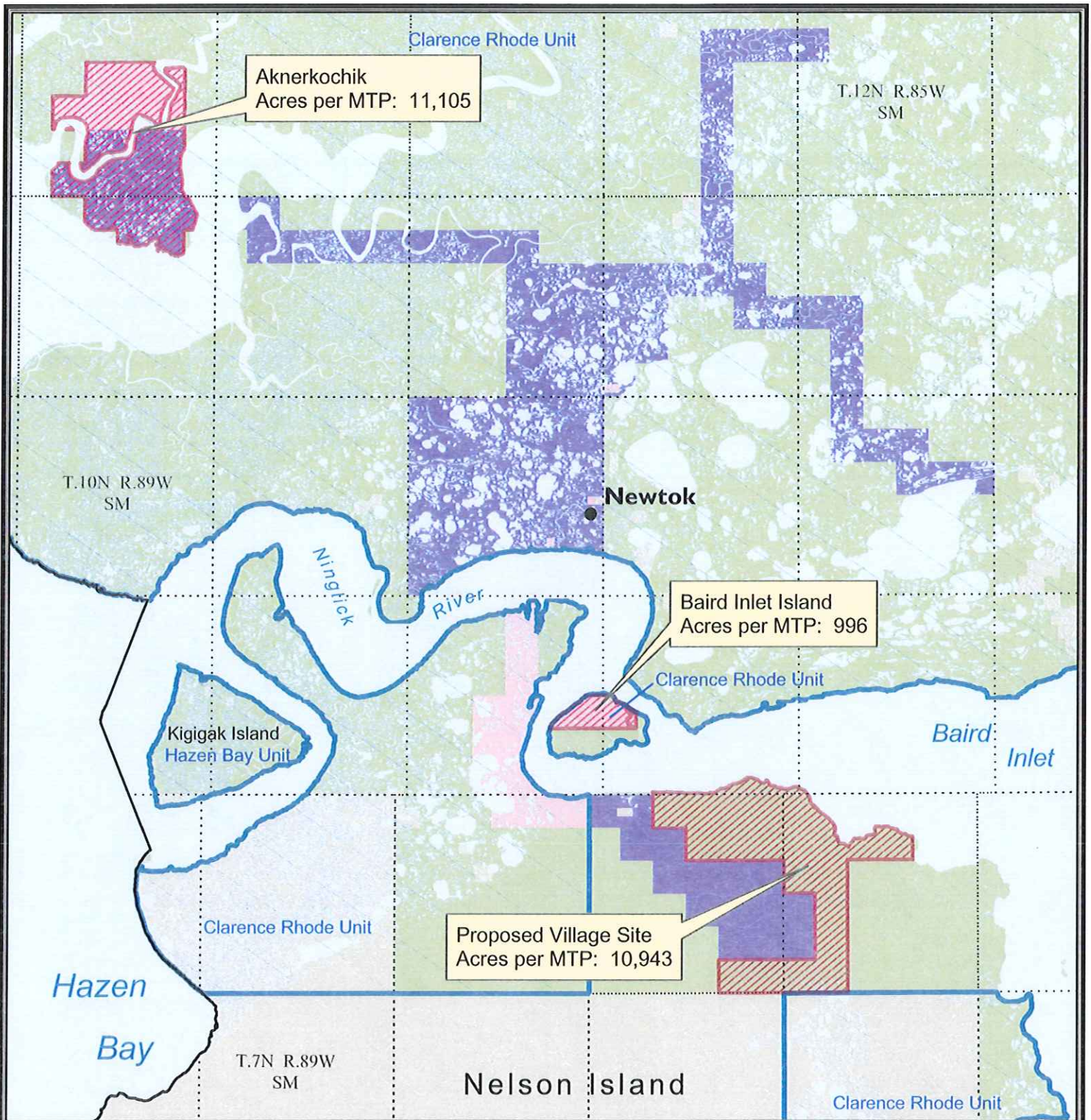
SENATE REPORTS: No. 108-97 (Comm. on Energy and Natural Resources).

CONGRESSIONAL RECORD, Vol. 149 (2003):

July 17, considered and passed Senate.

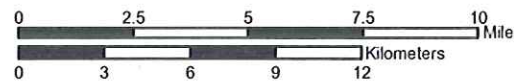
Nov. 4, considered and passed House.

○



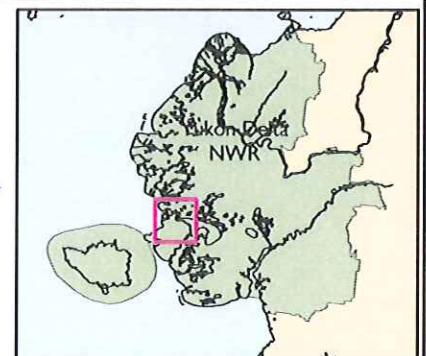
Proposed Newtok Exchange **U.S. Fish & Wildlife Service** **Yukon Delta National Wildlife Refuge**

- Newtok Conveyed
- Newtok Selected
- Other Status



September, 2002

Land status represents USFWS
 interpretation of BLM records.
 Land status current to 07/22/2002.



APPENDIX D

Master Site Control Agreement

Bethel Recording District

After Recording, Return To:

Glen Price
Law Office of Glen Price
P.O. Box 1491
Palmer, Alaska 99645

REAL PROPERTY MASTER SITE CONTROL AGREEMENT

THIS REAL PROPERTY MASTER SITE CONTROL AGREEMENT ("Agreement") is made and entered into by and between ***NEWTOK NATIVE CORPORATION***, an Alaska Native Village Corporation ("***Corporation***"), whose address is P.O. Box 5528, Newtok, Alaska 99559, and ***NEWTOK VILLAGE***, a federally recognized Tribe, acting by and through the ***NEWTOK VILLAGE COUNCIL*** (the Tribe and Council collectively the "***Council***"), whose address is P.O. Box 5596, Newtok, Alaska 99559. The effective date ("***Effective Date***") of this Agreement is the last date this Agreement is signed by both of the parties. This Agreement amends, supersedes, and replaces in all respects the (i) Mertarvik Site Control letter dated May 12, 2015, between the Corporation and Council only as it pertains to site control between the Corporation and Council; (ii) Barge Landing Lease dated March 30, 2009, between the Corporation and Council; and (iii) Mertarvik Evacuation Center Lease dated May 22, 2012, between the Corporation and Council, the relevant provisions of which are continued in effect by way of this Agreement.

RECITALS

WHEREAS, in approximately 2000, the Village of Newtok began efforts for the relocation of the community due to the effects of thermal degradation of the permafrost, erosion, and flooding at the existing village site; and

WHEREAS, after investigation of various site options, the Corporation, Council, and the community selected a site on Nelson Island, and the Corporation's Board directed the President to initiate negotiations for a land exchange with the United States Department of Interior, U.S. Fish & Wildlife Service for such site; and

WHEREAS, the negotiations resulted in a Congressionally approved land exchange

between the USFWS and the Corporation as set forth in Public Law 108-129 (November 17, 2003) ("**Exchange Legislation**"), which was signed by the President in 2004 (a copy of which is attached as **Attachment A**); and

WHEREAS, as a result of the Exchange Legislation, the Corporation received title to 10,943 acres of surface and subsurface estate at the new Village site named "**Mertarvik**" by way of Interim Conveyance (IC #1876; recorded in the Bethel Recording District on May 17, 2004; Reception # 2004-000727-0) ("**Interim Conveyance**") (a copy of which Interim Conveyance is attached as **Attachment B**); and

WHEREAS, subsequent to receiving title, extensive planning was undertaken to relocate the community to Mertarvik, and numerous state, federal, and private agencies/entities provided grant funds to the Council to implement the relocation and provide for the necessary infrastructure at Mertarvik; and

WHEREAS, to facilitate the relocation and provide necessary land for the infrastructure, it is necessary for the Corporation to provide certain site control to the Council, which will in-turn temporarily license such lands to the Council's contractors and their respective subcontractors (collectively the "**Contractors**") as necessary for the infrastructure engineering and construction work, and thereafter the Council will own, operate and maintain such infrastructure; and

WHEREAS, the Corporation and Council have agreed upon a goal to provide for only one comprehensive site control agreement to govern all site control granted by the Corporation to the Council at Mertarvik; and

WHEREAS, the Corporation and the Council have agreed on the terms and conditions to provide for the necessary site control as hereinafter set forth in this Agreement;

NOW, THEREFORE, in consideration of the foregoing and the mutual covenants and promises herein contained and other good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, the parties hereto covenant and agree as follows:

Section 1. Purpose of Agreement. The purpose of this Agreement is (i) to help the Council facilitate the relocation of the community of Newtok to Mertarvik by permitting access, construction, and use of the Premises by the Council and the Council's Contractors; (ii) for the Corporation to provide necessary site control on corporate lands at Mertarvik to the Council for the relocation infrastructure; (iii) provide the necessary authority to the Council to temporarily license such lands to the Council's Contractors for the necessary infrastructure design, engineering and construction work; and (iv) subsequent to the infrastructure construction, to provide the Council long-term site control for purposes of owning, operating and maintaining such infrastructure. *The parties acknowledge and agree that the purpose of this Agreement is to only provide needed site control to the Council (and subsequent temporary licenses to the Council's Contractors), and that the Corporation will be entering into separate site control arrangements with other third-parties as the Corporation deems appropriate and necessary.*

Section 2. Premises. All surface and subsurface estate leased, conveyed, transferred, sold, or otherwise granted to the Council under this Agreement shall individually and collectively be referred to as the “**Premises**” for all purposes under this Agreement. The Premises shall include, but not be limited to, all areas covered by this Agreement as of the Effective Date as identified in Section 3, and all areas hereinafter added to this Agreement. As the relocation progresses, it will be necessary to provide additional areas to the Council for various infrastructure and community needs. New areas will be added from time to time by way of amendments (“**Amendments**”) to this Agreement, and such added areas shall also be deemed part of the Premises for all purposes under this Agreement. Each Amendment shall, among other things, (i) identify the additional area(s) added to the Premises; (ii) have attached a diagram or community layout document which specifically identifies the location of the new area(s); and (iii) coordinate the length of time for the use of the new area(s) to provide that such time period coincides with the balance of the then existing Term (as such term is hereinafter defined) under this Agreement (and subsequent extensions to the Term).

At such time as the Mertarvik survey is completed, and a plat is filed with the Department of Natural Resources and thereafter recorded, legal descriptions for each of the areas for which site control is granted to the Council under this Agreement shall be conformed and reconciled by a comprehensive Amendment to this Agreement.

As of the Effective Date, the legal description of Mertarvik, within which the Premises are located, is legally described as follows:

Township 9 North, Range 85 West, Section 31;

Township 8 North, Range 86 West, Sections 3-10, 17, 18, 20, 29, 31, and 32;

Township 9 North, Range 86 West, Sections 32-36;

Township 8 North, Range 87 West, Sections 1-4, 10, 11, 12, 35, and 36.;

Seward Meridian; Bethel Recording District, Fourth Judicial District, State of Alaska; aggregating approximately 10,943 acres; Interim Conveyance #1876, recorded in the Bethel Recording District on May 17, 2004 at Reception # 2004-000727-0.

Further, as of the Effective Date, specific areas constituting part of the Premises to be utilized by the Council are identified on the “**Mertarvik, AK, Community Layout Conceptual (65%)**”, dated March 2, 2017, and prepared by the *Alaska Native Tribal Health Consortium, Division of Environmental Health and Engineering* (“**Mertarvik Community Layout**”), a copy of which is attached as **Attachment C**.

Section 3. Areas Constituting the Premises. As of the Effective Date, the Council is hereby granted the identified site control as provided below, and the following areas shall be considered part of the Premises for all purposes under this Agreement:

(a) **Barge Landing & Staging Area, Future Unloading Area, and Boat Storage Area.** The Corporation hereby leases to the Council the surface estate of the (i) barge landing and staging area; (ii) future unloading area; and (iii) boat storage area ((i)-(iii) collectively the "**Barge Landing Area**") identified on the **Mertarvik Community Layout** attached as **Attachment C**. The permitted uses of such areas are for the (i) landing of barges or other marine vessels; (ii) loading and unloading; (iii) staging of equipment, materials and supplies; (iv) future unloading area; (v) boat and marine vessel storage; and (vi) other ancillary and similar purposes. The lease rights are non-exclusive, and the Corporation reserves the right to allow third-party use (at cost or no-cost) of such areas as the Corporation deems appropriate, **provided, that**, such third-party use does not unreasonably interfere with the use by the Council or its Contractors.

(b) **Mertarvik Evacuation Center Area.** The Corporation hereby leases to the Council the surface estate of the Mertarvik Evacuation Center ("**MEC**") area identified on the **Mertarvik Community Layout** attached as **Attachment C**. The permitted uses of such area are for the (i) construction, operation, maintenance, repair, and expansion of the MEC; (ii) usage for the purposes identified from time to time by the Council as required for community purposes; (iii) construction of other improvements need for the proper use of the MEC or to be used in conjunction with the MEC; (iv) temporary location and storage of equipment and supplies necessary for construction; and (v) other ancillary and similar purposes. The lease rights are non-exclusive, and the Corporation reserves the right to allow third-party use (at cost or no-cost) of such area (but not the MEC itself, which is owned and controlled by the Council) as the Corporation deems appropriate and which are consistent with the purposes and use of the MEC and other improvements, **provided, that**, such third-party use does not unreasonably interfere with the use by the Council or its Contractors.

(c) **Rights-of-Way for Roads.** The Corporation hereby grants to the Council a **seventy-five (75) foot wide** right-of-way and easement to the surface estate and necessary subsurface estate of the "**Quarry Road**" as identified on the attached **Attachment D**. The permitted uses of such area are for the (i) construction, operation, maintenance, repair, and improvement of the Quarry Road; (ii) use of the Quarry Road as public rights-of-way; (iii) temporary location and storage of equipment and supplies necessary for construction; (iv) utility installation; (v) necessary cut/fill activities; and (vi) other ancillary and similar purposes.

The Corporation also hereby grants to the Council a **seventy-five (75) foot wide** right-of-way and easement to the surface estate and necessary subsurface estate of the "**Townsite Road**" as identified on the attached **Attachment E**, which Townsite Road will constitute a portion of the network of the Mertarvik Community Roads. The permitted uses of such area are for the (i) construction, operation, maintenance, repair, and improvement of the Townsite Road; (ii) use of the Townsite Road as public rights-of-way; (iii) temporary location and storage of equipment and supplies necessary for construction; (iv) utility installation; (v) necessary cut/fill activities; and (vi) other ancillary and similar purposes.

The right-of-way and easement width for other roads to be constructed by the Council and its Contractors shall be determined by the class of the road, which is unknown at this time, and will be determined as part of the future road design and project development process. Unless otherwise agreed in writing between the Corporation, Council, and BIA, for BIA funded roads, the Corporation

and Council agree to follow the processes for rights-of-way as prescribed in the ***"Uniform Act - Rights of Way Over Fee Lands"*** (42 U.S.C. § 4601; ***Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended***). Subject to the foregoing, the Corporation further hereby grants to the Council various rights-of-way and easements to the surface estate and necessary subsurface estate of the other ***"Mertarvik Community Roads"*** as identified on the ***Mertarvik Community Layout*** attached as ***Attachment C***, which areas will constitute the currently identified portions of the remaining network of the Mertarvik Community Roads. The permitted uses of such area are for the (i) construction, operation, maintenance, repair, and improvement of the Mertarvik Community Roads; (ii) use of the Mertarvik Community Roads as public rights-of-way; (iii) temporary location and storage of equipment and supplies necessary for construction; (iv) utility installation; (v) necessary cut/fill activities; and (vi) other ancillary and similar purposes.

(d) ***Gravel Pit & Operation Area.*** The Corporation hereby leases to the Council the surface and subsurface estate of the gravel pit and operation area identified on the ***Mertarvik Community Layout*** attached as ***Attachment C***. The permitted uses of such area are for the (i) location, storage, operation, and use of gravel equipment and vehicles needed for gravel operations; (ii) gravel operations; (iii) blasting of rock from the quarry hill to be used for gravel; and (iv) other ancillary and similar purposes. The lease rights are non-exclusive, and the Corporation reserves the right to allow Corporate and third-party use of such area as the Corporation deems appropriate, ***provided, that***, such third-party use does not unreasonably interfere with the use by the Council or its Contractors.

(e) ***Rock.*** The Corporation hereby agrees to sell the Council rock (both blasted and unblasted) (***"Rock"***) located on or in the surface and subsurface estate of the gravel area, gravel pit, and quarry hill located on the Premises, such areas as are identified on the ***Mertarvik Community Layout*** attached as ***Attachment C***, in such amounts as the Council and its Contractors deem necessary for the base of roads or the conversion to gravel for roads and other infrastructure needs. The Rock is being sold in place (fob at the gravel pit area), and all extraction, blasting, if necessary (given that the military IRT has already blasted a certain amount of Rock), and transportation of the Rock shall be done by the Council and its Contractors, at the Council's sole cost and expense. The purchase price for the Rock is a flat fee of ***\$50,000/year for each of the first two calendar years or portion thereof***, payable in full, and in advance, on the earlier of (i) the beginning of each construction season in a given year; or (ii) or ***June 1st***. The flat fee is payable irrespective of the amount of Rock used in a given calendar year, ***provided, that***, in no event shall the Council (A) store Rock in a given calendar year for use during the next construction season; (B) use Rock off of the Premises; or (C) sell or provide Rock to any third-party for use off of the Premises or otherwise, without the parties prior agreement in writing to an additional payment for such stored Rock, including when such amount shall be paid to the Corporation. After the ***first two (2) calendar years***, the parties shall agree in advance in writing on a fee schedule for the payment for the use of Rock during subsequent construction season(s).

The Council shall be responsible for determining the accurate location of the Rock and portions of the quarry hill owned by the Corporation. The Council shall be solely responsible for any taking, disturbing, or extracting any Rock or other materials on the subsurface owned by Calista Corporation, including any required payments to Calista Corporation. The Council shall indemnify, defend and

hold harmless the Corporation from and against any and all claims made by Calista with respect to any of the foregoing, provided, that, nothing in this Agreement shall in any way constitute a waiver of sovereign immunity arising out of the Council's status as a federally recognized Indian Tribe with regards to any claim brought by a party other than the Corporation against either the Council or the Corporation.

The right to use the Rock as provided herein is non-exclusive, and the Corporation reserves the right to allow Corporate and third-party use or extraction of such Rock as the Corporation deems appropriate, provided, that, such third-party use does not unreasonably interfere with the use by the Council or its Contractors.

(f) **Pioneer Landfill & Septage Disposal Site.** The Corporation hereby leases to the Council the surface and subsurface estate of the areas identified as the Pioneer Landfill and Septage Disposal Site on the ***Mertarvik Community Layout*** attached as ***Attachment C***. The permitted uses of such areas are only for a pioneer landfill and septage disposal site. At such time as the Mertarvik survey is completed, and a plat is filed with the Department of Natural Resources and thereafter recorded, the Corporation hereby agrees to convey by quitclaim deed fee simple title to such areas to the Council at no cost.

(g) **Community Spring Water Source.** The Corporation hereby leases to the Council the surface estate of the area identified as the Community Spring Water Source on the ***Mertarvik Community Layout*** attached as ***Attachment C***. The permitted use of such area is for the use of the water source by the Council and its Contractors for purposes related to the relocation. The right to use the water as provided herein is non-exclusive, and the Corporation reserves the right to allow Corporate and third-party use of such water as the Corporation deems appropriate.

(h) **Bulk Fuel Storage.** The Corporation hereby leases to the Council the surface estate of the area identified as the Bulk Fuel Storage area on the ***Mertarvik Community Layout*** attached as ***Attachment C***. The permitted use of such area is for (i) the construction of the necessary bulk fuel tank holding structures; (ii) placement of bulk fuel tanks on the holding structures; (iii) filling and dispensing of fuel from such tanks; (iv) storage and use of the necessary equipment, supplies and vehicles on such site related to the use of the tanks; and (v) location of pipes, hosing, and dispensing equipment. The use granted herein is solely granted to the Council and its Contractors. The Council and Corporation acknowledge and agree that the Corporation currently owns the existing fuel tanks to be utilized at the Bulk Fuel Storage facility, and the Corporation is permitting the Council to use such tanks at no charge for a ***two (2) year*** period beginning on the Effective Date, provided, that, the Council shall be responsible for all costs and liability related to the facility and tanks, including, without limitation, maintenance and repair costs for the tanks and associated equipment. Nothing herein is intended in anyway to transfer title or ownership of such tanks from the Corporation to the Council.

Beginning on a date ***two (2) years*** from the Effective Date, the Corporation and the Council shall negotiate an agreement pursuant to which (i) the Corporation shall assume operational control of the fuel dispensary; (ii) the Council shall sell or transfer at no cost to the Corporation Council owned tanks, structures, and ancillary equipment, if any, to the Corporation; and (iii) appropriate fuel costs

for the public, third-parties, and the Council and its Contractors.

(i) **Power Facility.** The Corporation hereby leases to the Council and the Council's division, Ungusraq Power Co., the surface estate of the area identified as the Power Facility site on the ***Mertarvik Community Layout*** attached as ***Attachment C***. The permitted use of such area is to construct and operate a power facility and such ancillary and similar uses as are necessary to provide power to the Mertarvik community. In the event the Council desires to construct power lines at Mertarvik, the Corporation, Council, and the Council's division, Ungusraq Power Co., shall agree on the necessary utility easements needed and amend this Agreement to provide for the granting of such easements to the Council. To the extent required by applicable law, this lease of the power facility site and easements for power lines shall terminate at such time that Ungusraq Power Co., or some other entity, receives a Certificate of Public Convenience and Necessity ("***CPCN***") or exemption from regulation issued by the Alaska Public Utilities Commission ("***APUC***") to provide electrical service to Mertarvik, Alaska.

(j) **Mancamp & Additional Construction Staging/Storage Area.** The Corporation hereby leases to the Council the surface estate of the areas identified for the location of the Mancamp and Additional Construction Staging/Storage areas on the ***Mertarvik Community Layout*** attached as ***Attachment C***. The permitted use of such areas is limited to the temporary use for the location of the mancamp and additional construction staging/storage area and such ancillary and similar uses as are necessary.

(k) **Equipment Shop.** The Corporation hereby leases to the Council the surface estate of the area identified for the location of the Equipment Shop on the ***Mertarvik Community Layout*** attached as ***Attachment C***. The permitted use of such area is limited to use for the location of the equipment shop and such ancillary and similar uses as are necessary.

(l) **House Pads and Driveways.** The Corporation hereby leases to the Council the surface estate of the areas identified (as of the Effective Date) for the location of the house pad and driveway areas on the ***Mertarvik Community Layout*** attached as ***Attachment C***, and as further delineated on the ***House Pad Locations Diagram*** attached as ***Attachment F***. The permitted use of such areas is limited to the use for the (i) location of house pads; (ii) location of driveways; (iii) surveying and marking lot corners; (iv) constructing gravel pads and driveways; (v) construction of homes; (vi) relocation of existing homes and prefabs to such areas; (vii) on-site utility placement; (viii) connection to off-site utilities; and (ix) such ancillary and similar uses as are necessary. In addition to the right to temporarily license such areas to the Council's Contractors as provided in Section 4, the Council is hereby authorized to also temporarily license such areas to home occupants, home building contractors, including AVCP regional Housing Authority and CCHRC, subject to the license requirements in Section 4.

(m) **Tribal Office.** The Corporation hereby leases to the Council the surface estate of the area identified for the location of the Tribal Office on the ***Mertarvik Community Layout*** attached as ***Attachment C***. The permitted use of such area is limited to use for the location and operation of the Tribal Office and such ancillary and similar uses as are necessary.

(n) **VPSO Office.** The Corporation hereby leases to the Council the surface estate of the area identified for the location of the VPSO Office on the ***Mertarvik Community Layout*** attached as ***Attachment C***. The permitted use of such area is limited to use for the location and operation of the VPSO Office and such ancillary and similar uses as are necessary.

(o) **Washateria.** The Corporation hereby leases to the Council the surface estate of the area identified for the location of the Washateria on the ***Mertarvik Community Layout*** attached as ***Attachment C***. The permitted use of such area is limited to use for the location and operation of the Washateria and such ancillary and similar uses as are necessary.

Section 4. Use of Premises. Subject to the terms and conditions of this Agreement, the Council and its Contractors shall use the Premises for the purposes identified in Section 3 and for other infrastructure and community needs. The Council is hereby authorized to temporarily license portions of the Premises (as identified by the Council) to the Council's Contractors for the necessary infrastructure design, engineering, construction, and repair work required for the relocation to Mertarvik, **provided, that**, prior to such licensing, the Council and its Contractors have in-place a written license agreement that (i) provides for the construction; (ii) identifies the location of the Premises to be temporarily licensed; (iii) provides for insurance and indemnity provisions (as set forth in Sections 9, 10, and 16 below) protecting the Corporation; (iv) provides that the Contractor agrees in writing to be subject to the terms and conditions of this Agreement; and (v) provides that necessary insurance certificates reflecting required coverage in favor of the Corporation are provided to the Corporation.

Section 5. Term. The term ("***Term***") of this Agreement shall commence on the Effective Date and continue for a period of ***Fifty-Five (55) years***, unless earlier terminated as provided in this Agreement. Unless both parties mutually agree in writing at least ***one-hundred eighty (180) days*** prior to the end of the then existing Term, the Term shall automatically be extended for successive additional ***Fifty-Five (55) years*** periods at the end of each then existing Term. All such extensions shall be deemed part of the Term for all purposes under this Agreement.

Section 6. Rent. Except for the payment for Rock as provided in Section 3(e), the rent payable under this Agreement shall be ***one-dollar (\$1)*** per year.

Section 7. Utilities. All costs for utilities and other services necessary for the operation of the Premises, improvements and infrastructure thereon, and the Council and its Contractors' activities thereon, shall be provided by the Council, at the Council's sole cost and expense. The Council shall be solely responsible, at the Council's sole cost and expense, for necessary utility installation, hook-ups, connection, operation, maintenance, and repairs. The Corporation shall have no responsibility or cost for providing any utilities or any necessary utility installation, hook-ups, connection, operation, maintenance, and repairs.

Section 8. Acceptance of Condition of the Premises; Title. The Council and its Contractors shall use the Premises as authorized by this Agreement, and operate and maintain the Premises, in a manner that does not cause any waste or nuisance, and in accordance with all state, federal, and local laws, rules, and regulations, including, but not limited to, environmental protection,

fire, health and safety laws, rules, and regulations. The Council hereby represents and warrants, which representations and warranties shall be continuing during the entire Term of this Agreement, that the Council and its Contractors' use of the Premises shall be in full compliance with all laws, regulations, and orders applicable thereto. The Council and/or its Contractors shall obtain and maintain at all times during the Term, at the Council's sole cost and expense, all necessary permits, licenses, approvals, and other governmental authorizations necessary or incidental to the Council and its Contractors' activities and operations on the Premises. The Council and its Contractors shall maintain and operate the Premises in a safe and orderly condition.

The Corporation shall have no obligation whatsoever to maintain or make safe the Premises during the Term of this Agreement. The Council accepts the Premises and the condition of the Premises **"AS IS, WITH ALL FAULTS"** and acknowledges and agrees that the Council and its Contractors have inspected the Premises and determined the suitability and condition of the Premises is acceptable for the Council and its Contractors' use and intended purposes, and the Corporation does not make and hereby disclaims any and all representations and warranties (whether express or implied) with respect to the condition of the Premises or the suitability of the Premises for the Council and its Contractors' intended use and purposes.

The rights granted under this Agreement are subject to the exclusions, exceptions, reservations, restrictions, covenants, terms and conditions contained in the Interim Conveyance which conveyed the real property subject to this Agreement from the United States to the Corporation, and to any subsequent patent which has been, or will be, issued to the Corporation from the United States.

Section 9. Indemnification: Generally. The Council and its Contractors assume all risk for the use of the Premises. The Council and its Contractors shall indemnify, defend and hold harmless the Corporation from and against any and all demands, claims, causes of action (whether in the nature of an action for damages, indemnity, contribution, government cost recovery or otherwise), lawsuits, settlements, actions, damages, fines, penalties, judgments, costs and expenses (including without limitation costs of defense, settlement, and reasonable attorney's fees), charges, forfeitures, liens, and liabilities and losses of any nature or kind whatsoever, including, but not limited to, personal injury, property damage and wrongful death (all of the foregoing collectively **"Claims"**), arising or resulting from, or in any way connected with or otherwise related to (i) any (A) negligent act; (B) negligent omission; or (C) violation of law arising out of the Council or its Contractors' use of the Premises; (ii) any death, bodily injury, or other damages to any person or property, including but not limited to damage to the Premises, or injury to or death of persons occurring in or about Premises arising out of or relating to the Council or its Contractors' use, access, or occupation of the Premises; or (iii) any breach of this Agreement by the Council or its Contractors, **provided, that,** nothing in this Agreement shall in any way constitute a waiver of sovereign immunity arising out of the Council's status as a federally recognized Indian Tribe with regards to any claim brought by a party other than the Corporation against either the Council or the Corporation. The Corporation shall indemnify, defend, and hold harmless the Council from and against any and all material Claims arising from any breach of this Agreement by the Corporation.

Section 10. Indemnification: Hazardous Materials. Without limiting the duty to indemnify as provided in Section 9, the Council and its Contractors shall defend, indemnify and hold

harmless the Corporation from any and all Claims which arise during or after the Term of this Agreement from or in connection with the presence or suspected presence of Hazardous Materials in the soil, groundwater, or otherwise on, above or in the Premises to the extent caused by the Council or its Contractors' use, operations or activities, provided, that, nothing in this Agreement shall in any way constitute a waiver of sovereign immunity arising out of the Council's status as a federally recognized Indian Tribe with regards to any claim brought by a party other than the Corporation against either the Council or the Corporation. This indemnification includes, without limitation, costs incurred in connection with any investigation of site conditions or any clean-up, remedial, removal, or restoration work required by any federal, state, or local government agency or political subdivision. As used in this Section 10, the term "**Hazardous Materials**" means any hazardous or toxic substance, material, or waste which is or becomes regulated by any governmental authority, the State of Alaska, or the United States Government. All the foregoing obligations to indemnify, defend and hold harmless in Sections 9 and 10 shall survive the expiration or early termination of this Agreement.

Section 11. Use, Occupancy and Care of the Premises. At all times during the Term hereof, the Council and its Contractors shall, at the Council's sole cost and expense:

- (a) keep the Premises and improvements constructed thereon clean, safe and orderly;
- (b) conduct activities upon and generally maintain the Premises and improvements in such a manner and with such care that injury to persons and damage to property does not result therefrom;
- (c) not use or permit any part of the Premises or improvements to be used for any unlawful or unauthorized purpose, nor perform, permit or suffer any act or omission upon or about the Premises or improvements which would result in a nuisance or a violation of any applicable laws, ordinances or regulations;
- (d) comply with local, state, federal and other governmental laws, statutes, ordinances, rules, orders, and regulations of whatever type and nature, including but not limited to, health, fire, safety and environmental laws and regulations which in any manner affect the Premises, improvements, or activities thereon;
- (e) comply with all requirements of the funding and grant agencies providing funds to the Council for the relocation; and
- (f) not cause or permit any waste, damage, or injury to the Premises or improvements.

Section 12. Maintenance and Repair. The Council covenants throughout the Term hereof, at the Council's sole cost and expense, to properly keep the Premises and improvements in good maintenance, repair, order, and condition. The Council acknowledges and agrees that the Corporation has no responsibility to maintain the Premises or improvements. Further, except as

provided in Section 3(h) or expressly provided elsewhere in this Agreement, all improvements constructed or brought on to the Premises by the Council or its Contractors (on behalf of the Council) shall be the sole property of the Council, unless expressly agreed otherwise in writing between the Council and Corporation.

Section 13. Access. The Corporation, Corporation's agents, employees, Directors, officers, and designees shall have the right to enter the Premises at all reasonable times to inspect the same, to post "Notices of Non-Responsibility," and to preserve and protect the Premises.

Section 14. Liens. The Council and its Contractors shall keep the Premises and any part thereof free from liens for labor or materials ordered or supplied upon the express or implied request of Council or its Contractors. Should any such lien be recorded, the Council shall forthwith and within *thirty (30) days* of learning of such recording cause the same to be cancelled and discharged of record, at the Council's sole cost and expense.

Section 15. Taxes and Assessments. The Council shall be responsible for and shall pay promptly when due any and all general, special, real property, income, sales, personal property, and possessory interest taxes and assessments, if any, levied against the Premises and/or the improvements thereon, or the use thereof.

Section 16. Insurance. Without limiting the Council's indemnification obligations above, the Council and its Contractors shall purchase, at each of their own expense, and maintain in force at all times during the Term of this Agreement, the following policies of insurance, naming the Corporation as an additional insured with respect to the commercial general liability and automobile liability insurance, *provided, that*, nothing in this Agreement shall in any way constitute a waiver of sovereign immunity arising out of the Council's status as a federally recognized Indian Tribe with regards to any claim brought by a party other than the Corporation against either the Council or the Corporation. A Certificate of Insurance must be furnished to the Corporation within *twenty (20) days* of the Effective Date (and be amended, as necessary, when Amendments are added to this Agreement), and must provide for a *30-day* prior notice of cancellation, non-renewal, or reduction in limit. Failure to furnish satisfactory evidence of insurance or lapse of the policy is a material breach of this Agreement and shall be grounds for termination of this Agreement. All insurance policies shall comply with, and be issued by insurers licensed to transact the business of insurance under Alaska state law. All Contractors of the Council shall also provide the insurance required by the contracts and agreements between such Contractors and the Council. All insurance required by this Section 16 shall be considered to be primary of any insurance carried by the Corporation. Nothing in this Section 16 is intended in any way to limit the insurance requirements imposed upon the Council's Contractors in any contracts and agreements with such Contractors, and any additional insurance or higher limits in such policies which cover the Corporation shall control in the event any lower limits are imposed by this Section 16. It shall be the Council's sole responsibility, if it so elects, to provide all-risk and casualty insurance on the Council's improvements and personal property.

(a) Worker's Compensation Insurance. The Council and its Contractors shall provide and maintain, for all employees engaged in work involving the Mertarvik relocation, coverage

as required by AS 23.30.045, and, where applicable, any other statutory obligations, including, but not limited to, Federal U.S.L & H. and Jones Act requirements.

(b) Commercial General Liability Insurance. The Council and its Contractors shall obtain commercial general liability insurance. This insurance shall protect against Claims which may arise under this Agreement and the Council's contract or agreement with the Contractor. Such policies shall provide minimum coverage limits of **\$1 million per occurrence/\$2 million annual aggregate**, which shall include, but not be limited to:

- Premises and Operations
- Independent Contractors
- Products/Completed Operations
- Owners and Contractors Protective
- Contractual (including coverage with respect to the indemnity requirements in this Agreement).

(c) Commercial Automobile Liability Insurance. The Council and its Contractors shall obtain commercial automobile liability insurance covering all vehicles used by Council or its Contractors in the performance of any work undertaken on the Premises, with minimum coverage limits of **\$300,000** combined single limit per occurrence.

Section 17. Notices. Any and all notices required or permitted under this Agreement, unless otherwise specified in writing by the party whose address is changed, shall be delivered to the addresses set forth above. Notice sent by mail shall be by first class, certified, return receipt requested mail, and deemed delivered upon receipt. Notice by personal delivery shall be deemed delivered upon such personal delivery.

Section 18. Default. The occurrence of the following shall constitute a default and breach of this Agreement by the Council: Violation or breach or failure to keep or perform any covenant, agreement, term or condition of this Agreement which shall continue or not be remedied within **thirty (30) days** after notice thereof is given by the Corporation to the Council specifying the matter or matters claimed to be in default. In the event of default, the Corporation shall have all such rights and remedies as are provided in this Agreement and which are available by law or in equity.

Section 19. Waiver of Sovereign Immunity. The Council hereby waives the Council's right to assert the defense of sovereign immunity with respect to any suit brought by the Corporation with respect to the enforcement of this Agreement in accordance with its terms, **provided, that,** nothing in this Agreement shall in any way constitute a waiver of sovereign immunity arising out of the Council's status as a federally recognized Indian Tribe with regards to any claim brought by a party other than the Corporation against either the Council or the Corporation.

Section 20. Attorneys' Fees, Costs and Expenses; Venue. In the event either party brings or commences legal proceedings to enforce any of the terms of this Agreement, the prevailing party in such action shall receive from the other, in every action commenced, reasonable attorney fees and costs. The Council and the Corporation consent to suit against each other in the Superior Court for the State of Alaska in Bethel, Alaska.

Section 21. Rights and Remedies. No right or remedy herein conferred upon or reserved to a party hereunder is intended to be exclusive of any other right or remedy, and such and every right and remedy shall be cumulative and in addition to any other right or remedy given hereunder, or now or hereafter existing at law or in equity or by statute.

Section 22. Assignment and Subletting. Except as provided in Section 4 with respect to the Council's ability to temporarily License portions of the Premises to the Council's Contractors for the necessary infrastructure design, engineering, construction, and repair work required for the relocation to Mertarvik, the Council shall not transfer, sublet, mortgage, pledge, encumber, or assign (collectively "**Transfer**") any of its rights under this Agreement, and any purported Transfer shall be null and void and of no force or effect.

Section 23. Waiver and Forbearance. No waiver shall be valid except in writing signed by both parties. No waiver by a party hereto of any breach by the other party of any of its obligations, agreements, or covenants hereunder shall be deemed to be a waiver of any subsequent breach of the same or any other covenant, agreement, or obligation. No forbearance by a party to seek a remedy for any breach of the other party shall be deemed a waiver by the first party of its rights or remedies with respect to such breach.

Section 24. Applicable Law. This Agreement shall be construed and enforced in accordance with the laws of the State of Alaska.

Section 25. No Partnership, Joint Venture, Etc. Nothing in this Agreement shall be intended or deemed to create a partnership, joint venture, corporation, limited liability company, association, or other similar relationship between the parties hereto.

Section 26. No Third-Party Beneficiaries. This Agreement does not create, and shall not be construed as creating, any rights enforceable by any person not a party to this Agreement.

Section 27. Severability. If any provision of this Agreement or any application thereof shall be held invalid, illegal or unenforceable, the remainder of this Agreement or any other application of such provision shall not be affected thereby.

Section 28. Authority. Each party covenants and agrees that (i) it has the full, complete, and absolute authority to enter into this Agreement; (ii) the Agreement has been duly authorized by its governing body; (iii) the Agreement is a binding and enforceable agreement of and against it in accordance with its terms; and (iv) the person executing the Agreement on such party's behalf is duly and properly authorized to do so.

Section 29. Headings. Title, section and paragraph headings used in this Agreement are for the convenience and reference of the parties only, and in no way define, limit, extend, or describe the scope of this Agreement or the intent of any of the provisions hereof.

Section 30. Construction. This Agreement has been negotiated by the parties

and their respective legal counsel, and the parties specifically agree that any legal or equitable principles that might require the construction of this Agreement or any provision of this Agreement against the party drafting shall not apply in any construction or interpretation of this Agreement.

Section 31. Miscellaneous Provisions.

(a) This Agreement constitutes all of the agreements and conditions made between the parties and may not be modified orally or in any manner other than by an agreement in writing signed by both parties. This Agreement replaces and supersedes in all respects any oral or written prior agreements between the parties regarding the subject matter hereof.

(b) Each term and such provision of this Agreement shall be construed to be both a covenant and a condition of this Agreement.

(c) Time is of the essence with respect to each term and provision of this Agreement.

(d) This Agreement and the Attachments, and all future Amendments, shall be recorded by the parties.

Section 32. Attachments. The following Attachments are attached to this Agreement:

Attachment A: *Land Exchange Legislation*
Attachment B: *Mertarvik Interim Conveyance*
Attachment C: *Mertarvik Community Layout*
Attachment D: *Diagram/Legal Description of Quarry Road*
Attachment E: *Diagram/Legal Description of Townsite Road*
Attachment F: *House Pad Location Diagram*

IN WITNESS WHEREOF, the undersigned have caused this Agreement to be executed effective as of the Effective Date.

COUNCIL:

NEWTOK VILLAGE

By: 

Paul Charles

Its: President

Date: 4/27/17

CORPORATION:

NEWTOK NATIVE CORPORATION

By: Jimmy Charles Jr

Jimmy Charles, Jr.

Its: President

Date: 4.27.17 JC

ACKNOWLEDGEMENTS

STATE OF ALASKA)

) ss:

THIRD JUDICIAL DISTRICT)

THIS IS TO CERTIFY that on the 27th day of April, 2017, before me, the undersigned, a Notary Public in and for the State of Alaska, personally appeared **JIMMY CHARLES, JR.**, to me known and known to me to be the **PRESIDENT** of **NEWTOK NATIVE CORPORATION**, the corporation named in the foregoing Real Property Master Site Control Agreement, and he acknowledged to me that he executed the foregoing Real Property Master Site Control Agreement on behalf of said corporation for the uses and purposes therein stated.



WITNESS my hand and notarial seal on the date and year in this certificate first above written.

Sherri Ballon
NOTARY PUBLIC in and for Alaska
My commission expires: 12-11-17

STATE OF ALASKA)

) ss:

THIRD JUDICIAL DISTRICT)

THIS IS TO CERTIFY that on the 27th day of April, 2017, before me, the undersigned, a Notary Public in and for the State of Alaska, personally appeared **PAUL CHARLES**, to me known and known to me to be the **PRESIDENT** of **NEWTOK VILLAGE**, the entity named in the foregoing Real Property Master Site Control Agreement, and he acknowledged to me that he executed the foregoing Real Property Master Site Control Agreement on behalf of said entity for the uses and purposes therein stated.



WITNESS my hand and notarial seal on the date and year in this certificate first above written.

Sherri Ballon
NOTARY PUBLIC in and for Alaska
My commission expires: 12-11-17

PUBLIC LAW 108-129—NOV. 17, 2003

ALASKAN NATIVE VILLAGE AND THE
INTERIOR DEPARTMENT LAND EXCHANGE

Attachment A

Public Law 108-129
108th Congress

An Act

Nov. 17, 2003
[S. 924]

To authorize the exchange of lands between an Alaska Native Village Corporation and the Department of the Interior, and for other purposes.

16 USC 668dd
note.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

SECTION 1. DEFINITIONS.

For the purposes of this Act, the term—

(1) “ANCSA” means the Alaska Native Claims Settlement Act (43 U.S.C. 1601 et seq.);

(2) “ANILCA” means the Alaska National Interest Lands Conservation Act (16 U.S.C. 3101 et seq.);

(3) “Calista” means the Calista Corporation, an Alaska Native Regional Corporation established pursuant to ANCSA;

(4) “Identified Lands” means approximately 10,943 acres of lands (including surface and subsurface estates) designated as “Proposed Village Site” on a map entitled “Proposed Newtok Exchange,” dated September, 2002, and available for inspection in the Anchorage office of the United States Fish and Wildlife Service;

(5) “limited warranty deed” means a warranty deed which is, with respect to its warranties, limited to that portion of the chain of title from the moment of conveyance from the United States to Newtok to and including the moment at which such title is validly reconveyed to the United States;

(6) “Newtok” means the Newtok Native Corporation, an Alaska Native Village Corporation established pursuant to ANCSA;

(7) “Newtok lands” means approximately 12,101 acres of surface estate comprising conveyed lands and selected lands identified as Aknerkochik on the map referred to in paragraph (4) and that surface estate selected by Newtok on Baird Inlet Island as shown on the map; and

(8) “Secretary” means the Secretary of the Interior.

SEC. 2. LANDS TO BE EXCHANGED.

(a) LANDS EXCHANGED TO THE UNITED STATES.—If, within 180 days after the date of enactment of this Act, Newtok expresses to the Secretary in writing its intent to enter into a land exchange with the United States, the Secretary shall accept from Newtok a valid, unencumbered conveyance, by limited warranty deed, of the Newtok lands previously conveyed to Newtok. The Secretary shall also accept from Newtok a relinquishment of irrevocable prioritized selections for approximately 4,956 acres for those validly selected lands not yet conveyed to Newtok.

(b) **LANDS EXCHANGED TO NEWTOK.**—In exchange for the Newtok lands conveyed and selections relinquished under subsection (a), the Secretary shall, subject to valid existing rights and notwithstanding section 14(f) of ANCSA, convey to Newtok the surface and subsurface estates of the Identified Lands. The conveyance shall be by interim conveyance. Subsequent to the interim conveyance, the Secretary shall survey Identified Lands at no cost to Newtok and issue a patent to the Identified Lands subject to the provisions of ANCSA and this Act.

SEC. 3. CONVEYANCE.

(a) **TIMING.**—The Secretary shall issue interim conveyances pursuant to subsection 2(b) at the earliest possible time after acceptance of the Newtok conveyance and relinquishment of selections under subsection 2(a).

(b) **RELATIONSHIP TO ANCSA.**—Lands conveyed to Newtok under this Act shall be treated as having been conveyed under the provisions of ANCSA, except that the provisions of 14(c) and 22g of ANCSA shall not apply to these lands. Consistent with section 103(c) of ANILCA, these lands shall not be included as a portion of the Yukon Delta National Wildlife Refuge and shall not be subject to regulations applicable solely to public lands within this Conservation System Unit.

(c) **EFFECT ON ENTITLEMENT.**—Except as otherwise provided, nothing in this Act shall be construed to change the total acreage of land to which Newtok is entitled under ANCSA.

(d) **EFFECT ON NEWTOK LANDS.**—The Newtok Lands shall be included in the Yukon Delta National Wildlife Refuge as of the date of acceptance of the conveyance of those lands from Newtok, except that residents of the Village of Newtok, Alaska, shall retain access rights to subsistence resources on those Newtok lands as guaranteed under section 811 of ANILCA (16 U.S.C. 3121), and to subsistence uses, such as traditional subsistence fishing, hunting and gathering, consistent with section 803 of ANILCA (16 U.S.C. 3113).

(e) **ADJUSTMENT TO CALISTA CORPORATION ANCSA ENTITLEMENT FOR RELINQUISHED NEWTOK SELECTIONS.**—To the extent that Calista subsurface rights are affected by this Act, Calista shall be entitled to an equivalent acreage of in lieu subsurface entitlement for the Newtok selections relinquished in the exchange as set forth in subsection 2(a) of this Act. This equivalent entitlement shall come from subsurface lands already selected by Calista, but which have not been conveyed. If Calista does not have sufficient subsurface selections to accommodate this additional entitlement, Calista Corporation is hereby authorized to make an additional in lieu selection for the deficient acreage from lands within the region but outside any conservation system unit.

(f) ADJUSTMENT TO EXCHANGE.—If requested by Newtok, the Secretary may consider and make adjustments to the exchange to meet the purposes of this Act, subject to all the same terms and conditions of this Act.

Approved November 17, 2003.

LEGISLATIVE HISTORY—S. 924:

HOUSE REPORTS: No. 108-345 (Comm. on Resources).

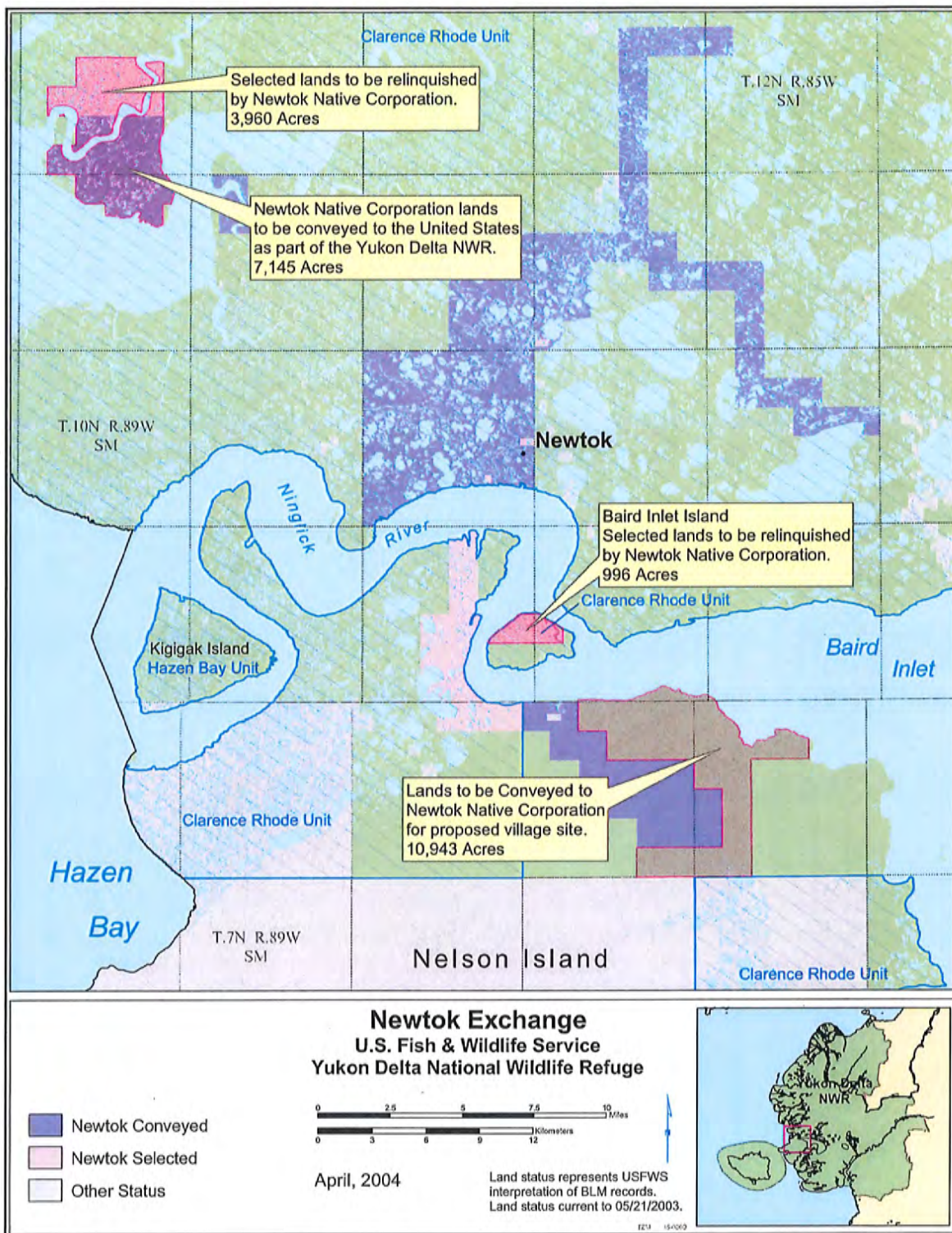
SENATE REPORTS: No. 108-97 (Comm. on Energy and Natural Resources).

CONGRESSIONAL RECORD, Vol. 149 (2003):

July 17, considered and passed Senate.

Nov. 4, considered and passed House.







2004-000727-0

Recording Dist: 402 - Bethel
5/17/2004 1:24 PM Pages: 1 of 3

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The United States of America

Interim Conveyance

AA-85363

This Interim Conveyance is issued by the UNITED STATES, Department of the Interior, Bureau of Land Management, 222 West Seventh Avenue, #13, Anchorage, Alaska 99513-7599, as GRANTOR, to Newtok Native Corporation, P.O. Box 5528, Newtok, Alaska, 99559, as GRANTEE, for lands in the Bethel Recording District.

WHEREAS

Newtok Native Corporation

is entitled to a conveyance pursuant to the Alaskan Native Village and the Interior Department Land Exchange Act of November 17, 2003, Pub. L. 108-129, 117 Stat. 1358, of the surface and subsurface estates in the following-described lands, designated as Proposed Village Site on the map entitled Proposed Newtok Exchange, dated September 2002, referenced in the Act:

Seward Meridian, Alaska

T. 9 N., R. 85 W.,
That portion of Nelson Island lying within:

Sec. 31.

Containing approximately 0 acres.

T. 8 N., R. 86 W.,
Those portions of Nelson Island lying within:

Secs. 3 to 10, inclusive;
Secs. 17 and 18;
Secs. 20 and 29;
Secs. 31 and 32.

Interim Conveyance No. _____

1876

Page 1 of 3

Attachment B

Containing approximately 5,563 acres.

T. 9 N., R. 86 W.,
Those portions of Nelson Island lying within:

Secs. 32 to 36, inclusive.

Containing approximately 70 acres.

T. 8 N., R. 87 W.,
Those portions of Nelson Island lying within:

Secs. 1 to 4, inclusive;
Secs. 10, 11, and 12;
Secs. 35 and 36.

Containing approximately 5,310 acres.

Aggregating approximately 10,943 acres.

Excluded from the above-described lands herein conveyed are the submerged lands, if any, up to the ordinary high water mark, beneath rivers or streams 3 chains wide (198 feet) and wider, and lakes 50 acres in size and larger, which are meanderable according to the 1973 Bureau of Land Management *Manual of Surveying Instructions*, as modified by Departmental regulation 43 CFR § 2650.5-1, and navigable waters, if any, of lesser size. These submerged lands will be identified at the time of survey. Also excluded from the above-described lands herein conveyed are lands covered by tidal waters up to the line of mean high tide. The actual limits of tidal influence for those water bodies, if any, will be determined at the time of survey.

NOW KNOW YE, that there is, therefore, granted by the UNITED STATES OF AMERICA, unto the above-named corporation the surface and subsurface estates in the lands above described; TO HAVE AND TO HOLD the said lands with all the rights, privileges, immunities, and appurtenances, of whatsoever nature, thereunto belonging, unto the said corporation, its successors and assigns, forever.

THE GRANT OF THE ABOVE-DESCRIBED LANDS IS SUBJECT TO:

1. Issuance of a patent after approval and filing by the Bureau of Land Management of the official plat of survey confirming the boundary description and acreage of the lands hereinabove granted;

Interim Conveyance No. _____

1876

Page 2 of 3



2 of 3


2004-000727-0

2. The provisions, conditions, and limitations of the Alaskan Native Village and the Interior Department Land Exchange Act of November 17, 2003, 117 Stat. 1358; and
3. Valid existing rights therein, if any.

IN WITNESS WHEREOF, the Secretary of the Interior has, in the name of the United States, set her hand and caused the seal of the Bureau of Land Management to be hereunto affixed on this 28th day of April, 2004, in Anchorage, Alaska.



UNITED STATES OF AMERICA


Gale A. Norton
Secretary of the Interior

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Interim Conveyance No. _____

1876

Page 3 of 3



3 of 3
2004-000727-0

APPENDIX E

Newtok PCE Data Fiscal Year 2012 - 2016

Newtok PCE

Utility: UNGUSRAQ POWER COMPANY

Reporting Period: 07/01/15..06/30/16

Community Population	380
Last Reported Month	June
No. of Monthly Payments Made	12
Residential Customers	71
Community Facility Customers	3
Other Customers (Non-PCE)	25



Fiscal Year PCE Payments **\$136,125**

PCE Statistical Data			
PCE Eligible kWh - Residential Customers	257,831	Average Annual PCE Payment per Eligible Customer	\$1,840
PCE Eligible kWh - Community Facility Customers	29,251	Average PCE Payment per Eligible kWh	\$0.47
<i>Total PCE Eligible kWh</i>	<i>287,082</i>	Last Reported Residential Rate Charged (based on 500 kWh)	\$0.80
Average Monthly PCE Eligible kWh per Residential Customer	303	Last Reported PCE Level (per kWh)	\$0.44
Average Monthly PCE Eligible kWh per Community Facility Customer	813	Effective Residential Rate (per kWh)	\$0.36
Average Monthly PCE Eligible Community Facility kWh per Person	6	PCE Eligible kWh vs Total kWh Sold	67.9%

Additional Statistical Data Reported by Community*			
Generated and Purchased kWh		Generation Costs	
Diesel kWh Generated	476,848	Fuel Used (Gallons)	41,839
Non-Diesel kWh Generated	0	Fuel Cost	\$137,869
Purchased kWh	0	Average Price of Fuel	\$3.30
<i>Total Purchased & Generated</i>	<i>476,848</i>	Fuel Cost per kWh sold	\$0.33
		Annual Non-Fuel Expenses	\$152,492
		Non-Fuel Expense per kWh Sold	\$0.36
		Total Expense per kWh Sold	\$0.69

Consumed and Sold kWh		Efficiency and Line Loss	
Residential kWh Sold	272,301	Consumed vs Generated (kWh Sold vs Generated-Purchased)	88.6%
Community Facility kWh Sold	29,251	Line Loss (%)	10.5%
Other kWh Sold (Non-PCE)	121,023	Fuel Efficiency (kWh per Gallon of Diesel)	11.40
<i>Total kWh Sold</i>	<i>422,575</i>	PH Consumption as % of Generation	0.9%
Powerhouse (PH) Consumption kWh	4,435		
<i>Total kWh Sold & PH Consumption</i>	<i>427,010</i>		

Comments

**The data contained in this report is primarily based on information submitted by the utility with their monthly PCE reports. Changes to the reported data and/or significant anomalies have been noted in the comments.*

Newtok PCE

Utility: UNGUSRAQ POWER COMPANY

Reporting Period: 07/01/14..06/30/15

Community Population	400
Last Reported Month	June
No. of Monthly Payments Made	12
Residential Customers	68
Community Facility Customers	3
Other Customers (Non-PCE)	25
Fiscal Year PCE Payments	\$161,156



PCE Statistical Data			
PCE Eligible kWh - Residential Customers	252,251	Average Annual PCE Payment per Eligible Customer	\$2,270
PCE Eligible kWh - Community Facility Customers	33,270	Average PCE Payment per Eligible kWh	\$0.56
<i>Total PCE Eligible kWh</i>	<i>285,521</i>	Last Reported Residential Rate Charged (based on 500 kWh)	\$0.80
Average Monthly PCE Eligible kWh per Residential Customer	309	Last Reported PCE Level (per kWh)	\$0.56
Average Monthly PCE Eligible kWh per Community Facility Customer	924	Effective Residential Rate (per kWh)	\$0.24
Average Monthly PCE Eligible Community Facility kWh per person	7	PCE Eligible kWh vs Total kWh Sold	67.3%

Additional Statistical Data Reported by Community*			
Generated and Purchased kWh		Generation Costs	
Diesel kWh Generated	442,280	Fuel Used (Gallons)	44,743
Non-Diesel kWh Generated	0	Fuel Cost	\$173,896
Purchased kWh	0	Average Price of Fuel	\$3.89
<i>Total Purchased & Generated</i>	<i>442,280</i>	Fuel Cost per kWh sold	\$0.41
		Annual Non-Fuel Expenses	\$160,646
		Non-Fuel Expense per kWh sold	\$0.38
		Total Expense per kWh sold	\$0.79

Consumed and Sold kWh		Efficiency and Line Loss	
Residential kWh Sold	267,789	Consumed vs Generated (kWh Sold vs Generated-Purchased)	95.9%
Community Facility kWh Sold	33,270	Line Loss (%)	2.7%
Other kWh Sold (Non-PCE)	123,081	Fuel Efficiency (kWh per gallon of diesel)	9.88
<i>Total kWh Sold</i>	<i>424,140</i>	PH Consumption as % of generation	1.4%
Powerhouse (PH) Consumption kWh	6,132		
<i>Total kWh Sold & PH Consumption</i>	<i>430,272</i>		

Comments

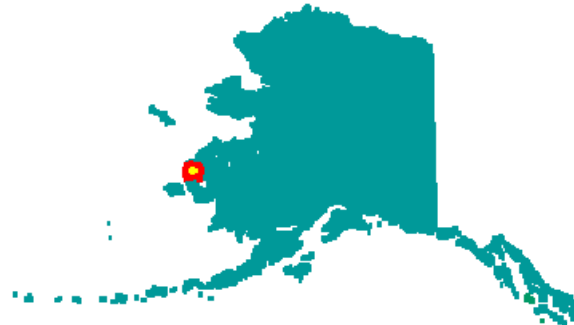
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Newtok PCE

Utility: UNGUSRAQ POWER COMPANY

Reporting Period: 07/01/13..06/30/14

Community Population	377
Last Reported Month	June
No. of Monthly Payments Made	12
Residential Customers	68
Community Facility Customers	3
Other Customers (Non-PCE)	25
Fiscal Year PCE Payments	\$164,276



PCE Statistical Data			
PCE Eligible kWh - Residential Customers	252,423	Average Annual PCE Payment per Eligible Customer	\$2,314
PCE Eligible kWh - Community Facility Customers	33,101	Average PCE Payment per Eligible kWh	\$0.58
<i>Total PCE Eligible kWh</i>	<i>285,524</i>	Last Reported Residential Rate Charged (based on 500 kWh)	\$0.80
Average Monthly PCE Eligible kWh per Residential Customer	309	Last Reported PCE Level (per kWh)	\$0.57
Average Monthly PCE Eligible kWh per Community Facility Customer	919	Effective Residential Rate (per kWh)	\$0.23
Average Monthly PCE Eligible Community Facility kWh per person	7	PCE Eligible kWh vs Total kWh Sold	67.2%

Additional Statistical Data Reported by Community*			
Generated and Purchased kWh		Generation Costs	
Diesel kWh Generated	446,009	Fuel Used (Gallons)	44,165
Non-Diesel kWh Generated	0	Fuel Cost	\$177,209
Purchased kWh	0	Average Price of Fuel	\$4.01
<i>Total Purchased & Generated</i>	<i>446,009</i>	Fuel Cost per kWh sold	\$0.42
		Annual Non-Fuel Expenses	\$146,654
		Non-Fuel Expense per kWh sold	\$0.35
		Total Expense per kWh sold	\$0.76

Consumed and Sold kWh		Efficiency and Line Loss	
Residential kWh Sold	272,602	Consumed vs Generated (kWh Sold vs Generated-Purchased)	95.3%
Community Facility kWh Sold	33,101	Line Loss (%)	3.3%
Other kWh Sold (Non-PCE)	119,141	Fuel Efficiency (kWh per gallon of diesel)	10.10
<i>Total kWh Sold</i>	<i>424,844</i>	PH Consumption as % of generation	1.4%
Powerhouse (PH) Consumption kWh	6,380		
<i>Total kWh Sold & PH Consumption</i>	<i>431,224</i>		

Comments

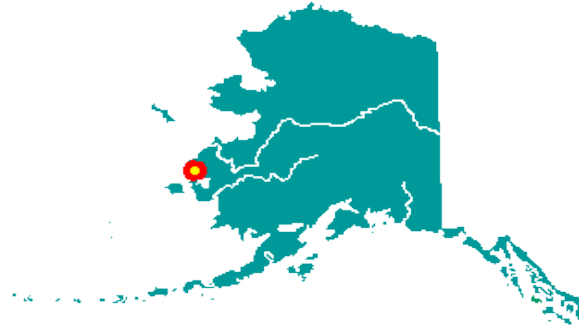
**The data contained in this report is primarily based on information submitted by the utility with their monthly PCE reports. Changes to the reported data and/or significant anomalies have been noted in the comments.*

Newtok PCE

Utility: UNGUSRAQ POWER COMPANY

Reporting Period: 07/01/12..06/30/13

Community Population	370
Last Reported Month	June
No. of Monthly Payments Made	12
Residential Customers	66
Community Facility Customers	3
Other Customers (Non-PCE)	23



Fiscal Year PCE Payments **\$174,283**

PCE Statistical Data			
PCE Eligible kWh - Residential Customers	253,549	Average Annual PCE Payment per Eligible Customer	\$2,526
PCE Eligible kWh - Community Facility Customers	33,438	Average PCE Payment per Eligible kWh	\$0.61
<i>Total PCE Eligible kWh</i>	<i>286,987</i>	Last Reported Residential Rate Charged (based on 500 kWh)	\$0.80
Average Monthly PCE Eligible kWh per Residential Customer	320	Last Reported PCE Level (per kWh)	\$0.62
Average Monthly PCE Eligible kWh per Community Facility Customer	929	Effective Residential Rate (per kWh)	\$0.18
Average Monthly PCE Eligible Community Facility kWh per person	8	PCE Eligible kWh vs Total kWh Sold	64.0%

Additional Statistical Data Reported by Community*			
Generated and Purchased kWh		Generation Costs	
Diesel kWh Generated	462,408	Fuel Used (Gallons)	42,851
Non-Diesel kWh Generated	0	Fuel Cost	\$192,650
Purchased kWh	0	Average Price of Fuel	\$4.50
<i>Total Purchased & Generated</i>	<i>462,408</i>	Fuel Cost per kWh sold	\$0.43
		Annual Non-Fuel Expenses	\$152,169
		Non-Fuel Expense per kWh sold	\$0.34
		Total Expense per kWh sold	\$0.77

Consumed and Sold kWh		Efficiency and Line Loss	
Residential kWh Sold	276,720	Consumed vs Generated (kWh Sold vs Generated-Purchased)	97.0%
Community Facility kWh Sold	34,057	Line Loss (%)	2.3%
Other kWh Sold (Non-PCE)	137,729	Fuel Efficiency (kWh per gallon of diesel)	10.79
<i>Total kWh Sold</i>	<i>448,506</i>	PH Consumption as % of generation	0.7%
Powerhouse (PH) Consumption kWh	3,462		
<i>Total kWh Sold & PH Consumption</i>	<i>451,968</i>		

Comments

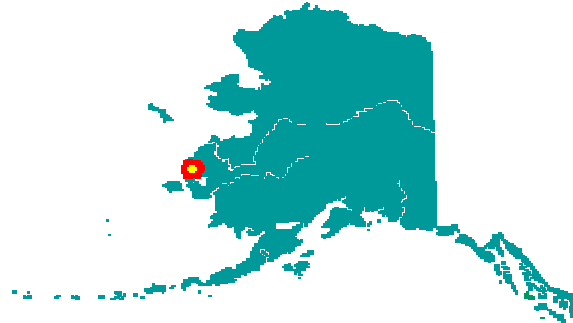
**The data contained in this report is primarily based on information submitted by the utility with their monthly PCE reports. Changes to the reported data and/or significant anomalies have been noted in the comments.*

Newtok PCE

Utility: UNGUSRAQ POWER COMPANY

Reporting Period: 07/01/11..06/30/12

Community Population	354
Last Reported Month	June
No. of Monthly Payments Made	12
Residential Customers	66
Community Facility Customers	3
Other Customers (Non-PCE)	23
Fiscal Year PCE Payments	\$143,685



PCE Statistical Data			
PCE Eligible kWh - Residential Customers	243,114	Average Annual PCE Payment per Eligible Customer	\$2,082
PCE Eligible kWh - Community Facility Customers	36,173	Average PCE Payment per Eligible kWh	\$0.51
<i>Total PCE Eligible kWh</i>	<i>279,287</i>	Last Reported Residential Rate Charged (based on 500 kWh)	\$0.80
Average Monthly PCE Eligible kWh per Residential Customer	307	Last Reported PCE Level (per kWh)	\$0.56
Average Monthly PCE Eligible kWh per Community Facility Customer	1,005	Effective Residential Rate (per kWh)	\$0.24
Average Monthly PCE Eligible Community Facility kWh per person	9	PCE Eligible kWh vs Total kWh Sold	64.5%

Additional Statistical Data Reported by Community*			
Generated and Purchased kWh		Generation Costs	
Diesel kWh Generated	497,892	Fuel Used (Gallons)	44,253
Non-Diesel kWh Generated	0	Fuel Cost	\$180,849
Purchased kWh	0	Average Price of Fuel	\$4.09
<i>Total Purchased & Generated</i>	<i>497,892</i>	Annual Non-Fuel Expenses	\$160,848
		Non-Fuel Expense per kWh sold	\$0.37

Consumed and Sold kWh		Efficiency and Line Loss	
Residential kWh Sold	262,020	Consumed vs Generated (kWh Sold vs Generated-Purchased)	87.0%
Community Facility kWh Sold	36,173	Line Loss (%)	11.8%
Other kWh Sold (Non-PCE)	134,736	Fuel Efficiency (kWh per gallon of diesel)	11.25
<i>Total kWh Sold</i>	<i>432,929</i>		
Powerhouse (PH) Consumption kWh	6,140		
<i>Total kWh Sold & PH Consumption</i>	<i>439,069</i>		

Comments

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APPENDIX F

Golder Preliminary Test Hole Information

BULK FUEL FARM BORINGS N-E		
#	NORTHING	EASTING
F1	2494843.64	1905914.28
F2	2494778.16	1905965.67
F3	2494913.08	1906002.98
F4	2494849.91	1906058.62
F5	2494986.76	1906092.15
F6	2494918.24	1906145.83

POWER PLANT BORINGS N-E		
#	NORTHING	EASTING
P1	2495089.17	1907377.83
P2	2495117.04	1907472.60
P3	2495186.52	1907491.96
P4	2495139.73	1907504.86
P5	2495137.58	1907535.69
P6	2495108.21	1907513.94



Division of Environmental
Health and Engineering
4500 Diplomacy Drive
Anchorage, Alaska 99508
(907) 729-3600

0 1"

BAR IS ONE INCH ON
ORIGINAL DRAWING, IF NOT
ADJUST SCALES ACCORDINGLY

MERTARVIK, AK
COMMUNITY LAYOUT
FINAL

MRK	DATE	DESCRIPTION	INIT

PLAN SET: MTV-17-000
PROJ MGR: GND
PROJ ENG: JEH
DRUMS ENG: ----
DRAWN BY: ----

SHEET TITLE

BULK FUEL FARM AND
POWER PLANT
GEOTECHNICAL MAPS

R-103

SHEET ---- OF ----

D

C

B

A

A1 BULK FUEL FARM GEOTECHNICAL BORING PLAN

1" = 30'

0 30' 60'

C1 POWER PLANT GEOTECHNICAL BORING PLAN

1" = 30'

0 30' 60'



Mertarvik Geotechnical Program – Power Plant Site

PHOTO 1

Borehole G17-P1



PHOTO 2

Borehole G17-P2





PHOTO 3

Borehole G17-P1, silty sand, sample at 5 feet



PHOTO 4

Borehole G17-P1, frozen silty sand, sample at 10 feet





PHOTO 5

Borehole G17-P3, frozen
silty sand, sample at 15 feet



PHOTO 6

Borehole G17-P4, frozen
silty sand, trace gravel,
sample at 20 feet





PHOTO 7

Borehole G17-P4, gravel
with sand, sample at 35 feet



PHOTO 8

Borehole G17-P5, frozen
silty sand, sample at 15 feet





Mertarvik Geotechnical Program – Fuel Farm Site

PHOTO 1

Borehole G17-F1



PHOTO 2

Borehole G17-F3





PHOTO 3

Borehole G17-F4

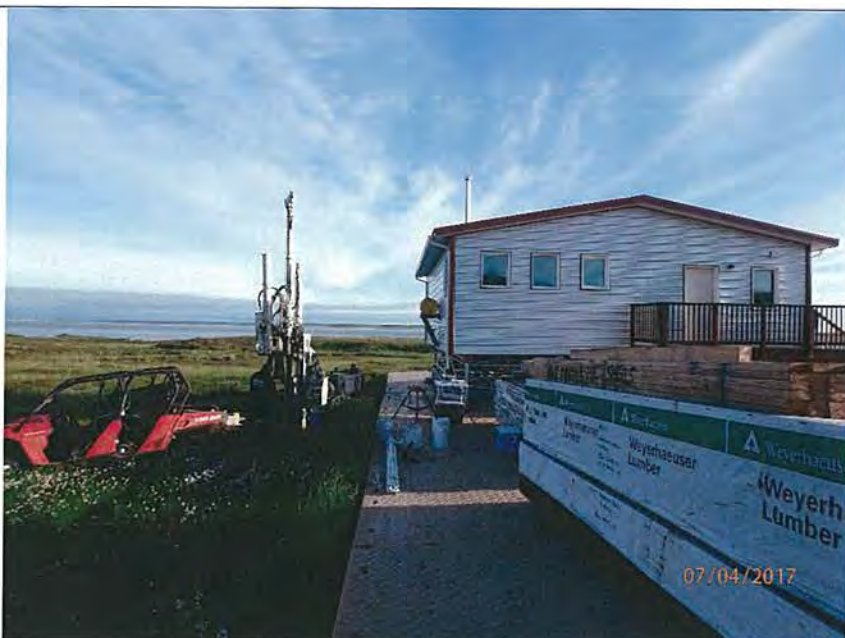


PHOTO 4

Borehole G17-F5



**PHOTO 5**

Borehole G17-F5, frozen silty sand with ice lenses and trace organic material, sample at 7.5 feet

**PHOTO 6**

Borehole G17-F5, frozen silt with ice lenses, sample at 20 feet



**PHOTO 7**

Borehole G17-F6, frozen silt with ice lenses, sample at 10 feet

**PHOTO 8**

Borehole G17-F2, frozen silt with ice, sample at 15 feet



**PHOTO 9**

Borehole G17-F4, frozen silt with ice lenses, sample at 5 feet

**PHOTO 10**

Borehole G17-F4, fractured bedrock, sample at 18 feet





PHOTO 9

Borehole G17-P5, silty sand with gravel, sample at 35 feet



PHOTO 10

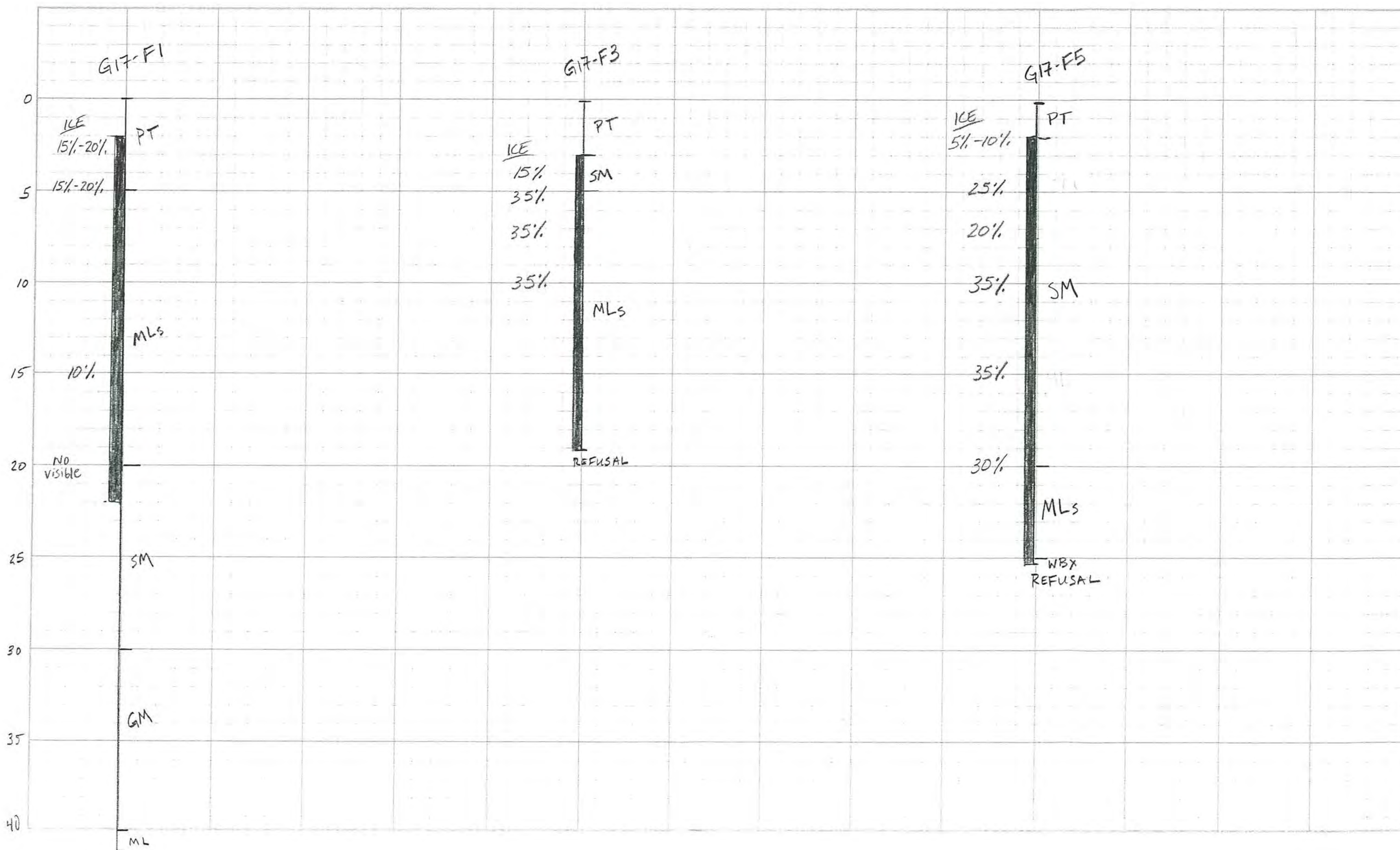
Borehole G17-P6, frozen silty sand, sample at 25 feet





SUBJECT <i>Mertarvik Geotech, Fuel Farm</i>		
Job No.	Made by	Date
<i>1775079</i>	<i>BBS</i>	<i>7/12/17</i>
	Reviewed	Sheet <i>2</i> of <i>2</i>

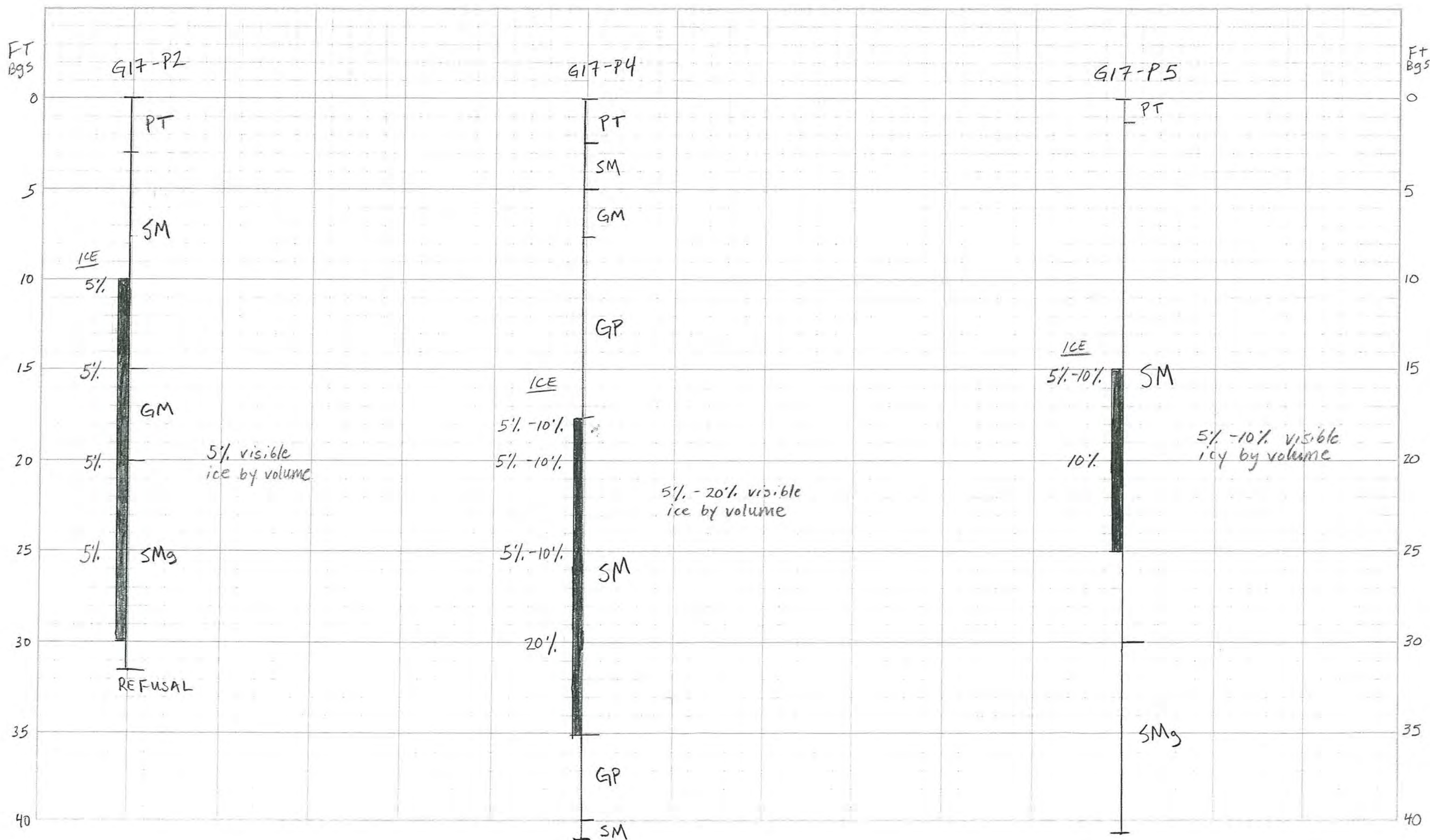
Section A - A'





SUBJECT Mertarvik Geotech, Power Plant		
Job No.	Made by	Date
1775079	BBS	7/12/17
	Reviewed	Sheet 1 of 3

Section C-C'



APPENDIX G

Heat Recovery Analysis

Est. Annual Fuel Savings (Gallons):19,707

Fuel heat value: 134000 Btu/gal (based on #1 arctic diesel fuel)

Heat rate at kw-load above	0	3417	Btu/kwh
Heat rate at kw-load above	26	3417	Btu/kwh
Heat rate at kw-load above	52	3417	Btu/kwh
Heat rate at kw-load above	78	3417	Btu/kwh
Heat rate at kw-load above	104	3417	Btu/kwh
Heat rate at kw-load above	131	3417	Btu/kwh
Heat rate at kw-load above	157	3417	Btu/kwh
Heat rate at kw-load above	183	3417	Btu/kwh
Heat rate at kw-load above	209	3417	Btu/kwh
Heat rate at kw-load above	235	3417	Btu/kwh
Heat rate at kw-load above	261	3417	Btu/kwh

Plant piping:	1218	Btu/hr.	Approx. 60 LF 3" Insulated Power Plant Cooling System Piping
Buried Arctic piping:		Btu/hr.	See Exterior Piping below
Genset Eng. Preheat:	3412	Btu/hr.	Assume 1 kW lost for engine pre-heat
Total constant:	4630	Btu/hr.	

Exterior piping:	793 Btu/hr.xF	from piping loss tab
Plant heating:	35 Btu/hr.xF	Plant Control Room Heat
Radiator losses:	50 Btu/hr.xF	Estimate for radiator losses

January	98408
February	84577
March	88870
April	104928
May	81749
June	73626
July	67165
August	85105
September	95832
October	95510
November	102097
December	110742

	1640
	1563
	1597
	1279
	964
	676
	515
	477
	591
	946
	1190
	1593

Month	kWh Gen	Fuel Used
July	67165	5607
August	85105	6963
September	95832	8235
October	95510	7984
November	102097	8537
December	110742	9242
January	98408	7959
February	84577	5656
March	88870	7030
April	104928	8421
May	81749	6981
June	73626	6793
Total:	1088609	89408

- 1) kWh Generated & Fuel Used Based on Akiak PCE Data.
- 2) Not Used
- 3) Heat rate of marine JD engine

Oct thru Apr HDD:	9808
Avg Winter Temp:	19

[illegible]

BUILDING HEAT DEMAND VARIATION			ELECTRIC POWER PRODUCTION VARIATION														
Winter	Summer	Hour:	January	February	March	April	May	June	July	August	September	October	November	December			
0.049	0.049	1	0.038	0.038	0.038	0.038	0.040	0.040	0.040	0.040	0.040	0.040	0.038	0.038			
0.048	0.048	2	0.036	0.036	0.036	0.036	0.037	0.037	0.037	0.037	0.037	0.037	0.036	0.036			
0.046	0.046	3	0.034	0.034	0.034	0.034	0.035	0.035	0.035	0.035	0.035	0.035	0.034	0.034			
0.044	0.044	4	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034			
0.043	0.043	5	0.033	0.033	0.033	0.033	0.034	0.034	0.034	0.034	0.034	0.034	0.033	0.033			
0.041	0.041	6	0.034	0.034	0.034	0.034	0.037	0.037	0.037	0.037	0.037	0.037	0.034	0.034			
0.040	0.040	7	0.038	0.038	0.038	0.038	0.037	0.037	0.037	0.037	0.037	0.037	0.038	0.038			
0.039	0.039	8	0.042	0.042	0.042	0.042	0.039	0.039	0.039	0.039	0.039	0.039	0.042	0.042			
0.038	0.038	9	0.042	0.042	0.042	0.042	0.043	0.043	0.043	0.043	0.043	0.043	0.042	0.042			
0.038	0.038	10	0.047	0.047	0.047	0.047	0.046	0.046	0.046	0.046	0.046	0.046	0.047	0.047			
0.037	0.037	11	0.048	0.048	0.048	0.048	0.039	0.039	0.039	0.039	0.039	0.039	0.048	0.048			
0.037	0.037	12	0.047	0.047	0.047	0.047	0.047	0.047	0.047	0.047	0.047	0.047	0.047	0.047			
0.037	0.037	13	0.045	0.045	0.045	0.045	0.048	0.048	0.048	0.048	0.048	0.048	0.045	0.045			
0.037	0.037	14	0.047	0.047	0.047	0.047	0.049	0.049	0.049	0.049	0.049	0.049	0.047	0.047			
0.037	0.037	15	0.048	0.048	0.048	0.048	0.048	0.048	0.048	0.048	0.048	0.048	0.048	0.048			
0.038	0.038	16	0.048	0.048	0.048	0.048	0.048	0.048	0.048	0.048	0.048	0.048	0.048	0.048			
0.039	0.039	17	0.049	0.049	0.049	0.049	0.044	0.044	0.044	0.044	0.044	0.044	0.049	0.049			
0.040	0.040	18	0.046	0.046	0.046	0.046	0.047	0.047	0.047	0.047	0.047	0.047	0.046	0.046			
0.041	0.041	19	0.043	0.043	0.043	0.043	0.046	0.046	0.046	0.046	0.046	0.046	0.043	0.043			
0.043	0.043	20	0.038	0.038	0.038	0.038	0.042	0.042	0.042	0.042	0.042	0.042	0.038	0.038			
0.044	0.044	21	0.038	0.038	0.038	0.038	0.040	0.040	0.040	0.040	0.040	0.040	0.038	0.038			
0.046	0.046	22	0.041	0.041	0.041	0.041	0.039	0.039	0.039	0.039	0.039	0.039	0.041	0.041			
0.048	0.048	23	0.044	0.044	0.044	0.044	0.040	0.040	0.040	0.040	0.040	0.040	0.044	0.044			
0.049	0.049	24	0.040	0.040	0.040	0.040	0.041	0.041	0.041	0.041	0.041	0.041	0.040	0.040			
			Days:	31	28	31	30	31	30	31	31	30	31	30	31	Year Total:	
			HDD:	1640	1563	1597	1279	964	676	515	477	591	946	1190	1593	13031	HDD
			kwh:	98408	84577	88870	104928	81749	73626	67165	85105	95832	95510	102097	110742	1088609	kWh
			Av kW	132	126	119	146	110	102	90	114	133	128	142	149	124	avg/mo
Power year factor	1	Building heat-use per month, MBH (Boiler Output)															
Year no.	0	57335	54643	55831	44714	33702	23633	18004	16676	20661	33072	41603	55691	455565			
Seasonal consumption, gls.:	25450	57335	54643	55831	44714	33702	23633	18004	16676	20661	33072	41603	55691	455565			
Non-seasonal consump.,gls.:	0	21500	20491	20937	16768	12638	8862	6752	6253	7748	12402	15601	20884	170837			
Compound boiler efficiency:	0.85	57335	54643	55831	44714	33702	23633	18004	16676	20661	33072	41603	55691	455565			
		21500	20491	20937	16768	12638	8862	6752	6253	7748	12402	15601	20884	170837			
		21500	20491	20937	16768	12638	8862	6752	6253	7748	12402	15601	20884	170837			
		21500	20491	20937	16768	12638	8862	6752	6253	7748	12402	15601	20884	170837			
		28667	27321	27916	22357	16851	11817	9002	8338	10331	16536	20801	27846	227783			
		43001	40982	41873	33535	25276	17725	13503	12507	15496	24804	31202	41769	341674			
		35117	33469	34197	27387	20642	14475	11028	10214	12655	20257	25482	34111	279034			
		364791	347664	355226	284493	214426	150365	114553	106101	131458	210422	264696	354337	2898533			
Total Boiler Input (Gal/mo):		3203	3052	3119	2498	1883	1320	1006	932	1154	1847	2324	3111	25448	Gal		
Recovered Heat available per hour by month, MBH (after subtracting System Losses from page 1)																	

	January	February	March	April	May	June	July	August	September	October	November	December	
1	273	250	234	324	240	222	188	269	326	301	314	326	
2	251	229	214	300	213	197	166	240	293	270	291	301	
3	229	209	195	276	195	181	151	222	272	248	267	277	
4	229	209	195	276	186	172	144	212	261	238	267	277	
5	218	198	185	264	186	172	144	212	261	238	256	265	
6	229	209	195	276	213	197	166	240	293	270	267	277	
7	273	250	234	324	213	197	166	240	293	270	314	326	
8	316	291	273	371	231	214	181	259	315	291	360	374	
9	316	291	273	371	267	248	211	297	359	333	360	374	
10	370	343	322	431	294	273	233	325	392	364	419	435	
11	381	353	332	443	231	214	181	259	315	291	430	448	
12	370	343	322	431	303	281	240	334	403	375	419	435	
13	348	322	302	407	312	290	248	344	413	385	395	411	
14	370	343	322	431	321	298	255	353	424	396	419	435	
15	381	353	332	443	312	290	248	344	413	385	430	448	
16	381	353	332	443	312	290	248	344	413	385	430	448	
17	392	364	342	455	276	256	218	306	370	343	442	460	
18	359	333	312	419	303	281	240	334	403	375	407	423	
19	327	302	283	383	294	273	233	325	392	364	372	387	
20	273	250	234	324	258	239	203	287	348	322	314	326	
21	273	250	234	324	240	222	188	269	326	301	314	326	
22	305	281	263	359	231	214	181	259	315	291	349	362	
23	338	312	293	395	240	222	188	269	326	301	384	399	
24	294	271	253	347	249	231	196	278	337	312	337	350	Year Total:
	232376	193447	200691	264500	189700	170251	149331	211433	247920	237101	256702	275512	2628963 MBH
Equivalent Boiler Input (Gal/mo):	2040	1698	1762	2322	1666	1495	1311	1856	2177	2082	2254	2419	23081 Gal

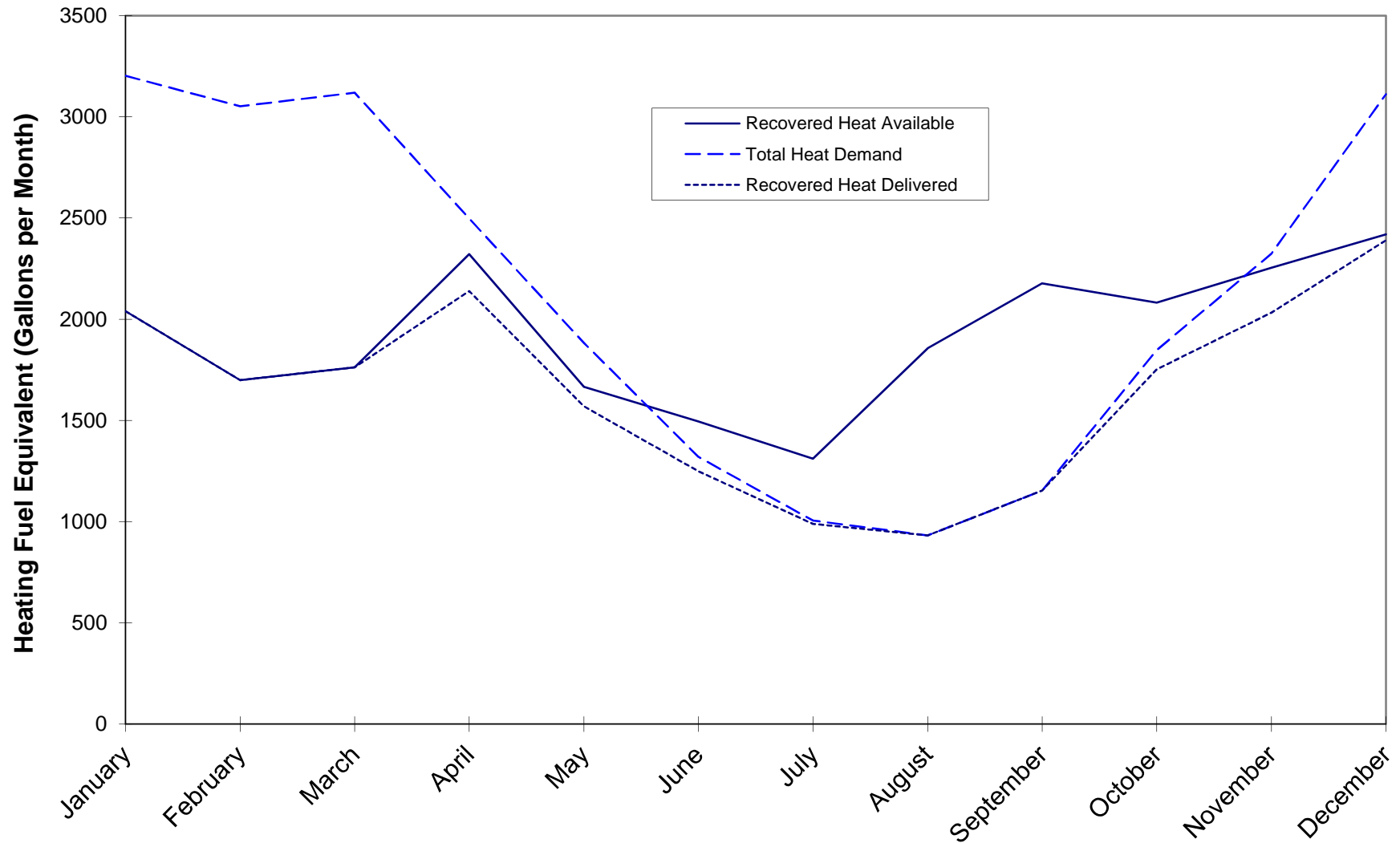
Average Heat demand per hour by month, MBH (total for all Bldgs)

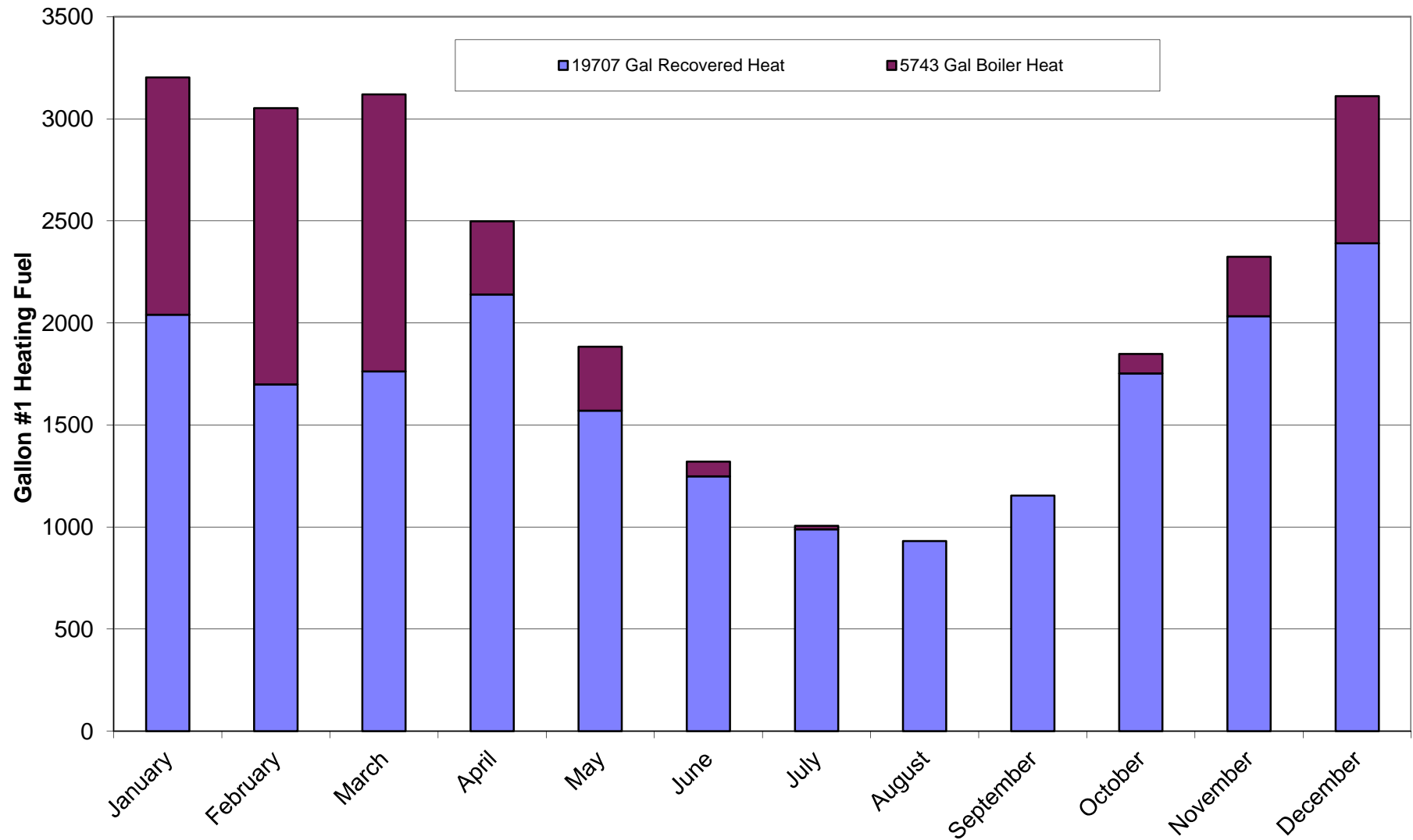
	January	February	March	April	May	June	July	August	September	October	November	December	
1	581	613	566	468	342	248	183	169	216	335	436	565	
2	562	594	548	453	331	240	177	164	209	324	422	546	
3	541	571	527	436	318	231	170	157	202	312	406	526	
4	521	550	508	420	306	222	164	152	194	301	391	506	
5	504	531	490	406	296	215	158	146	188	291	378	489	
6	487	514	474	393	286	208	153	142	181	281	365	473	
7	472	498	460	380	277	201	148	137	176	272	354	458	
8	459	484	447	370	270	195	144	133	171	265	344	446	
9	448	473	437	361	264	191	141	130	167	259	336	435	
10	447	472	435	360	263	190	140	130	167	258	335	434	
11	435	459	424	351	256	185	137	127	162	251	326	423	
12	432	456	421	348	254	184	136	126	161	249	324	419	
13	432	456	421	348	254	184	136	126	161	249	324	419	
14	435	459	424	351	256	185	137	127	162	251	326	423	
15	435	459	424	351	256	185	137	127	162	251	326	423	
16	448	473	437	361	264	191	141	130	167	259	336	435	
17	459	484	447	370	270	195	144	133	171	265	344	446	
18	472	498	460	380	277	201	148	137	176	272	354	458	
19	487	514	474	393	286	208	153	142	181	281	365	473	
20	504	531	490	406	296	215	158	146	188	291	378	489	
21	521	550	508	420	306	222	164	152	194	301	391	506	
22	541	571	527	436	318	231	170	157	202	312	406	526	
23	561	592	547	452	330	239	176	163	209	324	421	545	
24	581	613	566	468	342	248	183	169	216	335	436	565	Year Total:
	364828	347699	355262	284521	214447	150380	114565	106111	131471	210443	264722	354372	2898822 MBH
Total Boiler Input (Gal/mo):	3203	3053	3119	2498	1883	1320	1006	932	1154	1848	2324	3111	25451 Gal

Recovered Heat delivered per hour by month, MBH (total for all Bldgs)

	January	February	March	April	May	June	July	August	September	October	November	December	
1	273	250	234	324	240	222	183	169	216	301	314	326	
2	251	229	214	300	213	197	166	164	209	270	291	301	
3	229	209	195	276	195	181	151	157	202	248	267	277	
4	229	209	195	276	186	172	144	152	194	238	267	277	
5	218	198	185	264	186	172	144	146	188	238	256	265	
6	229	209	195	276	213	197	153	142	181	270	267	277	
7	273	250	234	324	213	197	148	137	176	270	314	326	
8	316	291	273	370	231	195	144	133	171	265	344	374	
9	316	291	273	361	264	191	141	130	167	259	336	374	
10	370	343	322	360	263	190	140	130	167	258	335	434	
11	381	353	332	351	231	185	137	127	162	251	326	423	
12	370	343	322	348	254	184	136	126	161	249	324	419	
13	348	322	302	348	254	184	136	126	161	249	324	411	
14	370	343	322	351	256	185	137	127	162	251	326	423	
15	381	353	332	351	256	185	137	127	162	251	326	423	
16	381	353	332	361	264	191	141	130	167	259	336	435	
17	392	364	342	370	270	195	144	133	171	265	344	446	
18	359	333	312	380	277	201	148	137	176	272	354	423	
19	327	302	283	383	286	208	153	142	181	281	365	387	
20	273	250	234	324	258	215	158	146	188	291	314	326	
21	273	250	234	324	240	222	164	152	194	301	314	326	
22	305	281	263	359	231	214	170	157	202	291	349	362	
23	338	312	293	395	240	222	176	163	209	301	384	399	
24	294	271	253	347	249	231	183	169	216	312	337	350	Year Total:
	232376	193447	200691	243653	178810	142183	112610	106111	131471	199590	231467	272255	2244665 MBH
Equiv Recovered Heat Delivered (Gal/mo):	2040	1698	1762	2139	1570	1248	989	932	1154	1752	2032	2390	19707 Gal
Equiv Additional Heat Required (Gal/mo):	1163	1354	1357	359	313	72	17	0	0	95	292	721	5743 Gal

Mertarvik Estimated Recovered Heat Utilization



MERTARVIK RECOVERED HEAT VS FUEL USE

APPENDIX H

Construction 35% Cost Estimate

35% DESIGN SUBMITTAL
CONSTRUCTION COST ESTIMATE

METARVIK BULK FUEL AND RURAL POWER SYSTEM
METARVIK, ALASKA

PREPARED FOR:

Hattenburg Dilley and Linnell
3335 Arctic Blvd., Suite 100
Anchorage, Alaska 99503

August 24, 2017



NOTES REGARDING THE PREPARATION OF THIS ESTIMATE

DRAWINGS AND DOCUMENTS

Level of Documents: (66) civil and architectural design drawings and systems narratives for all disciplines
Date: July 20, 2017 (draft)
Provided By: HDL and their subconsultants of Anchorage, Alaska

RATES

Pricing is based on current material, equipment and freight costs.

Labor Rates: A.S. Title 36 working 60 hours per week
Premium Time: 16.70%

BIDDING ASSUMPTIONS

Contract: Standard construction contract without restrictive bidding clauses
Bidding Situation: Competitive bids assumed
Bid Date: Spring 2018
Start of Construction: Summer 2018
Months to Complete: Within (10) months

EXCLUDED COSTS

1. A/E design fees
2. Administrative and management costs
3. Remediation of contaminated soils, if found during construction

HMS Project No.: 17083

NOTES REGARDING THE PREPARATION OF THIS ESTIMATE (Continued)

GENERAL

When included in HMS Inc.'s scope of services, opinions or estimates of probable construction costs are prepared on the basis of HMS Inc.'s experience and qualifications and represent HMS Inc.'s judgment as a professional generally familiar with the industry. However, since HMS Inc. has no control over the cost of labor, materials, equipment or services furnished by others, over contractor's methods of determining prices, or over competitive bidding or market conditions, HMS Inc. cannot and does not guarantee that proposals, bids, or actual construction cost will not vary from HMS Inc.'s opinions or estimates of probable construction cost.

This estimate assumes normal escalation based on the current economic climate. While the global economic downturn appears to be moderating, it remains unclear how its effects and subsequent economic recovery will affect construction costs. HMS Inc. will continue to monitor this, as well as other international, domestic and local events, and the resulting construction climate, and will adjust costs and contingencies as deemed appropriate.

GROSS FLOOR AREA

Power Module	<u>750 SF</u>
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HMS Project No.: 17083

35% DESIGN GENERAL COST SUMMARY

	<i>General</i>					
	<i>Package 1</i>	<i>Package 2</i>	<i>Package 3</i>	<i>Requirements</i>	<i>Contingencies</i>	<i>Total</i>
PACKAGE 1 - GENERATOR MODULE	\$ 1,181,297	\$ 0	\$ 0	\$ 334,855	\$ 351,080	\$ 1,867,232
PACKAGE 2 - GENERATOR PAD AND SITE WORK	0	1,545,112	0	437,983	459,205	2,442,300
PACKAGE 3 - NEW TANK FARM, BARGE OFF-LOADING PIPELINE AND MARINE HEADERS, NEW TANK FARM TANKS TRANSFER PIPELINE, TRUCK FILL AND DISPENSER BUILDING, AND STORE DISPENSING STATION	0	0	5,320,693	1,508,222	1,581,304	8,410,219
TOTAL ESTIMATED CONSTRUCTION COST:	\$ 1,181,297	\$ 1,545,112	\$ 5,320,693	\$ 2,281,060	\$ 2,391,589	\$ 12,719,751

HMS Project No.: 17083

35% DESIGN GENERAL COST SUMMARY

	<i>Total</i>
GENERATOR MODULE	\$ 1,181,297
GENERATOR PAD AND SITE WORK	1,545,112
NEW TANK FARM	4,111,997
BARGE OFF-LOADING PIPELINE AND MARINE HEADERS	152,177
NEW TANK FARM TANKS TRANSFER PIPELINE	382,385
TRUCK FILL AND DISPENSER BUILDING	162,450
STORE DISPENSING STATION	511,684
<i>SUBTOTAL:</i>	<i>\$ 8,047,102</i>
12 - GENERAL REQUIREMENTS	2,281,060
<i>SUBTOTAL:</i>	<i>\$ 10,328,162</i>
13 - CONTINGENCIES	2,391,589
TOTAL ESTIMATED CONSTRUCTION COST:	\$ 12,719,751

HMS Project No.: 17083

GENERATOR PAD AND SITE WORK
35% DESIGN COST SUMMARY

	<i>Material</i>	<i>Labor</i>	<i>Total</i>
01 - SITE WORK	\$ 710,071	\$ 508,469	\$ 1,218,540
02 - SUBSTRUCTURE	54,677	99,390	154,067
03 - SUPERSTRUCTURE	10,176	17,202	27,378
04 - EXTERIOR CLOSURE	360	701	1,061
05 - ROOF SYSTEMS	21,413	21,718	43,131
06 - INTERIOR CONSTRUCTION	0	0	0
07 - CONVEYING SYSTEMS	0	0	0
08 - MECHANICAL	39,360	56,142	95,502
09 - ELECTRICAL	967	4,466	5,433
10 - EQUIPMENT	0	0	0
11 - SPECIAL CONSTRUCTION	0	0	0
<i>SUBTOTAL:</i>	<i>\$ 837,024</i>	<i>\$ 708,088</i>	<i>\$ 1,545,112</i>
12 - GENERAL REQUIREMENTS		With General Summary	
13 - CONTINGENCIES		With General Summary	
TOTAL ESTIMATED CONSTRUCTION COST:			\$ 1,545,112

HMS Project No.: 17083

GENERATOR PAD AND SITE WORK
ELEMENTAL SUMMARY

<i>Element</i>	<i>Material</i>	<i>Labor</i>	<i>Total Material/Labor</i>	<i>Total Cost</i>
01 - SITE WORK				\$ 1,218,540
011 - Hazmat Abatement	\$ 0	\$ 0	\$ 0	
012 - Site Preparation and Earthwork	158,851	61,912	220,763	
013 - Site Improvements	93,181	44,059	137,240	
014 - Site Mechanical	176,297	123,170	299,467	
015 - Site Electrical	281,742	279,328	561,070	
02 - SUBSTRUCTURE				\$ 154,067
021 - Standard Foundations	\$ 54,677	\$ 99,390	\$ 154,067	
022 - Slab on Grade	0	0	0	
023 - Basement	0	0	0	
024 - Special Foundations	0	0	0	
03 - SUPERSTRUCTURE				\$ 27,378
031 - Floor Construction	\$ 0	\$ 0	\$ 0	
032 - Roof Construction	10,176	17,202	27,378	
033 - Stair Construction	0	0	0	
04 - EXTERIOR CLOSURE				\$ 1,061
041 - Exterior Walls	\$ 360	\$ 701	\$ 1,061	
042 - Exterior Doors and Windows	0	0	0	
05 - ROOF SYSTEMS				\$ 43,131
051 - Roofing	\$ 21,413	\$ 21,718	\$ 43,131	
052 - Skylights	0	0	0	
06 - INTERIOR CONSTRUCTION				\$ 0
061 - Partitions and Doors	\$ 0	\$ 0	\$ 0	
062 - Interior Finishes	0	0	0	
063 - Specialties	0	0	0	

HMS Project No.: 17083

**GENERATOR PAD AND SITE WORK
 ELEMENTAL SUMMARY**

<i>Element</i>	<i>Material</i>	<i>Labor</i>	<i>Total Material/Labor</i>	<i>Total Cost</i>
07 - CONVEYING SYSTEMS	\$ 0	\$ 0		\$ 0
08 - MECHANICAL				\$ 95,502
081 - Plumbing	\$ 0	\$ 0	\$ 0	
082 - HVAC	39,360	56,142	95,502	
083 - Fire Protection	0	0	0	
084 - Special Mechanical Systems	0	0	0	
09 - ELECTRICAL				\$ 5,433
091 - Service and Distribution	\$ 967	\$ 4,466	\$ 5,433	
092 - Lighting and Power	0	0	0	
093 - Special Electrical Systems	0	0	0	
10 - EQUIPMENT				\$ 0
101 - Fixed and Movable Equipment	\$ 0	\$ 0	\$ 0	
102 - Furnishings	0	0	0	
11 - SPECIAL CONSTRUCTION	\$ 0	\$ 0		\$ 0
SUBTOTAL DIRECT WORK:	\$ 837,024	\$ 708,088		\$ 1,545,112
12 - GENERAL REQUIREMENTS			<i>With General Summary</i>	
13 - CONTINGENCIES			<i>With General Summary</i>	
TOTAL ESTIMATED CONSTRUCTION COST:				\$ 1,545,112

METARVIK BULK FUEL AND RURAL POWER SYSTEM
METARVIK, ALASKA
35% DESIGN SUBMITTAL CONSTRUCTION COST ESTIMATE

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DATE: 8/24/2017

HMS Project No.: 17083

GENERATOR PAD AND SITE WORK 01 - SITE WORK 012 - Site Preparation and Earthwork	QUANTITY	UNIT	MATERIAL		LABOR		TOTAL	TOTAL
			RATE	TOTAL	RATE	TOTAL	UNIT RATE	MATERIAL/LABOR
			\$	\$	\$	\$	\$	\$

PREPARATION

Site survey and staking	0.33	AC	1000.00	330	7000.00	2,310	8000.00	2,640
Erosion and pollution control at pad	14,200	SF	0.03	426	0.07	994	0.10	1,420

EARTHWORK

Excavate and dispose for pad (assume 3'0" excavation)	1,580	CY			7.50	11,850	7.50	11,850
Imported structural fill, compacted (6'0" average)	3,632	CY	35.00	127,120	8.00	29,056	43.00	156,176

MISCELLANEOUS

Soil compaction tests	20	EA	225.00	4,500			225.00	4,500
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SUBTOTAL:				\$ 132,376		\$ 44,210		\$ 176,586
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Labor Premium Time	16.70%					7,383		7,383
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SUBTOTAL:				\$ 132,376		\$ 51,593		\$ 183,969
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Subcontractor's Overhead and Profit on Material and Labor	20.00%			26,475		10,319		36,794
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TOTAL ESTIMATED COST:				\$ 158,851		\$ 61,912		\$ 220,763
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METARVIK BULK FUEL AND RURAL POWER SYSTEM
 METARVIK, ALASKA
 35% DESIGN SUBMITTAL CONSTRUCTION COST ESTIMATE

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DATE: 8/24/2017

HMS Project No.: 17083

GENERATOR PAD AND SITE WORK 01 - SITE WORK 013 - Site Improvements	QUANTITY	UNIT	MATERIAL		LABOR		TOTAL	TOTAL
			RATE	TOTAL	RATE	TOTAL	UNIT RATE	MATERIAL/LABOR
			\$	\$	\$	\$	\$	\$
6" crushed aggregate gravel cap, compacted	263	CY	42.00	11,046	8.50	2,236	50.50	13,282
Finish grade pad	14,214	SF			0.22	3,127	0.22	3,127
Geotextile fabric at pad fills	1,580	SY	2.10	3,318	1.05	1,659	3.15	4,977
6'0" chainlink fence	233	LF	32.00	7,456	15.00	3,495	47.00	10,951
4'0" chainlink man gates	3	EA	750.00	2,250	275.00	825	1025.00	3,075
<u>STEPS AND LANDINGS, ETC.</u>								
Galvanized steel framing and connections	1,200	LBS	1.25	1,500	1.15	1,380	2.40	2,880
6" pad at stairs to module pad	21	SF	23.00	483	4.50	95	27.50	578
Channel steel stringer and support	1,100	LBS	1.15	1,265	1.30	1,430	2.45	2,695
1 1/4" diameter guardrail	37	LF	67.00	2,479	23.00	851	90.00	3,330
2"x11" galvanized grip strut planking	94	SF	18.50	1,739	2.60	244	21.10	1,983
Miscellaneous fasteners, clips, angles, etc.	1	LOT	250.00	250	250.00	250	500.00	500
<u>MODULE WORK</u>								
Module shipping via barge, Anchorage to Metarvik							With Generator Package	
Barge loading and unloading	2	DAYS	15000.00	30,000			15000.00	30,000

METARVIK BULK FUEL AND RURAL POWER SYSTEM
METARVIK, ALASKA
35% DESIGN SUBMITTAL CONSTRUCTION COST ESTIMATE

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DATE: 8/24/2017

HMS Project No.: 17083

GENERATOR PAD AND SITE WORK 01 - SITE WORK 013 - Site Improvements	QUANTITY	UNIT	MATERIAL		LABOR		TOTAL	TOTAL
			RATE	TOTAL	RATE	TOTAL	UNIT RATE	MATERIAL/LABOR
			\$	\$	\$	\$	\$	\$

MODULE WORK (Continued)

Set module on prepared foundation	1	EA	750.00	750	4500.00	4,500	5250.00	5,250
Labor allowance for transport from barge landing to site	60	MH			80.00	4,800	80.00	4,800
Miscellaneous equipment, cribbing, hoisting and staging for transport from barge to site	1	LOT	10000.00	10,000	2500.00	2,500	12500.00	12,500

MISCELLANEOUS

Pipe bollards	11	EA	465.00	5,115	370.00	4,070	835.00	9,185
SUBTOTAL:				\$ 77,651		\$ 31,462		\$ 109,113
Labor Premium Time	16.70%					5,254		5,254
SUBTOTAL:				\$ 77,651		\$ 36,716		\$ 114,367
Subcontractor's Overhead and Profit on Material and Labor	20.00%			15,530		7,343		22,873

TOTAL ESTIMATED COST:				\$ 93,181		\$ 44,059		\$ 137,240
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HMS Project No.: 17083

GENERATOR PAD AND SITE WORK 01 - SITE WORK 014 - Site Mechanical	QUANTITY	UNIT	MATERIAL		LABOR		TOTAL	TOTAL
			RATE	TOTAL	RATE	TOTAL	UNIT RATE	MATERIAL/LABOR
			\$	\$	\$	\$	\$	\$

FUEL STORAGE AND DISTRIBUTION

10,000 gallon above ground, double wall fuel tank including all valves, fittings and appurtenances	1	EA	55000.00	55,000	2200.00	2,200	57200.00	57,200
2" diameter Schedule 80 black steel fuel piping in HDPE containment pipe with fused joints, above grade, farm tank to power module	60	LF	51.00	3,060	48.00	2,880	99.00	5,940
2" diameter Schedule 80 black steel fuel piping in HDPE containment pipe with fused joints, above grade, from farm tank	1,700	LF	51.00	86,700	48.00	81,600	99.00	168,300
2" check valve at tank fill	1	EA	300.00	300	130.00	130	430.00	430
2" gate valve	1	EA	300.00	300	130.00	130	430.00	430
2" ball valve at tank fill	1	EA	300.00	300	130.00	130	430.00	430
2" cam lock with dust cap	1	EA	48.00	48	46.00	46	94.00	94
2" blind flange	1	EA	120.00	120	55.00	55	175.00	175
Tank ladder assembly	12	VLF	38.00	456	24.00	288	62.00	744
Warning signage at fuel storage	5	EA	76.00	380	34.00	170	110.00	550
Spill box assembly	1	EA	150.00	150	175.00	175	325.00	325

HMS Project No.: 17083

GENERATOR PAD AND SITE WORK 01 - SITE WORK 014 - Site Mechanical	QUANTITY	UNIT	MATERIAL		LABOR		TOTAL	TOTAL
			RATE	TOTAL	RATE	TOTAL	UNIT RATE	MATERIAL/LABOR
			\$	\$	\$	\$	\$	\$

FUEL STORAGE AND DISTRIBUTION (Continued)

Allowance for tundra pipe support assembly	1	EA	100.00	100	150.00	150	250.00	250
SUBTOTAL:				\$ 146,914		\$ 87,954		\$ 234,868
Labor Premium Time	16.70%					14,688		14,688
SUBTOTAL:				\$ 146,914		\$ 102,642		\$ 249,556
Subcontractor's Overhead and Profit on Material and Labor	20.00%			29,383		20,528		49,911

TOTAL ESTIMATED COST:				\$ 176,297		\$ 123,170		\$ 299,467
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METARVIK BULK FUEL AND RURAL POWER SYSTEM
 METARVIK, ALASKA
 35% DESIGN SUBMITTAL CONSTRUCTION COST ESTIMATE

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HMS Project No.: 17083

GENERATOR PAD AND SITE WORK 01 - SITE WORK 015 - Site Electrical	QUANTITY	UNIT	MATERIAL		LABOR		TOTAL	TOTAL
			RATE	TOTAL	RATE	TOTAL	UNIT RATE	MATERIAL/LABOR
			\$	\$	\$	\$	\$	\$

SITE SERVICE AND DISTRIBUTION

Pole riser assembly	1	EA	850.00	850	1650.00	1,650	2500.00	2,500
40'0" primary power poles	30	EA	1400.00	42,000	750.00	22,500	2150.00	64,500
Cross arms and associated hardware	30	EA	475.00	14,250	420.00	12,600	895.00	26,850
Pole guying	17	EA	175.00	2,975	250.00	4,250	425.00	7,225
15 KV pole mounted transformers	9	EA	1050.00	9,450	1200.00	10,800	2250.00	20,250
#2 ASRC 15 KV cable	32,481	LF	3.50	113,684	4.20	136,420	7.70	250,104
Service drops	20	EA	175.00	3,500	250.00	5,000	425.00	8,500
LED street lights mounted to poles	12	EA	2250.00	27,000	270.00	3,240	2520.00	30,240
4" diameter Schedule 80 PVC conduit in trench	60	LF	5.00	300	13.20	792	18.20	1,092
#2, 15 KV cable	160	LF	4.40	704	3.50	560	7.90	1,264
Trenching and backfill	12	CY	4.50	54	10.50	126	15.00	180
Marker tape	50	LF	0.35	18	0.50	25	0.85	43
Control panel	1	EA	20000.00	20,000	1500.00	1,500	21500.00	21,500
SUBTOTAL:				\$ 234,785		\$ 199,463		\$ 434,248

METARVIK BULK FUEL AND RURAL POWER SYSTEM
 METARVIK, ALASKA
 35% DESIGN SUBMITTAL CONSTRUCTION COST ESTIMATE

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GENERATOR PAD AND SITE WORK 01 - SITE WORK 015 - Site Electrical	QUANTITY	UNIT	MATERIAL		LABOR		TOTAL	TOTAL
			RATE	TOTAL	RATE	TOTAL	UNIT RATE	MATERIAL/LABOR
			\$	\$	\$	\$	\$	\$
Labor Premium Time	16.70%					33,310		33,310
SUBTOTAL:				\$ 234,785		\$ 232,773		\$ 467,558
Subcontractor's Overhead and Profit on Material and Labor	20.00%			46,957		46,555		93,512

METARVIK BULK FUEL AND RURAL POWER SYSTEM
 METARVIK, ALASKA
 35% DESIGN SUBMITTAL CONSTRUCTION COST ESTIMATE

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GENERATOR PAD AND SITE WORK 02 - SUBSTRUCTURE 021 - Standard Foundations	QUANTITY	UNIT	MATERIAL		LABOR		TOTAL	TOTAL
			RATE	TOTAL	RATE	TOTAL	UNIT RATE	MATERIAL/LABOR
			\$	\$	\$	\$	\$	\$

MODULE FOUNDATION

Excavate for footings	18	CY			12.00	216	12.00	216
Concrete including waste	10	CY	850.00	8,500	120.00	1,200	970.00	9,700
Forms	216	SF	1.50	324	4.50	972	6.00	1,296
Reinforcing steel	650	LBS	0.65	423	0.65	423	1.30	846
1" diameter x 24" stainless threaded steel rod	48	LF	30.50	1,464	11.00	528	41.50	1,992
40'0"x6" diameter helical piers	960	LF	35.00	33,600	69.00	66,240	104.00	99,840
Plate steel at anchor rods	861	LBS	1.20	1,033	1.30	1,119	2.50	2,152
Allowance for steel shims	183	LBS	1.20	220	1.50	275	2.70	495
SUBTOTAL:				\$ 45,564		\$ 70,973		\$ 116,537
Labor Premium Time	16.70%					11,852		11,852
SUBTOTAL:				\$ 45,564		\$ 82,825		\$ 128,389
Subcontractor's Overhead and Profit on Material and Labor	20.00%			9,113		16,565		25,678
TOTAL ESTIMATED COST:				\$ 54,677		\$ 99,390		\$ 154,067

METARVIK BULK FUEL AND RURAL POWER SYSTEM
METARVIK, ALASKA
35% DESIGN SUBMITTAL CONSTRUCTION COST ESTIMATE

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GENERATOR PAD AND SITE WORK 03 - SUPERSTRUCTURE 032 - Roof Construction	QUANTITY	UNIT	MATERIAL		LABOR		TOTAL	TOTAL
			RATE	TOTAL	RATE	TOTAL	UNIT RATE	MATERIAL/LABOR
			\$	\$	\$	\$	\$	\$
Field install premanufactured roof truss at module	662	LF	8.50	5,627	11.00	7,282	19.50	12,909
5/8" plywood sheathing at roof deck	1,186	SF	0.85	1,008	1.20	1,423	2.05	2,431
5/8" plywood fascia	518	SF	0.85	440	1.30	673	2.15	1,113
2"x4" blocking	104	LF	0.60	62	1.50	156	2.10	218
2"x8" blocking	68	LF	0.88	60	1.60	109	2.48	169
2"x fascia ripped	98	LF	1.10	108	2.10	206	3.20	314
2"x6" treated plate bolted to module frame	134	LF	1.75	235	2.25	302	4.00	537
5/8" plywood at snow baffle/shear ply	136	SF	0.85	116	1.50	204	2.35	320
1/2" bolt anchoring truss to frame	66	EA	1.12	74	6.50	429	7.62	503
Miscellaneous blocking and rough hardware	1	LOT	750.00	750	1500.00	1,500	2250.00	2,250
SUBTOTAL:				\$ 8,480		\$ 12,284		\$ 20,764
Labor Premium Time	16.70%					2,051		2,051
SUBTOTAL:				\$ 8,480		\$ 14,335		\$ 22,815
Subcontractor's Overhead and Profit on Material and Labor	20.00%			1,696		2,867		4,563
TOTAL ESTIMATED COST:				\$ 10,176		\$ 17,202		\$ 27,378

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GENERATOR PAD AND SITE WORK 04 - EXTERIOR CLOSURE 041 - Exterior Walls	QUANTITY	UNIT	MATERIAL		LABOR		TOTAL	TOTAL
			RATE	TOTAL	RATE	TOTAL	UNIT RATE	MATERIAL/LABOR
			\$	\$	\$	\$	\$	\$
Miscellaneous patching and sealants at exterior walls for penetrations	1	LOT	300.00	300	500.00	500	800.00	800
SUBTOTAL:				\$ 300		\$ 500		\$ 800
Labor Premium Time	16.70%					84		84
SUBTOTAL:				\$ 300		\$ 584		\$ 884
Subcontractor's Overhead and Profit on Material and Labor	20.00%			60		117		177
TOTAL ESTIMATED COST:				\$ 360		\$ 701		\$ 1,061

METARVIK BULK FUEL AND RURAL POWER SYSTEM
METARVIK, ALASKA
35% DESIGN SUBMITTAL CONSTRUCTION COST ESTIMATE

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GENERATOR PAD AND SITE WORK 05 - ROOF SYSTEMS 051 - Roofing	QUANTITY	UNIT	MATERIAL		LABOR		TOTAL	TOTAL
			RATE	TOTAL	RATE	TOTAL	UNIT RATE	MATERIAL/LABOR
			\$	\$	\$	\$	\$	\$
Bituthene roofing underlayment (ice/water shield)	1,186	SF	0.90	1,067	0.90	1,067	1.80	2,134
24 gauge standing seam metal roofing	1,186	SF	7.50	8,895	6.00	7,116	13.50	16,011
24 gauge metal siding at fascias	518	SF	7.50	3,885	6.50	3,367	14.00	7,252
24 gauge metal siding at soffit	439	SF	7.50	3,293	7.50	3,293	15.00	6,586
Gable/peak flashing	153	LF	2.20	337	2.10	321	4.30	658
Drip edge flashing	153	LF	2.20	337	2.10	321	4.30	658
Corner flashing	10	LF	2.95	30	2.25	23	5.20	53
SUBTOTAL:				\$ 17,844		\$ 15,508		\$ 33,352
Labor Premium Time	16.70%					2,590		2,590
SUBTOTAL:				\$ 17,844		\$ 18,098		\$ 35,942
Subcontractor's Overhead and Profit on Material and Labor	20.00%			3,569		3,620		7,189
TOTAL ESTIMATED COST:				\$ 21,413		\$ 21,718		\$ 43,131

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GENERATOR PAD AND SITE WORK 08 - MECHANICAL 082 - HVAC	QUANTITY	UNIT	MATERIAL		LABOR		TOTAL	TOTAL
			RATE	TOTAL	RATE	TOTAL	UNIT RATE	MATERIAL/LABOR
			\$	\$	\$	\$	\$	\$

HEAT PIPING

2"x12" heat supply in arctic pipe on above ground supports, including joints	400	LF	44.00	17,600	52.00	20,800	96.00	38,400
1 1/4"x12" heat supply in arctic pipe on above ground supports, including joints	340	LF	41.00	13,940	51.00	17,340	92.00	31,280
Arctic connections to building	6	EA	210.00	1,260	325.00	1,950	535.00	3,210
SUBTOTAL:				\$ 32,800		\$ 40,090		\$ 72,890
Labor Premium Time	16.70%					6,695		6,695
SUBTOTAL:				\$ 32,800		\$ 46,785		\$ 79,585
Subcontractor's Overhead and Profit on Material and Labor	20.00%			6,560		9,357		15,917

TOTAL ESTIMATED COST:				\$ 39,360		\$ 56,142		\$ 95,502
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GENERATOR PAD AND SITE WORK 09 - ELECTRICAL 091 - Service and Distribution	QUANTITY	UNIT	MATERIAL		LABOR		TOTAL	TOTAL
			RATE	TOTAL	RATE	TOTAL	UNIT RATE	MATERIAL/LABOR
			\$	\$	\$	\$	\$	\$

GROUNDING

3/4"x10'0" ground rods	6	EA	56.00	336	165.00	990	221.00	1,326
#6 bare copper ground wire	200	LF	0.55	110	0.75	150	1.30	260
Cadwelds	19	EA	13.00	247	94.00	1,786	107.00	2,033
Trenching and backfill	25	CY	4.50	113	10.50	263	15.00	376
SUBTOTAL:				\$ 806		\$ 3,189		\$ 3,995
Labor Premium Time	16.70%					533		533
SUBTOTAL:				\$ 806		\$ 3,722		\$ 4,528
Subcontractor's Overhead and Profit on Material and Labor	20.00%			161		744		905

TOTAL ESTIMATED COST:				\$ 967		\$ 4,466		\$ 5,433
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NEW TANK FARM
35% DESIGN COST SUMMARY

	<i>Material</i>	<i>Labor</i>	<i>Total</i>
01 - SITE WORK	\$ 2,958,635	\$ 1,153,362	\$ 4,111,997
02 - SUBSTRUCTURE	0	0	0
03 - SUPERSTRUCTURE	0	0	0
04 - EXTERIOR CLOSURE	0	0	0
05 - ROOF SYSTEMS	0	0	0
06 - INTERIOR CONSTRUCTION	0	0	0
07 - CONVEYING SYSTEMS	0	0	0
08 - MECHANICAL	0	0	0
09 - ELECTRICAL	0	0	0
10 - EQUIPMENT	0	0	0
11 - SPECIAL CONSTRUCTION	0	0	0
SUBTOTAL:	\$ 2,958,635	\$ 1,153,362	\$ 4,111,997
12 - GENERAL REQUIREMENTS		With General Summary	
13 - CONTINGENCIES		With General Summary	
TOTAL ESTIMATED CONSTRUCTION COST:			\$ 4,111,997

HMS Project No.: 17083

**NEW TANK FARM
ELEMENTAL SUMMARY**

<i>Element</i>	<i>Material</i>	<i>Labor</i>	<i>Total Material/Labor</i>	<i>Total Cost</i>
01 - SITE WORK				\$ 4,111,997
011 - Hazmat Abatement	\$ 0	\$ 0	\$ 0	
012 - Site Preparation and Earthwork	1,155,328	663,630	1,818,958	
013 - Site Improvements	195,323	132,968	328,291	
014 - Site Mechanical				
• New Fuel Tanks at Tank Farm	1,427,950	202,475	1,630,425	
• Tank Farm Pumps, Piping, Etc.	78,563	81,055	159,618	
015 - Site Electrical	101,471	73,234	174,705	
02 - SUBSTRUCTURE				\$ 0
021 - Standard Foundations	\$ 0	\$ 0	\$ 0	
022 - Slab on Grade	0	0	0	
023 - Basement	0	0	0	
024 - Special Foundations	0	0	0	
03 - SUPERSTRUCTURE				\$ 0
031 - Floor Construction	\$ 0	\$ 0	\$ 0	
032 - Roof Construction	0	0	0	
033 - Stair Construction	0	0	0	
04 - EXTERIOR CLOSURE				\$ 0
041 - Exterior Walls	\$ 0	\$ 0	\$ 0	
042 - Exterior Doors and Windows	0	0	0	
05 - ROOF SYSTEMS				\$ 0
051 - Roofing	\$ 0	\$ 0	\$ 0	
052 - Skylights	0	0	0	

HMS Project No.: 17083

**NEW TANK FARM
 ELEMENTAL SUMMARY**

<i>Element</i>	<i>Material</i>	<i>Labor</i>	<i>Total Material/Labor</i>	<i>Total Cost</i>
06 - INTERIOR CONSTRUCTION				\$ 0
061 - Partitions and Doors	\$ 0	\$ 0	\$ 0	
062 - Interior Finishes	0	0	0	
063 - Specialties	0	0	0	
07 - CONVEYING SYSTEMS	\$ 0	\$ 0		\$ 0
08 - MECHANICAL				\$ 0
081 - Plumbing	\$ 0	\$ 0	\$ 0	
082 - HVAC	0	0	0	
083 - Fire Protection	0	0	0	
084 - Special Mechanical Systems	0	0	0	
09 - ELECTRICAL				\$ 0
091 - Service and Distribution	\$ 0	\$ 0	\$ 0	
092 - Lighting and Power	0	0	0	
093 - Special Electrical Systems	0	0	0	
10 - EQUIPMENT				\$ 0
101 - Fixed and Movable Equipment	\$ 0	\$ 0	\$ 0	
102 - Furnishings	0	0	0	
11 - SPECIAL CONSTRUCTION	\$ 0	\$ 0		\$ 0
SUBTOTAL DIRECT WORK:	\$ 2,958,635	\$ 1,153,362		\$ 4,111,997
12 - GENERAL REQUIREMENTS			<i>With General Summary</i>	
13 - CONTINGENCIES			<i>With General Summary</i>	
TOTAL ESTIMATED CONSTRUCTION COST:				\$ 4,111,997

METARVIK BULK FUEL AND RURAL POWER SYSTEM
METARVIK, ALASKA
35% DESIGN SUBMITTAL CONSTRUCTION COST ESTIMATE

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NEW TANK FARM 01 - SITE WORK 012 - Site Preparation and Earthwork	QUANTITY	UNIT	MATERIAL		LABOR		TOTAL	TOTAL
			RATE	TOTAL	RATE	TOTAL	UNIT RATE	MATERIAL/LABOR
			\$	\$	\$	\$	\$	\$

PREPARATION

Site survey and staking	1.60	AC	1000.00	1,600	7000.00	11,200	8000.00	12,800
Erosion and pollution control	69,280	SF	0.03	2,078	0.07	4,850	0.10	6,928
Traffic control, barriers and signage	1	LOT	350.00	350	250.00	250	600.00	600

EARTHWORK

Cut trees and dispose	1.60	AC			10500.00	16,800	10500.00	16,800
Grub up roots, clear site and dispose	1.60	AC			8000.00	12,800	8000.00	12,800

TANK FARM

Excavate and dispose for tank pads (6'0" average assumed)	15,395	CY			14.00	215,530	14.00	215,530
Imported structural fill, compacted (9'0" assumed)	26,557	CY	35.00	929,495	8.00	212,456	43.00	1,141,951

MISCELLANEOUS

Soil compaction tests (1 per 200 CY)	130	EA	225.00	29,250			225.00	29,250
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SUBTOTAL:					\$ 962,773	\$ 473,886		\$ 1,436,659
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Labor Premium Time	16.70%					79,139		79,139
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SUBTOTAL:					\$ 962,773	\$ 553,025		\$ 1,515,798
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METARVIK BULK FUEL AND RURAL POWER SYSTEM
 METARVIK, ALASKA
 35% DESIGN SUBMITTAL CONSTRUCTION COST ESTIMATE

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NEW TANK FARM 01 - SITE WORK 012 - Site Preparation and Earthwork	QUANTITY	UNIT	MATERIAL		LABOR		TOTAL	TOTAL
			RATE	TOTAL	RATE	TOTAL	UNIT RATE	MATERIAL/LABOR
			\$	\$	\$	\$	\$	\$

Subcontractor's Overhead and Profit on Material and Labor	20.00%		192,555		110,605		303,160	
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TOTAL ESTIMATED COST:			\$ 1,155,328		\$ 663,630		\$ 1,818,958	
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METARVIK BULK FUEL AND RURAL POWER SYSTEM
 METARVIK, ALASKA
 35% DESIGN SUBMITTAL CONSTRUCTION COST ESTIMATE

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NEW TANK FARM 01 - SITE WORK 013 - Site Improvements	QUANTITY	UNIT	MATERIAL		LABOR		TOTAL	TOTAL
			RATE	TOTAL	RATE	TOTAL	UNIT RATE	MATERIAL/LABOR
			\$	\$	\$	\$	\$	\$

TANK FARM PADS

6" crushed aggregate gravel cap, compacted	1,160	CY	42.00	48,720	8.50	9,860	50.50	58,580
Finish grade tank farm pad	69,280	SF			0.18	12,470	0.18	12,470
18" CMP culverts (2)	72	LF	21.50	1,548	10.50	756	32.00	2,304
Form 6" deep gravel lined erosion control trench/pad	166	CY	42.00	6,972	9.50	1,577	51.50	8,549

LANDSCAPING

4" imported topsoil at shoulders	85	CY	70.00	5,950	15.00	1,275	85.00	7,225
Grass seeding	6.70	MSF	80.00	536	255.00	1,709	335.00	2,245
6'0" chainlink fencing with barbed wire top and 4" diameter x 10'0" posts, 10'0" o/c	994	LF	32.00	31,808	15.00	14,910	47.00	46,718
18"x48" deep concrete post bases	100	EA	58.00	5,800	75.00	7,500	133.00	13,300
10'0"x6'0" swing gate and hardware	1	EA	1875.00	1,875	650.00	650	2525.00	2,525
Warning and caution signs mounted to fence/gate	12	EA	87.00	1,044	45.00	540	132.00	1,584
Geofabric under tank farm	8,467	SY	2.10	17,781	1.05	8,890	3.15	26,671

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NEW TANK FARM 01 - SITE WORK 013 - Site Improvements	QUANTITY	UNIT	MATERIAL		LABOR		TOTAL	TOTAL
			RATE	TOTAL	RATE	TOTAL	UNIT RATE	MATERIAL/LABOR
			\$	\$	\$	\$	\$	\$

LANDSCAPING (Continued)

75 mil HDPE containment liner	1,800	SY	8.40	15,120	6.20	11,160	14.60	26,280
18"x12" concrete grade beams under tanks	32	CY	225.00	7,200	85.00	2,720	310.00	9,920
Pump concrete	32	CY	40.00	1,280			40.00	1,280
Bar reinforcement to concrete	2,560	LBS	0.75	1,920	0.70	1,792	1.45	3,712
Formwork to grade beams	1,084	SF	1.90	2,060	5.75	6,233	7.65	8,293

STEPS AND LANDINGS, ETC. (7)

Galvanized steel framing and connections	1,400	LBS	2.20	3,080	1.30	1,820	3.50	4,900
2" deep galvanized steel landing gratings	40	SF	37.00	1,480	8.50	340	45.50	1,820
11 3/4"x36"x2" galvanized steel bar grate treads set over angle framing	16	EA	115.00	1,840	75.00	1,200	190.00	3,040
1 1/2" diameter (2) pipe galvanized steel pipe handrails, painted	65	LF	33.00	2,145	12.50	813	45.50	2,958

PERFORATED DRAIN PIPES AND SUMPS UNDER PAD

4" diameter PVC perforated geofabric wrapped drain pipes	900	LF	3.70	3,330	6.50	5,850	10.20	9,180
4" tees	10	EA	15.00	150	49.00	490	64.00	640

METARVIK BULK FUEL AND RURAL POWER SYSTEM
METARVIK, ALASKA
35% DESIGN SUBMITTAL CONSTRUCTION COST ESTIMATE

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NEW TANK FARM 01 - SITE WORK 013 - Site Improvements	QUANTITY	UNIT	MATERIAL		LABOR		TOTAL	TOTAL
			RATE	TOTAL	RATE	TOTAL	UNIT RATE	MATERIAL/LABOR
			\$	\$	\$	\$	\$	\$

PERFORATED DRAIN PIPES AND SUMPS UNDER PAD (Continued)

4" elbows	6	EA	10.00	60	45.00	270	55.00	330
4" joints	45	EA	8.00	360	27.00	1,215	35.00	1,575
4" end caps	14	EA	10.00	140	27.00	378	37.00	518
12" diameter x 21" deep dual wall fabricated sumps with lids	2	EA	255.00	510	170.00	340	425.00	850
4" sump connections	4	EA	15.00	60	48.00	192	63.00	252
SUBTOTAL:				\$ 162,769		\$ 94,950		\$ 257,719
Labor Premium Time	16.70%					15,857		15,857
SUBTOTAL:				\$ 162,769		\$ 110,807		\$ 273,576
Subcontractor's Overhead and Profit on Material and Labor	20.00%			32,554		22,161		54,715

TOTAL ESTIMATED COST:			\$ 195,323		\$ 132,968		\$ 328,291	
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NEW TANK FARM 01 - SITE WORK 014 - Site Mechanical • New Fuel Tanks at Tank Farm	QUANTITY	UNIT	MATERIAL		LABOR		TOTAL	TOTAL
			RATE	TOTAL	RATE	TOTAL	UNIT RATE	MATERIAL/LABOR
			\$	\$	\$	\$	\$	\$

12,000 gallon, single wall, transfer tank complete with vents, spill containment boxes, manholes with covers, float gauges, vertical pipes, etc., including epoxy coated exterior finish	1	EA	100000.00	100,000	9000.00	9,000	109000.00	109,000
20,000 gallon bulk fuel tank with 800 gallon transfer tank with vents, spill containment boxes, manhole with cover, float gauges, vertical pipes, etc., including epoxy coated exterior finish	1	EA	125000.00	125,000	11500.00	11,500	136500.00	136,500
27,000 gallon, skid mounted single product gasoline tanks complete with vents, spill containment boxes, manholes with covers, float gauges, vertical pipes, etc., including epoxy coated exterior finish	2	EA	115500.00	231,000	9500.00	19,000	125000.00	250,000
27,000 gallon, skid mounted single product diesel tanks complete with vents, spill containment boxes, manholes with covers, float gauges, vertical pipes, etc., including epoxy coated exterior finish	6	EA	115000.00	690,000	9500.00	57,000	124500.00	747,000
20,000 gallon, skid mounted single product diesel tank complete with vents, spill containment boxes, manholes with covers, float gauges, vertical pipes, etc., including epoxy coated exterior finish	1	EA	95000.00	95,000	9000.00	9,000	104000.00	104,000
Tank ladders, platforms, railings, etc.	11	LOTS	8750.00	96,250	3200.00	35,200	11950.00	131,450

METARVIK BULK FUEL AND RURAL POWER SYSTEM
METARVIK, ALASKA
35% DESIGN SUBMITTAL CONSTRUCTION COST ESTIMATE

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NEW TANK FARM 01 - SITE WORK 014 - Site Mechanical • New Fuel Tanks at Tank Farm	QUANTITY	UNIT	MATERIAL		LABOR		TOTAL	TOTAL
			RATE	TOTAL	RATE	TOTAL	UNIT RATE	MATERIAL/LABOR
			\$	\$	\$	\$	\$	\$

40'0"x10'0"x8'0" high connex unit spill response container, including spill containing equipment set over timber sleepers

1 EA 28500.00 28,500 3700.00 3,700 32200.00 32,200

Fuel for testing

10,000 GALS 5.50 55,000 0.25 2,500 5.75 57,500

Pressure test TK-6 and 8

2 EA 225.00 450 875.00 1,750 1100.00 2,200

Pressure test TK-1-5, 7, and 9-11

8 EA 300.00 2,400 950.00 7,600 1250.00 10,000

Information, warning caution and operations signs mounted at tanks (5 per tank)

50 EA 87.00 4,350 45.00 2,250 132.00 6,600

Test and commission tanks, valves, gauges, etc. (10 each)

100 HRS 150.00 15,000 150.00 15,000

SUBTOTAL:

\$ 1,427,950 \$ 173,500 \$ 1,601,450

Labor Premium Time

16.70% 28,975 28,975

Note: All work by prime.

TOTAL ESTIMATED COST:

\$ 1,427,950 \$ 202,475 \$ 1,630,425

METARVIK BULK FUEL AND RURAL POWER SYSTEM
METARVIK, ALASKA
35% DESIGN SUBMITTAL CONSTRUCTION COST ESTIMATE

PAGE 32

DATE: 8/24/2017

HMS Project No.: 17083

NEW TANK FARM 01 - SITE WORK 014 - Site Mechanical • Tank Farm Pumps, Piping, Etc.	QUANTITY	UNIT	MATERIAL		LABOR		TOTAL	TOTAL
			RATE	TOTAL	RATE	TOTAL	UNIT RATE	MATERIAL/LABOR
			\$	\$	\$	\$	\$	\$

PUMP CONSTRUCTION (2 EACH)

8" concrete foundation pad	150	SF	9.00	1,350	7.50	1,125	16.50	2,475
3"x3"x1/4" galvanized angle framing and bracings	4,000	LBS	1.25	5,000	1.20	4,800	2.45	9,800
6"x6"x1/4" welded steel base plates anchored to ground	8	EA	14.50	116	22.00	176	36.50	292
3/16" welded steel plate walls and roof	150	SF	8.65	1,298	6.50	975	15.15	2,273
1/4" welded steel plate bottom	50	SF	11.50	575	7.35	368	18.85	943
Extra for 2'6"x4'6" double doors and hardware	2	PRS	345.00	690	195.00	390	540.00	1,080
Paint steel enclosure and framing	300	SF	0.30	90	1.80	540	2.10	630
Warning and caution signs mounted at each door	2	EA	85.00	170	35.00	70	120.00	240
10# dry chemical fire extinguishers, bracket mounted	2	EA	97.00	194	45.00	90	142.00	284

PIPING AND VALVES INSIDE PUMP BOXES

___ GPM, ___ head, 2 HP, 230 volt, explosion proof fuel transfer pumps	2	EA	5750.00	11,500	1850.00	3,700	7600.00	15,200
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HMS Project No.: 17083

NEW TANK FARM 01 - SITE WORK 014 - Site Mechanical • Tank Farm Pumps, Piping, Etc.	QUANTITY	UNIT	MATERIAL		LABOR		TOTAL	TOTAL
			RATE	TOTAL	RATE	TOTAL	UNIT RATE	MATERIAL/LABOR
			\$	\$	\$	\$	\$	\$

PIPING AND VALVES INSIDE PUMP BOXES (Continued)

2" diameter x 12" long flanged flexible connections	4	EA	32.00	128	55.00	220	87.00	348
2" ball valves	4	EA	145.00	580	75.00	300	220.00	880
2" actuated ball valves	2	EA	270.00	540	105.00	210	375.00	750
1" pressure relief valves	2	EA	138.00	276	70.00	140	208.00	416
Pressure test ports and connections	2	EA	55.00	110	80.00	160	135.00	270
1" diameter Schedule 80 welded steel piping	15	LF	11.90	179	14.50	218	26.40	397
2" diameter Schedule 80 welded steel piping	40	LF	18.50	740	21.75	870	40.25	1,610
1" diameter welded fittings and connections	10	EA	28.00	280	85.00	850	113.00	1,130
2" diameter welded fittings and connections	24	EA	137.00	3,288	116.00	2,784	253.00	6,072
2" connections to underground piping	2	EA	35.00	70	127.00	254	162.00	324
Test system	2	LOTS	50.00	100	275.00	550	325.00	650

TANK HEADERS PIPING, VALVES, ETC. WITHIN TANK FARM

Pipe support assemblies	33	EA	85.00	2,805	70.00	2,310	155.00	5,115
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HMS Project No.: 17083

NEW TANK FARM 01 - SITE WORK 014 - Site Mechanical • Tank Farm Pumps, Piping, Etc.	QUANTITY	UNIT	MATERIAL		LABOR		TOTAL	TOTAL
			RATE	TOTAL	RATE	TOTAL	UNIT RATE	MATERIAL/LABOR
			\$	\$	\$	\$	\$	\$

TANK HEADERS PIPING, VALVES, ETC. WITHIN TANK FARM (Continued)

Double pipe support assemblies	2	EA	140.00	280	105.00	210	245.00	490
Quad pipe support assemblies	10	EA	250.00	2,500	175.00	1,750	425.00	4,250
3" diameter Schedule 80 welded steel piping supported on pipe support pads	650	LF	38.75	25,188	36.50	23,725	75.25	48,913
2" diameter Schedule 80 welded steel piping	270	LF	18.50	4,995	21.75	5,873	40.25	10,868
1" diameter Schedule 80 welded steel piping	220	LF	11.90	2,618	14.50	3,190	26.40	5,808
3"x2" welded reducers	2	EA	67.00	134	102.00	204	169.00	338
3" flanged check valves	2	EA	335.00	670	120.00	240	455.00	910
3" flanged ball valves	2	EA	270.00	540	95.00	190	365.00	730
3" welded joints	43	EA	22.00	946	93.00	3,999	115.00	4,945
2" welded joints	20	EA	18.00	360	85.00	1,700	103.00	2,060
1" welded joints	20	EA	15.00	300	70.00	1,400	85.00	1,700
1"x12" flexible flanged connections	9	EA	21.00	189	42.00	378	63.00	567
1" flanged ball valves	13	EA	87.00	1,131	70.00	910	157.00	2,041

HMS Project No.: 17083

NEW TANK FARM 01 - SITE WORK 014 - Site Mechanical • Tank Farm Pumps, Piping, Etc.	QUANTITY	UNIT	MATERIAL		LABOR		TOTAL	TOTAL
			RATE	TOTAL	RATE	TOTAL	UNIT RATE	MATERIAL/LABOR
			\$	\$	\$	\$	\$	\$

TANK HEADERS PIPING, VALVES, ETC. WITHIN TANK FARM (Continued)

1" flanged anti-siphon valves	13	EA	170.00	2,210	85.00	1,105	255.00	3,315
Thermal relief valves	6	EA	675.00	4,050	35.00	210	710.00	4,260
1" tank connections	13	EA	28.00	364	70.00	910	98.00	1,274
1" locking ball valves	13	EA	87.00	1,131	85.00	1,105	172.00	2,236
1" camlocks with dust cap	13	EA	56.00	728	39.00	507	95.00	1,235
Test and label piping	1	LOT	150.00	150	750.00	750	900.00	900
SUBTOTAL:				\$ 78,563		\$ 69,456		\$ 148,019
Labor Premium Time	16.70%					11,599		11,599

Note: All work by prime.

TOTAL ESTIMATED COST:				\$ 78,563		\$ 81,055		\$ 159,618
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METARVIK BULK FUEL AND RURAL POWER SYSTEM
 METARVIK, ALASKA
 35% DESIGN SUBMITTAL CONSTRUCTION COST ESTIMATE

PAGE 36

DATE: 8/24/2017

HMS Project No.: 17083

NEW TANK FARM 01 - SITE WORK 015 - Site Electrical	QUANTITY	UNIT	MATERIAL		LABOR		TOTAL	TOTAL
			RATE	TOTAL	RATE	TOTAL	UNIT RATE	MATERIAL/LABOR
			\$	\$	\$	\$	\$	\$

SERVICE AND DISTRIBUTION

Panel A: Tank farm panel with alarm strobe	1	EA	45000.00	45,000	6000.00	6,000	51000.00	51,000
Panel CP: 100 amp, 208/120 volt, 3 phase, 18 circuit subpanel with 50 amp main circuit breaker	1	EA	1560.00	1,560	1060.00	1,060	2620.00	2,620
1 1/2" diameter galvanized rigid steel conduit	650	LF	9.00	5,850	12.00	7,800	21.00	13,650
#1/0 XHHW copper conductor	2,640	LF	3.20	8,448	2.30	6,072	5.50	14,520
#10 bare copper ground	700	LF	0.30	210	0.70	490	1.00	700
Grounding to panel	1	EA						With Ground
Excavate trench and backfill	150	LF						With Mechanical
Warning tape	150	LF	0.52	78	0.33	50	0.85	128

AREA LIGHTING

6"x6"x1/4"x16'0" high tube steel light poles with (2) 4"x10" hand holes, and steel base plates mounted to dike wall	3	EA	1325.00	3,975	660.00	1,980	1985.00	5,955
Type S1: 48 watt LED flood lights with photocell	3	EA	1470.00	4,410	450.00	1,350	1920.00	5,760
Weatherproof junction boxes	3	EA	25.00	75	60.00	180	85.00	255

METARVIK BULK FUEL AND RURAL POWER SYSTEM
METARVIK, ALASKA
35% DESIGN SUBMITTAL CONSTRUCTION COST ESTIMATE

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DATE: 8/24/2017

HMS Project No.: 17083

NEW TANK FARM 01 - SITE WORK 015 - Site Electrical	QUANTITY	UNIT	MATERIAL		LABOR		TOTAL	TOTAL
			RATE	TOTAL	RATE	TOTAL	UNIT RATE	MATERIAL/LABOR
			\$	\$	\$	\$	\$	\$

AREA LIGHTING (Continued)

1/2" diameter galvanized rigid steel conduit	160	LF	9.00	1,440	12.00	1,920	21.00	3,360
#12 XHHW copper conductor	180	LF	0.25	45	0.60	108	0.85	153
#12 bare copper ground	170	LF	0.23	39	0.60	102	0.83	141
Excavate trench and backfill	160	LF	3.75	600	12.50	2,000	16.25	2,600
Warning tape	160	LF	0.52	83	0.33	53	0.85	136

LIGHTING AND POWER

Type L1: Surface ceiling mounted enclosed and gasketed wet location LED fixtures	3	EA	210.00	630	110.00	330	320.00	960
120 volt, 20 amp, Class 1, Division 1, factory sealed SNAP switches, explosion proof	3	EA	310.00	930	60.00	180	370.00	1,110

DEVICES

120 volt, 20 amp, rated GFI receptacle in cast weatherproof enclosure, explosion proof	1	EA	280.00	280	60.00	60	340.00	340
Emergency shutdown push buttons (ESD) with emergency shutdown label	2	EA	130.00	260	80.00	160	210.00	420

HMS Project No.: 17083

NEW TANK FARM 01 - SITE WORK 015 - Site Electrical	QUANTITY	UNIT	MATERIAL		LABOR		TOTAL	TOTAL
			RATE	TOTAL	RATE	TOTAL	UNIT RATE	MATERIAL/LABOR
			\$	\$	\$	\$	\$	\$

EQUIPMENT CONNECTIONS

Fractional single phase connections to motor operated valves, explosion proof	3	EA	75.00	225	110.00	330	185.00	555
Fractional single phase connections to sump pumps, explosion proof	2	EA	75.00	150	110.00	220	185.00	370
2 HP, three phase connections to tank pumps, explosion proof	2	EA	110.00	220	210.00	420	320.00	640
120 volt, 20 amp, rated SNAP switches with flow switch type cast device box and gasketed rain tight cover (disconnect switch)	2	EA	285.00	570	210.00	420	495.00	990
Weatherproof junction boxes	20	EA	25.00	500	60.00	1,200	85.00	1,700

CONDUIT AND WIRING

3/4" diameter galvanized rigid steel conduit	410	LF	3.75	1,538	8.30	3,403	12.05	4,941
1/2" diameter galvanized rigid steel conduit	190	LF	3.50	665	7.50	1,425	11.00	2,090
#8 XHHW copper conductor	50	LF	0.55	28	0.85	43	1.40	71
#12 XHHW copper conductor	1,390	LF	0.25	348	0.60	834	0.85	1,182
#14 XHHW copper conductor	2,700	LF	0.22	594	0.60	1,620	0.82	2,214
#10 bare copper ground	700	LF	0.30	210	0.66	462	0.96	672

METARVIK BULK FUEL AND RURAL POWER SYSTEM
 METARVIK, ALASKA
 35% DESIGN SUBMITTAL CONSTRUCTION COST ESTIMATE

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DATE: 8/24/2017

HMS Project No.: 17083

NEW TANK FARM 01 - SITE WORK 015 - Site Electrical	QUANTITY	UNIT	MATERIAL		LABOR		TOTAL	TOTAL
			RATE	TOTAL	RATE	TOTAL	UNIT RATE	MATERIAL/LABOR
			\$	\$	\$	\$	\$	\$

CONDUIT AND WIRING (Continued)

#12 bare copper ground	580	LF	0.23	133	0.60	348	0.83	481
#14 bare copper ground	60	LF	0.20	12	0.60	36	0.80	48
Seal off fittings	5	EA	0.40	2	0.60	3	1.00	5
Excavate trench and backfill in tank farm	350	LF	3.75	1,313	12.50	4,375	16.25	5,688
Warning tape	350	LF	0.52	182	0.33	116	0.85	298

TANK FARM GROUNDING

3/4" diameter x 10'0" long copper clad steel ground rods	4	EA	65.00	260	150.00	600	215.00	860
#1/0 bare copper ground	700	LF	2.80	1,960	2.00	1,400	4.80	3,360
#6 bare copper ground jumpers (4 each)	190	LF	0.75	143	1.00	190	1.75	333
Grounding connections to pump box, tank skids and containment wall	14	EA	20.00	280	60.00	840	80.00	1,120
Excavate trench and backfill	650	LF	1.50	975	6.00	3,900	7.50	4,875
Warning tape	650	LF	0.52	338	0.33	215	0.85	553

SUBTOTAL:				\$ 84,559		\$ 52,295		\$ 136,854
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HMS Project No.: 17083

DATE: 8/24/2017

NEW TANK FARM 01 - SITE WORK 015 - Site Electrical	QUANTITY	UNIT	MATERIAL		LABOR		TOTAL	TOTAL
			RATE	TOTAL	RATE	TOTAL	UNIT RATE	MATERIAL/LABOR
			\$	\$	\$	\$	\$	\$
Labor Premium Time	16.70%					8,733		8,733
SUBTOTAL:				\$ 84,559		\$ 61,028		\$ 145,587
Subcontractor's Overhead and Profit on Material and Labor	20.00%			16,912		12,206		29,118
TOTAL ESTIMATED COST:				\$ 101,471		\$ 73,234		\$ 174,705

HMS Project No.: 17083

BARGE OFF-LOADING PIPELINE AND MARINE HEADERS	QUANTITY	UNIT	MATERIAL		LABOR		TOTAL	TOTAL
			RATE	TOTAL	RATE	TOTAL	UNIT RATE	MATERIAL/LABOR
			\$	\$	\$	\$	\$	\$
Marine Header Boxes and Piping								

TRENCHING FOR BURIED PIPES

Excavate and dispose	40	CY			7.50	300	7.50	300
Average 20" deep sand bedding	6	CY	43.00	258	10.00	60	53.00	318
NFS fill, compacted	41	CY	35.00	1,435	8.00	328	43.00	1,763
6" PVC marker tapes (2)	60	LF	0.38	23	0.20	12	0.58	35

NEW MARINE HEADER BOXES

3'0"x8'4"x3'0" high, 1/4"x4" flat bar box framing	86	SF	7.20	619	10.50	903	17.70	1,522
1/8" thick painted sheetmetal enclosure	86	SF	8.75	753	12.00	1,032	20.75	1,785
Extra for 3'0"x4'2" lockable doors and hardware	2	EA	285.00	570	130.00	260	415.00	830
3" diameter x 72" Schedule 80 pipe bollards over 12" diameter x 36" deep concrete bases painted yellow, above grade	4	EA	295.00	1,180	240.00	960	535.00	2,140
3" diameter horizontal pipe barrier welded to bollards	8	LF	39.75	318	38.00	304	77.75	622
3" diameter welded vertical piping	16	LF	39.75	636	35.00	560	74.75	1,196
3" flanged check valves	4	EA	335.00	1,340	120.00	480	455.00	1,820

HMS Project No.: 17083

BARGE OFF-LOADING PIPELINE AND MARINE HEADERS	QUANTITY	UNIT	MATERIAL		LABOR		TOTAL	TOTAL
			RATE	TOTAL	RATE	TOTAL	UNIT RATE	MATERIAL/LABOR
Marine Header Boxes and Piping			\$	\$	\$	\$	\$	\$

NEW MARINE HEADER BOXES (Continued)

3" flanged ball valves	4	EA	270.00	1,080	95.00	380	365.00	1,460
Reinstall 3'0"x4'2"x1'0" salvaged drip pans under boxes	2	EA	30.00	60	135.00	270	165.00	330

NEW MARINE HEADER PIPING, ETC.

3" diameter Schedule 80 welded steel piping	60	LF	37.00	2,220	35.00	2,100	72.00	4,320
3" diameter Schedule 80 welded, painted, above grade piping set over supports	1,040	LF	39.75	41,340	38.00	39,520	77.75	80,860
3" diameter Schedule 80 welded piping inside 18" HDPE insulated carrier pipe	60	LF	76.00	4,560	62.00	3,720	138.00	8,280
3" diameter welded fittings	55	EA	127.00	6,985	335.00	18,425	462.00	25,410
Connect 3" above grade pipes to tank farm piping	4	EA	55.00	220	120.00	480	175.00	700

MISCELLANEOUS

Labels and tags for above grade piping	1	LOT	750.00	750	1275.00	1,275	2025.00	2,025
Test and commission marine header piping system	1	LOT	750.00	750	3250.00	3,250	4000.00	4,000

SUBTOTAL:				\$ 65,097		\$ 74,619		\$ 139,716
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HMS Project No.: 17083

BARGE OFF-LOADING PIPELINE AND MARINE HEADERS Marine Header Boxes and Piping	QUANTITY	UNIT	MATERIAL		LABOR		TOTAL	TOTAL
			RATE	TOTAL	RATE	TOTAL	UNIT RATE	MATERIAL/LABOR
			\$	\$	\$	\$	\$	\$

Labor Premium Time	16.70%					12,461		12,461
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Note: All work by prime.

TOTAL ESTIMATED COST:	\$ 65,097	\$ 87,080	\$ 152,177
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METARVIK BULK FUEL AND RURAL POWER SYSTEM
 METARVIK, ALASKA
 35% DESIGN SUBMITTAL CONSTRUCTION COST ESTIMATE

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DATE: 8/24/2017

HMS Project No.: 17083

NEW TANK FARM TANKS TRANSFER PIPELINE	QUANTITY	UNIT	MATERIAL		LABOR		TOTAL	TOTAL
			RATE	TOTAL	RATE	TOTAL	UNIT RATE	MATERIAL/LABOR
			\$	\$	\$	\$	\$	\$

TRENCHING FOR BURIED PIPES

Excavate and dispose	140	CY			7.50	1,050	7.50	1,050
Average 20" deep sand bedding	46	CY	43.00	1,978	10.00	460	53.00	2,438
NFS fill, compacted	113	CY	35.00	3,955	8.00	904	43.00	4,859
6" PVC marker tapes (2)	300	LF	0.38	114	0.20	60	0.58	174

NEW TRANSFER PIPING, ETC.

3" diameter Schedule 80 welded, painted, above grade piping set over supports	2,670	LF	39.75	106,133	38.00	101,460	77.75	207,593
3" diameter Schedule 80 welded piping inside 18" CMP insulated carrier pipe inside trenching	300	LF	76.00	22,800	62.00	18,600	138.00	41,400
3" diameter welded fittings	149	EA	127.00	18,923	335.00	49,915	462.00	68,838
3" welded joints	149	EA	20.00	2,980	96.00	14,304	116.00	17,284
Connect 2" above grade pipes	4	EA	55.00	220	120.00	480	175.00	700

MISCELLANEOUS

Labels and tags for above grade piping	1	LOT	750.00	750	1275.00	1,275	2025.00	2,025
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METARVIK BULK FUEL AND RURAL POWER SYSTEM
 METARVIK, ALASKA
 35% DESIGN SUBMITTAL CONSTRUCTION COST ESTIMATE

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DATE: 8/24/2017

HMS Project No.: 17083

NEW TANK FARM TANKS TRANSFER PIPELINE	QUANTITY	UNIT	MATERIAL		LABOR		TOTAL	TOTAL
			RATE	TOTAL	RATE	TOTAL	UNIT RATE	MATERIAL/LABOR
			\$	\$	\$	\$	\$	\$

MISCELLANEOUS (Continued)

Test and commission marine header piping system	1	LOT	750.00	750	3250.00	3,250	4000.00	4,000
SUBTOTAL:				\$ 158,603		\$ 191,758		\$ 350,361
Labor Premium Time	16.70%					32,024		32,024

Note: All work by prime.

TOTAL ESTIMATED COST:				\$ 158,603		\$ 223,782		\$ 382,385
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HMS Project No.: 17083

TRUCK FILL AND DISPENSER BUILDING	QUANTITY	UNIT	MATERIAL		LABOR		TOTAL	TOTAL
			RATE	TOTAL	RATE	TOTAL	UNIT RATE	MATERIAL/LABOR
			\$	\$	\$	\$	\$	\$

SUBSTRUCTURE

Excavate and dispose	122	CY			7.50	915	7.50	915
Select backfill	146	CY	35.00	5,110	8.50	1,241	43.50	6,351
Structural excavation	3	CY			11.00	33	11.00	33
Channel steel frame	2,057	LBS	1.30	2,674	1.30	2,674	2.60	5,348
1/2" steel plate	12,240	LBS	1.20	14,688	1.25	15,300	2.45	29,988
4"x12" pressure treated timber	560	LF	6.70	3,752	7.00	3,920	13.70	7,672
Concrete slab on grade	1	CY	750.00	750	150.00	150	900.00	900
Form slab on grade	16	SF	1.90	30	5.75	92	7.65	122
Reinforcing steel	120	LBS	0.75	90	0.75	90	1.50	180

EXTERIOR CLOSURE

7'0" chainlink fence with 3-strand barbed wire	20	LF	35.00	700	17.50	350	52.50	1,050
5'0" gate walls	2	EA	875.00	1,750	300.00	600	1175.00	2,350
6" diameter bollards	10	EA	350.00	3,500	295.00	2,950	645.00	6,450

METARVIK BULK FUEL AND RURAL POWER SYSTEM
METARVIK, ALASKA
35% DESIGN SUBMITTAL CONSTRUCTION COST ESTIMATE

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DATE: 8/24/2017

HMS Project No.: 17083

TRUCK FILL AND DISPENSER BUILDING	QUANTITY	UNIT	MATERIAL		LABOR		TOTAL	TOTAL
			RATE	TOTAL	RATE	TOTAL	UNIT RATE	MATERIAL/LABOR
			\$	\$	\$	\$	\$	\$

ROOF STRUCTURE

Roof structure	980	LBS	1.15	1,127	1.25	1,225	2.40	2,352
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ROOF SYSTEMS

Metal roofing assembly	49	SF	8.50	417	4.75	233	13.25	650
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Galvanized angle steel hose stand rack, including plate	435	LBS	1.50	653	2.25	979	3.75	1,632
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1/2"x4" epoxy anchors	16	EA	7.50	120	23.00	368	30.50	488
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SUBTOTAL:				\$ 35,361		\$ 31,120		\$ 66,481
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Labor Premium Time	16.70%					5,197		5,197
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SUBTOTAL:				\$ 35,361		\$ 36,317		\$ 71,678
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Subcontractor's Overhead and Profit on Material and Labor	20.00%			7,072		7,263		14,335
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SUBTOTAL SUBSTRUCTURE, EXTERIOR CLOSURE, AND ROOF:				\$ 42,433		\$ 43,580		\$ 86,013
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MECHANICAL

Diesel filter	1	EA	196.00	196	118.00	118	314.00	314
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Hose reel	1	EA	1650.00	1,650	750.00	750	2400.00	2,400
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HMS Project No.: 17083

TRUCK FILL AND DISPENSER BUILDING	QUANTITY	UNIT	MATERIAL		LABOR		TOTAL	TOTAL
			RATE	TOTAL	RATE	TOTAL	UNIT RATE	MATERIAL/LABOR
			\$	\$	\$	\$	\$	\$

MECHANICAL (Continued)

Fuel meter	1	EA	270.00	270	102.00	102	372.00	372
1 1/2" diameter Schedule 80 welded steel pipe	50	LF	14.90	745	20.00	1,000	34.90	1,745
1 1/2" welded joints	12	EA	17.00	204	80.00	960	97.00	1,164
1 1/2" ball valves	3	EA	115.00	345	82.00	246	197.00	591
1 1/2" plug valve	1	EA	440.00	440	82.00	82	522.00	522
Custody meter assembly	1	EA	5500.00	5,500	190.00	190	5690.00	5,690
Test and label	1	LOT	100.00	100	750.00	750	850.00	850
SUBTOTAL:				\$ 9,450		\$ 4,198		\$ 13,648

Labor Premium Time	16.70%					701		701
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Note: All work by prime.

SUBTOTAL MECHANICAL:				\$ 9,450		\$ 4,899		\$ 14,349
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ELECTRICAL

Service and Distribution

Provide 50 amp, 3 pole new circuit breaker in existing Panel A and match existing manufacturer equipment	1	EA	165.00	165	75.00	75	240.00	240
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HMS Project No.: 17083

TRUCK FILL AND DISPENSER BUILDING	QUANTITY	UNIT	MATERIAL		LABOR		TOTAL	TOTAL
			RATE	TOTAL	RATE	TOTAL	UNIT RATE	MATERIAL/LABOR
			\$	\$	\$	\$	\$	\$

ELECTRICAL (Continued)

Service and Distribution (Continued)

Panel at truck fill	1	EA	20000.00	20,000	3800.00	3,800	23800.00	23,800
1 1/2" diameter galvanized rigid steel conduit	10	LF	9.00	90	12.00	120	21.00	210
#1/0 XHHW copper conductor	60	LF	3.20	192	2.30	138	5.50	330
#10 bare copper ground	50	LF	0.33	17	0.60	30	0.93	47
Grounding to panel	1	EA						With Grounding

Lighting and Power

Surface ceiling mounted enclosed and gasketed wet location LED fixtures	3	EA	440.00	1,320	170.00	510	610.00	1,830
120 volt, 20 amp, Class 1, Division 1, factory sealed SNAP switch, explosion proof	1	EA	310.00	310	60.00	60	370.00	370
Emergency shutdown push buttons (ESD) with emergency shutdown label	2	EA	130.00	260	60.00	120	190.00	380
Fractional single phase connections to motor operated valves, explosion proof	2	EA	210.00	420	110.00	220	320.00	640

HMS Project No.: 17083

TRUCK FILL AND DISPENSER BUILDING	QUANTITY	UNIT	MATERIAL		LABOR		TOTAL	TOTAL
			RATE	TOTAL	RATE	TOTAL	UNIT RATE	MATERIAL/LABOR
			\$	\$	\$	\$	\$	\$

ELECTRICAL (Continued)

Lighting and Power (Continued)

Fractional single phase connections to sump pump, explosion proof	1	EA	210.00	210	110.00	110	320.00	320
Weatherproof duplex receptacles, explosion proof	2	EA	280.00	560	60.00	120	340.00	680
Weatherproof junction boxes	4	EA	25.00	100	60.00	240	85.00	340
3/4" diameter galvanized rigid steel conduit	90	LF	3.75	338	8.30	747	12.05	1,085
1/2" diameter galvanized rigid steel conduit	540	LF	3.50	1,890	7.50	4,050	11.00	5,940
#12 XHHW copper conductors	380	LF	0.25	95	0.60	228	0.85	323
#14 XHHW copper conductors	3,400	LF	0.22	748	0.60	2,040	0.82	2,788
#12 bare copper ground	460	LF	0.23	106	0.60	276	0.83	382
Excavate trench and backfill	260	LF	3.75	975	12.50	3,250	16.25	4,225
Warning tape	260	LF	0.52	135	0.33	86	0.85	221

Grounding

3/4" diameter x 10'0" long copper clad steel ground rods	4	EA	65.00	260	150.00	600	215.00	860
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METARVIK BULK FUEL AND RURAL POWER SYSTEM
 METARVIK, ALASKA
 35% DESIGN SUBMITTAL CONSTRUCTION COST ESTIMATE

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DATE: 8/24/2017

HMS Project No.: 17083

TRUCK FILL AND DISPENSER BUILDING	QUANTITY	UNIT	MATERIAL		LABOR		TOTAL	TOTAL
			RATE	TOTAL	RATE	TOTAL	UNIT RATE	MATERIAL/LABOR
			\$	\$	\$	\$	\$	\$

ELECTRICAL (Continued)

Grounding (Continued)

#1/0 bare copper ground	190	LF	2.80	532	2.00	380	4.80	912
#6 bare copper ground jumpers (5 each)	30	LF	0.75	23	1.00	30	1.75	53
Grounding connections to rods, fence and fuel canopy	12	EA	20.00	240	60.00	720	80.00	960
Excavate trench and backfill	192	LF	1.50	288	6.00	1,152	7.50	1,440
Warning tape	192	LF	0.52	100	0.33	63	0.85	163
SUBTOTAL:				\$ 29,374		\$ 19,165		\$ 48,539
Labor Premium Time	16.70%					3,201		3,201
SUBTOTAL:				\$ 29,374		\$ 22,366		\$ 51,740
Subcontractor's Overhead and Profit on Material and Labor	20.00%			5,875		4,473		10,348
SUBTOTAL ELECTRICAL:				\$ 35,249		\$ 26,839		\$ 62,088
TOTAL ESTIMATED COST:				\$ 87,132		\$ 75,318		\$ 162,450

HMS Project No.: 17083

STORE DISPENSING STATION	QUANTITY	UNIT	MATERIAL		LABOR		TOTAL	TOTAL
			RATE	TOTAL	RATE	TOTAL	UNIT RATE	MATERIAL/LABOR
			\$	\$	\$	\$	\$	\$

SUBSTRUCTURE

Excavate and dispose	1,900	CY			7.50	14,250	7.50	14,250
Select backfill	4,500	CY	35.00	157,500	8.50	38,250	43.50	195,750
Structural excavation	10	CY			11.00	110	11.00	110
Concrete spread footings at tank	6	CY	285.00	1,710	85.00	510	370.00	2,220
Concrete slab on grade	2	CY	285.00	570	85.00	170	370.00	740
Form slab on grade	33	SF	1.90	63	5.75	190	7.65	253
Reinforcing steel	240	LBS	0.75	180	0.75	180	1.50	360
Place concrete	2	CY	40.00	80			40.00	80

EXTERIOR CLOSURE

6'0" chainlink fence with 3-strand barbed wire, including at tank	122	LF	32.00	3,904	15.00	1,830	47.00	5,734
8'0" double gate	1	EA	2200.00	2,200	750.00	750	2950.00	2,950
4'0" single man gates	2	EA	750.00	1,500	250.00	500	1000.00	2,000
6" diameter bollards	3	EA	350.00	1,050	295.00	885	645.00	1,935

METARVIK BULK FUEL AND RURAL POWER SYSTEM
METARVIK, ALASKA
35% DESIGN SUBMITTAL CONSTRUCTION COST ESTIMATE

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DATE: 8/24/2017

HMS Project No.: 17083

STORE DISPENSING STATION	QUANTITY	UNIT	MATERIAL		LABOR		TOTAL	TOTAL
			RATE	TOTAL	RATE	TOTAL	UNIT RATE	MATERIAL/LABOR
			\$	\$	\$	\$	\$	\$

ROOF STRUCTURE

Metal building roof structure	1,760	LBS	1.15	2,024	1.25	2,200	2.40	4,224
16 gauge metal roof deck	100	SF	3.50	350	2.25	225	5.75	575

ROOF SYSTEMS

Metal roofing assembly	100	SF	8.50	850	4.75	475	13.25	1,325
1/2"x4" epoxy anchors	8	EA	7.50	60	23.00	184	30.50	244

SUBTOTAL:				\$ 172,041		\$ 60,709		\$ 232,750
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Labor Premium Time	16.70%					10,138		10,138
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SUBTOTAL:				\$ 172,041		\$ 70,847		\$ 242,888
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Subcontractor's Overhead and Profit on Material and Labor	20.00%			34,408		14,169		48,577
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SUBTOTAL SUBSTRUCTURE, EXTERIOR CLOSURE, AND ROOF:				\$ 206,449		\$ 85,016		\$ 291,465
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MECHANICAL

5,000 gallon above ground dual product tank	1	EA	42000.00	42,000	4900.00	4,900	46900.00	46,900
Product dispensing pump	1	EA	23200.00	23,200	5000.00	5,000	28200.00	28,200
2" diameter Schedule 80 welded steel pipe	118	LF	18.50	2,183	23.00	2,714	41.50	4,897

METARVIK BULK FUEL AND RURAL POWER SYSTEM
 METARVIK, ALASKA
 35% DESIGN SUBMITTAL CONSTRUCTION COST ESTIMATE

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DATE: 8/24/2017

HMS Project No.: 17083

STORE DISPENSING STATION	QUANTITY	UNIT	MATERIAL		LABOR		TOTAL	TOTAL
			RATE	TOTAL	RATE	TOTAL	UNIT RATE	MATERIAL/LABOR
			\$	\$	\$	\$	\$	\$

MECHANICAL (Continued)

2" ball valves	2	EA	695.00	1,390	105.00	210	800.00	1,600
2" backflow preventers	4	EA	720.00	2,880	115.00	460	835.00	3,340
2" motorized ball valves	2	EA	1400.00	2,800	255.00	510	1655.00	3,310
Welded joints	30	EA	17.00	510	80.00	2,400	97.00	2,910
Test and label	1	LOT	100.00	100	750.00	750	850.00	850
Test and commission	1	LOT	250.00	250	1750.00	1,750	2000.00	2,000
SUBTOTAL:				\$ 75,313		\$ 18,694		\$ 94,007
Labor Premium Time	16.70%					3,122		3,122

Note: All work by prime.

SUBTOTAL MECHANICAL:				\$ 75,313		\$ 21,816		\$ 97,129
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ELECTRICAL

Service and Distribution

Provide 50 amp, 3 pole new circuit breaker in existing Panel A and match existing manufacturer equipment

1	EA	165.00	165	75.00	75	240.00	240
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HMS Project No.: 17083

STORE DISPENSING STATION	QUANTITY	UNIT	MATERIAL		LABOR		TOTAL	TOTAL
			RATE	TOTAL	RATE	TOTAL	UNIT RATE	MATERIAL/LABOR
			\$	\$	\$	\$	\$	\$

ELECTRICAL (Continued)

Service and Distribution (Continued)

Gas station/truck fill panel with alarm strobe	1	EA	45000.00	45,000	5000.00	5,000	50000.00	50,000
Control panel at fill station	1	EA	20000.00	20,000	3800.00	3,800	23800.00	23,800
1 1/2" diameter galvanized rigid steel conduit	10	LF	9.00	90	12.00	120	21.00	210
#1/0 XHHW copper conductor	60	LF	3.20	192	2.30	138	5.50	330
#10 bare copper ground	50	LF	0.33	17	0.60	30	0.93	47
Grounding to panel	1	EA						With Grounding

Lighting and Power

Surface ceiling mounted enclosed and gasketed wet location LED fixtures	3	EA	440.00	1,320	170.00	510	610.00	1,830
120 volt, 20 amp, Class 1, Division 1, factory sealed SNAP switch, explosion proof	1	EA	310.00	310	60.00	60	370.00	370
Emergency shutdown push buttons (ESD) with emergency shutdown label	2	EA	130.00	260	60.00	120	190.00	380
Fractional single phase connections to motor operated valves, explosion proof	2	EA	210.00	420	110.00	220	320.00	640

METARVIK BULK FUEL AND RURAL POWER SYSTEM
 METARVIK, ALASKA
 35% DESIGN SUBMITTAL CONSTRUCTION COST ESTIMATE

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DATE: 8/24/2017

HMS Project No.: 17083

STORE DISPENSING STATION	QUANTITY	UNIT	MATERIAL		LABOR		TOTAL	TOTAL
			RATE	TOTAL	RATE	TOTAL	UNIT RATE	MATERIAL/LABOR
			\$	\$	\$	\$	\$	\$

ELECTRICAL (Continued)

Lighting and Power (Continued)

Fractional single phase connections to sump pump, explosion proof	1	EA	210.00	210	110.00	110	320.00	320
Weatherproof duplex receptacles, explosion proof	2	EA	280.00	560	60.00	120	340.00	680
Weatherproof junction boxes	4	EA	25.00	100	60.00	240	85.00	340
3/4" diameter galvanized rigid steel conduit	90	LF	3.75	338	8.30	747	12.05	1,085
1/2" diameter galvanized rigid steel conduit	540	LF	3.50	1,890	7.50	4,050	11.00	5,940
#12 XHHW copper conductors	380	LF	0.25	95	0.60	228	0.85	323
#14 XHHW copper conductors	3,400	LF	0.22	748	0.60	2,040	0.82	2,788
#12 bare copper ground	460	LF	0.23	106	0.60	276	0.83	382
Excavate trench and backfill	260	LF	3.75	975	12.50	3,250	16.25	4,225
Warning tape	260	LF	0.52	135	0.33	86	0.85	221

Grounding

3/4" diameter x 10'0" long copper clad steel ground rods	4	EA	65.00	260	150.00	600	215.00	860
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METARVIK BULK FUEL AND RURAL POWER SYSTEM
 METARVIK, ALASKA
 35% DESIGN SUBMITTAL CONSTRUCTION COST ESTIMATE

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DATE: 8/24/2017

HMS Project No.: 17083

STORE DISPENSING STATION	QUANTITY	UNIT	MATERIAL		LABOR		TOTAL	TOTAL
			RATE	TOTAL	RATE	TOTAL	UNIT RATE	MATERIAL/LABOR
			\$	\$	\$	\$	\$	\$

ELECTRICAL (Continued)

Grounding (Continued)

#1/0 bare copper ground	190	LF	2.80	532	2.00	380	4.80	912
#6 bare copper ground jumpers (5 each)	30	LF	0.75	23	1.00	30	1.75	53
Grounding connections to rods, fence and fuel canopy	12	EA	20.00	240	60.00	720	80.00	960
Excavate trench and backfill	192	LF	1.50	288	6.00	1,152	7.50	1,440
Warning tape	192	LF	0.52	100	0.33	63	0.85	163
SUBTOTAL:				\$ 74,374		\$ 24,165		\$ 98,539
Labor Premium Time	16.70%					4,036		4,036
SUBTOTAL:				\$ 74,374		\$ 28,201		\$ 102,575
Subcontractor's Overhead and Profit on Material and Labor	20.00%			14,875		5,640		20,515
SUBTOTAL ELECTRICAL:				\$ 89,249		\$ 33,841		\$ 123,090

TOTAL ESTIMATED COST:				\$ 371,011		\$ 140,673		\$ 511,684
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METARVIK BULK FUEL AND RURAL POWER SYSTEM
 METARVIK, ALASKA
 35% DESIGN SUBMITTAL CONSTRUCTION COST ESTIMATE

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DATE: 8/24/2017

HMS Project No.: 17083

GENERATOR MODULE	QUANTITY	UNIT	MATERIAL		LABOR		TOTAL	TOTAL
			RATE	TOTAL	RATE	TOTAL	UNIT RATE	MATERIAL/LABOR
			\$	\$	\$	\$	\$	\$

Note: Costs provided by Gray Stassel Engineering.

MODULE

Module structure	1	EA	150000.00	150,000			150000.00	150,000
Move/set up module	1	LOT	7000.00	7,000	8400.00	8,400	15400.00	15,400
Doors and windows	1	LOT	21000.00	21,000			21000.00	21,000
100 KW genset	1	EA	75000.00	75,000	6300.00	6,300	81300.00	81,300
67 KW genset	2	EA	65000.00	130,000	6300.00	12,600	71300.00	142,600
Switchgear	1	EA	220000.00	220,000	10500.00	10,500	230500.00	230,500
Fire suppression	1	LOT	2000.00	2,000	8400.00	8,400	10400.00	10,400
Sheetmetal fabrications	1	LOT	12000.00	12,000	6300.00	6,300	18300.00	18,300
Radiators	2	EA	7500.00	15,000	4200.00	8,400	11700.00	23,400
Day tank, hopper, and blender	1	EA	20000.00	20,000	6300.00	6,300	26300.00	26,300
Day tank appurtenances	1	LOT	6000.00	6,000	3150.00	3,150	9150.00	9,150
Fuel and oil pumps	1	LOT	8000.00	8,000	3150.00	3,150	11150.00	11,150
Fuel, oil, and exhaust piping	1	LOT	10000.00	10,000	8400.00	8,400	18400.00	18,400

METARVIK BULK FUEL AND RURAL POWER SYSTEM
 METARVIK, ALASKA
 35% DESIGN SUBMITTAL CONSTRUCTION COST ESTIMATE

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DATE: 8/24/2017

HMS Project No.: 17083

GENERATOR MODULE	QUANTITY	UNIT	MATERIAL		LABOR		TOTAL	TOTAL
			RATE	TOTAL	RATE	TOTAL	UNIT RATE	MATERIAL/LABOR
			\$	\$	\$	\$	\$	\$

MODULE (Continued)

Hoses and fittings	1	LOT	3000.00	3,000	4200.00	4,200	7200.00	7,200
Pipe insulation	1	LOT	3000.00	3,000	4200.00	4,200	7200.00	7,200
Conduit, cable, and electrical equipment	1	LOT	20000.00	20,000	36750.00	36,750	56750.00	56,750
Feeder and shielded cable	1	LOT	15000.00	15,000	14700.00	14,700	29700.00	29,700
Miscellaneous strut, hangers, fasteners, etc.	1	LOT	4000.00	4,000	10500.00	10,500	14500.00	14,500
Fill coolant, fuel, and lube	1	LOT	5000.00	5,000	2100.00	2,100	7100.00	7,100
Shop load test	1	LOT			12600.00	12,600	12600.00	12,600
Punch list corrections	1	LOT			10500.00	10,500	10500.00	10,500
Package for shipping	1	LOT	5000.00	5,000	10500.00	10,500	15500.00	15,500

POWER PLANT INSTALLATION

Place module on footings	1	LOT			6300.00	6,300	6300.00	6,300
Interior tank piping and accessories	1	LOT	6000.00	6,000	6300.00	6,300	12300.00	12,300
Interior tank TF pipeline and conduit	1	LOT	30000.00	30,000	12600.00	12,600	42600.00	42,600
Interior tank pump and control panel	1	LOT	20000.00	20,000	10500.00	10,500	30500.00	30,500

METARVIK BULK FUEL AND RURAL POWER SYSTEM
METARVIK, ALASKA
35% DESIGN SUBMITTAL CONSTRUCTION COST ESTIMATE

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DATE: 8/24/2017

HMS Project No.: 17083

GENERATOR MODULE	QUANTITY	UNIT	MATERIAL		LABOR		TOTAL	TOTAL
			RATE	TOTAL	RATE	TOTAL	UNIT RATE	MATERIAL/LABOR
			\$	\$	\$	\$	\$	\$

POWER PLANT INSTALLATION (Continued)

Install hoods and exhaust	1	LOT			8400.00	8,400	8400.00	8,400
HR end user piping, heat exchanger, and devices	2	EA	7500.00	15,000	8400.00	16,800	15900.00	31,800
Energy meter	1	EA	10000.00	10,000	2100.00	2,100	12100.00	12,100
Commission/train operators	1	LOT			5000.00	5,000	5000.00	5,000
Tool/equipment demobilization	1	LOT			60500.00	60,500	60500.00	60,500
SUBTOTAL:				\$ 812,000		\$ 316,450		\$ 1,128,450
Labor Premium Time	16.70%					52,847		52,847

TOTAL ESTIMATED COST:				\$ 812,000		\$ 369,297		\$ 1,181,297
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METARVIK BULK FUEL AND RURAL POWER SYSTEM
METARVIK, ALASKA
35% DESIGN SUBMITTAL CONSTRUCTION COST ESTIMATE

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DATE: 8/24/2017

HMS Project No.: 17083

12 - GENERAL REQUIREMENTS	QUANTITY	UNIT	MATERIAL		LABOR		TOTAL	TOTAL
			RATE	TOTAL	RATE	TOTAL	UNIT RATE	MATERIAL/LABOR
			\$	\$	\$	\$	\$	\$

OPERATION COSTS

Mobilize/demobilize (set-up and move off)	1	LOT	3000.00	3,000	10000.00	10,000	13000.00	13,000
Miscellaneous air freight and handling	2,500	LBS	1.25	3,125	0.25	625	1.50	3,750
Miscellaneous barge freight (rest with unit rates)	50	TONS	700.00	35,000	50.00	2,500	750.00	37,500
Field engineering	160	HRS			150.00	24,000	150.00	24,000
Project manager (part time)	250	HRS			115.00	28,750	115.00	28,750
Supervision (working foreman)	11	MOS	200.00	2,200	6250.00	68,750	6450.00	70,950
Inspection/quality control (part time)	10	MOS	150.00	1,500	6000.00	60,000	6150.00	61,500
Building permits	1	LOT						By Owner
Plan check and inspection fees	1	LOT	7500.00	7,500			7500.00	7,500
Miscellaneous material testing	1	LOT	7500.00	7,500			7500.00	7,500
Expediting (part time)	10	MOS	125.00	1,250	2500.00	25,000	2625.00	26,250
Scheduling/estimating (part time)	10	MOS	125.00	1,250	2800.00	28,000	2925.00	29,250
Clerical/timekeeper	10	MOS	150.00	1,500	1800.00	18,000	1950.00	19,500
Equipment, trucks, vehicles, etc.	10	MOS	3500.00	35,000	500.00	5,000	4000.00	40,000

METARVIK BULK FUEL AND RURAL POWER SYSTEM
METARVIK, ALASKA
35% DESIGN SUBMITTAL CONSTRUCTION COST ESTIMATE

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DATE: 8/24/2017

HMS Project No.: 17083

12 - GENERAL REQUIREMENTS	QUANTITY	UNIT	MATERIAL		LABOR		TOTAL	TOTAL
			RATE	TOTAL	RATE	TOTAL	UNIT RATE	MATERIAL/LABOR
			\$	\$	\$	\$	\$	\$

OPERATION COSTS (Continued)

Tools, safety equipment, etc.	10	MOS	1200.00	12,000	300.00	3,000	1500.00	15,000
Field office and consumables	10	MOS	1300.00	13,000	500.00	5,000	1800.00	18,000
Connex material storage units (2)	10	MOS	800.00	8,000	100.00	1,000	900.00	9,000
Temporary utilities, communications, lighting, etc.	10	MOS	1500.00	15,000	300.00	3,000	1800.00	18,000
Fuel oil, grease, etc. (500 gallons per month)	10	MOS	3000.00	30,000			3000.00	30,000
Port cans and cleaning (4)	10	MOS	500.00	5,000	100.00	1,000	600.00	6,000
Dumpster (1)	10	MOS	450.00	4,500			450.00	4,500
General clean-up	10	MOS	150.00	1,500	750.00	7,500	900.00	9,000
Final clean-up and punch list	1	LOT	2000.00	2,000	3000.00	3,000	5000.00	5,000
Shop and as-built drawings, progress schedules, manuals, photographs, etc.	1	LOT	800.00	800	3500.00	3,500	4300.00	4,300
Daily loading and unloading	10	MOS	150.00	1,500	750.00	7,500	900.00	9,000
Alaska Dept. of Labor filing fee	1	LOT	5000.00	5,000			5000.00	5,000
Travel costs (imported crew)	40	RT	850.00	34,000			850.00	34,000

METARVIK BULK FUEL AND RURAL POWER SYSTEM
 METARVIK, ALASKA
 35% DESIGN SUBMITTAL CONSTRUCTION COST ESTIMATE

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DATE: 8/24/2017

HMS Project No.: 17083

12 - GENERAL REQUIREMENTS	QUANTITY	UNIT	MATERIAL		LABOR		TOTAL	TOTAL
			RATE	TOTAL	RATE	TOTAL	UNIT RATE	MATERIAL/LABOR
			\$	\$	\$	\$	\$	\$

OPERATION COSTS (Continued)

Per diem (imported crew)	2,450	MD	180.00	441,000			180.00	441,000
Premium time (general contractor)	0	HRS						With Direct Work
SUBTOTAL:					\$ 672,125	\$ 305,125		\$ 977,250
Home Office	3.25%							293,291
Overhead and Profit	8.50%							792,000
Bonds	1.00%							101,096
Insurances	1.15%							117,423

TOTAL ESTIMATED COST:	\$ 2,281,060
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HMS Project No.: 17083

13 - CONTINGENCIES	QUANTITY	UNIT	MATERIAL		LABOR		TOTAL	TOTAL
			RATE	TOTAL	RATE	TOTAL	UNIT RATE	MATERIAL/LABOR
			\$	\$	\$	\$	\$	\$

131 - ESTIMATOR'S CONTINGENCY

The estimator's allowance for architectural and engineering requirements that are not apparent at this level of design documentation and unknown site conditions

20.00%

\$ 2,065,632

132 - ESCALATION CONTINGENCY

The allowance for escalation from the date of estimate to the proposed bid date of spring 2018 at the rate of 3.50% per annum (9 months)

2.63%

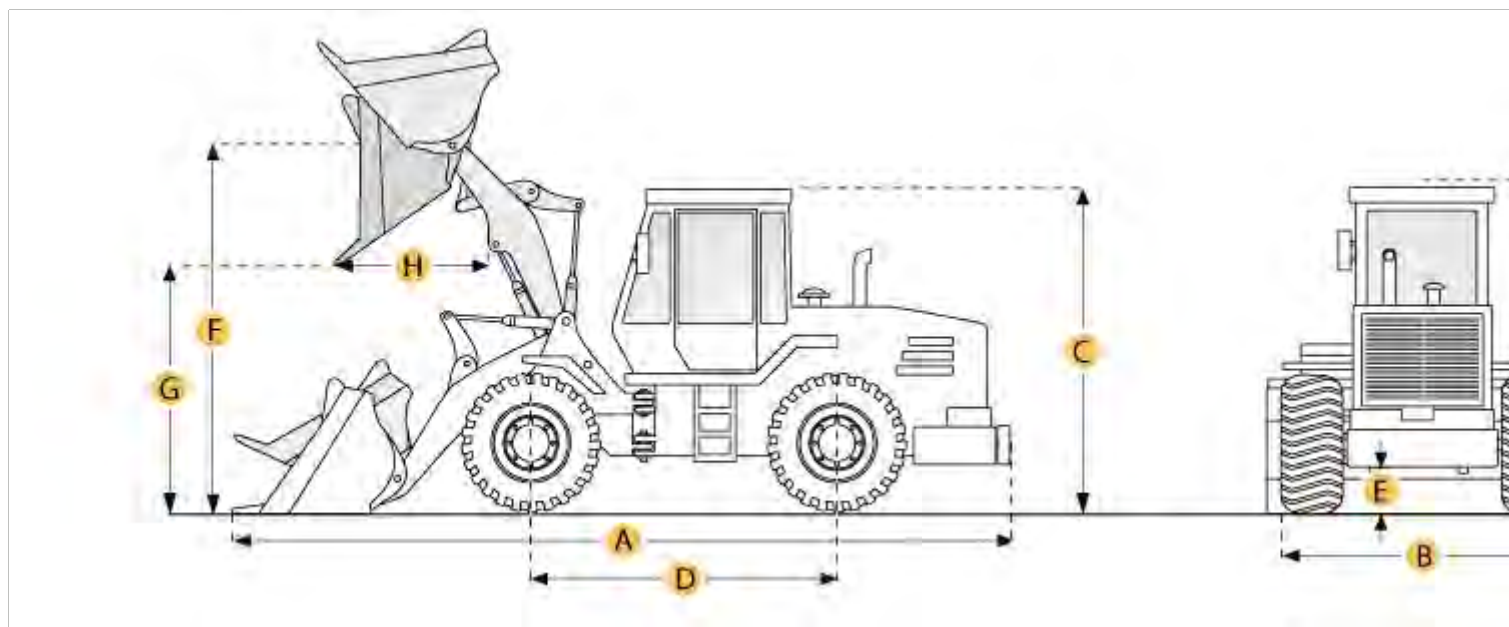
\$ 325,957

TOTAL ESTIMATED COST:

\$ 2,391,589

APPENDIX I

Equipment

[Home](#) → [Spec Search](#) → [con](#) → [Wheel Loader](#) → [Caterpillar](#) → 980H**CATERPILLAR 980H WHEEL LOADER**[VIEW AR](#) Print specification**Looking to purchase this item?**[Find a Caterpillar 980H Wheel Loader](#) being sold at Ritchie Bros. auctions.**Need to sell equipment?**[Complete this form](#) and a Ritchie Bros. represent

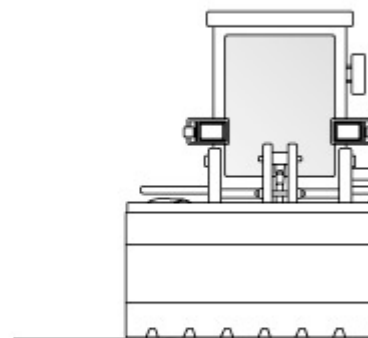
Selected Dimensions

Bucket

G. DUMP CLEARANCE AT MAX RAISE	10.8 ft in	3305 mm
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Dimensions

A. LENGTH WITH BUCKET ON GROUND	31.1 ft in	9480 mm
B. WIDTH OVER TIRES	10.6 ft in	3227 mm
C. HEIGHT TO TOP OF CAB	12.4 ft in	3765 mm
D. WHEELBASE	12.2 ft in	3700 mm
E. GROUND CLEARANCE	1.5 ft in	442 mm
F. HINGE PIN - MAX HEIGHT	14.8 ft in	4505 mm
H. REACH AT MAX LIFT AND DUMP	5.1 ft in	1554 mm



Specification

Engine

MAKE	Caterpillar	
MODEL	C15 ACERT	
NET POWER	318 hp	237 kw
GROSS POWER	355 hp	264 kw

POWER MEASURED @	1800 rpm	
DISPLACEMENT	928 cu in	15.2 L
NUMBER OF CYLINDERS	6	
MAX TORQUE	1191 lb ft	1615 Nm

Operational

OPERATING WEIGHT	66489.2 lb	30159 kg
FUEL CAPACITY	127 gal	479 L
HYDRAULIC SYSTEM FLUID CAPACITY	66 gal	250 L
ENGINE OIL FLUID CAPACITY	10 gal	37.9 L
COOLING SYSTEM FLUID CAPACITY	22 gal	83 L
TRANSMISSION FLUID CAPACITY	16 gal	62 L
FRONT AXLE/DIFF FLUID CAPACITY	23 gal	87 L
REAR AXLE/DIFF FLUID CAPACITY	23 gal	87 L
STATIC TIPPING WEIGHT	50201 lb	22767 kg
TURNING RADIUS	26.1 ft in	7962 mm
OPERATING VOLTAGE	24 V	
ALTERNATOR SUPPLIED AMPERAGE	80 amps	
REAR AXLE OSCILLATION	26 degrees	
TIRE SIZE	29.5-25	

Transmission

TYPE	Powershift	
NUMBER OF FORWARD GEARS	4	
NUMBER OF REVERSE GEARS	4	
MAX SPEED - FORWARD	22.6 mph	36.3 km/h
MAX SPEED - REVERSE	25.8 mph	41.5 km/h

Hydraulic System

PUMP TYPE	Gear	
RELIEF VALVE PRESSURE	3000 psi	20700 kPa
PUMP FLOW CAPACITY	123 gal/min	464 L/min
RAISE TIME	6 sec	
DUMP TIME	2.1 sec	
LOWER TIME	3.4 sec	

Bucket

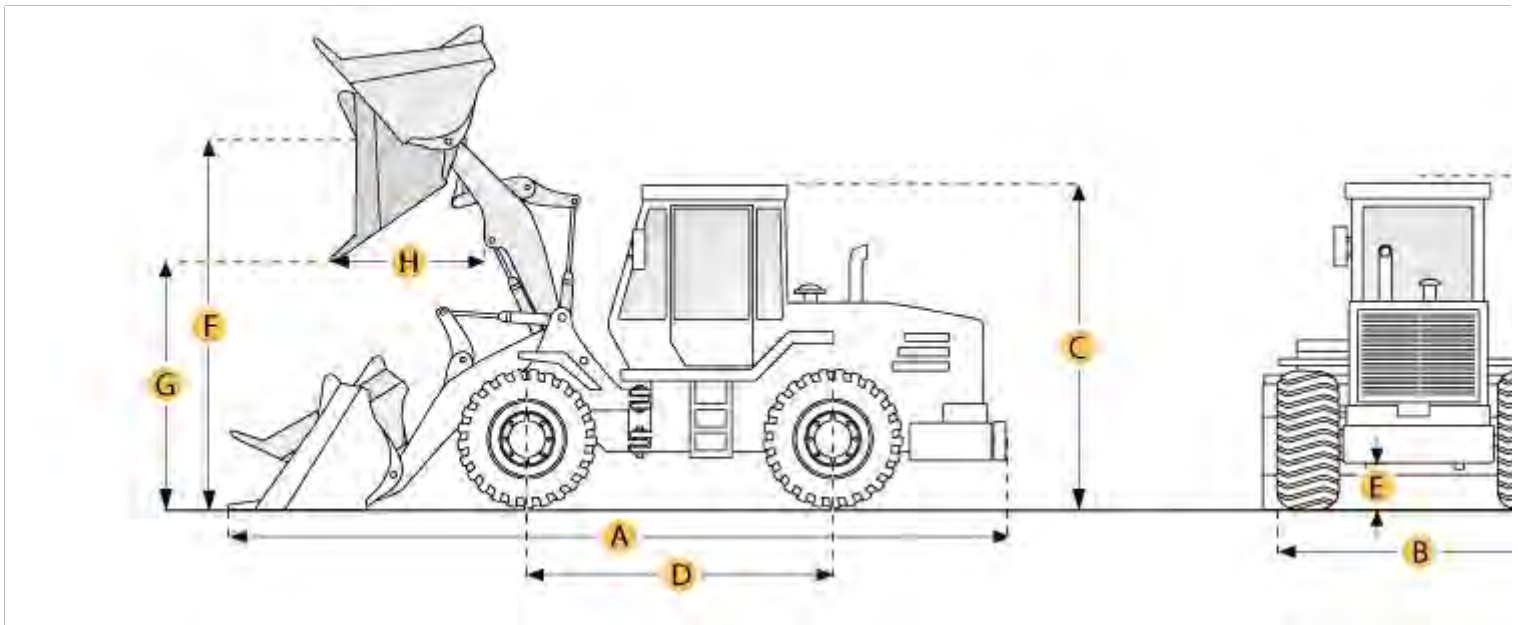
BREAKOUT FORCE	61425 lb	273 kN
DUMP CLEARANCE AT MAX RAISE	10.8 ft in	3305 mm
BUCKET WIDTH	11.6 ft in	3533 mm
BUCKET CAPACITY - HEAPED	5.5 yd ³	4.2 m ³
BUCKET CAPACITY - STRUCK	4.8 yd ³	3.7 m ³

Dimensions

LENGTH WITH BUCKET ON GROUND	31.1 ft in	9480 mm
WIDTH OVER TIRES	10.6 ft in	3227 mm
HEIGHT TO TOP OF CAB	12.4 ft in	3765 mm
GROUND CLEARANCE	1.5 ft in	442 mm
WHEELBASE	12.2 ft in	3700 mm
HINGE PIN - MAX HEIGHT	14.8 ft in	4505 mm
REACH AT MAX LIFT AND DUMP	5.1 ft in	1554 mm



Viewing Photo 1 of 5

[Home](#) → [Spec Search](#) → [Cons](#) → [Wheel Loader](#) → [Caterpillar](#) → 966H**CATERPILLAR 966H WHEEL LOADER**[VIEW AR](#) Print specification**Looking to purchase this item?**[Find a Caterpillar 966H Wheel Loader](#) being sold at Ritchie Bros. auctions.**Need to sell equipment?**[Complete this form](#) and a Ritchie Bros. represent

Selected Dimensions

Bucket

G. DUMP CLEARANCE AT MAX RAISE	10.2 ft in	3086 mm
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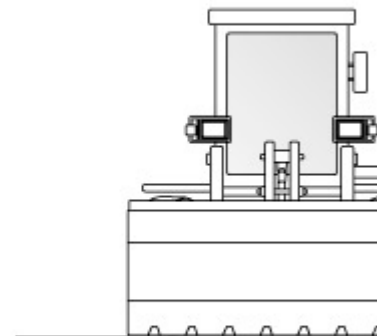
Dimensions

A. LENGTH WITH BUCKET ON GROUND	29.1 ft in	8855 mm
B. WIDTH OVER TIRES	9.7 ft in	2956 mm
C. HEIGHT TO TOP OF CAB	11.8 ft in	3600 mm
D. WHEELBASE	11.3 ft in	3450 mm
E. GROUND CLEARANCE	1.6 ft in	496 mm
F. HINGE PIN - MAX HEIGHT	13.9 ft in	4224 mm
H. REACH AT MAX LIFT AND DUMP	4.3 ft in	1294 mm

Specification

Engine

MAKE	Caterpillar	
MODEL	C11 ACERT	
NET POWER	262 hp	195 kw
GROSS POWER	286 hp	213 kw



POWER MEASURED @	1800 rpm	
DISPLACEMENT	677 cu in	11.1 L
TORQUE MEASURED @	1400 rpm	
MAX TORQUE	896 lb ft	1215 Nm
NUMBER OF CYLINDERS	6	
TORQUE RISE	38 %	
ASPIRATION	Turbocharged	

Operational

OPERATING WEIGHT	52254 lb	23698 kg
FUEL CAPACITY	100.4 gal	380 L
HYDRAULIC SYSTEM FLUID CAPACITY	29 gal	110 L
ENGINE OIL FLUID CAPACITY	9.3 gal	35 L
COOLING SYSTEM FLUID CAPACITY	10.3 gal	39 L
TRANSMISSION FLUID CAPACITY	11.6 gal	44 L
FRONT AXLE/DIFF FLUID CAPACITY	16.9 gal	64 L
REAR AXLE/DIFF FLUID CAPACITY	16.9 gal	64 L
STATIC TIPPING WEIGHT	38354 lb	17394 kg
TURNING RADIUS	24.2 ft in	7367 mm
OPERATING VOLTAGE	24 V	
ALTERNATOR SUPPLIED AMPERAGE	80 amps	
REAR AXLE OSCILLATION	26 degrees	
TIRE SIZE	26.5-25	

Transmission

TYPE	Powershift	
NUMBER OF FORWARD GEARS	4	
NUMBER OF REVERSE GEARS	4	
MAX SPEED - FORWARD	23.2 mph	37.4 km/h
MAX SPEED - REVERSE	23.2 mph	37.4 km/h

Hydraulic System

PUMP TYPE	Piston	
RELIEF VALVE PRESSURE	1000 psi	6900 kPa
PUMP FLOW CAPACITY	80.6 gal/min	305 L/min
RAISE TIME	5.9 sec	
DUMP TIME	1.6 sec	
LOWER TIME	2.4 sec	

Bucket

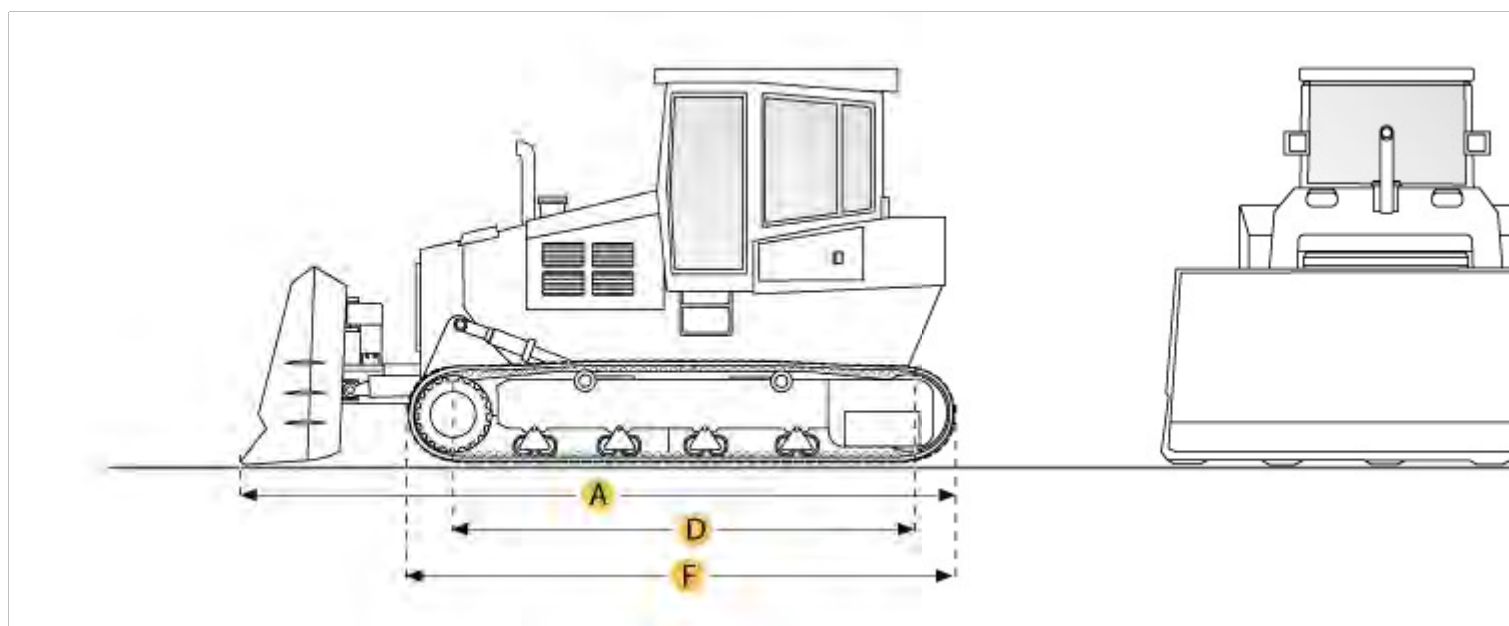
BREAKOUT FORCE	42300 lb	188 kN
DUMP CLEARANCE AT MAX RAISE	10.2 ft in	3086 mm
BUCKET WIDTH	10.6 ft in	3220 mm
BUCKET CAPACITY - HEAPED	5.5 yd ³	4.3 m ³
BUCKET CAPACITY - STRUCK	4.7 yd ³	3.6 m ³

Dimensions

LENGTH WITH BUCKET ON GROUND	29.1 ft in	8855 mm
WIDTH OVER TIRES	9.7 ft in	2956 mm
HEIGHT TO TOP OF CAB	11.8 ft in	3600 mm
GROUND CLEARANCE	1.6 ft in	496 mm
WHEELBASE	11.3 ft in	3450 mm
HINGE PIN - MAX HEIGHT	13.9 ft in	4224 mm
REACH AT MAX LIFT AND DUMP	4.3 ft in	1294 mm



Viewing Photo 1 of 5

[Home](#) → [Spec Search](#) → [Constru](#) → [Crawler Tractor](#) → [John Deere](#) → 450H LPG**JOHN DEERE 450H LPG CRAWLER TRACTOR**[VIEW AR](#) Print specification**Looking to purchase this item?**[Find a John Deere 450H LPG Crawler Tractor](#) being sold at Ritchie Bros. auctions.**Need to sell equipment?**[Complete this form](#) and a Ritchie Bros. represent

Selected Dimensions

Dimensions

B. WIDTH OVER TRACKS	2 ft in	610 mm
C. HEIGHT TO TOP OF CAB	8.5 ft in	2590 mm
D. LENGTH OF TRACK ON GROUND	7.2 ft in	2184 mm
E. GROUND CLEARANCE	1.1 ft in	346 mm
F. LENGTH W/O BLADE	13.2 ft in	4013 mm

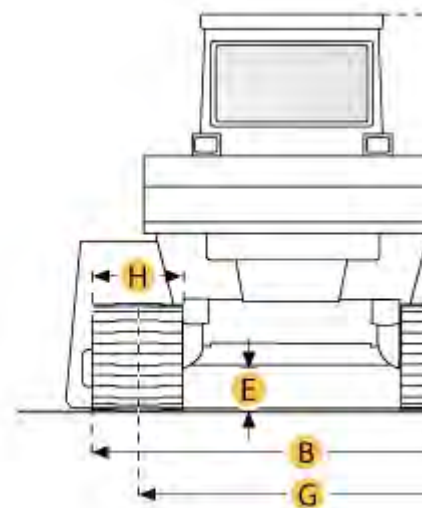
Undercarriage

H. STANDARD SHOE SIZE	24 in	610 mm
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Specification

Engine

MAKE	John Deere	
MODEL	4045T	
GROSS POWER	79 hp	58.9 kw
NET POWER	74 hp	55.2 kw
POWER MEASURED @	2200 rpm	



MAX TORQUE	254 lb ft	344.4 Nm
DISPLACEMENT	276 cu in	4.5 L
TORQUE MEASURED @	1200 rpm	
NUMBER OF CYLINDERS	4	

ASPIRATION Altitude-compensating turbocharger

Operational

OPERATING WEIGHT	16500 lb	7500 kg
FUEL CAPACITY	36 gal	136 L
COOLING SYSTEM FLUID CAPACITY	4.2 gal	16 L
ENGINE OIL CAPACITY	3.7 gal	14 L
HYDRAULIC FLUID CAPACITY	8.5 gal	32.2 L
POWERTRAIN FLUID CAPACITY	11.3 gal	42.7 L
FINAL DRIVES FLUID CAPACITY	1.7 gal	6.6 L
OPERATING VOLTAGE	12 V	
ALTERNATOR SUPPLIED AMPERAGE	65 amps	

Transmission

TYPE	Dual-path, electronic-controlled, hydrostatic drive	
MAX SPEED - FORWARD	5 mph	8 km/h
MAX SPEED - REVERSE	5 mph	8 km/h

Undercarriage

GROUND PRESSURE	4 psi	27.6 kPa
GROUND CONTACT AREA	4128 in ²	2.7 m ²
STANDARD SHOE SIZE	24 in	610 mm
NUMBER OF SHOES PER SIDE	40	
NUMBER OF TRACK ROLLERS PER SIDE	6	
TRACK PITCH	6.3 in	159.8 mm

Hydraulic System

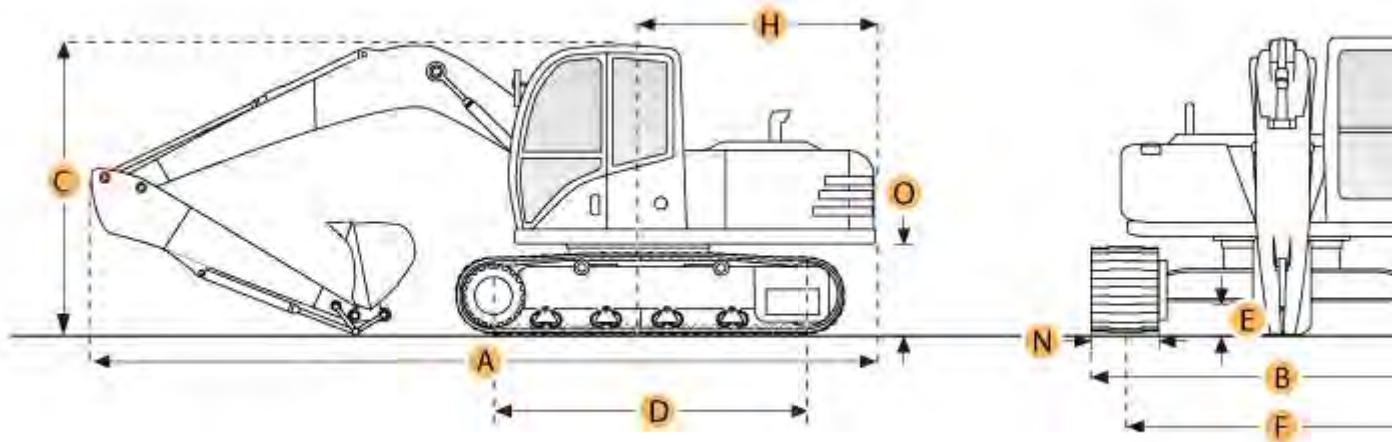
PUMP TYPE	Gear	
RELIEF VALVE PRESSURE	3000 psi	20685 kPa
PUMP FLOW CAPACITY	15 gal/min	56.8 L/min

Standard Blade

WIDTH	8.1 ft in	2464 mm
HEIGHT	32.5 in	826 mm
CAPACITY	2 yd ³	1.5 m ³
BLADE ANGLE (BOTH DIRECTIONS)	22.2 degrees	
CUTTING DEPTH	20.8 in	528 mm

Dimensions

LENGTH W/O BLADE	13.2 ft in	4013 mm
WIDTH OVER TRACKS	2 ft in	610 mm
HEIGHT TO TOP OF CAB	8.5 ft in	2590 mm
LENGTH OF TRACK ON GROUND	7.2 ft in	2184 mm
GROUND CLEARANCE	1.1 ft in	346 mm

[Home](#) → [Spec Search](#) → [Co](#) → [Hydraulic Excavator](#) → [Caterpillar](#) → 345C L**CATERPILLAR 345C L HYDRAULIC EXCAVATOR**[VIEW AR](#) Print specification**Looking to purchase this item?**[Find a Caterpillar 345C L Hydraulic Excavator](#) being sold at Ritchie Bros. auctions.**Need to sell equipment?**[Complete this form](#) and a Ritchie Bros. represent

Selected Dimensions

Boom/Stick Option	Boom/Stick Option (HEX) 1	
A. SHIPPING LENGTH OF UNIT	39.1 ft in	11910 mm
C. SHIPPING HEIGHT OF UNIT	12.3 ft in	3770 mm
J. MAX LOADING HEIGHT	24.9 ft in	7590 mm
K. MAX REACH ALONG GROUND	41.1 ft in	12520 mm
L. MAX VERTICAL WALL DIGGING DEPTH	19.4 ft in	5910 mm
M. MAX DIGGING DEPTH	28.3 ft in	8600 mm
Dimensions		
B. WIDTH TO OUTSIDE OF TRACKS	11.4 ft in	3490 mm
D. LENGTH OF TRACK ON GROUND	14.3 ft in	4360 mm
E. GROUND CLEARANCE	1.7 ft in	510 mm
G. HEIGHT TO TOP OF CAB	10.5 ft in	3210 mm
H. TAIL SWING RADIUS	12.3 ft in	3770 mm
O. COUNTERWEIGHT CLEARANCE	4.3 ft in	1320 mm

Undercarriage

F. TRACK GAUGE	9 ft in	2740 mm
N. SHOE SIZE	30 in	750 mm

Specification

Engine

MAKE	Caterpillar	
MODEL	C13 ACERT	
NET POWER	345 hp	257 kw
POWER MEASURED @	1800 rpm	
DISPLACEMENT	763 cu in	12.5 L
NUMBER OF CYLINDERS	6	

Operational

OPERATING WEIGHT	99150 lb	44970 kg
FUEL CAPACITY	186 gal	705 L
COOLING SYSTEM FLUID CAPACITY	16 gal	61 L
HYDRAULIC SYSTEM FLUID CAPACITY	150 gal	570 L
ENGINE OIL CAPACITY	11 gal	42 L
SWING DRIVE FLUID CAPACITY	2.6 gal	10 L
HYDRAULIC SYSTEM RELIEF VALVE PRESSURE	5080 psi	35000 kPa
HYDRAULIC PUMP FLOW CAPACITY	190 gal/min	720 L/min

Swing Mechanism

SWING SPEED	8.6 rpm	
SWING TORQUE	109560 lb ft	148500 Nm

Undercarriage

NUMBER OF SHOES PER SIDE	52	
SHOE SIZE	30 in	750 mm
NUMBER OF CARRIER ROLLERS PER SIDE	2	
NUMBER OF TRACK ROLLERS PER SIDE	9	
MAX TRAVEL SPEED	2.7 mph	4.4 km/h
DRAWBAR PULL	75920 lb	337700 kN
TRACK GAUGE	9 ft in	2740 mm

Buckets

REFERENCE BUCKET CAPACITY	2.5 yd3	1.9 m3
MAXIMUM BUCKET CAPACITY	4.6 yd3	3.5 m3

Boom/Stick Option (HEX) 1

BOOM/STICK OPTION (HEX) 1	R4.3TB-Reach Boom	
SHIPPING HEIGHT OF UNIT	12.3 ft in	3770 mm
SHIPPING LENGTH OF UNIT	39.1 ft in	11910 mm
MAX DIGGING DEPTH	28.3 ft in	8600 mm
MAX REACH ALONG GROUND	41.1 ft in	12520 mm
MAX LOADING HEIGHT	24.9 ft in	7590 mm
MAX VERTICAL WALL DIGGING DEPTH	19.4 ft in	5910 mm

Boom/Stick Option (HEX) 2

BOOM/STICK OPTION (HEX) 2	R3.9TB--Reach Boom	
SHIPPING HEIGHT OF UNIT	11.9 ft in	3630 mm
SHIPPING LENGTH OF UNIT	39.1 ft in	11920 mm
MAX DIGGING DEPTH	26.9 ft in	8200 mm
MAX REACH ALONG GROUND	39.8 ft in	12150 mm
MAX LOADING HEIGHT	24.5 ft in	7460 mm
MAX VERTICAL WALL DIGGING DEPTH	17.7 ft in	5400 mm

Boom/Stick Option (HEX) 3

BOOM/STICK OPTION (HEX) 3	R3.5TB-Reach Boom	
SHIPPING HEIGHT OF UNIT	10.9 ft in	3320 mm
SHIPPING LENGTH OF UNIT	38.8 ft in	11840 mm
MAX DIGGING DEPTH	25.1 ft in	7650 mm
MAX REACH ALONG GROUND	38.4 ft in	11710 mm
MAX LOADING HEIGHT	24.3 ft in	7420 mm

MAX VERTICAL WALL DIGGING DEPTH	17.1 ft in	5210 mm
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Boom/Stick Option (HEX) 4

BOOM/STICK OPTION (HEX) 4	R2.9TB-Mass Excavation Boom	
SHIPPING HEIGHT OF UNIT	11.6 ft in	3520 mm
SHIPPING LENGTH OF UNIT	38.9 ft in	11870 mm
MAX DIGGING DEPTH	23.6 ft in	7200 mm
MAX REACH ALONG GROUND	37.1 ft in	11290 mm
MAX LOADING HEIGHT	23.8 ft in	7240 mm
MAX VERTICAL WALL DIG DEPTH	15.8 ft in	4810 mm

Boom/Stick Option (HEX) 5

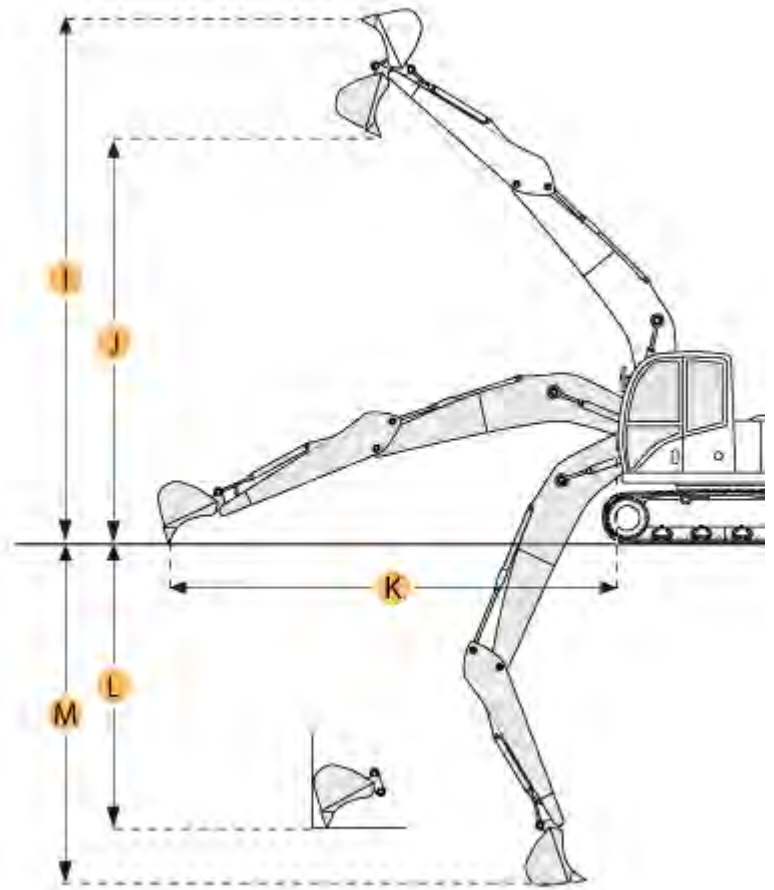
BOOM/STICK OPTION (HEX) 5	R4.3TB-Long Reach Boom	
SHIPPING HEIGHT OF UNIT	11.8 ft in	3590 mm
SHIPPING LENGTH OF UNIT	40.7 ft in	12390 mm
MAX DIGGING DEPTH	29.3 ft in	8920 mm
MAX REACH ALONG GROUND	42.5 ft in	12960 mm
MAX LOADING HEIGHT	26 ft in	7930 mm
MAX VERTICAL WALL DIG DEPTH	19.6 ft in	5960 mm

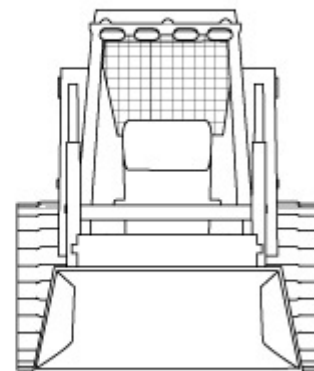
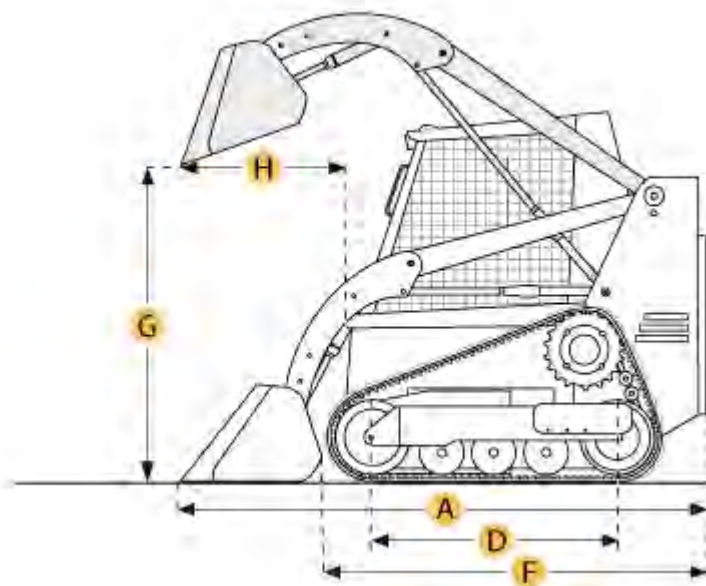
Boom/Stick Option (HEX) 6

BOOM/STICK OPTION (HEX) 6	R3.9TB-Long Reach Boom	
SHIPPING HEIGHT OF UNIT	11.5 ft in	3510 mm
SHIPPING LENGTH OF UNIT	40.8 ft in	12410 mm
MAX DIGGING DEPTH	27.9 ft in	8520 mm
MAX REACH ALONG GROUND	41.3 ft in	12600 mm
MAX LOADING HEIGHT	25.6 ft in	7800 mm
MAX VERTICAL WALL DIG DEPTH	17.8 ft in	5430 mm

Dimensions

WIDTH TO OUTSIDE OF TRACKS	11.4 ft in	3490 mm
HEIGHT TO TOP OF CAB	10.5 ft in	3210 mm
GROUND CLEARANCE	1.7 ft in	510 mm
COUNTERWEIGHT CLEARANCE	4.3 ft in	1320 mm
TAIL SWING RADIUS	12.3 ft in	3770 mm
LENGTH OF TRACK ON GROUND	14.3 ft in	4360 mm



[Home](#) → [Spec Search](#) → [Con](#) → [Multi Terrain Loader](#) → [Caterpillar](#) → 257B**CATERPILLAR 257B MULTI TERRAIN LOADER**[VIEW AR](#) Print specification**Looking to purchase this item?**[Find a Caterpillar 257B Multi Terrain Loader](#) being sold at Ritchie Bros. auctions.**Need to sell equipment?**[Complete this form](#) and a Ritchie Bros. represent

Selected Dimensions

Dimensions

A. LENGTH W/ BUCKET	11.5 ft in	3490 mm
B. WIDTH OVER TRACKS	5.5 ft in	1676 mm
C. HEIGHT TO TOP OF CAB	6.6 ft in	2022 mm
E. GROUND CLEARANCE	10.1 in	257 mm
F. LENGTH W/O BUCKET	8.9 ft in	2701 mm
G. CLEARANCE AT MAX LIFT AND DUMP	7.5 ft in	2278 mm
H. REACH AT MAX LIFT AND DUMP	2.6 ft in	790 mm

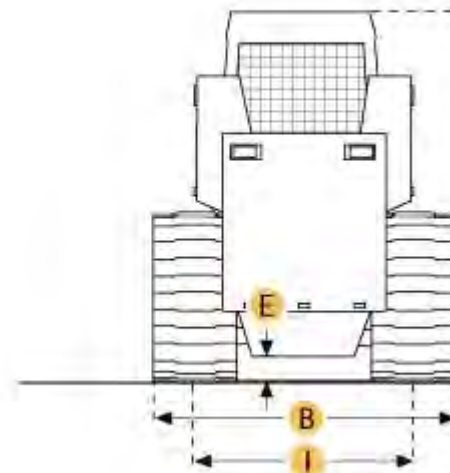
Undercarriage

D. LENGTH OF TRACK ON GROUND	4.9 ft in	1499 mm
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Specification

Engine

MAKE	Caterpillar
MODEL	3024C T



GROSS POWER	61.7 hp	46 kw
NET POWER	57.7 hp	43 kw
DISPLACEMENT	134.3 cu in	2.2 L
ASPIRATION	turbocharged	

Operational

OPERATING WEIGHT	7557.4 lb	3428 kg
FUEL CAPACITY	20.3 gal	77 L
COOLING SYSTEM FLUID CAPACITY	2.6 gal	10 L
ENGINE OIL CAPACITY	2.1 gal	8 L
HYDRAULIC SYSTEM FLUID CAPACITY	14.5 gal	55 L
OPERATING VOLTAGE	12 V	
ALTERNATOR SUPPLIED AMPERAGE	85 amps	
MAX SPEED - HIGH RANGE	7.1 mph	11.4 km/h

Undercarriage

GROUND CONTACT AREA	1767 in ²	1.1 m ²
GROUND PRESSURE	4.4 psi	30 kPa
LENGTH OF TRACK ON GROUND	4.9 ft in	1499 mm

Loader

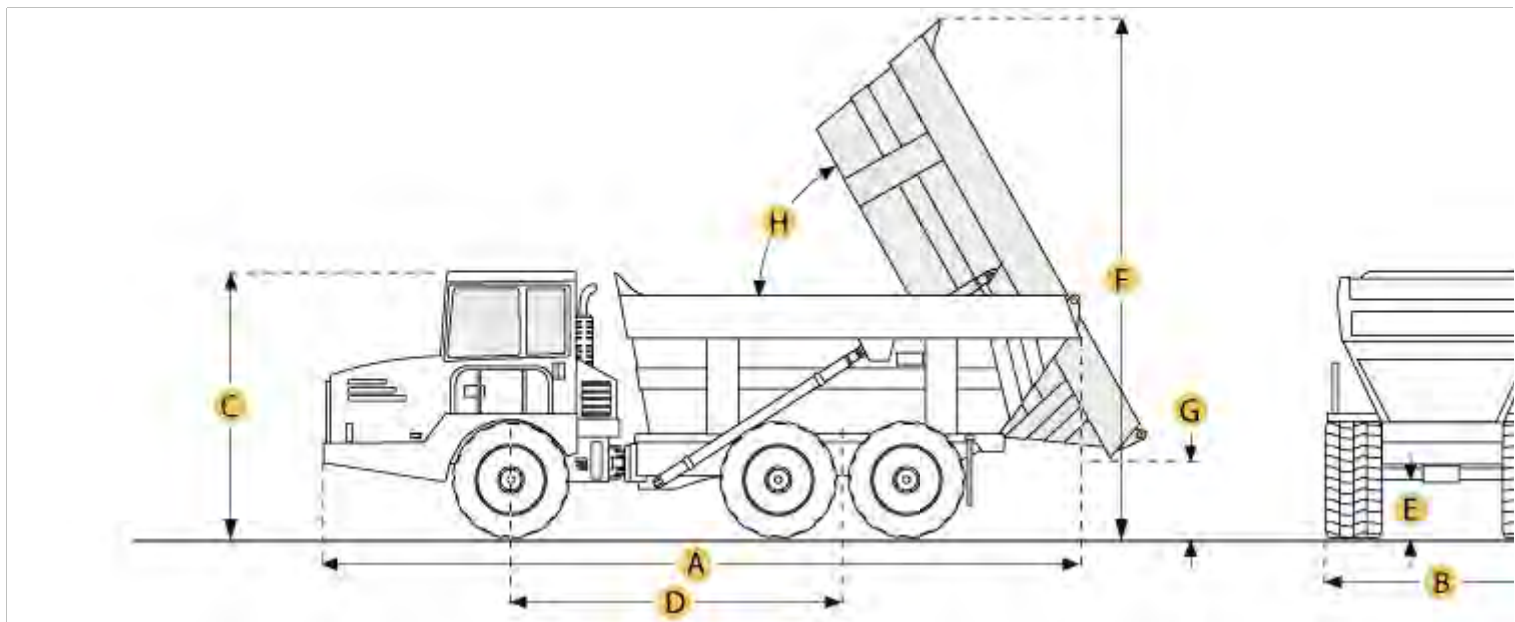
OPERATING LOAD	2308.2 lb	1047 kg
TIPPING LOAD	4620.9 lb	2096 kg
BREAKOUT FORCE	3732.4 lb	1693 kg

Hydraulic

PUMP FLOW	15.9 gal/min	60 L/min
RELIEF VALVE PRESSURE	3335.9 psi	23000 kPa

Dimensions

WIDTH OVER TRACKS	5.5 ft in	1676 mm
LENGTH W/ BUCKET	11.5 ft in	3490 mm
LENGTH W/O BUCKET	8.9 ft in	2701 mm
HEIGHT TO TOP OF CAB	6.6 ft in	2022 mm
GROUND CLEARANCE	10.1 in	257 mm
CLEARANCE AT MAX LIFT AND DUMP	7.5 ft in	2278 mm
REACH AT MAX LIFT AND DUMP	2.6 ft in	790 mm
TURNING RADIUS FROM CENTER - MACHINE REAR	58.2 in	1479 mm
TURNING RADIUS FROM CENTER - INC BUCKET	89 in	2261 mm

[Home](#) → [Spec Search](#) → [All Types](#) → [Articulated Dump Truck](#) → [CATERPILLAR](#) → 725**CATERPILLAR 725 ARTICULATED DUMP TRUCK**[VIEW AR](#) Print specification**Looking to purchase this item?**[Find a CATERPILLAR 725 Articulated Dump Truck](#) being sold at Ritchie Bros. auctions.**Need to sell equipment?**[Complete this form](#) and a Ritchie Bros. represent

Selected Dimensions

Dimensions

A. OVERALL LENGTH	32.5 ft in	9920 mm
B. OVERALL WIDTH	9.4 ft in	2877 mm
C. OVERALL HEIGHT	11.3 ft in	3440 mm
D. WHEELBASE	15.3 ft in	4669 mm
E. GROUND CLEARANCE	1.6 ft in	495 mm
F. DUMP HEIGHT	21 ft in	6405 mm
G. DUMP GROUND CLEARANCE	1.8 ft in	555 mm

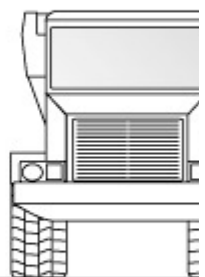
Dump

H. DUMP ANGLE	70 degrees
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Specification

Engine

MAKE	Caterpillar
MODEL	C11 with ACERT Technology



GROSS POWER	313 hp	233.4 kw
NET POWER	309 hp	230.4 kw
DISPLACEMENT	683.5 cu in	11.2 L
NUMBER OF CYLINDERS	6	
ASPIRATION	Turbocharged	

Operational

FUEL CAPACITY	95.1 gal	360 L
HYDRAULIC SYSTEM FLUID CAPACITY	26.9 gal	102 L
COOLING SYSTEM FLUID CAPACITY	22.5 gal	85 L
ENGINE OIL CAPACITY	9.8 gal	37 L
TRANSMISSION FLUID CAPACITY	9.5 gal	36 L
TIRE SIZE	23.5R25	

Transmission

NUMBER OF FORWARD GEARS	6	
NUMBER OF REVERSE GEARS	1	
MAX SPEED	35.3 mph	56.8 km/h

Weights

FRONT AXLE - EMPTY	28704.2 lb	13020 kg
CENTER AXLE - EMPTY	10648.3 lb	4830 kg
REAR AXLE - EMPTY	49074.9 lb	22260 kg
FRONT AXLE - LOADED	33135.5 lb	15030 kg
CENTER AXLE - LOADED	34436.2 lb	15620 kg
REAR AXLE - LOADED	33510.3 lb	15200 kg
TOTAL EMPTY	49074.9 lb	22260 kg
TOTAL LOADED	101082 lb	45850 kg

Dump

RATED PAYLOAD	52029.1 lb	23600 kg
CAPACITY - STRUCK	14.5 yd3	11.1 m3
CAPACITY - HEAPED	18.7 yd3	14.3 m3
DUMP ANGLE	70 degrees	
RAISE TIME	10 sec	
LOWER TIME	11 sec	

Dimensions

OVERALL LENGTH	32.5 ft in	9920 mm
OVERALL WIDTH	9.4 ft in	2877 mm
OVERALL HEIGHT	11.3 ft in	3440 mm
WHEELBASE	15.3 ft in	4669 mm
GROUND CLEARANCE	1.6 ft in	495 mm
DUMP HEIGHT	21 ft in	6405 mm
DUMP GROUND CLEARANCE	1.8 ft in	555 mm



Viewing Photo 1 of 5



Arrangement shown
with optional trailer

XQ400 SOUND ATTENUATED

50/60 Hz

FEATURES

EMISSIONS

- EPA Tier 3 and CARB Emissions Certified for non-road mobile applications at all 50 Hz and 60 Hz ratings

CAT® C15 ATAAC DIESEL ENGINE

- Utilizes ACERT™ Technology
- Reliable, rugged, durable design
- Field-proven in multiple applications worldwide
- Four-stroke-cycle diesel engine combines durability with minimum weight while providing dependability and economy
- 50/60 Hz convertibility

CAT® SR4B GENERATOR

- Designed to match performance and output characteristics of Caterpillar diesel engines
- Permanent magnet excitation
- Segregated AC/DC, low voltage accessory box provides single point access to accessory connections

ENCLOSURE

- Made with 12-gauge steel
- Single point lifting eye
- Sound attenuated
- Convenient hand holds and steps for safe operation
- Two coat polyester powder-coated finish

ENVIRONMENTALLY FRIENDLY DESIGN

- Sound attenuated for low noise operation
- OSHA compliant safe design
- 110% spill containment for coolant and oil
- UL 142 certified dual wall fuel tank

MULTI-VOLTAGE DISTRIBUTION PANEL

- Dual voltage, manual changeover board
- Load door safety switch
- Rust-free hinges on rear opening door
- Adequate space for line and plug connection without interference
- Remote start and stop contacts
- Remote monitoring hardware

SINGLE-SOURCE SUPPLIER

- Complete systems designed at Caterpillar ISO 9001:2000 certified facilities
- **Certified Prototype Tested** with torsional analysis

WORLDWIDE PRODUCT SUPPORT

- Worldwide parts availability through the Caterpillar dealer network
- With over 1,875 dealer outlets operating in 200 countries, you're never far from the Caterpillar part you need.
- 99.7% of parts orders filled within 48 hours. The best product support record in the industry.
- Caterpillar dealer service technicians are trained to service every aspect of your electric power generation system.

FACTORY INSTALLED STANDARD AND OPTIONAL EQUIPMENT

STANDARD FEATURES	
Air Inlet System	Air cleaner, dual element Turbocharger
Charging System	Battery charger Heavy duty charging alternator
Control Panel	Generator controls and monitoring Fuel tank monitoring Engine controls and monitoring Digital displays Remote monitoring hardware
Cooling System	Fan and belt guards Base mounted radiator Air to air aftercooling
Distribution Panel	Lockable doors Load door safety switch (trips breaker upon door opening) Individual bus bar connections Circuit breaker with 24 VDC shunt trip Remote start/stop contacts Shore power connections
Enclosure	Sound attenuated 12-gauge steel Lockable doors Separate vented battery compartment Single point lifting Exterior oil and water drains with interior valves Hidden exterior fuel drain Hand holds and steps Powder-coated finish
Fuel System	Primary fuel filter/water separator UL 142 dual wall fuel tank, 1970 L (520 g) Radiator-mounted fuel cooler
Generator	Brushless, permanent magnet Coastal corrosion protection Shock mounted VR6 voltage regulator Space heater UL approved Reconnectable 240-480 volt
Mounting System	Generator soft mounted to base Base contains integral fuel tank Skiddable structural steel design 110% oil and coolant spill containment
Starting System	Electric starting motor Battery set with disconnect switch Jacket water heater with thermostat, shut-off valves

OPTIONAL FEATURES	
Trailer	Full frame support Tandem axle trailer frame with tongue Electric actuated hydraulic brakes with rechargeable battery backup breakaway system Overcenter mechanical parking brake Full length fenders Non-skid surface on steps Heavy duty safety chains and grab hooks Reinforced 4540 kg (10,000 lb) top wind drop jack

SPECIFICATIONS

CAT SR4B GENERATOR

Frame size	450
Type	Permanent magnet brushless
Construction	Single bearing, close coupled
Three phase	12 lead reconnectable
Insulation	Class H with coastal insulation protection
IP rating	22
Alignment	Pilot shaft
Voltage regulator	3-phase sensing with Volts-per-Hertz
Voltage regulation	± ½% steady state/± ½% no load to full load
TIF	Less than 50
THD	Less than 4%

CAT ENGINE

C15 ATAAC, 4-stroke-cycle watercooled diesel	
Bore – mm (in)	137.2 (5.4)
Stroke – mm (in)	171.45 (6.75)
Displacement – L (cu in)	15.2 (928)
Compression ratio	16.1:1
Aspiration	Turbocharged-ATAAC
Engine control	ADEM™ A4

CAT CONTROL PANEL – EMCP 3.2

24 Volt DC Control

NEMA 1, IP22 enclosure
Lockable hinged door
Enclosure mounted
Single location customer connector point
16 light alarm module with alarm horn
Electric fuel level gauge

Consult your Caterpillar dealer for available voltages.

TECHNICAL DATA

		XQ400			
Power Rating 60 Hz 50 Hz	ekW kVA	Standby 400 400	TMI Ref. DM9100 DM9101	Prime 365 365	TMI Ref. DM9117 DM9118
Engine and Container Information Engine model Container dimensions		C15 see chart on page 6			
Shipping Weight (Dry) Unit with trailer Unit without trailer	kg (lb) kg (lb)	7952 (17,530) 6546 (14,430)			
Maximum Fuel Capacity Weight Unit with trailer Unit without trailer	kg (lb) kg (lb)	9662 (21,300) 8256 (18,200)			
Engine Lubricating Oil Capacity Engine Coolant Capacity with Radiator Fuel Tank Capacity	L (qts) L (gal) L (gal)	60 (15.8) 38.1 (10.1) 1970 (520)			
Fuel Consumption Fuel Consumption (75% Prime) Running Time @ 75% Prime Sound Level Standby No load @ 7 m (23 ft) Prime	L/hr (gal/hr) L/hr (gal/hr) hours dB(A) dB(A) dB(A)	120.8 (31.9) 74.6 71.7 73.9	112.5 (29.7) 94.0 (24.8) 21.0		
Ambient Capability	Deg C (Deg F)	43 (109.4)			

RATING DEFINITIONS AND CONDITIONS

Meets or Exceeds International Specifications:

- NEMA MG1-32, IEC 60034, CSA, 98/37/EEC, 72/23/EEC, UL 508, UL142, ISO3046/1, ISO8528, 89/336/EEC

Standby – Output available with varying load for the duration of the interruption of the normal source power. Standby power in accordance with ISO8528. Fuel stop power in accordance with ISO3046/1, AS2789, DIN6271, and BS5514.

Prime – Output available with varying load for an unlimited time. Prime power in accordance with ISO8528. 10% overload power in accordance with ISO3046/1, AS2789, DIN6271, and BS5514 available on request.

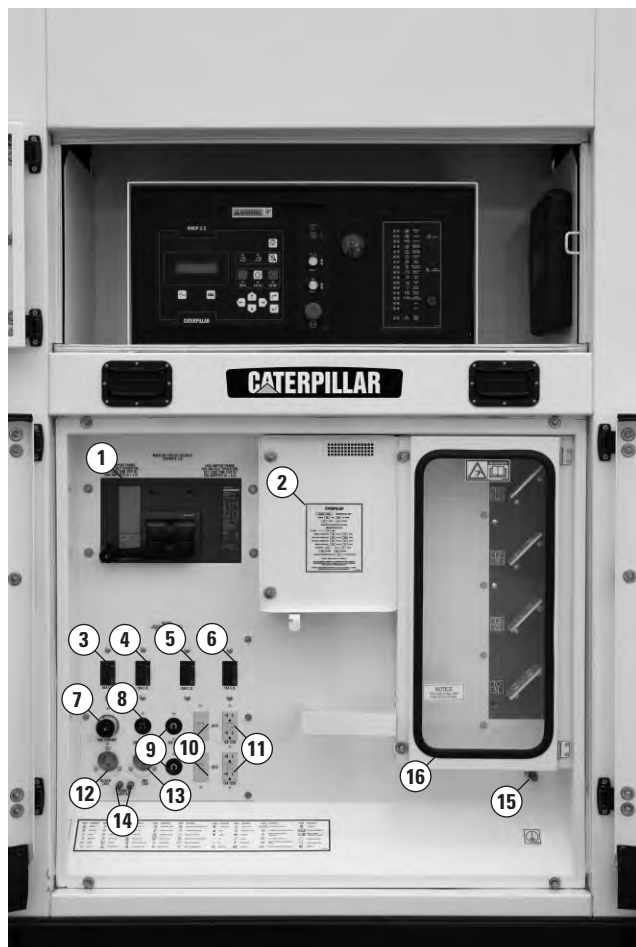
Ratings are based on SAE J1349 standard conditions.

These ratings also apply at ISO3046/1, DIN6271, and BS5514 standard conditions.

Fuel rates are based on fuel oil of 35° API [@ 16° C (60° F)] gravity having an LHV of 42 780 kJ/kg (18,390 Btu/lb) when used at 29° C (85° F) and weighing 838.9 g/liter (7.001 lb/U.S. gal).

Additional ratings may be available for specific customer requirements. Consult your Caterpillar representative for details.

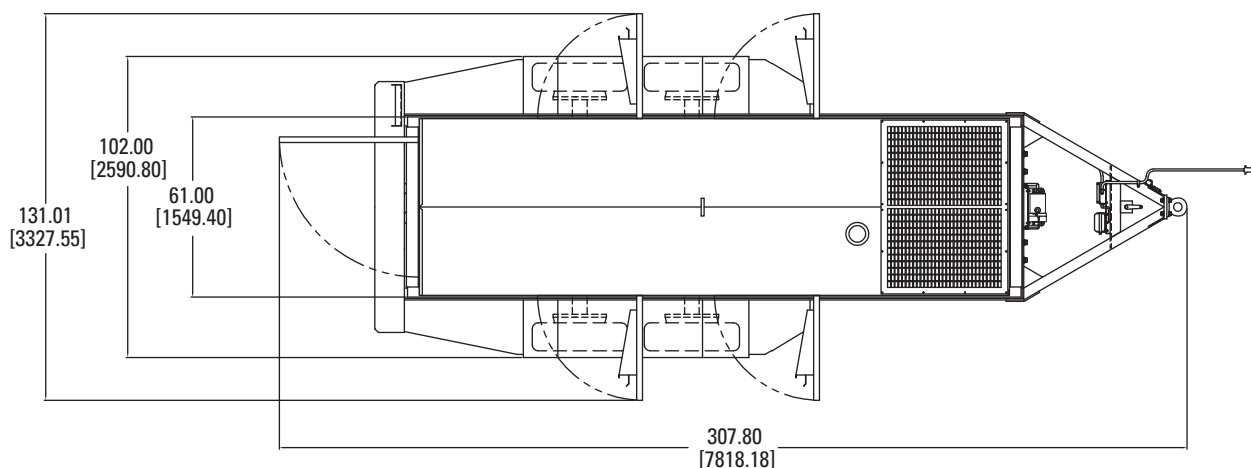
DISTRIBUTION PANEL



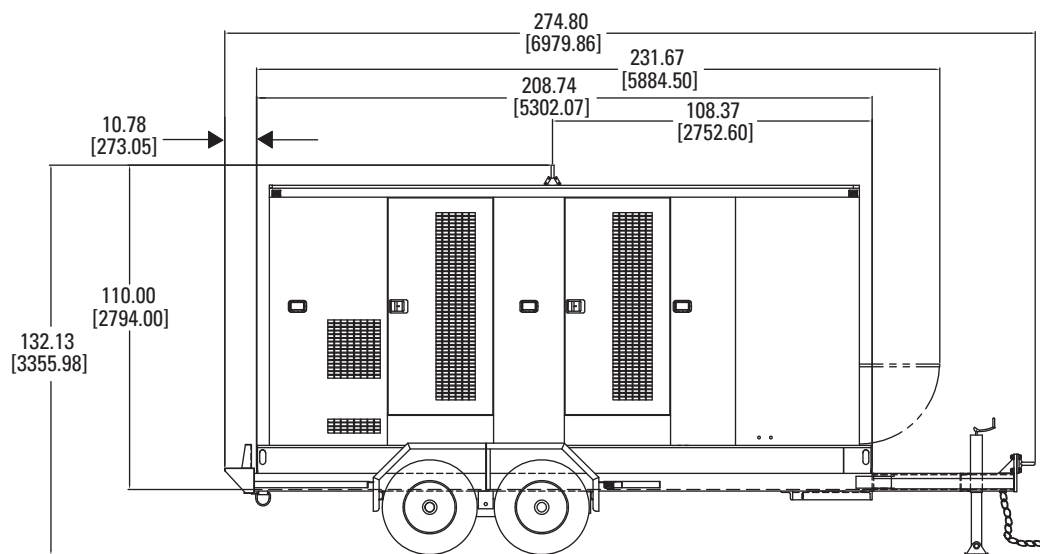
Wiring Descriptions

1. 1600A main breaker 240V/480V with adjustable trip and 24V DC shunt trip
2. Voltage change over board
3. 50 amp 240V branch breaker
4. 20 amp 240V branch breaker
5. 20 amp 120V branch breaker
6. 15 amp 120V branch breaker
7. 50 amp 240V twistlock receptacle
8. 20 amp 240V twistlock receptacle
9. 20 amp 120V twistlock receptacle (2x)
10. 20 amp 120V ground fault interrupter, (2x)
11. 15 amp 120V ground fault interrupter, duplex receptacle (2x)
12. 30 amp 120V battery charger/generator space heater receptacle
13. 30 amp 120V JWH receptacle
14. Remote start/stop contacts
15. 12.7 mm (1/2") ground stud
16. Load connection bus board
[6.35 mm × 101.6 mm × 101.6 mm
(1/4" × 4" × 4") bus bars]

CONTAINER DIMENSIONS — TOP VIEW



CONTAINER DIMENSIONS — RIGHT SIDE VIEW



Overall Dimensions				
	Package		With Trailer	
Length	5302.07 mm	208.74 in	6979.8 mm	274.8 in
Width	1549.4 mm	61.0 in	2590.8 mm	102.0 in
Height	2794.0 mm	110.0 in	3355.98 mm	132.13 in

Information contained in this publication may be considered confidential.

Discretion is recommended when distributing.

Materials and specifications are subject to change without notice.

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U.S. Sourced

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www.cat-electricpower.com

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RDS-15

THE **ULTIMATE** TOUGH CRUSHING SOLUTIONS

IROCK'S RDS-15 closed-circuit, portable crusher offers rapid set-up time and exceptional portability. This versatile plant is ideally suited for asphalt recycling applications, but it also effectively and efficiently crushes materials such as rock, gravel and slag. And with the ability to easily return two decks to the crusher, the RDS-15 can increase output by up to 20 percent.



RDS-15



ENGINE	350-horsepower CAT® C9 ACERT (Tier 3)
PROCESSING CAPACITY	Up to 350 TPH
TOP DECK	14 feet by 5 feet
BOTTOM DECK	14 feet by 5 feet
FEEDER SIZE	40 inches by 14 feet
ROTOR SIZE	40 inches by 43 inches
WEIGHT	97,940 pounds



FEATURES

▶ Closed-circuit design with a four-bar impactor offers exceptional durability and efficiency for producing uniformly sized product.

▶ Ability to return top and middle deck oversized material back to the crusher. This feature increases production by splitting the load on two decks rather than one.

▶ The RDS-15's on-board power source runs the complete operation as well as three auxiliary outlets.

▶ The ROCK BOX allows crushed material to build into a natural rock shelf. The shelf acts as a liner that reduces wear on the discharge point.

IROCK 5531 CANAL ROAD, VALLEY VIEW, OH 44125

Phone: 866-240-0201 • Fax: 440-735-4974 • Email: sales@irockcrushers.com

www.irockcrushers.com

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Proposal Summary

Quantity	Description	Each	Total
1	Doosan DL450 Wheel Loader	\$ 320,430.00	\$ 320,430.00
1	Doosan DL420 Wheel Loader	\$ 189,000.00	\$ 189,000.00
1	Doosan DX490 Excavator	\$ 295,000.00	\$ 295,000.00
1	Bobcat E85 Mini Excavator	\$ 85,737.00	\$ 85,737.00
1	Doosan DA30 Articulated Dump Truck	\$ 230,000.00	\$ 230,000.00
1	Doosan DA30 Articulated Dump Truck	\$ 230,000.00	\$ 230,000.00
1	Bobcat T550 Compact Track Loader (with attachments)	\$ 59,150.00	\$ 59,150.00
1	Komatsu D39PX-22 Dozer	\$ 120,000.00	\$ 120,000.00
1	Caterpillar D8R Dozer	\$ 160,000.00	\$ 160,000.00
1	Doosan G450 Trailered Generator	\$ 185,000.00	\$ 185,000.00
			\$ 1,874,317.00



Doosan DL450 Wheel Loader

Quantity	Description	Each	Total
1	<p>Doosan DL450-5 US10 Wheel Loader 6 yd bucket with JRB style hydraulic quick coupler 96" pallet forks Current hours: 187</p> <p>Specifications: 354HP Scania DC13 T4 diesel engine Load isolation system Xenon head lamps Block heater Water separator w/ heater Full automatic power shift transmission Limited slip front & rear differentials Dual pedal breaking system Outboard wet disc brakes Full hydraulic power steering Travel Speed: 22.4mph forward, 11.5mph reverse 111 gallon fuel tank capacity Height to hinge pin: 14' 9" Max dump height: 10' 8" Breakout force: 51,930 lbs Static tipping load: 45,225lbs Operating weight: 50,900lbs Shipping dimensions (LxWxH): 30' x 9'9" x 11'9" (without bucket)</p>	\$ 320,430.00	\$ 320,430.00





Doosan DL420 Wheel Loader

Quantity	Description	Each	Total
1	<p>Doosan DL420-3 US10 Wheel Loader 5 yd GP bucket with JRB style hydraulic quick coupler 96" pallet forks Current hours: 615</p> <p>Specifications: 354HP Scania DC13 turbo iT4 diesel engine Load isolation system Xenon head lamps Block heater Water separator w/ heater Full automatic power shift transmission Limited slip front & rear differentials Dual pedal breaking system Outboard wet disc brakes Full hydraulic power steering Travel Speed: 22.4mph forward, 11.5mph reverse 111 gallon fuel tank capacity Height to hinge pin: 14' 1" Max dump height: 10' 8" Breakout force: 47,210 lbs Static tipping load: 39,990lbs Operating weight: 50,900lbs Shipping dimensions (LxWxH): 28'7" x 9'9" x 11'7" (without bucket)</p>	\$ 189,000.00	\$ 189,000.00





Doosan DX490 Excavator

Quantity	Description	Each	Total
1	Doosan DX490 LC-3 US30 Excavator 60" HD bucket Hydraulic quick coupler Hydraulic thumb Current hours: 420 Specifications: 370HP Isuzu AL-6WG1X variable geometry turbo iT4 diesel engine EPOS (electronic power optimizing system) controller Two way piping Boom length: 23'4" Arm length: 11' 35.4" triple grouser shoes Operating weight: 112,206lbs (without attachments) 12'10" normal track guard 20,283lbs counterweight Travel Speed: 3.4mph high / 1.9mph low Fuel tank capacity: 181 gallons Dig depth: 25'7" Max reach: 39'9" Max bucket pin height: 31'9" Shipping dimensions (LxWxH): 40'1" x 10'9" x 12'1" (without attachments)	\$ 295,000.00	\$ 295,000.00





Bobcat E85 Mini Excavator

Quantity	Description	Each	Total
1	Bobcat E85 Mini Excavator 24" trenching bucket Pin grabber coupler Hydraulic thumb Current hours: 220 Specifications: 59.4HP T4 Yanmar diesel engine 26.4 gpm aux hydraulic flow Travel motion alarm Dozer blade w/ float 2.9mph max travel speed Dig depth: 15'6" Max reach: 23'11" Dump height: 16'5" Boom swing: 70 degrees left, 55 degrees right Bucket breakout force: 14,509 lbs Arm breakout force: 8,069lbs Operating weight 18,960lbs Shipping dimensions (LxWxH): 20'7" x 7'6" x 8'8"	\$ 85,737.00	\$ 85,737.00





Doosan DA30 Articulated Dump Truck

Quantity	Description	Each	Total
1	<p>Doosan DA30 Articulated Dump Truck</p> <p>Current hours: 927</p> <p>Specifications:</p> <p>365HP iT4 Scania DC9 turbo W/C diesel engine ZF 8EP320 transmission: 8F/4R fulltime 6x6 Travel speed max: 34.2mph forward / 9.9mpg reverse Limited slip front differential 100% lockable rear differential HB400 steel body Scissor type top tailgate 23.3cy heaped capacity w/ tailgate Dump time: 10 seconds up, 9 seconds down HVAC tilt cab w/ air seat LCD instrument display Rear view camera Automatic lubrication system Fuel tank capacity: 88.5 gallons Hydraulic wet disc brakes 23.5R25 two star tubeless radials Empty weight: 51,588lbs Full weight: 113,318lbs Height at full dump: 19'4" Shipping dimensions (LxWxH): 31'4" x 9'10" x 11'8"</p>	\$ 230,000.00	\$ 230,000.00





Doosan DA30 Articulated Dump Truck

Quantity	Description	Each	Total
1	<p>Doosan DA30 Articulated Dump Truck</p> <p>Current hours: 1216</p> <p>Specifications:</p> <p>365HP iT4 Scania DC9 turbo W/C diesel engine</p> <p>ZF 8EP320 transmission: 8F/4R fulltime 6x6</p> <p>Travel speed max: 34.2mph forward / 9.9mpg reverse</p> <p>Limited slip front differential</p> <p>100% lockable rear differential</p> <p>HB400 steel body</p> <p>Scissor type top tailgate</p> <p>23.3cy heaped capacity w/ tailgate</p> <p>Dump time: 10 seconds up, 9 seconds down</p> <p>HVAC tilt cab w/ air seat</p> <p>LCD instrument display</p> <p>Rear view camera</p> <p>Automatic lubrication system</p> <p>Fuel tank capacity: 88.5 gallons</p> <p>Hydraulic wet disc brakes</p> <p>23.5R25 two star tubeless radials</p> <p>Empty weight: 51,588lbs</p> <p>Full weight: 113,318lbs</p> <p>Height at full dump: 19'4"</p> <p>Shipping dimensions (LxWxH): 31'4" x 9'10" x 11'8"</p>	\$ 230,000.00	\$ 230,000.00





Bobcat T550 Compact Track Loader

Quantity	Description	Each	Total
1	Bobcat T550 Compact Track Loader	\$ 52,200.00	\$ 52,200.00
	74" Heavy Duty C&I Bucket (included in machine price)		
1	80" Light Duty Bucket	\$ 1,699.00	\$ 1,699.00
1	48" Forks (w/ frame)	\$ 1,439.00	\$ 1,439.00
1	Model 30C Auger (w/ mounting frame & 18" auger bit)	\$ 3,284.00	\$ 3,284.00
2	48" adjustable round auger bit extensions	\$ 264.00	\$ 528.00
	Total		\$ 59,150.00
	Current hours: 208		
	Specifications:		
	66HP 2.4L Bobcat diesel T4 engine		
	Hydraulic flow: 17.1gpm		
	H51 cab w/heat - power Bobtach, cab accessory package		
	Selectable Joystick Controls (SJC)		
	Hydraulic bucket positioning		
	Cold weather package: block heater & 950cca large battery		
	16" rubber track		
	Travel speed: 7.3mph		
	Horn & backup alarm		
	Height to hinge pin: 9'6"		
	Rated operating capacity (ROC): 1,995 lbs		
	Operating weight: 7,633 lbs		
	Shipping dimensions (LxWxH): 8'9" x 5'10" x 6'6" (without attachments)		





Komatsu D39PX-22 Dozer

Quantity	Description	Each	Total
1	<p>Komatsu D39PX-22 Dozer - SN 3896</p> <p>Current hours: 1,069</p> <p>Specifications: 107HP Komatsu SAA4D107E-1 engine 25" tracks Ripper 10'7" blade Full cab w/ heat and AC Operating weight: 21,803lbs Travel speed: 5.3mph forward, 5.3mph reverse Shipping dimensions (LxWxH): 14'2" x 8' x 9'3"</p>	\$ 120,000.00	\$ 120,000.00





Caterpillar D8R Dozer

Quantity	Description	Each	Total
1	Caterpillar D8R Dozer Current hours: 16,663 <u>Specifications:</u> EROPS cab, A/C, heat, diff steering Full U single tilt blade with liners Multi shank ripper with 2 shanks Fuel tank guards Arctic heating package Shipping dimensions (LxWxH): 21' x 8'6" x 11'5"	\$ 160,000.00	\$ 160,000.00





Doosan G450WCU-T2 Trailered Generator

Quantity	Description	Each	Total
1	<p>Doosan G450WCU-T2 trailered generator</p> <p>Current hours: New</p> <p><u>Specifications:</u> 544HP Cummins ZSX15-G9 engine Prime power rating: 466kVA (373 kW), 448 Amps Link board voltage configuration Frequency capability: 60Hz only Fuel tank capacity: 574 gallons Runtime @ 100% load: 22.2 hours Sound level @ 23ft and 100% load: 74 dB(A) Shipping dimensions (LxWxH): 21'9" x 7'2" x 10'</p>	\$ 185,000.00	\$ 185,000.00



Current lead times are 3 weeks.



Perkins 150 kW Diesel Generator - This Perkins diesel generator is suitable for continuous use or emergency power and has plenty of power to your home, job site or business. This unit operates at 1800 RPM and with its critical exhaust silencer, deep stiff crankcase, electronic governing, isolated valve cover and 4 point vibration mounts, this set runs smooth and quiet.

This unit features a Perkins 6.6L in-line 6-cylinder diesel engine, turbocharged cooling, direct injection for increased fuel efficiency, low heat rejection and quicker starts, brushless generator end, cool flow radiator w/ fan guards, muffler, automatic voltage regulation, high volume air filter, control panel w/ hour meter and automatic safety shutdowns for low oil pressure and high water temperature.

Options

Sound Proof Enclosure	+ \$2,359
100 Gallon Subbase Fuel Tank	+ \$1,395
250 Gallon Subbase Fuel Tank	+ \$1,795
Double-Axle Trailer	+ \$3,295
Remote Monitoring with Gauge Panel	+ \$1,195

Generator

Is this unit suitable for powering sensitive electronic equipment like a laptop computer?	YES
Automatic Voltage Regulation	Standard
Electrical Specifications	
Maximum Output	152,000 watts
Continuous Output	150,000 watts
Power One-Phase Reconnectable	
Load Amperage at 120 volts	
Maximum Load	1267 Amps
Continuous Load	1250 Amps
Load Amperage at 240 volts	

Maximum Load	634 Amps
Continuous Load	625 Amps
Power Three-Phase Reconnectable	
Load Amperage at 120 volts	
Maximum Load	915 Amps
Continuous Load	903 Amps
Load Amperage at 208 volts	
Maximum Load	528 Amps
Continuous Load	521 Amps
Load Amperage at 277 volts	
Maximum Load	396 Amps
Continuous Load	391 Amps
Load Amperage at 480 volts	
Maximum Load	229 Amps
Continuous Load	226 Amps

Engine

Model	Perkins 1106D-E66TA
Combustion System	Direct Injection
Operating RPM	1800
Number of Cylinders	6
Cylinder Arrangement	Vertical in-line
Cycle	4 stroke
Cylinder Block	Cast Iron Block w/ Cast Iron Sleeve
Bore & Stroke	4.13" x 4.99"
Displacement	6600 cc
Compression Ratio	16.2:1
Exhaust Outlet	3" OD Muffler Outlet
Oil Capacity (w/ Oil Filter)	17.4 Qts
Induction System	Turbocharged, Air to Air Charge Cooled
Cooling	Water-Cooled
Coolant Capacity	Approx. 5 Gal
Fuel	No. 2 Diesel
Electric Fuel Pump	12 V - Standard
Fuel/Water Separator	Standard
Cold Weather Starting Aid	Glow Plugs
Starting System	Electric

Consumption

Consumption at 1/2 load	5.3 gallons/hour
Consumption at 3/4 load	6.9 gallons/hour
Consumption at full load	8.7 gallons/hour

Control Panel

Key Start	Standard
Hour Meter	Standard
Circuit Breaker	10 Amps - Resettable
Oil Pressure Shutdown	Standard
Engine Overspeed Shutdown	Standard
High Temperature Shutdown	Standard

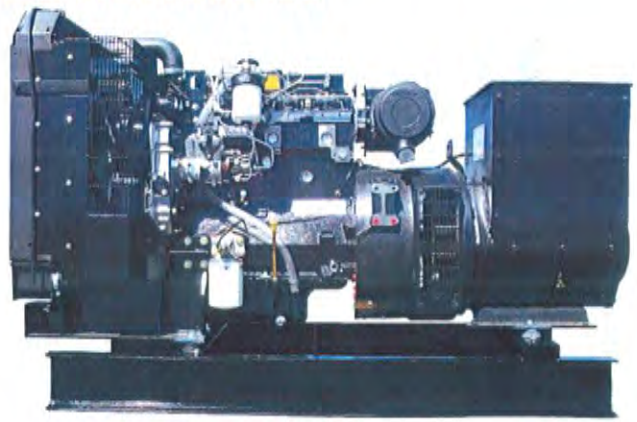
Installation Data

Fuel Inlet Hose Size	5/8"
Fuel Return Hose Size	1/2"
Power Lead Size	3/0
Exhaust Outlet	3" OD Muffler Outlet
Coolant Recommendation	Mixture: 1/2 Anti-Freeze & 1/2 Water
Radiator Dimensions (L x D x H)	29-3/4" x 14" x 28"
Service-Side Direction (Facing Radiator)	Right-Side
Exhaust Direction (Facing Service Side)	Front-Side
Fuel Inlet & Return Location (Facing Service Side)	Inlet: Front-Side Outlet: Front-Side
Power Output Direction (Facing Service Side)	Right-Side
Battery Type	12 VDC - 800 CCA - Not Included
Engine Oil Type	10W-40 Synthetic

Warranty

Engine Warranty	2 Years
Generator Warranty	1 Year
100% Coverage for Parts & Labor	Standard

Dimensions



Length	98 inches
Width	37 inches
Height	62 inches
Dry weight	2780 lbs.

MICHIGAN L90-I

The L90-I features:

- Direct-injected, turbocharged Volvo diesel
- Volvo BM Automatic Power Shift
- Precision steering and small turning radius
- Unmatched operator comfort
- Loader unit with parallel lift-arm action, high lift height and long reach
- Pilot operated hydraulic system
- Ample breakout and lifting forces
- Hydraulic attachment bracket
- The largest family of attachments on the market
- Comfort drive control (opt.)



L90-I	specifications
Engine	Cummins 6 BT 5.9
Rated output SAE J1349, kW (hp)	108 (145)
Bucket volume, m3	1,9-2,5
Tires	20.5-25
Operating weight, kg	12550

DOWNLOADS

[📄 L90-I, Português \(PDF, 1.4MB\) >](#)

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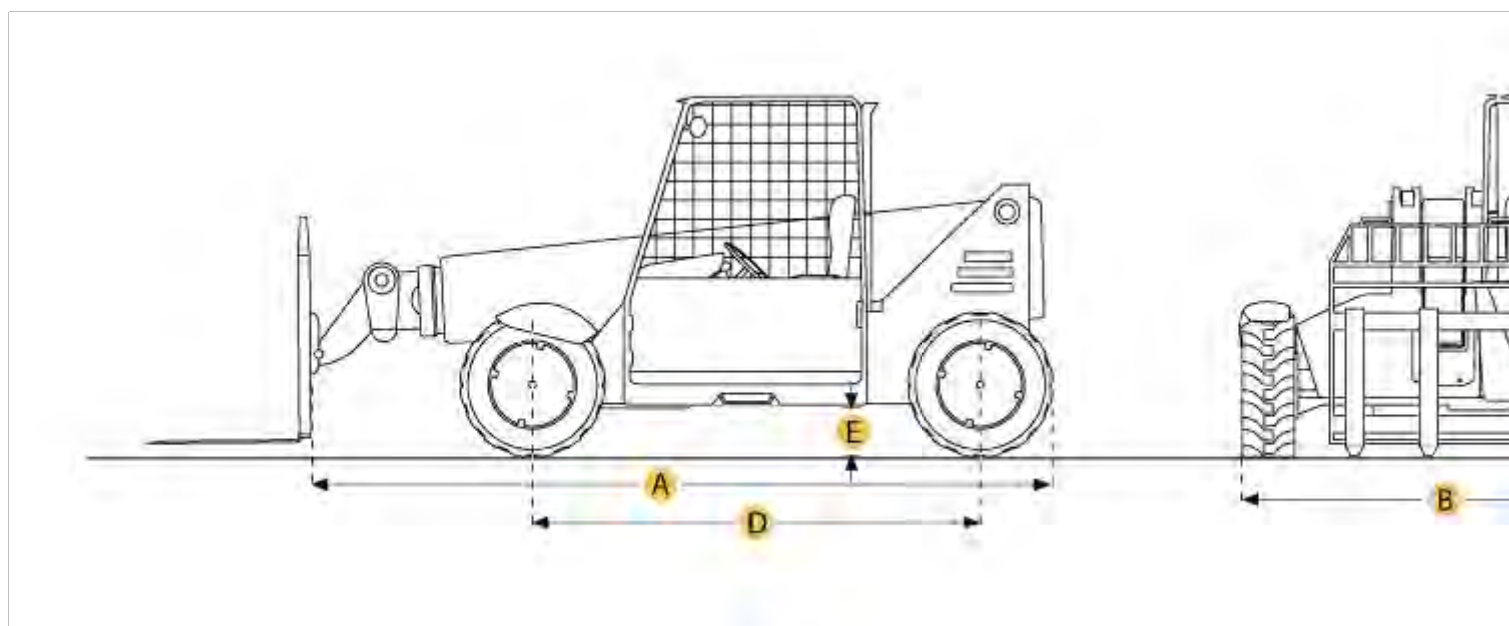


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Selected Dimensions

Dimensions

A. LENGTH TO FORK FACE	19.8 ft in	6020 mm
B. WIDTH OVER TIRES	8.1 ft in	2460 mm
C. OVERALL HEIGHT	7.8 ft in	2380 mm
D. WHEELBASE	11.2 ft in	3420 mm
E. GROUND CLEARANCE	19 ft in	483 mm

Lift

F. MAX LIFT HEIGHT	45 ft in	13716 mm
G. MAX FORWARD REACH	31.5 ft in	9601.2 mm

Specification

Engine

MAKE	John Deere	
MODEL	e 4045TF275	
GROSS POWER	110 hp	82 kw
POWER MEASURED @	2400 rpm	

DISPLACEMENT	274.6 cu in	4.5 L
NUMBER OF CYLINDERS	4	
ASPIRATION	turbocharged	

Operational

OPERATING WEIGHT	24420.6 lb	11077 kg
FUEL CAPACITY	38 gal	144 L
HYDRAULIC SYSTEM FLUID CAPACITY	40 gal	151.4 L
OPERATING VOLTAGE	12 V	
ALTERNATOR SUPPLIED AMPERAGE	65 amps	
DRAWBAR PULL	20000 lb	9071.8 kg
TIRE SIZE	13.00x24 12PR	

Transmission

MAX SPEED - FORWARD	18 mph	29 km/h
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Hydraulic

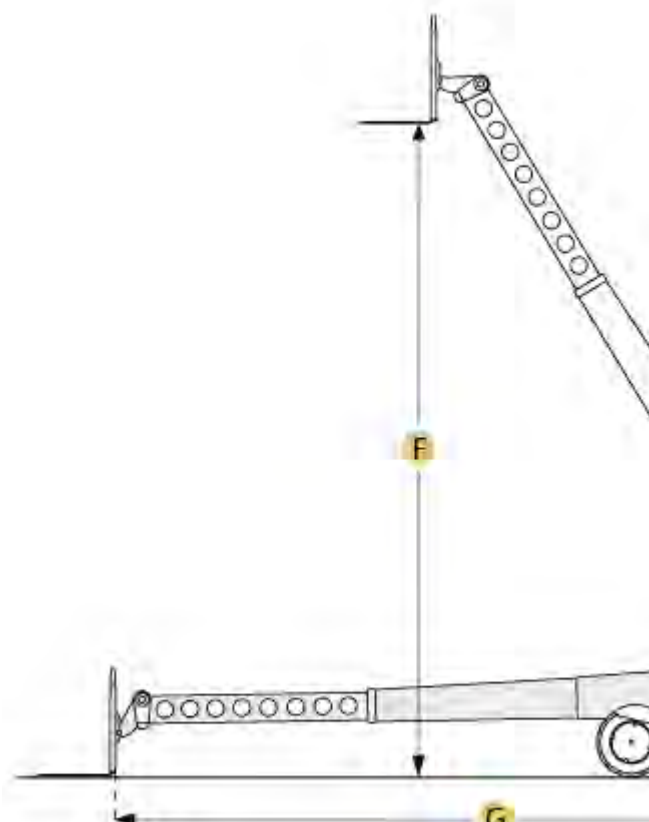
PUMP TYPE	single-section gear pump	
RELIEF VALVE PRESSURE	6300 psi	43436.9 kPa

Lift

MAX LIFT CAPACITY	9000 lb	4082.3 kg
MAX LIFT HEIGHT	45 ft in	13716 mm
MAX LOAD AT MAX HEIGHT	7000 lb	3175.1 kg
MAX FORWARD REACH	31.5 ft in	9601.2 mm
MAX LOAD AT MAX REACH	1600 lb	725.7 kg

Dimensions

LENGTH TO FORK FACE	19.8 ft in	6020 mm
WIDTH OVER TIRES	8.1 ft in	2460 mm
OVERALL HEIGHT	7.8 ft in	2380 mm
WHEELBASE	11.2 ft in	3420 mm
GROUND CLEARANCE	19 ft in	483 mm
TURNING RADIUS OUTSIDE TIRES	14.4 ft in	4390 mm





Viewing Photo 1 of 5

APPENDIX J

Mertarvik Bulk Fuel and Rural Power Systems 35% Drawings

(Separate attachment to this report)