FINAL REPORT
BULK FUEL FACILITY ASSESSMENT
VARIOUS LOCATIONS, ALASKA
CONTRACT TFSADNC17D0001, DELIVERY ORDER 20342918F00012

MARCH 2019

Prepared for:
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ACRONYMS AND ABBREVIATIONS

AAC ....Alaska Administrative Code
ADEC................Alaska Department of Environmental Conservation
AEA ....Alaska Energy Authority
AFI ....Arctic Foundations, Inc.
Ahtna.................Ahtna Environmental, Inc.
API ....American Petroleum Institute
AST ....aboveground storage tank
ATV ....all-terrain vehicle
AVTEC ....Alaska Vocational Technical Center
BFS ...................U.S. Department of the Treasury, Bureau of the Fiscal Service
CNC ....Chefarnrmute Native Corporation
Commission ......Denali Commission
DFT ....dry film thickness
EPA ....United States Environmental Protection Agency
LKSD ....Lower Kuskokwim School District
NDE ....non-destructive examination
NPS ....nominal pipe size
OD.....................outer diameter
psig....................pounds per square inch gauge
SPCC.................Spill Prevention, Control, and Countermeasure
STI.....................Steel Tank Institute
Taku ....Taku Engineering
UL ....Underwriters Laboratories
ULSD ....Ultra Low Sulfur Diesel
USCG................United States Coast Guard
UT ....ultrasonic testing
UV.....................ultraviolet
VT ....visual examination
°F.......................degrees Fahrenheit

EXECUTIVE SUMMARY

Ahtna Environmental, Inc. (Ahtna) collected bulk fuel facility condition data on behalf of the Denali Commission (Commission), to support prioritization of renovation, training, and maintenance/repair actions across its bulk fuel facility investments.

Bulk fuel facility evaluations were conducted at four facilities in three Alaska locations – Kwigillingok, Chefornak, and Nikolai – representing a range of designs, service environments, and fuel delivery methods. The August 2018 site visits included overall facility condition assessment, evaluation of corrosion, thermosyphon inspections (if present), evaluation of water or other contaminants in the tanks, and evaluation of fuel transfer practices.

Based on facility conditions at the three project locations, Ahtna observed several general concern areas, and recommends the following priorities for the Commission's Energy and Bulk Fuel Program:

- Address deferred maintenance, particularly related to maintenance of coatings and prevention of corrosion;
- Increase access to and encourage bulk fuel operator training for village or tribal employees working on bulk fuel storage facilities;
- Develop a regular facility inspection and maintenance program, including periodic corrosion and thermosiphon testing; and
- Develop a design review checklist, including climate change considerations in foundation designs.

1.0 INTRODUCTION

Ahtna Environmental, Inc. (Ahtna) developed this report for the Denali Commission (Commission) under U.S. Department of the Treasury, Bureau of the Fiscal Service (BFS) contract TFSADNC17D0001, order 20342918F00012, to document bulk fuel facility evaluations that were conducted at three locations in Alaska, in accordance with the Final Work Plan dated 3 August 2018.

1.1 Project Goal and Objectives

The Commission has funded the construction of new bulk fuel storage facilities in approximately 110 communities. The oldest of these "newer" facilities are now almost 20 years old. Recently, concerns have been raised about tank corrosion; buried pipe corrosion; the long-term reliability of thermosyphons or thermopile foundations in warming permafrost; water and other contaminants in delivered fuel; fuel transfer practices; operator turnover/expertise/certification; and the transition to Ultra Low Sulfur Diesel (ULSD) including associated fuel storage needs. In line with its investment focus on renovation, training, and maintenance/repair, the Commission wants to assess any impacts related to these concerns on aboveground storage tank (AST) reliability, and prioritize which courses of action should be taken to address the concerns across all its bulk fuel investments.

In order to satisfy this goal, facility condition data regarding the following five concern areas were collected and evaluated:

- Overall Facility Condition.
- Tank and Pipe Corrosion.
- Tank Farm Foundation Condition.
- Water and other Contaminants in Tanks.
- Fuel Transfer Practices.

1.2 Project Locations

In accordance with the Work Plan, the Ahtna team inspected four bulk fuel facilities in the following three locations (Figure 1-1):

- Kwigillingok.
- Chefornak.
- Nikolai.

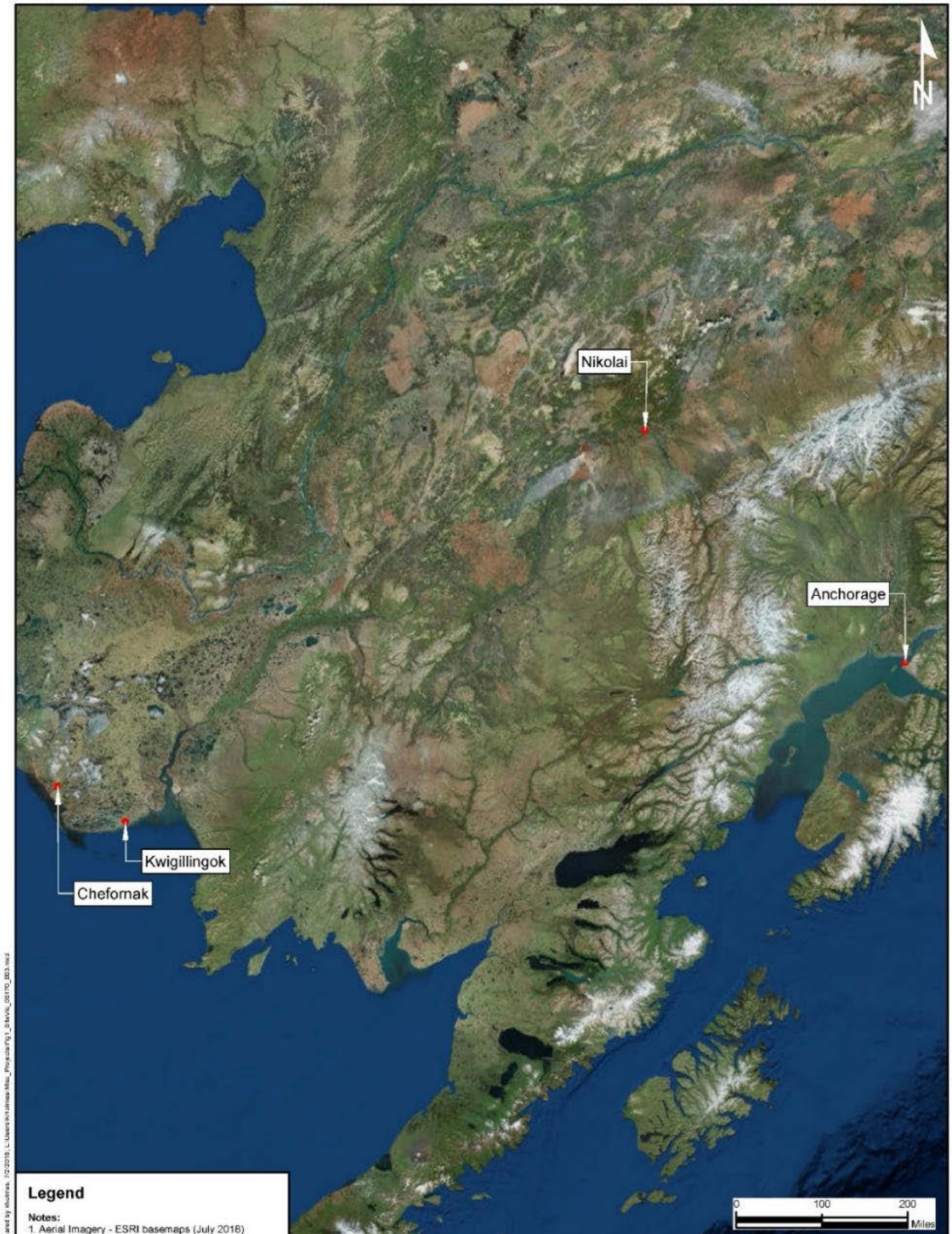


Figure 1-1 Project Locations

Table 1-1 summarizes key characteristics of the bulk fuel facilities that were assessed.

TABLE 1-1: BULK FUEL FACILITY KEY CHARACTERISTICS OVERVIEW

Bulk Fuel Facility	Region	Fuel Delivery Method	Year Constructed	Years of Service	New Tanks	Refurbished Tanks	Assumed New Tanks
Kwigillingok Marina	Coastal	Barge	1997	21	Unknown	Unknown	All
Kwigillingok Powerhouse	Coastal	Barge	2005	13	#1-3	None	None
Chefornak	Coastal	Barge	2000	18	#13-17, #20	#1-12, #18, #19, City's additional skid tank	#21-22 (LKSD tanks installed 2010)
Nikolai	Interior	Air	2003	15	C1-C4	C5, C6, S1, Contingency	None

2.0 BULK FUEL FACILITY ASSESSMENTS

Bulk fuel facility evaluations were conducted at the three project locations in August 2018. All site visits included an overall facility condition assessment, an evaluation of corrosion, thermosyphon inspections (if present), evaluation of water or other contaminants in the tanks, and evaluation of fuel transfer practices. Ahtna engineers led the site visits, with specialty support from Taku Engineering, LLC (Taku) and Arctic Foundations, Inc. (AFI) personnel.

2.1 Kwigillingok

The village of Kwigillingok is located about 80 miles southwest of Bethel on the western shore of Kuskokwim Bay (Figure 1-1). The community can be accessed with small commercial aircraft operated by various carriers. The two tank farms evaluated in Kwigillingok are described in the following subsections.

2.1.1 Kwigillingok Marina Bulk Fuel Facility

The Kwigillingok Marina Bulk Fuel Facility was constructed during the summer of 1997. It is owned and operated by the Native Village of Kwigillingok. The facility has a total contained capacity of about 150,000 gallons, of which 116,800 gallons are currently used. This categorizes it as a "Class 2" facility per 18 Alaska Administrative Code (AAC) 75. In addition, there is an approximately 10,000-gallon, double-walled skid tank outside containment.

The tank farm consists of a 64.5-foot by 84.5-foot steel containment dike with 20-inch-high dike walls and security fence. The steel containment dike is founded on W12 x16 beams spaced 3-foot-4.5-inch on-center set directly on top of an earthen pad, per USKH 28 February 1997 design drawings (Figure 2-1). Per the design drawings, the earthen pad consists of woven geotextile (MiraFi® 500) placed on the natural vegetative tundra mat, with a sand fill pad approximately 2 feet thick with 2:1 side slopes. Thermosyphons were installed 9-foot-3-inch on-center beneath 4 inches of rigid insulation to maintain permafrost conditions under the pad. A fuel-resistant membrane liner was placed over the rigid insulation and a sand-filled cellular confinement grid (GeoWeb®) was placed on top of the pad for the surface course.

Eight horizontal cylindrical tanks (two gas, five diesel, one dual-product) and four vertical tanks (not currently in use) are located inside the containment dike. All tanks within the containment are painted steel single wall. A single double-walled horizontal diesel tank is located outside the containment.

The primary purpose of the tank farm is retail sale to the community.

2.1.1.1 Site Visit Overview

On 14 August 2018, Andrew DuComb (Ahtna), Eric Weiler (Taku), James Adams (Taku/QA Services), and Jason Zottola (AFI) arrived in Kwigillingok. The team toured the Marina Bulk Fuel Facility together, and then performed their specialty assessments.

The tank farm appeared to be mostly original, based on as-built drawings reviewed prior to the site visit. It should be noted that the generator building that lies between the tank farm and the river is no longer in use.

During the site visit, a double-walled skid tank (estimated at 10,000 gallons) was discovered adjacent and hard-piped to the tank farm. The facility's operator, Jimmy Oscar, indicated that this tank was added after the construction of the tank farm. He thinks perhaps it was added by a construction company working on the airport, to be able to transfer fuel for heavy equipment from the marine header, utilizing existing piping. The skid tank has since been retrofitted with a Fill-Rite® 120-volt metered fuel transfer pump inside a plywood structure to shield from the weather (Appendix B1, Photographs 4 and 5). Mr. Oscar indicated that the four vertical tanks in the tank farm were put out of service approximately three to four years prior to this visit, due to integrity concerns.

2.1.1.2 Overall Condition Assessment

Mr. DuComb met with Mr. Oscar to discuss operations, concerns, and the evaluation checklist. At the time of the site visit, he had worked at the tank farm on and off for the past 11 years and had been the sole operator for the last year and a half. Mr. Oscar attended the Alaska Bulk Fuel Operator Training in Seward in 2009.

The discussion revealed that likely no tanks or piping within the facility had ever received any scraping and repainting as preventive maintenance.

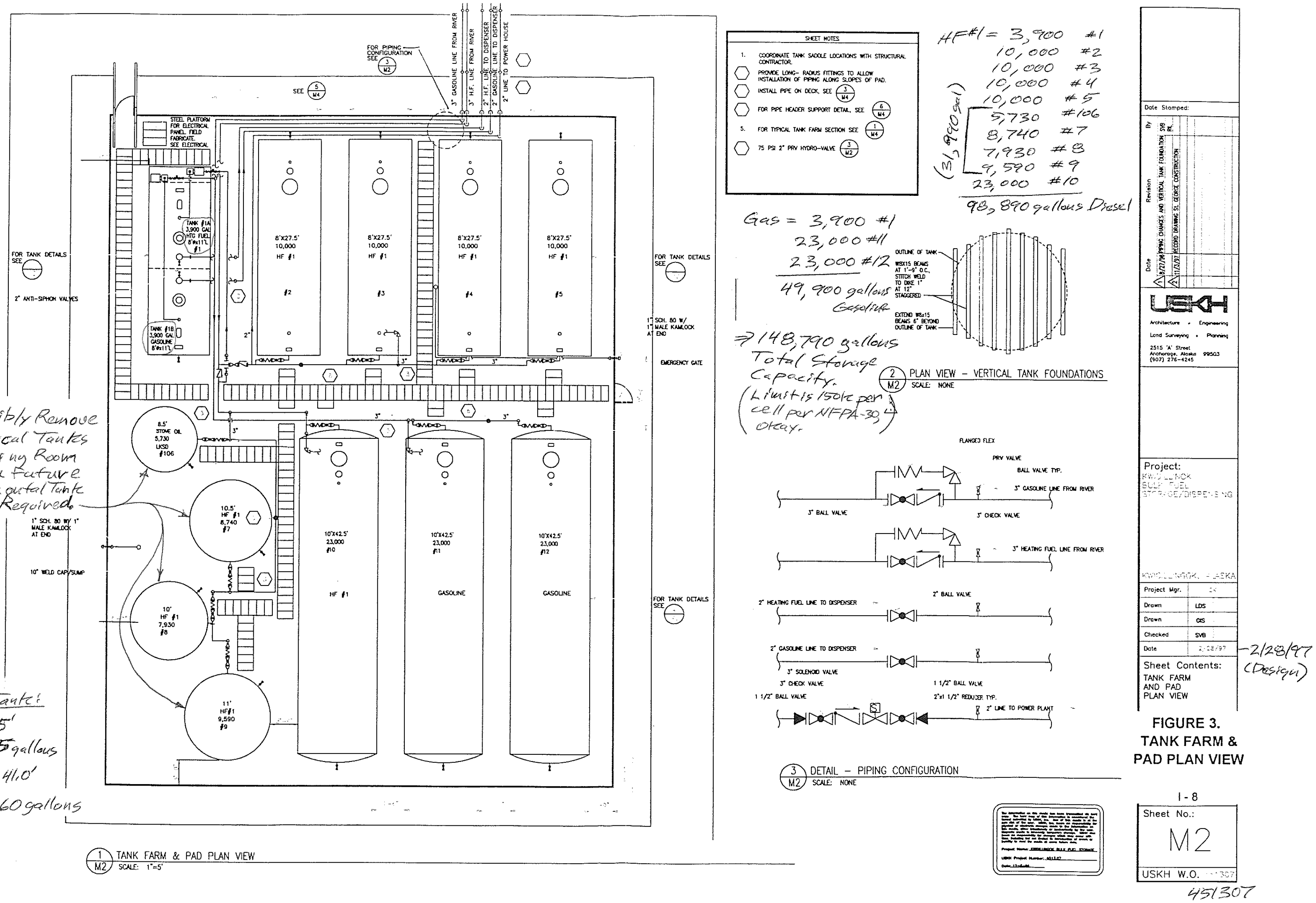


Figure 2-1 Kwigillingok Marina Bulk Fuel Facility Tank Layout

Mr. Oscar's concerns and recommendations regarding operation of the tank farm include:

- Marine header and dispenser piping integrity:
    - Raise or relocate to alleviate annual flooding issues. Mr. Oscar stated the flood waters during spring break-up submerge the piping corridor and make travel to the marine header and dispenser dangerous.
    - Evaluate stability of old generator house foundation since foundation failure could damage the header piping. (AFI determined during this field work that the 2 thermosyphons at this foundation are functional. No additional foundation evaluations were made.)
- Internal tank integrity: perform internal out-of-service tank corrosion inspections to assess extent of damage.
- Tank piping integrity: raise piping within the containment pan to reduce submersion.
- Security lighting: repair the security lights, to enhance security and safety during general work around the tank farm during times of reduced daylight.
- Operation panel fuse failures: diagnose and correct issue causing operational panel fuses to fail occasionally.
- Fuel storage: add gasoline and heating oil storage capacity. Mr. Oscar thinks there are more all-terrain vehicles (ATVs), snow machines, and boats in use than when the tank farm was designed. Reportedly, the facility can get very low on fuel before a barge delivery.

Mr. DuComb visually assessed the condition of Kwigillingok Marina Bulk Fuel Facility using the checklist provided in Appendix A1. The checklist establishes scoring and criteria for: Site Location, Secondary Containment, Foundation, Tanks, Piping, Electrical and Life/Health/Safety. The checklist is the same as was used during 2015 facility assessments, for comparability. The facilities were also documented with photographs, attached in Appendix B1 and Appendix F.

The Kwigillingok Marina Bulk Fuel Facility received a score of 85 out of 240 possible points and was ranked as a medium-risk facility.

The facility received punitive points for:

- The proximity of the dispenser to the flooding river bank and the header pipes that are seasonally submerged.
- The immediate need of cleaning and painting of tank exteriors and piping.
- Welded piping below grade (buried in flood plain), and threaded piping above grade.
- Exposed electrical wiring.

Deficiencies noted on the checklist included:

- Tanks not listed (or listing not placarded), other than the dual-product dispenser tank.
- Dispenser threatened by coastal erosion.
- Tanks not numbered or labeled.
- Excessive tank corrosion.
- Improper valve material (brass ball valves on skid tank piping).
- Inadequate pipe support.
- Electrical conduit not supported.

- Missing regulatory signs.
- Missing fire extinguisher (at header/dispenser).
- Missing regulatory Spill Prevention, Control, and Countermeasure (SPCC) plan.

Additional deficiency and concern observations included:

- Approximately 4 inches of water was present standing in the containment during the time of evaluation. Water staining on the wall and tank supports suggest water depths of 5–6 inches are commonly present. Visual evidence suggests containment is not regularly dewatered.
- The ball valve at the low point drain on the dispenser secondary containment is corroded open and inoperable.
- Few clock gauges in the tank farm are functional. Visual observations of tank levels are relied upon during barge fuel transfers.
- Sumps within the steel containment are clogged with paint and rust chips from the tanks and containment floor making them barely operational.
- Gravity syphoning is relied upon to drain water from containment.
- Security lighting does not work.
- Heavy vehicle traffic exists along the low-lying marine header and dispenser supply pipes.
- Tanks and secondary containment are not de-watered.
- Limited spill response resources are available for capturing and cleaning up a release.
- A rubber transfer hose is connected to the unlocked low point drain of Tank #5 and openly terminates outside of the containment.

2.1.1.3 Tank and Pipe Corrosion Assessment

Taku completed a corrosion evaluation consisting of integrity inspections for six of the eight horizontal tanks, piping evaluations for the aboveground diesel and gasoline piping circuits, and corrosion and coating assessments for the steel containment. Non-destructive examination (NDE) inspection included visual examination (VT), ultrasonic testing (UT), and measurement of coating dry film thickness (DFT). The inspection was performed in accordance with the applicable sections of the Steel Tank Institute (STI) standard SP001, 5th Edition, 2011 and the American Petroleum Institute (API) standard 570, 2nd Edition Addendum 3, 2003.

Per the original construction design drawing for this tank farm, four of the storage tanks are 10,000-gallon diesel tanks and three are 23,000-gallon tanks (two gasoline, one diesel). The dispenser tank is a two-compartment tank with 7,900 gallons total capacity, and is the only UL-listed tank in the tank farm. The tank farm also contains four small vertical tanks that have been taken out of service and abandoned in place. The piping inspected in the tank farm is of an unknown grade and material type with wall thicknesses that correspond to a mix of Schedule 40 and Schedule 80. All piping is in either diesel or gasoline service. The piping circuits inspected included nominal pipe size (NPS) 1-inch, 2-inch, and 3-inch piping, with the majority of piping being NPS 2-inch. The original design basis of the fuel system is unknown. A single original construction drawing was available and contained no information about the piping other than size. All piping and tanks, with exception to minor modifications, were assumed to have been installed in 1997 based on this drawing.

The following items were visually inspected: piping, supports, shell plates, shell appurtenances, heads, walking/working surfaces, containment, venting, gauging, bonding and grounding, and coating condition. UT and VT were performed on the shell, heads, shell nozzles, reinforcement pads, and piping.

Taku's complete report is provided in Appendix C1.

2.1.1.4 Tank Farm Foundation Assessment

There are 12 thermosyphons located at the Kwigillingok Marina Bulk Fuel Facility, and two more located at the abandoned generator building north of the tank farm. No ground temperature instrumentation was found to have been installed at the facility. AFI measured the internal pressure of each thermosyphon and computed the temperature of the gas/liquid interface. AFI also made visual observations of their condition.

Each thermosyphon unit is constructed of 3.5-inch outer diameter (OD) steel pipe with a 70SF condenser and a 42-foot sloping evaporator. Internal pressures of the thermosyphons ranged from 481 pounds per square inch gauge (psig) to 485 psig. From the pressure data, the internal temperatures of the thermosyphon evaporators were computed and ranged from 30.7 degrees Fahrenheit (°F) to 31.3 °F. The pressure data indicate that all 14 units were operational at the time of the inspection.

AFI observed corrosion extending the full length of the finned condenser on all 14 thermosyphons (Appendix D, Figure 1). AFI observed cavities in the soil around the thermosyphon riser pipe (Appendix D, Figure 2). These cavities are assumed to be caused by slumping of the pad in these locations (Appendix D, Figures 3 and 4). No water was visible inside the cavities; however, it is assumed that water does penetrate the cavities, ponds, and then seeps through the pad.

AFI's complete report is provided in Appendix D.

2.1.1.5 Water and other Contaminants in Tanks

Ahtna collected information about water and other contaminants in the fuel tanks at the Marina Bulk Fuel Facility. Mr. Oscar stated that he had dipped the tanks to look for water in the past but had not recently. No records of past water measurements were located; however, Mr. Oscar recalled finding small amounts of water at the bottom of tanks, below the supply draw level. He said that the four out-of-service vertical tanks would be used as contingency tanks in the event of a release, but it is not clear how product would be transferred into them. Water draws have not been done at the tanks, since equipment and supplies to containerize removed liquids for treatment or disposal are not available.

Ahtna measured the quantity of water in seven of the eight tanks using a brass-tipped oil gauging tape and Gasoila® water finding paste. The eighth tank was empty at the time of inspection. The paste was applied on the bottom portion of the tape in the area where water was expected to appear. When the paste contacts water, the color of the paste changes from golden brown to bright red and the thickness of the water can be measured. Water was found to be present in measurable amounts settled at the bottom of five of the seven tanks. The height of the measured water layer is presented in Table 2-1.

Ahtna performed qualitative fuel quality analyses using Fleet Fuel Testing brand field test kits capable of testing diesel fuel for visual clarity and detecting water, bacteria, fungus, bugs, and algae. The field test kits were used on fuel from the five heating oil tanks. The fuel samples were collected from the top 0–0.5-foot interval of the fuel column from the top of the tank through the threaded hole by removing the clock gauge.

Suspended water was found to be present in three of the five fuel samples, with a fourth having undiscernible amounts. Fuel samples from all five tanks passed the clarity, degraded fuel and bacteria tests. All five tanks tested negative for the presence of yeast/mold. Field test results are summarized in Table 2-1. It should be noted that while the field test kits provide almost instant feedback, laboratory fuel analyses would provide higher accuracy data, if needed.

TABLE 2-1: KWIGILLINGOK MARINA FIELD TEST RESULTS

Tank #	Water (Present?)	Water Quantity	Suspended Water (Present?)	Clarity (Pass/Fail)	Degraded (Pass/Fail)	Bacteria (Pass/Fail)	Yeast/Mold (Present?)
12	Yes	1”	-	-	-	-	-
11	Yes	1”	-	-	-	-	-
10	No	N/A	No	Pass	Pass	Pass	No
5	No	N/A	Yes	Pass	Pass	Pass	No
4	Yes	1/2”	Yes	Pass	Pass	Pass	No
3	Yes	1”	Yes	Pass	Pass	Pass	No
1	Yes	1/8”	Undiscernible	Pass	Pass	Pass	No

2.1.1.6 Fuel Transfer Practices

There was not an SPCC plan at the tank farm or tank farm office during the visit. Mr. Oscar believes there is an SPCC plan at the tribal office. There were no records of historical spills or releases; however, several 5-gallon buckets filled with oil-saturated sausage booms and sorbent pads were observed next to the tank farm, indicating that releases have likely occurred. Spill response equipment and supplies are limited to a minimal amount of sorbent pads and sausage booms. There is no dedicated spill contingency tank in the facility, but in the event of a release one or more of the out-of-service vertical tanks would be used to hold released liquid. Mr. Oscar did not know of any pumps, hoses, oil suction equipment, or skimmers available in the community that would be needed to clean up a release in the secondary containment and pump into a contingency tank.

The fuel dispenser with a steel canopy and security enclosure is located near the bank of the Kwigillingok River. The marine header is adjacent to the dispenser canopy. A piping corridor consisting of 2-inch and 3-inch piping approximately 450 feet long connects the inland tank farm to the dispenser and marine header. Fuel is delivered by barge twice per year. Generally, the summer delivery is in July, and the fall delivery is in September. Receipts from barge deliveries were available.

ATVs are the primary mode of transportation in the community during the summer and snow machines are frequently used in the winter. River boats are also used during the summer months. All three local modes of transportation require gasoline and are filled at the single fuel dispenser on the riverbank. Heating oil is relied upon heavily throughout the year for cooking, hot water, and residential heating. There is no residential fuel delivery service in Kwigillingok. Typically, residents visit the dispenser with 5- or 30-gallon fuel jugs and shuttle heating oil to their residences. Larger community facilities with fuel storage, such as the water treatment plant, power plant, and school are hard piped to a different marine header.

In conversation with Mr. Oscar, it was learned that the heating oil in the pipe run to the dispenser at the river bank gels up during the winter months and becomes inoperable. Note that this may indicate usage of No. 2 heating oil in residential heating units designed for longest life using No. 1 heating oil. The auxiliary dispenser setup is now used exclusively for dispensing heating oil during the winter. The heating oil is pumped into the skid tank from a storage tank within the tank farm.

2.1.1.7 Recommendations

The tank farm has been in service for 20 years with no change in operating conditions. Numerous repairs were found that should be completed to prolong the life of the tank farm.

2.1.1.7.1 Ahtna

Ahtna makes the following recommendations for the Kwigillingok Marina Bulk Fuel Facility:

- Clean out and evaluate effectiveness of all containment sumps.
- Implement program to perform water draw on all tanks and dewater containment.
- Repair or replace all nonworking clock gauges.
- Relocate dispenser to higher ground.
- Label tanks with numbers.
- Evaluate safety and code compliance of the skid tank with brass valves and Fill-Rite® dispenser.
- Procure material resources and attend training to improve spill response.
- Add fire extinguisher to dispenser.
- Add to and improve supports to piping along corridor from the marine header to the tank farm.
- Review tank filling procedures to reduce or eliminate the potential for overfilling.

2.1.1.7.2 Taku

Taku makes the following recommendations:

2.1.1.7.2.1 General

- Conduct external monthly and annual inspections to note any progressing issues with the tank farm structures, tanks, piping, foundations, or coating.

- Evaluate the stability of the abandoned generator building and consider removal to prevent damage to the pipelines. If this is not feasible, consider rerouting the piping between the tank farm and shore-side dispenser.
- Conduct the next round of STI formal external inspections on or before August 2023. These inspections should be completed sooner if there are changes in service or operation. Maintain documentation that any tank or piping repairs and modifications were completed with qualified procedures and personnel.
- Continue formal inspection of all fuel piping within the Marina tank farm at 5-year intervals for the piping outside of containment (Class 1) and at 10-year intervals for piping within containment (Class 3), as prescribed by API-570. The next formal API-570 inspection for the piping outside of containment should be carried out no later than August 2023.
- Ensure that new operators are aware of the resources available on the Alaska Department of Environmental Conservation (ADEC) website for Class 2 facilities. When possible send new operators through the Bulk Fuel Operator Training program offered through Alaska Vocational Technical Center (AVTEC).
- Ensure that all Listing information for new tanks is recorded on metal tags permanently affixed to the tank shell.
- Ensure that fuel drums for temporary storage are in secondary containment and that there is enough room in the container to allow for thermal expansion of the fuel.

2.1.1.7.2.2 Foundation and Tank Supports

- Abrasively blast and recoat the supports for all tanks in the Marina tank farm.

2.1.1.7.2.3 Containment, Spill Control, and Continuous Release Detection

- Regularly pump the rainwater from containment to prevent water from contacting the tank shells and piping. This is critical for prolong the life of the asset now that the coatings have failed.
- Remove all mud, scale, and corrosion product from the tank farm to better assess the condition of the coating and sumps.
- Ensure that all tank drain valves are locked and that hoses used for temporary transfers are properly terminated and stored when not in use.
- Repair the leaking drain valve for the riverside dispenser containment.

2.1.1.7.2.4 Coating

- Recoat all external tank and piping surfaces and the internal surfaces of the containment using a suitable exterior coating system per manufacturer's recommendations. Coating materials should be resistant to ultraviolet (UV) degradation and suitable for industrial-type service. Ensure that all welds, fittings, and crevices such as those present at pipe supports are properly coated. Perform surface preparation in accordance with industry standards and manufacturers' requirements to maximize coating performance.

2.1.1.7.2.5 Shell and Ancillary Equipment

- The accuracy/functionality of all level indicators should be verified by dipping the tanks and recorded periodically by the operator as part of regular tank farm inspections. Replace level indicators that are non-functional.
- Perform further evaluation of the dents in the shell of Tanks #2 and #12 to determine what, if any, corrective action should be taken.

2.1.1.7.2.6 Internal and Tank Bottom

- Use water finding paste after each fuel delivery to help determine if water has settled out in the bottom of the tank. Water-draw the tanks if water is present.
- Properly prepare the bottom 4–6 feet of shell on Tank #4 so a better assessment of the external and potential internal wall loss can be completed, then perform the assessment as a 2019 priority.

2.1.1.7.2.7 Piping

- Monitor all tank farm piping for leaks at bolted connections, and mechanical damage/active corrosion during the regular tank farm inspections.
- Maintain water levels below the elevation of the pipe and bolted connections to prevent corrosion-related failures. This is especially important with the bolted connections at flanges.
- Pressure test the piping on an annual basis to verify the proper operation of the pressure-relieving devices.
- Isolate the piping to the abandoned fuel tanks. This will remove the deadleg from the system and reduce the risk of a spill.
- Install permanent pipe supports for the cargo and header piping to prevent damage if cribbing pile are knocked over.
- Consider elevating the 190 feet of pipe between the riverside dispenser and the old power plant so that it is no longer in contact with soil or submerged when water levels rise.
- Determine if there is containment beneath the winter dispenser or its protective shack. If none is present then containment should be installed.
- Develop formal fuel handling/transfer procedures for the tank farm piping if none currently exist.

2.1.1.7.3 AFI

AFI makes the following recommendations:

- Remove the corrosion and repair the coating to make for a more efficient thermosyphon. This could be done by cleaning the corrosion with a high-pressure wash. After allowing the steel to dry, it can be covered with a coat of epoxy. This can be done in coordination with other maintenance painting. Contact AFI for specific instructions for removing the corrosion and recoating.
- Establish a maintenance program to fill the surface cavities with fine-grained soil and keep them filled.

2.1.1.7.4 High Priority

Addressing widespread corrosion is a high priority to reduce risk of reduced service lives and potential corrosion related releases at the Kwigillingok Marina Bulk Fuel Facility. Taku recommends that additional inspections be performed in 2019 on Tank #4 to determine the remaining wall thickness in the area along bottom dead center. Details are presented in Taku's Inspection Report. Abrasive blasting will be required to prepare these areas for additional inspection due to the severity of the corrosion and the amount of corrosion product/scale present. Additionally, an internal evaluation may be required if accurate UT data cannot be collected from the exterior of the tank due to the corrosion.

It is Ahtna's opinion that the additional testing of Tank #4 is of great importance to prevent a potential release from breach of the tank wall by corrosion. The consequences of a release on this foundation system could be catastrophic if the liner is breached and fuel reaches and degrades the insulation through imperfections in the liner. Overfills must be avoided if there are any breaches in the liner for the same reason.

2.1.2 Kwigillingok Powerhouse Bulk Fuel Facility

The Kwigillingok Powerhouse Bulk Fuel Facility was built in 2005 (Commission project 350166). The Kwigillingok Power Company owns and operates the facility. The purpose of the tank farm is to store fuel for use in the power plant to generate electricity.

The tank farm is contained by a 50-foot by 50-foot steel containment dike with 3-foot-high dike walls founded on 30 HP10x57 driven piles. The containment dike is set 4.5 feet above the ground surface. Three 23,700-gallon single-walled vertical tanks sit inside the containment. There is space for an additional fourth tank if necessary, in the future. A 12,000-gallon, double-walled tank sits on pilings adjacent to the powerhouse building and serves as an intermediate tank between the tank farm and the 100-gallon day tank inside the powerhouse. The tanks are Underwriters Laboratories (UL)-listed.

A site plan is presented in Figure 2-2 and a tank layout is provided in Figure 2-3.

2.1.2.1 Site Visit Overview

On 15 August 2018, Andrew DuComb (Ahtna) and Jason Zottola (AFI) toured the Kwigillingok Powerhouse Bulk Fuel Facility. On 16 August 2018, Eric Weiler (Taku) and James Adams (Taku/QA Services) performed a corrosion evaluation of the facility. The purpose of the visit was to perform a brief assessment of the facility for durability comparisons with the Marina Bulk Fuel Facility.

The tank farm appeared to be constructed as shown on the 2002 95-percent drawings reviewed prior to the site visit. It should be noted that this facility and the marine header are not connected to the Kwigillingok Marina Facility Bulk Fuel Facility discussed in Section 2.1.1.

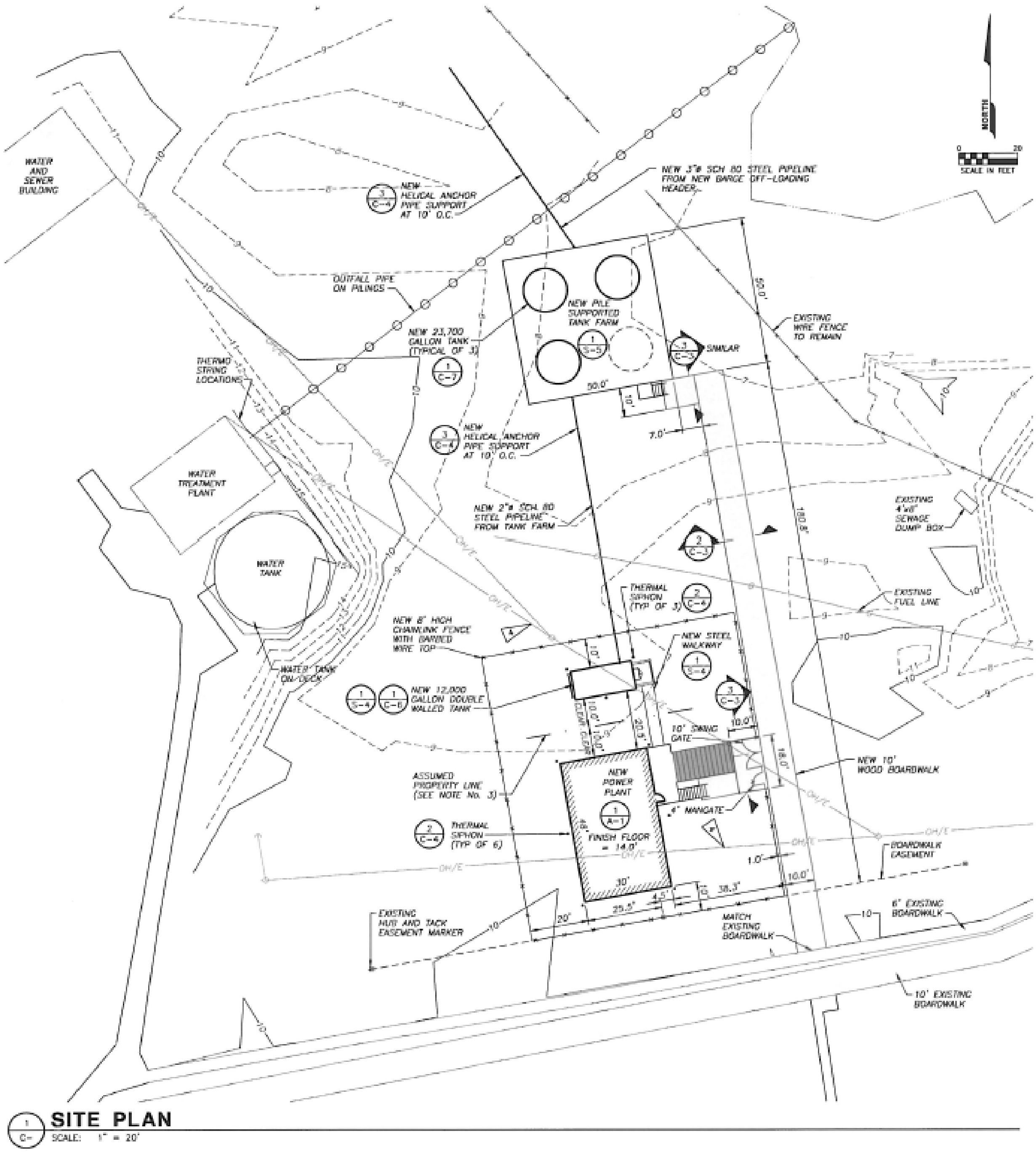


Figure 2-2 Kwigillingok Powerhouse Bulk Fuel Facility Site Plan

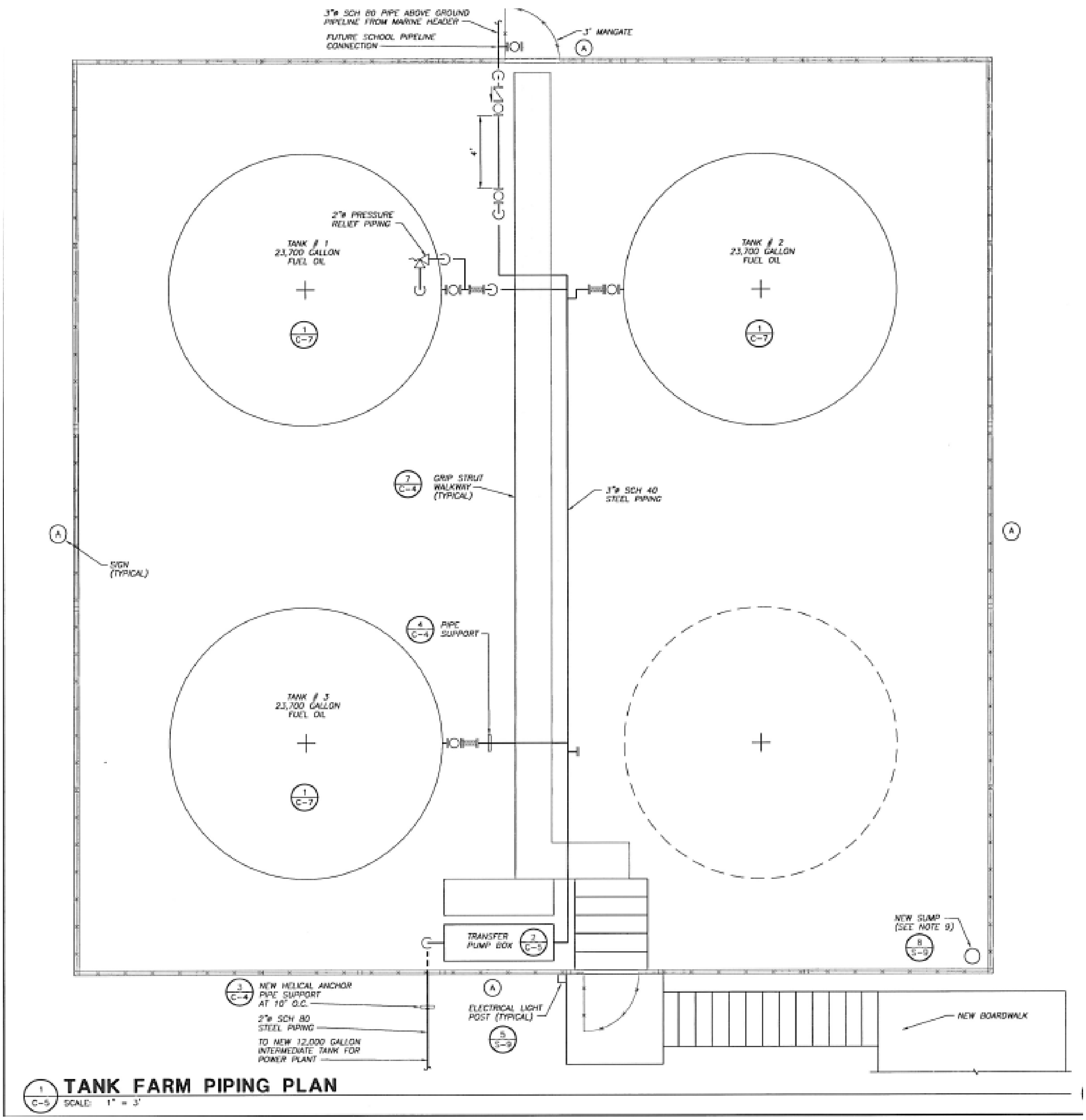


Figure 2-3 Kwigillingok Powerhouse Bulk Fuel Facility Tank Layout

2.1.2.2 Overall Condition Assessment

Mr. DuComb met with John Lewis, the operator of the powerhouse and the attached tank farm, to discuss operations, concerns, and the evaluation checklist. At the time of the site visit, Mr. Lewis had worked at the powerhouse for less than one year. Several of his staff members have been working and running the powerhouse since it was constructed. Mr. Lewis has not yet attended the Alaska Bulk Fuel Operator Training, but most of his staff have. An SPCC plan and a log of tank level readings were available in his office.

Mr. Lewis indicated that if there were to be a release, he does not have a contingency spill storage tank.

The conversation revealed that the tank farm may need additional storage. Mr. Lewis said that in the spring of 2018 the operations staff was concerned that the powerhouse would run out of fuel if the barge was delayed. As a precaution, the Kwigillingok Power Company purchased 1,000 gallons of diesel from the Marina Bulk Fuel Facility and shuttled it to the powerhouse tank farm with ATVs in 55-gallon drums.

Mr. Lewis acknowledged that it is difficult to keep up with dewatering the containment with the constant precipitation that Kwigillingok receives.

Mr. Lewis' concerns regarding operation of the tank farm include:

- Inadequate security: recommend adding fencing with a locking gate, and more lighting.
- Foundation: melting permafrost is impacting infrastructure.
- Capacity: a fourth vertical tank inside of the containment would be beneficial.

Mr. Lewis said that his main priority is keeping the existing infrastructure in good shape by performing routine and preventive maintenance. He and his staff would welcome training regarding maintenance activities such as scraping and repainting.

Mr. DuComb visually assessed the condition of Kwigillingok Powerhouse Bulk Fuel Facility using the checklist provided in Appendix A2. The checklist establishes scoring and criteria for: Site Location, Secondary Containment, Foundation, Tanks, Piping, Electrical and Life/Health/Safety. The checklist is the same as was used during 2015 facility assessments, for comparability. The facilities were documented with photographs, attached in Appendix B2 and Appendix F.

The Kwigillingok Powerhouse Bulk Fuel Facility received 50 out of 240 possible points and was categorized as a medium-risk facility.

The facility received punitive points for:

- The use of a rubber hose ("jumper line").
- The immediate need to clean and paint select appurtenances.
- Lack of security fence (drives ranking as a medium-risk facility).

Deficiencies noted included:

- No fence.
- No locks on gates (no gates).
- No locks on closed tank valves.

Additional deficiency and concern observations included:

- The flange fill port on the intermediate tank is not bolted shut. The bolts lie next to the flange top.

- The floor area around the single sump in the southeast corner of the containment lies at the highest elevation of the containment, not allowing the containment to be fully dewatered. It is presumed that because this quadrant of the containment does not support a tank, it has not settled with the rest of the containment. Approximately 2 inches of standing water were present within parts of the containment.
- The coating on the bottoms of the tanks within the containment are in poor condition and appear to have been repaired recently, but large areas of failing coating are still present.
- Limited spill response resources are available for capturing and cleaning up a release.

2.1.2.3 Tank and Pipe Corrosion Assessment

Taku performed a brief inspection of the new Powerhouse Bulk Fuel Facility to compare construction practices with the Marina Bulk Fuel Facility. The Powerhouse tank farm was found with approximately 2 inches of standing water present at the beginning of the assessment. The coating system for the new tank farm is in very good condition with the exception of the shell-to-bottom weld on all three tanks. The coating in this area appears to have been repaired recently, but large areas of failed coating are still present. This shell-to-bottom weld is the point of highest stress in a vertical tank and needs to be adequately protected from corrosion damage. Soil and debris are beginning to collect in the tank farm and grass was found growing near the inlet/outlet on the tank adjacent to the stairs. UV degradation has left some of the new tank data plate information illegible.

Taku's complete report is provided in Appendix C1.

2.1.2.4 Tank Farm Foundation Assessment

There are a total of 17 thermosyphons installed at Kwigillingok Powerhouse facilities: six at the powerhouse, three at a tank adjacent to the powerhouse, and eight at the tank farm north of the powerhouse. No ground temperature instrumentation was found to have been installed at the facility. AFI measured the internal pressure of each thermosyphon and computed the temperature of the gas/liquid interface. AFI also made visual observations of their condition.

Each thermosyphon unit is constructed of 3.5-inch OD steel pipe with a 70SF condenser and a 26-foot evaporator. Each unit is embedded approximately 20 feet. Typically, thermosyphons are installed into pre-drilled holes, however, these units were designed to be driven into the ground and thus were installed in this manner.

Thermosyphon Unit #1 at the southeast corner of the powerhouse was not safe to measure, and its status is unknown. Three other units were found to be non-operational: Unit #7 at the tank adjacent to the powerhouse had a sheared valve (Appendix D, Figure 5), Unit #8 at the tank adjacent to the powerhouse had no pressure, and Unit #11 at the tank farm had low pressure. The primary part of the valve is sheared off and the threaded portion of the valve is still installed. Internal pressures of the 13 operational thermosyphons ranged from 461 psig to 479 psig. From the pressure data, the internal temperatures of the thermosyphon evaporators were computed and ranged from 27.9°F to 30.4°F.

AFI's complete inspection report is provided in Appendix D.

2.1.2.5 Water and other Contaminants in Tanks

Ahtna collected information about suspended water and other contaminants from the day tank inside of the powerhouse. There were no records of the quantities of water normally found in the fuel tanks, but records of fuel levels were available. Mr. Lewis said his staff dips the tanks with water finding paste after barge deliveries, but mostly they read and record the tank levels off the tape gauges on the sides of the tanks. He said they have not found water in the tanks since he has been working there. Mr. Lewis is familiar with the concept of water drawing the tanks but has not performed it.

Ahtna did not dip any of the Kwigillingok Powerhouse Bulk Fuel Facility tanks with water finding paste, because the tops of the vertical tanks could not be accessed safely.

Ahtna performed qualitative fuel quality analyses on the single day tank fuel sample using a Fleet Fuel Testing brand field test kit capable of testing diesel fuel for visual clarity and detecting water, bacteria, fungus, bugs, and algae. The fuel sample was collected from the top 0–0.5-foot interval of the fuel column from the top of the tank through a threaded test hole.

Suspended water was not found to be present. The sample passed the clarity, degraded fuel, and bacteria tests. The sample tested negative for the presence of yeast/mold. Field test results are summarized in Table 2-2. It should be noted that while the field test kits provide almost instant feedback, laboratory fuel analyses would provide higher accuracy data, if needed.

TABLE 2-2: KWIGILLINGOK POWERHOUSE FIELD TEST RESULTS

Tank #	Water (Present?)	Water Quantity	Suspended Water (Present?)	Clarity (Pass/Fail)	Degraded (Pass/Fail)	Bacteria (Pass/Fail)	Yeast/Mold (Present?)
Powerhouse Day Tank	N/A	N/A	No	Pass	Pass	Pass	No

2.1.2.6 Fuel Transfer Practices

There was a SPCC plan dated February 2005 at the Powerhouse office during the visit. There were no records of historical spills or releases. A minimal quantity of spill response sorbent pads and sausage booms were available. There is no dedicated spill contingency tank in the facility.

The marine header consists of an approximately ¼-mile 3-inch pipe run and is used to fill the vertical tanks in the containment. The marine header was constructed to protrude through the containment floor. A 3-inch header to the water treatment plant's fuel tank was also constructed through the containment floor. A 3-inch header to the Kwigillingok School has been retrofitted to the side of the containment. A 3-inch rubber jumper line with camlock fittings is used to transfer fuel (within the containment) between the marine header, the water treatment plant header, the school header, and the vertical tanks.

Fuel is delivered by barge twice per year. Generally, the summer delivery is in July, and the fall delivery is in September.

2.1.2.7 Recommendations

Ahtna makes the following recommendations for the Kwigillingok Powerhouse Bulk Fuel Facility:

- Add a fence around the containment with a locking gate.
- Remove the rust and coat the tank bottoms in accordance with manufacturer's recommendations.
- Bolt shut the flange fill port on the intermediate tank.
- Keep up with constant dewatering of containment. Consider adding a second sump at lowest point within the containment.
- Perform water draw activities on all tanks.
- Procure material resources and attend training to improve spill response.
- Evaluate the need for adding a fourth vertical tank within the containment.

Taku makes the following recommendations:

- Future designs need to take into account the water handling that can be expected at a given location and possibly elevate the tanks and piping to keep the piping, critical welds, and bolted connections out of the water.
- Tank data plates should be specified as stamped metal instead of stickers.

AFI makes the following recommendations:

- Repair Units #7, #8, and #11 by replacing the valves and recharging the thermosyphons. Bubble test valves and aboveground welds to ensure that no aboveground pressure leaks exist.
- Once safe electrical conditions exist, measure internal pressure of Unit #1 to determine functionality and repair as required.

2.2 Chefornak

The village of Chefornak is located about 100 miles southwest of Bethel on the Kinia River (Figure 1). Chefornak lies within the Yukon Delta National Wildlife Refuge. The community can be accessed with small commercial aircraft operated by various carriers. The Chefornak Bulk Fuel Facility evaluation is described in the following subsections.

2.2.1 Site Visit Overview

On 15 August 2018, Andrew DuComb (Ahtna) and Jason Zottola (AFI) arrived in Chefornak and toured the tank farm vicinity. On 16 August 2018, they met with members of the community, attained access to the tank farm, and completed evaluations.

The Chefornak Bulk Fuel Facility is a single tank farm with three separate cells, each with respective owners and operators. The facility provides bulk fuel storage for all bulk fuel users within the community. The facility has a total capacity of approximately 313,600 gallons, which categorizes it as a "Class 2" facility per 18 AAC 75.

The City of Chefornak owns and maintains seven tanks, including one spill contingency tank. The City of Chefornak uses the stored fuel solely to generate electricity at their Naterkaq Light Plant.

The Lower Kuskokwim School District (LKSD) owns and maintains four tanks that provides heating oil to the school building.

The Chefarnrmute Native Corporation (CNC) owns and maintains 13 tanks, including one dual-product dispensing tank. Six of the CNC tanks hold gasoline. CNC fuels are used to heat CNC buildings and for retail sales within the community.

The facility includes a marine header with two (one diesel and one gasoline) approximately 950-foot, 3-inch pipe runs that are used to fill vertical tanks in the containment. The pipe corridor contains two (one diesel and one gasoline) approximately 950-foot, 2-inch return pipes that route to the dispenser station next to the marine header. A 1,580-foot, 2-inch supply pipe runs from the tank farm to the school. A 1,160-foot, 2-inch pipe runs from the tank farm to the Naterkaq Light Plant.

A roughly 30-foot by 70-foot, timber-framed containment dike with 3-foot-high dike walls was constructed atop a 1-foot layer compacted non-frost-susceptible fill and two layers of 2-inch rigid foam boards. The existing grade consisted of 1–2 feet of organics underlain by silt to silty sand. The perimeter dike consists of 6-inch by 12-inch timbers positioned 8 feet below ground surface and 8 feet on center. Non-woven geotextile material and liner material were placed and secured to the tops of the dike walls. A 1-foot layer of non-frost-susceptible fill was placed atop the liner and compacted. No thermosyphons or thermopiles were installed to maintain the permafrost beneath the insulation. Two interior dike walls divide the containment area into three separate ownership cells.

The City of Chefornak cell contains one 10,000-gallon refurbished horizontal (tank #1), three refurbished vertical tanks (Tanks #7, #8, and #9) with diesel storage capacities of 14,000, 13,500, and 8,000 gallons respectively, and one new 10,000-gallon diesel storage tank (Tank #17). At an unknown time, a refurbished 3,900-gallon, double-walled diesel storage tank was added to the City's cell just to the east of the containment wall. The combined gross diesel storage capacity for the City of Chefornak cell is approximately 60,000 gallons.

The LKSD cell contains two refurbished vertical tanks (Tanks #18 and #19) each capable of storing approximately 40,000 gallons of diesel fuel. In 2010, the LKSD added two 20,000-gallon, double-walled tanks just outside of the tank farm containment wall to the west. The thermosyphons used for the foundations for these tanks are reportedly operational and the foundations appear stable. The combined gross diesel fuel storage capacity for the LKSD is approximately 120,000 gallons.

The CNC cell contains three refurbished vertical tanks (Tanks# 10, #11 and #12) with diesel storage capacities of 5,800, 5,800 and 6,000 gallons respectively. The CNC cell also contains two refurbished horizontal tanks (Tanks# 2 and #3) and two new horizontal tanks (Tanks# 13 and #14) with 15,000, 10,000, 15,000 and 15,000 gallons of diesel fuel storage capacity respectively.

The control panel and load center are located within the facility fencing. Emergency shut-off devices are located at the tank farm facility and the dispensing station.

The facility is surrounded by chain link fencing with one personnel gate. The fencing prevents unauthorized entry and use of the facilities. Spill response kits are located in an intermodal shipping container adjacent to the tank farm. Warning signs and instructional placards are posted outside the facility.

A site plan is presented in Figure 2-4 and a tank layout is provided in Figure 2-5.

2.2.2 Overall Condition Assessment

Mr. DuComb met with Chefornak residents who have a working interest in the Chefornak Bulk Fuel Facility to discuss operations, concerns, and the evaluation checklist. The discussion was lively and engaging, as the community members are very much interested in their facility's viability.

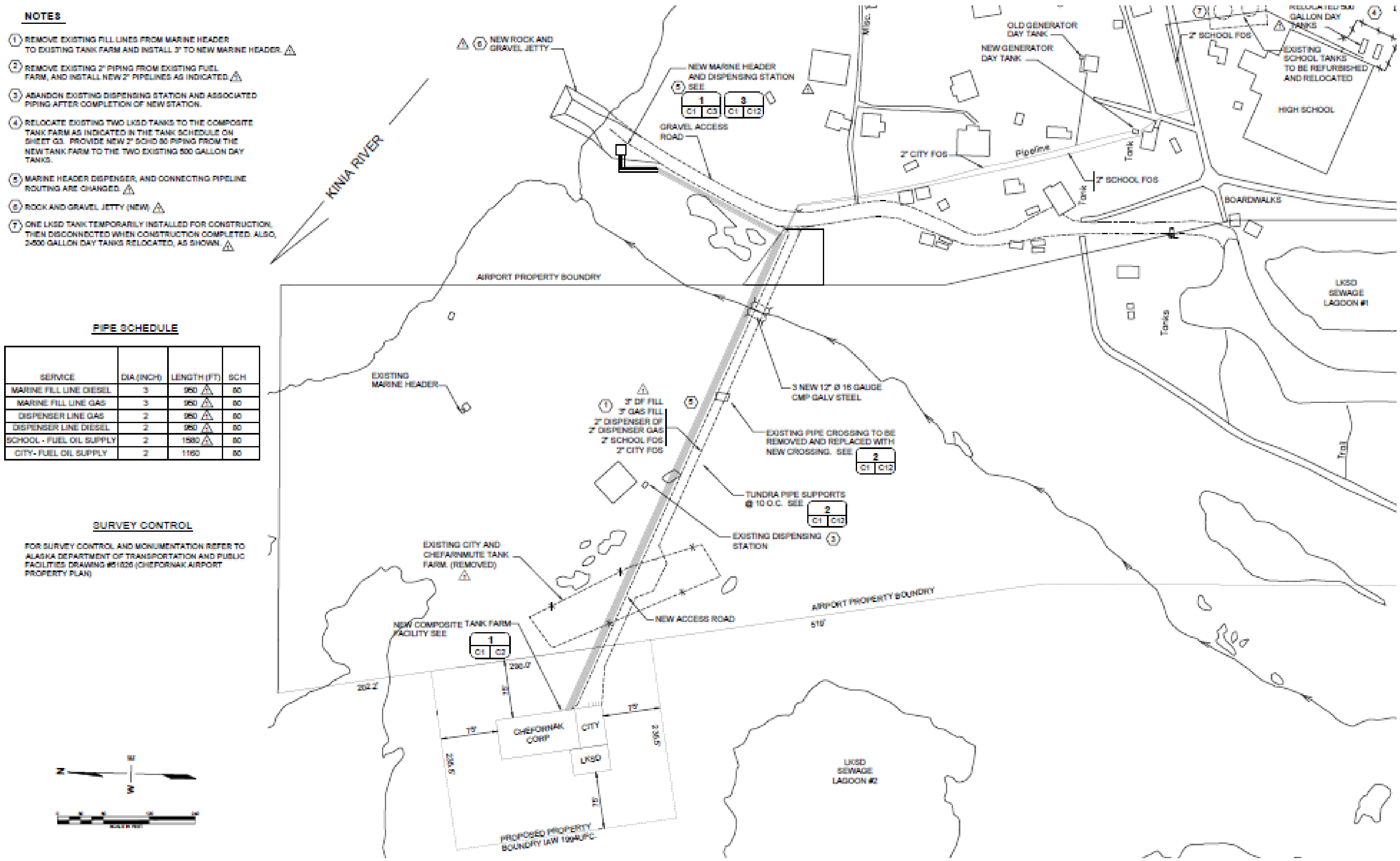
Personnel present included:

- Ken Erik – CNC Manager.
- Anna Abraham – Naterkaq Light Plant Manager.
- Joe Abraham – City of Chefornak Tank Farm Operator (15 years in position).
- Matthew Panruk – CNC Tank Farm Operator (5 years in position).
- *No representative from LKSD was able to be present.

Mr. Erik described recent autumn river floods that reached the road to the tank farm and submerged the header piping. He is concerned that the high-water events will erode the area of the marine header and dispenser. The floods have reportedly almost reached the tank farm previously.

The discussion revealed that as the community grows, the City (operating the light plant) has an increasing need for additional fuel storage. In recent years the city has had to purchase fuel from the CNC between barge deliveries, which affects forecasted financial budgets. The city added a refurbished 3,900-gallon, double-walled skid tank outside of the containment for additional storage. A diaphragm pump and jumper line are used to transfer fuel to and from this tank that is not otherwise connected to the facility. Sporadic construction projects add additional fuel and electric loads to the community, which are sometimes problematic. When fuel levels start to run low, fuel sales to outside members of the community and contractors are stopped.

The group described how the City and CNC work together to perform tank farm maintenance such as water draws and scraping/painting of tanks and piping. They are concerned that lack of maintenance in the LKSD cell is a liability for the entire facility.



SERVICE	DIA (INCH)	LENGTH (FT)	SCH
MARINE FILL LINE DIESEL	3	950	80
MARINE FILL LINE GAS	3	950	80
DISPENSER LINE GAS	2	950	80
DISPENSER LINE DIESEL	2	950	80
SCHOOL - FUEL OIL SUPPLY	2	1580	80
CITY- FUEL OIL SUPPLY	2	1160	80

Figure 2-4 Chefornak Bulk Fuel Facility Site Plan

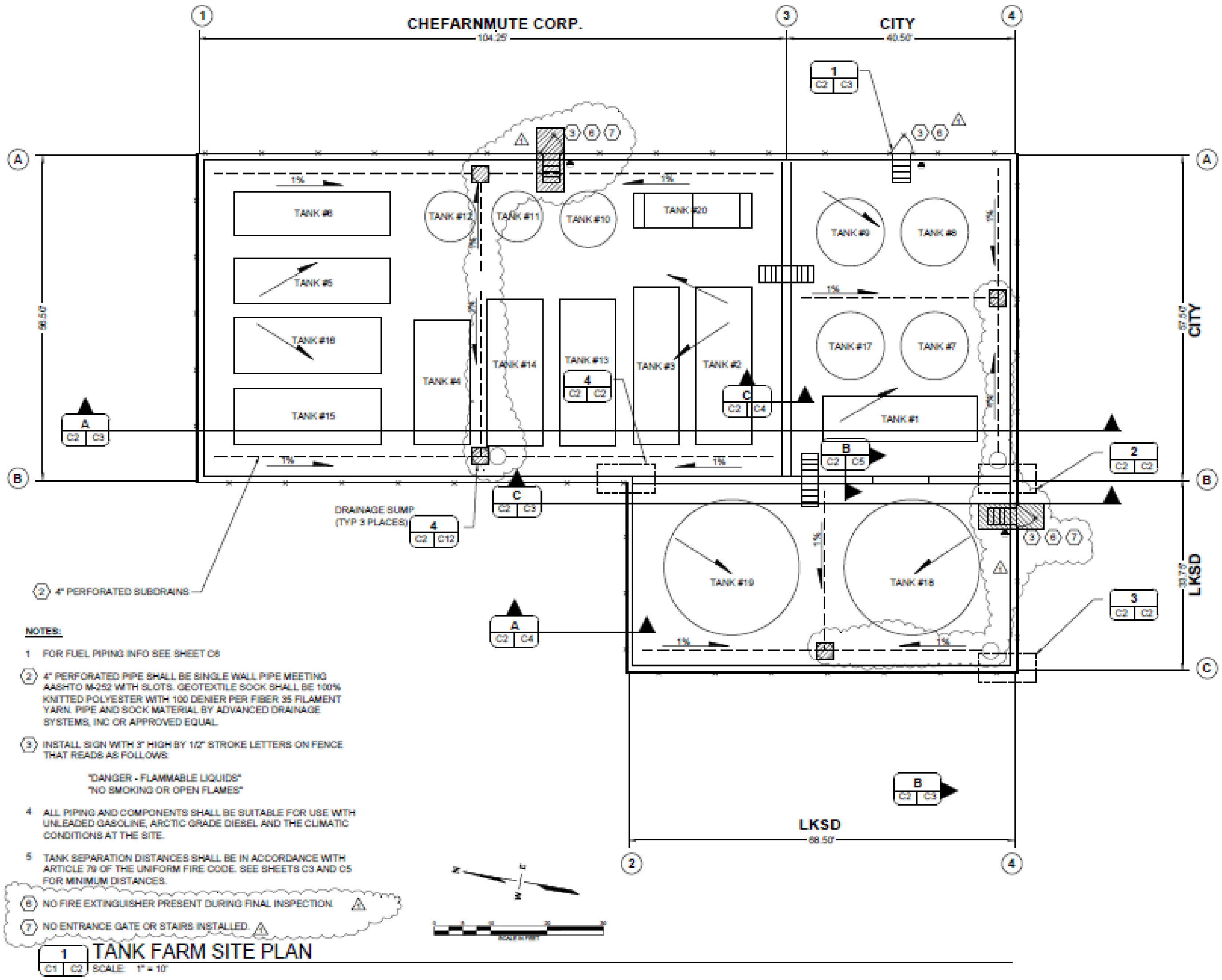


Figure 2-5 Chefornak Bulk Fuel Facility Tank Layout

The foremost concerns of the group are the long-term durability of the tank farm and community safety, particularly due to the facility's subsidence. With all three entities operating in the same containment infrastructure, a problem within one cell of the facility could cause a severe disruption for all users.

The group's recommended priorities for facility improvements include:

- Replacing aging tanks.
- Relocating the header piping and dispenser.
- Evaluating the feasibility of moving the entire facility to higher ground and splitting it into separate owner/operator tank farms.
- Evaluating the need for more fuel storage.

Mr. DuComb was able to locate and speak with Elijah Jimmy, a part-time assistant LKSD maintenance worker. Mr. Jimmy indicated that Raymond, the LKSD maintenance lead, has not been able to work recently. Mr. Jimmy has not been to the Alaska Bulk Fuel Operator Training and does not know whether Raymond has attended it.

Ahtna's engineer visually assessed the condition of Chefornak Bulk Fuel Facility using the checklist provided in Appendix A3. The checklist establishes scoring and criteria for: Site Location, Secondary Containment, Foundation, Tanks, Piping, Electrical and Life/Health/Safety. The checklist is the same as was used during 2015 facility assessments, for comparability. The facilities were also documented with photographs, attached in Appendix B3 and Appendix F.

The Chefornak Bulk Fuel Facility received a score of 115 out of 240 possible points and was categorized as a high-risk facility, primarily due to the unstable foundation.

The facility received punitive points for:

- Flooding and erosion issues: header piping has been submerged, the tank farm itself has nearly flooded, dispenser is less than 25 feet from the eroding river bank.
- The secondary containment is not liquid-tight (torn liner).
- The tank sits directly on light untreated timber cribbing material.
- The tanks are leaning considerably.
- Unsecured or bolted tank tops of vertical tanks.
- There is exposed wiring.

Deficiencies noted included:

- Tanks are not listed.
- Stressed flex connector.
- Inadequate pipe supports.
- Electrical conduit not supported.
- Insufficient fire extinguishers.

Additional deficiency and concern observations included:

- The ground beneath the facility appears to be subsiding, causing the tanks to lean and stressing the secondary containment liner. Small tears in the liner that have been patched are not liquid tight.
- The header piping and pipe run up to the school and light plant are susceptible to impacts and strikes from snow machine traffic. The piping close to the light plant is inadequately supported.
- Fuel transfers between the City's tanks and outside double-walled skid tank are outside of containment.
- The tank farm operators report having to seal gaps in the tops of the unsecured vertical tanks with caulking.
- The security fencing along the west side of the facility needs repair.
- The containment cell and tanks owned and operated by LKSD are in need of immediate maintenance. Standing water (roughly 8 inches to 1 feet) is present and inundating the bottoms of the tank shells. Vegetation is growing within the containment. The overall condition of the tanks and piping is poor. The LKSD containment does not appear to be dewatered.

2.2.3 Tank and Pipe Corrosion Assessment

Ahtna visually evaluated the surficial corrosion at the Chefornak facility, in reference to that observed in Kwigillingok. The Chefornak corrosion evaluation was not conducted by API-certified personnel and was intended to augment API corrosion inspection data collected at the other two locations.

The tanks and piping in the City cell are in fair condition. Recent painting has helped mitigate weathering to the tanks (Appendix B3, Photograph 11).

The tanks and piping in the LKSD cell are in poor condition. Severe pitting and rust blooms are present on Tanks #18 and #19. The secondary containment does not appear to be regularly dewatered and inundates some of the piping and bottoms of the tank shells (Appendix B3, Photographs 14 and 15). The newer double-walled Tanks #21 and #22 are in good condition outside of the containment.

The tanks and piping in the CNC cell are in fair to poor condition. The tanks show evidence of scraping and repainting. Rust blooms of varying severity are present. Heavy paint flaking is present on the bottoms of several tanks (Appendix B3, Photograph 10). The tops of vertical tanks are not welded and require the gaps to be filled by the tank farm staff with caulking (Appendix B3, Photograph 12).

2.2.4 Tank Farm Foundation Assessment

2.2.4.1 Thermosyphon Inspection

AFI inspected nine thermosyphons located around the two new tanks at the northwest corner of the Chefornak Bulk Fuel Facility. The units were manufactured in 2010 and are embedded approximately 25 feet. They are constructed of 3.5-inch OD steel pipe and are fitted with 70SF condensers.

Internal pressures of the thermosyphons ranged from 452 psig to 466 psig. From the pressure data, the internal temperatures of the thermosyphon evaporators were computed and ranged from 26.7°F to 28.6°F. The pressure data indicate that all nine units were fully operational at the time of the inspection.

The data verify that there were operational thermosyphons at each site; however, at the time of the inspections the ambient air temperature was approximately 50°F to 55°F, therefore the thermosyphons were not operating. The thermosyphons will not operate when the ambient air temperature is greater than that of the soil. When the winter season returns and the ambient air temperatures once again dip below the soil temperatures, then the thermosyphons will operate and begin passively removing heat from the soil and releasing it to the air.

AFI's complete inspection report is provided in Appendix D.

2.2.4.2 Differential Settlement

Ahtna visually evaluated the facility for differential settling of both the containment and individual tanks.

The Ahtna engineer observed that the northern containment perimeter, appears to be settling more than elsewhere. Large gaps are apparent between the bottom of the containment walls and the ground surface. These gaps are on the order of several inches to more than a foot in some locations, mostly noticeable on the north side of the tank farm. Differential settlement is also indicated by the fact that most of the cribbing and shims used to relevel the tanks are placed on the side of the tank closest to the pad perimeter. The tank farm operators noted that the ground surface was originally at the elevation of the bottom of the containment walls, and the gaps have grown over time. This is consistent with the design as indicated on the construction drawings, which specified 6 x 12" to be placed on compacted non-frost-susceptible (NFS) fill and a backfilled outward drainage slope.

The vertical timbers were specified to be installed to 8 feet below the existing grade. They are probably frozen into the permafrost and are holding the walls at a more constant elevation, but as the lowest point of the active layer becomes deeper each year, the shallow ground surface compacts and slumps. The combination of the geotextile fabric and liner that is secured between the existing grade and the NFS fill is stretched and heavily stressed as it transitions up the containment walls (Appendix B3, Photographs 21 and 22). Three short video clips in Appendix F show water dripping out of a patched tear in the liner and a section of stretched liner holding water-saturated fill.

The tank farm operators regularly jack low sides of tanks when they are empty using scraps of dimensional lumber for cribbing to level (Appendix B3, Photograph 30). Ahtna did not find any tanks severely leaning, although heights of material added for leveling ranged from 1–10 inches.

It is recommended that the tank farm operators diligently dewater the containment by pumping from the four drainage sumps. Spreading fill and lightly compacting under and around the wall sloping outward may help insulate the ground and provide minor support to the containment liner that is being stretched from the walls.

2.2.4.3 Supplemental Facility Data

While in Chefornak, AFI observed thermopiles at two other local facilities – the Old Powerhouse and the New Powerhouse. AFI took the opportunity to collect data at those facilities to supplement the Bulk Fuel Facility evaluation. Summaries are provided in the following subsections, and AFI's complete inspection report is provided in Appendix D.

2.2.4.3.1 Old Powerhouse

There are four thermopiles located below the Old Powerhouse, installed in the late 1980s. The New Powerhouse was built just east of this facility, in the mid-2000s. The Old Powerhouse has since been converted to a temporary washeteria, to be used until the new washeteria is completed, just north of the New Powerhouse. Each of the four piles is constructed with 6-inch NPS steel pipe and fitted with 10 plate fins on the aboveground portion of the pile. Each pile is embedded 14 feet.

Internal pressures of the thermopiles ranged from 479 psig to 482 psig. From the pressure data, the internal temperatures of the thermopile evaporators were computed and ranged from 30.4°F to 30.9°F. The pressure data indicate that three of the units were fully operational at the time of the inspection. Unit #2 had an internal pressure of 363 psig. It is assumed that this low pressure is not indicative of the temperature, but rather it is low due to partial discharge. All four units had extensive corrosion along the entire length of the aboveground portion of the thermopile (Appendix D, Figure 8). To enhance the efficiency of the thermopiles, the corrosion should be removed and the steel recoated with epoxy. Unit #2 should be repaired by replacing the valve and recharging the thermopile to ensure maximum heat transfer efficiency.

2.2.4.3.2 New Powerhouse and Tank

There are 18 thermopiles installed below the New Powerhouse and 6 installed below the 27,000-gallon fuel tank, located just north of the main powerhouse facility. These thermopiles were installed in the mid-2000s. Each is constructed of 12-inch NPS steel pipe and is embedded approximately 20 feet.

Internal pressures of the thermopiles ranged from 469 psig to 478 psig. From the pressure data, the internal temperatures of the thermopile evaporators were computed and ranged from 29.1°F to 30.3°F. The pressure data indicate that all 24 thermopiles were fully operational at the time of the inspection.

Water-filled depressions at the ground surface were observed around the circumference of nearly all the thermopiles (Appendix D, Figure 9). Thermopile Units #21 and #22 were located in an area of extensive ponded water, nearly a foot deep (Appendix D, Figure 10). It is recommended to establish positive drainage away from all the piles to prevent ponded water.

2.2.5 Water and other Contaminants in Tanks

Ahtna collected information about water and other contaminants in the fuel tanks at the Chefornak Bulk Fuel Facility. The City and CNC tank farm operators dip their tanks with water finding paste after barge deliveries and keep records. Information about the LKSD tank farm operator practices was unavailable. Mr. Jimmy with LKSD said that Raymond had dipped the tanks in the past with water paste but is unsure if water draws have ever been performed.

Ahtna measured the quantity of water in five tanks (two City of Chefornak, three CNC) using a brass-tipped oil gauging tape and Gasoila® water finding paste. Ahtna did not access vertical tanks for safety reasons and did not receive permission to enter the LKSD tank farm cell. The paste was applied on the bottom portion of the tape in the area where water was expected to appear. When the paste contacts water, the color of the paste changes from golden brown to bright red and the thickness of the water can be measured. Water was found to be present in measurable amounts in two of the five tanks. The measured water depths are presented in Table 2-3.

Ahtna performed qualitative fuel quality analyses using Fleet Fuel Testing brand field test kits capable of testing diesel fuel for visual clarity and detecting water, bacteria, fungus, bugs, and algae. The field test kits were used on fuel from the five accessible tanks. The fuel samples were collected from the top 0–0.5-foot interval of the fuel column from the top of the tank.

Suspended water was found to be present in one of the five fuel samples. Fuel samples from all five tanks passed the clarity, degraded fuel, and bacteria tests. All five tanks tested negative for the presence of yeast/mold. Field test results are summarized in Table 2-3. It should be noted that while the field test kits provide almost instant feedback, laboratory fuel analyses would provide higher accuracy data, if needed.

TABLE 2-3: CHEFORNAK FIELD TEST RESULTS

Tank #	Water (Present?)	Water Quantity	Suspended Water (Present?)	Clarity (Pass/Fail)	Degraded (Pass/Fail)	Bacteria (Pass/Fail)	Yeast/Mold (Present?)
2	Yes	3/4”	No	Pass	Pass	Pass	No
13	No	N/A	No	Pass	Pass	Pass	No
14	No	N/A	No	Pass	Pass	Pass	No
17	No	N/A	No	Pass	Pass	Pass	No
1	Yes	1”	Yes	Pass	Pass	Pass	No

2.2.6 Fuel Transfer Practices

SPCC plans for the City of Chefornak and CNC cells are located at the Naterkaq Light Plant and CNC office, respectively. An SPCC plan for the LKSD was not located because the tank farm operator was not available during the visit.

There were no records of historical spills or releases. No evidence of recent releases was noted during the evaluation.

Spill response equipment and supplies are housed in an intermodal shipping container adjacent to the tank farm and include sorbent pads, sausage booms, hand tools, and fuel transfer equipment. There is a dedicated spill contingency tank located outside of the containment at the southeast corner.

The fuel dispenser with a steel canopy, sheltered sides, and locked doors is located near the bank of the Kinia River. The marine header sits adjacent to the dispenser shelter. A piping corridor consisting of 2-inch and 3-inch piping approximately 900 feet long connects the inland tank farm to the dispenser and marine header.

Fuel is delivered by barge twice per year to the City and CNC tank farms. The LKSD receives fuel once per year. Generally, the summer delivery is in July, and the fall delivery is in September. LKSD personnel expressed concern about their lack of fuel barge transfer experience.

ATVs are the primary mode of transportation in the community during the summer and snow machines are frequently used in the winter. Boats are also used in the river during the summer months. All three local modes of transportation require gasoline and are filled at the single fuel dispenser on the riverbank. Heating oil is relied upon heavily throughout the year for cooking, hot water, and residential heating. There is no residential fuel delivery service in Chefornak except for an elder-care delivery assistance program. Typically, residents visit the dispenser with 5-gallon or 30-gallon fuel jugs to shuttle heating oil to their residences.

2.2.7 Recommendations

2.2.7.1 High Priority

2.2.7.1.1 Foundation Failure

The foundation soils of the Chefornak Bulk Fuel Facility appear to be thawing and causing the surface timber foundations to differentially subside requiring jacking to relevel the tanks and cribbing between the tanks and the foundation timbers. The differential movement has stretched the membrane liner to the point of rupture in several areas. The liner will leak in the event of a release (even over filling) allowing the escape of fuel product to the soils beneath and outside the containment. When the fuel comes in contact with the rigid foam insulation, the insulation will dissolve and the thawing causing the differential movement will accelerate. If the differential movement overstresses the pipe connection or the tanks themselves, a rupture and release may occur resulting in an environmental liability in addition to the loss of fuel and storage capacity and a potential hazard to health and safety if the release and loss of function of the tank farm occurs during the winter. Ahtna recommends that a geotechnical consultant competent in Arctic and Subarctic design to immediately evaluate the use of thermosiphons to stabilize the existing pad to prevent future subsidence. If the tank farm site can be salvaged, then a competent Civil/Mechanical engineer should evaluate the feasibility of reconstructing the tank farm at its current location considering the potential erosion issues associated with the proximal Kinia River, or constructing a new tank farm further from the River. In the interim, the tanks should continue to be releveled as required and great care exercised to not overfill the tanks.

2.2.7.1.2 Corrosion

There has apparently been a lack of maintenance at the LKSD Tank Farm allowing excessive pipe and tank corrosion. The water should be drained from the containment. Conduct STI formal external inspections in 2019.

2.2.7.2 General

Serious consideration of rebuilding the tank farm at a higher location with suitable soils and a foundation system designed to maintain permafrost below the foundation is recommended. The facility should be maintained by a single entity, or split into three separate facilities with each owner/operator liable for their individual tanks.

Ahtna makes the following additional general recommendations for the Chefornak Bulk Fuel Facility for the short term until the facility is replaced or repaired:

- Perform water gaging activities on all tanks and water draws if necessary.
- Reseal tops of vertical tanks to prevent water from entering the tank.
- Continue program of leveling tanks. Add and replace cribbing to evenly distribute load across the entire tank footprint to prevent distortion of tank structure.
- Repair or replace all damaged and exposed wiring.
- Replace fire extinguishers at the tank farm and dispenser.
- Undergo rigorous containment dewatering, remove vegetation, water draw, and scraping/paining in the LKSD tank farm cell.
- Inspect all flex connectors for stress from tank movement.
- Patch tears in the containment liner.
- Consider spreading fill and lightly compacting under and around the outside of containment walls sloping outward.
- Add a barrier fence along pipe runs to prevent strikes from snow machines.
- Add to and improve supports to piping to the Light Plant intermediate tank.
- Evaluate need for additional storage.
- Evaluate probability of future erosion at dispenser and marine header.

Overall the CNC and City of Chefornak tank farm operators do an admirable job maintaining their refurbished and aged infrastructure. The LKSD tank farm operators should reach out to programs available for training and undertake a rigorous maintenance event at their tank farm cell. The design of the foundation system and condition of the ground under the tank farm is increasingly susceptible to future damage and a release or loss of function, which could be catastrophic. In the future, the community may wish to split the tank farms so that an accident would not affect all fuel activities collectively.

2.3 Nikolai

Nikolai is located in interior Alaska east of McGrath on the South Fork Kuskokwim River, approximately 175 miles from Anchorage (Figure 1). The tank farm evaluation is described in the following subsections.

2.3.1 Nikolai Bulk Fuel Facility

The Nikolai Bulk Fuel Facility was constructed in 2003. It is owned and operated by the Native Village of Nikolai. The facility has a total capacity of 117,000 gallons, which categorizes it as a "Class 2" facility per 18 AAC 75.

The tank farm is within a 50-foot by 96-foot by 2-foot-tall secondary containment area with a capacity of 60,000-gallons. There is also a bulk transfer containment area with a capacity of 2,500 gallons. Per the design drawings, the earthen pad consists of the following layup from top to bottom: minimum 4-inch gravel layer, two layers of non-woven geotextile, dike membrane liner, non-woven geotextile, gravel pad.

Seven horizontal cylindrical tanks are located inside the containment dike with one 8,000-gallon spill contingency tank outside of the containment dike. All tanks are painted steel single-wall except for Tank C2, which is a double-walled gasoline dispensing tank. Tanks C1-C4 were new at the time of installation, while C5, C6, S1 and the contingency tank were refurbished.

The bulk fuel facility supplies diesel fuel directly to day tanks at the school and the power plant. There is a marine delivery header that is no longer in regular use. The facility also supplies a gasoline dispenser for personal vehicles to the west.

A tank layout is provided in Figure 2-6.

2.3.2 Site Visit Overview

On 21 August 2018, Baley Lenhart (Ahtna), Eric Weiler (Taku), and James Adams (Taku/QA Services) arrived in Nikolai to perform site assessments. The field team met with city officials Winchell Ticknor and Tamara Roberts multiple times during the site visit. Mr. Ticknor and Ms. Roberts were able to provide construction and upgrade design documents, a draft SPCC plan from 1985, fuel farm operator records and 2018 fueling invoices. Ahtna also learned that the primary fuel facility operator had moved away two months prior to the site visit. Three locals (Brad, Adam and Darrell) currently operate the facility. Brad was the only operator available for interview. Brad was scheduled to attend the Alaska Bulk Fuel Operator Training in Seward in October.

The field team toured the facility with Brad, and then performed their specialty assessments.

On 23 August 2018, Ahtna observed a petroleum sheen in the containment around the fuel transfer area. The sheen was photographed and mentioned to Brad. It was assumed the sheen came from a fuel transfer. The field team recommended the fuel farm operator use sorbent pads on the sheen before pumping the water out of the containment area. Ahtna then provided the fuel farm operator with water dipping paste and provided instructions for future use. The field team recommended that the operator dip tanks for water before and after every fuel delivery and advised to perform a water draw if present.

On 24 August 2018, Mr. Lenhart performed a final walkthrough of the fuel farm. The sheen observed the day before was not visible.

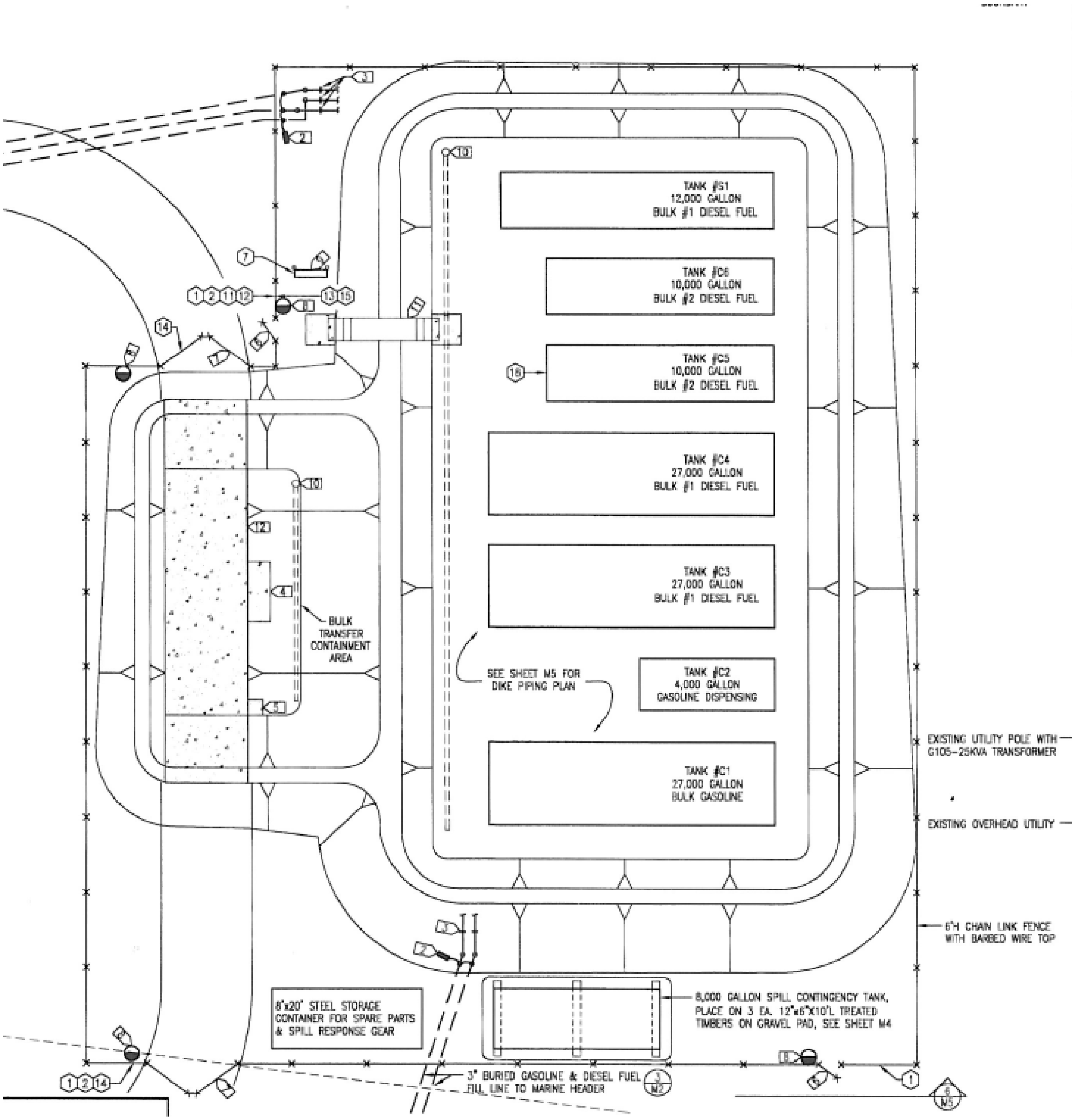


Figure 2-6 Nikolai Bulk Fuel Facility Tank Layout

2.3.3 Overall Condition Assessment

Mr. Lenhart met with Brad to discuss operations, concerns, and the evaluation checklist. Brad is scheduled to attend the Alaska Bulk Fuel Operator Training in Seward in October.

Brad voiced concerns regarding the limited spill response supplies and equipment available in an onsite intermodal shipping container.

Ahtna's engineer visually assessed the condition of the Nikolai Bulk Fuel Facility using the checklist provided in Appendix A4. The checklist establishes scoring and criteria for: Site Location, Secondary Containment, Foundation, Tanks, Piping, Electrical and Life/Health/Safety. The checklist is the same as was used during 2015 facility assessments, for comparability. The facilities were also documented with photographs, attached in Appendix B4 and Appendix F.

The Nikolai Bulk Fuel Facility received a score of 30 out of 240 possible points, and was categorized as a medium-risk facility (due to lack of security).

The facility received punitive points for:

- The immediate need to clean and paint tank exteriors and piping.
- The lack of security fence/locks on gates and valves.

Deficiencies noted included:

- Inadequate pipe supports.
- Damaged regulatory signs.
- Empty fire extinguisher.
- Missing regulatory SPCC plan.
- Missing tank farm operation records.

Additional deficiency and concern observations included:

- Uncertainty regarding whether the rubber hose used for fuel transfers from planes is properly drained and stored between fuel transfers.
- A sheen observed within the secondary containment adjacent to the transfer station; the source was not apparent.

2.3.4 Tank and Pipe Corrosion Assessment

Taku performed a corrosion evaluation consisting of integrity inspections for six of the seven horizontal tanks, piping evaluations for the aboveground diesel and gasoline circuits, and cursory cathodic protection readings at the pipe risers near the tank farm. NDE included VT, UT, and measurement of coating DFT. The inspection was performed in accordance with the applicable sections of the STI standard SP001, 5th Edition, 2011, and the API standard 570, 2nd Edition Addendum 3, 2003.

Per the original construction design drawings for this tank farm, four of the storage tanks are new construction (C1, C2, C3, and C4) and four are refurbished tanks from the original city tank farm (C5, C6, S1 and Contingency).

The new tank farm has a total capacity of 117,000 gallons, 31,000 for gasoline in tanks C1 and C2 and 86,000 gallons in tanks C3–C6 and S1. UL or STI data plates are present for three of the four new tanks while no construction standard information or data plates could be located for the refurbished tanks. All refurbished tanks were recoated as part of the construction project.

The piping inspected in the tank farm is A106B in diesel and gasoline service. The piping circuits inspected included NPS 1-inch, 2-inch, and 3-inch piping, with the majority of piping being NPS 2. The original design basis of the fuel system is unknown. Original construction drawings were available to aid in determining design pressure for the piping, which is 285 psig based on flange ratings. All piping, with exception to minor modifications, was assumed to have been installed in 2003.

The following items were visually inspected in the tank farm: foundation, supports, shell plates, shell appurtenances, heads, walking/working surfaces, containment, venting, gauging, bonding and grounding, and coating condition. UT and VT were performed on the shell, heads, shell nozzles, and reinforcement pads.

No items were found affecting hydraulic or structural integrity of the structures evaluated. The tank farm has been in service for 15 years with no change in operating conditions. "Good Business Practice" repairs were found that should be completed to prolong the life of the tank farm.

Taku's complete report is provided in Appendix C2.

2.3.5 Tank Farm Foundation Assessment

No thermopile, thermosyphon, or ground temperature data was collected at the Nikolai Bulk Fuel Facility, because no subgrade foundation soil cooling devices are present at the facility.

2.3.6 Water and other Contaminants in Tanks

No records were located regarding past testing or monitoring of the tanks. Brad had not dipped the tanks for water.

Ahtna collected information about water and other contaminants in the fuel tanks at the Nikolai Bulk Fuel facility on 22 August 2018. Brad had planned to participate, but ended up being unavailable. The quantity of water in the tanks was measured using water finding paste applied to a plumb bob lowered into the tank through the hatch. Water was found to be present in measurable quantities in three of the seven tanks tested. The measured water depths are presented in Table 2-4.

Ahtna performed qualitative fuel quality analyses using Fleet Fuel Testing brand field test kits capable of testing diesel fuel for visual clarity and detection water, bacteria, fungus, bugs, and algae. The field test kits were used on the five tanks containing diesel (C3-C6, S1). All fuel samples were collected from the top 0–0.5-foot interval of the fuel column in the tanks. The tanks were accessed through the hatch on the top of the tank. The water detection and degraded fuel tests were analyzed and recorded on site while the microbial contamination field test strips were bagged, sealed and analyzed following the manufacturer prescribed wait period (36–72 hours).

Suspended water was not found in any of the tanks. Fuel samples from all five tanks passed the clarity, degraded fuel, and bacteria tests. All five tanks tested negative for presence of yeast and mold. Field test results are summarized in Table 2-4. It should be noted that while the field test kits provide almost instant feedback, laboratory fuel analyses would provide higher accuracy data, if needed.

TABLE 2-4: NIKOLAI FIELD TEST RESULTS

Tank #	Water (Present?)	Water Quantity	Suspended Water (Present?)	Clarity (Pass/Fail)	Degraded (Pass/Fail)	Bacteria (Pass/Fail)	Yeast/Mold (Present?)
C1	No	N/A	-	-	-	-	-
C2	No	N/A	-	-	-	-	-
C3	Yes	1/2”	No	Pass	Pass	Pass	No
C4	Yes	1/8”	No	Pass	Pass	Pass	No
C5	No	N/A	No	Pass	Pass	Pass	No
C6	No	N/A	No	Pass	Pass	Pass	No
S1	Yes	1”	No	Pass	Pass	Pass	No

2.3.7 Fuel Transfer Practices

In Nikolai there were no records kept that indicated any spill history. A draft SPCC plan was available at the city office.

Spill response equipment was available, consisting of three 55-gallon spill kit containers containing sorbent socks, sorbent fuel pads, and personal protective equipment.

In Nikolai, fuel is delivered by air on an as-needed basis. When fuel is recognized as being low, an order is placed with Alaska Air Fuel, Inc. The fuel is transferred from the plane using a rubber hose extending back to the header. Gasoline is dispensed to personal vehicles through a header near the tank farm. Day tanks around the village are filled with ULSD using a filling tank pulled on a trailer or through the use of a city truck with a tank in the bed. The day tank at the school is directly piped to the tank farm.

The power plant is also directly piped to the tank farm.

2.3.8 Recommendations

Ahtna makes the following recommendations for the Nikolai Bulk Fuel Facility:

- Repair/replace damaged fence and gates.
- Replace missing locks on gates and valves.
- Replace expired/empty fire extinguishers.
- Procure material resources and attend training to improve spill response.
- Routinely dip for water in tanks with water finding paste after fuel deliveries and perform water drawing activities when necessary.
- Add backfill to the berm of the secondary containment to adequately cover the geogrid.
- Acquire a current and finalized SPCC plan.
- Maintain detailed records of operations at the Bulk Fuel Facility.
- Replaced damaged/faded placards.

Taku makes the following recommendations:

2.3.8.1 General

- Repair the tank farm gates so the tank farm can be secured.
- Ensure that the aircraft fuel transfer hose is drained down and removed between transfer operations.
- Conduct external monthly and annual inspections to note any progressing issues with the tank farm structures, tanks, piping, foundations, or coating.
- Conduct the next STI formal external inspection on or before August 2028. These inspections should be completed sooner if there are changes in service or operation.
- Maintain documentation that any tank or piping repairs and modifications were completed with qualified procedures and personnel.
- Continue formal inspection of all fuel piping within the Nikolai tank farm at 10-year intervals, as prescribed by API-570 for this Class 3 piping. The next formal API-570 inspection for the Tank Farm piping should be carried out no later than June 2028.
- Ensure that new operators are aware of the resources available on the ADEC website for Class 2 facilities. When possible send new operators through the tank farm operator training program offered by ADEC.
- Ensure that all Listing information for new tanks is recorded on metal tags permanently affixed to the tank shell.

2.3.8.2 Foundation and Tank Supports

- Monitor the condition of concrete footings and tank skid bolted connections for any signs of cracking or spalling. Repair as necessary with a suitable epoxy system.
- Consider installing a grounding ring inside the tank farm connected to a grounding ring outside the tank farm. Connect each tank to the grounding ring with a down conductor cad-welded to the tank supports.
- Caulk the areas of stitch welding on the tank supports for S1. This will help prevent water getting into the crevice between saddle and shell.

2.3.8.3 Containment, Spill Control, and Continuous Release Detection

- Continue to pump the rainwater from containment to prevent water from contacting the tank shells and piping.
- Place more gravel in the cells of the geogrid that have worked their way out of the existing material along the dike wall.
- Determine where the fuel sheen in containment adjacent to the aircraft headers is coming from. Ensure proper procedures are in place, and followed, for fuel transfer operations.

2.3.8.4 Coating

- Recoat all external tank and piping surfaces using a suitable exterior coating system per manufacturers' recommendations. Coating materials should be resistant to UV degradation and suitable for industrial-type service. Ensure that all welds, fittings, and crevices such as those present at pipe supports are properly coated. Perform surface preparation in accordance with industry standards and manufacturers' requirements to maximize coating performance.

2.3.8.5 Shell and Ancillary Equipment

- The tank level indicator float appeared to be in working condition. This should be verified by dipping the tank and recorded periodically by the operator as part of regular tank farm inspections.
- Increase the size of the normal vent for Tank S1 from 2 inches to 2.5 inches to meet code requirements.

2.3.8.6 Internal and Tank Bottom

- Use water finding paste after each fuel delivery to help determine if water has settled out in the bottom of the tank. Water-draw the tanks if water is present.

2.3.8.7 Piping

- Monitor all tank farm piping for leaks at bolted connections, settlement, damaged supports, or mechanical damage/active corrosion during the regular tank farm inspections.
- Pressure test the piping on an annual basis to verify the proper operation of the pressure-relieving devices.
- Develop formal fuel handling/transfer procedures for the tank farm piping if none currently exist.

2.4 General Fuel Transfer Practices

Ahtna interviewed the following parties regarding their experience with problematic fuel transfer practices and with storage/handling/transfer of ULSD:

- Alaska Air Fuel, Inc. (Nikolai fuel provider).
- Crowley Fuels, LLC.
- United States Coast Guard (USCG).
- United States Environmental Protection Agency (EPA).
- ADEC.

Ahtna also attempted to interview Vitus Marine (Kwigillingok and Chefornak fuel supplier), but did not receive a response.

2.4.1 Alaska Air Fuel, Inc.

Ahtna contacted John Sliwinski, the owner of Alaska Air Fuel, Inc., to discuss bulk fuel delivery experience. The main issue that Mr. Sliwinksi highlighted was the lack of training of operators. A common issue with operator training is the lack of a system for fuel transfers, resulting in overfilling of tanks. A common issue at many of the areas they service is also operator turnover. They do not have consistency in the operator of the fuel facility, which lends itself to the lack of a system for transfers and maintenance of the facility.

Mr. Sliwinski believed that onsite training would be beneficial in helping operators directly relate their training to their facilities.

He also commented on the lack of cleanliness within secondary containment at facilities they deliver to.

Another dimension to consider for the air deliveries to these bulk fuel facilities is the number of transfers that take place. Mr. Sliwinski noted that many Alaska Air Fuel clients receive their fuel into a fuel truck, which then transfers the fuel to the bulk fuel facility.

2.4.2 Crowley Fuels, LLC

Ahtna spoke with Carrie Godden, Crowley Fuels, LLC's director of facilities engineering. Her input focused less upon fuel transfer practices, and more on tank farm design and maintenance. She noted that many Alaska facilities were built before standard design guidance and API criteria for secondary containment, leak detection, and cathodic protection were developed. Although there are inspection requirements intended to mitigate risks posed by aging infrastructure, practical considerations may result in less frequent inspections at remote facilities. Ms. Godden also noted that operators may not have sufficient training to do adequate self-inspections.

2.4.3 EPA

Mr. Whittier, an EPA representative, recommended focusing on: 1) periodic integrity testing of the tanks, and 2) complete record-keeping of maintenance and spills, to improve remote tank farm operations. He indicated that onsite operator training would be beneficial to increase likelihood of integrity testing and record keeping being completed.

Mr. Whittier noted that many spills are due to overfilling of tanks. He indicated that better communication with the fuel transfer controller on the barge, as well as inspections ensuring that overfill protection features are in place would reduce incidents.

They also focused on the lack of records kept at these tank farms. Records of fuel tank fillings, spills, and secondary containment dewatering are required; however, in Mr. Whittier's experience, this documentation is rarely kept in rural Alaska villages.

2.4.4 USCG

Chief Howard of the USCG Anchorage Office voiced three major concerns that he sees regularly at coastal bulk fuel facilities: 1) the lack of training of operators, 2) the lack of periodic testing of pipes and valves, and 3) the lack of periodic inspection by third parties.

Chief Howard's main concern with the operation of bulk fuel facilities was the training of the operators. His impression was that it was common practice for the barge operator to take responsibility for the safe transfer of fuel to the facilities, because the fuel facility operators were not qualified or trained in safe transfer practices. Chief Howard recommended that fuel facility operators receive HAZWOPER training/refreshers as well as bulk fuel facility training. He believed that onsite training would be beneficial for the operators. However, he stressed the fact that the training would need to be extensive enough to properly train the operators, perhaps three days of training. He recognized the increased cost this would present and offered the opinion that robust offsite training would be more beneficial than incomplete onsite training.

Chief Howard also voiced concerns that annual testing of pipes and valves at locally-owned bulk fuel facilities is not being performed. He believed that pipe inspections likely aren't occurring more than once every four or five years. Although barge operators routinely pressurize the piping for 10 minutes or so during fuel deliveries, records of those tests are not provided to the facility or the USCG, and are not adequate substitutes for annual testing.

Chief Howard also recommended that periodic third-party inspections (such as Ahtna conducted in this project) be conducted at the bulk fuel facilities to ensure the proper maintenance and repairs are being made.

Chief Howard believes that for the most part, the facilities have appropriate spill response equipment available. However, he was not confident in the operator competence to address a major spill. He believed the response would be to apply sorbent boom and to contact the USCG to address it from there.

2.4.5 ADEC

Ahtna spoke with Amanda Compton, who oversees Class 2 Facilities with the ADEC. Ms. Compton highlighted post-construction handoff to local operators as a critical time for ensuring long-term project success. In her opinion, the bulk fuel facilities are doomed to fail from the beginning because of unrealistic expectations for the initial operations of the tank farm.

Ms. Compton believes that training programs should focus more on practical hands-on field operations than mathematical information. She believes training should also include fuel-pricing details to increase operators' knowledge. Rather than sending operators to Seward for training; Ms. Compton suggested that Rural Alaska Fueling Services (RAFS) may be able to offer cost-effective on-site trainings.

In additional to training enhancements, Ms. Compton believes that additional financial planning for these facilities would be beneficial. For instance, Ms. Compton suggested that a portion of the tank farm construction budget could be allocated into an operation, maintenance and training savings account.

Ms. Compton also suggested consideration of a probationary period when new facilities are transferred to local operation, with quarterly check-ins of required records and financial documentation that could be delivered to the Commission or a hired third-party responsible for the review of operations. Some of the construction project funds could be allocated to administrative assistance and third-party oversight.

3.0 PROGRAM DEVELOPMENT RECOMMENDATIONS

Based on facility conditions at the three project locations, Ahtna observed the following general concern areas, and recommends the following priorities for the Commission's Energy and Bulk Fuel Program.

3.1 Bulk Fuel Facilities Concern Assessment

3.1.1 Deferred maintenance

Deferred maintenance at rural bulk fuel facilities is a widespread issue, and is reducing service life of bulk fuel facilities. Some examples include:

3.1.1.1 Corrosion

Unless immediate attention is focused on maintaining or repairing the coating on tanks and pipe and draining water collected in the tanks and in the impoundments, particularly in Coastal Regions the service life will be further reduced. In extreme cases such as for Tank #4 at the Kwigillingok Marina Bulk Fuel Facility, excessive corrosion may be reducing the tank bottom thickness to unsafe limits. Per the recommendations of this report, this tank should be immediately prepared for inspection and the bottom thickness measured. The situation is sufficiently critical as to recommend that the tank be emptied prior to removing the existing corrosion to avoid rupturing the tank if the corrosion has reduced the bottom thickness beyond its safe limit.

3.1.1.2 Tank Releveling

If the foundation of any tank requires the tanks to be constantly releveled, then the cause of the movement should be evaluated by a competent Arctic/Geotechnical Engineer. Extreme cases, such as in Chefornak, may result in a release due to a failure from overstressing the piping or tank structure. Because the liner is ruptured, fuel from such a release could reach the insulation which will dissolve upon contact and increase the rate of thawing and subsidence. If the subsidence is reported early, evaluated, and repaired before too much subsidence has occurred, then the facility may be salvaged without replacing the liner and pad with tanks in place. Analysis may indicate that the thawing at Chefornak has been allowed to progress for so long that it may be more cost-effective to move the facility to a new, properly designed location.

3.2 Program Development Needs Analysis

3.2.1 Training

Ensure that bulk fuel system operators and utility managers are aware of free and subsidized training, assistance, advice, and other opportunities, such as those listed at ADEC's Class 2 facility outreach website (https://dec.alaska.gov/spar/ppr/prevention-preparedness/class-2-facilities/outreach/).

Encourage bulk fuel operators and utility managers to sign up for email updates from ADEC related to Class 2 facility operations (http://list.state.ak.us/mailman/listinfo/decsparclass2).

When possible, send new operators (or current operators without formal training) through the bulk fuel operator training program offered by Alaska Energy Authority (AEA) through AVTEC (http://www.akenergyauthority.org/programs/training).

Develop a training program for each tank farm and bring the trainers to the facility to train the operators on their own equipment.

The operators should be trained on the proper procedures for repairing the coatings on piping and tanks and required to do so.

The operators should be trained on filling procedures to prevent overfilling of tanks.

The operators should be trained on measuring for water in the tanks before and after filling, and the proper method to remove and dispose the water when detected and required to do so.

The operators should be trained on dewatering containment areas and required to do so.

Provide operators with the AEA's March 2018 *Rural Bulk Fuel Facilities Operator Handbook* as well as their Bulk Fuel Operation Videos (http://www.akenergyauthority.org/Programs/BulkFuelUpgrades). Due to frequent operator turnover and limited internet connectivity in many locations, annual mailings with paper copies and DVDs of training materials may be beneficial.

3.2.2 Inspection and Maintenance

Develop and adhere to a periodic third-party inspection and maintenance program, to supplement local efforts.

Develop a periodic thermosyphon inspection program.

3.2.3 Design Review Checklist

Develop and adhere to a bulk fuel facility design review checklist, including critical items such as appropriate foundation design and coating systems.

3.2.3.1 Foundations

All foundations in permafrost should be designed with appropriate consideration of changing climate conditions by a competent Arctic / Geotechnical Engineer. Foundations in marginal permafrost (including most of the Yukon-Kuskokwim Delta) should include thermosyphons.

APPENDIX A

FIELD FORMS

A1: Kwigillingok Marina

A2: Kwigillingok Powerhouse

A3: Chefornak

A4: Nikolai

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Tank Farm Name/Number/ID: Marina Bulk Fuel Facility

Owner/Phone #: Kwigillingok - 907-588-8114

Owner Type: NATIVE Village of Kwigillingok

Location: 59.88195, -163.15149

Total Evaluation Score (See Scoring Sheet): 85/240 (240 Max)

Regulatory Plans Available: ☒ No ☐ Yes (@ tribal office, NOT onsite)

Spill Response Equipment: ☐ No ☒ Yes; Spill Response Equipment Stored at TANK FARM OFFICE, BUT LIMITED TO SAUSAGE BOOMS/SORBENT PADS

Operator/Training/ Years on the Job: JIMMY OSCAR 11 years Around Farm, 1.5 years as operator

Distance from Moorage to Barge Header: 900 FT w/ 450 FT of Header piping

Facility Description and Usage:

FUEL IS DELIVERED BY BARGE, USUALLY 2x TIMES (JULY, SEPTEMBER)
* THE 3X VERTICAL TANKS ARE NOT USED IN LAST 3-4 YEARS
* SPCC PLAN NOT ONSITE
* TANKS ARE NEVER DE WATERED
* A DOUBLE WALL TANK ON SKIDS SITS ADJACENT TO TANK FARM AND IS USED BY CONSTRUCTION COMPANIES/CITY TO SELL HEATING OIL WHEN DISPENSARY IS TOO COLD TO WORK
* VERT TANKS ARE NOT USED ANYMORE, BUT WOULD BE FOR SPILL CONTINGENCY

Tank Inventory

Tank No.	Dia.	Height/ Length	Vertical/ Horizontal	Tank Type	Product	Tank Penetration Below Fuel Level	Tank Function	Approx. Age (Years)	Listing	Gross Capacity (Gallons)
									Total Gallons	

TANK TYPE: **SW** = Single Wall, **DW** = Double Wall, **SD** = Self Diked, **PR** = Protected. **PRODUCT**: **D1** = Diesel #1/Heating Fuel, **D2** =Diesel #2, **ULSD** = Ultra Low Sulfur Diesel, **G** = Gasoline, **AV** = Avgas. **TANK FUNCTION**: **FD** = Fleet Dispensing, **RD** = Retail Dispensing, **BF** = Bulk Fuel. **LISTING**: **UL** = Underwriters Laboratories, **STI** = Steel Tank Institute, **API** = American Petroleum Institute, **UNK** = Unknown.

Jimmy

Kwig -

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→ When Do you get Fuel Delivered? North Star, Butchasey Summer/Fall July/September
↳ How Many Times/year x2 30 K gal gas, 30 K gal D1

→ What Tanks Are not in use? 3 Verticals

→ When were the Tanks re painted?
No, not even touch up

→ How is Fuel Delivered Around Community? ATV's Fuel
@ Dispenser, Heating oil also, mostly in 5 or 30 gal cans

→ Years on Job: ~11 years, 1.5 years as manager
→ Operator Training in Seward: 2009
→ Do you have a spill contengency tank → will use the verticals
→ SPCC plan not on site | No log of spills or measurements
→ Spill response. Only sausage booms/sorbant pads → no pumps
→ Nothing availble to pump spill ~~water~~ into except vert tanks ↑ important

Dewater

- No, none @ low point drains
- Yes water in tanks sometimes but below drain/fill port

Security

- Lights do not work
- yes, locked/secured
- No real security problems

Water has never flooded, TF, close to dispensary though
No records kept, except pink slips from [illegible]
No fire extinguisher except one in TF

Deficiencies:

DISPENSARY IS

Site Location

- ☐ Tank farm in flood plain
- ☑ Facility threatened by coastal erosion/avalanche/river erosion/other DISPENSARY IS
- ☐ Tank Farm within 100 feet of a well

Secondary Containment

- ☐ No containment
- ☐ Inadequate containment

Foundations

- ☐ Belly of tank more than 12 inches above grade ← Check
- ☐ Insufficient foundation (Logs or < 6-inch timbers)
- ☐ No foundation (tank shell directly on ground)
- ☐ Failing foundation (leaning tank)

Tanks

- ☑ Tanks not numbered and labeled.
- ☐ Missing or improper emergency venting
- ☐ Missing or improper normal venting
- ☑ Excessive tank corrosion
- ☑ Tanks not listed or designed to current bulk fuel standards (riveted, water tanks, etc.) ← TANKS NOT LISTED
- ☐ No overfill protection ← Check

Piping

- ☐ No check valve at fill point ← Check
- ☑ Missing or inadequate drip pan at fill point
- ☐ Missing pressure relief
- ☑ Improper valve material (brass, bronze) Ball VALVES @ SKID TANK
- ☐ Active leaks
- ☐ Evidence of past leaks
- ☐ Damaged or stressed flex connector(s)
- ☑ Inadequate pipe supports ← See PHOTOS

Electrical

- ☑ Exposed or improper wiring
- ☑ Electrical conduit not supported at code-required intervals (10 feet or less)
- ☐ No evidence of grounding ← Check
  NO grounding wires, TF SITS on EARTH

Life, Health & Safety

- ☐ No fence
- ☐ Insufficient Egress
- ☑ Missing or insufficient regulatory signs
- ☑ Missing or insufficient fire extinguishers
- ☑ Missing Regulatory Plans
- ☐ Dispenser too close to tanks
- ☐ Inadequate separation from buildings
- ☐ Inadequate tank spacing
- ☐ No locks on gates
- ☐ No locks on closed tank issue valves
- ☐ Gravity dispensing
- ☐ Spill response equipment not available ← LIMITED

☐ Other Deficiencies (specify): MIXED METAL (UNI-STRUT) @ Header piping, poor support at Header piping, Security Lights Do NOT work, NO FIRE EXTINGUISHERS @ DISPENSARY

Recommendations: -Clean out + EVALUATE SUMPS

-Replace Leaking Ball VALVE @ DISPENSARY Low point Drain on Containment

-Replace Clock gauges w/ working ones

* Move DISPENSARY To Higher ground, Away From Flooding

* LABEL / NUMBER TANKS

→ Corrosion Issues to Be ADDRESSED BY TAKU

* Remove "Secondary Dispenser setup w/ DW TANK, BRASS VALVES

* Implement program to De water Secondary Containment

* ADD resources for improved Spill response

* Reach out For Help Dewatering TANKS / Implement Dewatering program

* ADD Fire EXTINGUISHERS

* ADEQUATELY Support piping, consider raising Pipe up w/ Barriers

What Are your concerns?

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→ Contractor to look @ insides
→ Low Fill Headers Are sometimes submerged.
↳ wish for it to be raised up

→ Funding to make lights work

→ wish for more storage, more vehicles seems like

→ Raised up pipelines within pan

→ Fuses occasionally blow in operation panel, possibly from power surges

★ Main concern is pipelines
→ Diesel fill line to dispensery slows down significantly in cold wx

Kwig Marina

Evaluation Score:

Facility Category	Possible Points	Awarded Points
Site Location		
Site suitable for tank farm	0 points	
< 100 feet from a public well	10 points	
< 25 feet from an eroding bank or beach, or history of flooding	10 points	10
Gasoline tanks < 25 feet from an important building	10 points	
	30 points max.	
Secondary Containment		
*Liquid-tight, lined dike of proper volume and construction, or double wall or self diked tanks	0 points	0
*Liquid-tight, lined dike of improper volume or construction	10 points	
*Fully diked but not liquid-tight (sand bag dike, gravel, torn or missing liner)	20 points	
*Partial or no dike	30 points	
	30 points max.	
Foundations		
*Tanks on stable foundations (steel skids, min. 6-inch timbers, no cribbing)	0 points	0
*Tanks directly on gravel pad or light timbers	5 points	
*Tanks directly on tundra or natural soils (no dike or liner, subject to erosion)	10 points	
Tanks leaning considerably or unstable foundations (seismic hazard)	10 points	
	20 points max.	
Tanks		
*Tanks in fair to good condition (no dents, min. rust, no major repairs needed)	0 points	
*Immediate need of cleaning and painting	10 points	10
*Rusted or dented beyond repair or riveted, bolted or other	30 points	20
	30 points max.	
Piping (choose most likely to leak, i.e., victaulic, threaded or welded, only)		
*No piping or welded piping above grade	0 points	
*Welded piping below grade	5 points	5
*Threaded piping above grade	10 points	10
*Threaded piping below grade	20 points	
*Victaulic piping above grade	30 points	
*Victaulic piping below grade	40 points	
Rubber hose	20 points	
Additional for active leaks	20 points	
	80 points max.	
Electrical		
Wiring appears appropriate or there is no wiring.	0 points	
Exposed wiring, improper grounding, etc.	10 points	10
	10 points max.	
Life, Health & Safety		
*Appears code compliant (No extraordinary factors observed)	0 points	
***Low risk** (Minor code violations that could result in personal injury to non-vigilant employees, such as tripping hazards, limited lighting, etc.)	10 points	
***Medium risk** (More severe code violations that increase risk such as lack of security fence, falling hazards, unlocked valves, gravity dispensing, etc.)	20 points	20
***High risk** (Situations that pose an immediate threat to safety such as Fire hazards, gas leaks, failing tanks, unstable foundations, etc.)	40 points	
	40 points max.	
Facility Total	**240 points max.**	85

*Indicates that only one of the group should be chosen.

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Kwig Power company

Tank Farm Name/Number/ID: Kwig Power PlanT

Owner/Phone #: Kwigillingok Power company/907-588-2070

Owner Type: Kwig Village Corporation

Location: 59.87648, -163.16188

Total Evaluation Score (See Scoring Sheet): ~~50~~ 30/240 (240 Max)

Regulatory Plans Available: ☐ No ☑ Yes SPCC plan

Spill Response Equipment: ☒ No ☑ Yes; Spill Response Equipment Stored at Power plant, But very limited Amount (Sorbent pads)

Operator/Training/ Years on the Job: John Lewis Manager <1 Year

Distance from Moorage to Barge Header: ~1/4 Mile

Facility Description and Usage:
Fuel Tank Farm (3x Storage + 1x Intermediate Tanks) For Power plant, Also Rubber "Jumper line" used to connect line from ~~the~~ River to Header at Water plant + School, contained within secondary containment

Tank Inventory

Tank No.	Dia.	Height/ Length	Vertical/ Horizontal	Tank Type	Product	Tank Penetration Below Fuel Level	Tank Function	Approx. Age (Years)	Listing	Gross Capacity (Gallons)	
1	15'	18'	Vert	SW	D1	Yes	BF		UL	23,700	
2	15'	18'	Vert	SW	D1	Yes	BF		UL	23,700	
3	15'	18'	Vert	SW	D1	Yes	BF		UL	23,700	
4	NA	NA	Horiz	DW	D1	Yes	BF		UL	12,000	Day Tank
									Total Gallons		

TANK TYPE: **SW** = Single Wall, **DW** = Double Wall, **SD** = Self Diked, **PR** = Protected. **PRODUCT**: **D1** = Diesel #1/Heating Fuel, **D2** =Diesel #2, **ULSD** = Ultra Low Sulfur Diesel, **G** = Gasoline, **AV** = Avgas. **TANK FUNCTION**: **FD** = Fleet Dispensing, **RD** = Retail Dispensing, **BF** = Bulk Fuel. **LISTING**: **UL** = Underwriters Laboratories, **STI** = Steel Tank Institute, **API** = American Petroleum Institute, **UNK** = Unknown.

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Manager <1 year on JOB
But STAFF HAS years on JOB, several of which have Been To Bulk Fuel Training

· No obvious signs of foundation slumping

· Has SPCC plan
- No log of spill/releases
· Has log of tank strapping/reading level gauges

Fuel Delivery - Same as marina
↳ possible in sufficent storage, This spring was concerned That They would run out if Barge came in late, Bought ~1,000 gallons from marina and shuttled over via 55gal Drums/ATVs.

No SPCC Contengency Tank

➔ Re-painting, → not sure, maybe done previosly

→ Dewatering
↳ yes, constantly w/ containment
↳ no to tanks, *show operator water Draw on intermediate Tank

→ Spring Delivery went smoothly

Security
No Fence, Non working light

what are some concerns
Security
*Melting of Permafrost affecting infrastructure
, More storage

· Very concerned about upkeep, of tanks/pipelines
↳ want to keep in good shape
↳ wishes he knew How To Scrape/paint ~~pi~~ lines/tanks

NWIG Power
Company

Deficiencies:

Site Location
☐ Tank farm in flood plain
☐ Facility threatened by coastal erosion/avalanche/river erosion/other
☐ Tank Farm within 100 feet of a well

Secondary Containment
☐ No containment
☐ Inadequate containment

Foundations
☐ Belly of tank more than 12 inches above grade
☐ Insufficient foundation (Logs or < 6-inch timbers)
☐ No foundation (tank shell directly on ground)
☐ Failing foundation (leaning tank)

Tanks
☐ Tanks not numbered and labeled
☐ Missing or improper emergency venting
☐ Missing or improper normal venting
☐ Excessive tank corrosion
☐ Tanks not listed or designed to current bulk fuel standards (riveted, water tanks, etc.)
☒ No overfill protection (on intermediate tank/day tank only)

Piping
☐ No check valve at fill point
☐ Missing or inadequate drip pan at fill point
☐ Missing pressure relief
☐ Improper valve material (brass, bronze)
☐ Active leaks
☐ Evidence of past leaks
☐ Damaged or stressed flex connector(s)
☐ Inadequate pipe supports

Electrical
☐ Exposed or improper wiring
☐ Electrical conduit not supported at code-required intervals (10 feet or less)
☐ No evidence of grounding

Life, Health & Safety
☒ No fence
☐ Insufficient Egress
☐ Missing or insufficient regulatory signs
☐ Missing or insufficient fire extinguishers
☐ Missing Regulatory Plans
☐ Dispenser too close to tanks
☐ Inadequate separation from buildings
☐ Inadequate tank spacing
☒ No locks on gates
☒ No locks on closed tank issue valves
☐ Gravity dispensing
☐ Spill response equipment not available (Limited

☐ Other Deficiencies (specify):
- Flange fill port @ intermediate tank not bolted/secured
- Limited spill response supplies available

Recommendations: * Add fence w/ locked gate
* Keep up w/ constant dewatering of containment
* Bolt up fill flange on intermediate tank.
* Implement a rust mitigation program (scrape + paint)
* Utilize water draw on intermediate tank
* Evaluate need for 4th storage tank
→ Sump sits @ highest corner of containment, consider adding sump to current lowest corner

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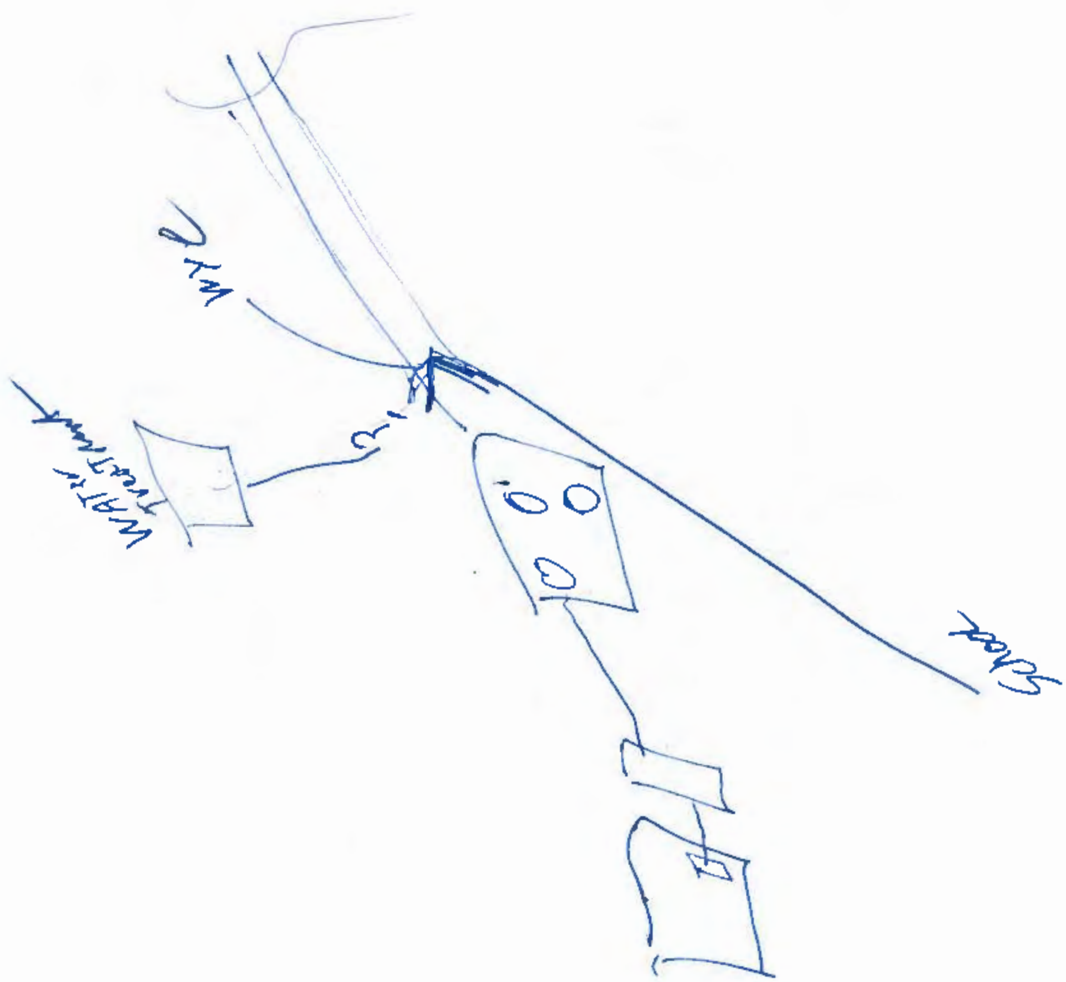

Kwig Power Company

Evaluation Score:

Facility Category	Possible Points	Awarded Points
Site Location		
Site suitable for tank farm	0 points	0
< 100 feet from a public well	10 points	
< 25 feet from an eroding bank or beach, or history of flooding	10 points	
Gasoline tanks < 25 feet from an important building	10 points	
	30 points max.	
Secondary Containment		
*Liquid-tight, lined dike of proper volume and construction, or double wall or self diked tanks	0 points	0
*Liquid-tight, lined dike of improper volume or construction	10 points	
*Fully diked but not liquid-tight (sand bag dike, gravel, torn or missing liner)	20 points	
*Partial or no dike	30 points	
	30 points max.	
Foundations		
*Tanks on stable foundations (steel skids, min. 6-inch timbers, no cribbing)	0 points	0
*Tanks directly on gravel pad or light timbers	5 points	
*Tanks directly on tundra or natural soils (no dike or liner, subject to erosion)	10 points	
Tanks leaning considerably or unstable foundations (seismic hazard)	10 points	
	20 points max.	
Tanks		
*Tanks in fair to good condition (no dents, min. rust, no major repairs needed)	0 points	
*Immediate need of cleaning and painting	10 points	10
*Rusted or dented beyond repair or riveted, bolted or other	30 points	
	30 points max.	
Piping (choose most likely to leak, i.e., victaulic, threaded or welded, only)		
*No piping or welded piping above grade	0 points	0
*Welded piping below grade	5 points	
*Threaded piping above grade	10 points	
*Threaded piping below grade	20 points	
*Victaulic piping above grade	30 points	
*Victaulic piping below grade	40 points	
Rubber hose ← Jumper line	20 points	20
Additional for active leaks	20 points	
	80 points max.	
Electrical		
Wiring appears appropriate or there is no wiring.	0 points	0
Exposed wiring, improper grounding, etc.	10 points	
	10 points max.	
Life, Health & Safety		
*Appears code compliant (No extraordinary factors observed)	0 points	
***Low risk** (Minor code violations that could result in personal injury to non-vigilant employees, such as tripping hazards, limited lighting, etc.)	10 points	
***Medium risk** (More severe code violations that increase risk such as lack of security fence, falling hazards, unlocked valves, gravity dispensing, etc.)	20 points	20 No Fence
***High risk** (Situations that pose an immediate threat to safety such as Fire hazards, gas leaks, failing tanks, unstable foundations, etc.)	40 points	
	40 points max.	
Facility Total	**240 points max.**	~~30~~ 50

*Indicates that only one of the group should be chosen.

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Tank Farm Name/Number/ID: ChefoRNAK Tank Farm (Corporation, City, School)

Owner/Phone #: Ken ERIC Corporation Manager 867-8114

Owner Type: SPLIT Between CORP, CITY, And School

Location: School 60,160194,-164.287262 CITY 60.160107,-164.286929, CORP 60,160 325,-164.28701

Total Evaluation Score (See Scoring Sheet): 115/240 (240 Max)

Regulatory Plans Available: ☐ No ☒ Yes @ EACH OFFICE LocaTion

Spill Response Equipment: ☐ No ☒ Yes; Spill Response Equipment Stored at CONNEX ADJacent TO TANK FARM, ALSO SPILL/SLOP TANK

Operator/Training/ Years on the Job: MATThew DamRuck/No/5 years (CORP)
Joe Abraham / Yes/15 years (CITY)
Andrew KILANAK / yes/ 15 years (CITY)
* School OPERATOR RAy-MoUNK NOT AVAILABLE

Distance from Moorage to Barge Header: 900 FT PIPE RUN.

Facility Description and Usage:
- TANK FARM is SPLIT Between CITY, CORPORATION (Village) And The School
- A DISPENSING STATION FOR GAS/DIESEL SITS ADJacent TO The Header @ River
- ~~A secondary Heating oil Dispenser is connected to ADW Tank And [illegible] into existing piping~~
- The TANK #20 is A SPLIT "DAY" TANK FOR gas/Diesel Dispenser
- A SLOP OIL TANK SITS OUTSIDE The TF FOR DeWATERING/spill contingency
- A DW TANK SITS OUTSIDE The TF FOR Extra CITY STorage.

Tank Inventory

Tank No.	Dia.	Height/ Length	Vertical/ Horizontal	Tank Type	Product	Tank Penetration Below Fuel Level	Tank Function	Approx. Age (Years)	Listing	Gross Capacity (Gallons)
									Total Gallons	

TANK TYPE: **SW** = Single Wall, **DW** = Double Wall, **SD** = Self Diked, **PR** = Protected. **PRODUCT**: **D1** = Diesel #1/Heating Fuel, **D2** =Diesel #2, **ULSD** = Ultra Low Sulfur Diesel, **G** = Gasoline, **AV** = Avgas. **TANK FUNCTION**: **FD** = Fleet Dispensing, **RD** = Retail Dispensing, **BF** = Bulk Fuel. **LISTING**: **UL** = Underwriters Laboratories, **STI** = Steel Tank Institute, **API** = American Petroleum Institute, **UNK** = Unknown.

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→ What do you have for spill response equipment?
Yes,

→ Do you have an SPCC Plan
Yes in office, at power plant, [AT School]

* Jeff Harris LKSD
Plant Maintainer (BETHEL)

→ Do you have records of spills, water, or deliveries
yes

→ Are any tanks not in use?
No, just spill contingency tank outside

→ When do you get fuel delivered?
2X per year for city/corp, 1X for LKSD Crowley

→ Has any re painting/touch up been done? yes (Every year sometimes)

→ How is fuel delivered around community?
Bring own container to dispensary, free delivery to elders

→ Do you dip/de water?
Yes but no regular program,

→ Does this ever flood?

→ Do all the containments hold water? Unsure

→ Does the city have gas or just D1?
Just D1

→ When gets low stop selling to outsiders or companys

→ When light plant buys fuel from city, hurts budget!

→ Do you have enough storage?
City yes, buys from corp, growing city, bigger loads w/ projects
Every construction project uses too much fuel (contractors)

* Problems w/ wiring in tank farm in water

* RAFTS recently did thickness testing → Accident

Deficiencies:

Site Location
☑ Tank farm in flood plain
☒ Facility threatened by coastal erosion/avalanche/river erosion/other
☐ Tank Farm within 100 feet of a well

Secondary Containment
☐ No containment
☒ Inadequate containment LEAKS

Foundations
☑ Belly of tank more than 12 inches above grade DISTRO TANK
☐ Insufficient foundation (Logs or < 6-inch timbers)
☐ No foundation (tank shell directly on ground)
☒ Failing foundation (leaning tank)

Tanks
☐ Tanks not numbered and labeled
☐ Missing or improper emergency venting
☐ Missing or improper normal venting
☐ Excessive tank corrosion
☒ Tanks not listed or designed to current bulk fuel standards (riveted, water tanks, etc.)
☑ No overfill protection

TANKS w/ OPEN/CAULKED TOPS

Piping
☐ No check valve at fill point
☐ Missing or inadequate drip pan at fill point
☐ Missing pressure relief
☐ Improper valve material (brass, bronze)
☐ Active leaks
☐ Evidence of past leaks
☑ Damaged or stressed flex connector(s)
☑ Inadequate pipe supports @ Power Plant w/ Recent construction

Electrical
☑ Exposed or improper wiring
☑ Electrical conduit not supported at code-required intervals (10 feet or less)
☐ No evidence of grounding

Life, Health & Safety
☐ No fence
☐ Insufficient Egress
☐ Missing or insufficient regulatory signs
☑ Missing or insufficient fire extinguishers
☐ Missing Regulatory Plans
☐ Dispenser too close to tanks
☐ Inadequate separation from buildings
☐ Inadequate tank spacing
☐ No locks on gates
☐ No locks on closed tank issue valves
☐ Gravity dispensing
☐ Spill response equipment not available

☐ Other Deficiencies (specify):
Failing Foundation, RIP in Liner not able to be patched
Piping to powerplant/school susceptible to snow machine accidents
• Flood waters reach TF.

Recommendations:
- Adding fencing over pipes that are susceptible to being hit by motor vehicle or snowmachine.
• Fix piping supports for pipe run to powerplant near wash plant
• Evaluate flooding/erosion @ dispenser
• Attempt to repair tears in liner, add fill material around heaving wood containment to support liner.

BUILT 2001

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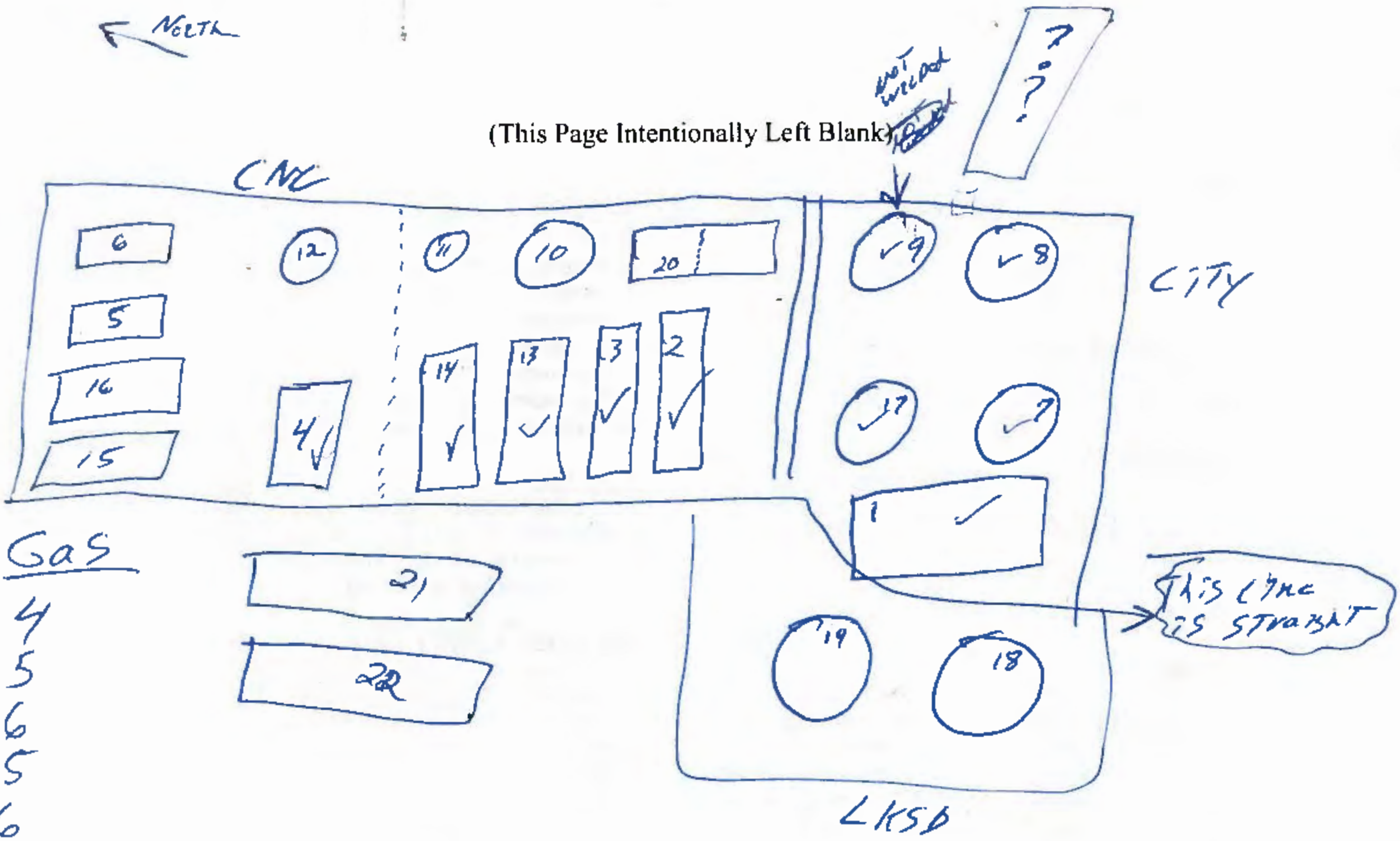

Gas
4
5
6
15
16

#20 DUAL PRODUCT DISPENSING TANK

TANKS 10, 11, 12, maybe #9 are 1970's

CHEF 1F

Evaluation Score:

Facility Category	Possible Points	Awarded Points
Site Location		
Site suitable for tank farm	0 points	
< 100 feet from a public well	10 points	
< 25 feet from an eroding bank or beach, or history of flooding	10 points	10
Gasoline tanks < 25 feet from an important building	10 points	
	30 points max.	
Secondary Containment		
*Liquid-tight, lined dike of proper volume and construction, or double wall or self diked tanks	0 points	
*Liquid-tight, lined dike of improper volume or construction	10 points	
*Fully diked but not liquid-tight (sand bag dike, gravel, torn or missing liner)	20 points	20
*Partial or no dike	30 points	
	30 points max.	
Foundations		
*Tanks on stable foundations (steel skids, min. 6-inch timbers, no cribbing)	0 points	
*Tanks directly on gravel pad or light timbers	5 points	5
*Tanks directly on tundra or natural soils (no dike or liner, subject to erosion)	10 points	
Tanks leaning considerably or unstable foundations (seismic hazard)	10 points	10
	20 points max.	
Tanks		
*Tanks in fair to good condition (no dents, min. rust, no major repairs needed)	0 points	
*Immediate need of cleaning and painting	10 points	
*Rusted or dented beyond repair or riveted, bolted or other	30 points	20 ← several TOPS unsecured
	30 points max.	
Piping (choose most likely to leak, i.e., victaulic, threaded or welded, only)		
*No piping or welded piping above grade	0 points	0
*Welded piping below grade	5 points	
*Threaded piping above grade	10 points	
*Threaded piping below grade	20 points	
*Victaulic piping above grade	30 points	
*Victaulic piping below grade	40 points	
Rubber hose	20 points	
Additional for active leaks	20 points	
	80 points max.	
Electrical		
Wiring appears appropriate or there is no wiring.	0 points	
Exposed wiring, improper grounding, etc.	10 points	10
	10 points max.	
Life, Health & Safety		
*Appears code compliant (No extraordinary factors observed)	0 points	
***Low risk** (Minor code violations that could result in personal injury to non-vigilant employees, such as tripping hazards, limited lighting, etc.)	10 points	
***Medium risk** (More severe code violations that increase risk such as lack of security fence, falling hazards, unlocked valves, gravity dispensing, etc.)	20 points	
***High risk** (Situations that pose an immediate threat to safety such as Fire hazards, gas leaks, failing tanks, unstable foundations, etc.)	40 points	40
	40 points max.	
Facility Total	**240 points max.**	115

*Indicates that only one of the group should be chosen.

* Fall Floods Seem More and More To Flood Tank Farm
↳ Middle Section of Road Becomes Completely Submerged
↳ Floods Have reached Elevation of Tank Farm

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Concerns

- Fuel Lines Close To Houses, Residents Drive over Them in winter
  ↳ wish To Be relocated
- Heavy and recent Erosion @ Dispensary/Header
- ~~Repl~~ wish For replaced Tanks
- wish For seperate TF's For Safety/Security. ~~Be~~ Anna Feels it's Too Much of A risk For it All To Be Together

Andrew Kilanak - City TF Operator - 15 years
Power Plant operator 30 years
Yes

Joe Abraham - City TF operator - 15 years
Power Plant operator - 30 years
yes

~~M~~ Matthew - Pankuk - Corp TF operator - 5 years
NO

* Andrew Kilanak indicates ~~that~~ That The City/Corp Containments Are Hydraulically connected Through A Tear in The Liner

Tank Farm Name/Number/ID: NIKOLAI TANK FARM

Owner/Phone #: CITY OF NIKOLAI (907) 293-2113

Owner Type: CITY

Location: 63.0139 -154.3692

Total Evaluation Score (See Scoring Sheet): 30 (DEPENDENT ON FILL HOSE) (240 Max)

Regulatory Plans Available: ☐ No ☒ Yes (DRAFT SPCC PLAN FROM 1985)

Spill Response Equipment: ☐ No ☒ Yes; Spill Response Equipment Stored at CONNEX INSIDE FENCE, OUTSIDE SECONDARY CONTAINMENT

Operator/Training/ Years on the Job: BRAD / N/A / ≈ 2 MONTHS

Distance from Moorage to Barge Header:

Facility Description and Usage:

FUEL TANK FARM FOR CITY OF NIKOLAI. FUEL DELIVERED BY AIR (ALASKA AIR FUEL). DIESEL #1 AND #2 AS WELL AS GASOLINE. DIRECT LINES TO GROUND AND MARINE HEADER. DIRECT LINES TO DAY TANK @ SCHOOL AND POWER PLANT. EMPTY SPILL CONTINGENCY TANK ON SIGHT OUTSIDE SECONDARY CONTAINMENT

Tank Inventory

Tank No.	Dia.	Height/ Length	Vertical/ Horizontal	Tank Type	Product	Tank Penetration Below Fuel Level	Tank Function	Approx. Age (Years)	Listing	Gross Capacity (Gallons)
C1	11'	38'	HORIZ	SW	G	YES	BF	16	UL	27000
C2	7'	17'	HORIZ	DW	G	YES	RD	16	UL	4000
C3	11'	38'	HORIZ	SW	D1	YES	BF	16	UL	27000
C4	11'	38'	HORIZ	SW	D1	YES	BF	16	UL	27000
C5	7.5'	30'	HORIZ	SW	D2	YES	BF	16	UL	10000
C6	7.5'	30'	HORIZ	SW	D2	YES	BF	16	UL	10000
S1	7.5'	36'	HORIZ	SW	D1	YES	BF	16	UL	12000
									Total Gallons	

TANK TYPE: **SW** = Single Wall, **DW** = Double Wall, **SD** = Self Diked, **PR** = Protected. **PRODUCT**: **D1** = Diesel #1/Heating Fuel, **D2** =Diesel #2, **ULSD** = Ultra Low Sulfur Diesel, **G** = Gasoline, **AV** = Avgas. **TANK FUNCTION**: **FD** = Fleet Dispensing, **RD** = Retail Dispensing, **BF** = Bulk Fuel. **LISTING**: **UL** = Underwriters Laboratories, **STI** = Steel Tank Institute, **API** = American Petroleum Institute, **UNK** = Unknown.

MINOR INADEQUACY, PIPE CLAMPS ARE CONDUIT CLAMPS, SHOULD BE ISOLATION BETWEEN PIPE AND CLAMP

Deficiencies:

Site Location
- ☐ Tank farm in flood plain
- ☐ Facility threatened by coastal erosion/avalanche/river erosion/other
- ☐ Tank Farm within 100 feet of a well

Secondary Containment
- ☐ No containment
- ☐ Inadequate containment

Foundations
- ☒ Belly of tank more than 12 inches above grade ≈16"
- ☐ Insufficient foundation (Logs or < 6-inch timbers)
- ☐ No foundation (tank shell directly on ground)
- ☐ Failing foundation (leaning tank)

Tanks
- ☐ Tanks not numbered and labeled
- ☐ Missing or improper emergency venting
- ☐ Missing or improper normal venting
- ☐ Excessive tank corrosion
- ☐ Tanks not listed or designed to current bulk fuel standards (riveted, water tanks, etc.)
- ☐ No overfill protection

Piping
- ☐ No check valve at fill point
- ☐ Missing or inadequate drip pan at fill point
- ☐ Missing pressure relief
- ☐ Improper valve material (brass, bronze)
- ☐ Active leaks
- ☐ Evidence of past leaks
- ☐ Damaged or stressed flex connector(s)
- ☒ Inadequate pipe supports

Electrical
- ☐ Exposed or improper wiring
- ☐ Electrical conduit not supported at code-required intervals (10 feet or less)
- ☐ No evidence of grounding

Life, Health & Safety GATE OFF HINGES
- ☒ No fence
- ☐ Insufficient Egress
- ☐ Missing or insufficient regulatory signs
- ☒ Missing or insufficient fire extinguishers 1 UNCHARGED
- ☐ Missing Regulatory Plans
- ☐ Dispenser too close to tanks
- ☐ Inadequate separation from buildings
- ☐ Inadequate tank spacing
- ☒ No locks on gates 3 GATES UNLOCKED
- ☐ No locks on closed tank issue valves
- ☐ Gravity dispensing
- ☐ Spill response equipment not available

☐ Other Deficiencies (specify): ______________________

Recommendations: CLEANING AND PAINTING OF TANKS PER RECOMMENDATIONS OF TAKU ENGINEERING, REPLACEMENT/USE OF LOCKS ON GATES AND VALVES, RECHARGING AND REPLACEMENT OF FIRE EXTINGUISHERS, INVENTORY OF SPILL RESPONSE EQUIPMENT REVIEW AND UPDATE OF SPCC PLAN, TRAINING FOR OPERATORS.

Evaluation Score:

Facility Category	Possible Points	Awarded Points	
Site Location			
Site suitable for tank farm	0 points	0	
< 100 feet from a public well	10 points		
< 25 feet from an eroding bank or beach, or history of flooding	10 points		
Gasoline tanks < 25 feet from an important building	10 points		
	30 points max.		
Secondary Containment			
*Liquid-tight, lined dike of proper volume and construction, or double wall or self diked tanks	0 points	0	NO SIGN OF DAMAGE TO LINER
*Liquid-tight, lined dike of improper volume or construction	10 points		
*Fully diked but not liquid-tight (sand bag dike, gravel, torn or missing liner)	20 points		
*Partial or no dike	30 points		
	30 points max.		
Foundations			
*Tanks on stable foundations (steel skids, min. 6-inch timbers, no cribbing)	0 points	0	
*Tanks directly on gravel pad or light timbers	5 points		
*Tanks directly on tundra or natural soils (no dike or liner, subject to erosion)	10 points		
Tanks leaning considerably or unstable foundations (seismic hazard)	10 points		
	20 points max.		
Tanks			
*Tanks in fair to good condition (no dents, min. rust, no major repairs needed)	0 points	~~0~~	RUST BLOOMS BEGINNING, NO SUBSTANTIAL DAMAGE
*Immediate need of cleaning and painting	10 points	10	
*Rusted or dented beyond repair or riveted, bolted or other	30 points		
	30 points max.		
Piping (choose most likely to leak, i.e., victaulic, threaded or welded, only)			
*No piping or welded piping above grade	0 points	0	
*Welded piping below grade	5 points		
*Threaded piping above grade	10 points		
*Threaded piping below grade	20 points		
*Victaulic piping above grade	30 points		
*Victaulic piping below grade	40 points		
Rubber hose	20 points		RUBBER FILL HOSE FROM PLANE, OK IF PRESSURE TEST BEFORE USE, HAVE CONFIRMED IF DONE
Additional for active leaks	20 points		
	80 points max.		
Electrical			
Wiring appears appropriate or there is no wiring.	0 points	0	
Exposed wiring, improper grounding, etc.	10 points		
	10 points max.		
Life, Health & Safety			
*Appears code compliant (No extraordinary factors observed)	0 points		
***Low risk** (Minor code violations that could result in personal injury to non-vigilant employees, such as tripping hazards, limited lighting, etc.)	10 points		
***Medium risk** (More severe code violations that increase risk such as lack of security fence, falling hazards, unlocked valves, gravity dispensing, etc.)	20 points	20	UNLOCKED GATES/VALVES
***High risk** (Situations that pose an immediate threat to safety such as Fire hazards, gas leaks, failing tanks, unstable foundations, etc.)	40 points		
	40 points max.		
Facility Total	**240 points max.**		

*Indicates that only one of the group should be chosen.

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APPENDIX B

PHOTOLOGS

B1: Kwigillingok Marina

B2: Kwigillingok Powerhouse

B3: Chefornak

B4: Nikolai

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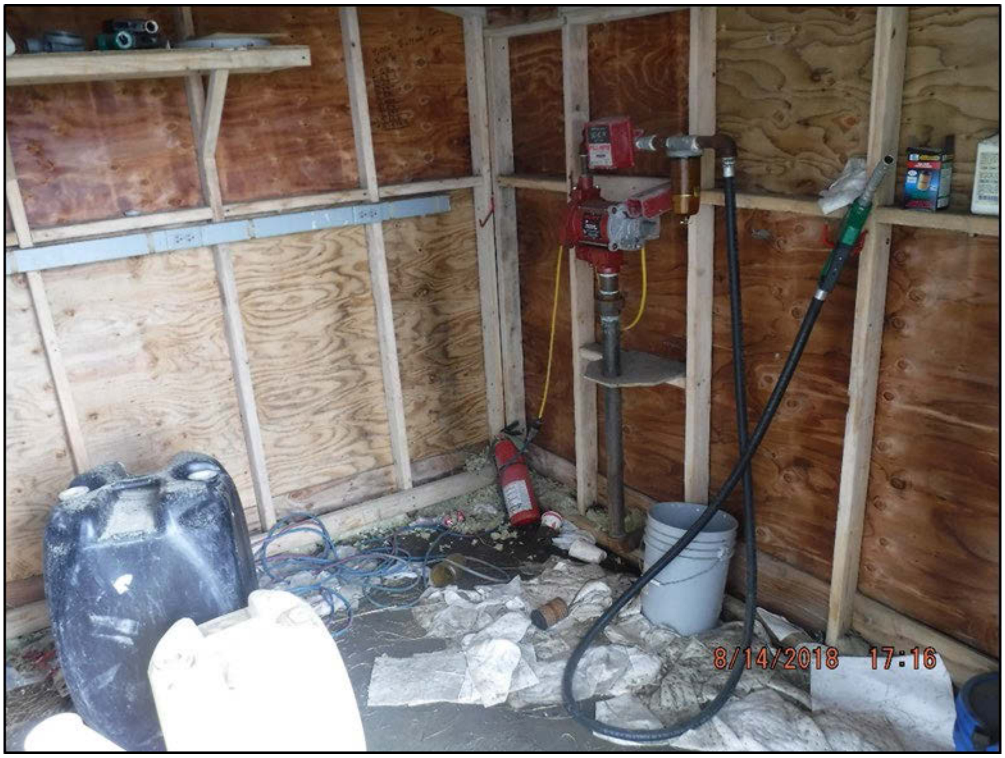
Photograph 1: Looking north at Kwigillingok Marina Bulk Facility.

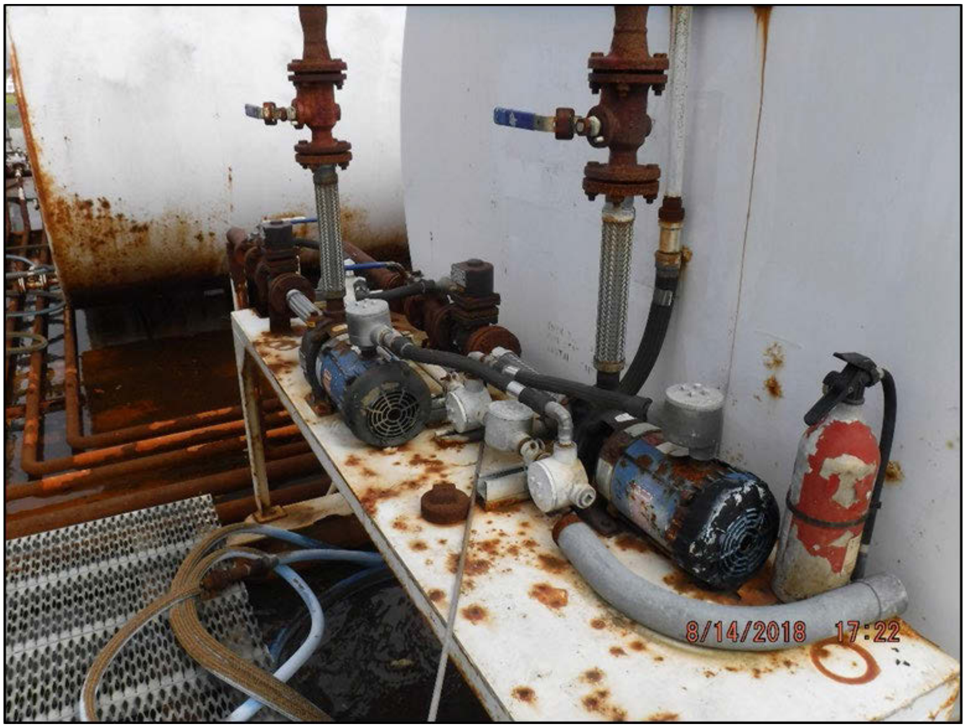
Photograph 2: Looking northeast with AFI staff measuring thermosyphons.

Photograph 3: Looking south at riverbank dispenser.

Photograph 4: Winter dispenser shed and skid tank.



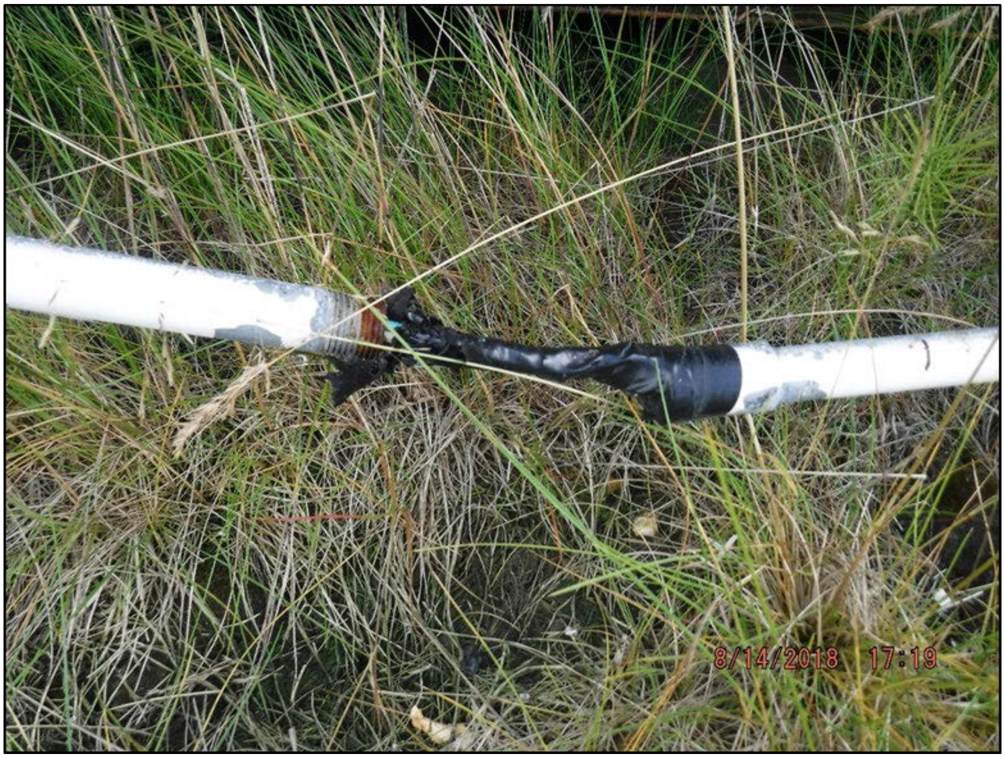
Photograph 5: Interior of winter dispenser shed.



Photograph 6: Typical condition of infrastructure.

Photograph 7: Looking north along pipe runs. Note standing water present.

Photograph 8: Rubber transfer hose is connected to the unlocked low point drain of Tank #5.



Photograph 9: Broken security light electrical conduit.

Photograph 10: Fuel saturated booms and sorbent pads outside of containment.

Photograph 11: Unsupported pipe run. Note partial cribbing.

Photograph 12: Looking north along east edge of containment. Typical condition of pad edge with exposed cellular confinement.

Photograph 13: Water finding past showing 1 inch of water in Tank #11.

Photograph 14: Suspended water detected (as pink beads) from Tank #5.

Photograph 1: Looking north at the Kwigillingok Powerhouse Bulk Fuel Facility

Photograph 2: Looking north along containment. Note standing water not able to be pumped out.

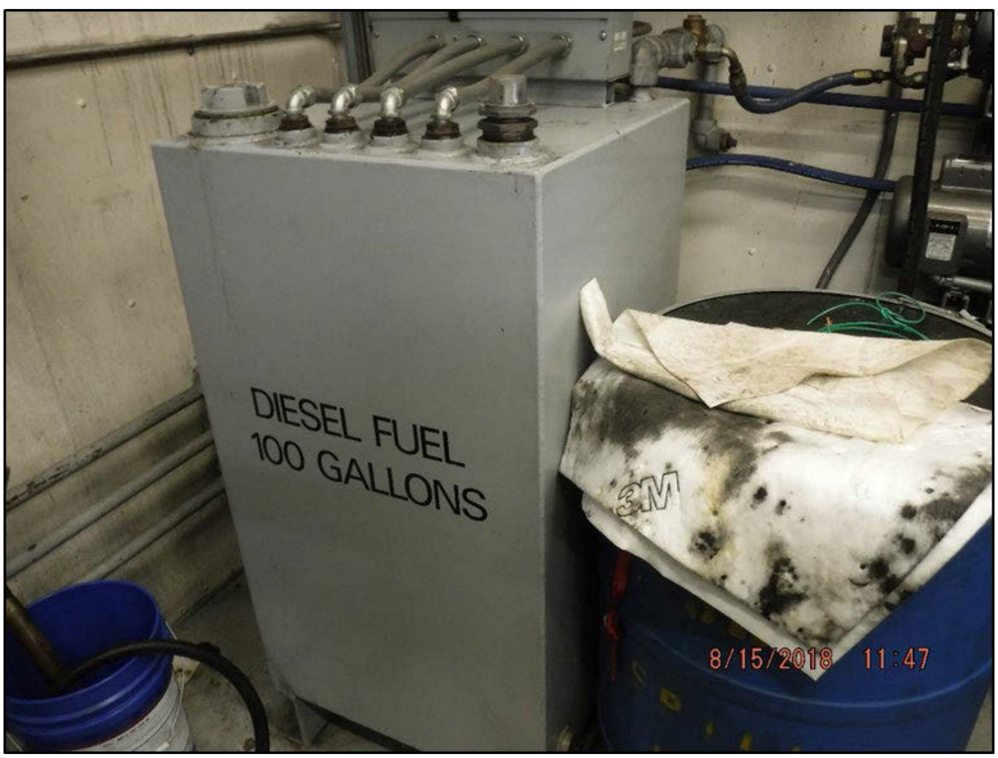
Photograph 3: Looking at marine header, school header, and rubber jumper line.

Photograph 4: Looking at standing water in containment and repainted tank bottom.

Photograph 5: Looking north along east wall of containment.

Photograph 6: Looking south at intermediate double-walled tank and powerhouse.

Photograph 7: Looking at unsecured flange on intermediate tank.



Photograph 8: 100-gallon day tank within powerhouse.

Photograph 9: Denali Commission sign on tank farm.

Photograph 10: Denali Commission sign on powerhouse.

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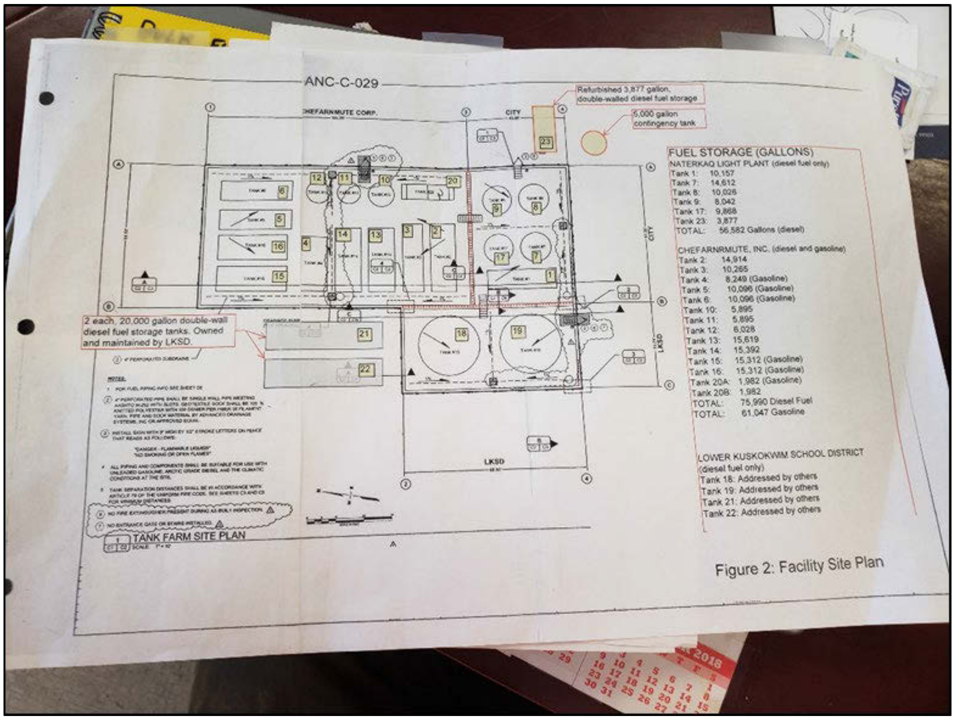


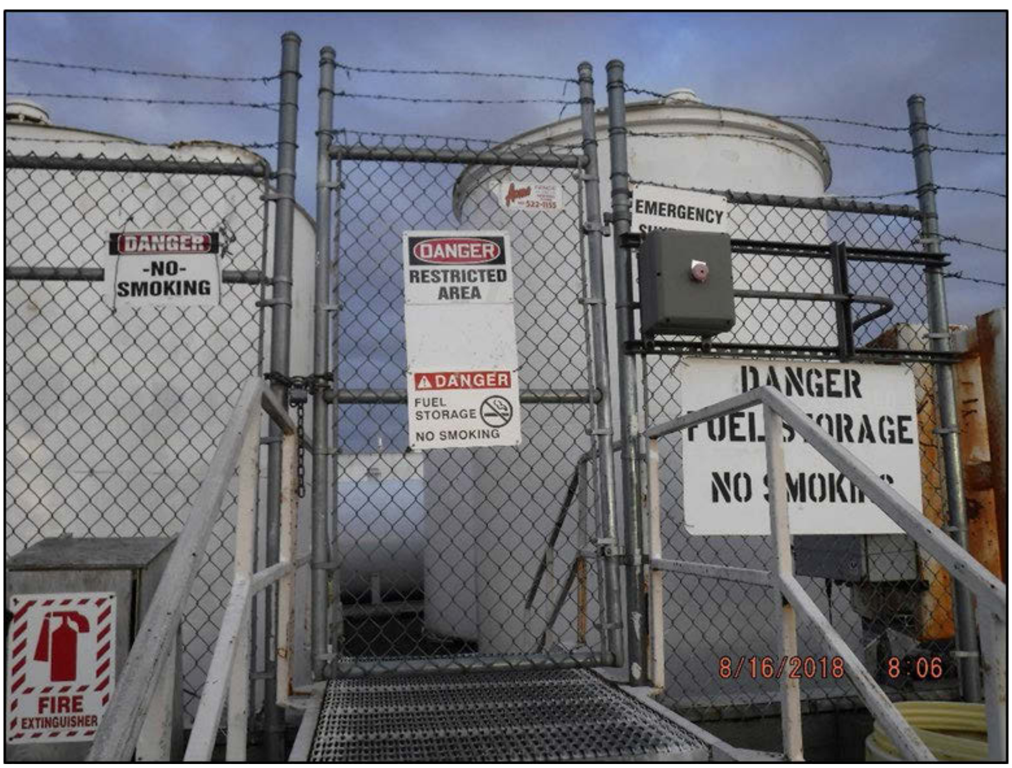
Photograph 1: Updated tank farm layout with tanks outside of containment illustrated.

Photograph 2: Looking west at the Chefornak Bulk Fuel Facility. Note leaning timber utility poles.

Photograph 3: Looking south along pipe run. Note retrofitted metal framing stud armoring.

Photograph 4: Looking east along pipe run to school and light plant. Note insulated water pipe placed on top to protect from winter snow machine traffic.

Photograph 5: Contents of spill response connex.



Photograph 6: Looking west at the entrance to the City of Chefornak tank farm cell.

Photograph 7: Looking at undercharged fire extinguisher.

Photograph 8: Looking northwest at the double-walled skid tank outside of containment used for additional storage for the City of Chefornak.

Photograph 9: Looking west along Tank #2 in the CNC tank farm cell.

Photograph 10: Looking south in the CNC tank farm cell.

Photograph 11: Looking west at Tank #1 that was recently painted.

Photograph 12: Looking up at Tank #12. Note the caulking used to seal gap along tank rim.

Photograph 13: Looking north at the dual-product dispensing Tank #20. Note exposed wiring.

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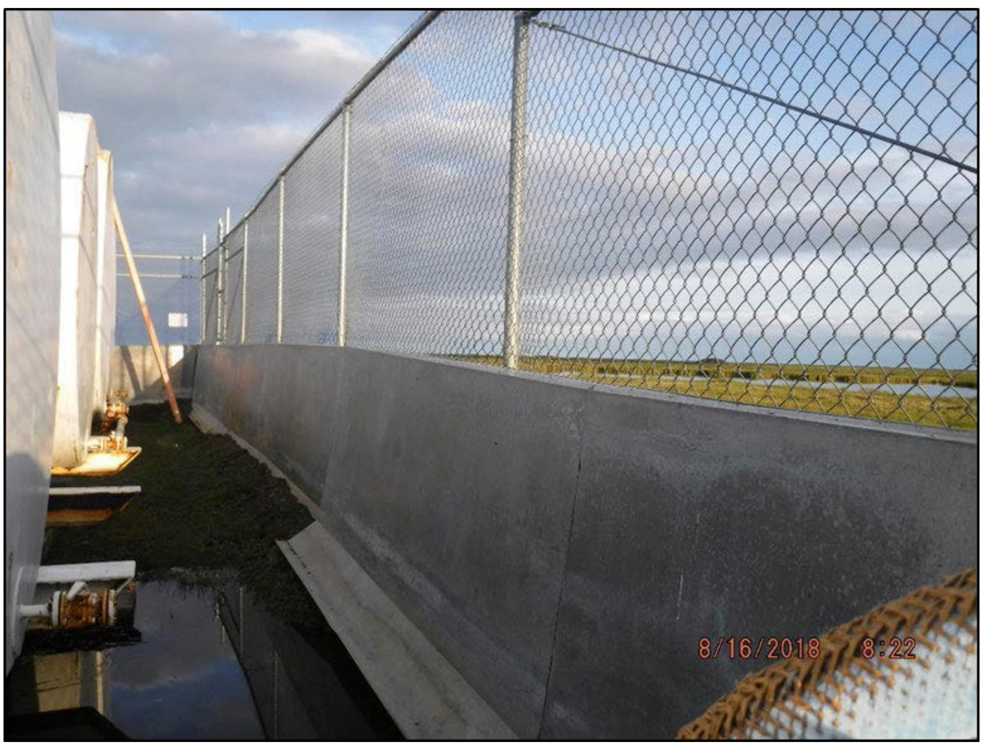
Photograph 15: Looking west at Tank #19. Note condition of LKSD tank and containment.

Photograph 16: Looking southeast at the 5,000-gallon contingency tank outside of containment.

Photograph 17: Looking east at the compromised security fence.



Photograph 18: Looking south along the west wall. Note where fill has subsided below the previously buried sheet metal wing.

Photograph 19: Patched tear in liner material. Note water actively dripping.

Photograph 20: Typical use of dimensional lumber used for cribbing on top of original treated wood foundation.

Photograph 21: Northwest corner of tank farm containment. Construction drawings show that the bottom timber should lie on the ground surface. Note stretched geotextile and liner material.

Photograph 22: Looking west along the north side of the tank containment wall. Note gap of exposed liner beneath lowest horizontal timber.

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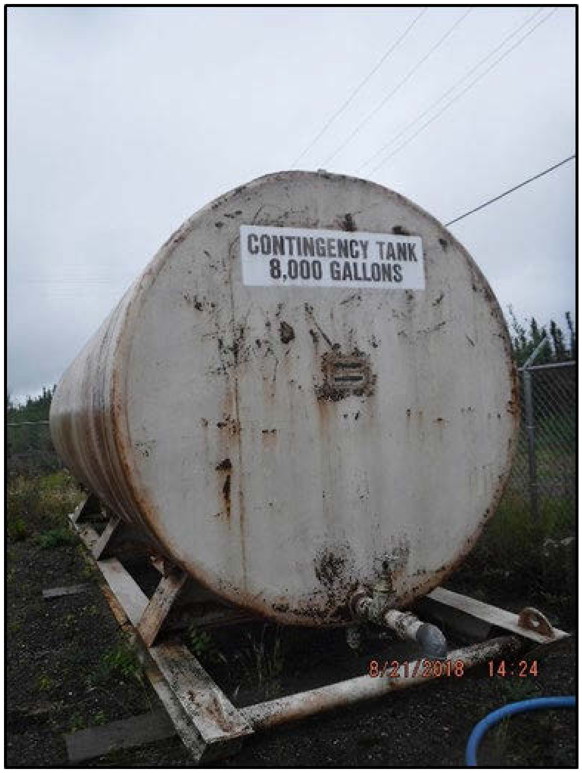
Photograph 1: View of tank farm, facing southeast.

Photograph 2: View of tank farm, facing northeast.

Photograph 3: Unlocked valve at Tank C6.

Photograph 4: Plumb bob with water indicating paste after being dropped into Tank S1.



Photograph 5: Spill contingency tank, facing east.

Photograph 6: Entrance gate that was damaged and removed before our arrival on site.

Photograph 7: Hose used for fuel delivery, facing south.

Photograph 8: Gasoline fueling station for personal vehicles.

Photograph 9: "Empty" fire extinguisher at gasoline fueling station for personal vehicles.

Photograph 10: Marine header.

Photograph 11: Pipe clamps lacking insulation between clamp and piping.

Photograph 12: Petroleum sheen seen within dike by fueling header on 23 August 2018.

APPENDIX C

CORROSION INSPECTION REPORTS

C1: Kwigillingok

C2: Nikolai

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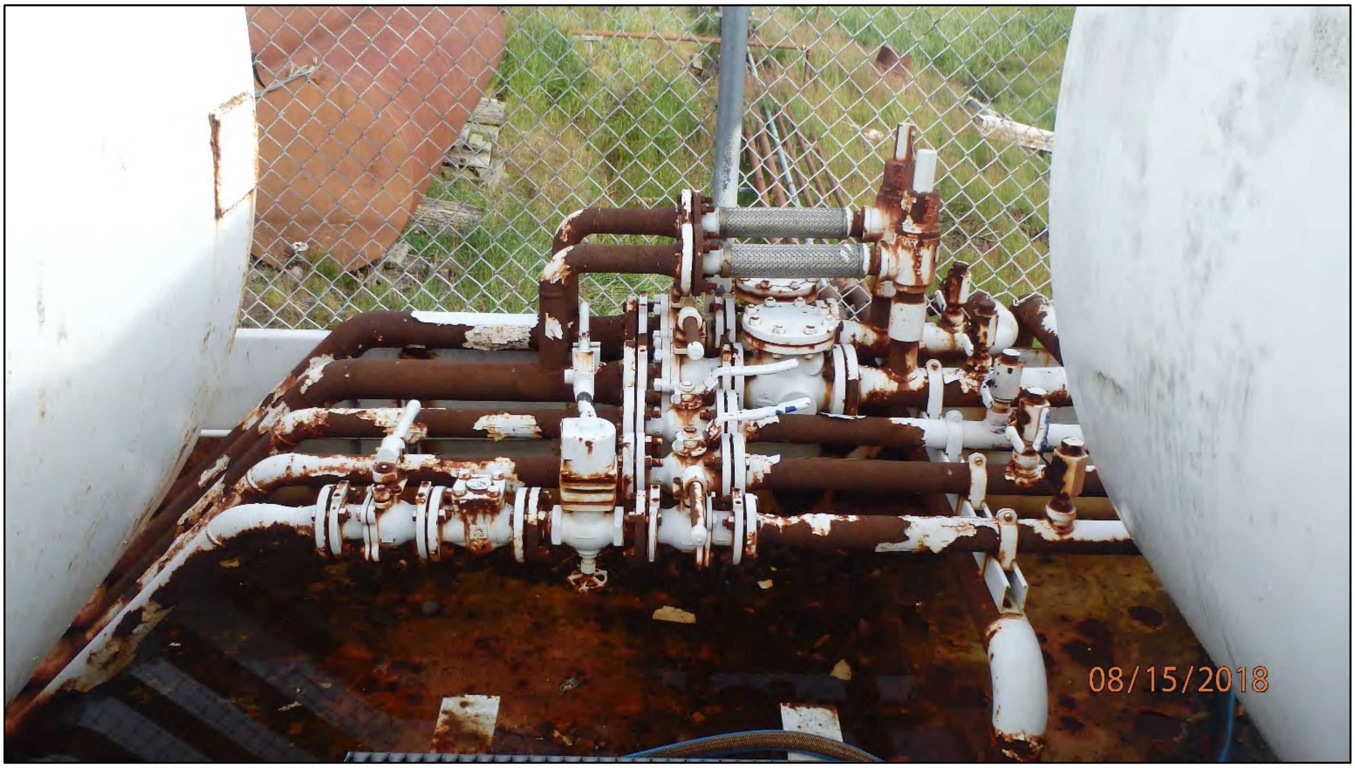
Prepared for:



Kwigillingok Marina Bulk Fuel Facility

STI SP001 and API 570 Tank Farm Evaluations

PREPARED BY
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October 2018

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Abstract

In August 2018, Taku Engineering, LLC completed a Steel Tank Institute (STI) SP001 Formal External inspection and an American Petroleum Institute (API) 570 Piping evaluation for the Kwigillingok Marina Bulk Fuel Facility located adjacent to the old power plant. The evaluations were completed for six of the eight active horizontal tanks as well as all associated piping within the tank farm and at the nearby dispensers. The inspections were performed in accordance with the applicable portions of STI SP001 - *Standard for the Inspection of Aboveground Storage Tanks* and API 570 - *Inspection, Repair, Alteration, and Rerating of In-service Piping Systems*. The inspections were performed from August 14st to the 17th, 2018.

This report provides inspection findings, recommendations and the asset suitability for service evaluation. Repairs were found requiring completion for the tank to remain in continued service. Recommendations for continued long-term service are provided.

Taku Engineering recommends that additional inspections be performed in 2019 on Tank 4 to determine the remaining wall thickness in the area along bottom dead center. This tank was found with severe external corrosion (noted in the 2010 report by LCMF) that could not be evaluated accurately due the amount of corrosion product present. Schedule the next STI SP001 Formal External inspection for the Marina tank farm no later than August 2023, 5 years from this inspection, in accordance with STI SP-001 Section 10.2.4 *Suitability for Continued Service.* Schedule the next API 570 inspection for the cargo and service piping between the tank farm and riverside dispenser no later than August 2023, in accordance with API 570 Table 6.1 *Recommended Maximum Inspection Intervals,* for Class 1 pipe. Schedule the next API 570 inspection for the tank farm piping no later than August 2028, in accordance with API 570 Table 6.1 *Recommended Maximum Inspection Intervals,* for Class 3 pipe. These dates must be revisited and updated with any change in condition or service of the tank. Complete the monthly and annual inspections per the requirements of STI SP001 and API 570.

This report satisfies the STI SP001 and API 570 requirements for integrity inspections and as such, should remain available as a historical record for future reference.

By: Eric G. Weiler Date: 11-29-18

Eric G. Weiler
Taku Engineering, LLC
STI SP001 Inspector Certification No.: AC44071
API 570 Inspector Certification No.: 25147

James Adams
QA Services
ASNT Level II: MT UT VT

τaku engineering, llc

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1 EXECUTIVE SUMMARY

In August 2018, Taku Engineering, LLC completed an evaluation of the Kwigillingok Marina Bulk Fuel Facility located adjacent to the old power plant. The evaluation consisted of integrity inspections for six of the eight horizontal tanks, piping evaluations for the above ground diesel and gasoline piping circuits, corrosion and coating assessments for the steel containment and a cursory inspection of the new powerplant tank farm. QA Services provided non-destructive examination (NDE) support for the inspection effort, including visual examination (VT), ultrasonic testing (UT) and measurement of coating dry film thickness (DFT). The inspection was performed in accordance with the applicable sections of the Steel Tank Institute (STI) standard SP001, 5th Edition, 2011 and the American Petroleum Institute (API) standard 570, 2nd Edition Addendum 3, 2003.

Per the original construction design drawing for this tank farm, four of the storage tanks are 10,000-gallon diesel tanks and three are 23,000-gallon tanks (two gasoline, one diesel). The dispenser tank is a 2-compartment tank with 7,900-gallons total capacity, and is the only UL listed tank in the tank farm. The tank farm also contains 4 small vertical tanks that have been taken out of service and abandoned in place. The piping inspected in the tank farm is of an unknown grade and material type with wall thicknesses that correspond to a mix of Schedule 40 and Schedule 80. All piping is in either Diesel or Gasoline service. The piping circuits inspected included nominal pipe size (NPS) 1-inch, 2-inch, and 3-inch piping, with the majority of piping being NPS 2-inch. The original design basis of the fuel system is unknown. A single original construction drawing was available and contains no information about the piping other than size. All piping and tanks, with exception to minor modifications, were assumed to have been installed in 1997 based on this drawing.

The following items were visually inspected in both the marina and power plant tank farms: piping, supports, shell plates, shell appurtenances, heads, walking/working surfaces, containment, venting, gauging, bonding and grounding, and coating condition. Ultrasonic testing (UT) and visual examination (VT) were performed on the shell, heads, shell nozzles, reinforcement pads and piping.

Taku Engineering recommends that additional inspections be performed in 2019 on Tank 4 to determine the remaining wall thickness in the area along bottom dead center. Abrasive blasting will be required to prepare these areas for additional inspection due to the severity of the corrosion and the amount of corrosion product/scale present. Additionally, an internal evaluation may be required if accurate UT data cannot be collected from the exterior of the tank due to the corrosion. The tank farm has been in service for 20 years with no change in operating conditions and numerous repairs were found that should be completed to prolong the life of the tank farm.

1.1 Findings

1.1.1 General

1. No formal monthly or annual inspection reports were available for review.
2. The normal tank farm operator was available to answer historical and typical operation questions.
3. The tank farm operator expressed concerns about the stability of the abandoned power plant and its proximity to the cargo and service lines between the tank farm and the shore side fueling station.
4. The two-compartment dispensing tank is the only tank with a UL data plate.
5. A full fuel drum was found outside of containment in direct sunlight. This drum was filled to capacity and began leaking in the afternoon due to thermal expansion of the fuel. The operator was notified.

1.1.2 Foundation Tank Supports

1. All tank supports are welded directly to the containment floor.
2. Tank supports show extensive coating failures with corrosion present at all failures.
3. All tank saddle reinforcing pads are seal welded to the tank shell.

1.1.3 Containment, Spill Control and CRDM

1. The secondary containment is appropriately sized to accommodate a spill from the largest tank in the tank farm plus rainwater accumulation.
2. The containment was found with approximately 4-inches of standing water when we arrived. No evidence of a fuel sheen was seen on the water. Water staining on the containment walls indicates that water depths of 5-6 inches are common.
3. Mud, scale, and debris up to an inch thick was noted in some areas of the containment.
4. The coating has failed over approximately 50% of the internal surfaces of containment. Active corrosion is present in these areas. Plate loss due to corrosion was measured at 20% in some areas.
5. Three sumps are present for water removal. All were found filled with corrosion scale and mud. Corrosion is present in all sumps.
6. A fuel transfer hose was found connected to the drain for Tank 5. This hose ran out of containment and was left coiled in an old fuel dispensing shack. No valve was present on the end outside of containment. The drain valve for Tank 5 was unlocked.
7. The containment drain valve for the riverside fuel dispenser is inoperable and has corroded to the point that it is leaking water from inside containment.

1.1.4 Coating

1. The coating system for the tanks in extremely poor condition. The bottom 4 to 8-feet of each tank shell, measured circumferentially across bottom dead center, show extensive coating failures with varying degrees of external corrosion present. Rust blooms are present on the remainder of the tank surfaces.
2. Pipe coatings have completely failed with general surface corrosion present on all low piping runs. Pressure relief piping and tank nozzles are in marginally better condition.

1.1.5 Shell and Ancillary Equipment

1. Dents are present in the shells of two of the six tanks inspected in the Marina tank farm.
2. Shell plate thickness measurements for Tanks 1, 2, 3 and 4 indicated that the shell plates are within +/- 8% of nominal plate thicknesses of 0.250-inches, except for the areas at bottom dead center. These areas show severe general corrosion 0.020-inches to 0.080-inches deep with some UT wall thickness readings as low as 0.160-inches. The tank heads are within +/- 2% of the nominal plate thickness of 0.250-inches.
3. Shell plate thickness measurements for tanks 10 and 12 indicated that the shell plates are within +/- 8% of nominal plate thicknesses of 0.375-inches. Elliptical heads for these tanks measure between 0.376-inches and 0.439-inches. The areas at bottom dead center show general corrosion 0.010-inches to 0.030-inches deep.
4. Isolated pitting up to 0.110-inches deep is present on the shells and heads of Tanks 10 and 12. This pitting has been coated over and is not active.
5. Morrison clock type level indicators are non-functional on several of the tanks, moisture is present behind the sight glass of all gauges.

1.1.6 Internal and Tank Bottom

1. Wall loss due to external corrosion was noted for all tanks inspected.
2. Wall loss due to internal corrosion may be present in some of the tanks. A more definitive evaluation will require extensive surface preparation due to external corrosion and may require an internal inspection.
3. Water testing was completed for some of the fuel tanks by Ahtna and tank farm personnel.

1.1.7 Piping

1. The external coating for all cargo, service, and tank farm piping has failed and external corrosion is present over 100% of the pipe surfaces.
2. Most of the tank farm piping is routed along the floor of the containment, resting on sections of Unistrut. This configuration leaves the piping partially submerged if 2 or more inches of standing water is present.
3. No evidence of wall loss due to internal corrosion was noted for any of the piping inspected.
4. All tank farm piping has adequate pressure relief.
5. The 2-inch branch connection in the tank farm to the four abandoned vertical tanks cannot be isolated from the remainder of the system, making it a large dead-leg.
6. The cargo and service piping between the tank farm and the riverside dispenser is in contact with the soil and water for approximately 190-feet.
7. The elevated sections of cargo and service piping between the tank farm and riverside dispenser are inadequately supported on lumber piles that have fallen over in some cases
8. The service line from the tank farm to the council tank was found off its support and sagging approximately 1-foot where it crosses the other fuel lines. This was putting stress on a union that was supported by a cribbing pile.
9. It is unclear if there is an impermeable liner or competent containment beneath the winter dispenser attached to the back of the old power plant.

1.2 Recommendations

1.2.1 General

1. Conduct external monthly and annual inspections to note any progressing issues with the tank farm structures, tanks, piping, foundations or coating.
2. Evaluate the stability of the abandoned powerplant and consider removal to prevent damage to the pipelines, if this is not feasible consider rerouting the piping between the tank farm and shoreside dispenser.
3. Conduct the next round of STI formal external inspections on or before August 2023. These inspections should be completed sooner if there are changes in service or operation. Maintain documentation that any tank or piping repairs and modifications were completed with qualified procedures and personnel.
4. Continue formal inspection of all fuel piping within the Marina tank farm at five year intervals for the piping outside of containment (Class 1) and at ten year intervals for piping within containment (Class 3), as prescribed by API-570. The next formal API-570 inspection for the piping outside of containment should be carried out no later than August 2023.
5. Ensure that new operators are aware of the resources available on the Alaska Department of Environmental Conservation (ADEC) website for Class 2 facilities. When possible send new operators through the tank farm operator training program offered by AVTEC.
6. Ensure that all Listing information for new tanks is recorded on metal tags permanently affixed to the tank shell.
7. Ensure that fuel drums for temporary storage are in secondary containment and that there is enough room in the container to allow for thermal expansion of the fuel.

1.2.2 Foundation and Tank Supports

1. Abrasively blast and recoat the supports for all tanks in the Marina tank farm.

1.2.3 Containment, Spill Control and CRDM

1. Regularly pump the rainwater from containment to prevent water from contacting the tank shells and piping. This is critical for prolong the life of the asset now that the coatings have failed.
2. Remove all mud, scale and corrosion product from the tank farm to better assess the condition of the coating and sumps.
3. Ensure that all tank drain valves are locked and that hoses used for temporary transfers are properly terminated and stored when not in use.
4. Repair the leaking drain valve for the riverside dispenser containment.

1.2.4 Coating

1. Recoat all external tank and piping surfaces and the internal surfaces of the containment using a suitable exterior coating system per manufacturer's recommendations. Coating materials should be resistant to ultra violet (UV) degradation and suitable for industrial-type service. Ensure that all welds, fittings, and crevices such as those present at pipe supports are properly coated. Perform surface preparation in accordance with industry standards and manufacturer's requirements to maximize coating performance.

1.2.5 Shell and Ancillary Equipment

1. The accuracy/functionality of all level indicators should be verified by dipping the tanks and recorded periodically by the operator as part of regular tank farm inspections. Replace level indicators that are non-functional.
2. Perform further evaluation of the dents in the shell of Tanks 2 and 12 to determine what, if any, corrective action should be taken.

1.2.6 Internal and Tank Bottom

1. Use water finding paste after each fuel delivery to help determine if water has settled out in the bottom of the tank. Water-draw the tanks if water is present.
2. Properly prepare the bottom 4-6 feet of shell on Tank 4 so a better assessment of the external and potential internal wall loss can be completed.

1.2.7 Piping

1. Monitor all tank farm piping for leaks at bolted connections, mechanical damage/active corrosion during the regular tank farm inspections.
2. Maintain water levels below the elevation of the pipe and bolted connections to prevent corrosion related failures. This is especially important with the bolted connections at flanges.
3. Pressure test the piping on an annual basis to verify the proper operation of the pressure relieving devices.
4. Consider isolating the piping to the abandoned fuel tanks. This will removed the deadleg from the system and reduce the risk of a spill.
5. Install permanent pipe supports for the cargo and header piping to prevent damage if cribbing pile are knocked over.
6. Consider elevating the 190-feet of pipe between the riverside dispenser and the old powerplant so that it is no longer in contact with soil or submerged when water levels rise.
7. Determine if there is containment beneath the winter dispenser, If none is present then containment should be installed.
8. Ensure that formal fuel handling/transfer procedures for the tank farm piping are kept updated based on any system modifications.

2 Technical Approach

Tank Shell and Appurtenances Inspection

The tanks shells were inspected using Visual (VT) and Ultrasonic (UT) inspection methods. UT and dry film thickness (DFT) readings were collected on each shell plate. UT measurements were collected at 45 to 60 locations on the shell and heads for each tank. Where possible pit depth measurements were collected in areas of external corrosion. Results of all tanks NDE evaluation are provided in *Appendix B*.

Vents were inspected for corrosion, obstructions and freedom of movement. All tank nozzles and appurtenances were evaluated by VT.

Tank Heads Inspection

The tank heads were inspected using VT and UT inspection methods. Thickness and DFT measurements were collected at five to eight locations per head depending on tank size and access. Where possible pit depth measurements were collected in areas of external corrosion.

Tank Containment Inspection

A visual evaluation of the containment and containment drainage equipment was completed.

Piping Inspection

The non-destructive examination for the Marina tank farm piping consisted of VT examinations and UT testing, coating thickness measurements were not collected due to the condition of the coatings. VT was performed to identify coating damage, pipe damage, and external corrosion. The system was checked for new field modifications or temporary repairs. Condition monitoring locations (CMLs) were established in locations where internal wall loss is likely, or degradation via other mechanisms is probable. CMLs include but are not limited to: weld heat-affected zones (HAZ), elbows, low points, dead legs, pump discharges, and fittings. Piping was externally inspected, and thicknesses were measured at each CML using UT. These CMLs are intended to be revisited in subsequent inspections to monitor pipe conditions and establish long-term/short-term corrosion rates

Remaining Wall Thickness Calculations

Corrosion rate and remaining life calculations were performed in accordance with API-570. Measured thicknesses were compared against required minimum thicknesses per ASME B31.3, *Process Piping* and API-574, *Inspection Practices for Piping System Components*. Calculations are provided in *Appendix D*.

3 Results and Discussion

3.1 General

The Kwigillingok Marina Bulk Fuel Facility has a total capacity of 116,800-gallons which categorizes it as a "Class 2" facility per 18 AAC 75. The inspection of the tank farm and fuel piping was completed for Ahtna Environmental and the Denali Commission to document the condition of the tank farm for planning future repairs/upgrades to similar facilities across the state of Alaska. The tanks and piping were inspected to the same standards as fully regulated facilities. Per STI SP001 Table 5.5, the Kwigillingok Marina Bulk Fuel Facility tanks are classified as a category 1 based on the presence of spill control and CRDM.

Based on the inspection and examination findings, the tanks evaluated in the Marina tank farm are suitable for continued service but have issues that must be addressed in the near future to prolong the life of the existing assets. The next STI SP001 Formal External inspections should be conducted before August 2023. This date will need to be re-evaluated with any change in operation or service of the tanks.

The STI inspection checklist can be found in *Appendix A*, all tank NDE data is located in *Appendix B* and a construction drawing of the tank farm is provided in *Appendix E*.

The tank farm fuel piping system was found to be in fair to poor condition, with some repairs recommended to ensure continued integrity and leak prevention. The winter fuel dispenser, located behind the old power plant, is inside a locked plywood enclosure attached to the power plant wall. It is unclear if the material beneath the dispenser is a competent impermeable liner or just the plastic used to cover the ground insulation in the area of the old powerplant. If no containment is present, then a system should be designed and installed.

Based on the findings of this inspection and execution of the necessary repairs, the fuel piping has been found suitable for continued service. The next formal API570 inspection for the tank farm Class 2 piping should be carried out no later than August 2028. The next formal API570 inspection for the cargo and service Class 1 piping should be carried out no later than August 2023.

A summary of the NDE data is provided below. All inspection data and calculations are provided in *Appendix D*.

Line Description	Ultrasonic Data		External Examination	
	Maximum Wall Loss (in)	**% Wall Loss:**	**Maximum Wall Loss (in)**	**% Wall Loss:**
Diesel Piping	0.035	16%	0.015	10%
Gasoline Piping	0.052	17%	0.023	10%

Table 1: Pipe UT and External Inspection Data Summary

3.2 Foundation and Tank Supports

All horizontal tanks in containment are supported on steel frame saddles which are welded to reinforcing pads on the shell and to the floor of containment. Corrosion is present on the lower portions of all supports. These supports should be abrasively blasted and recoated to arrest the external corrosion. Replacement, if required in the future, will be difficult with the supports welded to both tank and containment.

3.3 Containment, Spill Control and CRDM

The elevated steel containment is still liquid tight as shown by the water that was present at the beginning of the assessment. There are areas of containment near the abandoned tanks where as much as an inch of corrosion scale and mud have collected. Extensive coating failures and active corrosion are present beneath this layer of sludge with some areas showing 20% plate loss.

3.4 Coatings

The overall coating condition for the thin film systems applied to tank shells, tank farm piping and the steel containment system is poor. No information was available on the original coating system but the topcoat appears to be a urethane based on its resistance to UV degradation. The piping system coatings have completely failed on the piping outside of containment and all piping in containment. The coating on the lower four to eight feet (measured circumferentially) of all tanks except the dispenser tank, has failed.

To prolong the life of this tank farm and preserve the existing tanks a project should be considered in the near future to completely recoat all tanks, piping, and containment using a coating system that is suitable for direct UV exposure.

3.5 Shell and Ancillary Equipment

The tanks locate inside containment are horizontal cylindrical with both flat and elliptical heads. The shells are comprised of five or six courses and tank volumes range from 79,000-gallons to 23,000-gallons. Spot UT readings were obtained by scanning the subject steel plate through the exterior coating.

Corrosion and coating failures were observed on the shells of all tanks in areas at bottom dead center for 4 to 8-feet circumferentially, the full length of the tanks. Tanks 3 and 4 have the most aggressive external corrosion of the six tanks inspected. Tank nozzles were found in overall fair condition with no thinning noted but coating failures present on the lower half of the nozzle; see *Appendix B* for supporting NDE data. The level indicators appear to be working properly.

Dents were noted in the shells of two of the six tanks inspected, Tank 2 and Tank 12. Tank 2 had a single small diameter dent with wall loss in the area of deformation. Tank 12 had six dents in the lower half of the shell, the largest of which measured 7-feet long, 3.5-feet circumferentially and had a maximum deflection of roughly 0.75-inches. Another of the small diameter dents on Tank 12 had a 0.110-inch deep pit in the area of the deformation. This pitting was not active corrosion and had been painted over. Additional evaluations of the dents should be completed to determine what corrective action may be necessary.

Visual examination of accessible exterior shell welds found no indications meriting further inspection or examination.

3.6 Internal and Tank Bottom

Wall loss due to internal corrosion may be present in some of the tanks in this tank farm. At a minimum the exterior of Tank 4 should be abrasively blasted along bottom dead center to remove the tightly adhered corrosion scale and help facilitate additional internal corrosion measurements. An internal inspection may be required to evaluate the severity of internal corrosion if the external surface is too heavily corroded for a comprehensive UT scan. Water content in the tanks that were checked was minimal but there is no way to gauge historical fuel quality. Water monitoring should become a standard practice in the weeks after a fuel delivery, if found the subject tank(s) should have the water drawn off. This will help minimize damage due to internal corrosion and prolong the life of the assets.

3.7 Piping

System Risk Assessment

Examination of the subject Nikolai tank farm piping was conducted using a risk-based approach. The following potential damage mechanisms were identified for the subject fuel piping system:

1. **External Corrosion:** Corrosion damage to aboveground piping may result from water intrusion beneath the insulation, corrosion under insulation (CUI), atmospheric corrosion, crevice corrosion, dissimilar metal (galvanic) interactions, contaminants, and preferential corrosion of weld heat-affected zones. Corrosion to belowground piping may be caused by soil-pipe interactions, microbiologically induced corrosion, electrical stray current interference, etc.

   External corrosion is of particular concern within the tank farm due to the failed pipe coatings and the location of the piping. Based on the as-found condition of the piping, failure risk due to external corrosion on the aboveground piping is low at this time, but if not addressed will become a more serious threat in the future. Continued programmatic monitoring by the tank farm operators is also recommended. The tank farm operators need to be more responsive on evaluating the condition of containment and removing standing water before it reaches the level of the fuel piping.

2. **Internal Corrosion:** Many cases of internal corrosion are associated with the presence of water and/or sediment within the subject piping. Microbiologically induced corrosion can occur in stagnant, oxygen-free environments such as dead legs and under material films within the subject piping. Typically, diesel and gasoline piping like that at the Nikolai tank farm facility is largely free of water and sediment; however low points, irregularities, and operational dead legs within the system can lead to situations where accumulation can occur. Suspect areas were chosen as CMLs, examined and found free of significant internal corrosion.

   Another common cause of internal metal loss is associated with erosion-corrosion from relative fluid movement within the piping. Low-velocity fuel piping as is present at the Nikolai facility is not particularly susceptible to erosion-corrosion. However, CMLs were chosen in suspect areas such as the outside radii of elbows to monitor for metal loss due to this type of damage. No significant wall loss due to erosion-corrosion was identified.

3. **Over-pressurization:** Hazards posed by thermal expansion of trapped liquids are often identified in piping system inspections. Risks due to over-pressurization require two basic conditions:
    a. A blocked-in pipe segment (piping between block valves without pressure relief devices).
    b. Moderate to significant temperature fluctuations (as-found with external piping systems exposed to ambient conditions).

    Risks can be significant if the two above conditions are met. Many pipe failures across the US and Alaska have been attributed to over-pressurization due to thermal expansion. Theoretical calculations show that pressures within fuel oil piping can increase by as much as 74psi/°F, assuming no expansion of the vessel. Taking pipe expansion into consideration, actual pressure increase values are more likely around 25psi/°F.

    Over-pressurization is typically mitigated in the pipe design process by installing pressure relief valves, however the valves can become ineffective if blocked by isolation valves, if not properly maintained, or if system modifications are implemented. Pressure relief valve test/maintenance records were unavailable at the time of the piping inspection. No specific inspection interval is specified in API 570; however, pressure relief valves are to be inspected per API 576 at regular intervals. Inspection intervals may depend on the severity of service and the valve condition.

4. **Metallic Fatigue:** Typically associated with vibration or repeated mechanical loading. Piping near pumps, machinery, or other sources of vibration or movement are typically suspect. Visible pipe was examined for stress risers, and other areas where fatigue may be suspected. No locations were identified where damage due to fatigue is probable. Risks due to metallic fatigue are presumed minimal within this system.

5. **Third-Party Damage:** The Tank Farm piping is located entirely within the fenced area surrounding the tank farm containment. The cargo and service piping for the riverside dispenser are at risk of damage if the abandoned power plant crib pile foundation fails. According to the current tank farm operator, power plant personnel have been over to shore up the foundation at least once in the last three years after he expressed concerns about a notable tilt to the building. Damage from vehicle impact, snow removal equipment, vandalism, or terrorism is unlikely. The soft fuel transfer hose left in place for temporary transfers should be replaced due to UV degradation of the outer blue sheathing.

Integrity Management Plan Development

Integrity management plans have a history of providing cost-effective asset protection across a broad spectrum of applications. The development of an integrity management plan is recommended for all fuel and process fluid assets - both tanks and piping. In addition to assuring regulatory compliance, an integrity management plan will help to extend the service life of facility assets and minimize the risk of loss from unexpected shutdowns, leaks, clean-up efforts, regulatory enforcement, etc.

An integrity management plan should be developed with the following goals in mind:

- Documentation and trending of all inspection data, past and present
- Documentation of all upgrades to system components
- Calculation of long- and short-term corrosion rates

- Calculation of inspection intervals and protocols
- Tracking of equipment lifecycles based on inspection data
- Document and verify regulatory compliance

Once all areas of concern have been identified and evaluated, continued monitoring and maintenance should be performed. The goal of this continued monitoring and maintenance plan is to identify trends, changes and impacts to the system over its life.

3.8 Power Plant Tank Farm

A brief walk through of the new powerplant tank farm was completed to compare construction practices with the Marina tank farm. This tank farm was found with approximately 2-inches of standing water present at the beginning of the assessment. The coating system for the new tank farm is in very good condition with the exception of the shell to bottom weld on all three tanks. The coating in this area appears to have been repaired recently, but large areas of failed coating are still present. This shell to bottom weld is the point of highest stress in a vertical tank and needs to be adequately protected from corrosion damage. Soil and debris are beginning to collect in the tank farm and grass was found growing near the inlet/outlet on the tank adjacent to the stairs. Future designs need to take into account the water handling that can be expected at a given location and possibly elevate the tanks and piping to keep the piping, critical welds, and bolted connections out of the water. Tank data plates should be specified as stamped metal instead of stickers. UV degradation has left some of the new tank data plate information illegible.

APPENDIX A: STI SP001 FORMAL EXTERNAL INSPECTION CHECKLIST

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STI SP001 FORMAL EXTERNAL TANK INSPECTION REPORT

Tank ID Kwig 1 **Date** 8/16/2018

OWNER INFORMATION		INSPECTION INFORMATION	
Tank Location	Kwigillingok Marina	Inspector Name	Eric Weiler
Company Name	City of Kwigillingok	Company Name	Taku Engineering
Address	P.o. Box 90 Kwigillingok AK 99622	Address	406 W Fireweed Anch. AK 99503
Phone		Phone	(907) 529-9806
TANK ID	Kwig 1	**PRODUCT**	Diesel/Gasoline

TANK SPECIFICATION

Design:
- ☑ UL 181837
- ☐ Unknown
- ☐ API
- ☐ SWRI
- ☐ Other

Tank Type:
- ☐ Single Wall
- ☐ Double Wall
- ☑ Horizontal
- ☐ Double Bottom
- ☐ Rectangular
- ☐ Closed Top Dike
- ☐ Vertical
- ☐ Open Top Dike

Tank Fabricator: Unknown — Construction Date: Unknown

Manufacturer: Unknown — Repairs: Unknown

Repair Date: Unknown — Unknown

Tank Size

Primary: 7.75' x 11.66' for each tank — Capacity: 7,800 — Last Change of Service: Unknown

Secondary: NA — Capacity: NA

Containment: ☐ Earthen Dike ☑ Steel Dike ☐ Concrete ☑ Synthetic Liner ☐ Other

CDRM (Continuous Release Detection Method): ☑ Date Installed: Construction — Type: Elevated

RPB (Release Prevention Barrier): ☑ Date Installed: Construction — Type: Steel containment

AST Category: ☑ Category 1-with spill control, CRDM ☐ Category 2-with spill control, without CRDM ☐ Category 3-without spill control, without CRDM

Tank Foundation: ☐ In contact with ground ☐ Concrete ringwall ☑ Elevated ☐ Skid ☐ Other

Tank Entry: ☐ Tank equipped with no manway ☑ Tank equipped with manway — Size: 24"

Last Formal External Inspection: Unknown — Last Formal Internal Inspection: Unknown

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STI SP001 FORMAL EXTERNAL TANK INSPECTION REPORT

Tank ID Kwig 1 **Date** 8/16/2018

INSPECTION CHECKLIST

Item	Status	Comments
1.0 Tank Containment		
1.1 Water in primary tank, secondary containment, interstice, or spill container?	☑ Yes ☐ No	Tank farm was found with 4 inches of standing water.
1.2 Debris or fire hazard in containment?	☑ Yes ☐ No	Rust, scale and mud in containment. 1" deep in some areas.
1.3 Drain valves operable and in a closed position?	☑ Yes ☐ No	
1.4 Drainage pipes/valves in satisfactory condition?	☐ Yes ☑ No	Drain pipes run from sumps to the edge of containment. Pipes are continuously submerged and heavily corroded
1.5 Containment egress pathways clear and gates/doors operable?	☑ Yes ☐ No	
1.6 Containment structure in satisfactory condition?	☐ Yes ☑ No	Containment coating has failed and active corrosion is present over most of the floor. Floor is .187-inch nominal material with .040-.050 inches of plate loss.
2.0 Leak Detection		
2.1 Visible signs of leakage around the tank, concrete pad, containment, ringwall, or ground?	☐ Yes ☑ No	No sheen visible on standing water in containment.
3.0 Tank Foundation and Supports		
3.1 Evidence of tank settlement or foundation washout?	☐ Yes ☑ No	
3.2 Cracking or spalling of concrete pad or ring wall?	☐ Yes ☐ No	N/A
3.3 Tank supports in satisfactory condition?	☑ Yes ☐ No	Coating on supports has failed and corrosion ois present
3.4 Water able to drain away from tank?	☐ Yes ☑ No	Water is allowed to collect in dike
3.5 Grounding strap secured and in good condition?	☐ Yes ☑ No	No grounding straps present. Tanks are welded to containments which sits on piling
4.0 Cathodic Protection		
4.1 CP system functional?	☐ Yes ☐ No	N/A
5.0 Tank External Coating		
5.1 Evidence of paint failure?	☑ Yes ☐ No	generalized coating failures with surface corrosion
6.0 Tank Shell/Heads		
6.1 Noticeable shell/head distortions, buckling, denting or bulging?	☐ Yes ☑ No	
6.2 Evidence of shell/head corrosion or cracking?	☑ Yes ☐ No	surface corrosion
7.0 Tank Manways, Piping and Equipment within Secondary Containment		
7.1 Flanged connection bolts tight and fully engaged with no signs of wear or corrosion?	☑ Yes ☐ No	

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STI SP001 FORMAL EXTERNAL TANK INSPECTION REPORT

Tank ID Kwig 1 **Date** 8/16/2018

Item	Status	Comments
8.0 Tank Attachments and Appurtenances		
8.1 Ladder and platform structure secure with no sign of severe corrosion or damage?	☑ Yes ☐ No	
8.2 Tank Liquid level gauge readable and in good condition?	☑ Yes ☐ No	Readable but condensation is present inside dial housing
8.3 Check all tank openings are properly sealed?	☑ Yes ☐ No	
9.0 Tank Roof		
9.1 Standing water on roof	☐ Yes ☑ No	
9.2 Evidence of coating cracking, crazing, peeling, blistering?	☑ Yes ☐ No	Extensive coating failures on all appurtenances and shell.
9.3 Holes in roof	☐ Yes ☑ No	
10.0 Venting		
10.1 Vents free of obstructions?	☑ Yes ☐ No	
10.2 Emergency vent operable? Lift as required?	☑ Yes ☐ No	
10.3 Identify Normal & Emergency Vents and sizing?	6" emergency vent & 2" normal vent	
11.0 Other Conditions		
11.1 Are there other conditions that should be addressed for continued safe operation or that may affect the site SPCC plan?	☑ Yes ☐ No	See report

Tank Tightness Testing

Type of test (s) performed:	Pressure:	Time:	Comments:
Primary tank pressure test	n/a	n/a	n/a
Secondary tank pressure test	n/a	n/a	n/a

Additional Comments:

Nominal wall thickness:

Shell: .250-inch

Heads: .250-inch

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STI SP001 FORMAL EXTERNAL TANK INSPECTION REPORT

Tank ID Kwig 2 **Date** 8/16/2018

OWNER INFORMATION		**INSPECTION INFORMATION**	
Tank Location	Kwigillingok Marina	Inspector Name	Eric Weiler
Company Name	City of Kwigillingok	Company Name	Taku Engineering
Address	P.o. Box 90 Kwigillingok AK 99622	Address	406 W Fireweed Anch. AK 99503
Phone		Phone	(907) 529-9806

TANK ID Kwig 2 **PRODUCT** Diesel

TANK SPECIFICATION

Design: ☐ UL ☐ API ☐ SWRI ☐ Other ☑ Unknown

Tank Type: ☐ Single Wall ☐ Double Wall ☑ Horizontal ☐ Double Bottom ☐ Rectangular ☐ Closed Top Dike ☐ Vertical ☐ Open Top Dike

Tank Fabricator: Unknown — Construction Date: Unknown

Manufacturer: Unknown — Repairs: Unknown
Repair Date: Unknown — Unknown

Tank Size
Primary: 8' x 27.5' — Capacity: 10,000 — Last Change of Service: Unknown
Secondary: NA — Capacity: NA

Containment: ☐ Earthen Dike ☑ Steel Dike ☐ Concrete ☑ Synthetic Liner ☐ Other

CDRM ☑ Date Installed: Construction — Type: Elevated
Continuous Release Detection Method

RPB ☑ Date Installed: Construction — Type: Steel containment
Release Prevention Barrier

AST Category: ☑ Category 1-with spill control, CRDM ☐ Category 2-with spill control, without CRDM ☐ Category 3-without spill control, without CRDM

Tank Foundation: ☐ In contact with ground ☐ Concrete ringwall ☑ Elevated ☐ Skid ☐ Other

Tank Entry: ☐ Tank equipped with no manway ☑ Tank equipped with manway — Size: 20"

Last Formal External Inspection: Unknown — Last Formal Internal Inspection: Unknown

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STI SP001 FORMAL EXTERNAL TANK INSPECTION REPORT

Tank ID Kwig 2 **Date** 8/16/2018

INSPECTION CHECKLIST

Item	Status	Comments
1.0 Tank Containment		
1.1 Water in primary tank, secondary containment, interstice, or spill container?	☑ Yes ☐ No	Tank farm was found with 4 inches of standing water.
1.2 Debris or fire hazard in containment?	☑ Yes ☐ No	Rust, scale and mud in containment. 1" deep in some areas.
1.3 Drain valves operable and in a closed position?	☑ Yes ☐ No	
1.4 Drainage pipes/valves in satisfactory condition?	☐ Yes ☑ No	Drain pipes run from sumps to the edge of containment. Pipes are continuously submerged and heavily corroded
1.5 Containment egress pathways clear and gates/doors operable?	☑ Yes ☐ No	
1.6 Containment structure in satisfactory condition?	☐ Yes ☑ No	Containment coating has failed and active corrosion is present over most of the floor. Floor is .187-inch nominal material with .040-.050 inches of plate loss.
2.0 Leak Detection		
2.1 Visible signs of leakage around the tank, concrete pad, containment, ringwall, or ground?	☐ Yes ☑ No	No sheen visible on standing water in containment.
3.0 Tank Foundation and Supports		
3.1 Evidence of tank settlement or foundation washout?	☐ Yes ☑ No	
3.2 Cracking or spalling of concrete pad or ring wall?	☐ Yes ☐ No	N/A
3.3 Tank supports in satisfactory condition?	☑ Yes ☐ No	Coating on supports has failed and corrosion ois present
3.4 Water able to drain away from tank?	☐ Yes ☑ No	Water is allowed to collect in dike
3.5 Grounding strap secured and in good condition?	☐ Yes ☑ No	No grounding straps present. Tanks are welded to containments which sits on piling
4.0 Cathodic Protection		
4.1 CP system functional?	☐ Yes ☐ No	N/A
5.0 Tank External Coating		
5.1 Evidence of paint failure?	☑ Yes ☐ No	generalized coating failures with surface corrosion
6.0 Tank Shell/Heads		
6.1 Noticeable shell/head distortions, buckling, denting or bulging?	☑ Yes ☐ No	One dent noted in shell on north end of tank at BDC. RWT in dent .200-inch
6.2 Evidence of shell/head corrosion or cracking?	☑ Yes ☐ No	surface corrosion and general wall loss along BDC.
7.0 Tank Manways, Piping and Equipment within Secondary Containment		
7.1 Flanged connection bolts tight and fully engaged with no signs of wear or corrosion?	☑ Yes ☐ No	

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STI SP001 FORMAL EXTERNAL TANK INSPECTION REPORT

Tank ID Kwig 2 **Date** 8/16/2018

Item	Status	Comments
8.0 Tank Attachments and Appurtenances		
8.1 Ladder and platform structure secure with no sign of severe corrosion or damage?	☐ Yes ☑ No	No Ladder
8.2 Tank Liquid level gauge readable and in good condition?	☑ Yes ☐ No	Readable but condensation is present inside dial housing
8.3 Check all tank openings are properly sealed?	☑ Yes ☐ No	
9.0 Tank Roof		
9.1 Standing water on roof	☐ Yes ☑ No	
9.2 Evidence of coating cracking, crazing, peeling, blistering?	☑ Yes ☐ No	Extensive coating failures on all appurtenances, heads, and lower 25% of shell.
9.3 Holes in roof	☐ Yes ☑ No	
10.0 Venting		
10.1 Vents free of obstructions?	☑ Yes ☐ No	
10.2 Emergency vent operable? Lift as required?	☑ Yes ☐ No	
10.3 Identify Normal & Emergency Vents and sizing?	8" emergency vent & 2" normal vent	
11.0 Other Conditions		
11.1 Are there other conditions that should be addressed for continued safe operation or that may affect the site SPCC plan?	☑ Yes ☐ No	See report

Tank Tightness Testing

Type of test (s) performed:	Pressure:	Time:	Comments:
Primary tank pressure test	n/a	n/a	n/a
Secondary tank pressure test	n/a	n/a	n/a

Additional Comments:

Nominal wall thickness:

Shell: .250-inch

Heads: .250-inch

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STI SP001 FORMAL EXTERNAL TANK INSPECTION REPORT

Tank ID Kwig 3 **Date** 8/16/2018

OWNER INFORMATION		INSPECTION INFORMATION	
Tank Location	Kwigillingok Marina	Inspector Name	Eric Weiler
Company Name	City of Kwigillingok	Company Name	Taku Engineering
Address	P.o. Box 90 Kwigillingok AK 99622	Address	406 W Fireweed Anch. AK 99503
Phone		Phone	(907) 529-9806
TANK ID	Kwig 3	**PRODUCT**	Diesel

TANK SPECIFICATION

Design:
- ☐ UL
- ☐ API
- ☐ SWRI
- ☐ Other
- ☑ Unknown

Tank Type:
- ☐ Single Wall
- ☐ Double Wall
- ☑ Horizontal
- ☐ Double Bottom
- ☐ Rectangular
- ☐ Closed Top Dike
- ☐ Vertical
- ☐ Open Top Dike

Tank Fabricator: Unknown — Construction Date: Unknown

Manufacturer: Unknown — Repairs: Unknown
Repair Date: Unknown — Unknown

Tank Size
Primary: 8' x 27.5' — Capacity: 10,000 — Last Change of Service: Unknown
Secondary: NA — Capacity: NA

Containment: ☐ Earthen Dike ☑ Steel Dike ☐ Concrete ☑ Synthetic Liner ☐ Other

CDRM (Continuous Release Detection Method) ☑ Date Installed: Construction — Type: Elevated

RPB (Release Prevention Barrier) ☑ Date Installed: Construction — Type: Steel containment

AST Category: ☑ Category 1-with spill control, CRDM ☐ Category 2-with spill control, without CRDM ☐ Category 3-without spill control, without CRDM

Tank Foundation: ☐ In contact with ground ☐ Concrete ringwall ☑ Elevated ☐ Skid ☐ Other

Tank Entry: ☐ Tank equipped with no manway ☑ Tank equipped with manway — Size: 20"

Last Formal External Inspection: Unknown — Last Formal Internal Inspection: Unknown

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STI SP001 FORMAL EXTERNAL TANK INSPECTION REPORT

Tank ID Kwig 3 **Date** 8/16/2018

INSPECTION CHECKLIST

Item	Status	Comments
1.0 Tank Containment		
1.1 Water in primary tank, secondary containment, interstice, or spill container?	☑ Yes ☐ No	Tank farm was found with 4 inches of standing water.
1.2 Debris or fire hazard in containment?	☑ Yes ☐ No	Rust, scale and mud in containment. 1" deep in some areas.
1.3 Drain valves operable and in a closed position?	☑ Yes ☐ No	
1.4 Drainage pipes/valves in satisfactory condition?	☐ Yes ☑ No	Drain pipes run from sumps to the edge of containment. Pipes are continuously submerged and heavily corroded
1.5 Containment egress pathways clear and gates/doors operable?	☑ Yes ☐ No	
1.6 Containment structure in satisfactory condition?	☐ Yes ☑ No	Containment coating has failed and active corrosion is present over most of the floor. Floor is .187-inch nominal material with .040-.050 inches of plate loss.
2.0 Leak Detection		
2.1 Visible signs of leakage around the tank, concrete pad, containment, ringwall, or ground?	☐ Yes ☑ No	No sheen visible on standing water in containment.
3.0 Tank Foundation and Supports		
3.1 Evidence of tank settlement or foundation washout?	☐ Yes ☑ No	
3.2 Cracking or spalling of concrete pad or ring wall?	☐ Yes ☐ No	N/A
3.3 Tank supports in satisfactory condition?	☑ Yes ☐ No	Coating on supports has failed and corrosion ois present
3.4 Water able to drain away from tank?	☐ Yes ☑ No	Water is allowed to collect in dike
3.5 Grounding strap secured and in good condition?	☐ Yes ☑ No	No grounding straps present. Tanks are welded to containments which sits on piling
4.0 Cathodic Protection		
4.1 CP system functional?	☐ Yes ☐ No	N/A
5.0 Tank External Coating		
5.1 Evidence of paint failure?	☑ Yes ☐ No	generalized coating failures with surface corrosion
6.0 Tank Shell/Heads		
6.1 Noticeable shell/head distortions, buckling, denting or bulging?	☐ Yes ☑ No	
6.2 Evidence of shell/head corrosion or cracking?	☑ Yes ☐ No	surface corrosion and general wall loss along BDC. Lowest UT RWT recorded is .206-inches in an area with .025-.030 inch external corrosion.
7.0 Tank Manways, Piping and Equipment within Secondary Containment		
7.1 Flanged connection bolts tight and fully engaged with no signs of wear or corrosion?	☑ Yes ☐ No	

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STI SP001 FORMAL EXTERNAL TANK INSPECTION REPORT

Tank ID Kwig 3 **Date** 8/16/2018

Item	Status	Comments
8.0 Tank Attachments and Appurtenances		
8.1 Ladder and platform structure secure with no sign of severe corrosion or damage?	☐ Yes ☑ No	No Ladder
8.2 Tank Liquid level gauge readable and in good condition?	☑ Yes ☐ No	Readable but condensation is present inside dial housing
8.3 Check all tank openings are properly sealed?	☑ Yes ☐ No	
9.0 Tank Roof		
9.1 Standing water on roof	☐ Yes ☑ No	
9.2 Evidence of coating cracking, crazing, peeling, blistering?	☑ Yes ☐ No	Extensive coating failures on all appurtenances, heads, and lower 25% of shell.
9.3 Holes in roof	☐ Yes ☑ No	
10.0 Venting		
10.1 Vents free of obstructions?	☑ Yes ☐ No	
10.2 Emergency vent operable? Lift as required?	☑ Yes ☐ No	
10.3 Identify Normal & Emergency Vents and sizing?	8" emergency vent & 2" normal vent	
11.0 Other Conditions		
11.1 Are there other conditions that should be addressed for continued safe operation or that may affect the site SPCC plan?	☑ Yes ☐ No	See report

Tank Tightness Testing

Type of test (s) performed:	Pressure:	Time:	Comments:
Primary tank pressure test	n/a	n/a	n/a
Secondary tank pressure test	n/a	n/a	n/a

Additional Comments:

Nominal wall thickness:

Shell: .250-inch

Heads: .250-inch

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STI SP001 FORMAL EXTERNAL TANK INSPECTION REPORT

Tank ID Kwig 4 **Date** 8/16/2018

OWNER INFORMATION		**INSPECTION INFORMATION**	
Tank Location	Kwigillingok Marina	Inspector Name	Eric Weiler
Company Name	City of Kwigillingok	Company Name	Taku Engineering
Address	P.o. Box 90 Kwigillingok AK 99622	Address	406 W Fireweed Anch. AK 99503
Phone		Phone	(907) 529-9806
TANK ID	Kwig 4	**PRODUCT**	Diesel

TANK SPECIFICATION

Design:
- ☐ UL
- ☑ Unknown
- ☐ API
- ☐ SWRI
- ☐ Other

Tank Type:
- ☐ Single Wall
- ☐ Double Wall
- ☑ Horizontal
- ☐ Double Bottom
- ☐ Rectangular
- ☐ Closed Top Dike
- ☐ Vertical
- ☐ Open Top Dike

Tank Fabricator Unknown Construction Date Unknown

Manufacturer Unknown Repairs Unknown
Repair Date Unknown Unknown

Tank Size
Primary 8' x 27.5' Capacity 10,000 Last Change of Service Unknown
Secondary NA Capacity NA

Containment ☐ Earthen Dike ☑ Steel Dike ☐ Concrete ☑ Synthetic Liner ☐ Other

CDRM ☑ Date Installed Construction Type Elevated
Continuous Release Detection Method

RPB ☑ Date Installed Construction Type Steel containment
Release Prevention Barrier

AST Category ☑ Category 1-with spill control, CRDM ☐ Category 2-with spill control, without CRDM ☐ Category 3-without spill control, without CRDM

Tank Foundation ☐ In contact with ground ☐ Concrete ringwall ☑ Elevated ☐ Skid ☐ Other

Tank Entry ☐ Tank equipped with no manway ☑ Tank equipped with manway Size 20"

Last Formal External Inspection Unknown Last Formal Internal Inspection Unknown

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STI SP001 FORMAL EXTERNAL TANK INSPECTION REPORT

Tank ID Kwig 4 **Date** 8/16/2018

INSPECTION CHECKLIST

Item	Status	Comments
1.0 Tank Containment		
1.1 Water in primary tank, secondary containment, interstice, or spill container?	☑ Yes ☐ No	Tank farm was found with 4 inches of standing water.
1.2 Debris or fire hazard in containment?	☑ Yes ☐ No	Rust, scale and mud in containment. 1" deep in some areas.
1.3 Drain valves operable and in a closed position?	☑ Yes ☐ No	
1.4 Drainage pipes/valves in satisfactory condition?	☐ Yes ☑ No	Drain pipes run from sumps to the edge of containment. Pipes are continuously submerged and heavily corroded
1.5 Containment egress pathways clear and gates/doors operable?	☑ Yes ☐ No	
1.6 Containment structure in satisfactory condition?	☐ Yes ☑ No	Containment coating has failed and active corrosion is present over most of the floor. Floor is .187-inch nominal material with .040-.050 inches of plate loss.
2.0 Leak Detection		
2.1 Visible signs of leakage around the tank, concrete pad, containment, ringwall, or ground?	☐ Yes ☑ No	No sheen visible on standing water in containment.
3.0 Tank Foundation and Supports		
3.1 Evidence of tank settlement or foundation washout?	☐ Yes ☑ No	
3.2 Cracking or spalling of concrete pad or ring wall?	☐ Yes ☐ No	N/A
3.3 Tank supports in satisfactory condition?	☑ Yes ☐ No	Coating on supports has failed and corrosion ois present
3.4 Water able to drain away from tank?	☐ Yes ☑ No	Water is allowed to collect in dike
3.5 Grounding strap secured and in good condition?	☐ Yes ☑ No	No grounding straps present. Tanks are welded to containments which sits on piling
4.0 Cathodic Protection		
4.1 CP system functional?	☐ Yes ☐ No	N/A
5.0 Tank External Coating		
5.1 Evidence of paint failure?	☑ Yes ☐ No	generalized coating failures with surface corrosion
6.0 Tank Shell/Heads		
6.1 Noticeable shell/head distortions, buckling, denting or bulging?	☐ Yes ☑ No	
6.2 Evidence of shell/head corrosion or cracking?	☑ Yes ☐ No	heavy pitting and general wall loss along BDC. Lowest UT RWT recorded is .160-inches in an area with .050- inch external corrosion.
7.0 Tank Manways, Piping and Equipment within Secondary Containment		
7.1 Flanged connection bolts tight and fully engaged with no signs of wear or corrosion?	☑ Yes ☐ No	

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STI SP001 FORMAL EXTERNAL TANK INSPECTION REPORT

Tank ID Kwig 4 **Date** 8/16/2018

Item	Status	Comments
8.0 Tank Attachments and Appurtenances		
8.1 Ladder and platform structure secure with no sign of severe corrosion or damage?	☐ Yes ☑ No	No Ladder
8.2 Tank Liquid level gauge readable and in good condition?	☑ Yes ☐ No	Readable but condensation is present inside dial housing
8.3 Check all tank openings are properly sealed?	☑ Yes ☐ No	
9.0 Tank Roof		
9.1 Standing water on roof	☐ Yes ☑ No	
9.2 Evidence of coating cracking, crazing, peeling, blistering?	☑ Yes ☐ No	Extensive coating failures on all appurtenances, heads, and lower 25% of shell.
9.3 Holes in roof	☐ Yes ☑ No	
10.0 Venting		
10.1 Vents free of obstructions?	☑ Yes ☐ No	
10.2 Emergency vent operable? Lift as required?	☑ Yes ☐ No	
10.3 Identify Normal & Emergency Vents and sizing?	8" emergency vent & 2" normal vent	
11.0 Other Conditions		
11.1 Are there other conditions that should be addressed for continued safe operation or that may affect the site SPCC plan?	☑ Yes ☐ No	See report

Tank Tightness Testing

Type of test (s) performed:	Pressure:	Time:	Comments:
Primary tank pressure test	n/a	n/a	n/a
Secondary tank pressure test	n/a	n/a	n/a

Additional Comments:

Some areas at BDC are so heavily corroded that the scale could not be removed so readings could be collected. Worst case external pitting is .080-inches in an area that is so corroded we could not collect UT plate thickness data.

Nominal wall thickness:

Shell: .250-inch

Heads: .250-inch

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STI SP001 FORMAL EXTERNAL TANK INSPECTION REPORT

Tank ID Kwig 10 **Date** 8/15/2018

OWNER INFORMATION		**INSPECTION INFORMATION**	
Tank Location	Kwigillingok Marina	Inspector Name	Eric Weiler
Company Name	City of Kwigillingok	Company Name	Taku Engineering
Address	P.o. Box 90 Kwigillingok AK 99622	Address	406 W Fireweed Anch. AK 99503
Phone		Phone	(907) 529-9806
TANK ID	Kwig 10	**PRODUCT**	Diesel

TANK SPECIFICATION

Design: ☐ UL ☐ API ☐ SWRI ☐ Other ☑ Unknown

Tank Type: ☑ Single Wall ☐ Double Wall ☑ Horizontal ☐ Double Bottom ☐ Rectangular ☐ Closed Top Dike ☐ Vertical ☐ Open Top Dike

Tank Fabricator Unknown Construction Date Unknown

Manufacturer Unknown Repairs Unknown
Repair Date Unknown Unknown

Tank Size
Primary 10' x 42.5' Capacity 23,000 Last Change of Service Unknown
Secondary NA Capacity NA

Containment ☐ Earthen Dike ☑ Steel Dike ☐ Concrete ☐ Synthetic Liner ☐ Other

CDRM ☑ Date Installed Construction Type Elevated
Continuous Release Detection Method

RPB ☑ Date Installed Construction Type Steel containment
Release Prevention Barrier

AST Category ☑ Category 1-with spill control, CRDM ☐ Category 2-with spill control, without CRDM ☐ Category 3-without spill control, without CRDM

Tank Foundation ☐ In contact with ground ☐ Concrete ringwall ☑ Elevated ☐ Skid ☐ Other

Tank Entry ☐ Tank equipped with no manway ☑ Tank equipped with manway Size 18"

Last Formal External Inspection Unknown Last Formal Internal Inspection Unknown

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STI SP001 FORMAL EXTERNAL TANK INSPECTION REPORT

Tank ID Kwig 10 **Date** 8/15/2018

INSPECTION CHECKLIST

Item	Status	Comments
1.0 Tank Containment		
1.1 Water in primary tank, secondary containment, interstice, or spill container?	☑ Yes ☐ No	Tank farm was found with 4 inches of standing water.
1.2 Debris or fire hazard in containment?	☑ Yes ☐ No	Rust, scale and mud in containment. 1" deep in some areas.
1.3 Drain valves operable and in a closed position?	☑ Yes ☐ No	
1.4 Drainage pipes/valves in satisfactory condition?	☐ Yes ☑ No	Drain pipes run from sumps to the edge of containment. Pipes are continuously submerged and heavily corroded
1.5 Containment egress pathways clear and gates/doors operable?	☑ Yes ☐ No	
1.6 Containment structure in satisfactory condition?	☐ Yes ☑ No	Containment coating has failed and active corrosion is present over most of the floor. Floor is .187-inch nominal material with .040-.050 inches of plate loss.
2.0 Leak Detection		
2.1 Visible signs of leakage around the tank, concrete pad, containment, ringwall, or ground?	☐ Yes ☑ No	No sheen visible on standing water in containment.
3.0 Tank Foundation and Supports		
3.1 Evidence of tank settlement or foundation washout?	☐ Yes ☑ No	
3.2 Cracking or spalling of concrete pad or ring wall?	☐ Yes ☐ No	N/A
3.3 Tank supports in satisfactory condition?	☑ Yes ☐ No	Coating on supports has failed and corrosion is present
3.4 Water able to drain away from tank?	☐ Yes ☑ No	Water is allowed to collect in dike
3.5 Grounding strap secured and in good condition?	☐ Yes ☑ No	No grounding straps present. Tanks are welded to containment which sits on piling
4.0 Cathodic Protection		
4.1 CP system functional?	☐ Yes ☐ No	N/A
5.0 Tank External Coating		
5.1 Evidence of paint failure?	☑ Yes ☐ No	generalized coating failures with corrosion
6.0 Tank Shell/Heads		
6.1 Noticeable shell/head distortions, buckling, denting or bulging?	☐ Yes ☑ No	
6.2 Evidence of shell/head corrosion or cracking?	☑ Yes ☐ No	RWT recorded is .343-inches in an area with .030- inch external corrosion.
7.0 Tank Manways, Piping and Equipment within Secondary Containment		
7.1 Flanged connection bolts tight and fully engaged with no signs of wear or corrosion?	☑ Yes ☐ No	

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STI SP001 FORMAL EXTERNAL TANK INSPECTION REPORT

Tank ID Kwig 10 **Date** 8/15/2018

Item	Status	Comments
8.0 Tank Attachments and Appurtenances		
8.1 Ladder and platform structure secure with no sign of severe corrosion or damage?	☐ Yes ☑ No	No Ladder
8.2 Tank Liquid level gauge readable and in good condition?	☑ Yes ☐ No	Readable but condensation is present inside dial housing
8.3 Check all tank openings are properly sealed?	☑ Yes ☐ No	
9.0 Tank Roof		
9.1 Standing water on roof	☐ Yes ☑ No	
9.2 Evidence of coating cracking, crazing, peeling, blistering?	☑ Yes ☐ No	Extensive coating failures on all appurtenances, and lower 25% of shell.
9.3 Holes in roof	☐ Yes ☑ No	
10.0 Venting		
10.1 Vents free of obstructions?	☑ Yes ☐ No	
10.2 Emergency vent operable? Lift as required?	☑ Yes ☐ No	
10.3 Identify Normal & Emergency Vents and sizing?	10" emergency vent & 3" normal vent	
11.0 Other Conditions		
11.1 Are there other conditions that should be addressed for continued safe operation or that may affect the site SPCC plan?	☑ Yes ☐ No	See report

Tank Tightness Testing

Type of test (s) performed:	Pressure:	Time:	Comments:
Primary tank pressure test	n/a	n/a	n/a
Secondary tank pressure test	n/a	n/a	n/a

Additional Comments:

Pitting on heads and shell ranges from .030-inches to .100 inches. Some of this pitting has been coated over.

Nominal wall thickness:

Shell: .375-inch

Heads: .375-inch

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STI SP001 FORMAL EXTERNAL TANK INSPECTION REPORT

Tank ID Kwig 12 **Date** 8/15/2018

OWNER INFORMATION		INSPECTION INFORMATION	
Tank Location	Kwigillingok Marina	Inspector Name	Eric Weiler
Company Name	City of Kwigillingok	Company Name	Taku Engineering
Address	P.o. Box 90 Kwigillingok AK 99622	Address	406 W Fireweed Anch. AK 99503
Phone		Phone	(907) 529-9806
TANK ID	Kwig 12	**PRODUCT**	Gasoline

TANK SPECIFICATION

Design:
- ☐ UL
- ☑ Unknown
- ☐ API
- ☐ SWRI
- ☐ Other

Tank Type:
- ☑ Single Wall
- ☐ Double Wall
- ☑ Horizontal
- ☐ Double Bottom
- ☐ Rectangular
- ☐ Closed Top Dike
- ☐ Vertical
- ☐ Open Top Dike

Tank Fabricator: Unknown   Construction Date: Unknown

Manufacturer: Unknown   Repairs: Unknown
Repair Date: Unknown   Unknown

Tank Size
Primary: 10' x 42.5'   Capacity: 23,000   Last Change of Service: Unknown
Secondary: NA   Capacity: NA

Containment: ☐ Earthen Dike ☑ Steel Dike ☐ Concrete ☐ Synthetic Liner ☐ Other

CDRM (Continuous Release Detection Method) ☑ Date Installed: Construction   Type: Elevated

RPB (Release Prevention Barrier) ☑ Date Installed: Construction   Type: Steel containment

AST Category: ☑ Category 1-with spill control, CRDM ☐ Category 2-with spill control, without CRDM ☐ Category 3-without spill control, without CRDM

Tank Foundation: ☐ In contact with ground ☐ Concrete ringwall ☑ Elevated ☐ Skid ☐ Other

Tank Entry: ☐ Tank equipped with no manway ☑ Tank equipped with manway   Size: 18"

Last Formal External Inspection: Unknown   Last Formal Internal Inspection: Unknown

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STI SP001 FORMAL EXTERNAL TANK INSPECTION REPORT

Tank ID Kwig 12 **Date** 8/15/2018

INSPECTION CHECKLIST

Item	Status	Comments
1.0 Tank Containment		
1.1 Water in primary tank, secondary containment, interstice, or spill container?	☑ Yes ☐ No	Tank farm was found with 4 inches of standing water.
1.2 Debris or fire hazard in containment?	☑ Yes ☐ No	Rust, scale and mud in containment. 1" deep in some areas.
1.3 Drain valves operable and in a closed position?	☑ Yes ☐ No	
1.4 Drainage pipes/valves in satisfactory condition?	☐ Yes ☑ No	Drain pipes run from sumps to the edge of containment. Pipes are continuously submerged and heavily corroded
1.5 Containment egress pathways clear and gates/doors operable?	☑ Yes ☐ No	
1.6 Containment structure in satisfactory condition?	☐ Yes ☑ No	Containment coating has failed and active corrosion is present over most of the floor. Floor is .187-inch nominal material with .040-.050 inches of plate loss.
2.0 Leak Detection		
2.1 Visible signs of leakage around the tank, concrete pad, containment, ringwall, or ground?	☐ Yes ☑ No	No sheen visible on standing water in containment.
3.0 Tank Foundation and Supports		
3.1 Evidence of tank settlement or foundation washout?	☐ Yes ☑ No	
3.2 Cracking or spalling of concrete pad or ring wall?	☐ Yes ☐ No	N/A
3.3 Tank supports in satisfactory condition?	☑ Yes ☐ No	Coating on supports has failed and corrosion is present
3.4 Water able to drain away from tank?	☐ Yes ☑ No	Water is allowed to collect in dike
3.5 Grounding strap secured and in good condition?	☐ Yes ☑ No	No grounding straps present. Tanks are welded to containment which sits on piling
4.0 Cathodic Protection		
4.1 CP system functional?	☐ Yes ☐ No	N/A
5.0 Tank External Coating		
5.1 Evidence of paint failure?	☑ Yes ☐ No	generalized coating failures with corrosion
6.0 Tank Shell/Heads		
6.1 Noticeable shell/head distortions, buckling, denting or bulging?	☐ Yes ☑ No	
6.2 Evidence of shell/head corrosion or cracking?	☑ Yes ☐ No	RWT recorded is .335-inches in an area with .030-.040 inch external corrosion.
7.0 Tank Manways, Piping and Equipment within Secondary Containment		
7.1 Flanged connection bolts tight and fully engaged with no signs of wear or corrosion?	☑ Yes ☐ No	

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STI SP001 FORMAL EXTERNAL TANK INSPECTION REPORT

Tank ID Kwig 12 **Date** 8/15/2018

Item	Status	Comments
8.0 Tank Attachments and Appurtenances		
8.1 Ladder and platform structure secure with no sign of severe corrosion or damage?	☐ Yes ☑ No	No Ladder
8.2 Tank Liquid level gauge readable and in good condition?	☑ Yes ☐ No	Readable but condensation is present inside dial housing
8.3 Check all tank openings are properly sealed?	☑ Yes ☐ No	
9.0 Tank Roof		
9.1 Standing water on roof	☐ Yes ☑ No	
9.2 Evidence of coating cracking, crazing, peeling, blistering?	☑ Yes ☐ No	Extensive coating failures on all appurtenances, and lower 25% of shell.
9.3 Holes in roof	☐ Yes ☑ No	
10.0 Venting		
10.1 Vents free of obstructions?	☑ Yes ☐ No	
10.2 Emergency vent operable? Lift as required?	☑ Yes ☐ No	
10.3 Identify Normal & Emergency Vents and sizing?	10" emergency vent & 3" normal vent	
11.0 Other Conditions		
11.1 Are there other conditions that should be addressed for continued safe operation or that may affect the site SPCC plan?	☑ Yes ☐ No	See report

Tank Tightness Testing

Type of test (s) performed:	Pressure:	Time:	Comments:
Primary tank pressure test	n/a	n/a	n/a
Secondary tank pressure test	n/a	n/a	n/a

Additional Comments:

Worst case external pitting is .110-inches and is found on the north end of the tank in an area of shell deformation. Pitting on heads and shell ranges from .030-inches to .100 inches. Some of this pitting has been coated over. Seven dents are present in the shell material for this tank.

Tanks 11 and 12 use a nonstandard construction method. The shells are comprised of six plates 5.25-feet by 42-feet, butt welded on the long edges.

Nominal wall thickness:

Shell: .375-inch

Heads: .375-inch

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APPENDIX B: TANK NDE DATA

ULTRASONIC THICKNESS MEASUREMENTS

OWNER: City of Kwigillingok
TANK #: 1
LOCATION: Marina Tank Farm
DATE: 8/14/2018

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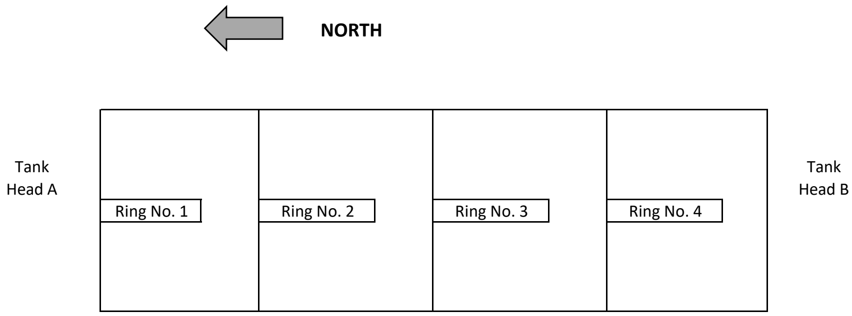
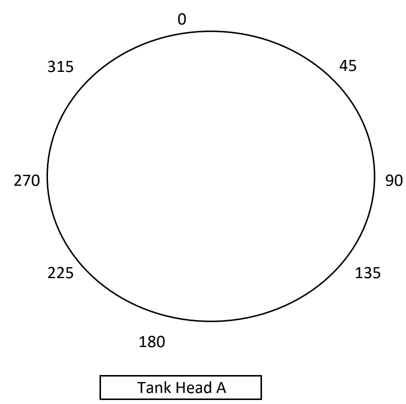


UT Thickness Measurements									
Location	**0°**	**45°**	**90°**	**135°**	**180°**	**225°**	**270°**	**315°**	**avg**
Head A	**Primary Tank**								
	0.251	0.254	0.254	0.251	0.249	0.249	0.252	0.249	0.251
DFT Range									
Ring No. 1	**Primary Tank**								
	0.242	0.242	0.242	0.242	0.242	0.241	0.241	0.241	0.242
DFT Range									
Ring No. 2	**Primary Tank**								
	--	0.241	0.242	0.242	0.244	0.241	0.242	0.241	0.242
DFT Range									
Ring No. 2	**Primary Tank 1" before 2nd to 3rd course weld**								
	0.244	0.245	0.244	0.245	--	0.244	0.246	0.244	0.245
DFT Range									
Ring No. 3	**Primary Tank 1" after 2nd to 3rd course weld**								
	0.239	0.242	0.242	0.239	--	0.242	0.242	0.242	0.241
DFT Range									
Ring No. 4	**Primary Tank**								
	--	0.242	0.244	0.242	0.244	0.242	0.244	0.244	0.243
DFT Range									
Ring No. 4	**Primary Tank 1" from knuckle weld**								
	0.244	0.244	--	0.242	0.242	0.242	0.242	0.244	0.243
DFT Range									
Head B	**Primary Tank**								
1	0.258	0.255	0.255	0.258	0.258	0.258	0.255	0.258	0.257
DFT Range									

-- No Reading Taken



Equipment: Magnaflux UT thickness tester

Equipment S/N: 5051922

Transducer: dk718ee 7.5MHz

Transducer S/N: 8877

STI Inspector Eric Weiler
Date: 8/14/2018

UL-142 Venting Calculations for Horizontal Cylindrical Storage Tank

OWNER: City of Kwigillingok
TANK #: 1
LOCATION: Marina Tank Farm
DATE: 8/14/2018

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Tank Diameter (Ft)	7.75
Tank Length in Feet	11.66
Tank Volume in Gallons	4114.5511
Calculated Wetted Area in Square Footage	283.67698
Minimum Emergency Vent Required	6"
****Minimum Normal Vent Required**	2"

Size of Opening for Normal Venting	
Capacity of Tank U.S. Gallons	Minimum Diameter Nominal Pipe Size Inches
Under 2,500	1-1/4"
2,500 - 3,000	1-1/2"
3,001 - 10,000	2
10,001 - 20,000	2-1/2"
20,001 - 35,000	3
35,001 - 50,000	4
50,001 - 75,000	6

Size of Opening for Emergency Venting		
Wetted Surface (Sq Ft.)	Venting Capacity (CFH)	Minimum Opening Nominal Pipe Size (inches)
20	21,100	2
30	31,600	2
40	42,100	3
50	52,700	3
60	63,200	3
70	73,700	4
80	84,200	4
90	94,800	4
100	105,000	4
120	126,000	5
140	147,000	5
160	168,000	5
180	190,000	5
200	211,000	6
250	239,000	6
300	265,000	6
350	288,000	8
400	312,000	8
500	354,000	8
600	392,000	8
700	428,000	8
800	462,000	8
900	493,000	8
1000	524,000	10
1200	557,000	10
1400	587,000	10
1600	614,000	10
1800	639,000	10
2000	662,000	10
2400	704,000	10
2800	742,000	10
3200	776,000	12
3600 and over	806,000	12

**NFPA 30--2008, 21.4.3.2 Normal vents shall be sized to be at least as large as the filling or withdrawal connection, whichever is larger, but in no case less than 1-1/4 in. (3 cm) nominal inside diameter.

ULTRASONIC THICKNESS MEASUREMENTS

OWNER: City of Kwigillingok
TANK #: 2
LOCATION: Marina Tank Farm
DATE: 8/15/2018

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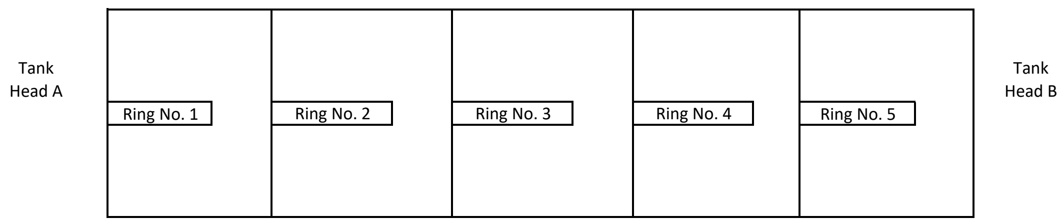
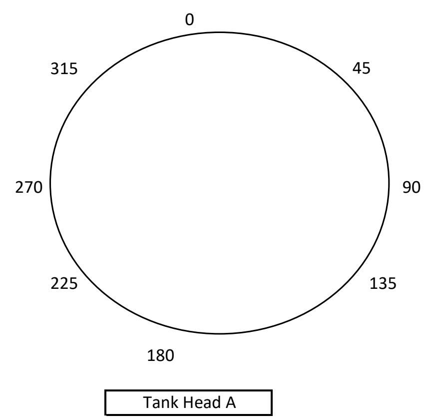
NORTH



UT Thickness Measurements									
Location	**0°**	**45°**	**90°**	**135°**	**180°**	**225°**	**270°**	**315°**	**avg**
Head A	**Primary Tank**								
	0.248	0.248	0.251	0.249	0.251	0.245	0.249	0.249	0.249
DFT Range									
Ring No. 1	**Primary Tank**								
	0.235	0.238	0.236	0.235	0.216	0.239	0.242	0.242	0.235
DFT Range									
Ring No. 2	**Primary Tank**								
	0.242	0.241	0.239	0.239	0.222	0.239	0.242	0.242	0.238
DFT Range									
Ring No. 3	**Primary Tank**								
	--	0.242	0.242	0.242	0.223	0.244	0.244	0.245	0.240
DFT Range									
Ring No. 4	**Primary Tank**								
	0.243	0.242	0.241	0.239	0.222	0.241	0.241	0.242	0.239
DFT Range									
Ring No. 5	**Primary Tank**								
	0.241	0.24	0.242	0.238	0.222	0.241	0.243	0.242	0.239
DFT Range									
Head B	**Primary Tank**								
	0.249	0.249	0.249	0.248	--	0.246	0.248	0.251	0.249
DFT Range									



Equipment: Magnaflux UT thickness tester
Equipment S/N: 5051922
Transducer: dk718ee 7.5MHz
Transducer S/N: 8877

-- No Reading Taken

STI Inspector Eric Weiler
Date: 8/14/2018

Nozzles **DFT** 4.6-13.6 mils
manway 0.236
e-vent 0.174

UL-142 Venting Calculations for Horizontal Cylindrical Storage Tank

OWNER: City of Kwigillingok
TANK #: 2
LOCATION: Marina Tank Farm
DATE: 8/15/2018

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Tank Diameter (Ft)	7.83
Tank Length in Feet	27.5
Tank Volume in Gallons	9905.5074
Calculated Wetted Area in Square Footage	579.57542
Minimum Emergency Vent Required	8"
****Minimum Normal Vent Required**	2"

Size of Opening for Normal Venting	
Capacity of Tank U.S. Gallons	Minimum Diameter Nominal Pipe Size Inches
Under 2,500	1-1/4"
2,500 - 3,000	1-1/2"
3,001 - 10,000	2
10,001 - 20,000	2-1/2"
20,001 - 35,000	3
35,001 - 50,000	4
50,001 - 75,000	6

Size of Opening for Emergency Venting		
Wetted Surface (Sq Ft.)	Venting Capacity (CFH)	Minimum Opening Nominal Pipe Size (inches)
20	21,100	2
30	31,600	2
40	42,100	3
50	52,700	3
60	63,200	3
70	73,700	4
80	84,200	4
90	94,800	4
100	105,000	4
120	126,000	5
140	147,000	5
160	168,000	5
180	190,000	5
200	211,000	6
250	239,000	6
300	265,000	6
350	288,000	8
400	312,000	8
500	354,000	8
600	392,000	8
700	428,000	8
800	462,000	8
900	493,000	8
1000	524,000	10
1200	557,000	10
1400	587,000	10
1600	614,000	10
1800	639,000	10
2000	662,000	10
2400	704,000	10
2800	742,000	10
3200	776,000	12
3600 and over	806,000	12

**NFPA 30--2008, 21.4.3.2 Normal vents shall be sized to be at least as large as the filling or withdrawal connection, whichever is larger, but in no case less than 1-1/4 in. (3 cm) nominal inside diameter.

ULTRASONIC THICKNESS MEASUREMENTS

OWNER: City of Kwigillingok
TANK #: 3
LOCATION: Marina Tank Farm
DATE: 8/15/2018

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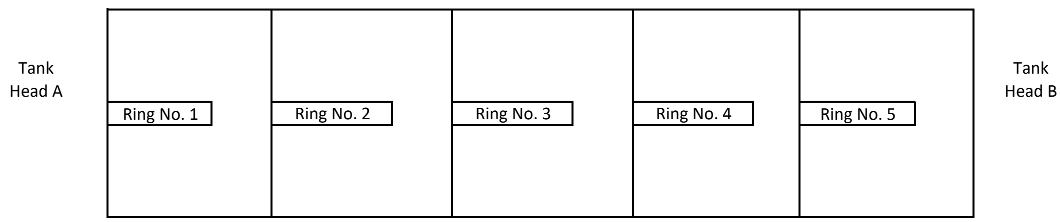
NORTH

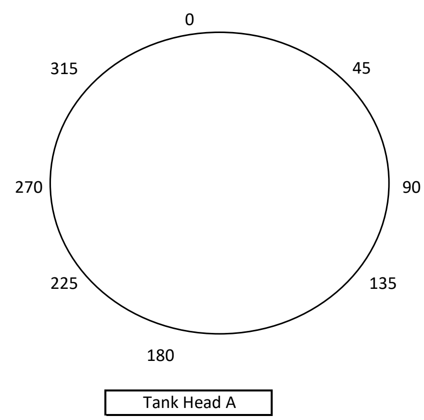


UT Thickness Measurements									
Location	**0°**	**45°**	**90°**	**135°**	**180°**	**225°**	**270°**	**315°**	**avg**
Head A	**Primary Tank**								
	0.251	0.251	0.248	0.248	0.251	0.246	0.249	0.248	0.249
DFT Range									
Ring No. 1	**Primary Tank**								
	0.248	0.248	0.248	0.248	0.242	0.248	0.246	0.245	0.247
DFT Range									
Ring No. 2	**Primary Tank**								
	0.238	0.238	0.241	0.238	0.214	0.235	0.236	0.236	0.235
DFT Range									
Ring No. 3	**Primary Tank**								
	--	0.233	0.233	0.232	0.206	0.227	0.233	0.233	0.228
DFT Range									
Ring No. 4	**Primary Tank**								
	0.233	0.233	0.232	0.232	0.204	0.232	0.236	0.235	0.230
DFT Range									
Ring No. 5	**Primary Tank**								
	0.235	0.235	0.233	0.232	0.21	0.232	0.233	0.233	0.230
DFT Range									
Head B	**Primary Tank**								
	0.252	0.252	0.252	0.249	--	0.249	0.246	0.251	0.250
DFT Range									

-- No Reading Taken

Nozzles
manway 0.200
e-vent 0.184

DFT 4.6-13.6 mils



Equipment: Magnaflux UT thickness tester
Equipment S/N: 5051922
Transducer: dk718ee 7.5MHz
Transducer S/N: 8877

STI Inspector Eric Weiler
Date: 8/15/2018

UL-142 Venting Calculations for Horizontal Cylindrical Storage Tank

OWNER: City of Kwigillingok
TANK #: 3
LOCATION: Marina Tank Farm
DATE: 8/15/2018

taku engineering, llc

Tank Diameter (Ft)	7.83
Tank Length in Feet	27.5
Tank Volume in Gallons	9905.5074
Calculated Wetted Area in Square Footage	579.57542
Minimum Emergency Vent Required	8"
****Minimum Normal Vent Required**	2"

Size of Opening for Normal Venting	
Capacity of Tank U.S. Gallons	Minimum Diameter Nominal Pipe Size Inches
Under 2,500	1-1/4"
2,500 - 3,000	1-1/2"
3,001 - 10,000	2
10,001 - 20,000	2-1/2"
20,001 - 35,000	3
35,001 - 50,000	4
50,001 - 75,000	6

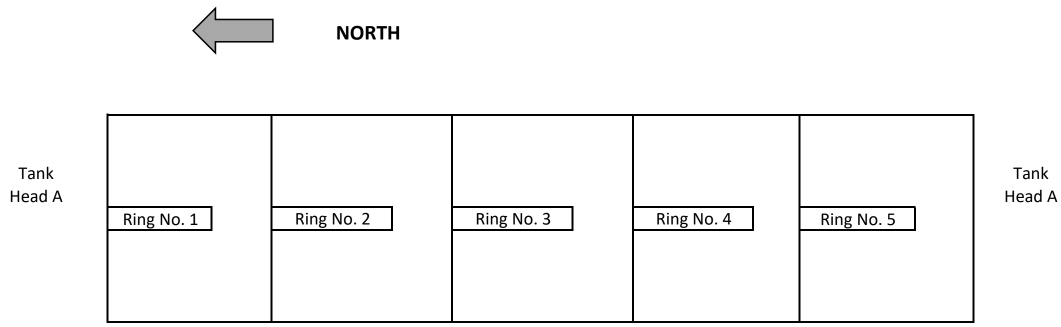
Size of Opening for Emergency Venting		
Wetted Surface (Sq Ft.)	Venting Capacity (CFH)	Minimum Opening Nominal Pipe Size (inches)
20	21,100	2
30	31,600	2
40	42,100	3
50	52,700	3
60	63,200	3
70	73,700	4
80	84,200	4
90	94,800	4
100	105,000	4
120	126,000	5
140	147,000	5
160	168,000	5
180	190,000	5
200	211,000	6
250	239,000	6
300	265,000	6
350	288,000	8
400	312,000	8
500	354,000	8
600	392,000	8
700	428,000	8
800	462,000	8
900	493,000	8
1000	524,000	10
1200	557,000	10
1400	587,000	10
1600	614,000	10
1800	639,000	10
2000	662,000	10
2400	704,000	10
2800	742,000	10
3200	776,000	12
3600 and over	806,000	12

**NFPA 30--2008, 21.4.3.2 Normal vents shall be sized to be at least as large as the filling or withdrawal connection, whichever is larger, but in no case less than 1-1/4 in. (3 cm) nominal inside diameter.

ULTRASONIC THICKNESS MEASUREMENTS

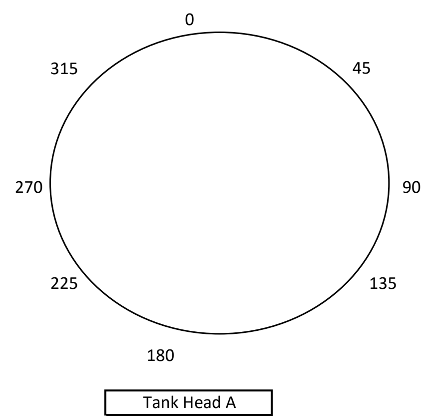
OWNER: City of Kwigillingok
TANK #: 4
LOCATION: Marina Tank Farm
DATE: 8/15/2018

taku engineering, llc



UT Thickness Measurements									
Location	**0°**	**45°**	**90°**	**135°**	**180°**	**225°**	**270°**	**315°**	**avg**
Head A	**Primary Tank**								
1	0.249	0.249	0.248	0.248	--	0.249	0.249	0.242	0.248
DFT Range									
Ring No. 1	**Primary Tank**								
1	0.234	0.229	0.233	0.232	0.222	0.233	0.233	0.235	0.231
DFT Range									
Ring No. 2	**Primary Tank**								
1	0.238	0.232	0.233	0.235	0.160	0.235	0.238	0.239	0.226
DFT Range									
Ring No. 3	**Primary Tank**								
1	--	0.242	0.235	0.238	*	0.238	0.239	0.239	0.239
DFT Range									
Ring No. 4	**Primary Tank**								
1	0.239	0.238	0.238	0.238	*	0.235	0.239	0.241	0.238
DFT Range									
Ring No. 5	**Primary Tank**								
1	0.23	0.235	0.233	0.235	0.206	0.233	0.233	0.235	0.230
DFT Range									
Head B	**Primary Tank**								
1	0.251	0.249	0.248	0.251	--	0.251	0.251	0.251	0.250
DFT Range									

* Unable to collect data due to external corrosion and scale. External pitting 50-80 mils
-- No Reading Taken



Equipment: Magnaflux UT thickness tester

Equipment S/N: 5051922

Transducer: dk718ee 7.5MHz

Transducer S/N: 8877

Nozzles | **DFT** 4.1-10.5 mils
manway 0.216
event nozzle 0.187

STI Inspector Eric Weiler
Date: 8/15/2018

Heavy pitting present along bottom dead center

External pitting 50 mils deep in this area.

UL-142 Venting Calculations for Horizontal Cylindrical Storage Tank

OWNER: City of Kwigillingok
TANK #: 4
LOCATION: Marina Tank Farm
DATE: 8/15/2018

Tank Diameter (Ft)	7.83
Tank Length in Feet	27.5
Tank Volume in Gallons	9905.5074
Calculated Wetted Area in Square Footage	579.57542
Minimum Emergency Vent Required	8"
****Minimum Normal Vent Required**	2"

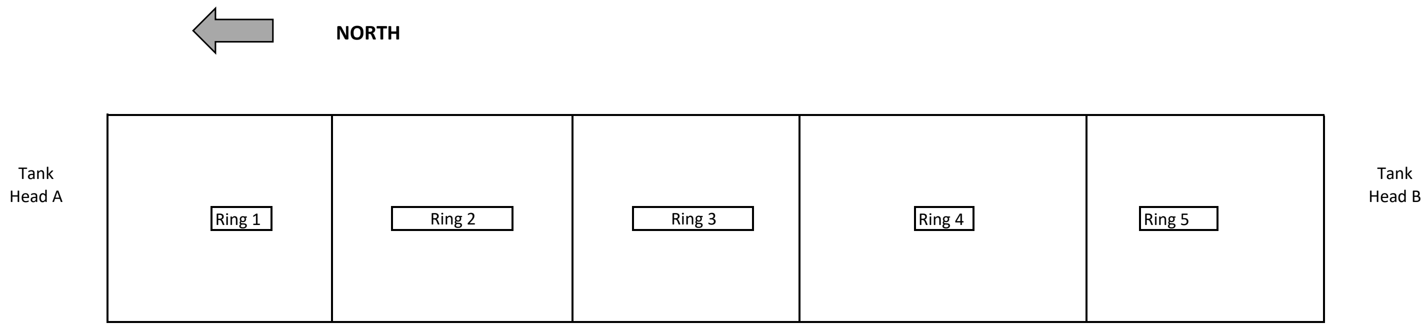
Size of Opening for Normal Venting	
Capacity of Tank U.S. Gallons	Minimum Diameter Nominal Pipe Size Inches
Under 2,500	1-1/4"
2,500 - 3,000	1-1/2"
3,001 - 10,000	2
10,001 - 20,000	2-1/2"
20,001 - 35,000	3
35,001 - 50,000	4
50,001 - 75,000	6

Size of Opening for Emergency Venting		
Wetted Surface (Sq Ft.)	Venting Capacity (CFH)	Minimum Opening Nominal Pipe Size (inches)
20	21,100	2
30	31,600	2
40	42,100	3
50	52,700	3
60	63,200	3
70	73,700	4
80	84,200	4
90	94,800	4
100	105,000	4
120	126,000	5
140	147,000	5
160	168,000	5
180	190,000	5
200	211,000	6
250	239,000	6
300	265,000	6
350	288,000	8
400	312,000	8
500	354,000	8
600	392,000	8
700	428,000	8
800	462,000	8
900	493,000	8
1000	524,000	10
1200	557,000	10
1400	587,000	10
1600	614,000	10
1800	639,000	10
2000	662,000	10
2400	704,000	10
2800	742,000	10
3200	776,000	12
3600 and over	806,000	12

**NFPA 30--2008, 21.4.3.2 Normal vents shall be sized to be at least as large as the filling or withdrawal connection, whichever is larger, but in no case less than 1-1/4 in. (3 cm) nominal inside diameter.

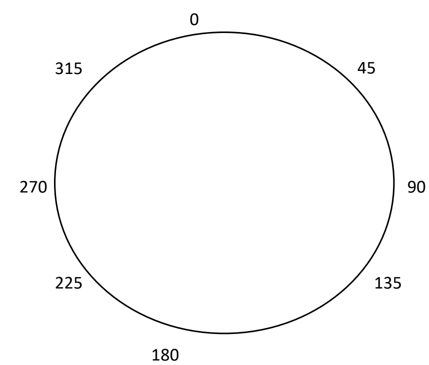
ULTRASONIC THICKNESS MEASUREMENTS

OWNER: City of Kwigillingok
TANK #: 10
LOCATION: Marina Tank Farm
DATE: 8/15/2018



UT Thickness Measurements									
Location	**0°**	**45°**	**90°**	**135°**	**180°**	**225°**	**270°**	**315°**	**avg**
Head A	**Primary Tank**								
	0.387	0.386	0.39	0.387	0.76	0.384	0.387	0.394	0.434
DFT Range									
Ring No. 1	**Primary Tank**								
	--	0.38	0.357	0.362	0.348	0.359	0.357	0.353	0.359
DFT Range									
Ring No. 2	**Primary Tank**								
	--	0.37	0.37	0.369	0.376	0.373	0.373	0.372	0.372
DFT Range									
Ring No. 3	**Primary Tank**								
	--	0.367	0.377	0.383	0.343	0.367	0.37	0.369	0.368
DFT Range									
Ring No. 4	**Primary Tank**								
	--	0.366	0.362	0.367	0.36	0.367	0.359	0.356	0.362
DFT Range									
Ring No. 5	**Primary Tank**								
	--	0.379	0.367	0.37	0.354	0.359	0.377	0.377	0.369
DFT Range									
Head B	**Primary Tank**								
1	0.379	0.404	0.411	0.394	0.392	0.427	0.409	0.395	0.401
DFT Range									

-- No Reading Taken



Tank Head A

Equipment: Magnaflux UT thickness tester

Equipment S/N: 5051922

Transducer: dk718ee 7.5MHz

Transducer S/N: 8877

STI Inspector Eric Weiler
Date: 8/15/2018

UL-142 Venting Calculations for Horizontal Cylindrical Storage Tank

OWNER: City of Kwigillingok
TANK #: 10
LOCATION: Marina Tank Farm
DATE: 8/15/2018

τaku engineering, llc

Tank Diameter (Ft)	10
Tank Length in Feet	42.5
Tank Volume in Gallons	24969.477
Calculated Wetted Area in Square Footage	1119.1924
Minimum Emergency Vent Required	10"
****Minimum Normal Vent Required**	3"

Size of Opening for Normal Venting	
Capacity of Tank U.S. Gallons	Minimum Diameter Nominal Pipe Size Inches
Under 2,500	1-1/4"
2,500 - 3,000	1-1/2"
3,001 - 10,000	2
10,001 - 20,000	2-1/2"
20,001 - 35,000	3
35,001 - 50,000	4
50,001 - 75,000	6

Size of Opening for Emergency Venting		
Wetted Surface (Sq Ft.)	Venting Capacity (CFH)	Minimum Opening Nominal Pipe Size (inches)
20	21,100	2
30	31,600	2
40	42,100	3
50	52,700	3
60	63,200	3
70	73,700	4
80	84,200	4
90	94,800	4
100	105,000	4
120	126,000	5
140	147,000	5
160	168,000	5
180	190,000	5
200	211,000	6
250	239,000	6
300	265,000	6
350	288,000	8
400	312,000	8
500	354,000	8
600	392,000	8
700	428,000	8
800	462,000	8
900	493,000	8
1000	524,000	10
1200	557,000	10
1400	587,000	10
1600	614,000	10
1800	639,000	10
2000	662,000	10
2400	704,000	10
2800	742,000	10
3200	776,000	12
3600 and over	806,000	12

**NFPA 30--2008, 21.4.3.2 Normal vents shall be sized to be at least as large as the filling or withdrawal connection, whichever is larger, but in no case less than 1-1/4 in. (3 cm) nominal inside diameter.

ULTRASONIC THICKNESS MEASUREMENTS

OWNER: City of Kwigillingok
TANK #: 12
LOCATION: Marina Tank Farm
DATE: 8/15/2018

taku engineering, llc

NORTH

Tank Head A

Plate 6

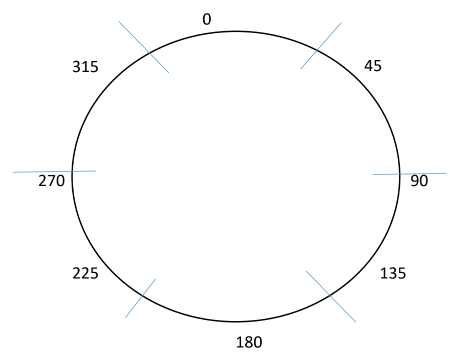
Plate 1

Plate 2

Tank Head B

UT Thickness Measurements									
Location	**0°**	**45°**	**90°**	**135°**	**180°**	**225°**	**270°**	**315°**	**avg**
Head A	**Primary Tank**								
	0.419	0.410	0.414	0.406	0.396	0.414	0.38	0.403	0.405
DFT Range									
+1' from head weld	**Primary Tank**								
	0.366	0.405	0.385	0.344	0.353	0.361	0.358	0.372	0.368
DFT Range									
+8' from head weld	**Primary Tank**								
	--	0.369	0.36	0.356	0.373	0.362	0.364	0.363	0.364
DFT Range									
+16' from head weld	**Primary Tank**								
	--	0.409	0.354	0.362	0.36	0.356	0.364	0.361	0.367
DFT Range									
+24' from head weld	**Primary Tank**								
	--	0.363	0.357	0.357	0.36	0.356	0.357	0.383	0.362
DFT Range									
+32' from head weld	**Primary Tank**								
	--	0.372	0.391	0.382	0.335	0.357	0.354	0.357	0.364
DFT Range									
+40' from head weld	**Primary Tank**								
	0.36	0.37	0.367	0.375	0.366	0.356	0.356	0.343	0.362
DFT Range									
Head B	**Primary Tank**								
	0.417	0.394	0.436	0.425	0.384	0.396	0.433	0.439	0.416
DFT Range									

-- No Reading Taken



Tank Head A

Equipment: Magnaflux UT thickness tester

Equipment S/N: 5051922

Transducer: dk718ee 7.5MHz

Transducer S/N: 8877

STI Inspector Eric Weiler
Date: 8/15/2018

UL-142 Venting Calculations for Horizontal Cylindrical Storage Tank

OWNER: City of Kwigillingok
TANK #: 12
LOCATION: Marina Tank Farm
DATE: 8/15/2018

(χ/δτ) taku engineering, llc

Tank Diameter (Ft)	10
Tank Length in Feet	42.5
Tank Volume in Gallons	24969.477
Calculated Wetted Area in Square Footage	1119.1924
Minimum Emergency Vent Required	10"
****Minimum Normal Vent Required**	3"

Size of Opening for Normal Venting	
Capacity of Tank U.S. Gallons	Minimum Diameter Nominal Pipe Size Inches
Under 2,500	1-1/4"
2,500 - 3,000	1-1/2"
3,001 - 10,000	2
10,001 - 20,000	2-1/2"
20,001 - 35,000	3
35,001 - 50,000	4
50,001 - 75,000	6

Size of Opening for Emergency Venting		
Wetted Surface (Sq Ft.)	Venting Capacity (CFH)	Minimum Opening Nominal Pipe Size (inches)
20	21,100	2
30	31,600	2
40	42,100	3
50	52,700	3
60	63,200	3
70	73,700	4
80	84,200	4
90	94,800	4
100	105,000	4
120	126,000	5
140	147,000	5
160	168,000	5
180	190,000	5
200	211,000	6
250	239,000	6
300	265,000	6
350	288,000	8
400	312,000	8
500	354,000	8
600	392,000	8
700	428,000	8
800	462,000	8
900	493,000	8
1000	524,000	10
1200	557,000	10
1400	587,000	10
1600	614,000	10
1800	639,000	10
2000	662,000	10
2400	704,000	10
2800	742,000	10
3200	776,000	12
3600 and over	806,000	12

**NFPA 30--2008, 21.4.3.2 Normal vents shall be sized to be at least as large as the filling or withdrawal connection, whichever is larger, but in no case less than 1-1/4 in. (3 cm) nominal inside diameter.

APPENDIX C: PIPE EXAMINATION REPORTS

taku engineering, llc

PIPE EXAMINATION REPORT

Date of Examination: ***August 15, 2018***

Client or Owner Name:	***City of Kwigillingok***
Facility & General Location:	***Bulk Fuel Tank Farm at Marina***
Piping Size, Service & Type:	***2" and 3" Carbon Steel, Refined Fuel Service***
Line No. or Designation:	***Diesel***
Location or Stationing	***All above grade piping from marine header to tanks***
Above or Below Ground:	***Above Ground and On-Grade***

Insulation Condition

Insulation Present?	☐ Yes	☒ No	☐ N/A	
Insulation Type:	☐ Fiberglass ☐ Polyethylene	☐ Rigid Foam ☐ Other	☒ N/A	
Insulation Thickness:	in	☒ N/A		
Jacket Condition:	☐ Good	☐ Separated	☐ Perforated	☒ N/A
Insulation Condition:	☐ Good	☐ Wet	☒ N/A	
Comments:				

Coating Condition

Coated?	☒ Yes	☐ No	☐ N/A
Coating Color:	☒ White ☐ Black	☐ Gray ☐ Other	☐ N/A
Coating Type:	☒ Epoxy ☐ IOZ	☐ Urethane ☐ Other	☐ N/A
Coating Condition:	☐ Poor ☒ Fair	☐ Good ☐ Excellent	☐ N/A
Coating Damage:	☐ Abrasion ☐ Delamination	☐ Disbonding ☒ Other: UV and corrosion	☐ N/A
Comments: *Complete failure of the pipe coating.*			

Tape Wrap Condition

Wrapped?	☐ Yes	☐ No	☒ N/A
Wrap Type:	☐ Petrolatum	☐ PE-Backed	☒ N/A
Wrap Color:	☐ Black ☐ Gray	☐ Green ☐ Other	☒ N/A
Wrap Condition:	☐ Poor ☐ Fair	☐ Good ☐ Excellent	☒ N/A
Tape Damage:	☐ Delaminated ☐ Disbonded	☐ Perforated ☐ Wrinkled	☒ N/A
Comments: *None*			

Rock Shield Condition

Rock Shield Present?	☐ Yes	☐ No	☒ N/A
Rock Shield Type:	☐ Mesh ☐ Fabric	☐ Mat ☐ Other	☒ N/A
Condition:	☐ Ripped ☐ Disbanded	☐ Missing ☐ Other	☒ N/A
NDE Performed:	☐ Yes	☐ No	☒ N/A
Damage Repaired:	☐ Yes	☐ No	☒ N/A
Comments: *None*			

External Corrosion

External Corrosion Present?	☐ Yes	☒ No	☐ N/A
Type:	☐ Surface ☐ Pitting	☐ Weld Attack ☐ Other	☒ N/A
Description:	*NA*		
Comments: *NA*			

Internal Corrosion

Internal Corrosion Present?	☐ Yes	☒ No	☐ N/A
Method of Examination:	☐ Visual	☒ NDE	☐ N/A
Description:	*None Noted*		
Comments: *Spot readings collected. No indications of wall thinning due to internal corrosion found.*			

Mechanical Damage or Fabrication Defects

Damage or Defects Observed?	☐ Yes	☒ No	☐ N/A
Damage Type:	☐ Scrape ☐ Arch Burn	☐ Gouge ☐ Other	☐ Dent ☒ N/A
Dent Information:	Size Indications	Deflection	☒ N/A
NDE Performed?	☐ Yes	☐ No	☒ N/A
Damage Repaired?	☐ Yes	☐ No	☒ N/A
Comments: *NA*			

Cathodic Protection Components Exposed

CP Components Found?	☐ Yes	☒ No	☐ N/A
Type:	*None Exposed.*		
Condition:	☐ Good ☐ Damaged	☐ Consumed ☐ Other	☒ N/A
Repair Information:	☐ Repaired ☐ Replaced	☐ Removed ☐ Other	☒ N/A
Comments: *NA*			

Aboveground or Vault Information

Length of Applicable Pipe Examined: *All aboveground piping at tankfarm.*	Piping Location? ☐ Indoors ☒ Outdoors ☐ Vault or Confined Space ☐ N/A
Height Above Grade or within Vault: *12-18 inches*	Was water present? ☒ Yes ☐ No ☐ N/A If Yes, Depth Encountered: *N/A*
Pipe Anchors or Support Information: *Unistrut and uninsulated conduit clamps*	Vault Condition (Visible Damage, Corrosion, Coated, etc.): *NA*
Pipe Penetration or Transition Information: *NA*	Support Condition: (Visible Damage, Corrosion, Coating, etc.) *Good condition*
Comments: *Cargo and service lines between the tank farm and marine header rest on cribbing piles and stacks of lumber, some of which have fallen over.*	

Excavation Information

Length of Pipe Exposure: *N/A*	Did excavation require trench boxes or slope shoring? ☐ Yes ☒ No ☐ N/A If Yes, Method Used: *N/A*
Depth of Burial: *N/A*	Was water encountered in excavation? ☐ Yes ☒ No ☐ N/A If Yes, Depth Encountered: *N/A*
Backfill Material (Type and Size): *N/A*	Padding and Bedding (Type and Size): *N/A*
Foreign Piping, Structures or Utilities Present in Excavation: *N/A*	Unusual Conditions: (Organic Material, Unusual Odors, etc.) *N/A*
Comments: *NA. All piping above grade*	

Additional Information

NDE Inspection Results (if any), Owner/Operator Information, etc.:

Pipe coating has completely failed both inside the tank farm and outside. Tank farm was found with 3 to 4 inches of standing water which leaves piping partially submerged for an unknown amount of time during the summer months. No monthly or annual inspections documented per the operator. Piping corrosion is class 4.

Performed By

Name/Company:	*Eric Weiler Taku Engineering*	Signature:	Date: *8-15-2018*
Name/Company:	*James Adams, QA Services*	Signature:	Date: *8-15-2018*

Photos or Site Sketches

Provide Photograph(s), Site Sketches and/or Aerial Information to Document Pipe Location & Damage Observed:

Cargo and service lines at tank farm wall. Highpoint vent valve on 2-inch line to Council tank is corroded in the open position

Brass Valves on piping to winter dispenser and council tank.

See trip report and Gasoline piping PER for additional photos.

Otaku engineering, llc

PIPE EXAMINATION REPORT

Date of Examination: ***August 15, 2018***

Client or Owner Name:	***City of Kwigillingok***
Facility & General Location:	***Bulk Fuel Tank Farm at Marina***
Piping Size, Service & Type:	***2" and 3" Carbon Steel, Refined Fuel Service***
Line No. or Designation::	***Gasoline***
Location or Stationing	***All above grade piping from marine header to tanks***
Above or Below Ground:	***Above Ground and On-Grade***

Insulation Condition

Insulation Present?	☐ Yes	☒ No		☐ N/A
Insulation Type:	☐ Fiberglass ☐ Polyethylene	☐ Rigid Foam ☐ Other		☒ N/A
Insulation Thickness:	in	☒ N/A		
Jacket Condition:	☐ Good	☐ Separated	☐ Perforated	☒ N/A
Insulation Condition:	☐ Good	☐ Wet		☒ N/A

Comments:
NA

Coating Condition

Coated?	☒ Yes	☐ No	☐ N/A
Coating Color:	☒ White ☐ Black	☐ Gray ☐ Other	☐ N/A
Coating Type:	☒ Epoxy ☐ IOZ	☐ Urethane ☐ Other	☐ N/A
Coating Condition:	☒ Poor ☐ Fair	☐ Good ☐ Excellent	☐ N/A
Coating Damage:	☐ Abrasion ☐ Delamination	☒ Disbonding ☒ Other: UV and corrosion	☐ N/A

Comments:
Complete failure of the pipe coating.

Tape Wrap Condition

Wrapped?	☐ Yes	☐ No	☒ N/A
Wrap Type:	☐ Petrolatum	☐ PE-Backed	☒ N/A
Wrap Color:	☐ Black ☐ Gray	☐ Green ☐ Other	☒ N/A
Wrap Condition:	☐ Poor ☐ Fair	☐ Good ☐ Excellent	☒ N/A
Tape Damage:	☐ Delaminated ☐ Disbonded	☐ Perforated ☐ Wrinkled	☒ N/A

Comments:
None

Rock Shield Condition

Rock Shield Present?	☐ Yes	☐ No	☒ N/A
Rock Shield Type:	☐ Mesh ☐ Fabric	☐ Mat ☐ Other	☒ N/A
Condition:	☐ Ripped ☐ Disbanded	☐ Missing ☐ Other	☒ N/A
NDE Performed:	☐ Yes	☐ No	☒ N/A
Damage Repaired:	☐ Yes	☐ No	☒ N/A

Comments:
None

External Corrosion

External Corrosion Present?	☒ Yes	☐ No	☐ N/A
Type:	☐ Surface ☒ Pitting	☐ Weld Attack ☒ Other *General*	☐ N/A
Description:	*Generalized external corrosion with areas of pitting.*		

Comments:
Uniform 10-15 mils of general external corrosion with areas of pitting on piping segments that are immersed during part of the year.

Internal Corrosion

Internal Corrosion Present?	☐ Yes	☒ No	☐ N/A
Method of Examination:	☐ Visual	☒ NDE	☐ N/A
Description:	*None Noted*		

Comments:
Spot readings collected. No indications of wall thinning due to internal corrosion found.

Mechanical Damage or Fabrication Defects

Damage or Defects Observed?	☐ Yes	☒ No	☐ N/A
Damage Type:	☐ Scrape ☐ Arch Burn	☐ Gouge ☐ Other	☐ Dent ☒ N/A
Dent Information:	Size Indications	Deflection	☒ N/A
NDE Performed?	☐ Yes	☐ No	☒ N/A
Damage Repaired?	☐ Yes	☐ No	☒ N/A
Comments: *NA*			

Cathodic Protection Components Exposed

CP Components Found?	☐ Yes	☒ No	☐ N/A
Type:	*None Exposed.*		
Condition:	☐ Good ☐ Damaged	☐ Consumed ☐ Other	☒ N/A
Repair Information:	☐ Repaired ☐ Replaced	☐ Removed ☐ Other	☒ N/A
Comments: *NA*			

Aboveground or Vault Information

Length of Applicable Pipe Examined: *All aboveground piping to and in the tankfarm.*	Piping Location? ☐ Indoors ☒ Outdoors ☐ Vault or Confined Space ☐ N/A
Height Above Grade or within Vault: *On grade to 6 feet above the ground.*	Was water present? ☒ Yes ☐ No ☐ N/A If Yes, Depth Encountered: *3"-4"*
Pipe Anchors or Support Information: *Unistrut and uninsulated conduit clamps in tank farm, wood outside.*	Vault Condition (Visible Damage, Corrosion, Coated, etc.): *NA*
Pipe Penetration or Transition Information: *NA*	Support Condition: (Visible Damage, Corrosion, Coating, etc.) *Coating failures and Corrosion in tank farm*
Comments: *Cargo and service lines between the tank farm and marine header rest on cribbing piles and stacks of lumber, some of which have fallen over.*	

Excavation Information

Length of Pipe Exposure: *NA*	Did excavation require trench boxes or slope shoring? ☐ Yes ☐ No ☒ N/A If Yes, Method Used: *N/A*
Depth of Burial: *NA*	Was water encountered in excavation? ☐ Yes ☐ No ☒ N/A If Yes, Depth Encountered: *N/A*
Backfill Material (Type and Size): *NA*	Padding and Bedding (Type and Size): *NA*
Foreign Piping, Structures or Utilities Present in Excavation: *N/A*	Unusual Conditions: (Organic Material, Unusual Odors, etc.) *N/A*
Comments: *NA. All piping above grade.*	

Additional Information

NDE Inspection Results (if any), Owner/Operator Information, etc.:

Pipe coating has completely failed both inside the tank farm and outside. Tank farm was found with 3 to 4 inches of standing water which leaves piping partially submerged for an unknown amount of time during the summer months. No monthly or annual inspections documented per the operator. Piping corrosion is class 4.

Performed By

Name/Company:	*Eric Weiler Taku Engineering*	Signature:	Date: *8-15-2018*
Name/Company:	*James Adams, QA Services*	Signature:	Date: *8-15-2018*

Photos or Site Sketches

Provide Photograph(s), Site Sketches and/or Aerial Information to Document Pipe Location & Damage Observed:

Typical tankfarm piping condition showing complete coating failure and generalized corrosion.

Photos or Site Sketches continued

Provide Photograph(s), Site Sketches and/or Aerial Information to Document Pipe Location & Damage Observed:

Typical tankfarm piping condition showing complete coating failure and generalized corrosion.

Photos or Site Sketches continued

Provide Photograph(s), Site Sketches and/or Aerial Information to Document Pipe Location & Damage Observed:

Low piping from marine header to tank farm. ~190 feet of piping is in contact with the ground or submerged for part of the year.

Pipe coating condition during 2010 inspection

Same pipe during 2018 inspection showing complete coating failure.

Photos or Site Sketches continued

Provide Photograph(s), Site Sketches and/or Aerial Information to Document Pipe Location & Damage Observed:

Dispenser containment drain valve found failed and leaking.

Cargo and service piping at dispenser transitioning to on grade.

APPENDIX D: PIPING NDE DATA

API 570 Evaluation

Owner:	City of Kwigillingok	[1]**Design Press *(P)*:**	285	[5]**Pipe Mat'l Coeff *(Y)*:**	0.4
Location:	Kwigillingok marina tank farm	[2]**Pipe Material:**	Unknown	**Date of Installation:**	1998
Description:	Cargo, service and header piping	[3]**Allowable Stress *(S)*:**	15000	[7]**API 570 Insp Int:**	10 Years
Date of Insp:	August 14, 2018	[4]**Joint Efficiency *(E)*:**	0.85	**Next Inspection Year:**	2028

Calculation Formulas:

- Structural Minimum Required Wall Thickness: Per API 574, Table 6
- Pressure Design Thickness: Per ASME B31.3 -- $t_{min} = ((P \times D)/(2(SE+PY))$
- Long Term Corrosion Rate: Per API 570 -- $LT_{corr} = ((t_{initial} - t_{actual})$*/Years in Service)*
- Corrosion Loss at Next Inspection: $= LT_{corr}$ *x No. of Yrs to Next Inspection*
- Remaining Life: Per API 570 -- $RL = ((t_{actual} - t_{min})/Ltcorr)$
- Half-Life Inspection: Takes the lowest RL (structural vs pressure) and divides by 2.
- Next Inspection Year: Utilizes the lowest interval (API 570 Insp. Interval vs. Lowest Calculated Half-Life)

Inspection Point	Location	Year Installed	Nominal Pipe Size	[6]Pipe Schedule	Nominal Pipe OD *(D)*	Nominal Wall Thickness *($t_{initial}$)*	Years in Service	Structural Minimum Thickness (API 574)	Pressure Design Thickness (ASME B31.3)	O'Clock Position	UT Measured Thickness *(t_{actual})*	Greatest External Corrosion Depth *(If Present)*	Minimum Remaining Wall Thickness	Long Term Corrosion Rate (inches per year)	Corrosion Loss at Next Inspection (a)	*RL* Remaining Life (structural)	*RL* Remaining Life (pressure)	Calculated Half-Life Inspection (Years)	MAWP at Next Inspection
3" Gasoline																			
1	3" US of 1st pipe elbow weld	1998	3	80	3.500"	0.300"	20	0.090"	0.039"	12:00	0.300"	0.015"	0.285"	0.001	0.008"	280 Yrs.	348 Yrs.	140	2076.4
										3:00	0.302"	0.015"	0.287"	0.001	0.007"	326 Yrs.	405 Yrs.	163	2105.6
										6:00	0.309"	0.015"	0.294"	0.000	0.003"	730 Yrs.	901 Yrs.	365	2207.6
										9:00	0.305"	0.015"	0.290"	0.001	0.005"	430 Yrs.	532 Yrs.	215	2149.3
2	45° vert to horizontal	1998	3	80	3.500"	0.300"	20	0.090"	0.039"	12:00	0.316"	0.015"	0.301"	N/A	N/A	N/A	N/A	N/A	N/A
										3:00	0.306"	0.015"	0.291"	0.000	0.005"	480 Yrs.	594 Yrs.	240	2163.9
										6:00	0.309"	0.015"	0.294"	0.000	0.003"	730 Yrs.	901 Yrs.	365	2207.6
										9:00	0.309"	0.015"	0.294"	0.000	0.003"	730 Yrs.	901 Yrs.	365	2207.6
3	4th ell	1998	3	80	3.500"	0.300"	20	0.090"	0.039"	12:00	0.308"	0.015"	0.293"	0.000	0.004"	623 Yrs.	769 Yrs.	311	2193.0
										3:00	0.308"	0.015"	0.293"	0.000	0.004"	623 Yrs.	769 Yrs.	311	2193.0
										6:00	0.290"	0.015"	0.275"	0.001	0.013"	160 Yrs.	201 Yrs.	80	1930.7
										9:00	0.313"	0.015"	0.298"	0.000	0.001"	2230 Yrs.	2742 Yrs.	1115	2265.9
3A	6 feet past 4th ell	1998	3	80	3.500"	0.300"	20	0.090"	0.039"	12:00	0.295"	0.015"	0.280"	0.001	0.010"	205 Yrs.	256 Yrs.	103	2003.6
										3:00	0.284"	0.015"	0.269"	0.002	0.016"	125 Yrs.	158 Yrs.	63	1843.3
										6:00	0.305"	0.015"	0.290"	0.001	0.005"	430 Yrs.	532 Yrs.	215	2149.3
										9:00	0.289"	0.015"	0.274"	0.001	0.013"	153 Yrs.	192 Yrs.	77	1916.1
4	31' 4" from 3" gas 4th ell	1998	3	80	3.500"	0.300"	20	0.090"	0.039"	12:00	0.300"	0.015"	0.285"	0.001	0.008"	280 Yrs.	348 Yrs.	140	2076.4
										3:00	0.303"	0.015"	0.288"	0.001	0.006"	355 Yrs.	440 Yrs.	178	2120.1
										6:00	0.302"	0.015"	0.287"	0.001	0.007"	326 Yrs.	405 Yrs.	163	2105.6
										9:00	scale	0.015"	NA	NA	NA	NA	NA	NA	NA
4A	43' - 9" from 3" gas 4th ell	1998	3	80	3.500"	0.300"	20	0.090"	0.039"	12:00	0.290"	0.015"	0.275"	0.001	0.013"	160 Yrs.	201 Yrs.	80	1930.7
										3:00	0.295"	0.015"	0.280"	0.001	0.010"	205 Yrs.	256 Yrs.	103	2003.6
										6:00	0.308"	0.015"	0.293"	0.000	0.004"	623 Yrs.	769 Yrs.	311	2193.0
										9:00	0.292"	0.015"	0.277"	0.001	0.012"	176 Yrs.	220 Yrs.	88	1959.9
5	93' 6" from 3" gas 4th ell	1998	3	80	3.500"	0.300"	20	0.090"	0.039"	12:00	0.305"	0.015"	0.290"	0.001	0.005"	430 Yrs.	532 Yrs.	215	2149.3
										3:00	0.305"	0.015"	0.290"	0.001	0.005"	430 Yrs.	532 Yrs.	215	2149.3
										6:00	0.296"	0.015"	0.281"	0.001	0.010"	217 Yrs.	271 Yrs.	108	2018.1
										9:00	0.309"	0.015"	0.294"	0.000	0.003"	730 Yrs.	901 Yrs.	365	2207.6
5A	123' 11" from 3" gas 4th ell	1998	3	80	3.500"	0.300"	20	0.090"	0.039"	12:00	0.302"	0.015"	0.287"	0.001	0.007"	326 Yrs.	405 Yrs.	163	2105.6
										3:00	0.289"	0.015"	0.274"	0.001	0.013"	153 Yrs.	192 Yrs.	77	1916.1
										6:00	0.305"	0.015"	0.290"	0.001	0.005"	430 Yrs.	532 Yrs.	215	2149.3
										9:00	0.322"	0.015"	0.307"	N/A	N/A	N/A	N/A	N/A	N/A
6	45° ell up	1998	3	80	3.500"	0.300"	20	0.090"	0.039"	12:00	0.319"	0.015"	0.304"	N/A	N/A	N/A	N/A	N/A	N/A
										3:00	0.314"	0.015"	0.299"	0.000	0.001"	4480 Yrs.	5505 Yrs.	2240	2280.4
										6:00	0.274"	0.015"	0.259"	0.002	0.021"	90 Yrs.	115 Yrs.	45	1697.6
										9:00	0.248"	0.015"	0.233"	0.003	0.034"	47 Yrs.	62 Yrs.	24	1318.7
7	horiz 45° in front of old PP	1998	3	80	3.500"	0.300"	20	0.090"	0.039"	12:00	0.300"	0.015"	0.285"	0.001	0.008"	280 Yrs.	348 Yrs.	140	2076.4
										3:00	0.298"	0.015"	0.283"	0.001	0.009"	245 Yrs.	305 Yrs.	122	2047.3
										6:00	0.314"	0.015"	0.299"	0.000	0.001"	4480 Yrs.	5505 Yrs.	2240	2280.4
										9:00	0.315"	0.015"	0.300"	N/A	N/A	N/A	N/A	N/A	N/A
8	32' 5" from loc 7	1998	3	80	3.500"	0.300"	20	0.090"	0.039"	12:00	0.280"	0.015"	0.265"	0.002	0.018"	109 Yrs.	138 Yrs.	54	1785.0
										3:00	0.303"	0.015"	0.288"	0.001	0.006"	355 Yrs.	440 Yrs.	178	2120.1
										6:00	0.309"	0.015"	0.294"	0.000	0.003"	730 Yrs.	901 Yrs.	365	2207.6
										9:00	0.296"	0.015"	0.281"	0.001	0.010"	217 Yrs.	271 Yrs.	108	2018.1
9	@ 2" cross over to emergency dispenser/council tank	1998	3	80	3.500"	0.300"	20	0.090"	0.039"	12:00	0.306"	0.015"	0.291"	0.000	0.005"	480 Yrs.	594 Yrs.	240	2163.9
										3:00	0.313"	0.015"	0.298"	0.000	0.001"	2230 Yrs.	2742 Yrs.	1115	2265.9
										6:00	0.312"	0.015"	0.297"	0.000	0.002"	1480 Yrs.	1822 Yrs.	740	2251.3
										9:00	0.295"	0.015"	0.280"	0.001	0.010"	205 Yrs.	256 Yrs.	103	2003.6
10	@ 30°bend horiz to up	1998	3	80	3.500"	0.300"	20	0.090"	0.039"	12:00	0.309"	0.015"	0.294"	0.000	0.003"	730 Yrs.	901 Yrs.	365	2207.6
										3:00	0.300"	0.015"	0.285"	0.001	0.008"	280 Yrs.	348 Yrs.	140	2076.4
										6:00	0.306"	0.015"	0.291"	0.000	0.005"	480 Yrs.	594 Yrs.	240	2163.9
										9:00	0.306"	0.015"	0.291"	0.000	0.005"	480 Yrs.	594 Yrs.	240	2163.9
11	1" US of 1st pipe to ell weld up	1998	3	80	3.500"	0.300"	20	0.090"	0.039"	12:00	0.299"	0.015"	0.284"	0.001	0.008"	261 Yrs.	325 Yrs.	131	2061.9
										3:00	0.296"	0.015"	0.281"	0.001	0.010"	217 Yrs.	271 Yrs.	108	2018.1
										6:00	0.300"	0.015"	0.285"	0.001	0.008"	280 Yrs.	348 Yrs.	140	2076.4
										9:00	0.299"	0.015"	0.284"	0.001	0.008"	261 Yrs.	325 Yrs.	131	2061.9
12	1" DS of 1st pipe to ell weld	1998	3	40	3.500"	0.216"	20	0.090"	0.039"	12:00	0.232"	0.015"	0.217"	N/A	N/A	N/A	N/A	N/A	N/A
										3:00	0.226"	0.015"	0.211"	0.000	0.002"	544 Yrs.	749 Yrs.	272	1610.1
										6:00	0.226"	0.015"	0.211"	0.000	0.002"	544 Yrs.	749 Yrs.	272	1610.1
										9:00	0.228"	0.015"	0.213"	0.000	0.001"	920 Yrs.	1262 Yrs.	460	1639.3
13	1" DS of vert to Horizontal eklbow weld at TF fence.	1998	3	40	3.500"	0.216"	20	0.090"	0.039"	12:00	0.225"	0.015"	0.210"	0.000	0.003"	450 Yrs.	621 Yrs.	225	1595.6
										3:00	0.223"	0.015"	0.208"	0.000	0.004"	333 Yrs.	461 Yrs.	166	1566.4
										6:00	0.216"	0.015"	0.201"	0.001	0.007"	168 Yrs.	236 Yrs.	84	1464.4
										9:00	0.216"	0.015"	0.201"	0.001	0.007"	168 Yrs.	236 Yrs.	84	1464.4
										12:00	0.284"	0.015"	0.269"	0.002	0.016"	125 Yrs.	158 Yrs.	63	1843.3

API 570 Evaluation

Inspection Point	Location	Year Installed	Nominal Pipe Size	[6]Pipe Schedule	Nominal Pipe OD *(D)*	Nominal Wall Thickness *($t_{initial}$)*	Years in Service	Structural Minimum Thickness (API 574)	Pressure Design Thickness (ASME B31.3)	O'Clock Position	UT Measured Thickness *(t_{actual})*	Greatest External Corrosion Depth *(If Present)*	Minimum Remaining Wall Thickness	Long Term Corrosion Rate (inches per year)	Corrosion Loss at Next Inspection (a)	*RL* Remaining Life (structural)	*RL* Remaining Life (pressure)	Calculated Half-Life Inspection (Years)	MAWP at Next Inspection
14	Diagonal on TF side of the the valves, 6" from 45 deg elbow to pipe weld	1998	3	80	3.500"	0.300"	20	0.090"	0.039"	3:00	0.280"	0.015"	0.265"	0.002	0.018"	109 Yrs.	138 Yrs.	54	1785.0
										6:00	0.299"	0.015"	0.284"	0.001	0.008"	261 Yrs.	325 Yrs.	131	2061.9
										9:00	0.309"	0.015"	0.294"	0.000	0.003"	730 Yrs.	901 Yrs.	365	2207.6
15	1" before ell to pipe weld	1998	3	80	3.500"	0.300"	20	0.090"	0.039"	12:00	0.298"	0.015"	0.283"	0.001	0.009"	245 Yrs.	305 Yrs.	122	2047.3
										3:00	0.300"	0.015"	0.285"	0.001	0.008"	280 Yrs.	348 Yrs.	140	2076.4
										6:00	0.302"	0.015"	0.287"	0.001	0.007"	326 Yrs.	405 Yrs.	163	2105.6
										9:00	0.295"	0.015"	0.280"	0.001	0.010"	205 Yrs.	256 Yrs.	103	2003.6
16	2" supply vert to horiz 90° from day tank	1998	3	80	3.500"	0.300"	20	0.090"	0.039"	12:00	0.299"	0.015"	0.284"	0.001	0.008"	261 Yrs.	325 Yrs.	131	2061.9
										3:00	0.299"	0.015"	0.284"	0.001	0.008"	261 Yrs.	325 Yrs.	131	2061.9
										6:00	0.308"	0.015"	0.293"	0.000	0.004"	623 Yrs.	769 Yrs.	311	2193.0
										9:00	0.289"	0.015"	0.274"	0.001	0.013"	153 Yrs.	192 Yrs.	77	1916.1
17	1" before horiz 90°	1998	3	80	3.500"	0.300"	20	0.090"	0.039"	12:00	0.309"	0.015"	0.294"	0.000	0.003"	730 Yrs.	901 Yrs.	365	2207.6
										3:00	0.286"	0.015"	0.271"	0.001	0.015"	135 Yrs.	171 Yrs.	68	1872.4
										6:00	0.311"	0.015"	0.296"	0.000	0.002"	1105 Yrs.	1361 Yrs.	553	2236.7
										9:00	0.312"	0.015"	0.297"	0.000	0.002"	1480 Yrs.	1822 Yrs.	740	2251.3
18	1" before tee vert to tk 11 pressure relief	1998	3	80	3.500"	0.300"	20	0.090"	0.039"	12:00	0.309"	0.015"	0.294"	0.000	0.003"	730 Yrs.	901 Yrs.	365	2207.6
										3:00	0.295"	0.015"	0.280"	0.001	0.010"	205 Yrs.	256 Yrs.	103	2003.6
										6:00	0.299"	0.015"	0.284"	0.001	0.008"	261 Yrs.	325 Yrs.	131	2061.9
										9:00	0.303"	0.015"	0.288"	0.001	0.006"	355 Yrs.	440 Yrs.	178	2120.1
19	mid 90° ell on tank side of block valve	1998	3	40	3.500"	0.216"	20	0.090"	0.039"	12:00	0.230"	0.015"	0.215"	0.000	0.000"	2800 Yrs.	3825 Yrs.	1400	1668.4
										3:00	0.227"	0.015"	0.212"	0.000	0.002"	685 Yrs.	941 Yrs.	343	1624.7
										6:00	0.216"	0.015"	0.201"	0.001	0.007"	168 Yrs.	236 Yrs.	84	1464.4
										9:00	0.215"	0.015"	0.200"	0.001	0.008"	156 Yrs.	220 Yrs.	78	1449.9
20	1" before horiz to vert 90° @ tk 12	1998	3	40	3.500"	0.216"	20	0.090"	0.039"	12:00	0.223"	0.015"	0.208"	0.000	0.004"	333 Yrs.	461 Yrs.	166	1566.4
										3:00	0.220"	0.015"	0.205"	0.001	0.005"	236 Yrs.	330 Yrs.	118	1522.7
										6:00	0.223"	0.015"	0.208"	0.000	0.004"	333 Yrs.	461 Yrs.	166	1566.4
										9:00	0.225"	0.015"	0.210"	0.000	0.003"	450 Yrs.	621 Yrs.	225	1595.6
21	mid 90° ell on tank side of blk valve	1998	3	40	3.500"	0.216"	20	0.090"	0.039"	12:00	0.238"	0.015"	0.223"	N/A	N/A	N/A	N/A	N/A	N/A
										3:00	0.235"	0.015"	0.220"	N/A	N/A	N/A	N/A	N/A	N/A
										6:00	0.235"	0.015"	0.220"	N/A	N/A	N/A	N/A	N/A	N/A
										9:00	0.230"	0.015"	0.215"	0.000	0.000"	2800 Yrs.	3825 Yrs.	1400	1668.4

API 570 Evaluation

Inspection Point	Location	Year Installed	Nominal Pipe Size	[6]Pipe Schedule	Nominal Pipe OD *(D)*	Nominal Wall Thickness *(t initial)*	Years in Service	Structural Minimum Thickness (API 574)	Pressure Design Thickness (ASME B31.3)	O'Clock Position	UT Measured Thickness *(t actual)*	Greatest External Corrosion Depth *(If Present)*	Minimum Remaining Wall Thickness	Long Term Corrosion Rate (inches per year)	Corrosion Loss at Next Inspection (a)	*RL* Remaining Life (structural)	*RL* Remaining Life (pressure)	Calculated Half-Life Inspection (Years)	MAWP at Next Inspection
						3" Diesel													
1	3" US of 1st pipe elbow weld	1998	3	80	3.500"	0.300"	20	0.090"	0.039"	12:00	0.308"	0.015"	0.293"	0.000	0.004"	623 Yrs.	769 Yrs.	311	2193.0
										3:00	0.300"	0.015"	0.285"	0.001	0.008"	280 Yrs.	348 Yrs.	140	2076.4
										6:00	0.305"	0.015"	0.290"	0.001	0.005"	430 Yrs.	532 Yrs.	215	2149.3
										9:00	0.300"	0.015"	0.285"	0.001	0.008"	280 Yrs.	348 Yrs.	140	2076.4
2	45° vert to horizontal	1998	3	80	3.500"	0.300"	20	0.090"	0.039"	12:00	0.327"	0.015"	0.312"	N/A	N/A	N/A	N/A	N/A	N/A
										3:00	0.255"	0.015"	0.240"	0.003	0.030"	55 Yrs.	72 Yrs.	28	1420.7
										6:00	0.303"	0.015"	0.288"	0.001	0.006"	355 Yrs.	440 Yrs.	178	2120.1
										9:00	0.295"	0.015"	0.280"	0.001	0.010"	205 Yrs.	256 Yrs.	103	2003.6
3	4th ell	1998	3	80	3.500"	0.300"	20	0.090"	0.039"	12:00	0.312"	0.015"	0.297"	0.000	0.002"	1480 Yrs.	1822 Yrs.	740	2251.3
										3:00	0.308"	0.015"	0.293"	0.000	0.004"	623 Yrs.	769 Yrs.	311	2193.0
										6:00	0.305"	0.015"	0.290"	0.001	0.005"	430 Yrs.	532 Yrs.	215	2149.3
										9:00	0.327"	0.015"	0.312"	N/A	N/A	N/A	N/A	N/A	N/A
3A	6 feet past 4th ell	1998	3	80	3.500"	0.300"	20	0.090"	0.039"	12:00	0.303"	0.015"	0.288"	0.001	0.006"	355 Yrs.	440 Yrs.	178	2120.1
										3:00	0.295"	0.015"	0.280"	0.001	0.010"	205 Yrs.	256 Yrs.	103	2003.6
										6:00	0.290"	0.015"	0.275"	0.001	0.013"	160 Yrs.	201 Yrs.	80	1930.7
										9:00	0.309"	0.015"	0.294"	0.000	0.003"	730 Yrs.	901 Yrs.	365	2207.6
4	31' 4" from 3" gas 4th ell	1998	3	80	3.500"	0.300"	20	0.090"	0.039"	12:00	0.303"	0.015"	0.288"	0.001	0.006"	355 Yrs.	440 Yrs.	178	2120.1
										3:00	0.312"	0.015"	0.297"	0.000	0.002"	1480 Yrs.	1822 Yrs.	740	2251.3
										6:00	0.302"	0.015"	0.287"	0.001	0.007"	326 Yrs.	405 Yrs.	163	2105.6
										9:00	0.292"	0.015"	0.277"	0.001	0.012"	176 Yrs.	220 Yrs.	88	1959.9
4A	43' - 9" from 3" gas 4th ell	1998	3	80	3.500"	0.300"	20	0.090"	0.039"	12:00	0.305"	0.015"	0.290"	0.001	0.005"	430 Yrs.	532 Yrs.	215	2149.3
										3:00	0.308"	0.015"	0.293"	0.000	0.004"	623 Yrs.	769 Yrs.	311	2193.0
										6:00	0.308"	0.015"	0.293"	0.000	0.004"	623 Yrs.	769 Yrs.	311	2193.0
										9:00	0.302"	0.015"	0.287"	0.001	0.007"	326 Yrs.	405 Yrs.	163	2105.6
5	93' 6" from 3" gas 4th ell	1998	3	80	3.500"	0.300"	20	0.090"	0.039"	12:00	0.300"	0.015"	0.285"	0.001	0.008"	280 Yrs.	348 Yrs.	140	2076.4
										3:00	0.303"	0.015"	0.288"	0.001	0.006"	355 Yrs.	440 Yrs.	178	2120.1
										6:00	0.305"	0.015"	0.290"	0.001	0.005"	430 Yrs.	532 Yrs.	215	2149.3
										9:00	0.295"	0.015"	0.280"	0.001	0.010"	205 Yrs.	256 Yrs.	103	2003.6
5A	123' 11" from 3" gas 4th ell	1998	3	80	3.500"	0.300"	20	0.090"	0.039"	12:00	0.287"	0.015"	0.272"	0.001	0.014"	141 Yrs.	177 Yrs.	70	1887.0
										3:00	0.289"	0.015"	0.274"	0.001	0.013"	153 Yrs.	192 Yrs.	77	1916.1
										6:00	0.299"	0.015"	0.284"	0.001	0.008"	261 Yrs.	325 Yrs.	131	2061.9
										9:00	0.299"	0.015"	0.284"	0.001	0.008"	261 Yrs.	325 Yrs.	131	2061.9
6	45° ell up	1998	3	80	3.500"	0.300"	20	0.090"	0.039"	12:00	0.317"	0.015"	0.302"	N/A	N/A	N/A	N/A	N/A	N/A
										3:00	0.308"	0.015"	0.293"	0.000	0.004"	623 Yrs.	769 Yrs.	311	2193.0
										6:00	0.290"	0.015"	0.275"	0.001	0.013"	160 Yrs.	201 Yrs.	80	1930.7
										9:00	0.299"	0.015"	0.284"	0.001	0.008"	261 Yrs.	325 Yrs.	131	2061.9
7	horiz 45° in front of old PP	1998	3	80	3.500"	0.300"	20	0.090"	0.039"	12:00	0.290"	0.015"	0.275"	0.001	0.013"	160 Yrs.	201 Yrs.	80	1930.7
										3:00	0.305"	0.015"	0.290"	0.001	0.005"	430 Yrs.	532 Yrs.	215	2149.3
										6:00	0.305"	0.015"	0.290"	0.001	0.005"	430 Yrs.	532 Yrs.	215	2149.3
										9:00	0.319"	0.015"	0.304"	N/A	N/A	N/A	N/A	N/A	N/A
8	32' 5" from loc 7	1998	3	80	3.500"	0.300"	20	0.090"	0.039"	12:00	0.305"	0.015"	0.290"	0.001	0.005"	430 Yrs.	532 Yrs.	215	2149.3
										3:00	0.308"	0.015"	0.293"	0.000	0.004"	623 Yrs.	769 Yrs.	311	2193.0
										6:00	0.315"	0.015"	0.300"	N/A	N/A	N/A	N/A	N/A	N/A
										9:00	0.309"	0.015"	0.294"	0.000	0.003"	730 Yrs.	901 Yrs.	365	2207.6
9	@ 2" cross over to emergency dispenser/council tank	1998	3	80	3.500"	0.300"	20	0.090"	0.039"	12:00	0.297"	0.015"	0.282"	0.001	0.009"	230 Yrs.	287 Yrs.	115	2032.7
										3:00	0.305"	0.015"	0.290"	0.001	0.005"	430 Yrs.	532 Yrs.	215	2149.3
										6:00	0.303"	0.015"	0.288"	0.001	0.006"	355 Yrs.	440 Yrs.	178	2120.1
										9:00	0.296"	0.015"	0.281"	0.001	0.010"	217 Yrs.	271 Yrs.	108	2018.1
10	@ 30°bend horiz to up	1998	3	80	3.500"	0.300"	20	0.090"	0.039"	12:00	0.316"	0.015"	0.301"	N/A	N/A	N/A	N/A	N/A	N/A
										3:00	0.312"	0.015"	0.297"	0.000	0.002"	1480 Yrs.	1822 Yrs.	740	2251.3
										6:00	0.314"	0.015"	0.299"	0.000	0.001"	4480 Yrs.	5505 Yrs.	2240	2280.4
										9:00	0.314"	0.015"	0.299"	0.000	0.001"	4480 Yrs.	5505 Yrs.	2240	2280.4
11	1" US of 1st pipe to ell weld up	1998	3	80	3.500"	0.300"	20	0.090"	0.039"	12:00	0.305"	0.015"	0.290"	0.001	0.005"	430 Yrs.	532 Yrs.	215	2149.3
										3:00	0.306"	0.015"	0.291"	0.000	0.005"	480 Yrs.	594 Yrs.	240	2163.9
										6:00	0.314"	0.015"	0.299"	0.000	0.001"	4480 Yrs.	5505 Yrs.	2240	2280.4
										9:00	0.314"	0.015"	0.299"	0.000	0.001"	4480 Yrs.	5505 Yrs.	2240	2280.4
12	1" DS of 1st pipe to ell weld	1998	3	40	3.500"	0.216"	20	0.090"	0.039"	12:00	0.233"	0.015"	0.218"	N/A	N/A	N/A	N/A	N/A	N/A
										3:00	0.228"	0.015"	0.213"	0.000	0.001"	920 Yrs.	1262 Yrs.	460	1639.3
										6:00	0.213"	0.015"	0.198"	0.001	0.009"	137 Yrs.	194 Yrs.	68	1420.7
										9:00	0.226"	0.015"	0.211"	0.000	0.002"	544 Yrs.	749 Yrs.	272	1610.1
13	1" DS of vert to Horizontal eklbow weld at TF fence.	1998	3	40	3.500"	0.216"	20	0.090"	0.039"	12:00	0.216"	0.015"	0.201"	0.001	0.007"	168 Yrs.	236 Yrs.	84	1464.4
										3:00	0.224"	0.015"	0.209"	0.000	0.003"	383 Yrs.	529 Yrs.	191	1581.0
										6:00	0.219"	0.015"	0.204"	0.001	0.006"	215 Yrs.	300 Yrs.	108	1508.1
										9:00	0.214"	0.015"	0.199"	0.001	0.008"	146 Yrs.	206 Yrs.	73	1435.3
14	Diagonal on TF side of the the valves, 6" from 45 deg elbow to pipe weld	1998	3	80	3.500"	0.300"	20	0.090"	0.039"	12:00	0.309"	0.015"	0.294"	0.000	0.003"	730 Yrs.	901 Yrs.	365	2207.6
										3:00	0.296"	0.015"	0.281"	0.001	0.010"	217 Yrs.	271 Yrs.	108	2018.1
										6:00	0.313"	0.015"	0.298"	0.000	0.001"	2230 Yrs.	2742 Yrs.	1115	2265.9
										9:00	0.290"	0.015"	0.275"	0.001	0.013"	160 Yrs.	201 Yrs.	80	1930.7
15	1" before ell to pipe weld	1998	3	80	3.500"	0.300"	20	0.090"	0.039"	12:00	0.308"	0.015"	0.293"	0.000	0.004"	623 Yrs.	769 Yrs.	311	2193.0
										3:00	0.283"	0.015"	0.268"	0.002	0.016"	121 Yrs.	153 Yrs.	60	1828.7
										6:00	0.296"	0.015"	0.281"	0.001	0.010"	217 Yrs.	271 Yrs.	108	2018.1
										9:00	0.296"	0.015"	0.281"	0.001	0.010"	217 Yrs.	271 Yrs.	108	2018.1
16	2" supply vert to horiz 90° from day tank	1998	3	80	3.500"	0.300"	20	0.090"	0.039"	12:00	0.302"	0.015"	0.287"	0.001	0.007"	326 Yrs.	405 Yrs.	163	2105.6
										3:00	0.295"	0.015"	0.280"	0.001	0.010"	205 Yrs.	256 Yrs.	103	2003.6
										6:00	0.308"	0.015"	0.293"	0.000	0.004"	623 Yrs.	769 Yrs.	311	2193.0
										9:00	0.305"	0.015"	0.290"	0.001	0.005"	430 Yrs.	532 Yrs.	215	2149.3
										12:00	0.302"	0.015"	0.287"	0.001	0.007"	326 Yrs.	405 Yrs.	163	2105.6

Inspection Point	Location	Year Installed	Nominal Pipe Size	[6]Pipe Schedule	Nominal Pipe OD *(D)*	Nominal Wall Thickness *($t_{initial}$)*	Years in Service	Structural Minimum Thickness (API 574)	Pressure Design Thickness (ASME B31.3)	O'Clock Position	UT Measured Thickness *(t_{actual})*	Greatest External Corrosion Depth *(If Present)*	Minimum Remaining Wall Thickness	Long Term Corrosion Rate (inches per year)	Corrosion Loss at Next Inspection (a)	*RL* Remaining Life (structural)	*RL* Remaining Life (pressure)	Calculated Half-Life Inspection (Years)	MAWP at Next Inspection
22	1" before tee to small tanks	1998	3	80	3.500"	0.300"	20	0.090"	0.039"	3:00	0.300"	0.015"	0.285"	0.001	0.008"	280 Yrs.	348 Yrs.	140	2076.4
										6:00	0.305"	0.015"	0.290"	0.001	0.005"	430 Yrs.	532 Yrs.	215	2149.3
										9:00	0.300"	0.015"	0.285"	0.001	0.008"	280 Yrs.	348 Yrs.	140	2076.4
23	1" past vert tee to vert tanks	1998	3	40	3.500"	0.216"	20	0.090"	0.039"	12:00	0.219"	0.015"	0.204"	0.001	0.006"	215 Yrs.	300 Yrs.	108	1508.1
										3:00	0.222"	0.015"	0.207"	0.000	0.004"	293 Yrs.	407 Yrs.	147	1551.9
										6:00	0.219"	0.015"	0.204"	0.001	0.006"	215 Yrs.	300 Yrs.	108	1508.1
										9:00	0.225"	0.015"	0.210"	0.000	0.003"	450 Yrs.	621 Yrs.	225	1595.6
24	90° into flex for tkk 10 fill	1998	3	40	3.500"	0.216"	20	0.090"	0.039"	12:00	0.229"	0.015"	0.214"	0.000	0.001"	1390 Yrs.	1902 Yrs.	695	1653.9
										3:00	0.226"	0.015"	0.211"	0.000	0.002"	544 Yrs.	749 Yrs.	272	1610.1
										6:00	0.238"	0.015"	0.223"	N/A	N/A	N/A	N/A	N/A	N/A
										9:00	0.244"	0.015"	0.229"	N/A	N/A	N/A	N/A	N/A	N/A
25	90° past block valve into tk 10	1998	3	40	3.500"	0.216"	20	0.090"	0.039"	12:00	0.228"	0.015"	0.213"	0.000	0.001"	920 Yrs.	1262 Yrs.	460	1639.3
										3:00	0.222"	0.015"	0.207"	0.000	0.004"	293 Yrs.	407 Yrs.	147	1551.9
										6:00	0.223"	0.015"	0.208"	0.000	0.004"	333 Yrs.	461 Yrs.	166	1566.4
										9:00	0.225"	0.015"	0.210"	0.000	0.003"	450 Yrs.	621 Yrs.	225	1595.6
26	1" past vert to horiz ell @ tk106	1998	3	40	3.500"	0.216"	20	0.090"	0.039"	12:00	0.210"	0.015"	0.195"	0.001	0.011"	114 Yrs.	163 Yrs.	57	1377.0
										3:00	0.215"	0.015"	0.200"	0.001	0.008"	156 Yrs.	220 Yrs.	78	1449.9
										6:00	0.217"	0.015"	0.202"	0.001	0.007"	181 Yrs.	255 Yrs.	91	1479.0
										9:00	0.223"	0.015"	0.208"	0.000	0.004"	333 Yrs.	461 Yrs.	166	1566.4
27	1" before horiz 90°to tk 7	1998	3	40	3.500"	0.216"	20	0.090"	0.039"	12:00	0.222"	0.015"	0.207"	0.000	0.004"	293 Yrs.	407 Yrs.	147	1551.9
										3:00	0.219"	0.015"	0.204"	0.001	0.006"	215 Yrs.	300 Yrs.	108	1508.1
										6:00	0.219"	0.015"	0.204"	0.001	0.006"	215 Yrs.	300 Yrs.	108	1508.1
										9:00	0.207"	0.015"	0.192"	0.001	0.012"	98 Yrs.	140 Yrs.	49	1333.3
28	horiz ell between tk 7 & tk 8	1998	3	40	3.500"	0.216"	20	0.090"	0.039"	12:00	0.244"	0.015"	0.229"	N/A	N/A	N/A	N/A	N/A	N/A
										3:00	0.222"	0.015"	0.207"	0.000	0.004"	293 Yrs.	407 Yrs.	147	1551.9
										6:00	0.223"	0.015"	0.208"	0.000	0.004"	333 Yrs.	461 Yrs.	166	1566.4
										9:00	0.235"	0.015"	0.220"	N/A	N/A	N/A	N/A	N/A	N/A
29	1" before vert 90° to tk 9	1998	3	40	3.500"	0.216"	20	0.090"	0.039"	12:00	0.234"	0.015"	0.219"	N/A	N/A	N/A	N/A	N/A	N/A
										3:00	0.228"	0.015"	0.213"	0.000	0.001"	920 Yrs.	1262 Yrs.	460	1639.3
										6:00	0.216"	0.015"	0.201"	0.001	0.007"	168 Yrs.	236 Yrs.	84	1464.4
										9:00	0.220"	0.015"	0.205"	0.001	0.005"	236 Yrs.	330 Yrs.	118	1522.7
30	1" US of ball valve to tks 2-5 (flange to pipe)	1998	3	40	3.500"	0.216"	20	0.090"	0.039"	12:00	0.217"	0.015"	0.202"	0.001	0.007"	181 Yrs.	255 Yrs.	91	1479.0
										3:00	0.223"	0.015"	0.208"	0.000	0.004"	333 Yrs.	461 Yrs.	166	1566.4
										6:00	0.219"	0.015"	0.204"	0.001	0.006"	215 Yrs.	300 Yrs.	108	1508.1
										9:00	0.216"	0.015"	0.201"	0.001	0.007"	168 Yrs.	236 Yrs.	84	1464.4
31	pup @ tank 2 shell	1998	3	40	3.500"	0.216"	20	0.090"	0.039"	12:00	0.210"	0.015"	0.195"	0.001	0.011"	114 Yrs.	163 Yrs.	57	1377.0
										3:00	0.226"	0.015"	0.211"	0.000	0.002"	544 Yrs.	749 Yrs.	272	1610.1
										6:00	0.223"	0.015"	0.208"	0.000	0.004"	333 Yrs.	461 Yrs.	166	1566.4
										9:00	0.200"	0.015"	0.185"	0.002	0.016"	71 Yrs.	104 Yrs.	35	1231.3
32	1" before vert tee to tk 4	1998	3	40	3.500"	0.216"	20	0.090"	0.039"	12:00	0.217"	0.015"	0.202"	0.001	0.007"	181 Yrs.	255 Yrs.	91	1479.0
										3:00	0.213"	0.015"	0.198"	0.001	0.009"	137 Yrs.	194 Yrs.	68	1420.7
										6:00	0.213"	0.015"	0.198"	0.001	0.009"	137 Yrs.	194 Yrs.	68	1420.7
										9:00	0.223"	0.015"	0.208"	0.000	0.004"	333 Yrs.	461 Yrs.	166	1566.4
33	pup @ tk 3 shell	1998	3	40	3.500"	0.216"	20	0.090"	0.039"	12:00	0.225"	0.015"	0.210"	0.000	0.003"	450 Yrs.	621 Yrs.	225	1595.6
										3:00	0.210"	0.015"	0.195"	0.001	0.011"	114 Yrs.	163 Yrs.	57	1377.0
										6:00	0.222"	0.015"	0.207"	0.000	0.004"	293 Yrs.	407 Yrs.	147	1551.9
										9:00	0.220"	0.015"	0.205"	0.001	0.005"	236 Yrs.	330 Yrs.	118	1522.7
34	1" before vert 90° to tk 5	1998	3	40	3.500"	0.216"	20	0.090"	0.039"	12:00	0.213"	0.015"	0.198"	0.001	0.009"	137 Yrs.	194 Yrs.	68	1420.7
										3:00	0.219"	0.015"	0.204"	0.001	0.006"	215 Yrs.	300 Yrs.	108	1508.1
										6:00	0.229"	0.015"	0.214"	0.000	0.001"	1390 Yrs.	1902 Yrs.	695	1653.9
										9:00	0.219"	0.015"	0.204"	0.001	0.006"	215 Yrs.	300 Yrs.	108	1508.1
35	pup @ tk 4 shell	1998	3	40	3.500"	0.216"	20	0.090"	0.039"	12:00	0.229"	0.015"	0.214"	0.000	0.001"	1390 Yrs.	1902 Yrs.	695	1653.9
										3:00	0.230"	0.015"	0.215"	0.000	0.000"	2800 Yrs.	3825 Yrs.	1400	1668.4
										6:00	0.228"	0.015"	0.213"	0.000	0.001"	920 Yrs.	1262 Yrs.	460	1639.3
										9:00	0.217"	0.015"	0.202"	0.001	0.007"	181 Yrs.	255 Yrs.	91	1479.0
36	1" before vert 90° to tk 5	1998	3	40	3.500"	0.216"	20	0.090"	0.039"	12:00	0.225"	0.015"	0.210"	0.000	0.003"	450 Yrs.	621 Yrs.	225	1595.6
										3:00	0.220"	0.015"	0.205"	0.001	0.005"	236 Yrs.	330 Yrs.	118	1522.7
										6:00	0.225"	0.015"	0.210"	0.000	0.003"	450 Yrs.	621 Yrs.	225	1595.6
										9:00	0.223"	0.015"	0.208"	0.000	0.004"	333 Yrs.	461 Yrs.	166	1566.4
37	pup @ tk 5 shell	1998	3	40	3.500"	0.216"	20	0.090"	0.039"	12:00	0.232"	0.015"	0.217"	N/A	N/A	N/A	N/A	N/A	N/A
										3:00	0.206"	0.015"	0.191"	0.001	0.013"	93 Yrs.	134 Yrs.	46	1318.7
										6:00	0.215"	0.015"	0.200"	0.001	0.008"	156 Yrs.	220 Yrs.	78	1449.9
										9:00	0.213"	0.015"	0.198"	0.001	0.009"	137 Yrs.	194 Yrs.	68	1420.7
49	in TF 2" to day tank	1998	2	80	2.375"	0.218"	20	0.080"	0.026"	12:00	0.209"	0.015"	0.194"	0.001	0.012"	108 Yrs.	152 Yrs.	54	1986.3
										3:00	0.220"	0.015"	0.205"	0.001	0.006"	215 Yrs.	298 Yrs.	108	2222.5
										6:00	0.207"	0.015"	0.192"	0.001	0.013"	98 Yrs.	139 Yrs.	49	1943.4
										9:00	0.205"	0.015"	0.190"	0.001	0.014"	89 Yrs.	128 Yrs.	45	1900.4
50	1" before eccentric reducer to day tank pump	1998	2	80	2.375"	0.218"	20	0.080"	0.026"	12:00	0.220"	0.015"	0.205"	0.001	0.006"	215 Yrs.	298 Yrs.	108	2222.5
										3:00	0.220"	0.015"	0.205"	0.001	0.006"	215 Yrs.	298 Yrs.	108	2222.5
										6:00	0.205"	0.015"	0.190"	0.001	0.014"	89 Yrs.	128 Yrs.	45	1900.4
										9:00	0.225"	0.015"	0.210"	0.000	0.004"	363 Yrs.	497 Yrs.	181	2329.9

API 570 Evaluation

Inspection Point	Location	Year Installed	Nominal Pipe Size	[6]Pipe Schedule	Nominal Pipe OD *(D)*	Nominal Wall Thickness *(t initial)*	Years in Service	Structural Minimum Thickness (API 574)	Pressure Design Thickness (ASME B31.3)	O'Clock Position	UT Measured Thickness *(t actual)*	Greatest External Corrosion Depth *(If Present)*	Minimum Remaining Wall Thickness	Long Term Corrosion Rate (inches per year)	Corrosion Loss at Next Inspection (a)	*RL* Remaining Life (structural)	*RL* Remaining Life (pressure)	Calculated Half-Life Inspection (Years)	MAWP at Next Inspection
					2" Diesel														
1	3" US of 1st pipe elbow weld	1998	2	80	2.375"	0.218"	20	0.080"	0.026"	12:00	0.213"	0.015"	0.198"	0.001	0.010"	133 Yrs.	187 Yrs.	67	2072.2
										3:00	0.218"	0.015"	0.203"	0.001	0.007"	184 Yrs.	256 Yrs.	92	2179.6
										6:00	0.217"	0.015"	0.202"	0.001	0.008"	171 Yrs.	238 Yrs.	86	2158.1
										9:00	0.203"	0.015"	0.188"	0.002	0.015"	82 Yrs.	118 Yrs.	41	1857.5
2	45° vert to horizontal	1998	2	80	2.375"	0.218"	20	0.080"	0.026"	12:00	0.200"	0.015"	0.185"	0.002	0.017"	73 Yrs.	105 Yrs.	36	1793.1
										3:00	0.192"	0.015"	0.177"	0.002	0.021"	55 Yrs.	81 Yrs.	27	1621.3
										6:00	0.222"	0.015"	0.207"	0.001	0.005"	258 Yrs.	356 Yrs.	129	2265.5
										9:00	0.225"	0.015"	0.210"	0.000	0.004"	363 Yrs.	497 Yrs.	181	2329.9
3	4th ell	1998	2	80	2.375"	0.218"	20	0.080"	0.026"	12:00	0.189"	0.015"	0.174"	0.002	0.022"	50 Yrs.	74 Yrs.	25	1556.8
										3:00	0.183"	0.015"	0.168"	0.003	0.025"	41 Yrs.	63 Yrs.	21	1428.0
										6:00	0.185"	0.015"	0.170"	0.002	0.024"	44 Yrs.	66 Yrs.	22	1470.9
										9:00	0.220"	0.015"	0.205"	0.001	0.006"	215 Yrs.	298 Yrs.	108	2222.5
3A	6 feet past 4th ell	1998	2	80	2.375"	0.218"	20	0.080"	0.026"	12:00	0.206"	0.015"	0.191"	0.001	0.014"	93 Yrs.	133 Yrs.	47	1921.9
										3:00	0.211"	0.015"	0.196"	0.001	0.011"	119 Yrs.	168 Yrs.	60	2029.3
										6:00	0.200"	0.015"	0.185"	0.002	0.017"	73 Yrs.	105 Yrs.	36	1793.1
										9:00	0.220"	0.015"	0.205"	0.001	0.006"	215 Yrs.	298 Yrs.	108	2222.5
4	31' 4" from 3" gas 4th ell	1998	2	80	2.375"	0.218"	20	0.080"	0.026"	12:00	0.195"	0.015"	0.180"	0.002	0.019"	61 Yrs.	89 Yrs.	30	1685.7
										3:00	0.206"	0.015"	0.191"	0.001	0.014"	93 Yrs.	133 Yrs.	47	1921.9
										6:00	0.192"	0.015"	0.177"	0.002	0.021"	55 Yrs.	81 Yrs.	27	1621.3
										9:00	0.202"	0.015"	0.187"	0.002	0.016"	79 Yrs.	113 Yrs.	39	1836.0
4A	43' - 9" from 3" gas 4th ell	1998	2	80	2.375"	0.218"	20	0.080"	0.026"	12:00	0.220"	0.015"	0.205"	0.001	0.006"	215 Yrs.	298 Yrs.	108	2222.5
										3:00	0.209"	0.015"	0.194"	0.001	0.012"	108 Yrs.	152 Yrs.	54	1986.3
										6:00	0.219"	0.015"	0.204"	0.001	0.007"	199 Yrs.	275 Yrs.	99	2201.1
										9:00	0.217"	0.015"	0.202"	0.001	0.008"	171 Yrs.	238 Yrs.	86	2158.1
5	93' 6" from 3" gas 4th ell	1998	2	80	2.375"	0.218"	20	0.080"	0.026"	12:00	0.217"	0.015"	0.202"	0.001	0.008"	171 Yrs.	238 Yrs.	86	2158.1
										3:00	0.200"	0.015"	0.185"	0.002	0.017"	73 Yrs.	105 Yrs.	36	1793.1
										6:00	0.206"	0.015"	0.191"	0.001	0.014"	93 Yrs.	133 Yrs.	47	1921.9
										9:00	0.216"	0.015"	0.201"	0.001	0.008"	160 Yrs.	223 Yrs.	80	2136.6
5A	123' 11" from 3" gas 4th ell	1998	2	80	2.375"	0.218"	20	0.080"	0.026"	12:00	0.205"	0.015"	0.190"	0.001	0.014"	89 Yrs.	128 Yrs.	45	1900.4
										3:00	0.211"	0.015"	0.196"	0.001	0.011"	119 Yrs.	168 Yrs.	60	2029.3
										6:00	0.216"	0.015"	0.201"	0.001	0.008"	160 Yrs.	223 Yrs.	80	2136.6
										9:00	0.210"	0.015"	0.195"	0.001	0.012"	113 Yrs.	160 Yrs.	57	2007.8
6	45° ell up	1998	2	80	2.375"	0.218"	20	0.080"	0.026"	12:00	0.207"	0.015"	0.192"	0.001	0.013"	98 Yrs.	139 Yrs.	49	1943.4
										3:00	--	0.015"	NA	NA	NA	NA	NA	NA	NA
										6:00	--	0.015"	NA	N/A	N/A	N/A	N/A	N/A	N/A
										9:00	0.209"	0.015"	0.194"	0.001	0.012"	108 Yrs.	152 Yrs.	54	1986.3
7	horiz 45° in front of old PP	1998	2	80	2.375"	0.218"	20	0.080"	0.026"	12:00	0.220"	0.015"	0.205"	0.001	0.006"	215 Yrs.	298 Yrs.	108	2222.5
										3:00	0.196"	0.015"	0.181"	0.002	0.019"	63 Yrs.	92 Yrs.	31	1707.2
										6:00	0.209"	0.015"	0.194"	0.001	0.012"	108 Yrs.	152 Yrs.	54	1986.3
										9:00	0.210"	0.015"	0.195"	0.001	0.012"	113 Yrs.	160 Yrs.	57	2007.8
8	32' 5" from loc 7	1998	2	80	2.375"	0.218"	20	0.080"	0.026"	12:00	0.200"	0.015"	0.185"	0.002	0.017"	73 Yrs.	105 Yrs.	36	1793.1
										3:00	0.200"	0.015"	0.185"	0.002	0.017"	73 Yrs.	105 Yrs.	36	1793.1
										6:00	0.200"	0.015"	0.185"	0.002	0.017"	73 Yrs.	105 Yrs.	36	1793.1
										9:00	0.204"	0.015"	0.189"	0.001	0.015"	86 Yrs.	123 Yrs.	43	1878.9
9	@ 2" cross over to emergency dispenser/council tank	1998	2	80	2.375"	0.218"	20	0.080"	0.026"	12:00	0.219"	0.015"	0.204"	0.001	0.007"	199 Yrs.	275 Yrs.	99	2201.1
										3:00	0.201"	0.015"	0.186"	0.002	0.016"	76 Yrs.	109 Yrs.	38	1814.5
										6:00	0.198"	0.015"	0.183"	0.002	0.018"	67 Yrs.	98 Yrs.	34	1750.1
										9:00	0.198"	0.015"	0.183"	0.002	0.018"	67 Yrs.	98 Yrs.	34	1750.1
10	@ 30°bend horiz to up	1998	2	80	2.375"	0.218"	20	0.080"	0.026"	12:00	0.217"	0.015"	0.202"	0.001	0.008"	171 Yrs.	238 Yrs.	86	2158.1
										3:00	0.218"	0.015"	0.203"	0.001	0.007"	184 Yrs.	256 Yrs.	92	2179.6
										6:00	0.206"	0.015"	0.191"	0.001	0.014"	93 Yrs.	133 Yrs.	47	1921.9
										9:00	0.213"	0.015"	0.198"	0.001	0.010"	133 Yrs.	187 Yrs.	67	2072.2
11	1" US of 1st pipe to ell weld up	1998	2	80	2.375"	0.218"	20	0.080"	0.026"	12:00	0.212"	0.015"	0.197"	0.001	0.011"	126 Yrs.	177 Yrs.	63	2050.7
										3:00	0.198"	0.015"	0.183"	0.002	0.018"	67 Yrs.	98 Yrs.	34	1750.1
										6:00	0.216"	0.015"	0.201"	0.001	0.008"	160 Yrs.	223 Yrs.	80	2136.6
										9:00	0.219"	0.015"	0.204"	0.001	0.007"	199 Yrs.	275 Yrs.	99	2201.1
12	1" DS of 1st pipe to ell weld	1998	2	80	2.375"	0.218"	20	0.080"	0.026"	12:00	0.226"	0.015"	0.211"	0.000	0.003"	417 Yrs.	571 Yrs.	209	2351.4
										3:00	0.217"	0.015"	0.202"	0.001	0.008"	171 Yrs.	238 Yrs.	86	2158.1
										6:00	0.217"	0.015"	0.202"	0.001	0.008"	171 Yrs.	238 Yrs.	86	2158.1
										9:00	0.235"	0.015"	0.220"	N/A	N/A	N/A	N/A	N/A	N/A
13	1" DS of vert to Horizontal eklbow weld at TF fence.	1998	2	80	2.375"	0.218"	20	0.080"	0.026"	12:00	0.216"	0.015"	0.201"	0.001	0.008"	160 Yrs.	223 Yrs.	80	2136.6
										3:00	0.224"	0.015"	0.209"	0.000	0.004"	320 Yrs.	439 Yrs.	160	2308.4
										6:00	0.219"	0.015"	0.204"	0.001	0.007"	199 Yrs.	275 Yrs.	99	2201.1
										9:00	0.214"	0.015"	0.199"	0.001	0.009"	141 Yrs.	198 Yrs.	71	2093.7
14	Diagonal on TF side of the the valves, 6" from 45 deg elbow to pipe weld	1998	2	80	2.375"	0.218"	20	0.080"	0.026"	12:00	0.222"	0.015"	0.207"	0.001	0.005"	258 Yrs.	356 Yrs.	129	2265.5
										3:00	0.210"	0.015"	0.195"	0.001	0.012"	113 Yrs.	160 Yrs.	57	2007.8
										6:00	0.212"	0.015"	0.197"	0.001	0.011"	126 Yrs.	177 Yrs.	63	2050.7
										9:00	0.214"	0.015"	0.199"	0.001	0.009"	141 Yrs.	198 Yrs.	71	2093.7
15	1" before ell to pipe weld	1998	2	80	2.375"	0.218"	20	0.080"	0.026"	12:00	0.197"	0.015"	0.182"	0.002	0.018"	65 Yrs.	95 Yrs.	33	1728.6
										3:00	0.217"	0.015"	0.202"	0.001	0.008"	171 Yrs.	238 Yrs.	86	2158.1
										6:00	0.212"	0.015"	0.197"	0.001	0.011"	126 Yrs.	177 Yrs.	63	2050.7
										9:00	0.203"	0.015"	0.188"	0.002	0.015"	82 Yrs.	118 Yrs.	41	1857.5
16	2" supply vert to horiz 90° from day tank	1998	2	80	2.375"	0.218"	20	0.080"	0.026"	12:00	0.212"	0.015"	0.197"	0.001	0.011"	126 Yrs.	177 Yrs.	63	2050.7
										3:00	0.200"	0.015"	0.185"	0.002	0.017"	73 Yrs.	105 Yrs.	36	1793.1
										6:00	0.200"	0.015"	0.185"	0.002	0.017"	73 Yrs.	105 Yrs.	36	1793.1
										9:00	0.200"	0.015"	0.185"	0.002	0.017"	73 Yrs.	105 Yrs.	36	1793.1
					2" Gasoline														

API 570 Evaluation

Inspection Point	Location	Year Installed	Nominal Pipe Size	[6]Pipe Schedule	Nominal Pipe OD *(D)*	Nominal Wall Thickness *($t_{initial}$)*	Years in Service	Structural Minimum Thickness (API 574)	Pressure Design Thickness (ASME B31.3)	O'Clock Position	UT Measured Thickness *(t_{actual})*	Greatest External Corrosion Depth *(If Present)*	Minimum Remaining Wall Thickness	Long Term Corrosion Rate (inches per year)	Corrosion Loss at Next Inspection (a)	*RL* Remaining Life (structural)	*RL* Remaining Life (pressure)	Calculated Half-Life Inspection (Years)	MAWP at Next Inspection
1	3" US of 1st pipe elbow weld	1998	2	80	2.375"	0.218"	20	0.080"	0.026"	12:00	0.204"	0.015"	0.189"	0.001	0.015"	86 Yrs.	123 Yrs.	43	1878.9
										3:00	0.210"	0.015"	0.195"	0.001	0.012"	113 Yrs.	160 Yrs.	57	2007.8
										6:00	0.209"	0.015"	0.194"	0.001	0.012"	108 Yrs.	152 Yrs.	54	1986.3
										9:00	0.213"	0.015"	0.198"	0.001	0.010"	133 Yrs.	187 Yrs.	67	2072.2
2	45° vert to horizontal	1998	2	80	2.375"	0.218"	20	0.080"	0.026"	12:00	scale	0.015"	NA	N/A	N/A	N/A	N/A	N/A	N/A
										3:00	0.222"	0.015"	0.207"	0.001	0.005"	258 Yrs.	356 Yrs.	129	2265.5
										6:00	0.210"	0.015"	0.195"	0.001	0.012"	113 Yrs.	160 Yrs.	57	2007.8
										9:00	0.223"	0.015"	0.208"	0.000	0.005"	286 Yrs.	393 Yrs.	143	2286.9
3	4th ell	1998	2	80	2.375"	0.218"	20	0.080"	0.026"	12:00	0.197"	0.015"	0.182"	0.002	0.018"	65 Yrs.	95 Yrs.	33	1728.6
										3:00	0.200"	0.015"	0.185"	0.002	0.017"	73 Yrs.	105 Yrs.	36	1793.1
										6:00	0.195"	0.015"	0.180"	0.002	0.019"	61 Yrs.	89 Yrs.	30	1685.7
										9:00	0.202"	0.015"	0.187"	0.002	0.016"	79 Yrs.	113 Yrs.	39	1836.0
3A	6 feet past 4th ell	1998	2	80	2.375"	0.218"	20	0.080"	0.026"	12:00	0.214"	0.015"	0.199"	0.001	0.009"	141 Yrs.	198 Yrs.	71	2093.7
										3:00	0.216"	0.015"	0.201"	0.001	0.008"	160 Yrs.	223 Yrs.	80	2136.6
										6:00	0.217"	0.015"	0.202"	0.001	0.008"	171 Yrs.	238 Yrs.	86	2158.1
										9:00	0.204"	0.015"	0.189"	0.001	0.015"	86 Yrs.	123 Yrs.	43	1878.9
4	31' 4" from 3" gas 4th ell	1998	2	80	2.375"	0.218"	20	0.080"	0.026"	12:00	0.203"	0.015"	0.188"	0.002	0.015"	82 Yrs.	118 Yrs.	41	1857.5
										3:00	0.220"	0.015"	0.205"	0.001	0.006"	215 Yrs.	298 Yrs.	108	2222.5
										6:00	0.210"	0.015"	0.195"	0.001	0.012"	113 Yrs.	160 Yrs.	57	2007.8
										9:00	0.214"	0.015"	0.199"	0.001	0.009"	141 Yrs.	198 Yrs.	71	2093.7
4A	43' - 9" from 3" gas 4th ell	1998	2	80	2.375"	0.218"	20	0.080"	0.026"	12:00	0.219"	0.015"	0.204"	0.001	0.007"	199 Yrs.	275 Yrs.	99	2201.1
										3:00	0.222"	0.015"	0.207"	0.001	0.005"	258 Yrs.	356 Yrs.	129	2265.5
										6:00	0.211"	0.015"	0.196"	0.001	0.011"	119 Yrs.	168 Yrs.	60	2029.3
										9:00	0.219"	0.015"	0.204"	0.001	0.007"	199 Yrs.	275 Yrs.	99	2201.1
5	93' 6" from 3" gas 4th ell	1998	2	80	2.375"	0.218"	20	0.080"	0.026"	12:00	0.215"	0.015"	0.200"	0.001	0.009"	150 Yrs.	210 Yrs.	75	2115.2
										3:00	0.217"	0.015"	0.202"	0.001	0.008"	171 Yrs.	238 Yrs.	86	2158.1
										6:00	0.217"	0.015"	0.202"	0.001	0.008"	171 Yrs.	238 Yrs.	86	2158.1
										9:00	0.214"	0.015"	0.199"	0.001	0.009"	141 Yrs.	198 Yrs.	71	2093.7
5A	123' 11" from 3" gas 4th ell	1998	2	80	2.375"	0.218"	20	0.080"	0.026"	12:00	0.217"	0.015"	0.202"	0.001	0.008"	171 Yrs.	238 Yrs.	86	2158.1
										3:00	0.210"	0.015"	0.195"	0.001	0.012"	113 Yrs.	160 Yrs.	57	2007.8
										6:00	0.208"	0.015"	0.193"	0.001	0.013"	102 Yrs.	145 Yrs.	51	1964.8
										9:00	0.214"	0.015"	0.199"	0.001	0.009"	141 Yrs.	198 Yrs.	71	2093.7
6	45° ell up	1998	2	80	2.375"	0.218"	20	0.080"	0.026"	12:00	0.207"	0.015"	0.192"	0.001	0.013"	98 Yrs.	139 Yrs.	49	1943.4
										3:00	0.190"	0.015"	0.175"	0.002	0.022"	51 Yrs.	76 Yrs.	26	1578.3
										6:00	0.195"	0.015"	0.180"	0.002	0.019"	61 Yrs.	89 Yrs.	30	1685.7
										9:00	0.195"	0.015"	0.180"	0.002	0.019"	61 Yrs.	89 Yrs.	30	1685.7
7	horiz 45° in front of old PP	1998	2	80	2.375"	0.218"	20	0.080"	0.026"	12:00	0.210"	0.015"	0.195"	0.001	0.012"	113 Yrs.	160 Yrs.	57	2007.8
										3:00	0.206"	0.015"	0.191"	0.001	0.014"	93 Yrs.	133 Yrs.	47	1921.9
										6:00	0.213"	0.015"	0.198"	0.001	0.010"	133 Yrs.	187 Yrs.	67	2072.2
										9:00	0.213"	0.015"	0.198"	0.001	0.010"	133 Yrs.	187 Yrs.	67	2072.2
8	32' 5" from loc 7	1998	2	80	2.375"	0.218"	20	0.080"	0.026"	12:00	0.200"	0.015"	0.185"	0.002	0.017"	73 Yrs.	105 Yrs.	36	1793.1
										3:00	0.197"	0.015"	0.182"	0.002	0.018"	65 Yrs.	95 Yrs.	33	1728.6
										6:00	0.202"	0.015"	0.187"	0.002	0.016"	79 Yrs.	113 Yrs.	39	1836.0
										9:00	0.198"	0.015"	0.183"	0.002	0.018"	67 Yrs.	98 Yrs.	34	1750.1
9	@ 2" cross over to emergency dispenser/council tank	1998	2	80	2.375"	0.218"	20	0.080"	0.026"	12:00	0.213"	0.015"	0.198"	0.001	0.010"	133 Yrs.	187 Yrs.	67	2072.2
										3:00	0.216"	0.015"	0.201"	0.001	0.008"	160 Yrs.	223 Yrs.	80	2136.6
										6:00	0.209"	0.015"	0.194"	0.001	0.012"	108 Yrs.	152 Yrs.	54	1986.3
										9:00	0.199"	0.015"	0.184"	0.002	0.017"	70 Yrs.	102 Yrs.	35	1771.6
10	@ 30°bend horiz to up	1998	2	80	2.375"	0.218"	20	0.080"	0.026"	12:00	0.217"	0.015"	0.202"	0.001	0.008"	171 Yrs.	238 Yrs.	86	2158.1
										3:00	0.214"	0.015"	0.199"	0.001	0.009"	141 Yrs.	198 Yrs.	71	2093.7
										6:00	0.213"	0.015"	0.198"	0.001	0.010"	133 Yrs.	187 Yrs.	67	2072.2
										9:00	0.213"	0.015"	0.198"	0.001	0.010"	133 Yrs.	187 Yrs.	67	2072.2
11	1" US of 1st pipe to ell weld up	1998	2	80	2.375"	0.218"	20	0.080"	0.026"	12:00	0.213"	0.015"	0.198"	0.001	0.010"	133 Yrs.	187 Yrs.	67	2072.2
										3:00	0.216"	0.015"	0.201"	0.001	0.008"	160 Yrs.	223 Yrs.	80	2136.6
										6:00	0.217"	0.015"	0.202"	0.001	0.008"	171 Yrs.	238 Yrs.	86	2158.1
										9:00	0.216"	0.015"	0.201"	0.001	0.008"	160 Yrs.	223 Yrs.	80	2136.6
12	1" DS of 1st pipe to ell weld	1998	2	80	2.375"	0.218"	20	0.080"	0.026"	12:00	0.251"	0.015"	0.236"	N/A	N/A	N/A	N/A	N/A	N/A
										3:00	0.248"	0.015"	0.233"	N/A	N/A	N/A	N/A	N/A	N/A
										6:00	0.210"	0.015"	0.195"	0.001	0.012"	113 Yrs.	160 Yrs.	57	2007.8
										9:00	0.235"	0.015"	0.220"	N/A	N/A	N/A	N/A	N/A	N/A
13	1" DS of vert to Horizontal eklbow weld at TF fence.	1998	2	80	2.375"	0.218"	20	0.080"	0.026"	12:00	0.225"	0.015"	0.210"	0.000	0.004"	363 Yrs.	497 Yrs.	181	2329.9
										3:00	0.223"	0.015"	0.208"	0.000	0.005"	286 Yrs.	393 Yrs.	143	2286.9
										6:00	0.216"	0.015"	0.201"	0.001	0.008"	160 Yrs.	223 Yrs.	80	2136.6
										9:00	0.216"	0.015"	0.201"	0.001	0.008"	160 Yrs.	223 Yrs.	80	2136.6
14	Diagonal on TF side of the the valves, 6" from 45 deg elbow to pipe weld	1998	2	80	2.375"	0.218"	20	0.080"	0.026"	12:00	0.219"	0.015"	0.204"	0.001	0.007"	199 Yrs.	275 Yrs.	99	2201.1
										3:00	0.218"	0.015"	0.203"	0.001	0.007"	184 Yrs.	256 Yrs.	92	2179.6
										6:00	0.220"	0.015"	0.205"	0.001	0.006"	215 Yrs.	298 Yrs.	108	2222.5
										9:00	0.223"	0.015"	0.208"	0.000	0.005"	286 Yrs.	393 Yrs.	143	2286.9
15	1" before ell to pipe weld	1998	2	80	2.375"	0.218"	20	0.080"	0.026"	12:00	0.200"	0.015"	0.185"	0.002	0.017"	73 Yrs.	105 Yrs.	36	1793.1
										3:00	0.213"	0.015"	0.198"	0.001	0.010"	133 Yrs.	187 Yrs.	67	2072.2
										6:00	0.203"	0.015"	0.188"	0.002	0.015"	82 Yrs.	118 Yrs.	41	1857.5

API 570 Evaluation

Inspection Point	Location	Year Installed	Nominal Pipe Size	6Pipe Schedule	Nominal Pipe OD *(D)*	Nominal Wall Thickness *($t_{initial}$)*	Years in Service	Structural Minimum Thickness (API 574)	Pressure Design Thickness (ASME B31.3)	O'Clock Position	UT Measured Thickness *(t_{actual})*	Greatest External Corrosion Depth *(If Present)*	Minimum Remaining Wall Thickness	Long Term Corrosion Rate (inches per year)	Corrosion Loss at Next Inspection (a)	*RL* Remaining Life (structural)	*RL* Remaining Life (pressure)	Calculated Half-Life Inspection (Years)	MAWP at Next Inspection
										9:00	0.212"	0.015"	0.197"	0.001	0.011"	126 Yrs.	177 Yrs.	63	2050.7
16	2" supply vert to horiz 90° from day tank	1998	2	80	2.375"	0.218"	20	0.080"	0.026"	12:00	0.219"	0.015"	0.204"	0.001	0.007"	199 Yrs.	275 Yrs.	99	2201.1
										3:00	0.211"	0.015"	0.196"	0.001	0.011"	119 Yrs.	168 Yrs.	60	2029.3
										6:00	0.207"	0.015"	0.192"	0.001	0.013"	98 Yrs.	139 Yrs.	49	1943.4
										9:00	0.213"	0.015"	0.198"	0.001	0.010"	133 Yrs.	187 Yrs.	67	2072.2

API 570 Evaluation

Inspection Point	Location	Year Installed	Nominal Pipe Size	6Pipe Schedule	Nominal Pipe OD *(D)*	Nominal Wall Thickness *($t_{initial}$)*	Years in Service	Structural Minimum Thickness (API 574)	Pressure Design Thickness (ASME B31.3)	O'Clock Position	UT Measured Thickness *(t_{actual})*	Greatest External Corrosion Depth *(If Present)*	Minimum Remaining Wall Thickness	Long Term Corrosion Rate (inches per year)	Corrosion Loss at Next Inspection (a)	*RL* Remaining Life (structural)	*RL* Remaining Life (pressure)	Calculated Half-Life Inspection (Years)	MAWP at Next Inspection
2-inch to council tank and winter dispenser																			
38	1" past eccentric reducer to 2" after ck valve	1998	2	80	2.375"	0.218"	20	0.080"	0.026"	12:00	0.219"	0.015"	0.204"	0.001	0.007"	199 Yrs.	275 Yrs.	99	2201.1
										3:00	0.219"	0.015"	0.204"	0.001	0.007"	199 Yrs.	275 Yrs.	99	2201.1
										6:00	0.217"	0.015"	0.202"	0.001	0.008"	171 Yrs.	238 Yrs.	86	2158.1
										9:00	0.223"	0.015"	0.208"	0.000	0.005"	286 Yrs.	393 Yrs.	143	2286.9
39	@ 90° to tf block valves	1998	2	80	2.375"	0.218"	20	0.080"	0.026"	12:00	0.212"	0.015"	0.197"	0.001	0.011"	126 Yrs.	177 Yrs.	63	2050.7
										3:00	0.215"	0.015"	0.200"	0.001	0.009"	150 Yrs.	210 Yrs.	75	2115.2
										6:00	0.210"	0.015"	0.195"	0.001	0.012"	113 Yrs.	160 Yrs.	57	2007.8
										9:00	0.218"	0.015"	0.203"	0.001	0.007"	184 Yrs.	256 Yrs.	92	2179.6
40	1" before vert 45° to block valve	1998	2	80	2.375"	0.218"	20	0.080"	0.026"	12:00	0.212"	0.015"	0.197"	0.001	0.011"	126 Yrs.	177 Yrs.	63	2050.7
										3:00	0.213"	0.015"	0.198"	0.001	0.010"	133 Yrs.	187 Yrs.	67	2072.2
										6:00	0.222"	0.015"	0.207"	0.001	0.005"	258 Yrs.	356 Yrs.	129	2265.5
										9:00	0.216"	0.015"	0.201"	0.001	0.008"	160 Yrs.	223 Yrs.	80	2136.6
41	6" before vert to horiz 45° @ blk valve	1998	2	80	2.375"	0.218"	20	0.080"	0.026"	12:00	0.224"	0.015"	0.209"	0.000	0.004"	320 Yrs.	439 Yrs.	160	2308.4
										3:00	0.219"	0.015"	0.204"	0.001	0.007"	199 Yrs.	275 Yrs.	99	2201.1
										6:00	0.212"	0.015"	0.197"	0.001	0.011"	126 Yrs.	177 Yrs.	63	2050.7
										9:00	0.217"	0.015"	0.202"	0.001	0.008"	171 Yrs.	238 Yrs.	86	2158.1
42	@ fence 1" US of vert 90 down	1998	2	80	2.375"	0.218"	20	0.080"	0.026"	12:00	0.225"	0.015"	0.210"	0.000	0.004"	363 Yrs.	497 Yrs.	181	2329.9
										3:00	0.219"	0.015"	0.204"	0.001	0.007"	199 Yrs.	275 Yrs.	99	2201.1
										6:00	0.210"	0.015"	0.195"	0.001	0.012"	113 Yrs.	160 Yrs.	57	2007.8
										9:00	0.217"	0.015"	0.202"	0.001	0.008"	171 Yrs.	238 Yrs.	86	2158.1
43	elbow vert to horiz	1998	2	80	2.375"	0.218"	20	0.080"	0.026"	12:00	0.245"	0.015"	0.230"	N/A	N/A	N/A	N/A	N/A	N/A
										3:00	0.247"	0.015"	0.232"	N/A	N/A	N/A	N/A	N/A	N/A
										6:00	0.244"	0.015"	0.229"	N/A	N/A	N/A	N/A	N/A	N/A
										9:00	0.239"	0.015"	0.224"	N/A	N/A	N/A	N/A	N/A	N/A
45	bend diag to horiz	1998	2	80	2.375"	0.218"	20	0.080"	0.026"	12:00	0.229"	0.015"	0.214"	0.000	0.002"	745 Yrs.	1013 Yrs.	373	2415.8
										3:00	0.209"	0.015"	0.194"	0.001	0.012"	108 Yrs.	152 Yrs.	54	1986.3
										6:00	0.218"	0.015"	0.203"	0.001	0.007"	184 Yrs.	256 Yrs.	92	2179.6
										9:00	0.223"	0.015"	0.208"	0.000	0.005"	286 Yrs.	393 Yrs.	143	2286.9
44	1" after vert 90°	1998	2	80	2.375"	0.218"	20	0.080"	0.026"	12:00	0.210"	0.015"	0.195"	0.001	0.012"	113 Yrs.	160 Yrs.	57	2007.8
										3:00	0.209"	0.015"	0.194"	0.001	0.012"	108 Yrs.	152 Yrs.	54	1986.3
										6:00	0.200"	0.015"	0.185"	0.002	0.017"	73 Yrs.	105 Yrs.	36	1793.1
										9:00	0.223"	0.015"	0.208"	0.000	0.005"	286 Yrs.	393 Yrs.	143	2286.9
46	1" before vert 90° to council tank	1998	2	80	2.375"	0.218"	20	0.080"	0.026"	12:00	0.217"	0.015"	0.202"	0.001	0.008"	171 Yrs.	238 Yrs.	86	2158.1
										3:00	0.210"	0.015"	0.195"	0.001	0.012"	113 Yrs.	160 Yrs.	57	2007.8
										6:00	0.212"	0.015"	0.197"	0.001	0.011"	126 Yrs.	177 Yrs.	63	2050.7
										9:00	0.204"	0.015"	0.189"	0.001	0.015"	86 Yrs.	123 Yrs.	43	1878.9
47	1" before union	1998	2	40	2.375"	0.154"	20	0.080"	0.026"	12:00	0.142"	0.015"	0.127"	0.001	0.014"	46 Yrs.	86 Yrs.	23	1234.7
										3:00	0.142"	0.015"	0.127"	0.001	0.014"	46 Yrs.	86 Yrs.	23	1234.7
										6:00	0.142"	0.015"	0.127"	0.001	0.014"	46 Yrs.	86 Yrs.	23	1234.7
										9:00	0.142"	0.015"	0.127"	0.001	0.014"	46 Yrs.	86 Yrs.	23	1234.7
48	1" before brass valve	1998	2	40	2.375"	0.154"	20	0.080"	0.026"	12:00	0.145"	0.015"	0.130"	0.001	0.012"	54 Yrs.	99 Yrs.	27	1299.2
										3:00	0.145"	0.015"	0.130"	0.001	0.012"	54 Yrs.	99 Yrs.	27	1299.2
										6:00	0.145"	0.015"	0.130"	0.001	0.012"	54 Yrs.	99 Yrs.	27	1299.2
										9:00	0.145"	0.015"	0.130"	0.001	0.012"	54 Yrs.	99 Yrs.	27	1299.2

Maximum Long Term Corrosion Rate (inches/year):	**0.003"**
Maximum Corrosion Loss at Next Inspection (inches):	**0.034"**
Minimum Remaining Life Structural (years):	**41.2**
Minimum Remaining Life Pressure (years):	**62.5**
Minimum Calculated Half-Life Inspection (years):	**20.6**
Minimum MAWP at Next Inspection (psi):	**1231**

NDE Inspection Performed By: James Adams
Company: *QA Services*
Date: August 15, 2018

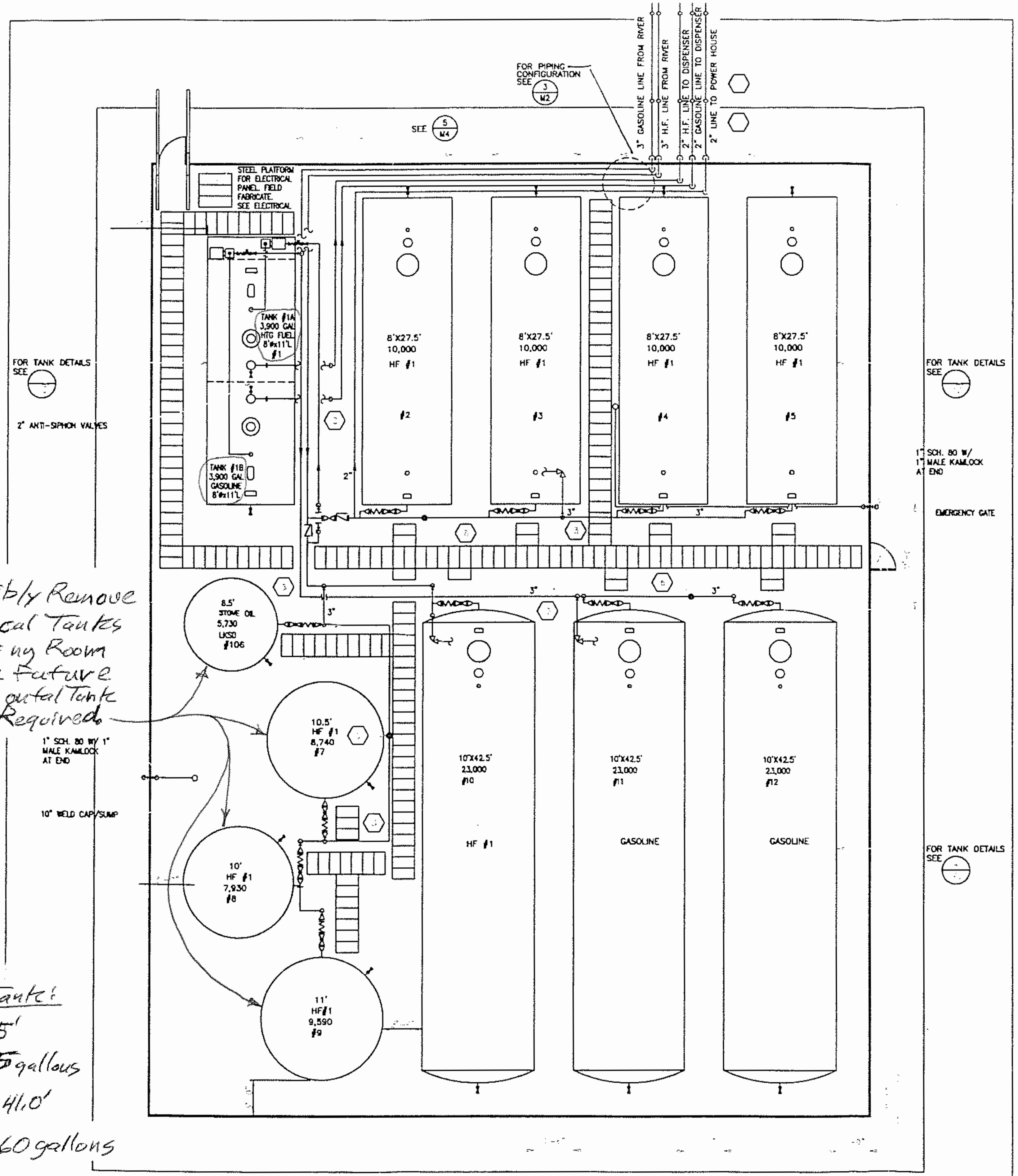
Engineering Calculations Performed By: Eric Weiler
Company: *Taku Engineering*
Date: August 15, 2018

Notes:

User Input Fields

1. Design Pressure: Based on Flange Rating
2. Pipe Material: Unknown.
3. Allowable Stress: Based on 15,000 value based on ASME B31.3, Table A-1 information for the assumed A 285 Gr A material.
4. Joint Efficiency: . Calculations use a value of 0.85 (lowest value) per API 570 recommendations & ASME B31.3 Table 302.3.4.
5. Material Coefficient: Unknown. Uses the lowest value (0.4) per API 570 and ASME B31.3.
6. Pipe Schedule: Actual design information not available. Data represents assumed information based on the wall thickness information collected during field testing.
7. API Inspection Interval: Based on API 570, Table 2 requirements for Class 1 designated piping (i.e. piping for flammable liquids outside containment)
8. Install date based on client provided drawing with a most recent revision date of 1979. This date has been applied to all piping in the investigations.

APPENDIX E: DRAWINGS



Possibly Remove Vertical Tanks Making Room For a Future Horizontal Tank when Required.

Future Tank:
⇒ 11'ø x 42.5' = 30,215 gallons
⇒ 11.5'ø x 41.0' = 31,860 gallons

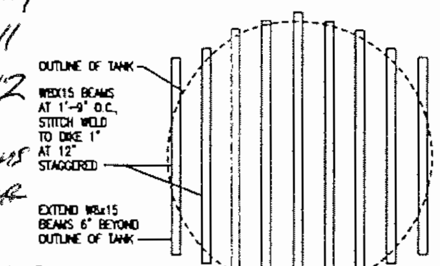
1 / M2 TANK FARM & PAD PLAN VIEW
SCALE: 1"=5'

SHEET NOTES	
1.	COORDINATE TANK SADDLE LOCATIONS WITH STRUCTURAL CONTRACTOR.
⬡	PROVIDE LONG- RADIUS FITTINGS TO ALLOW INSTALLATION OF PIPING ALONG SLOPES OF PAD.
⬡	INSTALL PIPE ON DECK, SEE 3/M4
⬡	FOR PIPE HEADER SUPPORT DETAIL, SEE 6/M4
5.	FOR TYPICAL TANK FARM SECTION SEE 1/M4
⬡	75 PSI 2" PRV HYDRO-VALVE 3/M2

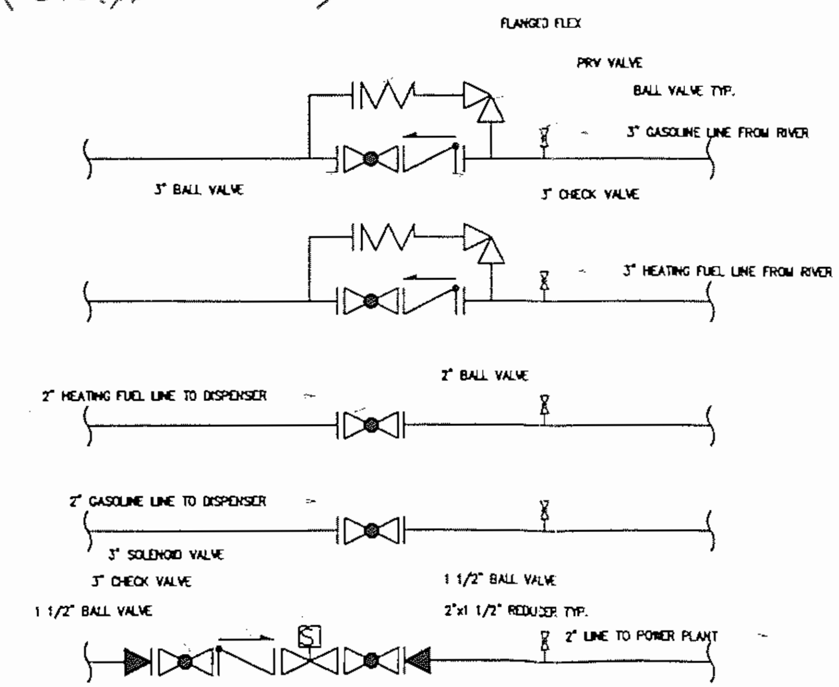
HF#1 = 3,900 #1
10,000 #2
10,000 #3
10,000 #4
10,000 #5
5,730 #106
8,740 #7
7,930 #8
9,590 #9
23,000 #10
(31,990 gal)
98,890 gallons Diesel

Gas = 3,900 #1
23,000 #11
23,000 #12
49,900 gallons Gasoline

⇒ 148,790 gallons Total Storage Capacity.
(Limit is 150k per cell per NFPA-30, okay.)



2 / M2 PLAN VIEW – VERTICAL TANK FOUNDATIONS
SCALE: NONE



3 / M2 DETAIL – PIPING CONFIGURATION
SCALE: NONE

Date Stamped:

	Date	Revision	By
1	8/27/96	PIPING CHANGES AND VERTICAL TANK FOUNDATION	SVB
2	11/3/97	RECORD DRAWING St. GEORGE CONSTRUCTION	RL

USKH
Architecture • Engineering
Land Surveying • Planning
2515 'A' Street
Anchorage, Alaska 99503
(907) 276-4245

Project:
KWIGILLINGOK BULK FUEL STORAGE/DISPENSING

KWIGILLINGOK, ALASKA

Project Mgr.	[illegible]
Drawn	LDS
Drawn	GIS
Checked	SVB
Date	2/28/97

2/28/97 (Design)

Sheet Contents:
TANK FARM AND PAD PLAN VIEW

FIGURE 3. TANK FARM & PAD PLAN VIEW

I - 8

Sheet No.:
M2

USKH W.O. [illegible]307
451307

APPENDIX F: PHOTOGRAPHS

TANKS

FIGURE 1: TANK 1, TWO COMPARTMENT DISPENSING TANK. UL LISTED

FIGURE 2: TYPICAL CONDITION TOP OF TANKS, TANK 2 THROUGH 5. 10,000 GALLONS EACH.

FIGURE 3: TANK 3 HEAD AND PIPING, TYPICAL CONDITION.

FIGURE 4: TYPICAL COATING CONDITION FOR THE BOTTOM 4 TO 8 FEET OF ALL TANK SHELLS. ALL TANKS SHOW SOME DEGREE OF CORROSION IN THIS AREA WITH TANK 4 EXHIBITING THE WORST PITTING AND GENERAL WALL LOSS.

FIGURE 5: TANK 4 TYPICAL BOTTOM CONDITION WITH EXTERNAL PITTING TO 80 MILS DEEP.

FIGURE 6: TYPICAL SHELL AND ELLIPTICAL HEAD COATING CONDITION FOR TANKS 10, 11 AND 12. 23,000 GALLONS EACH.

FIGURE 7: TYPICAL ISOLATED PITTING ON THE ELLIPTICAL HEADS FOR TANKS 10-12. MAXIMUM DEPTH 100 MILS

FIGURE 8: NON-STANDARD SHELL CONSTRUCTION FOR TANK 12. LONG SEAM WELDS ONLY, SHELL IS FABRICATED FROM 6 PLATES MEASURING 5.25 FEET BY 42.5 FEET LONG.

FIGURE 9: DENTING PRESENT IN SHELL FOR TANK 12. MAX DEFORMATION IS .75-INCHES FOR A DENT 7 FEET LONG BY 3.5 FEET CIRCUMFERENTIALLY. FIVE ADDITIONAL SMALLER DIAMETER DENTS PRESENT ON THIS TANK.

FIGURE 10: UL LISTING FOR TANK 1. THIS IS THE ONLY TANK WITH ANY LISTING INFORMATION.

PIPING

FIGURE 11: 3-INCH BARGE HEADER RISERS AT RIVER, ADJACENT TO FUEL DISPENSER. OLD POWER PLANT AND MARINA TANK FARM IN BACKGROUND.

FIGURE 12: FAILED CONTAINMENT DRAIN VALVE FOR DISPENSER CABINET AT RIVER. VALVE WAS FOUND DRIPPING WATER DURING INSPECTION.

FIGURE 13: ~190 FEET OF CARGO AND SERVICE PIPING ON GRADE BETWEEN DISPENSER AND OLD POWER PLANT.

FIGURE 14: CARGO AND SERVICE PIPING CONDITION, 2010.

FIGURE 15: CARGO AND SERVICE PIPING CONDITION, 2018.

FIGURE 16: TYPICAL CARGO AND SERVICE LINE CONDITION IN LOW AREA, IN CONTACT WITH SOIL/WATER, SOME PIPE CLAMPS COMPLETELY CORRODED.

FIGURE 17: PIPE IS SUPPORTED ON UNSECURED CRIB PILES THAT HAVE FALLEN OVER IN SOME AREAS.

FIGURE 18: CARGO AND SERVICE PIPING CONDITION AS IT ENTERS CONTAINMENT. NOTE HIGH POINT VENT FOR LINE ON RIGHT (COUNCIL TANK AND WINTER DISPENSER) IS SEIZED IN THE OPEN POSITION.

FIGURE 19: CROSS OVER TO FOUR ABANDONED VERTICAL TANKS. NO ISOLATION VALVES UNTIL TANK NOZZLES. 1 LARGE DEAD-LEG.

FIGURE 20: TYPICAL PIPING CONDITION IN TANK FARM. PIPING WAS PARTIALLY SUBMERGED ON ARRIVAL. PIPING IS CLAMPED TO UNI-STRUT WHICH IS WELDED TO THE FLOOR OF CONTAINMENT.

FIGURE 21: FUEL TRANSFER HOSE CONNECTED TO WATER-DRAW NOZZLE ON TANK 5. NO LOCK ON VALVE AND HOSE TERMINATES OUTSIDE OF CONTAINMENT IN OLD DISPENSER SHACK. NOTE UV DEGRADATION OF RUBBER.

Figure 22: Service line to secondary dispenser and council tank on the right side of pipe run. Note sag because piping is off of support. Operator was working to fix this while we were on site.

Figure 23: 2 brass valves in fuel service at secondary dispenser and Council tank.

FIGURE 24: STEEL CONTAINMENT GENERAL CONDITION, NOTE FAILING COATINGS AND RUST/DEBRIS BUILD-UP.

FIGURE 24: ONE OF THREE DRAIN SUMPS FOR CONTAINMENT. SUMPS ARE 10-INCH DIA WITH ELLIPTICAL HEADS. ALL THREE SUMPS WERE FOUND FILLED WITH SCALE AND DEBRIS AND WITH GENERAL WALL LOSS DUE TO CORROSION.

τaku
engineering, llc

Prepared for:

Nikolai City Tank Farm

STI SP001 and API 570 Tank Farm Evaluations

PREPARED BY
Eric G Weiler
Phone: 907-433-1134
October 2018

Taku Engineering, LLC
P.O. Box 241386
Anchorage, Alaska 99524

Abstract

In August 2018, Taku Engineering, LLC completed an STI SP001 Formal External inspection and an API 570 Piping evaluation for the City of Nikolai tank farm located near the southwest corner of the public airfield. The evaluations were completed for six of the seven horizontal tanks as well as all associated piping in the tank farm and at the nearby dispenser. The inspections were performed in accordance with the applicable portions of Steel Tank Institute (STI) SP001 - *Standard for the Inspection of Aboveground Storage Tanks* and API 570 - *Inspection, Repair, Alteration, and Rerating of In-service Piping Systems*. The inspections were performed from August 21st to the 23rd, 2018.

This report provides inspection findings, recommendations and the asset suitability for service evaluation. No immediate repairs were found requiring completion for the tank to remain in service. Recommendations for continued long-term service are provided.

Taku Engineering recommends that the next STI SP001 inspection be scheduled no later than August 2038, 20 years from this inspection, in accordance with STI SP-001 Table 5.5 *Table of Inspection Schedules*. Schedule the next API 570 inspection no later than August 2028, in accordance with API 570 Table 6.1 *Recommended Maximum Inspection Intervals*. These dates must be revisited and updated with any change in condition or service of the tank. Complete the monthly and annual inspections per the requirements of STI SP001 and API 570.

This report satisfies the STI SP001 and API 570 requirements for integrity inspections and as such, should remain available as a historical record for future reference.

By: Eric G. Weiler   Date: 11-15-18

Eric G. Weiler
Taku Engineering, LLC
STI SP001 Inspector Certification No.: AC44071
API 570 Inspector Certification No.: 25147

James Adams
QA Services
ASNT Level II: MT UT VT

TABLE OF CONTENTS

1 EXECUTIVE SUMMARY

In August 2018, Taku Engineering, LLC completed an evaluation of the City of Nikolai bulk fuel storage facility located near the aircraft fuel header on the southwest corner of the runway. The evaluation consisted of integrity inspections for six of the seven horizontal tanks, piping evaluations for the above ground diesel and gasoline circuits and cursory cathodic protection readings at the pipe risers near the tank farm. QA Services provided non-destructive examination (NDE) support for the inspection effort, including visual examination (VT), ultrasonic testing (UT) and measurement of coating dry film thickness (DFT). The inspection was performed in accordance with the applicable sections of the Steel Tank Institute (STI) standard SP001, 5th Edition, 2011 and the American Petroleum Institute (API) standard 570, 2nd Edition Addendum 3, 2003.

Per the original construction design drawings for this tank farm four of the storage tanks are new construction (C1, C2, C3 and C4) and four are refurbished tanks from the original city tank farm (C5, C6, S1 and Contingency). The new tank farm has a total capacity of 117,000 gallons, 31,000 for gasoline in tanks C1 and C2 and 86,000 gallons in tanks C3 – C6 and S1. UL or STI data plates are present for 3 of the 4 new tanks while no construction standard information or data plates could be located for the refurbished tanks. All tanks were recoated as part of the construction project

The piping inspected in the tank farm is A106B in Diesel and Gasoline service. The piping circuits inspected included nominal pipe size (NPS) 1-inch, 2-inch, and 3-inch piping, with the majority of piping being NPS 2. The original design basis of the fuel system is unknown. Original construction drawings were available to aid in determining design pressure for the piping, which is 285 psig based on flange ratings. All piping, with exception to minor modifications, was assumed to have been installed in 2002.

The following items were visually inspected in the tank farm: foundation, supports, shell plates, shell appurtenances, heads, walking/working surfaces, containment, venting, gauging, bonding and grounding, and coating condition. Ultrasonic testing (UT) and visual examination (VT) were performed on the shell, heads, shell nozzles and reinforcement pads.

No items were found affecting hydraulic or structural integrity of the structures evaluated. The tank farm has been in service for 16 years with no change in operating conditions. This report provides inspection conclusions, recommendations, detailed results and the suitability for continued service for the tanks and piping inspected. “Good Business Practice” repairs were found that should be completed to prolong the life of the tank farm. Based on the findings of this inspection, the city of Nikolai tank farm is suitable for continued service.

1.1 Findings

1.1.1 General

1. The tank farm vehicle gates are left unlocked and open. One of two doors for the north gate is no longer attached to the fence post.
2. The fuel transfer hose for aircraft transfers is left hanging on a post at the apron and connected to a valve at the tank farm truck rack. It is unclear if this hose is drained between fuel deliveries.
3. No formal monthly or annual inspection reports were available for review.
4. The normal tank farm operator was not available to answer historical and typical operation questions. The step-up operator had been on the job for 2 weeks at the time of the evaluation and could not answer historical questions regarding operations.
5. UL or STI data plates are present for 3 of the 4 new tanks while no construction standard information or data plates could be located for the refurbished tanks. The stickers with the UL numbers for tanks C1 and C4 are beginning to peel and crack. The sticker for tank C3 is missing.

1.1.2 Foundation Tank Supports

1. All tank skids are bolted to concrete footings which support the full length of the skids. No spalling, cracking or visible evidence of settlement were noted during the inspection.
2. No grounding ring is present for the tanks in the tank farm. The only grounding provisions that could be located are a single ground rod at the marine header riser and a single ground rod at the service line risers. Both rods are attached via mechanical grounding clamps.
3. With the exception of tank S1 all tank saddle reinforcing pads are seal welded to the tank shell. The reinforcing pads for tank S1 are stitch welded.

1.1.3 Containment, Spill Control and CRDM

1. The secondary containment is appropriately sized to accommodate a spill from the largest tank in the tank farm plus rainwater accumulation.
2. The containment is pumped out regularly by the tank farm operator and there is no evidence of water staining on the lower portions of the tank shell which would indicate standing water in contact with the shell.
3. The 4-inch geogrid laid across the dike wall is beginning to work its way out of the gravel infill in areas that are not weighed down by the concrete pipe supports.
4. A fuel sheen was noted on the water in containment directly adjacent to aircraft headers in the tank farm.

1.1.4 Coating

1. The coating systems for the tanks and piping are in poor condition. The epoxy has chalked and degraded to the point that the inorganic zinc primer is visible in some areas.
2. Rust blooms are starting to show over large areas of some tank shells.
3. Pipe coatings show uniform failures at all welds, fittings and flanged connections.
4. Rust blooms are present, and cracking is visible in the coating on some straight runs of pipe.

1.1.5 Shell and Ancillary Equipment

1. There are no signs of bulges, distortions, peaking or banding on the shells of the six tanks inspected.
2. Shell plate thickness measurements for tanks C1, C3, and C4 indicated that the shell plates are within +/- 5% of nominal plate thicknesses of 0.250-inches and the heads are within +/- 2% of the nominal plate thickness of .3125-inches.
3. Shell plate thickness measurements for tanks C5, C6, and S1 indicated that the shell plates and heads are within +/- 1% of nominal plate thicknesses of 0.250-inches.
4. Morrison clock type level indicators are present and functioning on all tanks.
5. The normal vent for tank S1 is 2-inches, UL 142 requires a 2.5-inch vent for a tank of this capacity.

1.1.6 Internal and Tank Bottom

1. No evidence of wall loss due to internal corrosion was noted for any of the six tanks inspected.
2. Water sampling was completed for some of the fuel tanks by Ahtna.

1.1.7 Piping

1. No evidence of wall loss due to internal corrosion was noted for any of the tank farm piping inspected.
2. All tank farm piping has adequate pressure relief.
3. Excavations were completed at the three service-line aboveground-to-belowground transitions and at the pipe riser for the unleaded gasoline dispenser. The extruded polyethylene coating (yellow jacket) exposed in these investigations is in excellent condition.
4. Construction drawings indicate that a single 17 lb magnesium anode is direct bonded to the fuel piping, below grade, at the marine header risers and at the service line risers.
5. The marine header could not be evaluated because the enclosure was locked.

1.2 Recommendations

1.2.1 General

1. Repair the tank farm gates so the tank farm can be secured.
2. Ensure that the aircraft fuel transfer hose is drained down and removed between transfer operations.
3. Conduct external monthly and annual inspections to note any progressing issues with the tank farm structures, tanks, piping, foundations or coating.
4. Conduct the next STI formal external inspection on or before August 2038. These inspections should be completed sooner if there are changes in service or operation. Maintain documentation that any tank or piping repairs and modifications were completed with qualified procedures and personnel.
5. Continue formal inspection of all fuel piping within the Nikolai tank farm at ten-year intervals, as prescribed by API-570 for this Class 3 piping. The next formal API-570 inspection for the Tank Farm piping should be carried out no later than June 2028.

6. Ensure that new operators are aware of the resources available on the Alaska Department of Environmental Conservation (ADEC) website for Class 2 facilities. When possible send new operators through the tank farm operator training program offered by ADEC.
7. Ensure that all Listing information for new tanks is recorded on metal tags permanently affixed to the tank shell.

1.2.2 Foundation and Tank Supports

1. Monitor the condition of concrete footings and tank skid bolted connections for any signs of cracking or spalling. Repair as necessary with a suitable epoxy system
2. Consider installing a grounding ring inside the tank farm connected to a grounding ring outside the tank farm. Connect each tank to the grounding ring with a down conductor cad-welded to the tank supports.
3. Caulk the areas of stitch welding on the tank supports for S1. This will help prevent water getting into the crevice between saddle and shell.

1.2.3 Containment, Spill Control and CRDM

1. Continue to pump the rainwater from containment to prevent water from contacting the tank shells and piping.
2. Place more gravel in the cells of the geogrid that have worked their way out of the existing material along the dike wall.
3. Determine where the fuel sheen in containment adjacent to the aircraft headers is coming from. Ensure proper procedures are in place, and followed, for fuel transfer operations.

1.2.4 Coating

1. Recoat all external tank and piping surfaces using a suitable exterior coating system per manufacturer's recommendations. Coating materials should be resistant to ultra violet (UV) degradation and suitable for industrial-type service. Ensure that all welds, fittings, and crevices such as those present at pipe supports are properly coated. Perform surface preparation in accordance with industry standards and manufacturer's requirements to maximize coating performance.

1.2.5 Shell and Ancillary Equipment

1. The tank level indicator float appeared to be in working condition. This should be verified by dipping the tank and recorded periodically by the operator as part of regular tank farm inspections.
2. Increase the size of the normal vent for tank S1 from 2-inches to 2.5-inches to meet code requirements.

1.2.6 Internal and Tank Bottom

1. Use water finding paste after each fuel delivery to help determine if water has settled out in the bottom of the tank. Water-draw the tanks if water is present.

1.2.7 Piping

1. Monitor all tank farm piping for leaks at bolted connections, settlement, damaged supports or mechanical damage/active corrosion during the regular tank farm inspections.
2. Pressure test the piping on an annual basis to verify the proper operation of the pressure relieving devices.
3. Develop formal fuel handling/transfer procedures for the tank farm piping if none currently exist.

2 TECHNICAL APPROACH

Tank Shell and Appurtenances Inspection

The tank shells were inspected using Visual (VT) and Ultrasonic (UT) inspection methods. UT and dry film thickness (DFT) readings were collected on each shell plate. UT measurements were collected at 45 to 60 locations on the shell and heads for each tank. Results of the tank NDE evaluation are provided in *Appendix B*.

Vents were inspected for corrosion, obstructions and freedom of movement. All tank nozzles and appurtenances were evaluated by VT.

Tank Heads Inspection

The tank heads were inspected using VT and UT inspection methods. Thickness and DFT measurements were collected at five to eight locations per head depending on tank size and access.

Tank Containment Inspection

A visual evaluation of the containment and containment drainage equipment was completed.

Piping Inspection

The non-destructive examination for the Nikolai tank farm piping consisted of VT examinations, UT testing, and coating thickness measurements. VT was performed to identify coating damage, pipe damage, and external corrosion. The system was checked for new field modifications or temporary repairs. Condition monitoring locations (CMLs) were established in locations where internal wall loss is likely, or degradation via other mechanisms is probable. CMLs include but are not limited to: weld heat-affected zones (HAZ), elbows, low points, dead legs, pump discharges, and fittings. Piping was externally inspected, and thicknesses were measured at each CML using UT. These CMLs are intended to be revisited in subsequent inspections to monitor pipe conditions and establish long-term/short-term corrosion rates

Remaining Wall Thickness Calculations

Corrosion rate and remaining life calculations were performed in accordance with API-570. Measured thicknesses were compared against required minimum thicknesses per ASME B31.3, *Process Piping* and API-574, *Inspection Practices for Piping System Components*. Calculations are provided in *Appendix D*.

3 RESULTS AND DISCUSSION

3.1 GENERAL

The city of Nikolai tank farm has a total capacity of 117,000-gallons which categorizes it as a "Class 2" facility per 18 AAC 75. The inspection of the tank farm was completed for Ahtna Environmental Inc and the Denali Commission to document the condition of the tank farm for planning future repairs/upgrades to similar facilities across the state of Alaska. The tanks and piping were inspected to the same standards as fully regulated facilities. Per STI SP001 Table 5.5, the Nikolai tank farm tanks are classified as a category 1 based on the presence of spill control and CRDM.

Based on the inspection and examination findings, the tanks evaluated in the Nikolai tank farm are suitable for continued service. The next STI SP001 Formal External inspections should be conducted before August 2028. This date will need to be re-evaluated with any change in operation or service of the tanks.

The STI inspection checklist can be found in *Appendix A*, all tank NDE data is located in *Appendix B* and construction drawings of the tank farm are provided in *Appendix E*.

The tank farm fuel piping system was found to be in very good condition, with some repairs recommended to ensure continued integrity and leak prevention. Based on the findings of this inspection and execution of the necessary repairs, the fuel piping has been found suitable for continued service. The next formal API570 inspection for the airport tank farm piping should be carried out no later than August 2028.

A summary of the NDE data is provided below. All inspection data and calculations are provided in *Appendix D*.

Line Description	Ultrasonic Data		External Examination	
	Maximum Wall Loss (in)	**% Wall Loss:**	**Maximum Wall Loss (in)**	**% Wall Loss:**
Diesel Piping	0.014	5%	0	0
Gasoline Piping	0.020	7%	0	0

Table 1: Pipe UT and External Inspection Data Summary

3.2 FOUNDATION AND TANK SUPPORTS

All seven tanks in containment are fully supported on, and bolted too, concrete beam foundations. No settlement is visually evident for any of the tanks. No signs of cracking, spalling or voids beneath the tank supports were noted during the inspection.

3.3 CONTAINMENT, SPILL CONTROL AND CRDM

The tank farm is located inside a lined gravel dike adjacent to the parking apron on the southwest side of the runway. All piping is located within the tank farm fence, the only piping outside of containment are the risers from the marine header and the risers to the city buildings. The dike area is kept clear of debris and excessive accumulated water, with some vegetation growing in the gravel around the tank foundations and dike wall. A sump is present in the tank farm top assist with dewatering and another is present for the catchment adjacent to the truck rack. A fuel sheen was noted on the water in the catchment adjacent to the header connections. This was pointed out to the operator during the final walk around.

3.4 Coatings

The overall coating condition for the thin film systems applied to tank shells and tank farm piping is poor. A review of the original coating specification found that the original system for the exterior surfaces of the tanks was Devoe Bar-Rust 236 on top of Devoe Catha-coat 302, this is an excellent inorganic zinc/epoxy system suitable for immersion service in petroleum systems but is not intended for direct UV exposure. Epoxy systems will chalk and rapidly degrade due to UV exposure and are typically covered with a Urethane topcoat when used in external service. The coating system for the tanks has degraded to the point that it can be wiped off by hand when wet and will easily transfer to clothing if you brush up against the tank. In areas with the greatest UV exposure the epoxy topcoat has washed away and the green IOZ primer is visible with large areas of rust bloom beginning.

The piping systems are coated with Devoe Speedenamel 4318, which is suitable for atmospheric service but has weathered and failed at all welds, fittings and flanges. The straight runs of pipe are showing damage to the coating as well, in the form of cracking.

The buried portions of the fuel piping excavations were completed at the three 2-inch supply risers and the gas pump riser to evaluate the condition of the below ground coating. The coating systems for the buried piping is extruded polyethylene, commonly referred to as yellow jacket, and is in excellent condition with no evidence of damage in the area of the soil to air interface.

The tanks and piping should be considered for recoating in the near future using systems with top coats that are designed for direct UV exposure.

3.5 Shell and Ancillary Equipment

The tanks locate inside containment are horizontal cylindrical with flat heads. With the exception of the gasoline dispensing tank, which is double walled and was not inspected, the shells are comprised of five or six courses and tank volumes range from 4,000-gallons to 27,000-gallons. Spot UT readings were obtained by scanning the subject steel plate through the exterior coating.

Corrosion and coating failures were observed on the shells of the tanks in areas of the heaviest UV exposure. Tank nozzles were found in overall good condition, with no thinning noted; see Appendix B for supporting NDE data. The level indicators appear to be working properly and the tanks are tied into a control panel for fuel transfer operations and level monitoring.

Visual examination of accessible exterior shell welds found no indications meriting further inspection or examination.

3.6 Internal and Tank Bottom

No evidence of wall loss due to internal corrosion was noted during the inspection and water content in the tanks that were checked was minimal. Water monitoring should become a standard practice in the weeks after a fuel delivery, if found the subject tank(s) should have the water drawn off. This will help minimize damage due to internal corrosion and prolong the life of the assets.

3.7 Piping

System Risk Assessment

Examination of the subject Nikolai tank farm piping was conducted using a risk-based approach. The following potential damage mechanisms were identified for the subject fuel piping system:

1. **External Corrosion:** Corrosion damage to aboveground piping may result from water intrusion beneath the insulation, corrosion under insulation (CUI), atmospheric corrosion, crevice corrosion, dissimilar metal (galvanic) interactions, contaminants, and preferential corrosion of weld heat-affected zones. Corrosion to belowground piping may be caused by soil-pipe interactions, microbiologically induced corrosion, electrical stray current interference, etc.

   External corrosion is of particular concern within the tank farm due to the failing pipe coatings. Based on the as-found condition of the piping, failure risk due to external corrosion on the aboveground piping is low at this time but if not addressed will become a more serious threat in the future. Continued programmatic monitoring by the tank farm operators is also recommended.

2. **Internal Corrosion:** Many cases of internal corrosion are associated with the presence of water and/or sediment within the subject piping. Microbiologically induced corrosion can occur in stagnant, oxygen-free environments such as dead legs and under material films within the subject piping. Typically, diesel and gasoline piping like that at the Nikolai tank farm facility is largely free of water and sediment; however low points, irregularities, and operational dead legs within the system can lead to situations where accumulation can occur. Suspect areas were chosen as CMLs, examined and found free of significant internal corrosion.

   Another common cause of internal metal loss is associated with erosion-corrosion from relative fluid movement within the piping. Low-velocity fuel piping as is present at the Nikolai facility is not particularly susceptible to erosion-corrosion. However, CMLs were chosen in suspect areas such as the outside radii of elbows to monitor for metal loss due to this type of damage. No significant wall loss due to erosion-corrosion was identified.

3. **Over-pressurization:** Hazards posed by thermal expansion of trapped liquids are often identified in piping system inspections. Risks due to over-pressurization require two basic conditions:

   a. A blocked-in pipe segment (piping between block valves without pressure relief devices).

   b. Moderate to significant temperature fluctuations (as-found with external piping systems exposed to ambient conditions).

   Risks can be significant if the two above conditions are met. Many pipe failures across the US and Alaska have been attributed to over-pressurization due to thermal expansion. Theoretical calculations show that pressures within fuel oil piping can increase by as much as 74psi/°F, assuming no expansion of the vessel. Taking pipe expansion into consideration, actual pressure increase values are more likely around 25psi/°F.

   Over-pressurization is typically mitigated in the pipe design process by installing pressure relief valves, however the valves can become ineffective if blocked by isolation valves, if not properly maintained, or if system modifications are implemented. Pressure relief valve test/maintenance records were unavailable at the time of the piping inspection. No specific inspection interval is specified in API 570; however, pressure relief valves are to be inspected per API 576 at regular intervals. Inspection intervals may depend on the severity of service and the valve condition.

4. **Metallic Fatigue:** Typically associated with vibration or repeated mechanical loading. Piping near pumps, machinery, or other sources of vibration or movement are typically suspect. Visible pipe was examined for stress risers, and other areas where fatigue may be suspected. No locations were

identified where damage due to fatigue is probable. Risks due to metallic fatigue are presumed minimal within this system.

5. **Third-Party Damage:** The Tank Farm piping is located entirely within the fenced area surrounding the tank farm containment. The north gates should be repaired so the facility can be locked. Damage from vehicle impact, snow removal equipment, vandalism, or terrorism is unlikely. The soft fuel transfer hose left in place for transfers from aircraft should be drained and removed to prevent damage or vandalism between fuel transfer operations.

Integrity Management Plan Development

Integrity management plans have a history of providing cost-effective asset protection across a broad spectrum of applications. The development of an integrity management plan is recommended for all fuel and process fluid assets - both tanks and piping. In addition to assuring regulatory compliance, an integrity management plan will help to extend the service life of facility assets and minimize the risk of loss from unexpected shutdowns, leaks, clean-up efforts, regulatory enforcement, etc.

An integrity management plan should be developed with the following goals in mind:

- Documentation and trending of all inspection data, past and present
- Documentation of all upgrades to system components
- Calculation of long- and short-term corrosion rates
- Calculation of inspection intervals and protocols
- Tracking of equipment lifecycles based on inspection data
- Document and verify regulatory compliance

Once all areas of concern have been identified and evaluated, continued monitoring and maintenance should be performed. The goal of this continued monitoring and maintenance plan is to identify trends, changes and impacts to the system over its life.

APPENDIX A: STI SP001 FORMAL EXTERNAL INSPECTION CHECKLIST

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STI SP001 FORMAL EXTERNAL TANK INSPECTION REPORT

Tank ID C-1 **Date** 8/22/2018

OWNER INFORMATION		**INSPECTION INFORMATION**	
Tank Location	Nikolai Airport Tank Farm	Inspector Name	Eric Weiler
Company Name	City of Nikolai	Company Name	Taku Engineering
Address	PO Box 9145 Nikolai, Alaska 99691	Address	406 W Fireweed Anch, AK 99503
Phone		Phone	(907)529-9806
TANK ID	C-1	**PRODUCT**	Gasoline

TANK SPECIFICATION

Design:
- ☑ UL B-447003
- ☐ Unknown
- ☐ API
- ☐ SWRI
- ☐ Other

Tank Type:
- ☑ Single Wall
- ☐ Double Wall
- ☑ Horizontal
- ☐ Double Bottom
- ☐ Rectangular
- ☐ Closed Top Dike
- ☐ Vertical
- ☐ Open Top Dike

Tank Fabricator: Westmore Industries — Construction Date: 3/26/2003

Manufacturer: Westmore Industries — Repairs: NA
Repair Date: NA — NA

Tank Size

Primary	11'x38'	Capacity	27,000	Last Change of Service	NA
Secondary	NA	Capacity	NA		

Containment: ☑ Earthen Dike ☐ Steel Dike ☐ Concrete ☑ Synthetic Liner ☐ Other

CDRM (Continuous Release Detection Method) ☑ Date Installed: Construction — Type: Elevated

RPB (Release Prevention Barrier) ☑ Date Installed: Construction — Type: Impermeable Liner

AST Category: ☑ Category 1-with spill control, CRDM ☐ Category 2-with spill control, without CRDM ☐ Category 3-without spill control, without CRDM

Tank Foundation: ☐ In contact with ground ☐ Concrete ringwall ☑ Elevated ☑ Skid ☐ Other — concrete piers under skids.

Tank Entry: ☐ Tank equipped with no manway ☑ Tank equipped with manway — Size: 24" x 2

Last Formal External Inspection: Unknown — Last Formal Internal Inspection: Unknown

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STI SP001 FORMAL EXTERNAL
TANK INSPECTION REPORT

Tank ID C-1 **Date** 8/22/2018

INSPECTION CHECKLIST

Item	Status	Comments
1.0 Tank Containment		
1.1 Water in primary tank, secondary containment, interstice, or spill container?	☑ Yes ☐ No	Water pumped out regularly by operator
1.2 Debris or fire hazard in containment?	☐ Yes ☑ No	
1.3 Drain valves operable and in a closed position?	☐ Yes ☐ No	NA. No drain valves, manual pump out.
1.4 Drainage pipes/valves in satisfactory condition?	☐ Yes ☐ No	NA. No drain valves, manual pump out.
1.5 Containment egress pathways clear and gates/doors operable?	☐ Yes ☑ No	North gate for drive through is broken.
1.6 Containment structure in satisfactory condition?	☑ Yes ☐ No	gravel sloughing off of dike embankment formwork
2.0 Leak Detection		
2.1 Visible signs of leakage around the tank, concrete pad, containment, ringwall, or ground?	☑ Yes ☐ No	Sheen noted on water in pit adjacent to truck rack. Inside containment.
3.0 Tank Foundation and Supports		
3.1 Evidence of tank settlement or foundation washout?	☐ Yes ☑ No	
3.2 Cracking or spalling of concrete pad or ring wall?	☐ Yes ☑ No	
3.3 Tank supports in satisfactory condition?	☑ Yes ☐ No	
3.4 Water able to drain away from tank?	☐ Yes ☑ No	Dike requires manual pump out
3.5 Grounding strap secured and in good condition?	☑ Yes ☐ No	Grounding on piping only. No tank grounds.
4.0 Cathodic Protection		
4.1 CP system functional?	☐ Yes ☐ No	N/A
5.0 Tank External Coating		
5.1 Evidence of paint failure?	☑ Yes ☐ No	Epoxy coating chalking heavily.
6.0 Tank Shell/Heads		
6.1 Noticeable shell/head distortions, buckling, denting or bulging?	☐ Yes ☑ No	
6.2 Evidence of shell/head corrosion or cracking?	☐ Yes ☑ No	
7.0 Tank Manways, Piping and Equipment within Secondary Containment		
7.1 Flanged connection bolts tight and fully engaged with no signs of wear or corrosion?	☑ Yes ☐ No	

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STI SP001 FORMAL EXTERNAL TANK INSPECTION REPORT

Tank ID C-1 **Date** 8/22/2018

Item	Status	Comments
8.0 Tank Attachments and Appurtenances		
8.1 Ladder and platform structure secure with no sign of severe corrosion or damage?	☑ Yes ☐ No	
8.2 Tank Liquid level gauge readable and in good condition?	☑ Yes ☐ No	
8.3 Check all tank openings are properly sealed?	☑ Yes ☐ No	
9.0 Tank Roof		
9.1 Standing water on roof	☐ Yes ☑ No	
9.2 Evidence of coating cracking, crazing, peeling, blistering?	☑ Yes ☐ No	
9.3 Holes in roof	☐ Yes ☑ No	
10.0 Venting		
10.1 Vents free of obstructions?	☑ Yes ☐ No	
10.2 Emergency vent operable? Lift as required?	☑ Yes ☐ No	
10.3 Identify Normal & Emergency Vents and sizing?	10" emergency vent & 3" normal vent	
11.0 Other Conditions		
11.1 Are there other conditions that should be addressed for continued safe operation or that may affect the site SPCC plan?	☐ Yes ☑ No	

Tank Tightness Testing

Type of test (s) performed:	Pressure:	Time:	Comments:
Primary tank pressure test	n/a	n/a	n/a
Secondary tank pressure test	n/a	n/a	n/a

Additional Comments:

Nominal wall thickness:

Shell .250-inch

Heads .3125-inch

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STI SP001 FORMAL EXTERNAL TANK INSPECTION REPORT

Tank ID C-3 **Date** 8/22/2018

OWNER INFORMATION		**INSPECTION INFORMATION**	
Tank Location	Nikolai Airport Tank Farm	Inspector Name	Eric Weiler
Company Name	City of Nikolai	Company Name	Taku Engineering
Address	PO Box 9145 Nikolai, Alaska 99691	Address	406 W Fireweed Anch, AK 99503
Phone		Phone	(907)529-9806
TANK ID	C-3	**PRODUCT**	Gasoline

TANK SPECIFICATION

Design: ☐ UL ☐ API ☐ SWRI ☐ Other ☐ Unknown

Tank Type: ☑ Single Wall ☐ Double Wall ☑ Horizontal ☐ Double Bottom ☐ Rectangular ☐ Closed Top Dike ☐ Vertical ☐ Open Top Dike

Tank Fabricator Westmore Industries Construction Date 3/26/2003

Manufacturer Westmore Industries Repairs NA

Repair Date NA NA

Tank Size

Primary	11'x38'	Capacity	27,000	Last Change of Service	NA
Secondary	NA	Capacity	NA		

Containment ☑ Earthen Dike ☐ Steel Dike ☐ Concrete ☑ Synthetic Liner ☐ Other

CDRM (Continuous Release Detection Method) ☑ Date Installed Construction Type Elevated

RPB (Release Prevention Barrier) ☑ Date Installed Construction Type Impermeable Liner

AST Category ☑ Category 1-with spill control, CRDM ☐ Category 2-with spill control, without CRDM ☐ Category 3-without spill control, without CRDM

Tank Foundation ☐ In contact with ground ☐ Concrete ringwall ☑ Elevated ☑ Skid ☐ Other concrete piers under skids.

Tank Entry ☐ Tank equipped with no manway ☑ Tank equipped with manway Size 24" x 2

Last Formal External Inspection Unknown Last Formal Internal Inspection Unknown

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STI SP001 FORMAL EXTERNAL TANK INSPECTION REPORT

Tank ID C-3 **Date** 8/22/2018

INSPECTION CHECKLIST

Item	Status	Comments
1.0 Tank Containment		
1.1 Water in primary tank, secondary containment, interstice, or spill container?	☑ Yes ☐ No	Water pumped out regularly by operator
1.2 Debris or fire hazard in containment?	☐ Yes ☑ No	
1.3 Drain valves operable and in a closed position?	☐ Yes ☐ No	NA. No drain valves, manual pump out.
1.4 Drainage pipes/valves in satisfactory condition?	☐ Yes ☐ No	NA. No drain valves, manual pump out.
1.5 Containment egress pathways clear and gates/doors operable?	☐ Yes ☑ No	North gate for drive through broken.
1.6 Containment structure in satisfactory condition?	☑ Yes ☐ No	gravel sloughing off of dike embankment formwork
2.0 Leak Detection		
2.1 Visible signs of leakage around the tank, concrete pad, containment, ringwall, or ground?	☑ Yes ☐ No	Sheen noted on water in pit adjacent to truck rack. Inside containment.
3.0 Tank Foundation and Supports		
3.1 Evidence of tank settlement or foundation washout?	☐ Yes ☑ No	
3.2 Cracking or spalling of concrete pad or ring wall?	☐ Yes ☑ No	
3.3 Tank supports in satisfactory condition?	☑ Yes ☐ No	
3.4 Water able to drain away from tank?	☐ Yes ☑ No	Dike requires manual pump out
3.5 Grounding strap secured and in good condition?	☑ Yes ☐ No	Grounding on piping only. No tank grounds.
4.0 Cathodic Protection		
4.1 CP system functional?	☐ Yes ☐ No	N/A
5.0 Tank External Coating		
5.1 Evidence of paint failure?	☑ Yes ☐ No	Epoxy coating chalking heavily.
6.0 Tank Shell/Heads		
6.1 Noticeable shell/head distortions, buckling, denting or bulging?	☐ Yes ☑ No	
6.2 Evidence of shell/head corrosion or cracking?	☐ Yes ☑ No	
7.0 Tank Manways, Piping and Equipment within Secondary Containment		
7.1 Flanged connection bolts tight and fully engaged with no signs of wear or corrosion?	☑ Yes ☐ No	

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STI SP001 FORMAL EXTERNAL TANK INSPECTION REPORT

Tank ID C-3 **Date** 8/22/2018

Item	Status	Comments
8.0 Tank Attachments and Appurtenances		
8.1 Ladder and platform structure secure with no sign of severe corrosion or damage?	☑ Yes ☐ No	
8.2 Tank Liquid level gauge readable and in good condition?	☑ Yes ☐ No	
8.3 Check all tank openings are properly sealed?	☑ Yes ☐ No	
9.0 Tank Roof		
9.1 Standing water on roof	☐ Yes ☑ No	
9.2 Evidence of coating cracking, crazing, peeling, blistering?	☑ Yes ☐ No	
9.3 Holes in roof	☐ Yes ☑ No	
10.0 Venting		
10.1 Vents free of obstructions?	☑ Yes ☐ No	
10.2 Emergency vent operable? Lift as required?	☑ Yes ☐ No	
10.3 Identify Normal & Emergency Vents and sizing?	10" emergency vent & 3" normal vent	
11.0 Other Conditions		
11.1 Are there other conditions that should be addressed for continued safe operation or that may affect the site SPCC plan?	☐ Yes ☑ No	

Tank Tightness Testing

Type of test (s) performed:	Pressure:	Time:	Comments:
Primary tank pressure test	n/a	n/a	n/a
Secondary tank pressure test	n/a	n/a	n/a

Additional Comments:

Tank C-3 does not have a UL dataplate. Project drawings required that the tanks bu UL listed and labled.

Labeling may have washed off as the coating failed.

Nominal wall thickness:

Shell .250-inch

Heads .3125-inch

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STI SP001 FORMAL EXTERNAL TANK INSPECTION REPORT

Tank ID C-4 **Date** 8/22/2018

OWNER INFORMATION		**INSPECTION INFORMATION**	
Tank Location	Nikolai Airport Tank Farm	Inspector Name	Eric Weiler
Company Name	City of Nikolai	Company Name	Taku Engineering
Address	PO Box 9145 Nikolai, Alaska 99691	Address	406 W Fireweed Anch, AK 99503
Phone		Phone	(907)529-9806
TANK ID	C-4	**PRODUCT**	Gasoline

TANK SPECIFICATION

Design:
- ☑ UL B-447004
- ☐ Unknown
- ☐ API
- ☐ SWRI
- ☐ Other

Tank Type:
- ☑ Single Wall
- ☐ Double Wall
- ☑ Horizontal
- ☐ Double Bottom
- ☐ Rectangular
- ☐ Closed Top Dike
- ☐ Vertical
- ☐ Open Top Dike

Tank Fabricator: Westmore Industries

Construction Date: 4/10/2003

Manufacturer: Westmore Industries

Repairs: NA

Repair Date: NA

NA

Tank Size

	Size		Capacity
Primary	11'x38'	Capacity	27,000
Secondary	NA	Capacity	NA

Last Change of Service: NA

Containment: ☑ Earthen Dike ☐ Steel Dike ☐ Concrete ☑ Synthetic Liner ☐ Other

CDRM (Continuous Release Detection Method): ☑ Date Installed: Construction; Type: Elevated

RPB (Release Prevention Barrier): ☑ Date Installed: Construction; Type: Impermeable Liner

AST Category: ☑ Category 1-with spill control, CRDM ☐ Category 2-with spill control, without CRDM ☐ Category 3-without spill control, without CRDM

Tank Foundation: ☐ In contact with ground ☐ Concrete ringwall ☑ Elevated ☑ Skid ☐ Other concrete piers under skids.

Tank Entry: ☐ Tank equipped with no manway ☑ Tank equipped with manway Size 24" x 2

Last Formal External Inspection: Unknown

Last Formal Internal Inspection: Unknown

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STI SP001 FORMAL EXTERNAL TANK INSPECTION REPORT

Tank ID C-4 **Date** 8/22/2018

INSPECTION CHECKLIST

Item	Status	Comments
1.0 Tank Containment		
1.1 Water in primary tank, secondary containment, interstice, or spill container?	☑ Yes ☐ No	Water pumped out regularly by operator
1.2 Debris or fire hazard in containment?	☐ Yes ☑ No	
1.3 Drain valves operable and in a closed position?	☐ Yes ☐ No	NA. No drain valves, manual pump out.
1.4 Drainage pipes/valves in satisfactory condition?	☐ Yes ☐ No	NA. No drain valves, manual pump out.
1.5 Containment egress pathways clear and gates/doors operable?	☐ Yes ☑ No	North gate for drive through broken.
1.6 Containment structure in satisfactory condition?	☑ Yes ☐ No	gravel sloughing off of dike embankment formwork
2.0 Leak Detection		
2.1 Visible signs of leakage around the tank, concrete pad, containment, ringwall, or ground?	☑ Yes ☐ No	Sheen noted on water in pit adjacent to truck rack. Inside containment.
3.0 Tank Foundation and Supports		
3.1 Evidence of tank settlement or foundation washout?	☐ Yes ☑ No	
3.2 Cracking or spalling of concrete pad or ring wall?	☐ Yes ☑ No	
3.3 Tank supports in satisfactory condition?	☑ Yes ☐ No	
3.4 Water able to drain away from tank?	☐ Yes ☑ No	Dike requires manual pump out
3.5 Grounding strap secured and in good condition?	☑ Yes ☐ No	Grounding on piping only. No tank grounds.
4.0 Cathodic Protection		
4.1 CP system functional?	☐ Yes ☐ No	N/A
5.0 Tank External Coating		
5.1 Evidence of paint failure?	☑ Yes ☐ No	Epoxy coating chalking heavily.
6.0 Tank Shell/Heads		
6.1 Noticeable shell/head distortions, buckling, denting or bulging?	☐ Yes ☑ No	
6.2 Evidence of shell/head corrosion or cracking?	☐ Yes ☑ No	
7.0 Tank Manways, Piping and Equipment within Secondary Containment		
7.1 Flanged connection bolts tight and fully engaged with no signs of wear or corrosion?	☑ Yes ☐ No	

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STI SP001 FORMAL EXTERNAL
TANK INSPECTION REPORT

Tank ID C-4 **Date** 8/22/2018

Item	Status	Comments
8.0 Tank Attachments and Appurtenances		
8.1 Ladder and platform structure secure with no sign of severe corrosion or damage?	☑ Yes ☐ No	
8.2 Tank Liquid level gauge readable and in good condition?	☑ Yes ☐ No	
8.3 Check all tank openings are properly sealed?	☑ Yes ☐ No	
9.0 Tank Roof		
9.1 Standing water on roof	☐ Yes ☑ No	
9.2 Evidence of coating cracking, crazing, peeling, blistering?	☑ Yes ☐ No	
9.3 Holes in roof	☐ Yes ☑ No	
10.0 Venting		
10.1 Vents free of obstructions?	☑ Yes ☐ No	
10.2 Emergency vent operable? Lift as required?	☑ Yes ☐ No	
10.3 Identify Normal & Emergency Vents and sizing?	10" emergency vent & 3" normal vent	
11.0 Other Conditions		
11.1 Are there other conditions that should be addressed for continued safe operation or that may affect the site SPCC plan?	☐ Yes ☑ No	

Tank Tightness Testing

Type of test (s) performed:	Pressure:	Time:	Comments:
Primary tank pressure test	n/a	n/a	n/a
Secondary tank pressure test	n/a	n/a	n/a

Additional Comments:

Nominal wall thickness:

Shell .250-inch

Heads .3125-inch

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STI SP001 FORMAL EXTERNAL TANK INSPECTION REPORT

Tank ID C-5 **Date** 8/22/2018

OWNER INFORMATION		**INSPECTION INFORMATION**	
Tank Location	Nikolai Airport Tank Farm	Inspector Name	Eric Weiler
Company Name	City of Nikolai	Company Name	Taku Engineering
Address	PO Box 9145 Nikolai, Alaska 99691	Address	406 W Fireweed Anch, AK 99503
Phone		Phone	(907)529-9806
TANK ID	C-5	**PRODUCT**	Diesel

TANK SPECIFICATION

Design: ☐ UL ☐ API ☐ SWRI ☐ Other ☐ Unknown

Tank Type: ☑ Single Wall ☐ Double Wall ☑ Horizontal ☐ Double Bottom ☐ Rectangular ☐ Closed Top Dike ☐ Vertical ☐ Open Top Dike

Tank Fabricator Unknown — Construction Date Unknown

Manufacturer Unknown — Repairs Unknown

Repair Date Unknown — Unknown

Tank Size

	Size		Capacity	
Primary	7.5'x30.25'	Capacity	10,000	Last Change of Service Unknown
Secondary	NA	Capacity	NA	

Containment: ☑ Earthen Dike ☐ Steel Dike ☐ Concrete ☑ Synthetic Liner ☐ Other

CDRM (Continuous Release Detection Method) ☑ Date Installed Construction — Type Elevated

RPB (Release Prevention Barrier) ☑ Date Installed Construction — Type Impermeable Liner

AST Category: ☑ Category 1-with spill control, CRDM ☐ Category 2-with spill control, without CRDM ☐ Category 3-without spill control, without CRDM

Tank Foundation: ☐ In contact with ground ☐ Concrete ringwall ☑ Elevated ☑ Skid ☐ Other concrete piers under skids.

Tank Entry: ☐ Tank equipped with no manway ☑ Tank equipped with manway — Size 24" x 2

Last Formal External Inspection Unknown — Last Formal Internal Inspection Unknown

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STI SP001 FORMAL EXTERNAL
TANK INSPECTION REPORT

Tank ID C-5 **Date** 8/22/2018

INSPECTION CHECKLIST

Item	Status	Comments
1.0 Tank Containment		
1.1 Water in primary tank, secondary containment, interstice, or spill container?	☑ Yes ☐ No	Water pumped out regularly by operator
1.2 Debris or fire hazard in containment?	☐ Yes ☑ No	
1.3 Drain valves operable and in a closed position?	☐ Yes ☐ No	NA. No drain valves, manual pump out.
1.4 Drainage pipes/valves in satisfactory condition?	☐ Yes ☐ No	NA. No drain valves, manual pump out.
1.5 Containment egress pathways clear and gates/doors operable?	☐ Yes ☑ No	North gate for drive through broken.
1.6 Containment structure in satisfactory condition?	☑ Yes ☐ No	gravel sloughing off of dike embankment formwork
2.0 Leak Detection		
2.1 Visible signs of leakage around the tank, concrete pad, containment, ringwall, or ground?	☑ Yes ☐ No	Sheen noted on water in pit adjacent to truck rack. Inside containment.
3.0 Tank Foundation and Supports		
3.1 Evidence of tank settlement or foundation washout?	☐ Yes ☑ No	
3.2 Cracking or spalling of concrete pad or ring wall?	☐ Yes ☑ No	
3.3 Tank supports in satisfactory condition?	☑ Yes ☐ No	
3.4 Water able to drain away from tank?	☐ Yes ☑ No	Dike requires manual pump out
3.5 Grounding strap secured and in good condition?	☑ Yes ☐ No	Grounding on piping only. No tank grounds.
4.0 Cathodic Protection		
4.1 CP system functional?	☐ Yes ☐ No	N/A
5.0 Tank External Coating		
5.1 Evidence of paint failure?	☑ Yes ☐ No	Epoxy coating chalking heavily.
6.0 Tank Shell/Heads		
6.1 Noticeable shell/head distortions, buckling, denting or bulging?	☐ Yes ☑ No	
6.2 Evidence of shell/head corrosion or cracking?	☐ Yes ☑ No	
7.0 Tank Manways, Piping and Equipment within Secondary Containment		
7.1 Flanged connection bolts tight and fully engaged with no signs of wear or corrosion?	☑ Yes ☐ No	

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STI SP001 FORMAL EXTERNAL TANK INSPECTION REPORT

Tank ID C-5 **Date** 8/22/2018

Item	Status	Comments
8.0 Tank Attachments and Appurtenances		
8.1 Ladder and platform structure secure with no sign of severe corrosion or damage?	☑ Yes ☐ No	
8.2 Tank Liquid level gauge readable and in good condition?	☑ Yes ☐ No	
8.3 Check all tank openings are properly sealed?	☑ Yes ☐ No	
9.0 Tank Roof		
9.1 Standing water on roof	☐ Yes ☑ No	
9.2 Evidence of coating cracking, crazing, peeling, blistering?	☑ Yes ☐ No	
9.3 Holes in roof	☐ Yes ☑ No	
10.0 Venting		
10.1 Vents free of obstructions?	☑ Yes ☐ No	
10.2 Emergency vent operable? Lift as required?	☑ Yes ☐ No	
10.3 Identify Normal & Emergency Vents and sizing?	8" emergency vent & 2" normal vent	
11.0 Other Conditions		
11.1 Are there other conditions that should be addressed for continued safe operation or that may affect the site SPCC plan?	☐ Yes ☑ No	

Tank Tightness Testing

Type of test (s) performed:	Pressure:	Time:	Comments:
Primary tank pressure test	n/a	n/a	n/a
Secondary tank pressure test	n/a	n/a	n/a

Additional Comments:

Nominal wall thickness:

Shell .250-inch

Heads .250-inch

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STI SP001 FORMAL EXTERNAL TANK INSPECTION REPORT

Tank ID C-6 **Date** 8/22/2018

OWNER INFORMATION		**INSPECTION INFORMATION**	
Tank Location	Nikolai Airport Tank Farm	Inspector Name	Eric Weiler
Company Name	City of Nikolai	Company Name	Taku Engineering
Address	PO Box 9145 Nikolai, Alaska 99691	Address	406 W Fireweed Anch, AK 99503
Phone		Phone	(907)529-9806
TANK ID	C-6	**PRODUCT**	Diesel

TANK SPECIFICATION

Design:
- ☐ UL
- ☐ API
- ☐ SWRI
- ☐ Other
- ☑ Unknown

Tank Type:
- ☑ Single Wall
- ☐ Double Wall
- ☑ Horizontal
- ☐ Double Bottom
- ☐ Rectangular
- ☐ Closed Top Dike
- ☐ Vertical
- ☐ Open Top Dike

Tank Fabricator: Unknown   Construction Date: Unknown

Manufacturer: Unknown   Repairs: Unknown

Repair Date: Unknown   Unknown

Tank Size

Primary	7.5'x30.25'	Capacity	10,000	Last Change of Service	Unknown
Secondary	NA	Capacity	NA		

Containment: ☑ Earthen Dike ☐ Steel Dike ☐ Concrete ☑ Synthetic Liner ☐ Other

CDRM (Continuous Release Detection Method) ☑ Date Installed: Construction   Type: Elevated

RPB (Release Prevention Barrier) ☑ Date Installed: Construction   Type: Impermeable Liner

AST Category: ☑ Category 1-with spill control, CRDM ☐ Category 2-with spill control, without CRDM ☐ Category 3-without spill control, without CRDM

Tank Foundation: ☐ In contact with ground ☐ Concrete ringwall ☑ Elevated ☑ Skid ☐ Other: concrete piers under skids.

Tank Entry: ☐ Tank equipped with no manway ☑ Tank equipped with manway   Size: 24" x 2

Last Formal External Inspection: Unknown   Last Formal Internal Inspection: Unknown

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STI SP001 FORMAL EXTERNAL TANK INSPECTION REPORT

Tank ID C-6 **Date** 8/22/2018

INSPECTION CHECKLIST

Item	Status	Comments
1.0 Tank Containment		
1.1 Water in primary tank, secondary containment, interstice, or spill container?	☑ Yes ☐ No	Water pumped out regularly by operator
1.2 Debris or fire hazard in containment?	☐ Yes ☑ No	
1.3 Drain valves operable and in a closed position?	☐ Yes ☐ No	NA. No drain valves, manual pump out.
1.4 Drainage pipes/valves in satisfactory condition?	☐ Yes ☐ No	NA. No drain valves, manual pump out.
1.5 Containment egress pathways clear and gates/doors operable?	☐ Yes ☑ No	North gate for drive through broken.
1.6 Containment structure in satisfactory condition?	☑ Yes ☐ No	gravel sloughing off of dike embankment formwork
2.0 Leak Detection		
2.1 Visible signs of leakage around the tank, concrete pad, containment, ringwall, or ground?	☑ Yes ☐ No	Sheen noted on water in pit adjacent to truck rack. Inside containment.
3.0 Tank Foundation and Supports		
3.1 Evidence of tank settlement or foundation washout?	☐ Yes ☑ No	
3.2 Cracking or spalling of concrete pad or ring wall?	☐ Yes ☑ No	
3.3 Tank supports in satisfactory condition?	☑ Yes ☐ No	
3.4 Water able to drain away from tank?	☐ Yes ☑ No	Dike requires manual pump out
3.5 Grounding strap secured and in good condition?	☑ Yes ☐ No	Grounding on piping only. No tank grounds.
4.0 Cathodic Protection		
4.1 CP system functional?	☐ Yes ☐ No	N/A
5.0 Tank External Coating		
5.1 Evidence of paint failure?	☑ Yes ☐ No	Epoxy coating chalking heavily.
6.0 Tank Shell/Heads		
6.1 Noticeable shell/head distortions, buckling, denting or bulging?	☐ Yes ☑ No	
6.2 Evidence of shell/head corrosion or cracking?	☐ Yes ☑ No	
7.0 Tank Manways, Piping and Equipment within Secondary Containment		
7.1 Flanged connection bolts tight and fully engaged with no signs of wear or corrosion?	☑ Yes ☐ No	

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STI SP001 FORMAL EXTERNAL TANK INSPECTION REPORT

Tank ID C-6 **Date** 8/22/2018

Item	Status	Comments
8.0 Tank Attachments and Appurtenances		
8.1 Ladder and platform structure secure with no sign of severe corrosion or damage?	☑ Yes ☐ No	
8.2 Tank Liquid level gauge readable and in good condition?	☑ Yes ☐ No	
8.3 Check all tank openings are properly sealed?	☑ Yes ☐ No	
9.0 Tank Roof		
9.1 Standing water on roof	☐ Yes ☑ No	
9.2 Evidence of coating cracking, crazing, peeling, blistering?	☑ Yes ☐ No	
9.3 Holes in roof	☐ Yes ☑ No	
10.0 Venting		
10.1 Vents free of obstructions?	☑ Yes ☐ No	
10.2 Emergency vent operable? Lift as required?	☑ Yes ☐ No	
10.3 Identify Normal & Emergency Vents and sizing?	8" emergency vent & 2" normal vent	
11.0 Other Conditions		
11.1 Are there other conditions that should be addressed for continued safe operation or that may affect the site SPCC plan?	☐ Yes ☑ No	

Tank Tightness Testing

Type of test (s) performed:	Pressure:	Time:	Comments:
Primary tank pressure test	n/a	n/a	n/a
Secondary tank pressure test	n/a	n/a	n/a

Additional Comments:

Nominal wall thickness:

Shell .250-inch

Heads .250-inch

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STI SP001 FORMAL EXTERNAL TANK INSPECTION REPORT

Tank ID S-1 **Date** 8/22/2018

OWNER INFORMATION		**INSPECTION INFORMATION**	
Tank Location	Nikolai Airport Tank Farm	Inspector Name	Eric Weiler
Company Name	City of Nikolai	Company Name	Taku Engineering
Address	PO Box 9145 Nikolai, Alaska 99691	Address	406 W Fireweed Anch, AK 99503
Phone		Phone	(907)529-9806
TANK ID	S-1	**PRODUCT**	Diesel

TANK SPECIFICATION

Design: ☐ UL ☐ API ☐ SWRI ☐ Other ☑ Unknown

Tank Type: ☑ Single Wall ☐ Double Wall ☑ Horizontal ☐ Double Bottom ☐ Rectangular ☐ Closed Top Dike ☐ Vertical ☐ Open Top Dike

Tank Fabricator: Unknown Construction Date: Unknown

Manufacturer: Unknown Repairs: Unknown

Repair Date: Unknown Unknown

Tank Size

	Size		Capacity	
Primary	7.5'x36.25'	Capacity	12,000	Last Change of Service: Unknown
Secondary	NA	Capacity	NA	

Containment: ☑ Earthen Dike ☐ Steel Dike ☐ Concrete ☑ Synthetic Liner ☐ Other

CDRM (Continuous Release Detection Method) ☑ Date Installed: Construction Type: Elevated

RPB (Release Prevention Barrier) ☑ Date Installed: Construction Type: Impermeable Liner

AST Category: ☑ Category 1-with spill control, CRDM ☐ Category 2-with spill control, without CRDM ☐ Category 3-without spill control, without CRDM

Tank Foundation: ☐ In contact with ground ☐ Concrete ringwall ☑ Elevated ☑ Skid ☐ Other concrete piers under skids.

Tank Entry: ☐ Tank equipped with no manway ☑ Tank equipped with manway Size 24" x 2

Last Formal External Inspection: Unknown Last Formal Internal Inspection: Unknown

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STI SP001 FORMAL EXTERNAL TANK INSPECTION REPORT

Tank ID S-1 **Date** 8/22/2018

INSPECTION CHECKLIST

Item	Status	Comments
1.0 Tank Containment		
1.1 Water in primary tank, secondary containment, interstice, or spill container?	☑ Yes ☐ No	Water pumped out regularly by operator
1.2 Debris or fire hazard in containment?	☐ Yes ☑ No	
1.3 Drain valves operable and in a closed position?	☐ Yes ☐ No	NA. No drain valves, manual pump out.
1.4 Drainage pipes/valves in satisfactory condition?	☐ Yes ☐ No	NA. No drain valves, manual pump out.
1.5 Containment egress pathways clear and gates/doors operable?	☐ Yes ☑ No	North gate for drive through broken.
1.6 Containment structure in satisfactory condition?	☑ Yes ☐ No	gravel sloughing off of dike embankment formwork
2.0 Leak Detection		
2.1 Visible signs of leakage around the tank, concrete pad, containment, ringwall, or ground?	☑ Yes ☐ No	Sheen noted on water in pit adjacent to truck rack. Inside containment.
3.0 Tank Foundation and Supports		
3.1 Evidence of tank settlement or foundation washout?	☐ Yes ☑ No	
3.2 Cracking or spalling of concrete pad or ring wall?	☐ Yes ☑ No	
3.3 Tank supports in satisfactory condition?	☑ Yes ☐ No	
3.4 Water able to drain away from tank?	☐ Yes ☑ No	Dike requires manual pump out
3.5 Grounding strap secured and in good condition?	☑ Yes ☐ No	Grounding on piping only. No tank grounds.
4.0 Cathodic Protection		
4.1 CP system functional?	☐ Yes ☐ No	N/A
5.0 Tank External Coating		
5.1 Evidence of paint failure?	☑ Yes ☐ No	Epoxy coating chalking heavily.
6.0 Tank Shell/Heads		
6.1 Noticeable shell/head distortions, buckling, denting or bulging?	☐ Yes ☑ No	
6.2 Evidence of shell/head corrosion or cracking?	☐ Yes ☑ No	
7.0 Tank Manways, Piping and Equipment within Secondary Containment		
7.1 Flanged connection bolts tight and fully engaged with no signs of wear or corrosion?	☑ Yes ☐ No	

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STI SP001 FORMAL EXTERNAL TANK INSPECTION REPORT

Tank ID S-1 **Date** 8/22/2018

Item	Status	Comments
8.0 Tank Attachments and Appurtenances		
8.1 Ladder and platform structure secure with no sign of severe corrosion or damage?	☑ Yes ☐ No	
8.2 Tank Liquid level gauge readable and in good condition?	☑ Yes ☐ No	
8.3 Check all tank openings are properly sealed?	☑ Yes ☐ No	
9.0 Tank Roof		
9.1 Standing water on roof	☐ Yes ☑ No	
9.2 Evidence of coating cracking, crazing, peeling, blistering?	☑ Yes ☐ No	
9.3 Holes in roof	☐ Yes ☑ No	
10.0 Venting		
10.1 Vents free of obstructions?	☑ Yes ☐ No	
10.2 Emergency vent operable? Lift as required?	☑ Yes ☐ No	
10.3 Identify Normal & Emergency Vents and sizing?	8" emergency vent & 2" normal vent	
11.0 Other Conditions		
11.1 Are there other conditions that should be addressed for continued safe operation or that may affect the site SPCC plan?	☑ Yes ☐ No	STI Code requires tanks with capacities from 10,001-20,000 gallons to have a 2 1/2" normal vent.

Tank Tightness Testing

Type of test (s) performed:	Pressure:	Time:	Comments:
Primary tank pressure test	n/a	n/a	n/a
Secondary tank pressure test	n/a	n/a	n/a

Additional Comments:

Nominal wall thickness:

Shell .250-inch

Heads .250-inch

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APPENDIX B: TANK NDE DATA

ULTRASONIC THICKNESS MEASUREMENTS

OWNER: City of Nikolai
TANK #: C1
LOCATION: Airport Tank Farm
DATE: 8/22/2018

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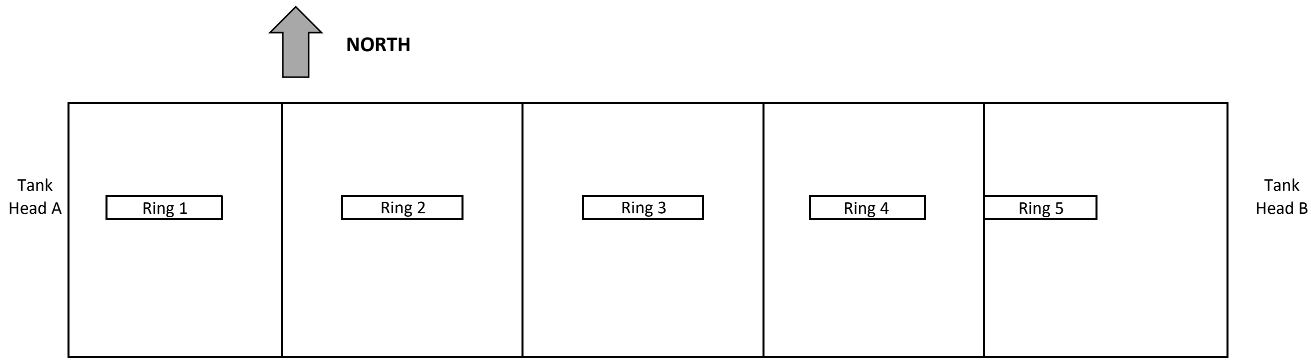
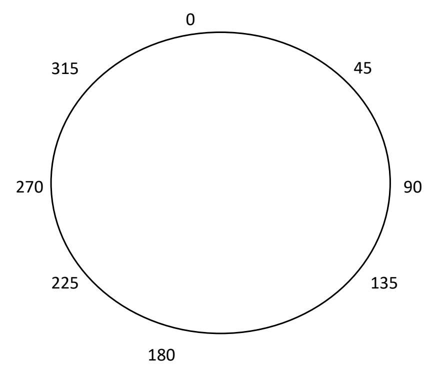


UT Thickness Measurements									
Location	**0°**	**45°**	**90°**	**135°**	**180°**	**225°**	**270°**	**315°**	**avg**
Head A	**Primary Tank**								
1	0.308	--	0.309	0.311	0.309	0.308	0.309	0.309	0.309
DFT Range									
Ring No. 1	**Primary Tank**								
1	0.245	--	0.245	0.245	0.245	0.245	0.245	0.246	0.245
DFT Range									
Ring No. 2	**Primary Tank**								
1	0.248	--	0.245	0.245	0.245	0.245	0.245	--	0.246
DFT Range									
Ring No. 3	**Primary Tank**								
1	--	--	0.245	0.245	0.245	0.245	0.246	--	0.245
DFT Range									
Ring No. 4	**Primary Tank**								
1	--	--	0.238	0.238	0.239	0.238	0.238	--	0.238
DFT Range									
Ring No. 5	**Primary Tank**								
1	--	--	0.238	0.239	0.238	0.238	0.239	--	0.238
DFT Range									
Head B	**Primary Tank**								
1	--	--	0.309	0.309	0.31	0.309	0.309	--	0.309
DFT Range									

-- No Reading Taken



Tank Head A

Equipment: Magnaflux UT thickness tester
Equipment S/N: 5051922
Transducer: dk718ee 7.5MHz
Transducer S/N: 8877

Nozzle Thickness **DFT** 6.8-19 Mils

1" waterdraw	0.163
3" cargo	0.300
manway	0.255
e-vent	0.233

STI Inspector Eric Weiler
Date: 8/22/2018

UL-142 Venting Calculations for Horizontal Cylindrical Storage Tank

OWNER: City of Nikolai
TANK #: C1
LOCATION: Airport Tank Farm
DATE: 8/22/2018

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Tank Diameter (Ft)	11
Tank Length in Feet	38
Tank Volume in Gallons	27014.036
Calculated Wetted Area in Square Footage	1127.4391
Minimum Emergency Vent Required	10"
****Minimum Normal Vent Required**	3"

Size of Opening for Normal Venting	
Capacity of Tank U.S. Gallons	Minimum Diameter Nominal Pipe Size Inches
Under 2,500	1-1/4"
2,500 - 3,000	1-1/2"
3,001 - 10,000	2
10,001 - 20,000	2-1/2"
20,001 - 35,000	3
35,001 - 50,000	4
50,001 - 75,000	6

Size of Opening for Emergency Venting		
Wetted Surface (Sq Ft.)	Venting Capacity (CFH)	Minimum Opening Nominal Pipe Size (inches)
20	21,100	2
30	31,600	2
40	42,100	3
50	52,700	3
60	63,200	3
70	73,700	4
80	84,200	4
90	94,800	4
100	105,000	4
120	126,000	5
140	147,000	5
160	168,000	5
180	190,000	5
200	211,000	6
250	239,000	6
300	265,000	6
350	288,000	8
400	312,000	8
500	354,000	8
600	392,000	8
700	428,000	8
800	462,000	8
900	493,000	8
1000	524,000	10
1200	557,000	10
1400	587,000	10
1600	614,000	10
1800	639,000	10
2000	662,000	10
2400	704,000	10
2800	742,000	10
3200	776,000	12
3600 and over	806,000	12

**NFPA 30--2008, 21.4.3.2 Normal vents shall be sized to be at least as large as the filling or withdrawal connection, whichever is larger, but in no case less than 1-1/4 in. (3 cm) nominal inside diameter.

ULTRASONIC THICKNESS MEASUREMENTS

OWNER: City of Nikolai
TANK #: C3
LOCATION: Airport Tank Farm
DATE: 8/22/2018

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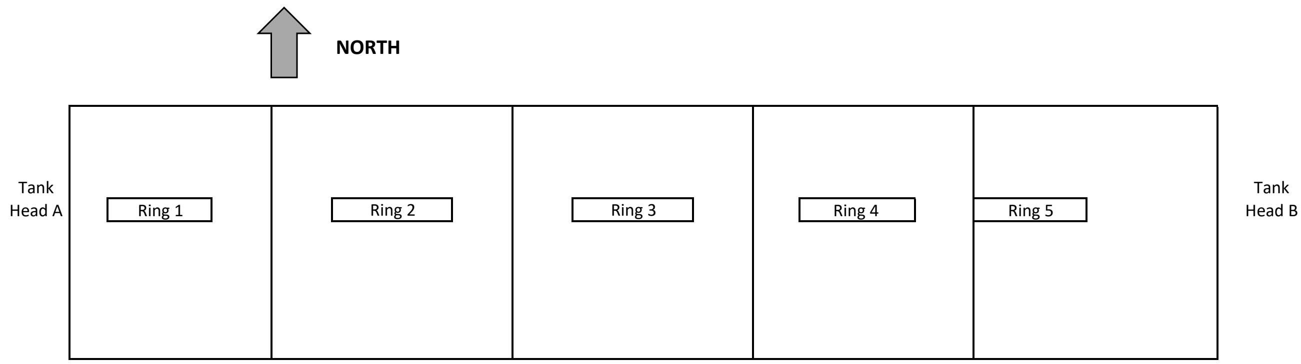
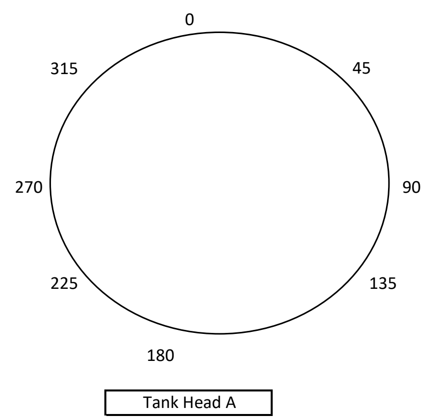


UT Thickness Measurements									
Location	**0°**	**45°**	**90°**	**135°**	**180°**	**225°**	**270°**	**315°**	**avg**
Head A	**Primary Tank**								
1	0.309	0.309	0.31	0.309	0.311	0.309	0.306	0.309	0.309
DFT Range									
Ring No. 1	**Primary Tank**								
1	0.245	0.245	0.246	0.24	0.239	0.246	0.246	0.245	0.244
DFT Range									
Ring No. 2	**Primary Tank**								
1	0.245	--	0.245	0.246	0.245	0.246	0.246	--	0.246
DFT Range									
Ring No. 3	**Primary Tank**								
1	--	--	0.245	0.245	0.245	0.245	0.245	--	0.245
DFT Range									
Ring No. 4	**Primary Tank**								
1	--	--	0.245	0.245	0.236	0.239	0.238	--	0.241
DFT Range									
Ring No. 5	**Primary Tank**								
1	--	--	0.238	0.238	0.238	0.238	0.239	--	0.238
DFT Range									
Head B	**Primary Tank**								
1	--	--	0.309	0.31	0.309	0.308	0.305	--	0.308
DFT Range									

-- No Reading Taken

Nozzle Thickness **DFT** 4.9-17.6 mils

manway	0.223
E-vent	0.233
1" water	
draw	0.171
repad	0.243
3" cargo	
repad	0.242



Equipment: Magnaflux UT thickness tester

Equipment S/N: 5051922

Transducer: dk718ee 7.5MHz

Transducer S/N: 8877

STI Inspector Eric Weiler
Date: 8/22/2018

UL-142 Venting Calculations for Horizontal Cylindrical Storage Tank

OWNER: City of Nikolai
TANK #: C3
LOCATION: Airport Tank Farm
DATE: 8/22/2018

taku engineering, llc

Tank Diameter (Ft)	11
Tank Length in Feet	38
Tank Volume in Gallons	27014.036
Calculated Wetted Area in Square Footage	1127.4391
Minimum Emergency Vent Required	10"
****Minimum Normal Vent Required**	3"

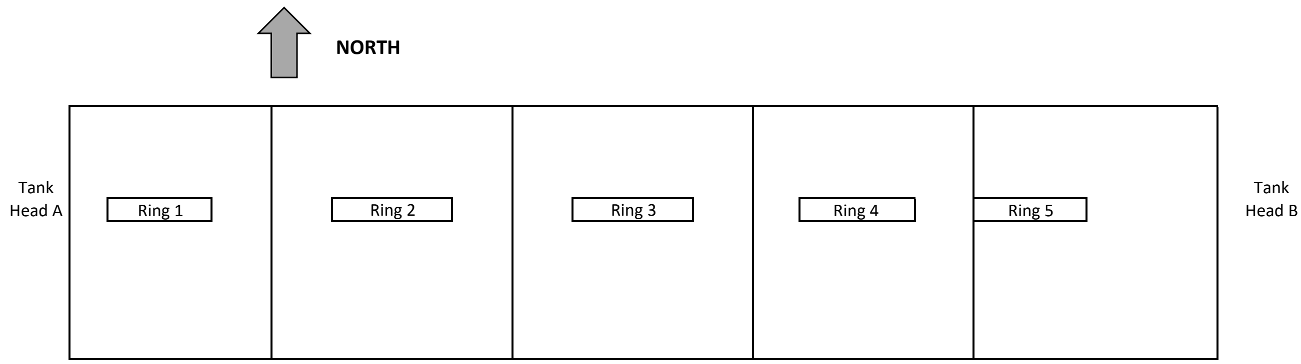
Size of Opening for Normal Venting	
Capacity of Tank U.S. Gallons	Minimum Diameter Nominal Pipe Size Inches
Under 2,500	1-1/4"
2,500 - 3,000	1-1/2"
3,001 - 10,000	2
10,001 - 20,000	2-1/2"
20,001 - 35,000	3
35,001 - 50,000	4
50,001 - 75,000	6

Size of Opening for Emergency Venting		
Wetted Surface (Sq Ft.)	Venting Capacity (CFH)	Minimum Opening Nominal Pipe Size (inches)
20	21,100	2
30	31,600	2
40	42,100	3
50	52,700	3
60	63,200	3
70	73,700	4
80	84,200	4
90	94,800	4
100	105,000	4
120	126,000	5
140	147,000	5
160	168,000	5
180	190,000	5
200	211,000	6
250	239,000	6
300	265,000	6
350	288,000	8
400	312,000	8
500	354,000	8
600	392,000	8
700	428,000	8
800	462,000	8
900	493,000	8
1000	524,000	10
1200	557,000	10
1400	587,000	10
1600	614,000	10
1800	639,000	10
2000	662,000	10
2400	704,000	10
2800	742,000	10
3200	776,000	12
3600 and over	806,000	12

**NFPA 30--2008, 21.4.3.2 Normal vents shall be sized to be at least as large as the filling or withdrawal connection, whichever is larger, but in no case less than 1-1/4 in. (3 cm) nominal inside diameter.

ULTRASONIC THICKNESS MEASUREMENTS

OWNER: City of Nikolai
TANK #: C4
LOCATION: Airport Tank Farm
DATE: 8/22/2018

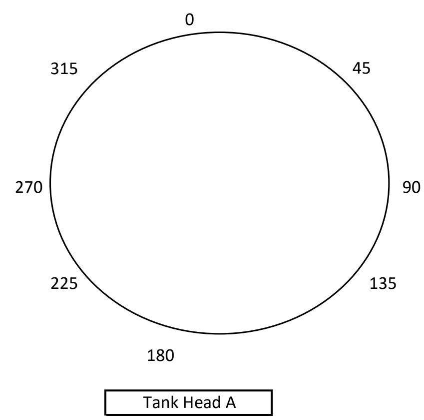


UT Thickness Measurements									
Location	**0°**	**45°**	**90°**	**135°**	**180°**	**225°**	**270°**	**315°**	**avg**
Head A	**Primary Tank**								
1	0.308	0.309	0.309	0.309	0.31	0.309	0.31	0.309	0.309
DFT Range									
Ring No. 1	**Primary Tank**								
1	0.245	0.245	0.245	0.243	0.238	0.245	0.245	0.245	0.244
DFT Range									
Ring No. 2	**Primary Tank**								
1	0.249	--	0.246	0.248	0.248	0.248	0.248	--	0.248
DFT Range									
Ring No. 3	**Primary Tank**								
1	--	--	0.245	0.245	0.245	0.245	0.247	--	0.245
DFT Range									
Ring No. 4	**Primary Tank**								
1	--	--	0.239	0.239	0.238	0.239	0.239	--	0.239
DFT Range									
Ring No. 5	**Primary Tank**								
1	--	--	0.239	0.238	0.236	0.238	0.238	--	0.238
DFT Range									
Head B	**Primary Tank**								
1	--	--	0.303	0.309	0.312	0.306	0.309	--	0.308
DFT Range									

-- No Reading Taken

Nozzle Thickness **DFT** 8-18.5 mils

manway	0.254
vent	0.232
1" wd	0.172
repad	0.241
3" cargo	0.21
no repad	



Equipment: Magnaflux UT thickness tester

Equipment S/N: 5051922

Transducer: dk718ee 7.5MHz

Transducer S/N: 8877

STI Inspector Eric Weiler
Date: 8/22/2018

UL-142 Venting Calculations for Horizontal Cylindrical Storage Tank

OWNER: City of Nikolai
TANK #: C4
LOCATION: Airport Tank Farm
DATE: 8/22/2018

(χ/δτ) taku engineering, llc

Tank Diameter (Ft)	11
Tank Length in Feet	38
Tank Volume in Gallons	27014.036
Calculated Wetted Area in Square Footage	1127.4391
Minimum Emergency Vent Required	10"
****Minimum Normal Vent Required**	3"

Size of Opening for Normal Venting	
Capacity of Tank U.S. Gallons	Minimum Diameter Nominal Pipe Size Inches
Under 2,500	1-1/4"
2,500 - 3,000	1-1/2"
3,001 - 10,000	2
10,001 - 20,000	2-1/2"
20,001 - 35,000	3
35,001 - 50,000	4
50,001 - 75,000	6

Size of Opening for Emergency Venting		
Wetted Surface (Sq Ft.)	Venting Capacity (CFH)	Minimum Opening Nominal Pipe Size (inches)
20	21,100	2
30	31,600	2
40	42,100	3
50	52,700	3
60	63,200	3
70	73,700	4
80	84,200	4
90	94,800	4
100	105,000	4
120	126,000	5
140	147,000	5
160	168,000	5
180	190,000	5
200	211,000	6
250	239,000	6
300	265,000	6
350	288,000	8
400	312,000	8
500	354,000	8
600	392,000	8
700	428,000	8
800	462,000	8
900	493,000	8
1000	524,000	10
1200	557,000	10
1400	587,000	10
1600	614,000	10
1800	639,000	10
2000	662,000	10
2400	704,000	10
2800	742,000	10
3200	776,000	12
3600 and over	806,000	12

**NFPA 30--2008, 21.4.3.2 Normal vents shall be sized to be at least as large as the filling or withdrawal connection, whichever is larger, but in no case less than 1-1/4 in. (3 cm) nominal inside diameter.

ULTRASONIC THICKNESS MEASUREMENTS

OWNER: City of Nikolai
TANK #: C5
LOCATION: Airport Tank Farm
DATE: 8/22/2018

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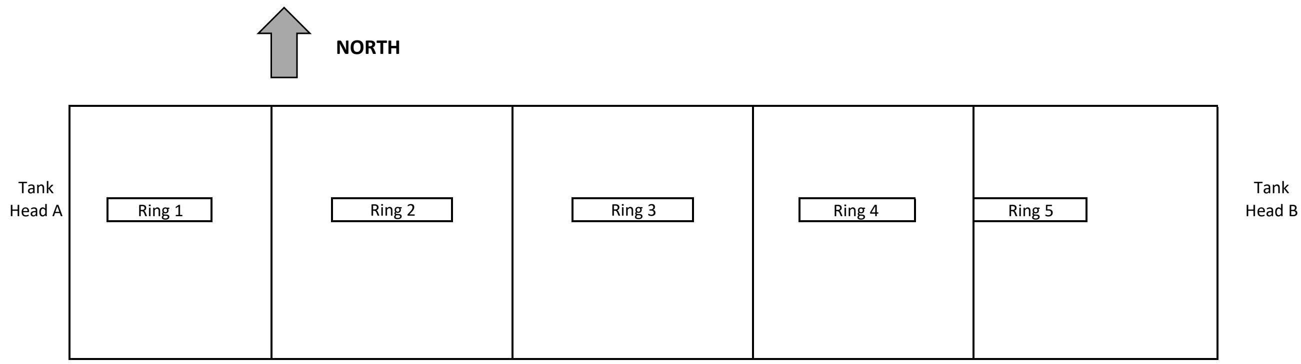


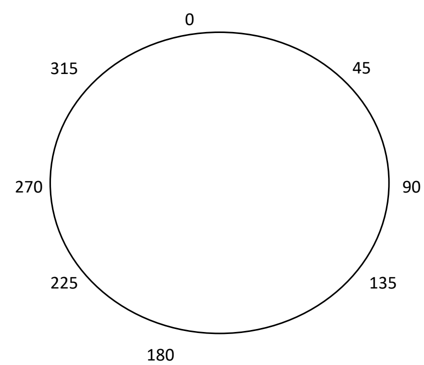
UT Thickness Measurements									
Location	**0°**	**45°**	**90°**	**135°**	**180°**	**225°**	**270°**	**315°**	**avg**
Head A	**Primary Tank**								
	0.254	0.255	0.254	0.254	0.257	0.255	0.254	0.254	0.255
DFT Range									
Ring No. 1	**Primary Tank**								
	--	0.258	0.258	0.258	0.257	0.26	0.261	0.26	0.259
DFT Range									
Ring No. 2	**Primary Tank**								
	--	0.262	0.261	0.261	0.258	0.26	0.259	0.26	0.260
DFT Range									
Ring No. 3	**Primary Tank**								
	--	0.26	0.261	0.261	0.261	0.261	0.261	0.261	0.261
DFT Range									
Ring No. 4	**Primary Tank**								
	--	0.263	0.262	0.263	0.261	0.261	0.261	0.263	0.262
DFT Range									
Ring No. 5	**Primary Tank**								
	--	0.263	0.262	0.261	0.261	0.26	0.261	0.261	0.261
DFT Range									
Head B	**Primary Tank**								
	0.255	0.258	0.262	0.261	0.258	0.261	0.261	0.257	0.259
DFT Range									

-- No Reading Taken

Nozzle Thickness

3" cargo	0.308
repad	0.242
1" waterdraw	0.245
repad	0.246
manway	0.220

DFT 6.8-17.2 mils



Tank Head A

Equipment: Magnaflux UT thickness tester

Equipment S/N: 5051922

Transducer: dk718ee 7.5MHz

Transducer S/N: 8877

STI Inspector Eric Weiler
Date: 8/22/2018

UL-142 Venting Calculations for Horizontal Cylindrical Storage Tank

OWNER: City of Nikolai
TANK #: C5
LOCATION: Airport Tank Farm
DATE: 8/22/2018

Tank Diameter (Ft)	7.5
Tank Length in Feet	30.25
Tank Volume in Gallons	9996.9706
Calculated Wetted Area in Square Footage	600.82959
Minimum Emergency Vent Required	8"
****Minimum Normal Vent Required**	2"

Size of Opening for Normal Venting	
Capacity of Tank U.S. Gallons	Minimum Diameter Nominal Pipe Size Inches
Under 2,500	1-1/4"
2,500 - 3,000	1-1/2"
3,001 - 10,000	2
10,001 - 20,000	2-1/2"
20,001 - 35,000	3
35,001 - 50,000	4
50,001 - 75,000	6

Size of Opening for Emergency Venting		
Wetted Surface (Sq Ft.)	Venting Capacity (CFH)	Minimum Opening Nominal Pipe Size (inches)
20	21,100	2
30	31,600	2
40	42,100	3
50	52,700	3
60	63,200	3
70	73,700	4
80	84,200	4
90	94,800	4
100	105,000	4
120	126,000	5
140	147,000	5
160	168,000	5
180	190,000	5
200	211,000	6
250	239,000	6
300	265,000	6
350	288,000	8
400	312,000	8
500	354,000	8
600	392,000	8
700	428,000	8
800	462,000	8
900	493,000	8
1000	524,000	10
1200	557,000	10
1400	587,000	10
1600	614,000	10
1800	639,000	10
2000	662,000	10
2400	704,000	10
2800	742,000	10
3200	776,000	12
3600 and over	806,000	12

**NFPA 30--2008, 21.4.3.2 Normal vents shall be sized to be at least as large as the filling or withdrawal connection, whichever is larger, but in no case less than 1-1/4 in. (3 cm) nominal inside diameter.

ULTRASONIC THICKNESS MEASUREMENTS

OWNER: City of Nikolai
TANK #: C6
LOCATION: Airport Tank Farm
DATE: 8/22/2018

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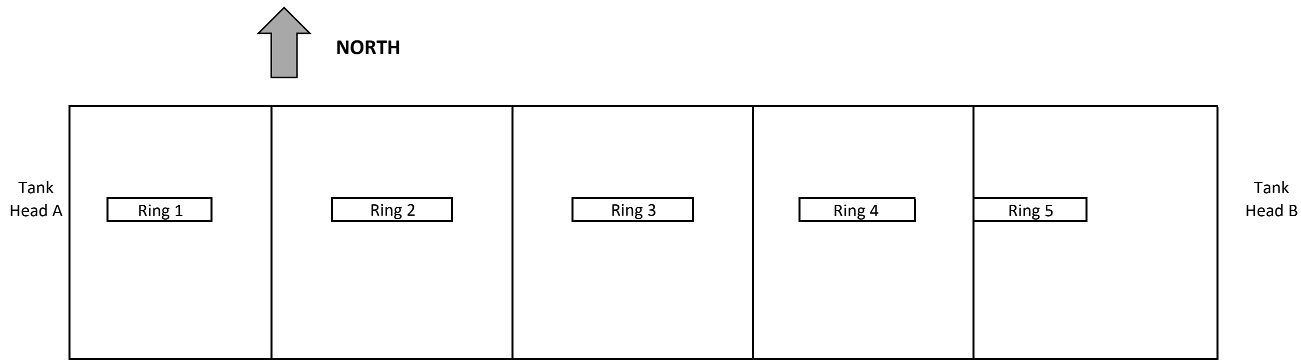
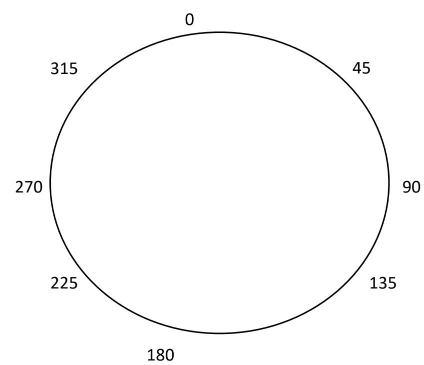


UT Thickness Measurements									
Location	**0°**	**45°**	**90°**	**135°**	**180°**	**225°**	**270°**	**315°**	**avg**
Head A	**Primary Tank**								
1	0.251	0.249	0.254	0.254	0.249	0.251	0.252	0.254	0.251
DFT Range									
Ring No. 1	**Primary Tank**								
1	0.262	0.261	0.261	0.261	0.261	0.263	0.263	0.264	0.262
DFT Range									
Ring No. 2	**Primary Tank**								
1	--	0.261	0.263	0.265	0.264	0.264	0.263	0.264	0.263
DFT Range									
Ring No. 3	**Primary Tank**								
1	--	0.264	0.263	0.263	0.255	0.261	0.261	0.263	0.261
DFT Range									
Ring No. 4	**Primary Tank**								
1	--	0.261	0.261	0.261	0.26	0.26	0.261	0.26	0.261
DFT Range									
Ring No. 5	**Primary Tank**								
1	--	0.26	0.261	0.26	0.26	0.26	0.26	0.261	0.260
DFT Range									
Head B	**Primary Tank**								
1	0.263	0.26	0.267	0.254	0.257	0.273	0.265	0.26	0.263
DFT Range									

-- No Reading Taken



Tank Head A

Nozzle Thickness **DFT** 5-9 mils

3" cargo	0.312
repad	0.245
1" waterdraw	0.236
repad	0.245

Equipment: Magnaflux UT thickness tester
Equipment S/N: 5051922
Transducer: dk718ee 7.5MHz
Transducer S/N: 8877

STI Inspector Eric Weiler
Date: 8/22/2018

UL-142 Venting Calculations for Horizontal Cylindrical Storage Tank

OWNER: City of Nikolai
TANK #: C6
LOCATION: Airport Tank Farm
DATE: 8/22/2018

taku engineering, llc

Tank Diameter (Ft)	7.5
Tank Length in Feet	3.25
Tank Volume in Gallons	1074.0547
Calculated Wetted Area in Square Footage	123.70021
Minimum Emergency Vent Required	5"
****Minimum Normal Vent Required**	1-1/4"

Size of Opening for Normal Venting	
Capacity of Tank U.S. Gallons	Minimum Diameter Nominal Pipe Size Inches
Under 2,500	1-1/4"
2,500 - 3,000	1-1/2"
3,001 - 10,000	2
10,001 - 20,000	2-1/2"
20,001 - 35,000	3
35,001 - 50,000	4
50,001 - 75,000	6

Size of Opening for Emergency Venting		
Wetted Surface (Sq Ft.)	Venting Capacity (CFH)	Minimum Opening Nominal Pipe Size (inches)
20	21,100	2
30	31,600	2
40	42,100	3
50	52,700	3
60	63,200	3
70	73,700	4
80	84,200	4
90	94,800	4
100	105,000	4
120	126,000	5
140	147,000	5
160	168,000	5
180	190,000	5
200	211,000	6
250	239,000	6
300	265,000	6
350	288,000	8
400	312,000	8
500	354,000	8
600	392,000	8
700	428,000	8
800	462,000	8
900	493,000	8
1000	524,000	10
1200	557,000	10
1400	587,000	10
1600	614,000	10
1800	639,000	10
2000	662,000	10
2400	704,000	10
2800	742,000	10
3200	776,000	12
3600 and over	806,000	12

**NFPA 30--2008, 21.4.3.2 Normal vents shall be sized to be at least as large as the filling or withdrawal connection, whichever is larger, but in no case less than 1-1/4 in. (3 cm) nominal inside diameter.

ULTRASONIC THICKNESS MEASUREMENTS

OWNER: City of Nikolai
TANK #: S1
LOCATION: Airport Tank Farm
DATE: 8/22/2018

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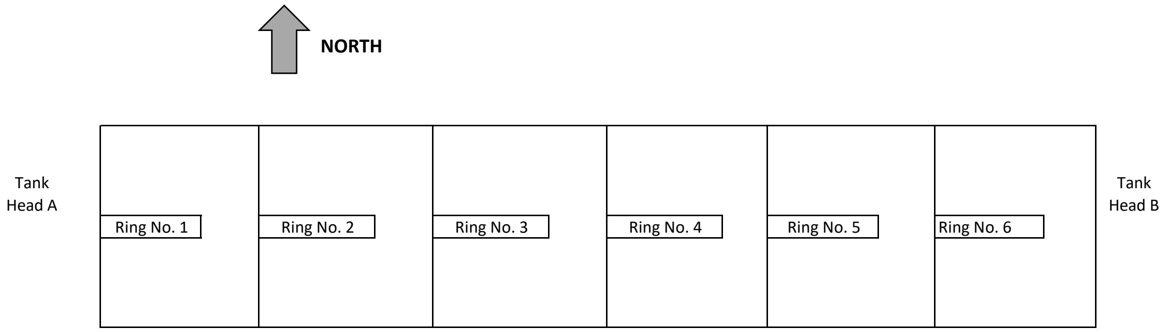
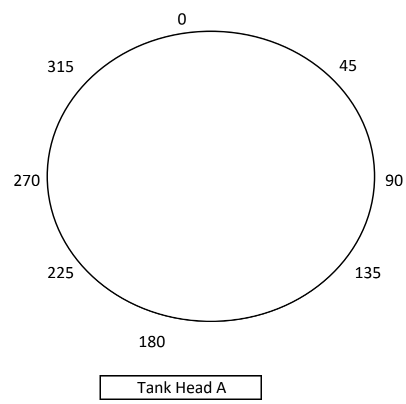


UT Thickness Measurements									
Location	**0°**	**45°**	**90°**	**135°**	**180°**	**225°**	**270°**	**315°**	**avg**
Head A	**Primary Tank**								
1	0.249	0.252	0.254	0.252	0.252	0.252	0.254	0.249	0.252
DFT Range									
Ring No. 1	**Primary Tank**								
1	0.258	0.263	0.261	0.261	0.255	0.26	0.261	0.26	0.260
DFT Range									
Ring No. 2	**Primary Tank**								
1	0.261	0.261	0.26	0.261	0.259	0.261	0.261	0.261	0.261
DFT Range									
Ring No. 3	**Primary Tank**								
1	--	0.259	0.263	0.263	0.261	0.264	0.264	0.263	0.262
DFT Range									
Ring No. 4	**Primary Tank**								
1	--	0.263	0.264	0.263	0.261	0.261	0.26	0.261	0.262
DFT Range									
Ring No. 5	**Primary Tank**								
1	--	0.26	0.261	0.26	0.258	0.258	0.26	0.26	0.260
DFT Range									
Ring No. 6	**Primary Tank**								
1	--	0.258	0.26	0.258	0.258	0.26	0.26	0.26	0.259
DFT Range									
Head B	**Primary Tank**								
1	--	0.277	0.264	0.26	0.273	0.28	0.27	0.264	0.271
DFT Range									

-- No Reading Taken

Nozzle Thickness		**DFT**	1.8-15.4 mils
3" cargo	0.296		
1" wd	0.233		
3" level	0.214		
24" manway	0.216		
8" relief	0.182		



Equipment: Magnaflux UT thickness tester

Equipment S/N: 5051922

Transducer: dk718ee 7.5MHz

Transducer S/N: 8877

STI Inspector Eric Weiler
Date: 8/22/2018

UL-142 Venting Calculations for Horizontal Cylindrical Storage Tank

OWNER: City of Nikolai
TANK #: S1
LOCATION: Airport Tank Farm
DATE: 8/22/2018

taku engineering, llc

Tank Diameter (Ft)	7.5
Tank Length in Feet	36.25
Tank Volume in Gallons	11979.841
Calculated Wetted Area in Square Footage	706.85835
Minimum Emergency Vent Required	8"
****Minimum Normal Vent Required**	2-1/2"

Size of Opening for Normal Venting	
Capacity of Tank U.S. Gallons	Minimum Diameter Nominal Pipe Size Inches
Under 2,500	1-1/4"
2,500 - 3,000	1-1/2"
3,001 - 10,000	2
10,001 - 20,000	2-1/2"
20,001 - 35,000	3
35,001 - 50,000	4
50,001 - 75,000	6

Size of Opening for Emergency Venting		
Wetted Surface (Sq Ft.)	Venting Capacity (CFH)	Minimum Opening Nominal Pipe Size (inches)
20	21,100	2
30	31,600	2
40	42,100	3
50	52,700	3
60	63,200	3
70	73,700	4
80	84,200	4
90	94,800	4
100	105,000	4
120	126,000	5
140	147,000	5
160	168,000	5
180	190,000	5
200	211,000	6
250	239,000	6
300	265,000	6
350	288,000	8
400	312,000	8
500	354,000	8
600	392,000	8
700	428,000	8
800	462,000	8
900	493,000	8
1000	524,000	10
1200	557,000	10
1400	587,000	10
1600	614,000	10
1800	639,000	10
2000	662,000	10
2400	704,000	10
2800	742,000	10
3200	776,000	12
3600 and over	806,000	12

**NFPA 30--2008, 21.4.3.2 Normal vents shall be sized to be at least as large as the filling or withdrawal connection, whichever is larger, but in no case less than 1-1/4 in. (3 cm) nominal inside diameter.

APPENDIX C: PIPE EXAMINATION REPORTS

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PIPE EXAMINATION REPORT

Date of Examination: ***August 22, 2018***

Client or Owner Name:	***City of Nikolai***
Facility & General Location:	***Bulk Fuel Tank Farm at Airstrip***
Piping Size, Service & Type:	***1”, 2” and 3” Carbon Steel (A106B) Refined Fuel Service***
Line No. or Designation::	***Diesel***
Location or Stationing	***All above grade piping and selected transitions***
Above or Below Ground:	***Above Ground and Below Ground***

Insulation Condition

Insulation Present?	☐ Yes	☒ No	☐ N/A	
Insulation Type:	☐ Fiberglass ☐ Polyethylene	☐ Rigid Foam ☐ Other	☒ N/A	
Insulation Thickness:	in	☒ N/A		
Jacket Condition:	☐ Good	☐ Separated	☐ Perforated	☒ N/A
Insulation Condition:	☐ Good	☐ Wet	☒ N/A	

Comments:

Coating Condition

Coated?	☒ Yes	☐ No	☐ N/A
Coating Color:	☒ White ☐ Black	☐ Gray ☐ Other	☐ N/A
Coating Type:	☒ Epoxy ☐ IOZ	☐ Urethane ☒ Other *Yellow Jacket*	☐ N/A
Coating Condition:	☐ Poor ☒ Fair	☐ Good ☐ Excellent	☐ N/A
Coating Damage:	☐ Abrasion ☐ Delamination	☐ Disbonding ☒ Other: UV	☐ N/A

Comments:

UV Degradation and chalking on all epoxy coating. Yellow jacket at transitions and on buried pipe is in excellent condition..

Tape Wrap Condition

Wrapped?	☐ Yes	☐ No	☒ N/A
Wrap Type:	☐ Petrolatum	☐ PE-Backed	☒ N/A
Wrap Color:	☐ Black ☐ Gray	☐ Green ☐ Other	☒ N/A
Wrap Condition:	☐ Poor ☐ Fair	☐ Good ☐ Excellent	☒ N/A
Tape Damage:	☐ Delaminated ☐ Disbonded	☐ Perforated ☐ Wrinkled	☒ N/A

Comments:

None

Rock Shield Condition

Rock Shield Present?	☐ Yes	☐ No	☒ N/A
Rock Shield Type:	☐ Mesh ☐ Fabric	☐ Mat ☐ Other	☒ N/A
Condition:	☐ Ripped ☐ Disbanded	☐ Missing ☐ Other	☒ N/A
NDE Performed:	☐ Yes	☐ No	☒ N/A
Damage Repaired:	☐ Yes	☐ No	☒ N/A

Comments:

None

External Corrosion

External Corrosion Present?	☒ Yes	☐ No	☐ N/A
Type:	☒ Surface ☐ Pitting	☐ Weld Attack ☐ Other	☐ N/A
Description:	*Light surface rust*		

Comments:

All welded joints, elbows and flanges.

Internal Corrosion

Internal Corrosion Present?	☐ Yes	☒ No	☐ N/A
Method of Examination:	☐ Visual	☒ NDE	☐ N/A
Description:	*None Noted*		

Comments:

Spot readings collected. No indications of wall thinning found.

Mechanical Damage or Fabrication Defects

Damage or Defects Observed?	☐ Yes	☒ No	☐ N/A
Damage Type:	☐ Scrape ☐ Arch Burn	☐ Gouge ☐ Other	☐ Dent ☒ N/A
Dent Information:	Size Indications	Deflection	☒ N/A
NDE Performed?	☐ Yes	☐ No	☒ N/A
Damage Repaired?	☐ Yes	☐ No	☒ N/A
Comments: *NA*			

Cathodic Protection Components Exposed

CP Components Found?	☐ Yes	☒ No	☐ N/A
Type:	*None Exposed.*		
Condition:	☐ Good ☐ Damaged	☐ Consumed ☐ Other	☒ N/A
Repair Information:	☐ Repaired ☐ Replaced	☐ Removed ☐ Other	☒ N/A
Comments: *NA*			

Aboveground or Vault Information

Length of Applicable Pipe Examined: *All aboveground piping at tankfarm.*	Piping Location? ☐ Indoors ☒ Outdoors ☐ Vault or Confined Space ☐ N/A
Height Above Grade or within Vault: *12-18 inches*	Was water present? ☒ Yes ☐ No ☐ N/A If Yes, Depth Encountered: *N/A*
Pipe Anchors or Support Information: *Unistrut and uninsulated conduit clamps*	Vault Condition (Visible Damage, Corrosion, Coated, etc.): *NA*
Pipe Penetration or Transition Information: *NA*	Support Condition: (Visible Damage, Corrosion, Coating, etc.) *Good condition*
Comments: *Replace uninsulated pipe straps with insulated variety to prevent metal to metal contact and corrosion*	

Excavation Information

Length of Pipe Exposure: *24 inches at 3 transitions in tank farm and 1 transition at dispenser.*	Did excavation require trench boxes or slope shoring? ☐ Yes ☒ No ☐ N/A If Yes, Method Used: *N/A*
Depth of Burial: *Unknown*	Was water encountered in excavation? ☐ Yes ☒ No ☐ N/A If Yes, Depth Encountered: *N/A*
Backfill Material (Type and Size): *3/8" minus*	Padding and Bedding (Type and Size): *3/8" minus*
Foreign Piping, Structures or Utilities Present in Excavation: *N/A*	Unusual Conditions: (Organic Material, Unusual Odors, etc.) *N/A*
Comments: *Excavations completed to assess condition of piping at the soil to air interface. Coating in excellent condition with no signs of damage.*	

Additional Information

NDE Inspection Results (if any), Owner/Operator Information, etc.:

No corrosion noted either externally or internally. Coating at excavated transitions was found in excellent condition. All diesel piping is coated gray, all gasoline piping is coated red.

Performed By

Name/Company: *Eric Weiler Taku Engineering*	Signature:	Date:	*8-22-2018*
Name/Company: *James Adams, QA Services*	Signature:	Date:	*8-22-2018*

Photos or Site Sketches

Provide Photograph(s), Site Sketches and/or Aerial Information to Document Pipe Location & Damage Observed:

General piping condition

General piping condition with surface rust at all welded connections, elbows and flanges. Below grade yellow jacket in excellent condition.

Taku Engineering, LLC

PIPE EXAMINATION REPORT

Date of Examination: *August 22, 2018*

Client or Owner Name:	***City of Nikolai***
Facility & General Location:	***Bulk Fuel Tank Farm at Airstrip***
Piping Size, Service & Type:	***1", 2" and 3" Carbon Steel (A106B) Refined Fuel Service***
Line No. or Designation::	***Gasoline***
Location or Stationing	***All above grade piping and selected transitions***
Above or Below Ground:	***Above Ground and Below Ground***

Insulation Condition

Insulation Present?	☐ Yes	☒ No	☐ N/A	
Insulation Type:	☐ Fiberglass ☐ Polyethylene	☐ Rigid Foam ☐ Other	☒ N/A	
Insulation Thickness:	in	☒ N/A		
Jacket Condition:	☐ Good	☐ Separated	☐ Perforated	☒ N/A
Insulation Condition:	☐ Good	☐ Wet	☒ N/A	
Comments:				

Coating Condition

Coated?	☒ Yes	☐ No	☐ N/A
Coating Color:	☒ White ☐ Black	☐ Gray ☐ Other	☐ N/A
Coating Type:	☒ Epoxy ☐ IOZ	☐ Urethane ☒ Other *Yellow Jacket*	☐ N/A
Coating Condition:	☐ Poor ☒ Fair	☐ Good ☐ Excellent	☐ N/A
Coating Damage:	☐ Abrasion ☐ Delamination	☐ Disbonding ☒ Other: UV	☐ N/A

Comments:
UV Degradation and chalking on epoxy. Belowgrade coating is yellowjacket in excellent condition.

Tape Wrap Condition

Wrapped?	☐ Yes	☐ No	☒ N/A
Wrap Type:	☐ Petrolatum	☐ PE-Backed	☒ N/A
Wrap Color:	☐ Black ☐ Gray	☐ Green ☐ Other	☒ N/A
Wrap Condition:	☐ Poor ☐ Fair	☐ Good ☐ Excellent	☒ N/A
Tape Damage:	☐ Delaminated ☐ Disbonded	☐ Perforated ☐ Wrinkled	☒ N/A

Comments:
None

Rock Shield Condition

Rock Shield Present?	☐ Yes	☐ No	☒ N/A
Rock Shield Type:	☐ Mesh ☐ Fabric	☐ Mat ☐ Other	☒ N/A
Condition:	☐ Ripped ☐ Disbanded	☐ Missing ☐ Other	☒ N/A
NDE Performed:	☐ Yes	☐ No	☒ N/A
Damage Repaired:	☐ Yes	☐ No	☒ N/A

Comments:
None

External Corrosion

External Corrosion Present?	☒ Yes	☐ No	☐ N/A
Type:	☒ Surface ☐ Pitting	☐ Weld Attack ☐ Other	☐ N/A
Description:	*Light Surface Corrosion.*		

Comments:
Surface corrosion present at all welded joints, elbows and flanges.

Internal Corrosion

Internal Corrosion Present?	☐ Yes	☒ No	☐ N/A
Method of Examination:	☐ Visual	☒ NDE	☐ N/A
Description:	*None Noted*		

Comments:
Spot readings collected. No indications of wall thinning found.

Mechanical Damage or Fabrication Defects

Damage or Defects Observed?	☐ Yes	☒ No	☐ N/A
Damage Type:	☐ Scrape ☐ Arch Burn	☐ Gouge ☐ Other	☐ Dent ☒ N/A
Dent Information:	Size Indications	Deflection	☒ N/A
NDE Performed?	☐ Yes	☐ No	☒ N/A
Damage Repaired?	☐ Yes	☐ No	☒ N/A
Comments: *NA*			

Cathodic Protection Components Exposed

CP Components Found?	☐ Yes	☒ No	☐ N/A
Type:	*None Exposed.*		
Condition:	☐ Good ☐ Damaged	☐ Consumed ☐ Other	☒ N/A
Repair Information:	☐ Repaired ☐ Replaced	☐ Removed ☐ Other	☒ N/A
Comments: *NA*			

Aboveground or Vault Information

Length of Applicable Pipe Examined: *All aboveground piping at tankfarm.*	Piping Location? ☐ Indoors ☒ Outdoors ☐ Vault or Confined Space ☐ N/A
Height Above Grade or within Vault: *12-18 inches*	Was water present? ☒ Yes ☐ No ☐ N/A If Yes, Depth Encountered: *N/A*
Pipe Anchors or Support Information: *Unistrut and uninsulated conduit clamps*	Vault Condition (Visible Damage, Corrosion, Coated, etc.): *NA*
Pipe Penetration or Transition Information: *NA*	Support Condition: (Visible Damage, Corrosion, Coating, etc.) *Good condition*
Comments: *Replace uninsulated pipe straps with insulated variety to prevent metal to metal contact and corrosion*	

Excavation Information

Length of Pipe Exposure: *24 inches at 3 transitions in tank farm and 1 transition at dispenser.*	Did excavation require trench boxes or slope shoring? ☐ Yes ☒ No ☐ N/A If Yes, Method Used: *N/A*
Depth of Burial: *Unknown*	Was water encountered in excavation? ☐ Yes ☒ No ☐ N/A If Yes, Depth Encountered: *N/A*
Backfill Material (Type and Size): *3/8" minus*	Padding and Bedding (Type and Size): *3/8" minus*
Foreign Piping, Structures or Utilities Present in Excavation: *N/A*	Unusual Conditions: (Organic Material, Unusual Odors, etc.) *N/A*
Comments: *Excavations completed to assess condition of piping at the soil to air interface. Coating in excellent condition with no signs of damage.*	

Additional Information

NDE Inspection Results (if any), Owner/Operator Information, etc.:

No corrosion noted either externally or internally. Yellow jacket at transitions is in excellent condition.

Performed By

Name/Company:	*Eric Weiler Taku Engineering*	Signature:		Date:	*8-22-2018*
Name/Company:	*James Adams, QA Services*	Signature:		Date:	*8-22-2018*

Photos or Site Sketches

Provide Photograph(s), Site Sketches and/or Aerial Information to Document Pipe Location & Damage Observed:

Typical gasoline piping condition.

Coating condition at gasoline dispenser transition.

APPENDIX D: PIPING NDE DATA

API 570 Evaluation

Owner:	City of Nikolai	[1]**Design Press *(P)*:**	285	[5]**Pipe Mat'l Coeff *(Y)*:**	0.4
Location:	Airfield	[2]**Pipe Material:**	A106-B	**Date of Installation:**	2002
Description:	City tank farm	[3]**Allowable Stress *(S)*:**	20000	[7]**API 570 Insp Int:**	10 Years
Date of Insp:	August 22, 2018	[4]**Joint Efficiency *(E)*:**	1	**Next Inspection Year:**	2028

Calculation Formulas:

- Structural Minimum Required Wall Thickness: Per API 574, Table 6
- Pressure Design Thickness: Per ASME B31.3 -- t_{min} ***= ((P x D)/(2(SE+PY))***
- Long Term Corrosion Rate: Per API 570 -- LT_{corr} ***= ((***$t_{initial}$ ***-*** t_{actual}***)/Years in Service)***
- Corrosion Loss at Next Inspection: ***=*** LT_{corr} ***x No. of Yrs to Next Inspection***
- Remaining Life: Per API 570 -- ***RL = ((***t_{actual} ***-*** t_{min}***)/Ltcorr)***
- Half-Life Inspection: Takes the lowest RL (structural vs pressure) and divides by 2.
- Next Inspection Year: Utilizes the lowest interval (API 570 Insp. Interval vs. Lowest Calculated Half-Life)

Inspection Point	Location	Year Installed	Nominal Pipe Size	[6]Pipe Schedule	Nominal Pipe OD *(D)*	Nominal Wall Thickness *($t_{initial}$)*	Years in Service	Structural Minimum Thickness (API 574)	Pressure Design Thickness (ASME B31.3)	O'Clock Position	UT Measured Thickness *(t_{actual})*	Greatest External Corrosion Depth *(If Present)*	Minimum Remaining Wall Thickness	Long Term Corrosion Rate (inches per year)	Corrosion Loss at Next Inspection (a)	*RL* Remaining Life (structural)	*RL* Remaining Life (pressure)	Calculated Half-Life Inspection (Years)	MAWP at Next Inspection
Diesel Piping																			
1	DS of marine header flange	2002	3	80	3.500"	0.300"	16	0.090"	0.025"	12:00	0.299"	0.000"	0.299"	0.000	0.001"	3344 Yrs.	4387 Yrs.	1672	3402.9
										3:00	0.286"	0.000"	0.286"	0.001	0.009"	224 Yrs.	299 Yrs.	112	3068.6
										6:00	0.289"	0.000"	0.289"	0.001	0.007"	289 Yrs.	384 Yrs.	145	3145.7
										9:00	0.295"	0.000"	0.295"	0.000	0.003"	656 Yrs.	865 Yrs.	328	3300.0
2	DS of flange after reducer	2002	2	80	2.375"	0.218"	16	0.080"	0.017"	12:00	0.210"	0.000"	0.210"	0.001	0.005"	260 Yrs.	386 Yrs.	130	3368.4
										3:00	0.225"	0.000"	0.225"	N/A	N/A	N/A	N/A	N/A	N/A
										6:00	0.220"	0.000"	0.220"	N/A	N/A	N/A	N/A	N/A	N/A
										9:00	0.222"	0.000"	0.222"	N/A	N/A	N/A	N/A	N/A	N/A
3	1" past 1st 90° ell to truck rack	2002	2	40	2.375"	0.154"	16	0.080"	0.017"	12:00	0.233"	0.000"	0.233"	N/A	N/A	N/A	N/A	N/A	N/A
										3:00	0.222"	0.000"	0.222"	N/A	N/A	N/A	N/A	N/A	N/A
										6:00	0.222"	0.000"	0.222"	N/A	N/A	N/A	N/A	N/A	N/A
										9:00	0.229"	0.000"	0.229"	N/A	N/A	N/A	N/A	N/A	N/A
4	1" before vert ell to truck rack valve	2002	2	40	2.375"	0.154"	16	0.080"	0.017"	12:00	0.220"	0.000"	0.220"	N/A	N/A	N/A	N/A	N/A	N/A
										3:00	0.220"	0.000"	0.220"	N/A	N/A	N/A	N/A	N/A	N/A
										6:00	0.220"	0.000"	0.220"	N/A	N/A	N/A	N/A	N/A	N/A
										9:00	0.228"	0.000"	0.228"	N/A	N/A	N/A	N/A	N/A	N/A
5	1" past header tee	2002	3	40	3.500"	0.216"	16	0.090"	0.025"	12:00	0.220"	0.000"	0.220"	N/A	N/A	N/A	N/A	N/A	N/A
										3:00	0.212"	0.000"	0.212"	0.000	0.003"	488 Yrs.	749 Yrs.	244	2365.7
										6:00	0.210"	0.000"	0.210"	0.000	0.004"	320 Yrs.	494 Yrs.	160	2314.3
										9:00	0.216"	0.000"	0.216"	N/A	N/A	N/A	N/A	N/A	N/A
6	1" past 2nd 45° ell	2002	3	40	3.500"	0.216"	16	0.090"	0.025"	12:00	0.217"	0.000"	0.217"	N/A	N/A	N/A	N/A	N/A	N/A
										3:00	0.210"	0.000"	0.210"	0.000	0.004"	320 Yrs.	494 Yrs.	160	2314.3
										6:00	0.217"	0.000"	0.217"	N/A	N/A	N/A	N/A	N/A	N/A
										9:00	0.213"	0.000"	0.213"	0.000	0.002"	656 Yrs.	1004 Yrs.	328	2391.4
7	1" before 90° to tanks	2002	3	40	3.500"	0.216"	16	0.090"	0.025"	12:00	0.206"	0.000"	0.206"	0.001	0.006"	186 Yrs.	290 Yrs.	93	2211.4
										3:00	0.204"	0.000"	0.204"	0.001	0.008"	152 Yrs.	239 Yrs.	76	2160.0
										6:00	0.207"	0.000"	0.207"	0.001	0.006"	208 Yrs.	324 Yrs.	104	2237.1
										9:00	0.207"	0.000"	0.207"	0.001	0.006"	208 Yrs.	324 Yrs.	104	2237.1
8	3" past flex flange of 1' bypass press relief	2002	1	160	1.315"	0.250"	16	0.070"	0.009"	12:00	0.245"	0.000"	0.245"	0.000	0.003"	560 Yrs.	754 Yrs.	280	7262.4
										3:00	0.238"	0.000"	0.238"	0.001	0.008"	224 Yrs.	305 Yrs.	112	6783.3
										6:00	0.257"	0.000"	0.257"	N/A	N/A	N/A	N/A	N/A	N/A
										9:00	0.251"	0.000"	0.251"	N/A	N/A	N/A	N/A	N/A	N/A
9	3" ell vert to horiz	2002	3	40	3.500"	0.216"	16	0.090"	0.025"	12:00	0.217"	0.000"	0.217"	N/A	N/A	N/A	N/A	N/A	N/A
										3:00	0.209"	0.000"	0.209"	0.000	0.004"	272 Yrs.	421 Yrs.	136	2288.6
										6:00	0.210"	0.000"	0.210"	0.000	0.004"	320 Yrs.	494 Yrs.	160	2314.3
										9:00	0.216"	0.000"	0.216"	N/A	N/A	N/A	N/A	N/A	N/A
10	1" before tee	2002	3	40	3.500"	0.216"	16	0.090"	0.025"	12:00	0.220"	0.000"	0.220"	N/A	N/A	N/A	N/A	N/A	N/A
										3:00	0.220"	0.000"	0.220"	N/A	N/A	N/A	N/A	N/A	N/A
										6:00	0.217"	0.000"	0.217"	N/A	N/A	N/A	N/A	N/A	N/A
										9:00	0.214"	0.000"	0.214"	0.000	0.001"	992 Yrs.	1514 Yrs.	496	2417.1
11	3rd ell @ tank C4	2002	3	40	3.500"	0.216"	16	0.090"	0.025"	12:00	0.270"	0.000"	0.270"	N/A	N/A	N/A	N/A	N/A	N/A
										3:00	0.260"	0.000"	0.260"	N/A	N/A	N/A	N/A	N/A	N/A
										6:00	0.245"	0.000"	0.245"	N/A	N/A	N/A	N/A	N/A	N/A
										9:00	0.217"	0.000"	0.217"	N/A	N/A	N/A	N/A	N/A	N/A
12	3" past reducer branch to power plant	2002	2	40	2.375"	0.154"	16	0.080"	0.017"	12:00	0.226"	0.000"	0.226"	N/A	N/A	N/A	N/A	N/A	N/A
										3:00	0.216"	0.000"	0.216"	N/A	N/A	N/A	N/A	N/A	N/A
										6:00	0.219"	0.000"	0.219"	N/A	N/A	N/A	N/A	N/A	N/A
										9:00	0.226"	0.000"	0.226"	N/A	N/A	N/A	N/A	N/A	N/A
13	1" past 3-2 reducer C3	2002	2	40	2.375"	0.154"	16	0.080"	0.017"	12:00	0.228"	0.000"	0.228"	N/A	N/A	N/A	N/A	N/A	N/A
										3:00	0.228"	0.000"	0.228"	N/A	N/A	N/A	N/A	N/A	N/A
										6:00	0.214"	0.000"	0.214"	N/A	N/A	N/A	N/A	N/A	N/A
										9:00	0.219"	0.000"	0.219"	N/A	N/A	N/A	N/A	N/A	N/A
14	1" past horiz 90° to truck rack	2002	2	40	2.375"	0.154"	16	0.080"	0.017"	12:00	0.230"	0.000"	0.230"	N/A	N/A	N/A	N/A	N/A	N/A
										3:00	0.234"	0.000"	0.234"	N/A	N/A	N/A	N/A	N/A	N/A
										6:00	0.226"	0.000"	0.226"	N/A	N/A	N/A	N/A	N/A	N/A
										9:00	0.222"	0.000"	0.222"	N/A	N/A	N/A	N/A	N/A	N/A
15	1" before 90° off of dike	2002	2	40	2.375"	0.154"	16	0.080"	0.017"	12:00	0.239"	0.000"	0.239"	N/A	N/A	N/A	N/A	N/A	N/A
										3:00	0.239"	0.000"	0.239"	N/A	N/A	N/A	N/A	N/A	N/A
										6:00	0.232"	0.000"	0.232"	N/A	N/A	N/A	N/A	N/A	N/A
										9:00	0.228"	0.000"	0.228"	N/A	N/A	N/A	N/A	N/A	N/A
16	1" DS of reducer past filter	2002	2	40	2.375"	0.154"	16	0.080"	0.017"	12:00	0.201"	0.000"	0.201"	N/A	N/A	N/A	N/A	N/A	N/A
										3:00	0.203"	0.000"	0.203"	N/A	N/A	N/A	N/A	N/A	N/A
										6:00	0.200"	0.000"	0.200"	N/A	N/A	N/A	N/A	N/A	N/A
										9:00	0.197"	0.000"	0.197"	N/A	N/A	N/A	N/A	N/A	N/A

API 570 Evaluation

Inspection Point	Location	Year Installed	Nominal Pipe Size	[6]Pipe Schedule	Nominal Pipe OD *(D)*	Nominal Wall Thickness *($t_{initial}$)*	Years in Service	Structural Minimum Thickness (API 574)	Pressure Design Thickness (ASME B31.3)	O'Clock Position	UT Measured Thickness *(t_{actual})*	Greatest External Corrosion Depth *(If Present)*	Minimum Remaining Wall Thickness	Long Term Corrosion Rate (inches per year)	Corrosion Loss at Next Inspection (a)	*RL* Remaining Life (structural)	*RL* Remaining Life (pressure)	Calculated Half-Life Inspection (Years)	MAWP at Next Inspection
17	1" DS of tee to C5	2002	3	40	3.500"	0.216"	16	0.090"	0.025"	12:00	0.226"	0.000"	0.226"	N/A	N/A	N/A	N/A	N/A	N/A
										3:00	0.220"	0.000"	0.220"	N/A	N/A	N/A	N/A	N/A	N/A
										6:00	0.206"	0.000"	0.206"	0.001	0.006"	186 Yrs.	290 Yrs.	93	2211.4
										9:00	0.219"	0.000"	0.219"	N/A	N/A	N/A	N/A	N/A	N/A
18	1" DS of tee to C6	2002	3	40	3.500"	0.216"	16	0.090"	0.025"	12:00	0.211"	0.000"	0.211"	0.000	0.003"	387 Yrs.	596 Yrs.	194	2340.0
										3:00	0.213"	0.000"	0.213"	0.000	0.002"	656 Yrs.	1004 Yrs.	328	2391.4
										6:00	0.222"	0.000"	0.222"	N/A	N/A	N/A	N/A	N/A	N/A
										9:00	0.216"	0.000"	0.216"	N/A	N/A	N/A	N/A	N/A	N/A
19	1" US of CKV @ S1	2002	3	40	3.500"	0.216"	16	0.090"	0.025"	12:00	0.213"	0.000"	0.213"	0.000	0.002"	656 Yrs.	1004 Yrs.	328	2391.4
										3:00	0.209"	0.000"	0.209"	0.000	0.004"	272 Yrs.	421 Yrs.	136	2288.6
										6:00	0.211"	0.000"	0.211"	0.000	0.003"	387 Yrs.	596 Yrs.	194	2340.0
										9:00	0.220"	0.000"	0.220"	N/A	N/A	N/A	N/A	N/A	N/A
20	1" DS of flex flange	2002	2	40	2.375"	0.154"	16	0.080"	0.017"	12:00	0.238"	0.000"	0.238"	N/A	N/A	N/A	N/A	N/A	N/A
										3:00	0.223"	0.000"	0.223"	N/A	N/A	N/A	N/A	N/A	N/A
										6:00	0.223"	0.000"	0.223"	N/A	N/A	N/A	N/A	N/A	N/A
										9:00	0.212"	0.000"	0.212"	N/A	N/A	N/A	N/A	N/A	N/A
21	1" DS of 1st 45°	2002	2	40	2.375"	0.154"	16	0.080"	0.017"	12:00	0.226"	0.000"	0.226"	N/A	N/A	N/A	N/A	N/A	N/A
										3:00	0.206"	0.000"	0.206"	N/A	N/A	N/A	N/A	N/A	N/A
										6:00	0.219"	0.000"	0.219"	N/A	N/A	N/A	N/A	N/A	N/A
										9:00	0.222"	0.000"	0.222"	N/A	N/A	N/A	N/A	N/A	N/A
22	1" US of flange set @ ground point	2002	2	40	2.375"	0.154"	16	0.080"	0.017"	12:00	0.225"	0.000"	0.225"	N/A	N/A	N/A	N/A	N/A	N/A
										3:00	0.216"	0.000"	0.216"	N/A	N/A	N/A	N/A	N/A	N/A
										6:00	0.222"	0.000"	0.222"	N/A	N/A	N/A	N/A	N/A	N/A
										9:00	0.222"	0.000"	0.222"	N/A	N/A	N/A	N/A	N/A	N/A

API 570 Evaluation

Inspection Point	Location	Year Installed	Nominal Pipe Size	[6]Pipe Schedule	Nominal Pipe OD *(D)*	Nominal Wall Thickness *($t_{initial}$)*	Years in Service	Structural Minimum Thickness (API 574)	Pressure Design Thickness (ASME B31.3)	O'Clock Position	UT Measured Thickness *(t_{actual})*	Greatest External Corrosion Depth *(If Present)*	Minimum Remaining Wall Thickness	Long Term Corrosion Rate (inches per year)	Corrosion Loss at Next Inspection (a)	*RL* Remaining Life (structural)	*RL* Remaining Life (pressure)	Calculated Half-Life Inspection (Years)	MAWP at Next Inspection
Gasoline Piping																			
1	1" after vert to horiz 90°	2002	3	80	3.500"	0.300"	16	0.090"	0.025"	12:00	0.280"	0.000"	0.280"	0.001	0.013"	152 Yrs.	204 Yrs.	76	2914.3
										3:00	0.305"	0.000"	0.305"	N/A	N/A	N/A	N/A	N/A	N/A
										6:00	0.308"	0.000"	0.308"	N/A	N/A	N/A	N/A	N/A	N/A
										9:00	0.305"	0.000"	0.305"	N/A	N/A	N/A	N/A	N/A	N/A
2	1" DS of flange to truck rack	2002	2	40	2.375"	0.154"	16	0.080"	0.017"	12:00	0.220"	0.000"	0.220"	N/A	N/A	N/A	N/A	N/A	N/A
										3:00	0.228"	0.000"	0.228"	N/A	N/A	N/A	N/A	N/A	N/A
										6:00	0.230"	0.000"	0.230"	N/A	N/A	N/A	N/A	N/A	N/A
										9:00	0.217"	0.000"	0.217"	N/A	N/A	N/A	N/A	N/A	N/A
3	1" DS of 90° to truck rack	2002	2	40	2.375"	0.154"	16	0.080"	0.017"	12:00	0.210"	0.000"	0.210"	N/A	N/A	N/A	N/A	N/A	N/A
										3:00	0.222"	0.000"	0.222"	N/A	N/A	N/A	N/A	N/A	N/A
										6:00	0.223"	0.000"	0.223"	N/A	N/A	N/A	N/A	N/A	N/A
										9:00	0.223"	0.000"	0.223"	N/A	N/A	N/A	N/A	N/A	N/A
4	1" US of flex flange to C1	2002	3	40	3.500"	0.216"	16	0.090"	0.025"	12:00	0.214"	0.000"	0.214"	0.000	0.001"	992 Yrs.	1514 Yrs.	496	2417.1
										3:00	0.216"	0.000"	0.216"	N/A	N/A	N/A	N/A	N/A	N/A
										6:00	0.220"	0.000"	0.220"	N/A	N/A	N/A	N/A	N/A	N/A
										9:00	0.220"	0.000"	0.220"	N/A	N/A	N/A	N/A	N/A	N/A
5	1" DS of 1" press relief branch	2002	1	160	1.315"	0.250"	16	0.070"	0.009"	12:00	0.238"	0.000"	0.238"	0.001	0.008"	224 Yrs.	305 Yrs.	112	6783.3
										3:00	0.255"	0.000"	0.255"	N/A	N/A	N/A	N/A	N/A	N/A
										6:00	0.254"	0.000"	0.254"	N/A	N/A	N/A	N/A	N/A	N/A
										9:00	0.240"	0.000"	0.240"	0.001	0.006"	272 Yrs.	369 Yrs.	136	6920.2
6	1" DS of 90° around tk C1	2002	2	80	2.375"	0.218"	16	0.080"	0.017"	12:00	0.230"	0.000"	0.230"	N/A	N/A	N/A	N/A	N/A	N/A
										3:00	0.229"	0.000"	0.229"	N/A	N/A	N/A	N/A	N/A	N/A
										6:00	0.225"	0.000"	0.225"	N/A	N/A	N/A	N/A	N/A	N/A
										9:00	0.232"	0.000"	0.232"	N/A	N/A	N/A	N/A	N/A	N/A
7	1" before 90° to dispensing tank vert	2002	2	80	2.375"	0.218"	16	0.080"	0.017"	12:00	0.220"	0.000"	0.220"	N/A	N/A	N/A	N/A	N/A	N/A
										3:00	0.225"	0.000"	0.225"	N/A	N/A	N/A	N/A	N/A	N/A
										6:00	0.218"	0.000"	0.218"	N/A	N/A	N/A	N/A	N/A	N/A
										9:00	0.216"	0.000"	0.216"	0.000	0.001"	1088 Yrs.	1593 Yrs.	544	3595.8
8	1" DS of vert to horiz 90°at dispensing tank	2002	2	80	2.375"	0.218"	16	0.080"	0.017"	12:00	0.210"	0.000"	0.210"	0.001	0.005"	260 Yrs.	386 Yrs.	130	3368.4
										3:00	0.225"	0.000"	0.225"	N/A	N/A	N/A	N/A	N/A	N/A
										6:00	0.230"	0.000"	0.230"	N/A	N/A	N/A	N/A	N/A	N/A
										9:00	0.225"	0.000"	0.225"	N/A	N/A	N/A	N/A	N/A	N/A
9	1" DS of 1st 90° on dike wall	2002	2	80	2.375"	0.218"	16	0.080"	0.017"	12:00	0.225"	0.000"	0.225"	N/A	N/A	N/A	N/A	N/A	N/A
										3:00	0.212"	0.000"	0.212"	0.000	0.004"	352 Yrs.	520 Yrs.	176	3444.2
										6:00	0.211"	0.000"	0.211"	0.000	0.004"	299 Yrs.	444 Yrs.	150	3406.3
										9:00	0.219"	0.000"	0.219"	N/A	N/A	N/A	N/A	N/A	N/A
10	1" DS of 2nd 45° on dike	2002	2	80	2.375"	0.218"	16	0.080"	0.017"	12:00	0.222"	0.000"	0.222"	N/A	N/A	N/A	N/A	N/A	N/A
										3:00	0.225"	0.000"	0.225"	N/A	N/A	N/A	N/A	N/A	N/A
										6:00	0.222"	0.000"	0.222"	N/A	N/A	N/A	N/A	N/A	N/A
										9:00	0.229"	0.000"	0.229"	N/A	N/A	N/A	N/A	N/A	N/A
11	1" DS of flange to elbow weld	2002	2	80	2.375"	0.218"	16	0.080"	0.017"	12:00	0.212"	0.000"	0.212"	0.000	0.004"	352 Yrs.	520 Yrs.	176	3444.2
										3:00	0.230"	0.000"	0.230"	N/A	N/A	N/A	N/A	N/A	N/A
										6:00	0.230"	0.000"	0.230"	N/A	N/A	N/A	N/A	N/A	N/A
										9:00	0.223"	0.000"	0.223"	N/A	N/A	N/A	N/A	N/A	N/A
12	1" DS of riser flange @ dispenser	2002	2	80	2.375"	0.218"	16	0.080"	0.017"	12:00	0.211"	0.000"	0.211"	0.000	0.004"	299 Yrs.	444 Yrs.	150	3406.3
										3:00	0.216"	0.000"	0.216"	0.000	0.001"	1088 Yrs.	1593 Yrs.	544	3595.8
										6:00	0.205"	0.000"	0.205"	0.001	0.008"	154 Yrs.	232 Yrs.	77	3178.9
										9:00	0.225"	0.000"	0.225"	N/A	N/A	N/A	N/A	N/A	N/A

Maximum Long Term Corrosion Rate (inches/year):	**0.001"**
Maximum Corrosion Loss at Next Inspection (inches):	**0.013"**
Minimum Remaining Life Structural (years):	**152.0**
Minimum Remaining Life Pressure (years):	**204.2**
Minimum Calculated Half-Life Inspection (years):	**76.0**
Minimum MAWP at Next Inspection (psi):	**2160**

NDE Inspection Performed By:	James Adams
Company:	*QA Services*
Date:	August 22, 2018

Engineering Calculations Performed By:	Eric Weiler
Company:	*Taku Engineering*
Date:	September 14, 2018

Notes:

User Input Fields

1. Design Pressure: Based on Flange Rating
2. Pipe Material: A106B.
3. Allowable Stress: Based on 20,000 value based on ASME B31.3, Table A-1 information for the A 106 Gr B material.
4. Joint Efficiency: . Calculations use a value of 0.8 (lowest value) per API 570 recommendations & ASME B31.3 Table 302.3.4.
5. Material Coefficient: Unknown. Uses the lowest value (0.4) per API 570 and ASME B31.3.
6. Pipe Schedule: Actual design information not available. Data represents assumed information based on the wall thickness information collected during field testing.
7. API Inspection Interval: Based on API 570, Table 2 requirements for Class 1 designated piping (i.e. piping for flammable liquids outside containment)
8. Install date based on client provided construction drawings.

APPENDIX E: DRAWINGS

GENERAL NOTE:

1) THE DRAWINGS ARE DIAGRAMMATIC AND DO NOT NECESSARILY SHOW ALL FEATURES OF THE REQUIRED WORK. COORDINATE PIPE ALIGNMENTS AND OBTAIN APPROVAL FROM CITY TO AVOID CONFLICTS WITH EXISTING UTILITIES.

LEGEND

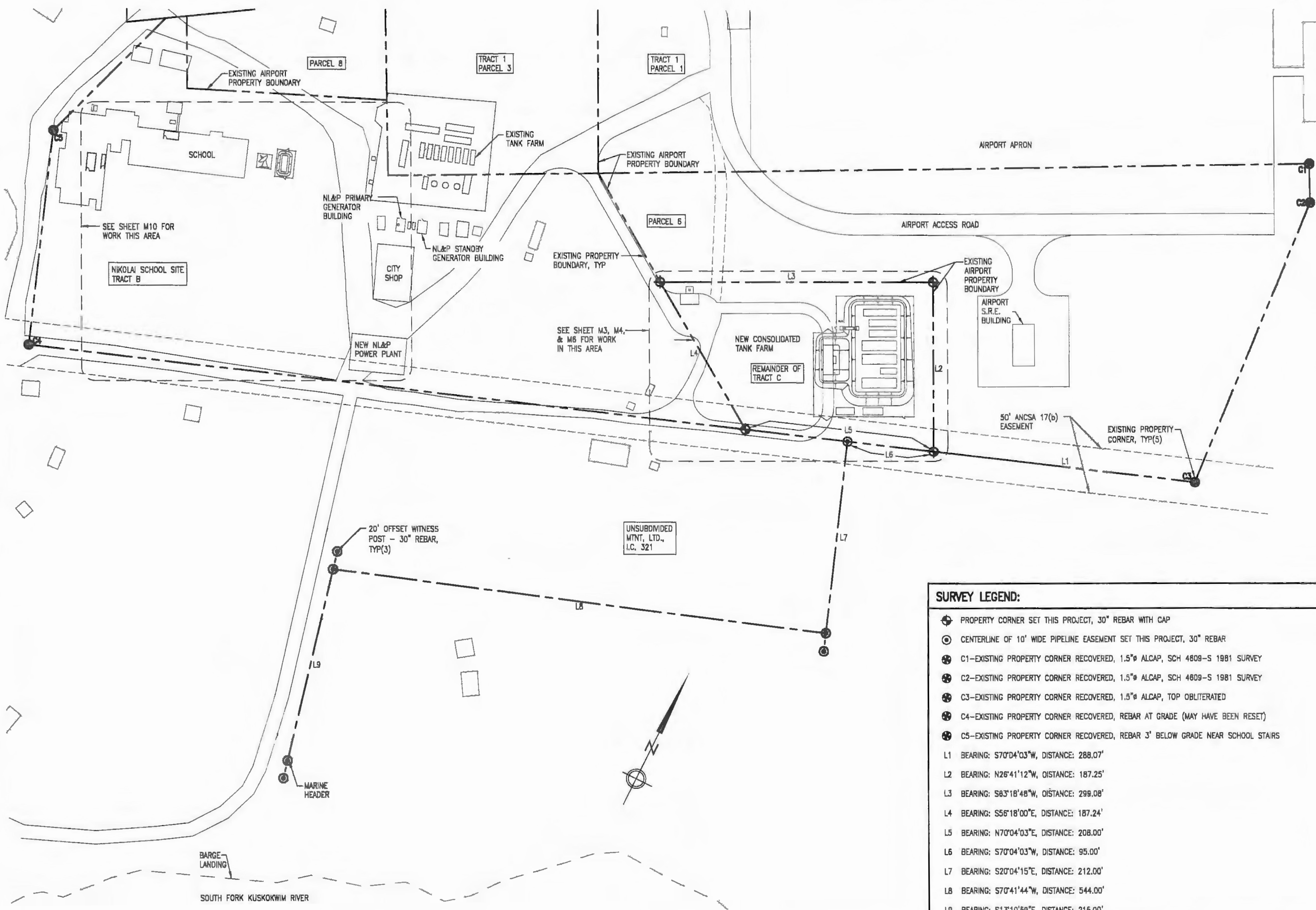
- GATE VALVE
- CHECK VALVE
- BALL VALVE
- FLEXIBLE CONNECTOR
- FLANGED JOINT
- UNION
- ELBOW TURNED UP
- ELBOW TURNED DOWN
- PIPING CONNECTION
- ABOVE-GRADE PIPE
- BURIED PIPE
- EXISTING PIPE/EQUIP.

ABBREVIATIONS

ø	DIAMETER (PHASE)	MPT	MALE PIPE THREAD
A	AMPS	NC	NORMALLY CLOSED
BGL	BELOW GROUND POWER LINE	NO	NORMALLY OPEN
EXIST	EXISTING	O.C.	ON CENTER
FOR	FUEL OIL RETURN	OHL	OVERHEAD POWER LINE
FOS	FUEL OIL SUPPLY	PRV	PRESSURE RELIEF VALVE
FPT	FEMALE PIPE THREAD	PSI	POUNDS PER SQUARE INCH
GALV	GALVANIZED	PSIG	POUNDS PER SQUARE INCH GAUGE
GPM	GALLONS PER MINUTE	SCH	SCHEDULE
GRC	GALVANIZED RIGID CONDUIT	SW	SOCKET WELD
HP	HORSE POWER	TDH	TOTAL DEVELOPED HEAD
LT	LIQUID TIGHT	TYP	TYPICAL
MAX	MAXIMUM	V	VOLTS
MIN	MINIMUM	W	WATTS

SCHEDULE OF DRAWINGS

M1	PROPERTY PLAN, LEGEND, SCHEDULE OF DRAWINGS, & PROJECT SCOPE
M2	OVERALL COMMUNITY SITE PLAN, MARINE HEADER PLAN & ELEVATION, BURIED PIPE & CONDUIT INSTALLATION
M3	ENLARGED SITE PLAN, SETBACK REQUIREMENTS, & WARNING SIGN & INFORMATIONAL PLACARD SCHEDULE
M4	GRADING PLAN
M5	SECTIONS & DETAILS
M6	PIPING PLAN, PUMP SCHEDULE, TANK SCHEDULE, & VALVE/PUMP TAG SCHEDULE
M7	TANK & PIPING DETAILS
M8	TANK DETAILS
M9	PIPING, TANK, & DISPENSER DETAILS
M10	SCHOOL & POWER PLANT PLANS & DETAILS
M11	DAY TANK FABRICATION & INSTALLATION DETAILS
M12	SPECIFICATIONS



PROJECT SCOPE:

THE PURPOSE OF THIS PROJECT IS TO UPGRADE AND CONSOLIDATE THE EXISTING CITY OF NIKOLAI, NIKOLAI LIGHT AND POWER (NL&P), AND IDITAROD AREA SCHOOL DISTRICT (IASD) FUEL STORAGE AND HANDLING SYSTEMS IN THE COMMUNITY OF NIKOLAI.

THE NEW TANK FARM FACILITY WILL PROVIDE CODE COMPLIANT BULK STORAGE, BULK TRANSFER OF DIESEL FUEL, AND RETAIL GASOLINE DISPENSING. THE NEW TANK FARM FACILITY, BULK TRANSFER FACILITY AND GASOLINE DISPENSER WILL BE LOCATED ON CITY PROPERTY BETWEEN THE NEW NL&P POWER PLANT SITE AND AIRPORT PROPERTY.

TWO EACH NEW BELOW GRADE FILL PIPELINES WILL TRANSFER FUEL FROM THE BARGE LANDING TO THE NEW TANK FARM. A NEW BULK FUEL TRANSFER FACILITY WILL ALLOW DIESEL FUEL TO BE TRANSFERRED FROM THE NEW TANK FARM FACILITY TO THE CITY'S FUEL TRUCK. A NEW SINGLE PRODUCT DISPENSER WITH KEY LOCK INVENTORY CONTROL SYSTEM WILL ALLOW FOR GASOLINE RETAIL SALES. A NEW BELOW GRADE DISTRIBUTION LINE WILL TRANSFER DIESEL FUEL FROM THE NEW TANK FARM TO A NEW DAY TANK THAT WILL FEED BOTH NIKOLAI LIGHT & POWER'S PRIMARY AND STANDBY GENERATORS. A BELOW GRADE DISTRIBUTION DIESEL FUEL LINE WILL RUN FROM THE EXISTING GENERATORS LOCATION TO THE NEW NL&P POWER PLANT BUILDING FOR FUTURE USE WHEN THE GENERATORS ARE RELOCATED.

A NEW BELOW GRADE DIESEL FUEL DISTRIBUTION PIPELINE WILL TRANSFER DIESEL FUEL FROM THE NEW TANK FARM TO A NEW INTERMEDIATE TANK LOCATED ADJACENT TO THE SCHOOL. DIESEL FUEL WILL BE TRANSFERRED FROM THE INTERMEDIATE TANK TO NEW DAY TANKS LOCATED IN THE SCHOOL BOILER AND FURNACE ROOMS.

THE EXISTING CITY DIESEL AND GASOLINE BULK STORAGE TANKS WILL BE DISCONNECTED FROM PIPING, DRAINED OF PRODUCT, AND BLIND FLANGED IN ACCORDANCE WITH CURRENT AEA POLICY AND APPLICABLE STATE AND FEDERAL REGULATIONS. THREE EXISTING CITY HORIZONTAL TANKS WILL BE REFURBISHED AND RELOCATED TO THE CONSOLIDATED TANK FARM. ONE EXISTING IASD VERTICAL TANK WILL BE RETAINED AND RELOCATED TO THE VICINITY OF THE NEW TANK FARM TO PROVIDE SPILL CONTINGENCY STORAGE. FINAL DEMOLITION AND DISPOSAL OF THE REMAINING TANKS WILL BE PERFORMED BY OTHERS. ALL ABOVE-GRADE PIPING ASSOCIATED WITH EXISTING TANKS THAT ARE BEING ABANDONED WILL BE DRAINED, PURGED, AND DEMOLISHED.

SURVEY LEGEND:

- PROPERTY CORNER SET THIS PROJECT, 30" REBAR WITH CAP
- CENTERLINE OF 10' WIDE PIPELINE EASEMENT SET THIS PROJECT, 30" REBAR
- C1-EXISTING PROPERTY CORNER RECOVERED, 1.5"ø ALCAP, SCH 4609-S 1981 SURVEY
- C2-EXISTING PROPERTY CORNER RECOVERED, 1.5"ø ALCAP, SCH 4609-S 1981 SURVEY
- C3-EXISTING PROPERTY CORNER RECOVERED, 1.5"ø ALCAP, TOP OBLITERATED
- C4-EXISTING PROPERTY CORNER RECOVERED, REBAR AT GRADE (MAY HAVE BEEN RESET)
- C5-EXISTING PROPERTY CORNER RECOVERED, REBAR 3' BELOW GRADE NEAR SCHOOL STAIRS

L1	BEARING: S70°04'03"W, DISTANCE: 288.07'
L2	BEARING: N26°41'12"W, DISTANCE: 187.25'
L3	BEARING: S83°18'48"W, DISTANCE: 299.08'
L4	BEARING: S56°18'00"E, DISTANCE: 187.24'
L5	BEARING: N70°04'03"E, DISTANCE: 208.00'
L6	BEARING: S70°04'03"W, DISTANCE: 95.00'
L7	BEARING: S20°04'15"E, DISTANCE: 212.00'
L8	BEARING: S70°41'44"W, DISTANCE: 544.00'
L9	BEARING: S13°10'59"E, DISTANCE: 215.00'

REDUCED PLOT - HALF SCALE
ISSUED FOR CONSTRUCTION JUNE 4, 2002

State of Alaska
Department of Community and Economic Development
AIDEA/AEA
Rural Energy Group
813 West Northern Lights Blvd.
Anchorage, Alaska 99503

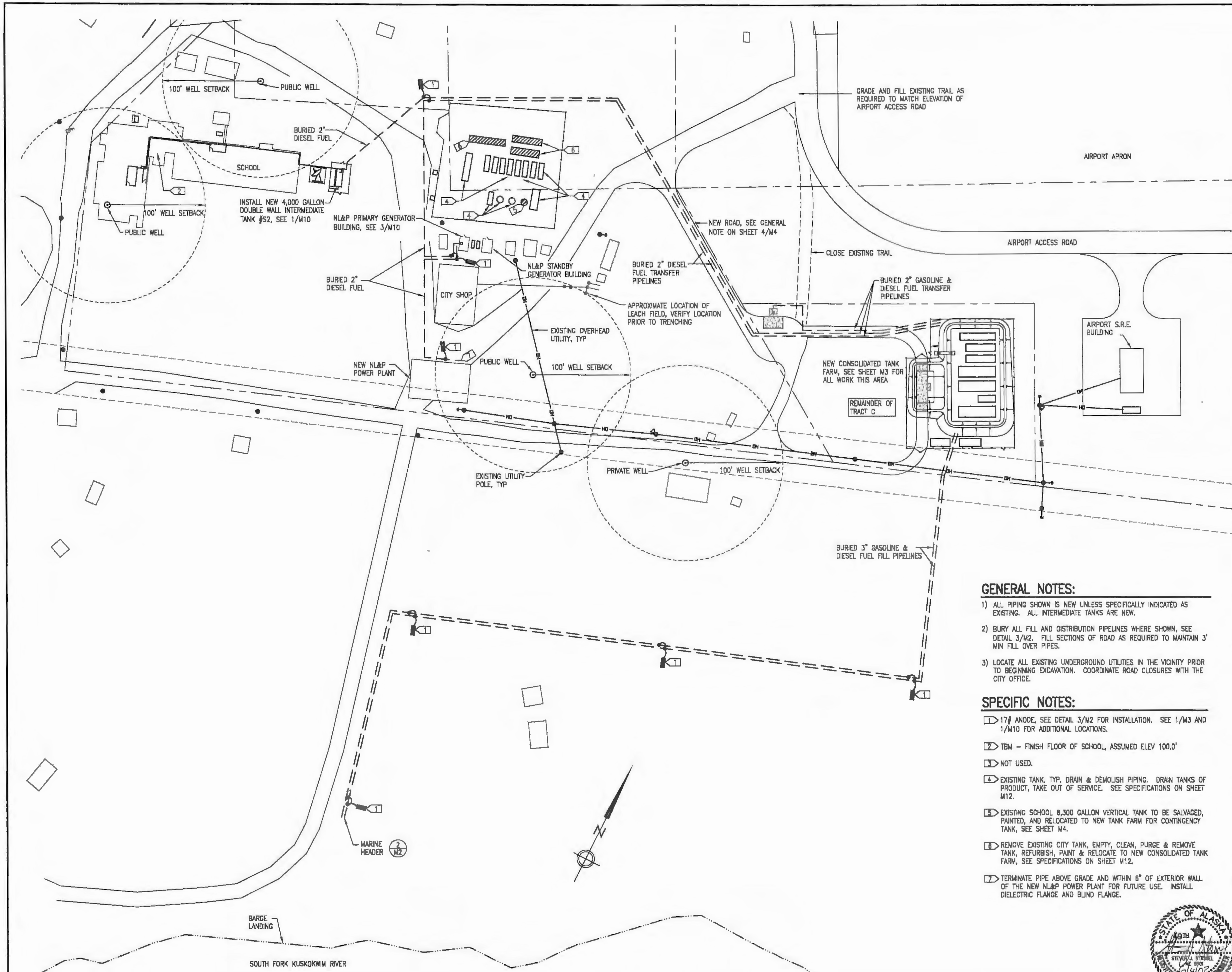
ALASKA ENERGY AUTHORITY

PROJECT: NIKOLAI BULK FUEL STORAGE CONSOLIDATION & UPGRADE

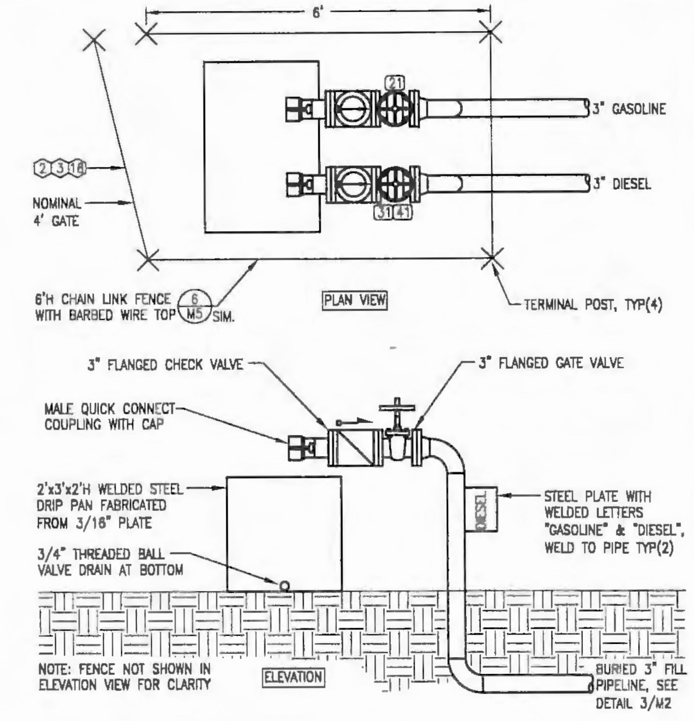
TITLE: PROPERTY PLAN, LEGEND, SCHEDULE OF DRAWINGS, & PROJECT SCOPE

ALASKA ENERGY AND ENGINEERING, INC
P.O. BOX 111405 ANCHORAGE, ALASKA 99511-1405 PHONE (907) 349-0100

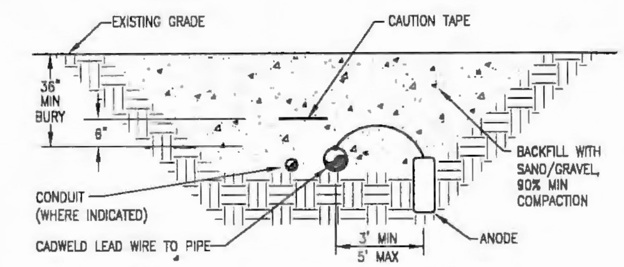
DRAWN BY: TDK	SCALE: 1"=60'	FILE NAME: NIKOBFM1	SHEET: M1 OF 12
DESIGNED BY: SJS	DATE: 5/31/02	PROJECT NUMBER: 99-06-9691	



1/M2 OVERALL COMMUNITY SITE PLAN
1"=50'



2/M2 MARINE HEADER PLAN & ELEVATION
NOT TO SCALE



NOTE: FOR MULTIPLE PIPELINES CADWELD COMMON LEAD WIRE TO ALL PIPES. INSTALL HEAT SHRINK SLEEVE/TAPE OVER WIRE CONNECTIONS AND SEAL TIGHT.

3/M2 BURIED PIPE & CONDUIT INSTALLATION
NO SCALE

GENERAL NOTES:

1) ALL PIPING SHOWN IS NEW UNLESS SPECIFICALLY INDICATED AS EXISTING. ALL INTERMEDIATE TANKS ARE NEW.
2) BURY ALL FILL AND DISTRIBUTION PIPELINES WHERE SHOWN, SEE DETAIL 3/M2. FILL SECTIONS OF ROAD AS REQUIRED TO MAINTAIN 3' MIN FILL OVER PIPES.
3) LOCATE ALL EXISTING UNDERGROUND UTILITIES IN THE VICINITY PRIOR TO BEGINNING EXCAVATION. COORDINATE ROAD CLOSURES WITH THE CITY OFFICE.

SPECIFIC NOTES:

1. 17# ANODE, SEE DETAIL 3/M2 FOR INSTALLATION. SEE 1/M3 AND 1/M10 FOR ADDITIONAL LOCATIONS.
2. TBM – FINISH FLOOR OF SCHOOL, ASSUMED ELEV 100.0'
3. NOT USED.
4. EXISTING TANK, TYP. DRAIN & DEMOLISH PIPING. DRAIN TANKS OF PRODUCT, TAKE OUT OF SERVICE. SEE SPECIFICATIONS ON SHEET M12.
5. EXISTING SCHOOL 8,300 GALLON VERTICAL TANK TO BE SALVAGED, PAINTED, AND RELOCATED TO NEW TANK FARM FOR CONTINGENCY TANK, SEE SHEET M4.
6. REMOVE EXISTING CITY TANK, EMPTY, CLEAN, PURGE & REMOVE TANK, REFURBISH, PAINT & RELOCATE TO NEW CONSOLIDATED TANK FARM, SEE SPECIFICATIONS ON SHEET M12.
7. TERMINATE PIPE ABOVE GRADE AND WITHIN 6" OF EXTERIOR WALL OF THE NEW NL&P POWER PLANT FOR FUTURE USE. INSTALL DIELECTRIC FLANGE AND BLIND FLANGE.

REDUCED PLOT - HALF SCALE
ISSUED FOR CONSTRUCTION JUNE 4, 2002

STATE OF ALASKA · STEVEN J. STASSEL · 6/4/02 · REGISTERED PROFESSIONAL ENGINEER

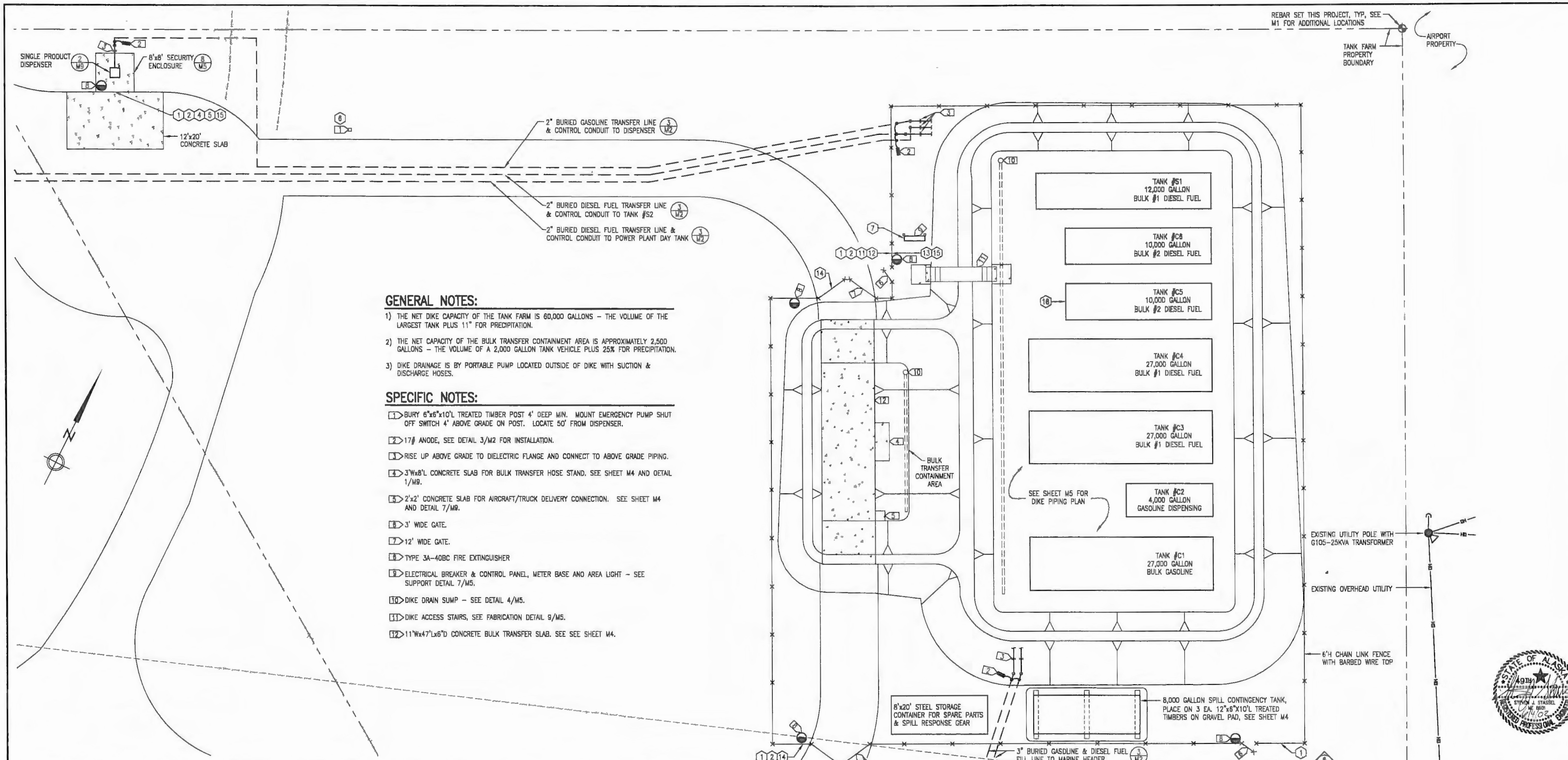
State of Alaska
Department of Community and Economic Development
AIDEA/AEA
Rural Energy Group
813 West Northern Lights Blvd.
Anchorage, Alaska 99503
ALASKA ENERGY AUTHORITY

PROJECT: NIKOLAI BULK FUEL STORAGE CONSOLIDATION & UPGRADE

TITLE: OVERALL COMMUNITY SITE PLAN, MARINE HEADER PLAN & ELEVATION, BURIED PIPE & CONDUIT INSTALLATION

ALASKA ENERGY AND ENGINEERING, INC
P.O. BOX 111405 ANCHORAGE, ALASKA 99511-1405 PHONE (907) 349-0100

DRAWN BY: TDK	SCALE: AS NOTED	FILE NAME: NIKOBFM2	SHEET: M2
DESIGNED BY: SJS	DATE: 5/31/02	PROJECT NUMBER: 99-06-9691	OF 12



GENERAL NOTES:

1) THE NET DIKE CAPACITY OF THE TANK FARM IS 60,000 GALLONS – THE VOLUME OF THE LARGEST TANK PLUS 11" FOR PRECIPITATION.

2) THE NET CAPACITY OF THE BULK TRANSFER CONTAINMENT AREA IS APPROXIMATELY 2,500 GALLONS – THE VOLUME OF A 2,000 GALLON TANK VEHICLE PLUS 25% FOR PRECIPITATION.

3) DIKE DRAINAGE IS BY PORTABLE PUMP LOCATED OUTSIDE OF DIKE WITH SUCTION & DISCHARGE HOSES.

SPECIFIC NOTES:

1 BURY 6"x6"x10'L TREATED TIMBER POST 4' DEEP MIN. MOUNT EMERGENCY PUMP SHUT OFF SWITCH 4' ABOVE GRADE ON POST. LOCATE 50' FROM DISPENSER.

2 17# ANODE, SEE DETAIL 3/M2 FOR INSTALLATION.

3 RISE UP ABOVE GRADE TO DIELECTRIC FLANGE AND CONNECT TO ABOVE GRADE PIPING.

4 3'Wx8'L CONCRETE SLAB FOR BULK TRANSFER HOSE STAND. SEE SHEET M4 AND DETAIL 1/M9.

5 2'x2' CONCRETE SLAB FOR AIRCRAFT/TRUCK DELIVERY CONNECTION. SEE SHEET M4 AND DETAIL 7/M9.

6 3' WIDE GATE.

7 12' WIDE GATE.

8 TYPE 3A-40BC FIRE EXTINGUISHER

9 ELECTRICAL BREAKER & CONTROL PANEL, METER BASE AND AREA LIGHT – SEE SUPPORT DETAIL 7/M5.

10 DIKE DRAIN SUMP – SEE DETAIL 4/M5.

11 DIKE ACCESS STAIRS, SEE FABRICATION DETAIL 9/M5.

12 11'Wx47'Lx6"D CONCRETE BULK TRANSFER SLAB. SEE SEE SHEET M4.

WARNING SIGN & INFORMATIONAL PLACARD SCHEDULE:

WARNING SIGNS & INFORMATIONAL PLACARDS – PROVIDE ALL SIGNS INDICATED IN THE SCHEDULE BELOW, QUANTITY & LOCATION AS INDICATED ON DRAWINGS. ALL SIGNS SHALL BE 0.08" ALUMINUM PLATE, 10"x14" UNLESS INDICATED OTHERWISE OR REQUIRED TO BE LARGER FOR SPECIFIED LETTER SIZE. PROVIDE 3/16" HOLES IN ALL FOUR CORNERS. WHITE NON-REFLECTIVE VINYL BACKGROUND, 3M 3650-10, WITH 3M SERIES 225 HIGH PERFORMANCE VINYL LETTERS, ONE SIDE ONLY. WARNING LITES OR EQUAL.

WARNING SIGNS – RED LETTERING ON WHITE BACKGROUND.

1 "DANGER – FLAMMABLE, NO SMOKING" (3" HIGH 1/2" STROKE LETTERS – 24"x18")

2 "IN CASE OF SPILL CALL DEC 1-800-478-9300"

3 "DANGEROUS CARGO, NO VISITORS, NO SMOKING, NO OPEN LIGHTS" (3" HIGH 1/2" STROKE LETTERS – 36"x24")

4 "DISPENSING INTO UNAPPROVED CONTAINERS PROHIBITED"

5 "STOP YOUR MOTOR"

6 "EMERGENCY PUMP SHUT OFF"

7 "IN CASE OF FIRE OR SPILL TURN OFF MAIN BREAKER"

8 "FUEL OIL DAY TANK ALARM"

9 NOT USED

10 NOT USED

INFORMATIONAL PLACARDS – BLACK LETTERING ON WHITE BACKGROUND.

11 "LEAVE MAIN VALVE OPEN ON ONLY ONE OF CITY DIESEL TANKS C3, C4, C5, & C6 FOR POWER PLANT DAY TANK FILL. CHECK LEVELS DAILY TO ENSURE ADEQUATE SUPPLY."

12 "TURN OFF MAIN POWER EACH NIGHT"

13 "PRIOR TO FILLING BULK TANKS CEASE TRANSFER OPERATIONS"

14 "CHOCK WHEELS, ATTACH STATIC WIRE, & VERIFY TANK CAPACITY PRIOR TO BULK TRANSFER"

15 "DISPENSING NOT PERMITTED WHILE DISPENSING TANK BEING FILLED"

INSTALLATION – ATTACH TO FENCING WITH HOG RINGS OR STAINLESS STEEL CABLE TIES. ATTACH TO STRUCTURES WITH LAGS OR BOLTS.

16 "CHECK GASOLINE DISPENSING TANK #C2 LEVEL DAILY, FILL WHEN BELOW 3'-2":
1) VERIFY BULK TANK #C1 LEVEL – DO NOT TRANSFER IF BELOW 1'-0"
2) OPEN VALVE ON TANK #C2
3) PRESS START BUTTON
4) MONITOR TANK LEVELS CONTINUOUSLY
5) WHEN DISPENSING TANK LEVEL REACHES 5'-0" PRESS STOP BUTTON
6) CLOSE & LOCK VALVE"

17 "CHECK INTERMEDIATE TANK #S2 LEVEL DAILY, FILL WHEN BELOW 3'-2":
1) GO TO TANK FARM & TURN ON CONTROL PANEL POWER
2) VERIFY BULK TANK #S1 LEVEL – DO NOT TRANSFER IF BELOW 1'-0"
3) OPEN VALVE BY SCHOOL TRANSFER PUMP TP-3
4) GO TO INTERMEDIATE TANK #S2 & OPEN VALVE
5) PRESS START BUTTON
6) MONITOR TANK LEVELS CONTINUOUSLY (MAKE SURE BULK TANK #S1 AT TANK FARM DOES NOT RUN EMPTY DURING TRANSFER)
7) WHEN INTERMEDIATE TANK LEVEL REACHES 5'-0" PRESS STOP BUTTON
8) CLOSE & LOCK VALVE ON INTERMEDIATE TANK #S2
9) RETURN TO TANK FARM, TURN CONTROL PANEL POWER OFF, CLOSE & LOCK VALVE BY SCHOOL TRANSFER PUMP TP-3

18 "VOLUME OF DIESEL FILL PIPELINE IS APPROXIMATELY 350 GALLONS. PURGE PIPELINE OF #1 DIESEL PRIOR TO FILLING TANK #2 DIESEL TANKS"

SETBACK/SEPARATION REQUIREMENTS

THE CONSOLIDATED TANK FARM WILL PERFORM THREE FUNCTIONS – BULK STORAGE, BULK TRANSFER, AND DISPENSING. ALL TANKS ARE INSTALLED ABOVE GROUND. TO COMPLY WITH THE REQUIREMENTS OF THE 2000 INTERNATIONAL FIRE CODE, THE 2002 ALASKA ENERGY AUTHORITY/DIVISION OF FIRE PREVENTION MEMORANDUM OF AGREEMENT, AND STATE OF ALASKA REGULATIONS THE FOLLOWING MINIMUM CLEARANCES ARE REQUIRED:

10'	FROM THE DISPENSER TO ALL BUILDINGS AND PROPERTY LINES.
20'	FROM THE DISPENSER TO FIXED SOURCES OF IGNITION.
50'	FROM THE DISPENSER TO ALL UNPROTECTED TANKS.
50'	FROM THE DISPENSER TO THE BULK TRANSFER AREA.
5'	FROM PROTECTED DISPENSING TANKS (6,000 GAL MAX) TO THE NEAREST IMPORTANT BUILDING OR NEAREST SIDE OF A PUBLIC WAY.
15'	FROM PROTECTED DISPENSING TANKS (6,000 GAL MAX) TO THE NEAREST PROPERTY LINE WHICH IS OR CAN BE BUILT UPON.
30'	FROM 751-12,000 GAL BULK STORAGE TANKS TO THE NEAREST PROPERTY LINE WHICH IS OR CAN BE BUILT UPON.
40'	FROM 12,001-30,000 GAL BULK STORAGE TANKS TO THE NEAREST PROPERTY LINE WHICH IS OR CAN BE BUILT UPON.
25'	FROM THE BULK TRANSFER HOSE STAND OR LOADING VALVE, TO THE NEAREST TANK, THE NEAREST IMPORTANT BUILDING, THE NEAREST PROPERTY LINE WHICH IS OR CAN BE BUILT UPON, COMBUSTIBLE MATERIALS, AND FIXED SOURCES OF IGNITION.
25'	FROM FUEL TANKS AND PIPELINES TO RESIDENTIAL WATER WELLS
100'	FROM FUEL TANKS AND PIPELINES TO PUBLIC WATER WELLS

REDUCED PLOT - HALF SCALE
ISSUED FOR CONSTRUCTION JUNE 4, 2002

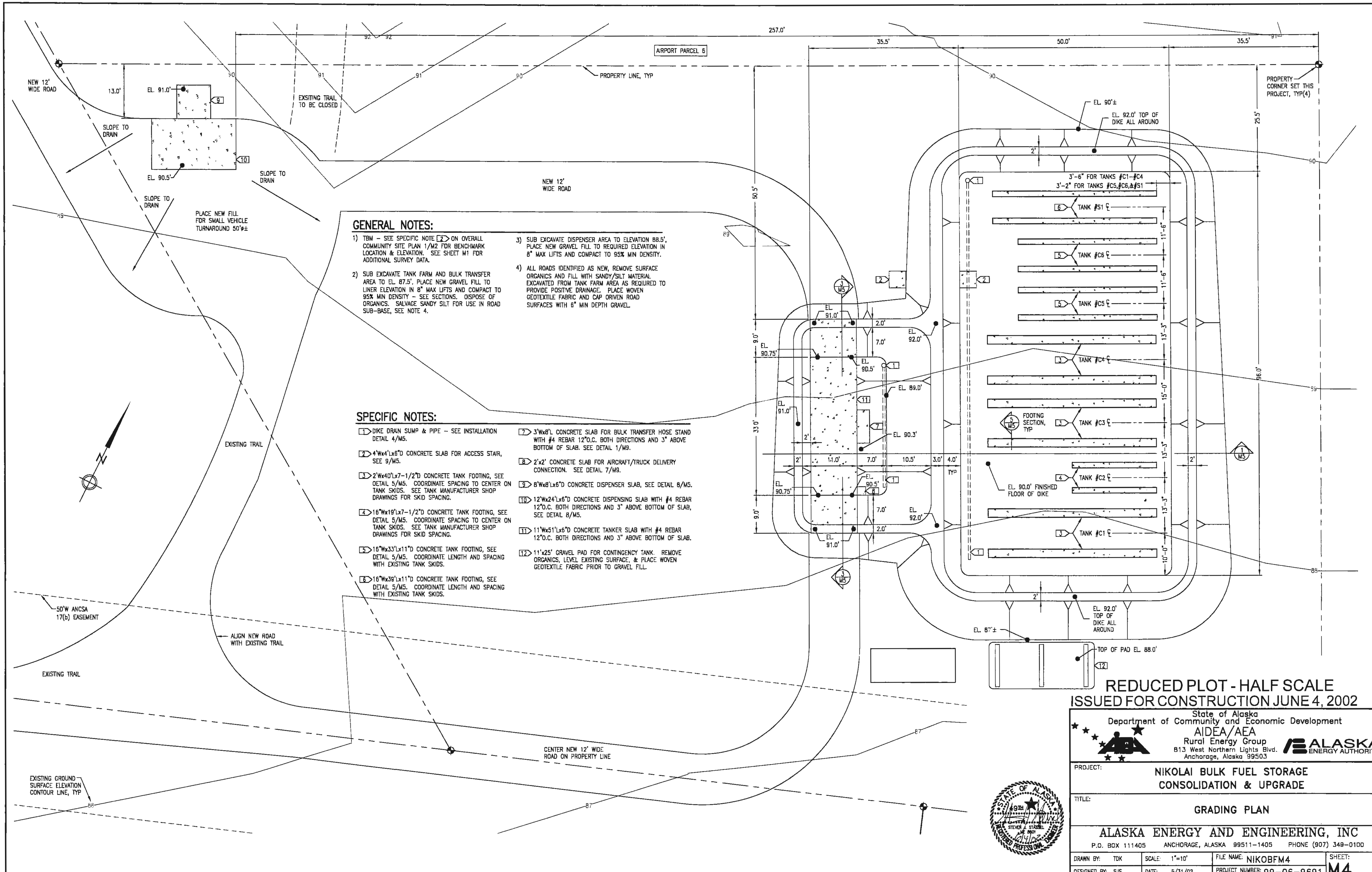
State of Alaska
Department of Community and Economic Development
AIDEA/AEA
Rural Energy Group
813 West Northern Lights Blvd.
Anchorage, Alaska 99503
ALASKA ENERGY AUTHORITY

PROJECT: NIKOLAI BULK FUEL STORAGE CONSOLIDATION & UPGRADE

TITLE: ENLARGED SITE PLAN, SETBACK REQUIREMENTS, & WARNING SIGN & INFORMATIONAL PLACARD SCHEDULE

ALASKA ENERGY AND ENGINEERING, INC
P.O. BOX 111405 ANCHORAGE, ALASKA 99511-1405 PHONE (907) 349-0100

DRAWN BY: TDK	SCALE: 1"=10'	FILE NAME: NIKOBFM3	SHEET: M3 OF 12
DESIGNED BY: SJS	DATE: 5/31/02	PROJECT NUMBER: 99-06-9691	



GENERAL NOTES:

1) TBM – SEE SPECIFIC NOTE 2 ON OVERALL COMMUNITY SITE PLAN 1/M2 FOR BENCHMARK LOCATION & ELEVATION. SEE SHEET M1 FOR ADDITIONAL SURVEY DATA.

2) SUB EXCAVATE TANK FARM AND BULK TRANSFER AREA TO EL. 87.5'. PLACE NEW GRAVEL FILL TO LINER ELEVATION IN 8" MAX LIFTS AND COMPACT TO 95% MIN DENSITY – SEE SECTIONS. DISPOSE OF ORGANICS. SALVAGE SANDY SILT FOR USE IN ROAD SUB-BASE, SEE NOTE 4.

3) SUB EXCAVATE DISPENSER AREA TO ELEVATION 88.5', PLACE NEW GRAVEL FILL TO REQUIRED ELEVATION IN 8" MAX LIFTS AND COMPACT TO 95% MIN DENSITY.

4) ALL ROADS IDENTIFIED AS NEW, REMOVE SURFACE ORGANICS AND FILL WITH SANDY/SILT MATERIAL EXCAVATED FROM TANK FARM AREA AS REQUIRED TO PROVIDE POSITIVE DRAINAGE. PLACE WOVEN GEOTEXTILE FABRIC AND CAP DRIVEN ROAD SURFACES WITH 6" MIN DEPTH GRAVEL.

SPECIFIC NOTES:

1. DIKE DRAIN SUMP & PIPE – SEE INSTALLATION DETAIL 4/M5.
2. 4'Wx4'Lx6"D CONCRETE SLAB FOR ACCESS STAIR, SEE 9/M5.
3. 2'Wx40'Lx7-1/2"D CONCRETE TANK FOOTING, SEE DETAIL 5/M5. COORDINATE SPACING TO CENTER ON TANK SKIDS. SEE TANK MANUFACTURER SHOP DRAWINGS FOR SKID SPACING.
4. 16"Wx19'Lx7-1/2"D CONCRETE TANK FOOTING, SEE DETAIL 5/M5. COORDINATE SPACING TO CENTER ON TANK SKIDS. SEE TANK MANUFACTURER SHOP DRAWINGS FOR SKID SPACING.
5. 16"Wx33'Lx11"D CONCRETE TANK FOOTING, SEE DETAIL 5/M5. COORDINATE LENGTH AND SPACING WITH EXISTING TANK SKIDS.
6. 16"Wx39'Lx11"D CONCRETE TANK FOOTING, SEE DETAIL 5/M5. COORDINATE LENGTH AND SPACING WITH EXISTING TANK SKIDS.
7. 3'Wx8'L CONCRETE SLAB FOR BULK TRANSFER HOSE STAND WITH #4 REBAR 12"O.C. BOTH DIRECTIONS AND 3" ABOVE BOTTOM OF SLAB. SEE DETAIL 1/M9.
8. 2'x2' CONCRETE SLAB FOR AIRCRAFT/TRUCK DELIVERY CONNECTION. SEE DETAIL 7/M9.
9. 8'Wx8'Lx6"D CONCRETE DISPENSER SLAB, SEE DETAIL 8/M5.
10. 12'Wx24'Lx6"D CONCRETE DISPENSING SLAB WITH #4 REBAR 12"O.C. BOTH DIRECTIONS AND 3" ABOVE BOTTOM OF SLAB, SEE DETAIL 8/M5.
11. 11'Wx51'Lx6"D CONCRETE TANKER SLAB WITH #4 REBAR 12"O.C. BOTH DIRECTIONS AND 3" ABOVE BOTTOM OF SLAB.
12. 11'x25' GRAVEL PAD FOR CONTINGENCY TANK. REMOVE ORGANICS, LEVEL EXISTING SURFACE, & PLACE WOVEN GEOTEXTILE FABRIC PRIOR TO GRAVEL FILL.

REDUCED PLOT - HALF SCALE

ISSUED FOR CONSTRUCTION JUNE 4, 2002

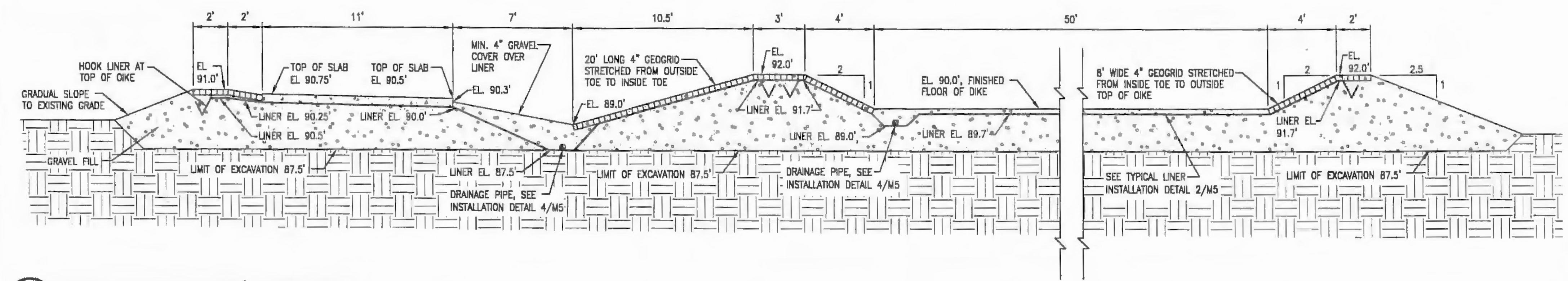
State of Alaska
Department of Community and Economic Development
AIDEA/AEA
Rural Energy Group
813 West Northern Lights Blvd.
Anchorage, Alaska 99503
ALASKA ENERGY AUTHORITY

PROJECT: NIKOLAI BULK FUEL STORAGE CONSOLIDATION & UPGRADE

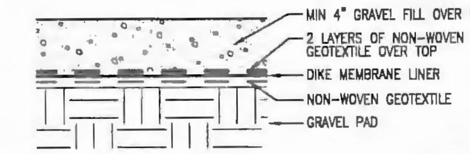
TITLE: GRADING PLAN

ALASKA ENERGY AND ENGINEERING, INC
P.O. BOX 111405 ANCHORAGE, ALASKA 99511-1405 PHONE (907) 349-0100

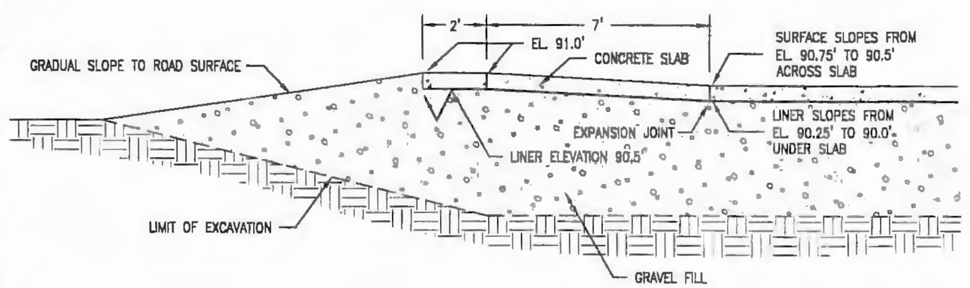
DRAWN BY: TDK	SCALE: 1"=10'	FILE NAME: NIKOBFM4	SHEET: M4 OF 12
DESIGNED BY: SJS	DATE: 5/31/02	PROJECT NUMBER: 99-06-9691	



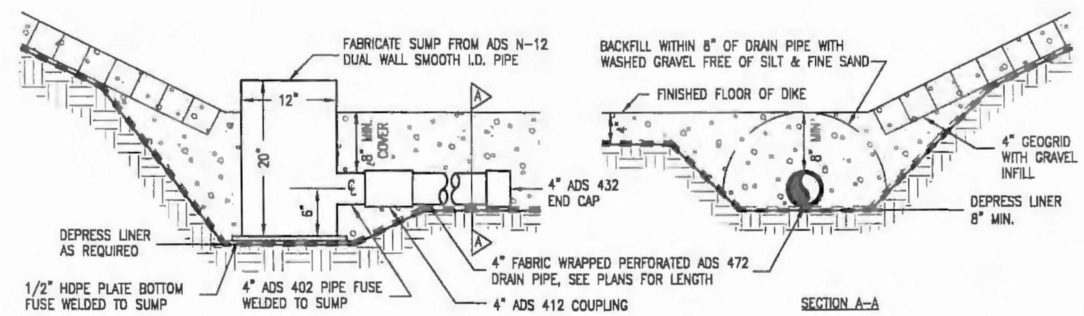
1/M5 BULK TRANSFER AREA/DIKE SECTION
1"=4'



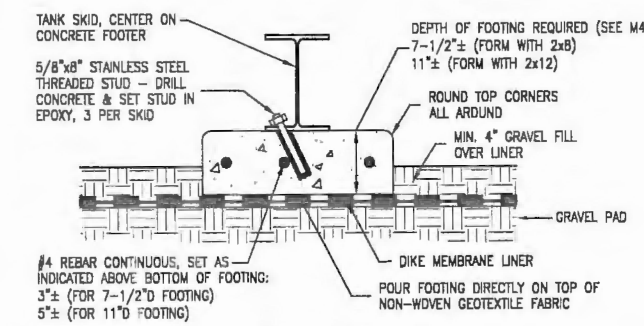
2/M5 TYPICAL MEMBRANE LINER INSTALLATION
NOT TO SCALE



3/M5 BULK TRANSFER SLAB SECTION
1"=3'

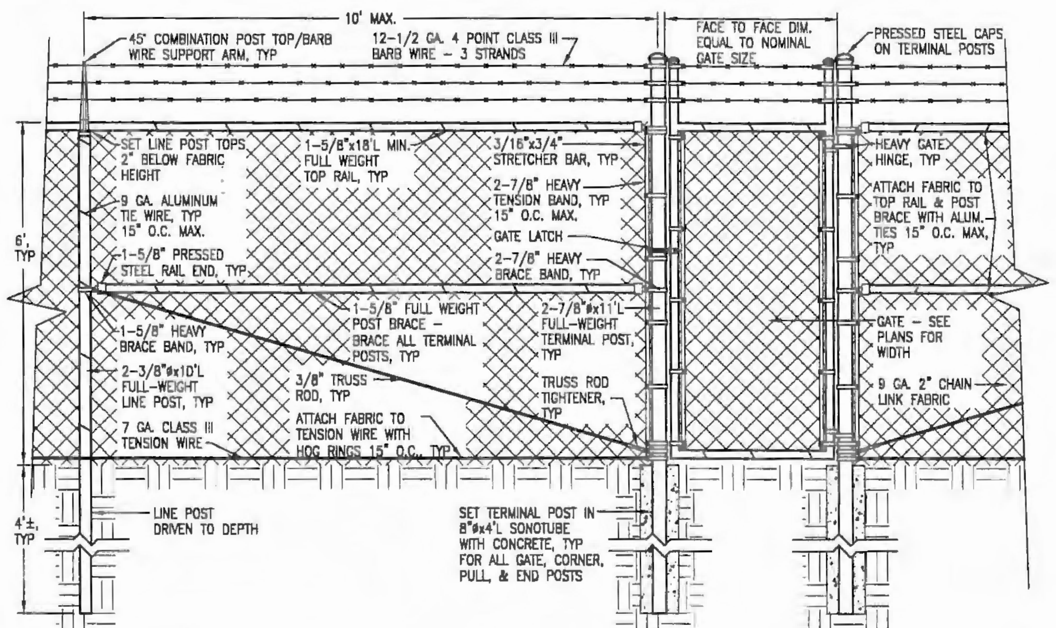


4/M5 DRAINAGE SUMP
1"=1'

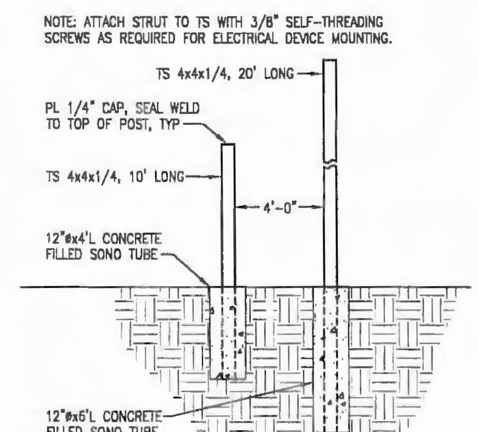


NOTES: 1) TAKE STEPS TO PROTECT LINER WHILE FORMING & POURING FOOTING. DO NOT USE STAKES FOR SETTING FORMS.
2) SEE DIKE PLAN FOR FOOTING LENGTH & WIDTH.

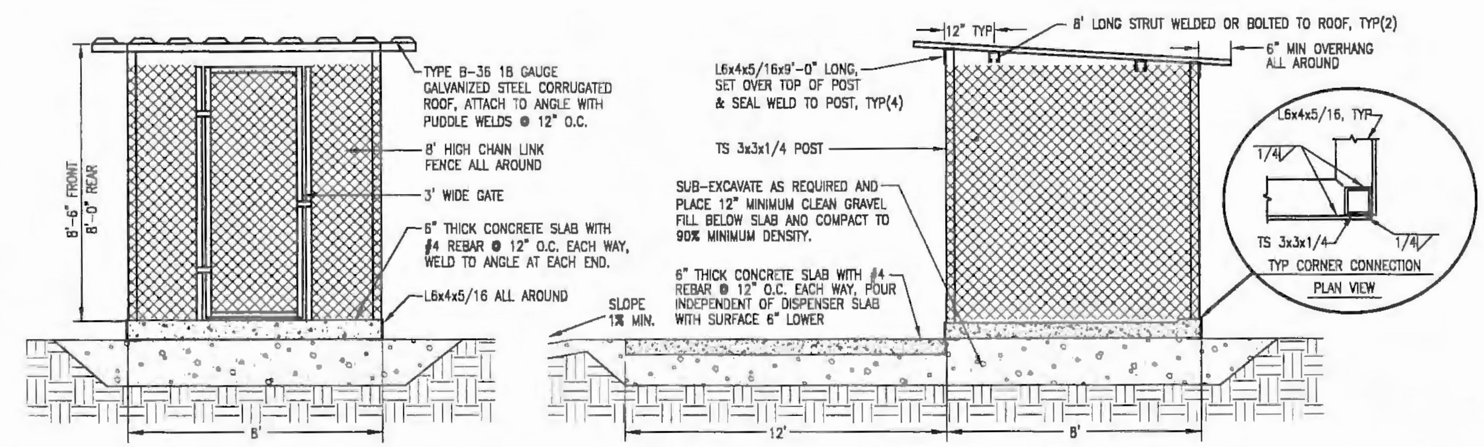
5/M5 TYPICAL TANK FOOTING
NO SCALE



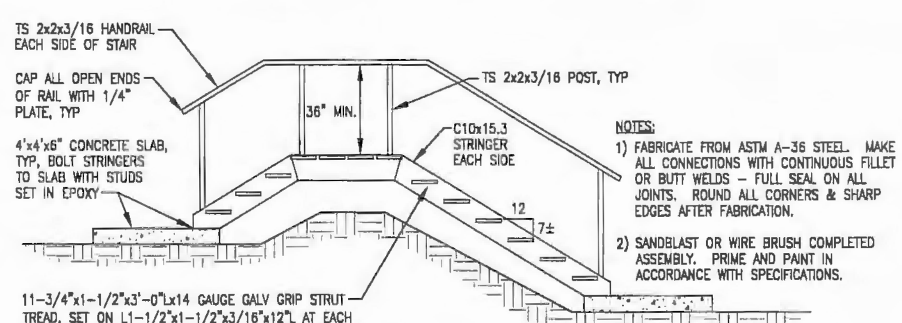
6/M5 TYPICAL FENCE INSTALLATION
NOT TO SCALE



7/M5 CONTROL PANEL SUPPORT
NO SCALE



8/M5 DISPENSER SECURITY ENCLOSURE & SLAB
NOT TO SCALE



NOTES:
1) FABRICATE FROM ASTM A-36 STEEL. MAKE ALL CONNECTIONS WITH CONTINUOUS FILLET OR BUTT WELDS – FULL SEAL ON ALL JOINTS. ROUND ALL CORNERS & SHARP EDGES AFTER FABRICATION.
2) SANDBLAST OR WIRE BRUSH COMPLETED ASSEMBLY. PRIME AND PAINT IN ACCORDANCE WITH SPECIFICATIONS.

9/M5 TYPICAL ACCESS STAIRS
NO SCALE

REDUCED PLOT - HALF SCALE
ISSUED FOR CONSTRUCTION JUNE 4, 2002

State of Alaska
Department of Community and Economic Development
AIDEA/AEA
Rural Energy Group
813 West Northern Lights Blvd.
Anchorage, Alaska 99503
ALASKA ENERGY AUTHORITY

PROJECT: NIKOLAI BULK FUEL STORAGE CONSOLIDATION & UPGRADE

TITLE: SECTIONS & DETAILS

ALASKA ENERGY AND ENGINEERING, INC
P.O. BOX 111405 ANCHORAGE, ALASKA 99511-1405 PHONE (907) 349-0100

DRAWN BY: TDK	SCALE: AS NOTED	FILE NAME: NIKOBFM5	SHEET: M5 OF 12
DESIGNED BY: SJS	DATE: 5/31/02	PROJECT NUMBER: 99-06-9691	

SPECIFIC NOTES:

1. 5/8"x8' COPPER CLAD GROUND ROD WITH #4 AWG STRANDED COPPER BARE GROUND WIRE. CLAMP TO ALL PIPES ON TANK FARM SIDE OF DIELECTRIC FLANGES.
2. DIELECTRIC FLANGE.
3. NOT USED.
4. 3/4" THREAD-O-LET WITH 3/4" THREADED BALL VALVE & PLUG FOR PRESSURE TEST.

PUMP SCHEDULE			
LABEL	FUNCTION	STYLE	MOTOR
DP-1	GASOLINE DISPENSING	SUBMERSIBLE	3/4HP, 230V
TP-1	GASOLINE BULK TRANSFER	SUBMERSIBLE	3/4HP, 230V
TP-2	DIESEL TRUCK LOADING	CENTRIFUGAL	1/2HP, 230V
TP-3	SCHOOL TRANSFER TO INTERMEDIATE	SUBMERSIBLE	3/4HP, 230V

GENERAL NOTES:

1. BULK STORAGE TANKS #C1, #C3, AND #C4 ARE NEW SINGLE WALL STEEL TANKS MANUFACTURED AND LABELED IN ACCORDANCE WITH UL STANDARD 142. GASOLINE DISPENSING TANK #C2 IS A NEW DOUBLE WALL TWO HOUR FIRE RATED WELDED STEEL TANK MANUFACTURED AND LABELED IN ACCORDANCE WITH UL STANDARD 2085.
2. DIESEL FUEL BULK STORAGE TANK #C5, #C6, AND #S1 ARE EXISTING SINGLE WALL WELDED STEEL CONSTRUCTION. MODIFY TANKS TO MEET IFC & PROJECT REQUIREMENTS. SEE NOTES ON DETAIL 4/M8 AND SPECIFICATIONS.
3. LABEL ENDS OF ALL TANK WITH MINIMUM 4" HIGH LETTERING INDICATING CAPACITY, PRODUCT, AND TANK NUMBER.
4. PROVIDE UNIQUE KEYED ALIKE BRASS PADLOCKS ON ALL VALVES FOR EACH OWNER.

TANK SCHEDULE (GROSS SHELL CAPACITY IN GALLONS)							
TANK #	NEW OWNER	PREVIOUS OWNER	NEW/ EXISTING	FUNCTION	#1 DIESEL CAPAC.	#2 DIESEL CAPAC.	GASOLINE CAPAC.
C1	CITY		NEW	BULK			27,000
C2	CITY		NEW	DISPENSING			4,000
C3	CITY		NEW	BULK	27,000		
C4	CITY		NEW	BULK	27,000		
C5	CITY	CITY	REFURB.	BULK		10,000	
C6	CITY	CITY	REFURB.	BULK		10,000	
CITY STORAGE TOTAL					**54,000**	**20,000**	**31,000**
S1	SCHOOL	CITY	REFURB.	BULK	12,000		
S2	SCHOOL		NEW	INTERMEDIATE	4,000		
SCHOOL STORAGE TOTAL					**16,000**		
PROJECT GROSS STORAGE CAPACITY BY PRODUCT					**70,000**	**20,000**	**31,000**
PROJECT TOTAL GROSS STORAGE CAPACITY							**121,000**
PROJECT TOTAL NET STORAGE CAPACITY (90% OF GROSS)							**108,900**

VALVE/PUMP TAG SCHEDULE

VALVE & PUMP TAGS – 3"x5"x.08" ALUMINUM, 3/16" HOLES IN ALL FOUR CORNERS. BLACK GERBER THERMAL TRANSFER FILM PRINTED LETTERS ON GERBER 220 HIGH PERFORMANCE VINYL BACKGROUND, COLOR AS INDICATED, ONE SIDE ONLY. WARNING LITES OR EQUAL.

TOMATO RED (CITY – UNLEADED GASOLINE)

21 "NORMALLY CLOSED, MAIN FILL, OPEN ONLY FOR BARGE DELIVERY"
22 "NORMALLY CLOSED, OPEN ONLY FOR FILLING TANK"
23 "TP-1, CITY, GASOLINE TRANSFER, DISPENSING TANK FILL"
24 "DP-1, CITY, GASOLINE DISPENSING"
25 "NORMALLY CLOSED, OPEN ONLY FOR AIRCRAFT/TRUCK DELIVERY"

APPLE GREEN (CITY – #1 DIESEL)

31 "NORMALLY CLOSED, MAIN FILL, OPEN ONLY FOR BARGE DELIVERY"
32 "NORMALLY CLOSED, OPEN FOR TRUCK LOADING #1 DIESEL"
33 "TP-2, CITY, #1 DIESEL TRUCK LOADING"
34 "NORMALLY CLOSED, OPEN ONLY FOR AIRCRAFT/TRUCK DELIVERY"

SKY BLUE (CITY – #2 DIESEL)

41 "NORMALLY CLOSED, MAIN FILL, OPEN ONLY FOR BARGE DELIVERY"
42 "NORMALLY CLOSED, OPEN FOR TRUCK LOADING #2 DIESEL"
43 "TP-2, CITY, #2 DIESEL TRUCK LOADING"
44 "NORMALLY CLOSED, OPEN ONLY FOR AIRCRAFT/TRUCK DELIVERY"

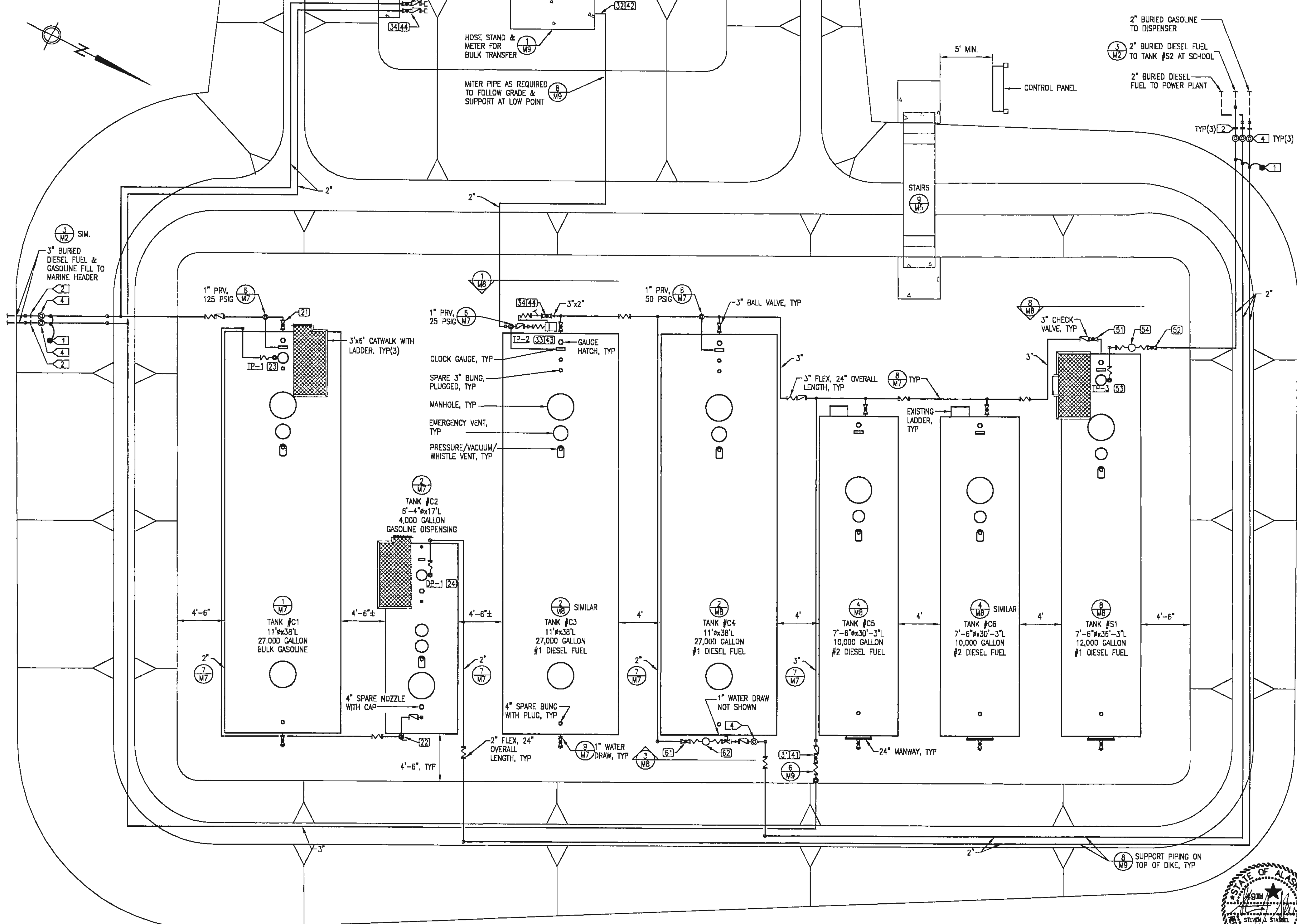
BEIGE (SCHOOL #1 DIESEL)

51 "NORMALLY CLOSED, MAIN FILL, OPEN ONLY FOR BARGE DELIVERY"
52 "NORMALLY CLOSED, OPEN ONLY FOR FILLING INTERMEDIATE TANK #S2"
53 "TP-3, SCHOOL, TRANSFER TO INTERMEDIATE TANK"
54 "CHANGE FILTER ELEMENTS EACH FALL AFTER FREEZE UP"
55 "NORMALLY OPEN, CLOSE ONLY FOR SERVICING ACTUATED BALL VALVE"
56 "NORMALLY OPEN, CLOSE ONLY FOR EMERGENCIES & TEMPORARY MAINTENANCE OF DAY TANK & DEVICES"
57 "NORMALLY CLOSED, OPEN ONLY FOR HAND PRIMING"

MAGENTA (CITY POWER PLANT – #1 & #2 DIESEL)

61 "NORMALLY OPEN, CLOSE ONLY FOR SERVICING FILTER/ACTUATED BALL VALVE"
62 "CHANGE FILTER ELEMENTS EACH FALL AFTER FREEZE UP"
63 "NORMALLY OPEN, CLOSE ONLY FOR EMERGENCIES & TEMPORARY MAINTENANCE OF DAY TANK & DEVICES"
64 "NORMALLY CLOSED, OPEN ONLY FOR HAND PRIMING"

INSTALLATION – SECURE EACH TAG TIGHT TO VALVE, PIPE, OR DEVICE WITH STAINLESS STEEL CABLE TIES THROUGH ALL FOUR CORNERS



1 PIPING PLAN
M6 1"=5'

REDUCED PLOT - HALF SCALE
ISSUED FOR CONSTRUCTION JUNE 4, 2002

State of Alaska
Department of Community and Economic Development
AIDEA/AEA
Rural Energy Group
813 West Northern Lights Blvd.
Anchorage, Alaska 99503

ALASKA ENERGY AUTHORITY

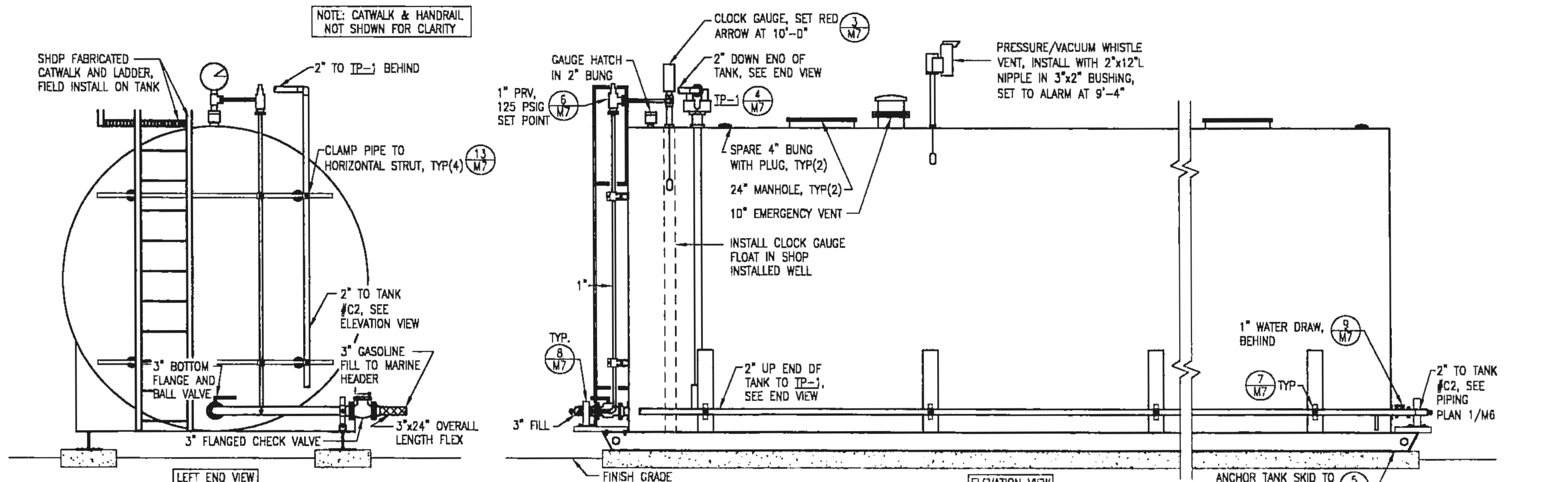
PROJECT: NIKOLAI BULK FUEL STORAGE CONSOLIDATION & UPGRADE

TITLE: PIPING PLAN, PUMP SCHEDULE, TANK SCHEDULE, & VALVE/PUMP TAG SCHEDULE

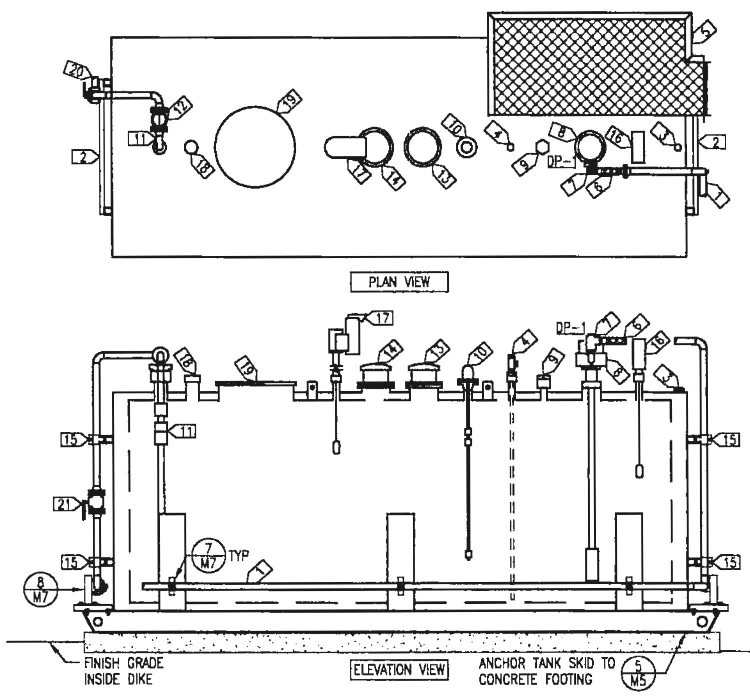
ALASKA ENERGY AND ENGINEERING, INC
P.O. BOX 111405 ANCHORAGE, ALASKA 99511-1405 PHONE (907) 349-0100

DRAWN BY: TDK	SCALE: AS NOTED	FILE NAME: NIKOBFM6	SHEET: M6 OF 12
DESIGNED BY: SJS	DATE: 5/31/02	PROJECT NUMBER: 99-06-9691	

STATE OF ALASKA 49TH STEVEN L. STASSEL ME 8801 6/4/02 PROFESSIONAL ENGINEER



1 M7 TANK #C1 END VIEW AND ELEVATION VIEW
1"=3'



2 M7 TANK #C2 PLAN VIEW AND ELEVATION VIEW
1"=3'

GENERAL NOTES:

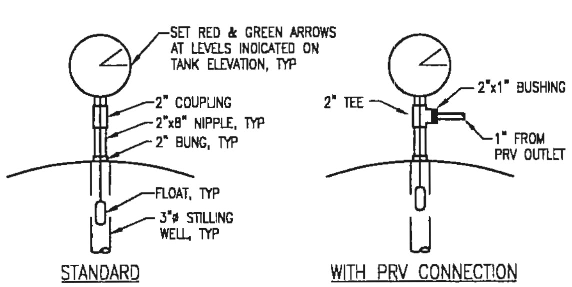
1. 6'-4"øx17'-0"L PRIMARY TANK, NOMINAL 4,000 GALLON CAPACITY 2 HOUR FIRE RATED DOUBLE WALL WELDED STEEL TANK MANUFACTURED & LABELED IN ACCORDANCE WITH U.L. 2085. PROVIDE REDUNDANT OVERFILL PROTECTION AS INDICATED IN ACCORDANCE WITH EPA GUIDELINES FOR ALTERNATIVE SECONDARY CONTAINMENT SYSTEMS.

SPECIFIC NOTES:

1. 2" TO GASOLINE DISPENSER.
2. STRUT SHOP WELDED TO TANK, TYP – SEE DETAIL 5/M7.
3. 2" SECONDARY TANK MONITOR PORT WITH CAP.
4. 3/4" THREADED BALL VALVE WATER DRAW WITH PLUG INSTALLED ON 2" THREADED NOZZLE WITH 2" COUPLING & 2"x3/4"x3/4" DOUBLE TAPPED BUSHING. EXTEND TO WITHIN 1" OF TANK BOTTOM.
5. SHOP FABRICATED BOLT-ON LADDER & CATWALK.
6. 2" FLEX, MPTxFLOATING FLANGE, 12" OVERALL LENGTH.
7. 2" ANTI-SYPHON VALVE – SEE DETAIL 4/M7, SIMILAR.
8. MOUNT SUBMERSIBLE PUMP ON 4" NOZZLE WITH THREADED COUPLING. SEE INSTALLATION DETAIL 4/M7, SIMILAR.
9. 2" FPT GAUGE HATCH INSTALLED ON 2" THREADED NOZZLE.
10. COMBINATION LOW/FULL/OVERFILL LEVEL SWITCH. SCIENTIFIC TECHNOLOGIES FR51 OR EQUAL. INSTALL ON 2-1/2" FLANGE. LOW LEVEL SET TO CLOSE AT 18" ABOVE PRIMARY TANK BOTTOM (64" ACTUATION LENGTH). FULL LEVEL (85%) SET TO CLOSE AT 5'-0" ABOVE PRIMARY TANK BOTTOM (22" ACTUATION LENGTH). OVERFILL LEVEL (90%) SET TO ALARM AT 5'-4" ABOVE PRIMARY TANK BOTTOM (18" ACTUATION LENGTH).

SPECIFIC NOTES (CONTINUED):

11. 2" FLOAT-TYPE FILL LIMITER, MORRISON FIGURE 9095A – SEE INSTALLATION DETAIL 11/M7.
12. 2" FLANGED CHECK VALVE
13. 8" FLANGED PRIMARY EMERGENCY VENT, MORRISON FIGURE 244-F.
14. 8" FLANGED SECONDARY EMERGENCY VENT, MORRISON FIGURE 244-F.
15. SECURE PIPE TO STRUT WITH PIPE CLAMP, 4 TOTAL.
16. 2" CLOCK GAUGE INSTALLED ON 2" THREADED NOZZLE WITH 2" COUPLING, MORRISON FIGURE 818 OR EQUAL. SET GREEN ARROW AT 3'-2" (50%) AND RED ARROW AT 5'-0" (85%). DETAIL 3/M7 SIMILAR.
17. 2" PRESSURE VACUUM VENT WITH WHISTLE ALARM, MORRISON FIGURE 922 OR EQUAL. INSTALL ON 2" THREADED NOZZLE WITH 2" COUPLING & 2" PIPE LENGTH AS REQUIRED TO ENSURE VENT OUTLET IS 12' MIN ABOVE GRADE & 5' MIN FROM ALL ELECTRICAL DEVICES, RACEWAYS, & CONNECTIONS. FEED CABLE THROUGH PIPE PRIOR TO CONNECTING TO TANK. SET WHISTLE TO ALARM AT 5'-0" (85%) ABOVE PRIMARY TANK BOTTOM.
18. SPARE 4" NOZZLE WITH THREADED CAP.
19. 24" MANHOLE.
20. 2" FROM GASOLINE BULK TANK #C1.
21. 2" FLANGED BALL VALVE.



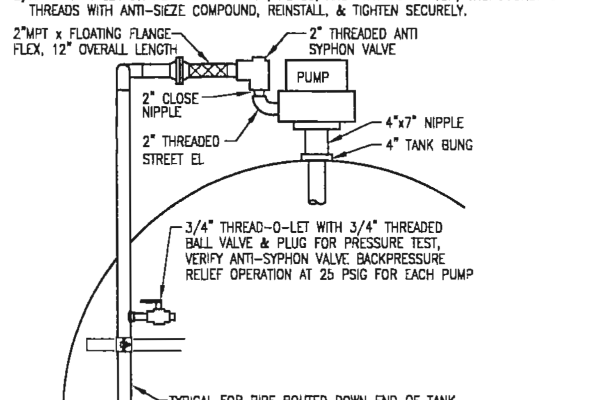
NOTES:

1) FEED FLOAT CABLE THROUGH NIPPLE PRIOR TO CONNECTING TO TANK.
2) GREASE FLOAT PRIOR TO INSTALLING IN TANK TO PREVENT FREEZING TO BOTTOM.
3) CALIBRATE GAUGE AFTER FILLING TANK AND VERIFY WITH MANUAL GAUGING ROD OR TAPE.
4) ENSURE THAT BACK COVER PLATE IS PROPERLY SEALED AFTER RE-ASSEMBLE (ANY LOOSENESS OR RATTLING WHEN TAPPED INDICATES A POOR SEAL).
5) ON 12'ø TANKS INSTALL 12" LONG STAINLESS STEEL FLOAT CABLE EXTENSION.

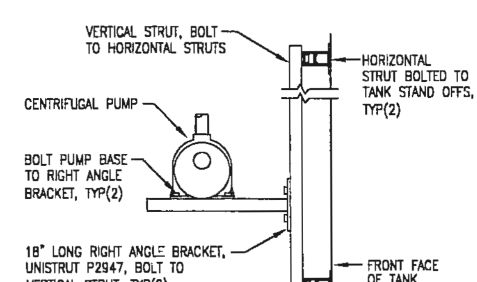
3 M7 CLOCK GAUGE INSTALLATION
NOT TO SCALE

NOTES:

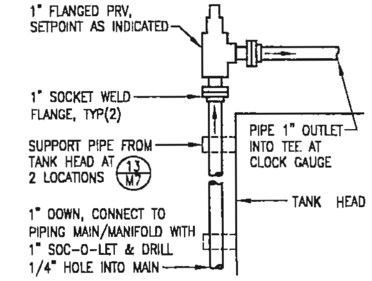
1) PRIOR TO PLACING PUMP IN TANK INSTALL TRAPPER SCREEN & SET PUMP LENGTH SO THAT INTAKE WILL BE 8" ABOVE TANK BOTTOM. SECURELY TIGHTEN & LOCK ADJUSTING MECHANISM.
2) AFTER INSTALLATION REMOVE ALL BOLTS, PLUGS, AND FITTINGS ON TOP, THOROUGHLY COAT THREADS WITH ANTI-SIEZE COMPOUND, REINSTALL, & TIGHTEN SECURELY.



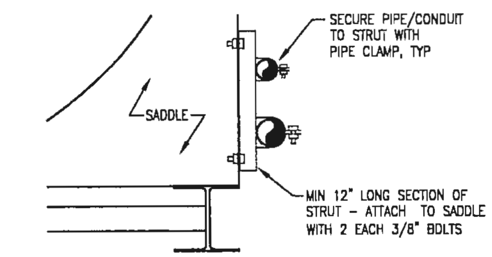
4 M7 TYP. SUBMERSIBLE PUMP INSTALLATION
NOT TO SCALE



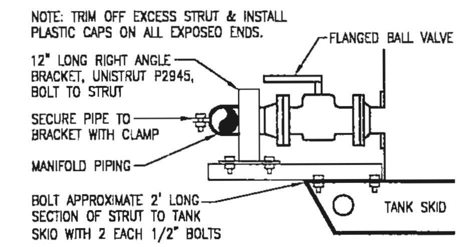
5 M7 PUMP SUPPORT AT FACE OF TANK
NO SCALE



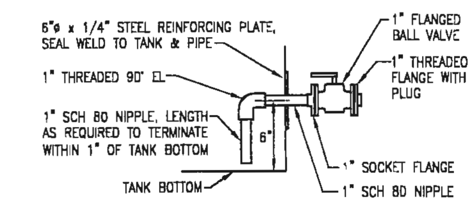
6 M7 TYPICAL PRV INSTALLATION
NOT TO SCALE



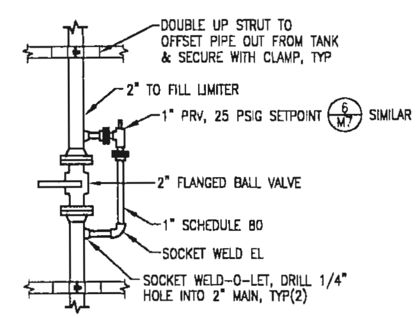
7 M7 PIPE SUPPORT FROM TANK SADDLE
NOT TO SCALE



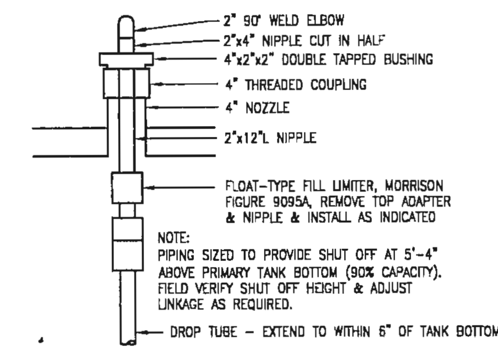
8 M7 PIPE SUPPORT FROM TANK SKID
NOT TO SCALE



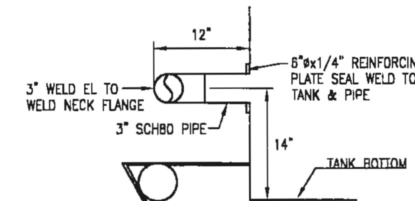
9 M7 TYPICAL WATER DRAW
NOT TO SCALE



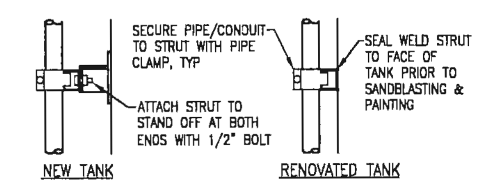
10 M7 VALVE/PRV INSTALLATION
NOT TO SCALE



11 M7 FILL LIMITER INSTALLATION
NOT TO SCALE



12 M7 TANK #S1 BOTTOM CONNECTION
NOT TO SCALE



13 M7 PIPE SUPPORT FROM TANK HEAD
NOT TO SCALE

REDUCED PLOT - HALF SCALE
ISSUED FOR CONSTRUCTION JUNE 4, 2002

State of Alaska
Department of Community and Economic Development
AIDEA/AEA
Rural Energy Group
813 West Northern Lights Blvd.
Anchorage, Alaska 99503
ALASKA ENERGY AUTHORITY

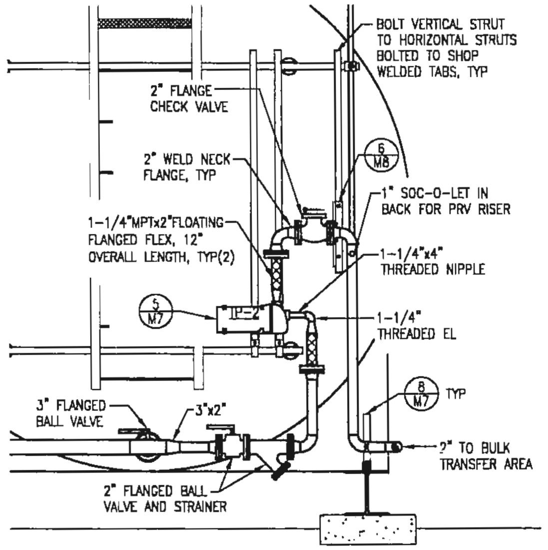
PROJECT: NIKOLAI BULK FUEL STORAGE CONSOLIDATION & UPGRADE

TITLE: TANK & PIPING DETAILS

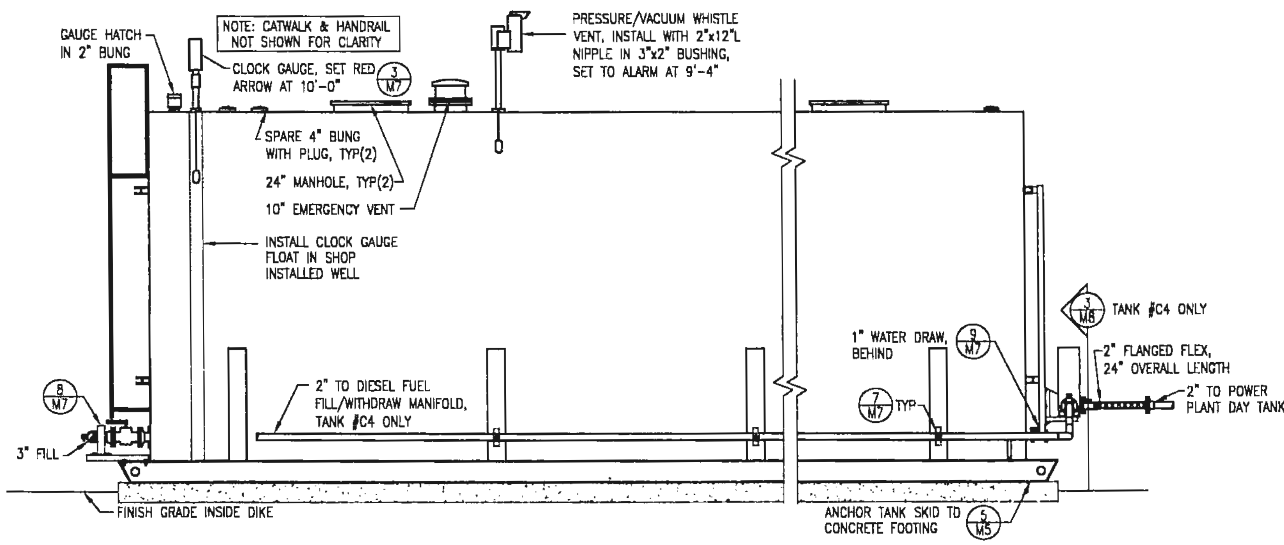
ALASKA ENERGY AND ENGINEERING, INC
P.O. BOX 111405 ANCHORAGE, ALASKA 99511-1405 PHONE (907) 349-0100

STATE OF ALASKA 49TH STEVEN J. STASSEL REGISTERED PROFESSIONAL ENGINEER

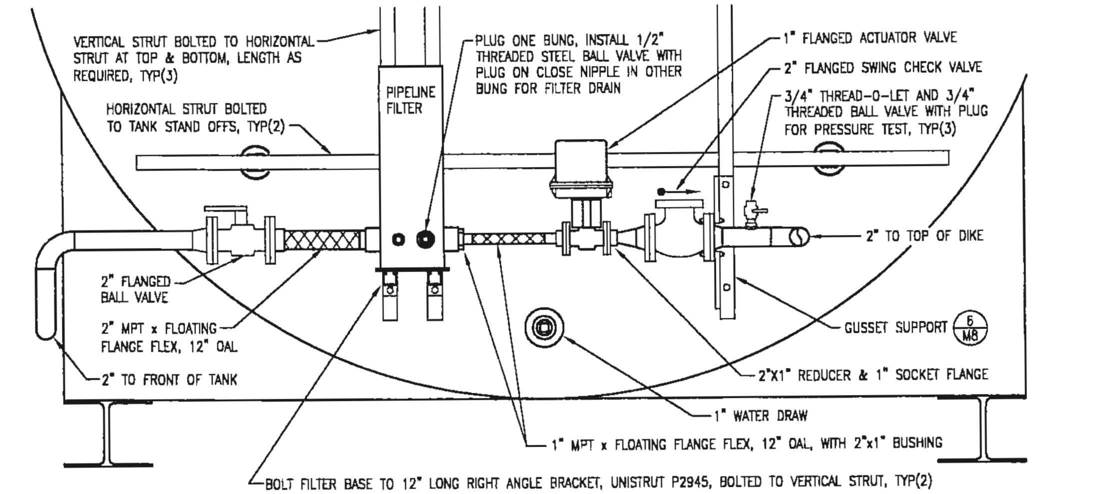
DRAWN BY: TDK	SCALE: AS NOTED	FILE NAME: NIKOBFM7	SHEET: M7 OF 12
DESIGNED BY: SJS	DATE: 5/31/02	PROJECT NUMBER: 99-06-9691	



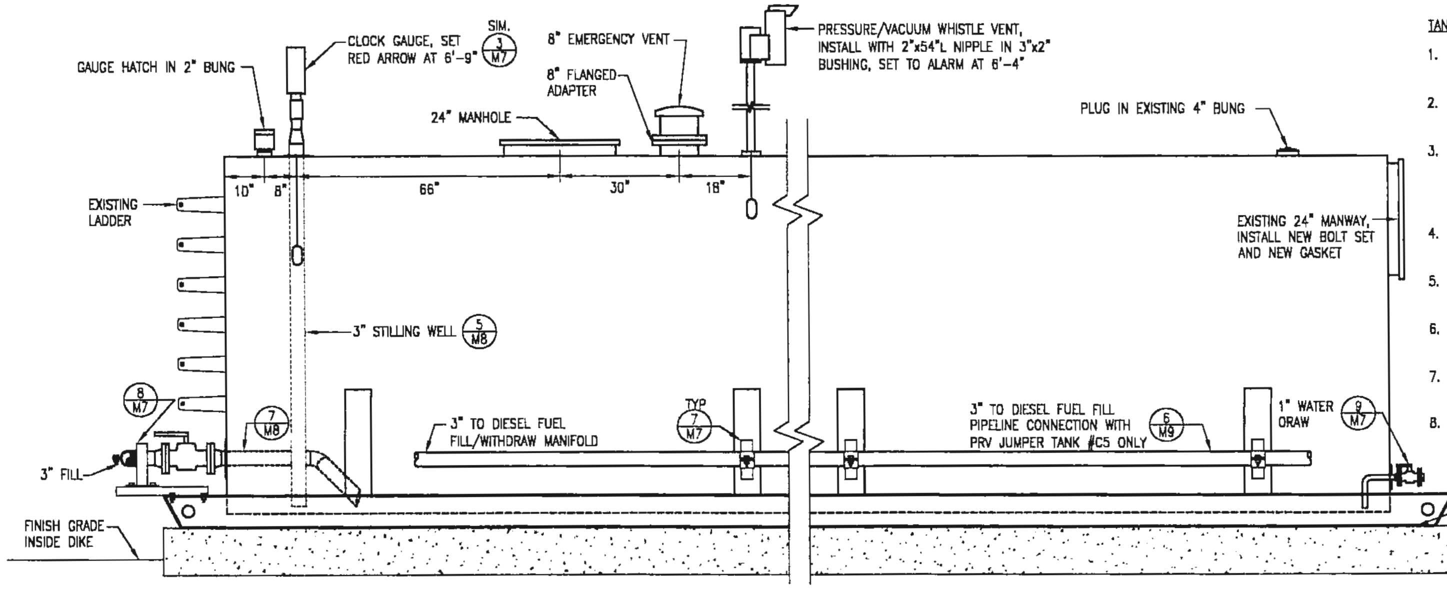
1 M8 TANK #C3 END VIEW
NOT TO SCALE



2 M8 TANK #C4 ELEVATION VIEW (TANK #C3 SIMILAR)
1"=3'



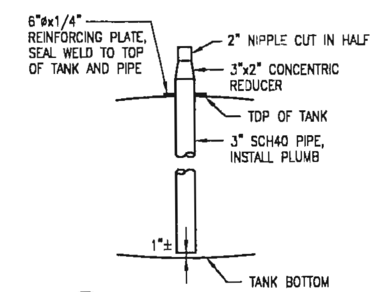
3 M8 ACTUATOR VALVE/FILTER INSTALLATION
NOT TO SCALE



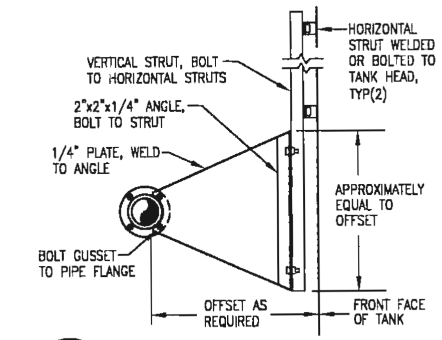
4 M8 TANK #C5 ELEVATION VIEW (TANK #C6 SIMILAR)
1"=2'

TANK MODIFICATION GENERAL NOTES (TANKS #C5,C6,&S1):

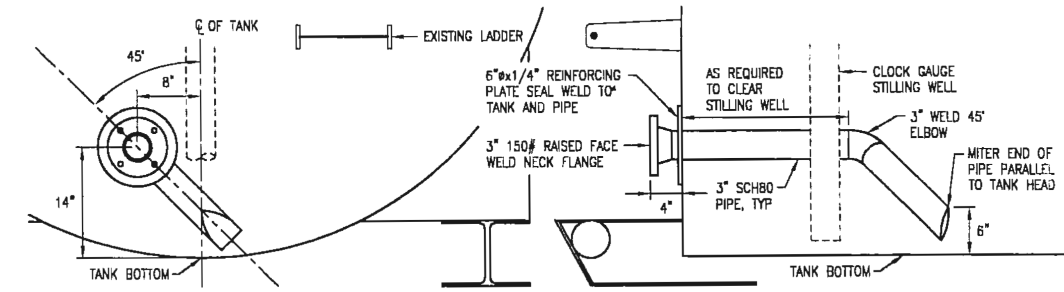
1. TANKS ARE EXISTING. DRAIN, CLEAN, & PURGE PRIOR TO MODIFYING. SEE SPECIFICATIONS.
2. ALL CONNECTIONS & APPURTENANCES ARE NEW UNLESS NOTED AS EXISTING.
3. CUT OUT ALL EXIST PIPING CONNECTIONS BELOW LIQUID LEVEL & INSTALL NEW PIPING CONNECTION WITH REINFORCING PLATE OR MIN 6"øx1/4" COVER PLATE & SEAL WELD.
4. PROVIDE MIN 6"øx1/4" REINFORCING PLATE ON ALL NEW PIPING CONNECTIONS BELOW LIQUID LEVEL. SIM. 9/M7
5. WELD NEW FLANGED ADAPTER TO TANKS FOR ALL EMERGENCY VENTS.
6. INSTALL NEW WATER DRAW VALVES ON ALL EXIST TANKS. 9/M7
7. THREAD WHISTLE VENT WIRE THROUGH NIPPLE & ATTACH TO FLOAT PRIOR TO INSTALLING ON TANK.
8. CLEAN & PAINT TANKS AFTER MODIFICATION. SEE SPECIFICATIONS.



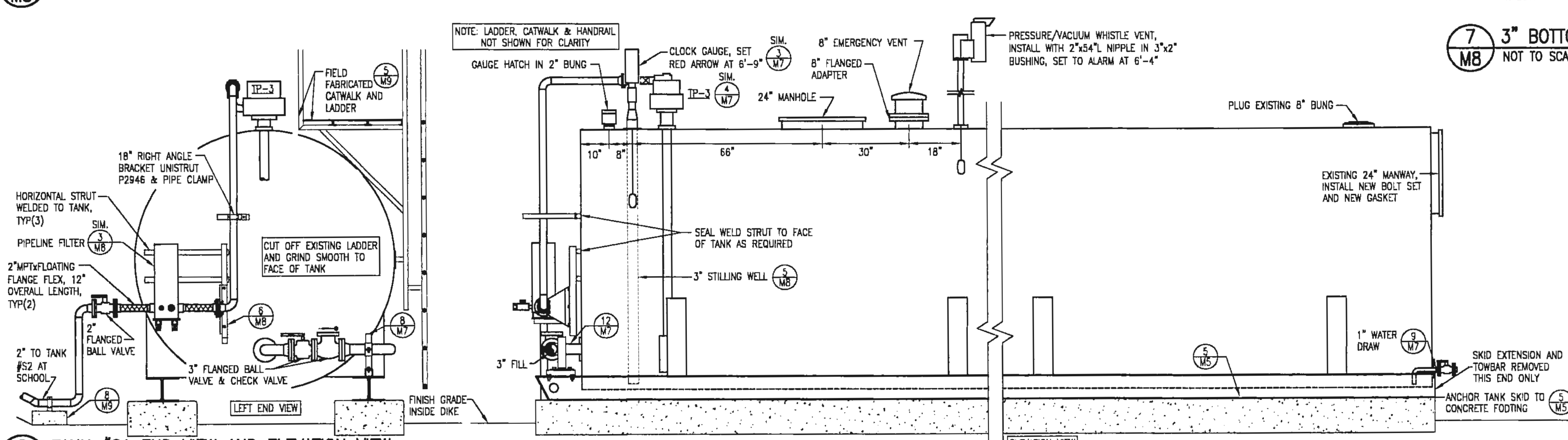
5 M8 GAUGE FLOAT STILLING WELL
NOT TO SCALE



6 M8 GUSSET SUPPORT AT FLANGE
NOT TO SCALE



7 M8 3" BOTTOM FLANGE RETROFIT (TANK #C5 & #C6)
NOT TO SCALE



8 M8 TANK #S1 END VIEW AND ELEVATION VIEW
1"=2'

REDUCED PLOT - HALF SCALE
ISSUED FOR CONSTRUCTION JUNE 4, 2002

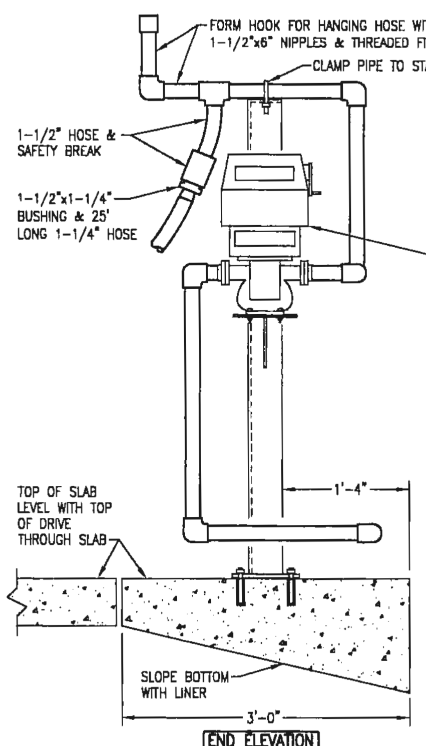
State of Alaska
Department of Community and Economic Development
AIDEA/AEA
Rural Energy Group
813 West Northern Lights Blvd.
Anchorage, Alaska 99503
ALASKA ENERGY AUTHORITY

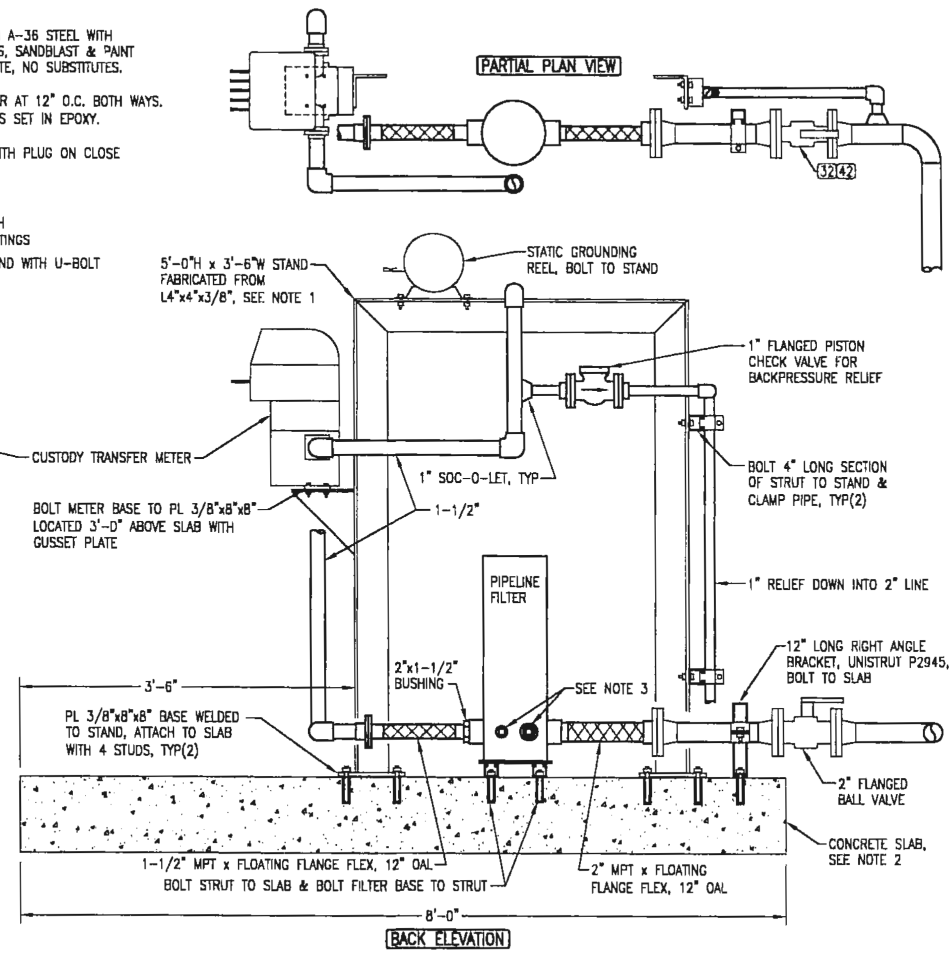
PROJECT:	NIKOLAI BULK FUEL STORAGE CONSOLIDATION & UPGRADE
TITLE:	TANK DETAILS

ALASKA ENERGY AND ENGINEERING, INC
P.O. BOX 111405 ANCHORAGE, ALASKA 99511-1405 PHONE (907) 349-0100

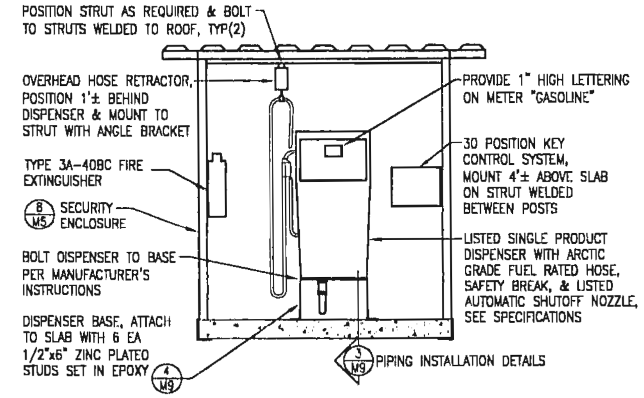
DRAWN BY: TDK	SCALE: AS NOTED	FILE NAME: NIKOBFM8	SHEET: M8 OF 12
DESIGNED BY: SJS	DATE: 5/31/02	PROJECT NUMBER: 99-06-9691	

NOTES:
1) FABRICATE STAND WITH BASE PLATES & METER PLATE FROM ASTM A-36 STEEL WITH CONTINUOUS WELD JOINTS, ROUND ALL CORNERS & SHARP EDGES, SANDBLAST & PAINT WITH 2 COATS OF SELF-PRIMING EPOXY, DEVOE 236, COLOR WHITE, NO SUBSTITUTES.
2) 3'-0"W x 8'-0"L x MIN 6" DEEP CONCRETE SLAB WITH #4 REBAR AT 12" O.C. BOTH WAYS. MAKE ALL ATTACHMENTS WITH 1/2" ZINC PLATED THREADED STUDS SET IN EPOXY.
3) PLUG ONE BUNG. INSTALL 1/2" THREADED STEEL BALL VALVE WITH PLUG ON CLOSE NIPPLE IN OTHER BUNG FOR FILTER DRAIN.

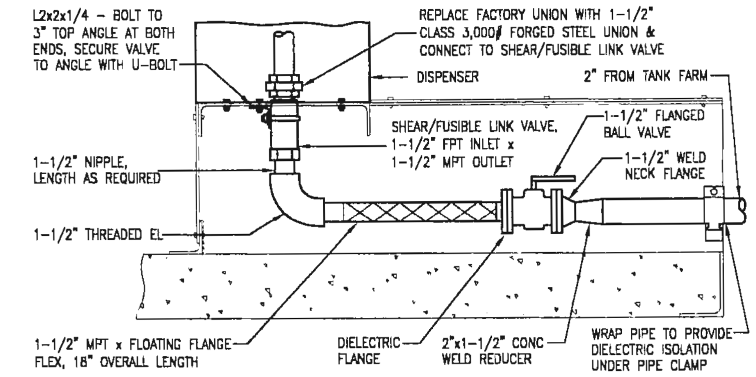




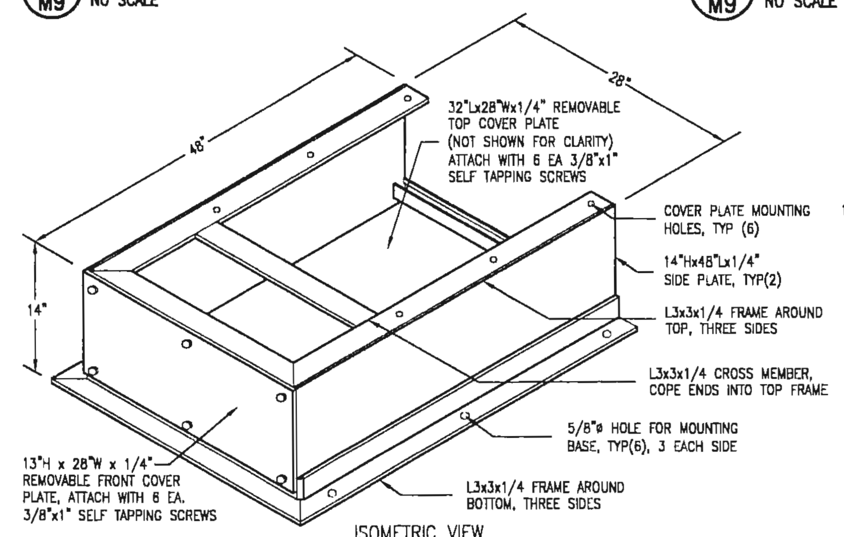
1/M9 BULK TRANSFER HOSE STAND
1"=1'

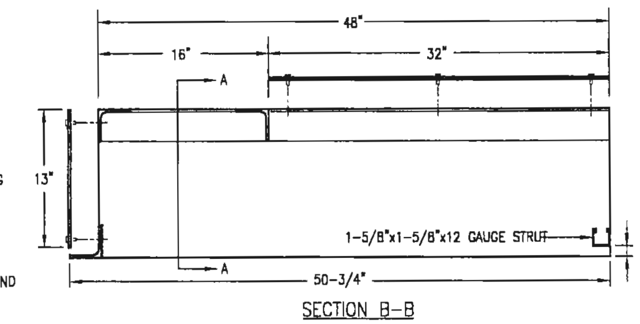


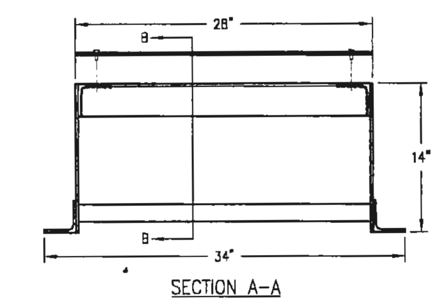
2/M9 SINGLE PRODUCT DISPENSER INSTALLATION
NO SCALE



3/M9 DISPENSER PIPING INSTALLATION
NO SCALE

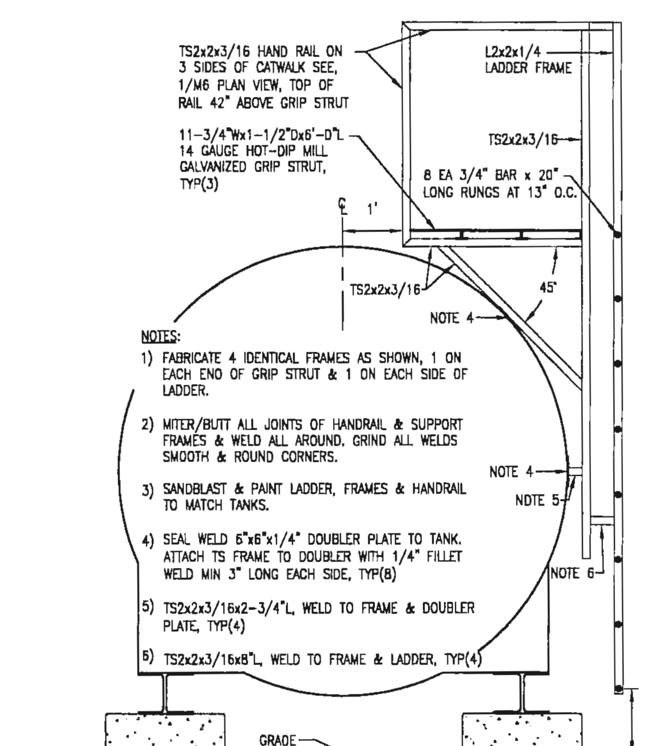






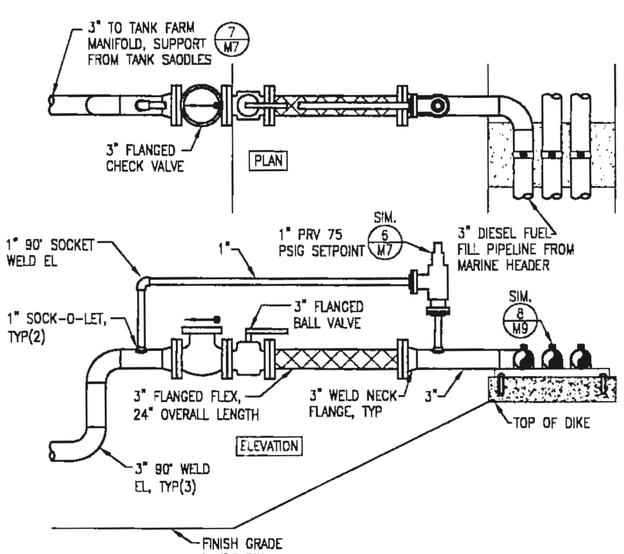
NOTES:
1) FABRICATE FROM ASTM A-36 STEEL. MAKE ALL CONNECTIONS WITH CONTINUOUS FILLET OR BUTT WELDS. ROUND ALL CORNERS & SHARP EDGES AFTER FABRICATION.
2) SANDBLAST EXTERIOR OF COMPLETED ASSEMBLY & PAINT WITH TWO COATS OF SELF-PRIMING EPOXY, DEVOE BAR-RUST 236, COLOR WHITE, NO SUBSTITUTES.
3) PROVIDE ALL FASTENERS & ASSEMBLE COMPLETED BASE AFTER PAINTING.

4/M9 DISPENSER BASE FABRICATION
NO SCALE



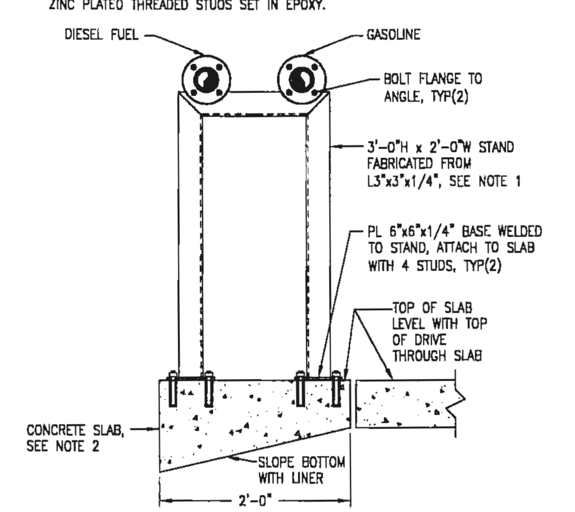
NOTES:
1) FABRICATE 4 IDENTICAL FRAMES AS SHOWN, 1 ON EACH END OF GRIP STRUT & 1 ON EACH SIDE OF LADDER.
2) MITER/BUTT ALL JOINTS OF HANDRAIL & SUPPORT FRAMES & WELD ALL AROUND. GRIND ALL WELDS SMOOTH & ROUND CORNERS.
3) SANDBLAST & PAINT LADDER, FRAMES & HANDRAIL TO MATCH TANKS.
4) SEAL WELD 6"x6"x1/4" DOUBLER PLATE TO TANK. ATTACH TS FRAME TO DOUBLER WITH 1/4" FILLET WELD MIN 3" LONG EACH SIDE, TYP(8)
5) TS2x2x3/16x2-3/4"L, WELD TO FRAME & DOUBLER PLATE, TYP(4)
5) TS2x2x3/16x8"L, WELD TO FRAME & LADDER, TYP(4)

5/M9 LADDER & CATWALK INSTALLATION (TANK #S1)
NOT TO SCALE



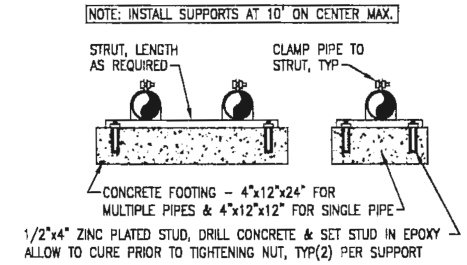
6/M9 FILL PIPELINE CONNECTION WITH PRV JUMPER
NOT TO SCALE

NOTES:
1) FABRICATE STAND AND BASE PLATES FROM ASTM A-36 STEEL WITH CONTINUOUS WELD JOINTS, ROUND ALL CORNERS & SHARP EDGES, SANDBLAST & PAINT WITH 2 COATS OF SELF-PRIMING EPOXY, DEVOE 236, COLOR WHITE, NO SUBSTITUTES.
2) 2'-0"W x 2'-0"L x MIN 6" DEEP CONCRETE SLAB. MAKE ALL ATTACHMENTS WITH 1/2" ZINC PLATED THREADED STUDS SET IN EPOXY.



7/M9 AIRCRAFT/TRUCK DELIVERY CONNECTION
NO SCALE

NOTE: INSTALL SUPPORTS AT 10' ON CENTER MAX.



8/M9 TYPICAL PIPE SUPPORT AT DIKE
NO SCALE

REDUCED PLOT - HALF SCALE
ISSUED FOR CONSTRUCTION JUNE 4, 2002

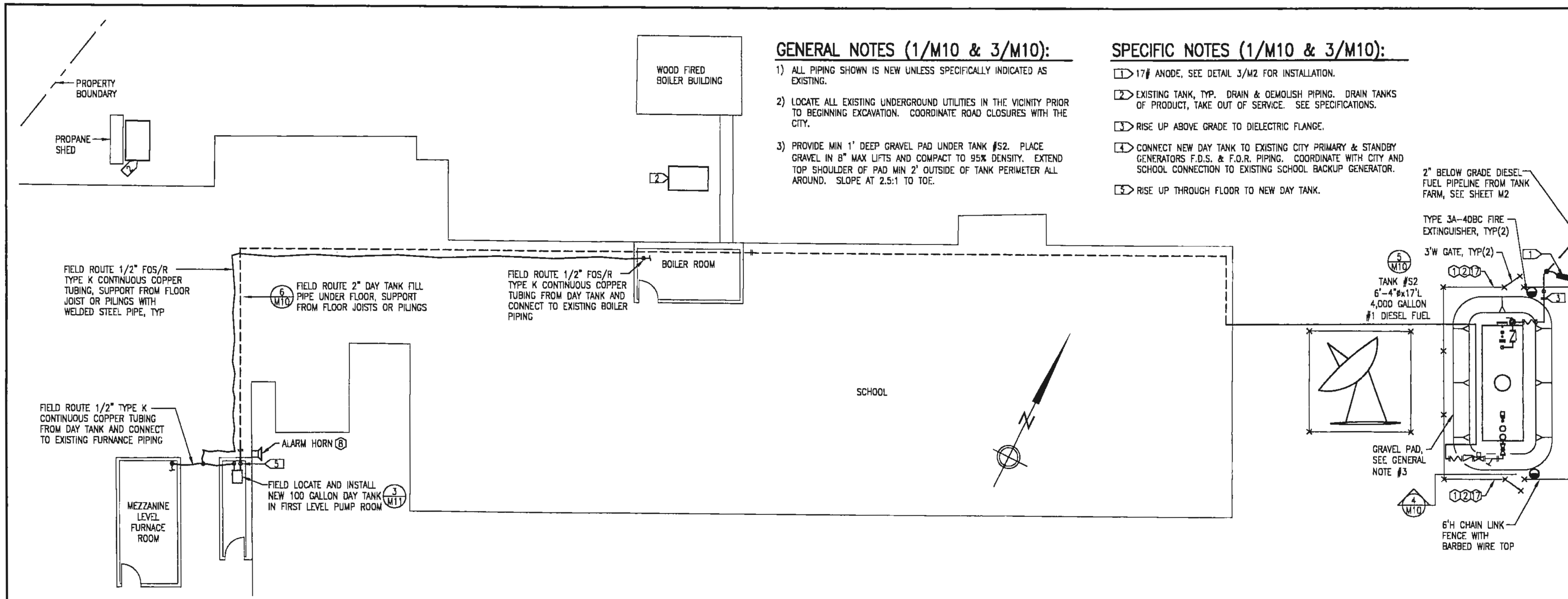
State of Alaska
Department of Community and Economic Development
AIDEA/AEA
Rural Energy Group
813 West Northern Lights Blvd.
Anchorage, Alaska 99503
ALASKA ENERGY AUTHORITY

PROJECT: NIKOLAI BULK FUEL STORAGE CONSOLIDATION & UPGRADE

TITLE: PIPING, TANK, & DISPENSER DETAILS

ALASKA ENERGY AND ENGINEERING, INC
P.O. BOX 111405 ANCHORAGE, ALASKA 99511-1405 PHONE (907) 349-0100

DRAWN BY: TDK	SCALE: AS NOTED	FILE NAME: NIKOBFM9	SHEET:
DESIGNED BY: SJS	DATE: 5/31/02	PROJECT NUMBER: 99-06-9691	M9 OF 12



GENERAL NOTES (1/M10 & 3/M10):

1) ALL PIPING SHOWN IS NEW UNLESS SPECIFICALLY INDICATED AS EXISTING.

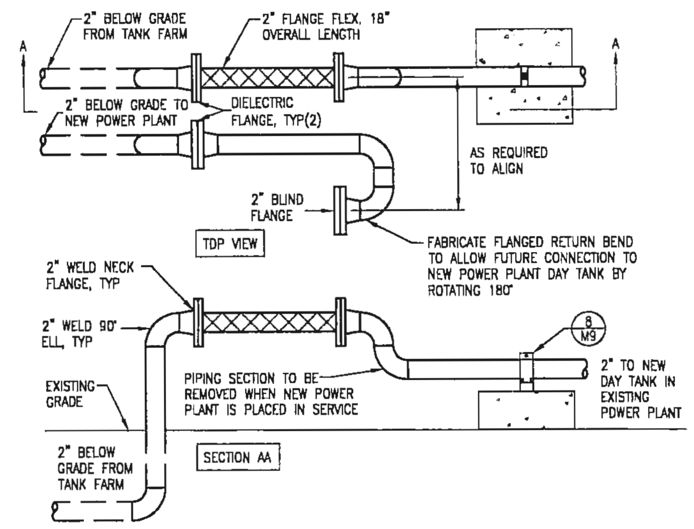
2) LOCATE ALL EXISTING UNDERGROUND UTILITIES IN THE VICINITY PRIOR TO BEGINNING EXCAVATION. COORDINATE ROAD CLOSURES WITH THE CITY.

3) PROVIDE MIN 1' DEEP GRAVEL PAD UNDER TANK #S2. PLACE GRAVEL IN 8" MAX LIFTS AND COMPACT TO 95% DENSITY. EXTEND TOP SHOULDER OF PAD MIN 2' OUTSIDE OF TANK PERIMETER ALL AROUND. SLOPE AT 2.5:1 TO TOE.

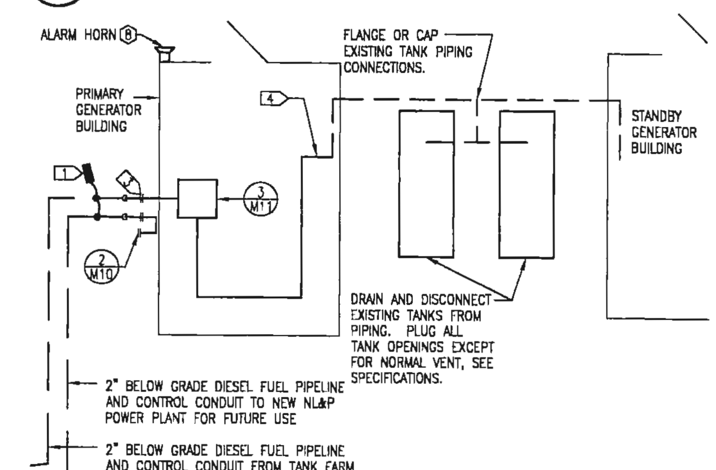
SPECIFIC NOTES (1/M10 & 3/M10):

1. 17# ANODE, SEE DETAIL 3/M2 FOR INSTALLATION.
2. EXISTING TANK, TYP. DRAIN & DEMOLISH PIPING. DRAIN TANKS OF PRODUCT, TAKE OUT OF SERVICE. SEE SPECIFICATIONS.
3. RISE UP ABOVE GRADE TO DIELECTRIC FLANGE.
4. CONNECT NEW DAY TANK TO EXISTING CITY PRIMARY & STANDBY GENERATORS F.D.S. & F.O.R. PIPING. COORDINATE WITH CITY AND SCHOOL CONNECTION TO EXISTING SCHOOL BACKUP GENERATOR.
5. RISE UP THROUGH FLOOR TO NEW DAY TANK.

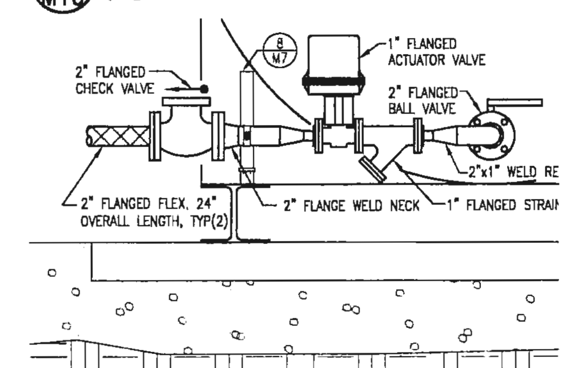
1/M10 SCHOOL SITE PLAN
1"=10'



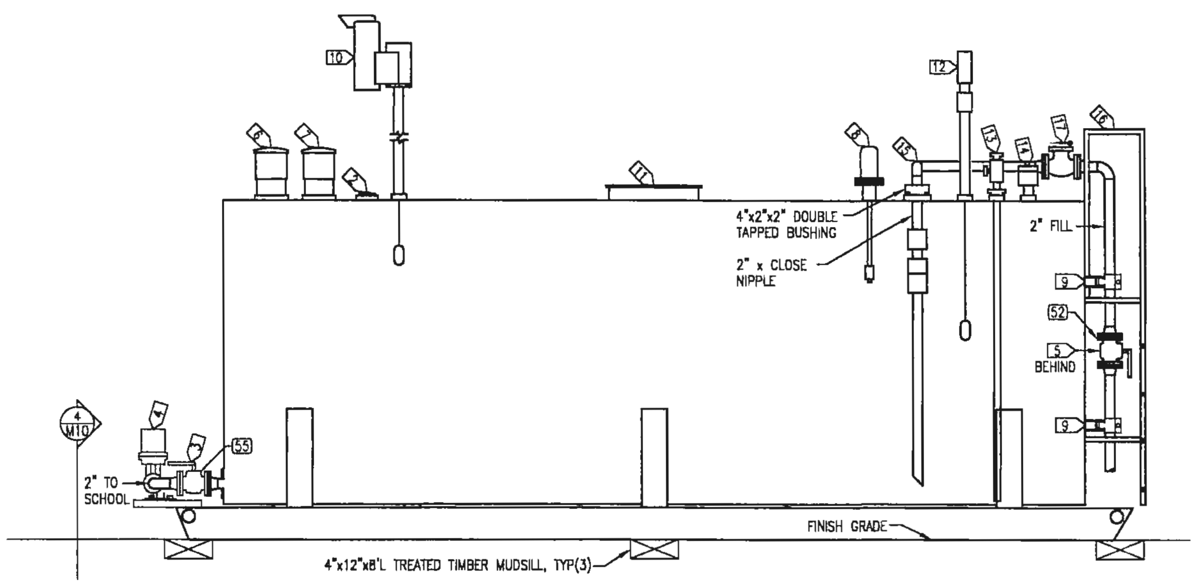
2/M10 EXISTING/NEW POWER PLANT PIPING DETAIL
NO SCALE



3/M10 EXISTING POWER PLANT PLAN
1"=5'



4/M10 TANK #S2 END VIEW
NOT TO SCALE



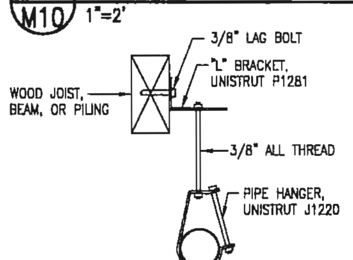
GENERAL NOTES:

1. 6'-4"øx17'-0"L NOMINAL 4,000 GALLON CAPACITY DOUBLE WALL WELDED STEEL TANK MANUFACTURED & LABELED IN ACCORDANCE WITH U.L. 142. PROVIDE REDUNDANT OVERFILL PROTECTION AS INDICATED IN ACCORDANCE WITH EPA GUIDELINES FOR ALTERNATIVE SECONDARY CONTAINMENT SYSTEMS.

SPECIFIC NOTES:

1. NOT USED.
2. SPARE 4" BUNG WITH PLUG.
3. 2" FLANGED BALL VALVE ON 2" FLANGED TANK BOTTOM WITHDRAWAL.
4. 1" FLANGED ACTUATOR VALVE, CONTROL FROM AUTOMATIC DAY TANK CONTROL PANEL.
5. 1" FLANGED PRV, 25 PSIG SET POINT, SEE DETAIL 10/M7, SIMILAR.
6. 6" MPT SECONDARY EMERGENCY VENT.
7. 6" MPT PRIMARY EMERGENCY VENT.
8. COMBINATION FULL/OVERFILL LEVEL SWITCH. SCIENTIFIC TECHNOLOGIES FR51 OR EQUAL. MOUNT ON 2-1/2" FLANGE. FULL LEVEL (85%) SET TO CLOSE AT 5'-0" ABOVE TANK BOTTOM (20" ACTUATION LENGTH). OVERFILL LEVEL (90%) SET TO ALARM AT 5'-4" ABOVE TANK BOTTOM (16" ACTUATION LENGTH).
9. SECURE PIPE TO STRUT WITH PIPE CLAMP, 2 TOTAL, SEE 13/M7.
10. 2" PRESSURE VACUUM VENT WITH WHISTLE ALARM, MORRISON FIGURE 922 OR EQUAL. INSTALL ON 3" BUNG WITH 3x2 REDUCING BUSHING & 2"x60" NIPPLE. FEED CABLE THROUGH PIPE PRIOR TO CONNECTING TO TANK. SET WHISTLE TO ALARM AT 5'-0" (85%) ABOVE TANK BOTTOM.
11. 24" MANHOLE.
12. 2" CLOCK GAUGE INSTALLED ON 2"x18" NIPPLE, MORRISON FIGURE 818 OR EQUAL. SET GREEN ARROW AT 3'-0" (50%) AND RED ARROW AT 5'-0" (85%). SEE INSTALLATION DETAIL 3/M7, SIMILAR.
13. 3/4" THREADED BALL VALVE WATER DRAW WITH PLUG. INSTALL ON SHOP INSTALLED 2"x3/4"x3/4" DOUBLE TAPPED BUSHING & DROP TUBE. VERIFY DROP TUBE EXTENDS TO WITHIN 1" OF TANK BOTTOM.
14. 2" FPT GAUGE HATCH INSTALLED ON 2"x4" NIPPLE.
15. 2" FILL LIMITER, SEE DETAIL 11/M7 SIM., EXCEPT AS NOTED.
16. SHOP FABRICATED BOLT-ON LADDER.
17. 2" FLANGED CHECK VALVE.

5/M10 TANK #S2 ELEVATION VIEW
1"=2'



6/M10 PIPE SUPPORT UNDER FLOOR
NOT TO SCALE

REDUCED PLOT - HALF SCALE

ISSUED FOR CONSTRUCTION JUNE 4, 2002

State of Alaska
Department of Community and Economic Development
AIDEA/AEA
Rural Energy Group
813 West Northern Lights Blvd.
Anchorage, Alaska 99503
ALASKA ENERGY AUTHORITY

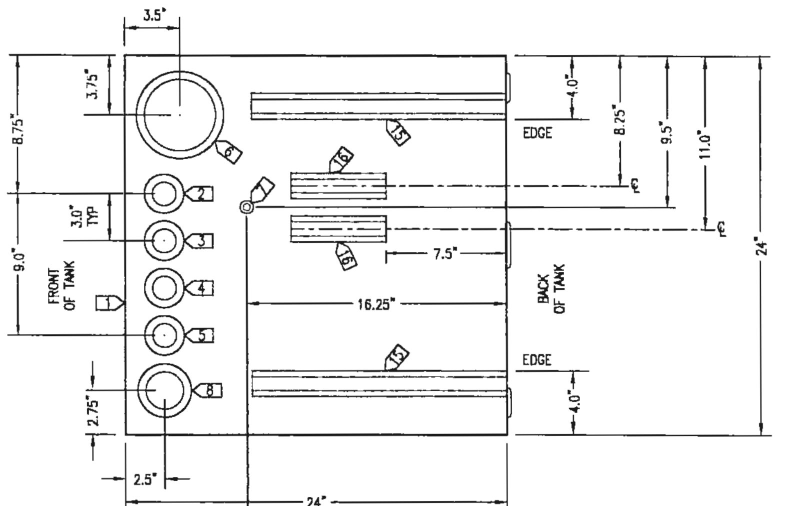
PROJECT:	NIKOLAI BULK FUEL STORAGE CONSOLIDATION & UPGRADE
TITLE:	SCHOOL & POWER PLANT PLANS & DETAILS

ALASKA ENERGY AND ENGINEERING, INC
P.O. BOX 111405 ANCHORAGE, ALASKA 99511-1405 PHONE (907) 349-0100

DRAWN BY: TDK	SCALE: AS NOTED	FILE NAME: NIKOBFM10	SHEET: M10 OF 12
DESIGNED BY: SJS	DATE: 5/31/02	PROJECT NUMBER: 99-06-9691	

GENERAL NOTES

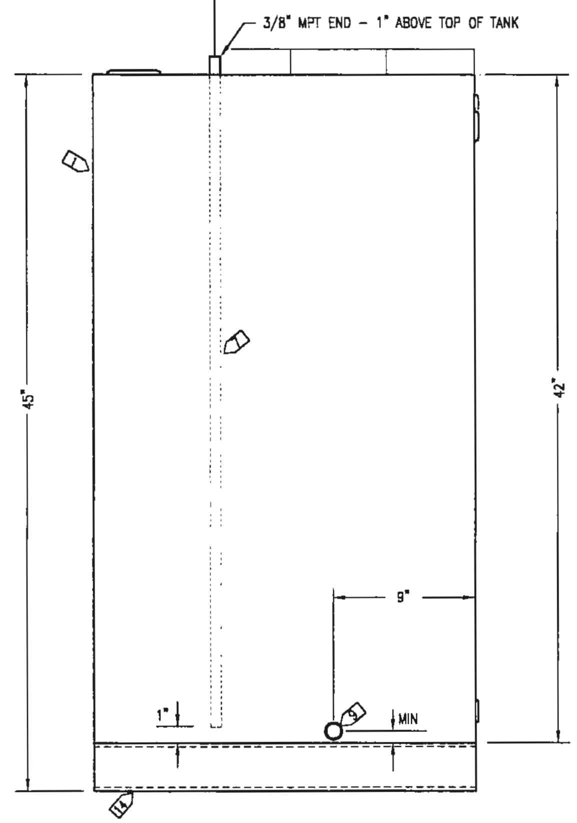
1) FABRICATE 2 EACH SINGLE WALL 100 GALLON NOMINAL CAPACITY TANK FROM 3/16" THICK ASTM A-36 STEEL PLATE. OVERALL TANK DIMENSIONS: 42"H x 24"W x 24"D. FABRICATE AND PRESSURE TEST IN ACCORDANCE WITH UL 142.
2) ALL TANK SEAM JOINTS TO BE FULL CONTINUOUS WELDS IN ACCORDANCE WITH UL 142 FIGURE 6.5 – #1, #6, #7, OR #8.
3) PROVIDE WITH ALL OPENINGS AND ATTACHMENTS INDICATED. ALL FPT OPENING INSTALLED IN ACCORDANCE WITH UL 142 FIGURE 7.1 – #4. ALL STRUT TO BE 1-5/8"x1-5/8"x12 GA SOLID BACK PLAIN (BLACK), UNISTRUT P1000 OR EQUAL. SEAL WELD ALL TANK ATTACHMENTS. ROUND ALL CORNERS AND SHARP EDGES.
4) SANDBLAST TANK EXTERIOR AND ALL ATTACHMENTS IN ACCORDANCE WITH SSPC-SP-6. PRIME WITH RED OXIDE PRIMER AND PAINT WITH TWO COATS OF ALKYD ENAMEL, COLOR MEDIUM GRAY.
5) LABEL ALL OPENINGS WITH 1/4" BLACK LETTERS INDICATING FUNCTION AS LISTED IN PARENTHESES ON INDIVIDUAL TANK DRAWINGS.
6) SEAL FPT TANK OPENINGS WITH PIPE PLUGS PRIOR TO SHIPPING. PLUGS MAY BE PLASTIC EXCEPT WHERE CALLED OUT AS STEEL. LEAVE DROP TUBE OPEN FOR TANK VENTING.



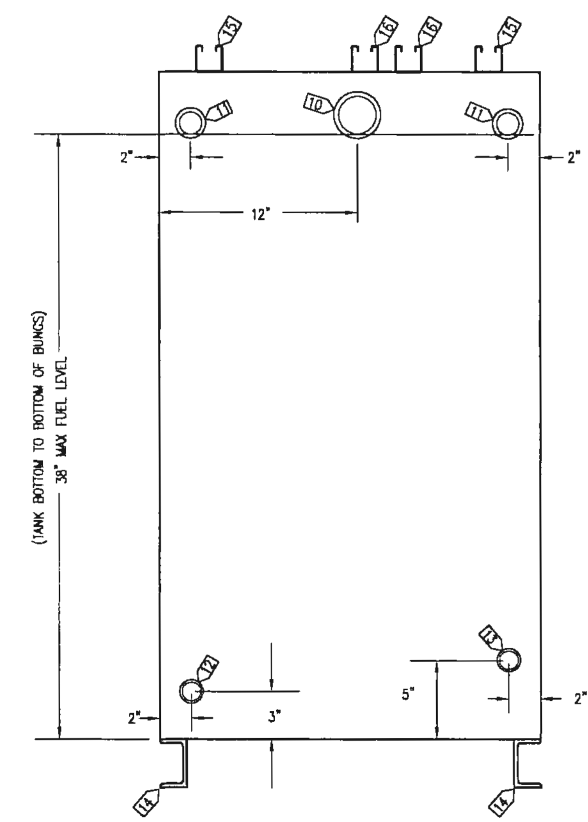
TOP VIEW

SPECIFIC NOTES

1. PROVIDE 2" HIGH LETTERING: "DIESEL FUEL 100 GALLONS".
2. 1-1/4" FPT (OVERFILL)
3. 1-1/4" FPT (PUMP STOP)
4. 1-1/4" FPT (PUMP START)
5. 1-1/4" FPT (LOW ALARM)
6. 4" FPT (MANUAL FILL) WITH THREADED STEEL PLUG.
7. 3/8" SCH 80 DROP TUBE (PUMP FILL).
8. 2" FPT (TANK GAUGE)
9. 3/4" FPT (DRAIN)
10. 2" FPT (VENT)
11. 1" FPT (SPARE)
12. 1" FPT (FUEL SUPPLY)
13. 1" FPT (FUEL RETURN)
14. C3x6.0x24" LONG WITH 9/16"ø MOUNTING HOLE EACH END.
15. 16"L STRUT, END FLUSH WITH BACK OF TANK, TYP(2)
16. 6"L STRUT, TYP(2)

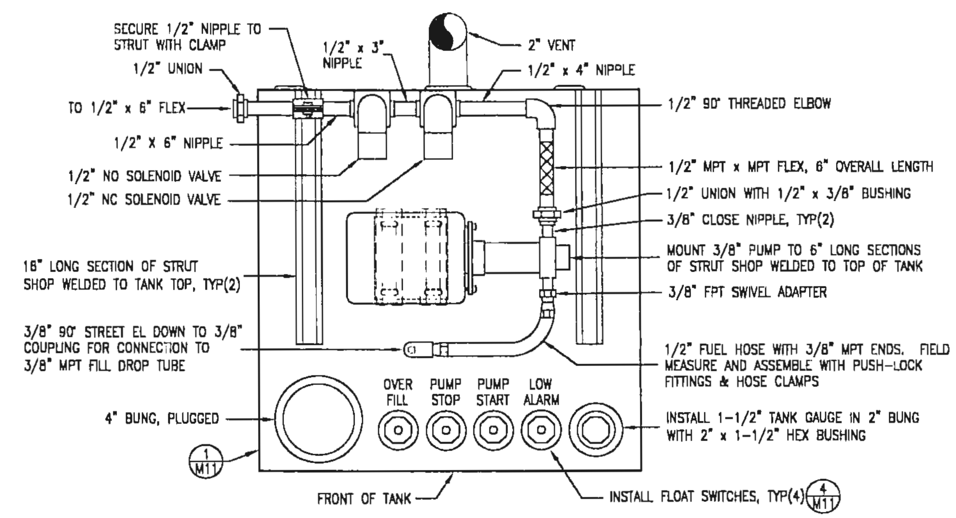


RIGHT SIDE VIEW

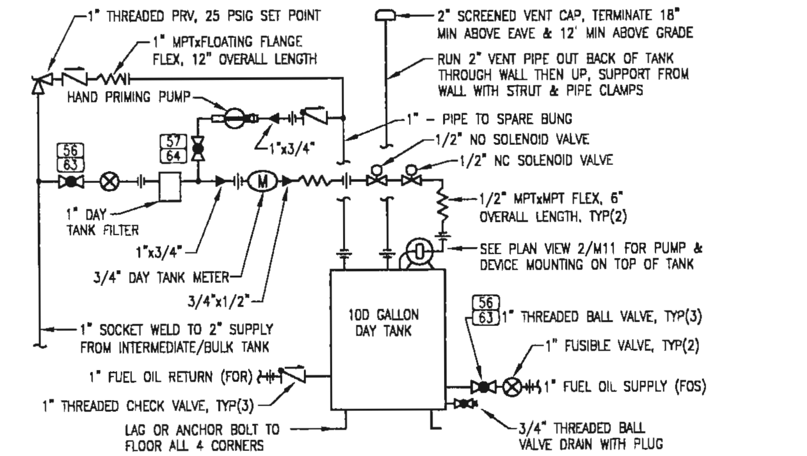


BACK VIEW

1/M11 DAY TANK FABRICATION DETAIL
1"=0'-6"

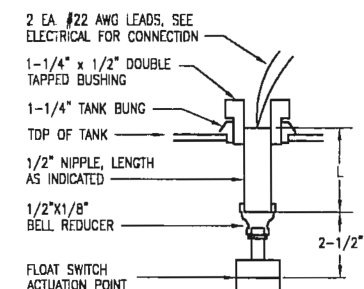


2/M11 SCHOOL & CITY POWER PLANT DAY TANK INSTALLATION – PLAN VIEW
NO SCALE



NOTES:
1) ALL PIPING, VALVES, & FITTINGS SHOWN ARE 1" THREADED UNLESS NOTED OTHERWISE.
2) CONNECT NEW FOS & FOR 1/2" TYPE K COPPER TUBING TO EXISTING BOILER, FURNACE, & GENERATOR PIPING.
3) PROVIDE METER ON CITY POWER PLANT DAY TANK ONLY.

3/M11 SCHOOL & CITY POWER PLANT DAY TANK PIPING DIAGRAM
NO SCALE



L=OVERALL LENGTH OF 1/2" NIPPLE
1. OVERFILL FLOAT L=2"
2. PUMP STOP FLOAT L=4"
3. PUMP START FLOAT L=18"
4. LOW ALARM FLOAT L=20"

4/M11 FLOAT SWITCH INSTALLATION
NO SCALE

REDUCED PLOT - HALF SCALE
ISSUED FOR CONSTRUCTION JUNE 4, 2002

State of Alaska
Department of Community and Economic Development
AIDEA/AEA
Rural Energy Group
813 West Northern Lights Blvd.
Anchorage, Alaska 99503
ALASKA ENERGY AUTHORITY

PROJECT:	NIKOLAI BULK FUEL STORAGE CONSOLIDATION & UPGRADE
TITLE:	DAY TANK FABRICATION & INSTALLATION DETAILS

ALASKA ENERGY AND ENGINEERING, INC
P.O. BOX 111405 ANCHORAGE, ALASKA 99511-1405 PHONE (907) 349-0100

DRAWN BY: TDK	SCALE: AS NOTED	FILE NAME: NIKOBFM11	SHEET: M11 OF 12
DESIGNED BY: SJS	DATE: 5/31/02	PROJECT NUMBER: 99-06-9691	

GENERAL

PERFORM ALL WORK IN ACCORDANCE WITH THE LATEST ADOPTED EDITION OF THE INTERNATIONAL FIRE CODE AND THE INTERNATIONAL BUILDING CODE INCLUDING STATE OF ALASKA AMENDMENTS. COMPLY WITH ALL APPLICABLE STATE AND FEDERAL REGULATIONS.

THE DRAWINGS ARE DIAGRAMMATIC AND DO NOT NECESSARILY SHOW ALL FEATURES OF THE REQUIRED WORK. PROVIDE ALL EQUIPMENT AND MATERIALS REQUIRED FOR A COMPLETE SYSTEM. VERIFY EXISTING FIELD CONDITIONS PRIOR TO STARTING CONSTRUCTION. IMMEDIATELY CONTACT THE ENGINEER FOR CLARIFICATION OF QUESTIONABLE ITEMS OR APPARENT CONFLICTS.

ALL ITEMS SHOWN ARE NEW UNLESS SPECIFICALLY INDICATED AS EXISTING. INSTALL ALL MATERIAL AND EQUIPMENT IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS, INSTRUCTIONS AND INSTALLATION DRAWINGS, UNLESS INDICATED OTHERWISE.

PERFORM WORK WITH SKILLED CRAFTSMEN SPECIALIZING IN SAID WORK. INSTALL ALL MATERIALS IN A NEAT, ORDERLY, AND SECURE FASHION, AS REQUIRED BY THESE SPECIFICATIONS AND COMMONLY RECOGNIZED STANDARDS OF GOOD WORKMANSHIP.

LEAVE ALL WORK SITES IN AN ORDERLY CONDITION CONSISTENT WITH THAT FOUND UPON ARRIVAL.

SITE

LOCATE ALL EXISTING UNDERGROUND UTILITIES IN THE VICINITY PRIOR TO BEGINNING EXCAVATION. CAREFULLY LAY OUT WORK TO MINIMIZE DISRUPTION AND DAMAGE TO EXISTING SURFACES. PERFORM ALL WORK IN ACCORDANCE WITH OSHA REQUIREMENTS. BARRICADE OPEN EXCAVATIONS TO PROHIBIT PUBLIC ENTRY.

BACKFILL WITH CLEAN EXCAVATED MATERIAL, LOCAL PIT-RUN GRAVEL, OR LOCAL SANDY SILTS AS INDICATED IN SECTIONS. FILL IN 8" MAXIMUM LIFTS AND COMPACT TO 90% MINIMUM DRY DENSITY OR AS INDICATED. FINISH GRADE TO PROVIDE POSITIVE DRAINAGE AS INDICATED IN PLANS AND BLEND NEW GRADING INTO EXISTING SURFACES.

WOVEN GEOTEXTILE FABRIC, 3 OZ/SQUARE YARD MINIMUM WEIGHT, 140 POUND MINIMUM GRAB TENSILE STRENGTH PER ASTM D-4632. AMOCO 2000 OR EQUAL. OVERLAP ALL SPLICES 2' MINIMUM.

NON-WOVEN GEOTEXTILE FABRIC, 8 OZ/SQUARE YARD MINIMUM WEIGHT, 130 POUND MINIMUM PUNCTURE STRENGTH PER ASTM D-4833. AMOCO 4553 OR EQUAL. OVERLAP ALL SPLICES 2' MINIMUM.

DIKE MEMBRANE LINER – OIL AND GASOLINE RESISTANT POLYETHER URETHANE MEMBRANE WITH POLYESTER REINFORCEMENT. 28 MIL NOMINAL THICKNESS, 23 OZ/SQUARE YARD NOMINAL WEIGHT, 400 POUND MINIMUM BALL TIP PUNCTURE STRENGTH PER ASTM D-751, -65F COLD CRACK PER ASTM D-2136. COOLEY L1023SDEP OR EQUAL. SHOP FABRICATE ENTIRE LINER IN ONE PIECE TO DIMENSIONS INDICATED. PACKAGE LINER IN A WOODEN CRATE. PROVIDE UNFOLDING/INSTALLATION INSTRUCTIONS IN CRATE WITH LINER ALONG WITH CERTIFICATES FOR MATERIAL AND SHOP FABRICATED SEAMS.

CONCRETE – PORTLAND CEMENT ASTM C 150 TYPE I, 3/4" MAX AGGREGATE, CLEAN POTABLE WATER, AND ASTM C-260 LIQUID AIR ENTRAINING RESIN, SIKA AEA15 OR EQUAL, 2,500 PSI MIN 28 DAY COMPRESSIVE STRENGTH WITH MIN 4% ENTRAINED AIR. MIX IN ACCORDANCE WITH ASTM C-94, 6 SACKS CEMENT PER CUBIC YARD MIN, 34 GAL WATER PER CUBIC YARD MAX, 8 FL. OZ. AIR ENTRAINMENT RESIN PER CUBIC YARD. INSTALL ASTM A-615 GRADE 40 DEFORMED REINFORCING BARS IN ACCORDANCE WITH ACI 315, SIZE AND QUANTITY AS INDICATED. PLACE CONCRETE IN ACCORDANCE WITH ACI 304.

STRUCTURAL STEEL – MISCELLANEOUS SHAPES AND PLATE ASTM A-36. RECTANGULAR TUBING ASTM A-500 GRADE B. STRUCTURAL PIPE ASTM A-53. REINFORCING BARS ASTM A-615 GRADE 40 UNLESS SPECIFICALLY INDICATED GRADE 60. WHERE INDICATED AS GALVANIZED, HOT DIP GALVANIZE IN ACCORDANCE WITH ASTM A-123, OTHERWISE PAINT AS INDICATED.

GRIP STRUT TREADS – 11-3/4"W x 1-1/2"D 14 GAUGE HOT-DIP MILL-GALVANIZED STEEL WITH SERRATED TOP, DIAMOND-GRIP CHANNEL OR EQUAL.

CHAIN LINK FENCE – PROVIDE ALL MATERIALS AND FASTENERS REQUIRED FOR A COMPLETE SYSTEM IN ACCORDANCE WITH THIS SPECIFICATION, INSTALLATION DRAWINGS, AND THE CHAIN LINK FENCE MANUFACTURER'S INSTITUTE. 8' HIGH GALVANIZED 9 GAUGE, 2" MESH CHAIN LINK FABRIC WITH 3/16" X 3/4" STRETCHER BARS. MINIMUM 18' LONG 1-5/8" DIAMETER FULL-WEIGHT PIPE TOP RAILS WITH 6" LONG COUPLINGS. 2-3/8" DIAMETER X 10' LONG FULL-WEIGHT PIPE LINE POSTS. 2-7/8" DIAMETER X 11' LONG FULL-WEIGHT PIPE TERMINAL (GATE, CORNER, PULL, AND END) POSTS. PROVIDE 1-5/8" FULL-WEIGHT PIPE POST BRACES AND 3/8" TRUSS RODS AND TURNBUCKLES FOR EACH TERMINAL POST. 1-7/8" DIAMETER COMMERCIAL QUALITY (CQ-20) GATE FRAMES COMPLETE WITH LOCKING FORKED LATCHES, STOPS, KEEPERS, AND HEAVY PATTERN POST AND GATE FRAME HINGES. PROVIDE 3 STRANDS OF 12-1/2 GAGE, 4 POINT CLASS III BARB WIRE OVER TOP OF ENTIRE FENCE INCLUDING GATES. 7 GAUGE COIL SPRING CLASS III BOTTOM TENSION WIRE. PROVIDE HEAVY-PRESSED STEEL AND MALLEABLE FITTINGS FOR ALL ATTACHMENTS. ALL STEEL AND IRON PARTS ZINC COATED AFTER FABRICATION.

INSTALL FENCE IN A WORKMAN-LIKE MANNER IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDED INSTALLATION PRACTICES. POSTS SHALL BE SET VERTICAL AND OF EQUAL HEIGHT WITH A MAXIMUM SPACING OF 10' ON CENTER. SET ALL TERMINAL POSTS AT 4' BURIAL DEPTH AND CEMENT USING 8" DIAMETER SONO-TUBES. SET ALL LINE POSTS SO POST TOPS ARE 2" BELOW FABRIC HEIGHT. INSTALL COMBINATION POST TOPS/BARBED WIRE ARMS. PASS TOP RAIL THROUGH LINE POST TOPS AND JOIN RAIL SECTIONS WITH SLEEVE COUPLINGS. FASTEN TOP RAIL TO TERMINAL POSTS WITH PRESSED STEEL FITTINGS. STRETCH FABRIC TAUT AND SECURELY FASTEN TO TERMINAL POSTS WITH STRETCHER BARS AND FABRIC BANDS AT 15" MAXIMUM INTERVALS. USE CONTINUOUS LENGTHS OF BARB WIRE AND TENSION WIRE BETWEEN TERMINAL POSTS. APPLY SUFFICIENT TENSION TO AVOID SAG BETWEEN POSTS AND TERMINATE BARB WIRE AND TENSION WIRE AT EACH TERMINAL POST. FASTEN FABRIC AT MAXIMUM 15" INTERVALS TO LINE POSTS AND TOP RAIL WITH TIES, AND TO BOTTOM TENSION WIRE WITH HOG RINGS. WHERE FENCE IS TO BE INSTALLED ON TIMBER DIKE WALLS ATTACH POSTS TO WALL AS INDICATED IN DETAILS.

TANKS

DAY TANKS – RECTANGULAR HEAVY GAUGE WELDED STEEL TANK MANUFACTURED IN ACCORDANCE WITH UL STANDARD 142, CAPACITY AND CONFIGURATION AS INDICATED. FURNISH COMPLETE WITH ALL CONTROLS AND ACCESSORIES AS INDICATED. FIELD TEST ALL CONTROL FUNCTIONS IN ACCORDANCE WITH THE SEQUENCE OF OPERATIONS AND LOGIC MATRIX.

SHOP FABRICATED TANKS – WELDED STEEL HORIZONTAL CONFIGURATION TANKS. SINGLE WALL CONSTRUCTION UNLESS SPECIFICALLY INDICATED AS DOUBLE WALL. PROVIDE STEEL "I-BEAM" SKID FOUNDATION DESIGNED TO ALLOW DRAGGING OF THE TANK AND LIFTING FROM ONE END. PROVIDE WITH ALL OPENINGS INDICATED. MANUFACTURE IN ACCORDANCE WITH UL STANDARD 142 AND PROVIDE WITH UL LABEL. FINISH IN ACCORDANCE WITH PAINTING SPECIFICATION BELOW.

FIRE RATED TANKS – TWO HOUR FIRE RATED INSULATED DOUBLE WALL WELDED STEEL TANKS. PROVIDE STEEL "I-BEAM" SKID FOUNDATION DESIGNED TO ALLOW DRAGGING OF THE TANK AND LIFTING FROM ONE END. PROVIDE WITH ALL OPENINGS INDICATED. MANUFACTURE IN ACCORDANCE WITH UL STANDARD 2085 AND PROVIDE WITH UL LABEL, FIREGUARD OR EQUAL. FINISH IN ACCORDANCE WITH PAINTING SPECIFICATION BELOW.

EXISTING TANKS BEING REUSED – PUMP OFF EXISTING PRODUCT AND SALVAGE FOR REUSE. CLEAN AND VAPOR FREE TANKS IN ACCORDANCE WITH API PUBLICATION 2015 AND APPLICABLE ALASKA AND FEDERAL OSHA REQUIREMENTS INCLUDING WORKER TRAINING. DRUM AND DISPOSE OF RESIDUAL SLUDGE AND WATER IN ACCORDANCE WITH ALL APPLICABLE STATE AND FEDERAL REGULATIONS. VISUALLY INSPECT TANKS FOR EVIDENCE OF CORROSION AND FOR WELD INTEGRITY. IMMEDIATELY REPORT ANY DEFICIENCIES TO THE ENGINEER. INERT TANKS WITH NITROGEN OR PURGE WITH FREE AIR. CUT OUT ALL EXISTING THREADED CONNECTIONS BELOW LIQUID LEVEL. WELD NEW FILL, WITHDRAWAL, AND WATER DRAW CONNECTIONS TO TANKS WITH REINFORCING PLATES, INSTALL SADDLES, PERFORM REPAIRS, AND ADD OPENINGS AND ATTACHMENTS AS INDICATED IN DETAILS. SEAL WELD MIN 6" DIAMETER BY 1/4" PLATE OVER UNUSED OPENINGS BELOW LIQUID LEVEL. INSTALL PLUGS IN ALL UNUSED OPENINGS ON TOP OF TANK. MAKE ALL REPAIRS AND NEW TANK CONNECTIONS IN ACCORDANCE WITH APPLICABLE UL 142 REQUIREMENTS. FINISH IN ACCORDANCE WITH PAINTING SPECIFICATION BELOW AFTER COMPLETION OF MODIFICATIONS.

EXISTING TANKS BEING TAKEN OUT OF SERVICE – PUMP OFF EXISTING PRODUCT AND TRANSFER TO NEW TANKS. DRAIN AND REMOVE ALL PIPING. BLIND FLANGE OR PLUG ALL PIPING CONNECTIONS. VERIFY THAT NORMAL VENT IS OPEN AND OPERATIONAL. FINAL DEMOLITION AND DISPOSAL OF TANKS TO BE PERFORMED BY OTHERS.

PAINTING

TANK PAINTING – UPON COMPLETION OF TANK MODIFICATIONS OR FABRICATION, SANDBLAST TANKS AND ATTACHMENTS IN ACCORDANCE WITH SSPC-SP-6. FOR FIELD RENOVATION OF EXISTING TANKS USE KLEEN BLAST #16/30 AGGREGATE WITH 15% BLASTOX ADDITIVE OR EQUAL. PRIME WITH ONE COAT OF REINFORCED INORGANIC ZINC PRIMER, DEVOE CATHA-COAT 302 OR EQUAL, COLOR GREEN, TO 3 MILS DRY FILM THICKNESS. COVER WITH TWO COATS OF EPOXY, DEVOE BAR-RUST 236 OR EQUAL, COLOR WHITE, TO 10 MILS DRY FILM THICKNESS. PERFORM ALL PAINTING IN A WARM DRY ENVIRONMENT IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS INCLUDING DRYING TIME TO RE-COAT.

TANK TOUCH UP – WHERE FIELD WELDING OF ATTACHMENTS TO TANKS THAT HAVE ALREADY RECEIVED FINISH PAINTING IS REQUIRED, WIRE BRUSH WELD AREA TO BARE METAL BEFORE AND AFTER WELDING AND PAINT WITH THREE COATS OF PAINT (PRIME AND TOP COAT) AS INDICATED ABOVE.

MISCELLANEOUS STEEL STRUCTURES – PAINT ALL STAIRS, CATWALKS, HANDRAILS, PUMP RACKS, PIPING SUPPORTS, MISCELLANEOUS STRUCTURAL FABRICATIONS, AND GALVANIZED ITEMS THAT HAVE BEEN FIELD WELDED OR CUT. GRIND OFF ZINC PRIOR TO WELDING GALVANIZED ITEMS. AFTER FABRICATION SANDBLAST OR WIRE BRUSH ALL STEEL TO CLEAN BARE METAL AND PRIME WITH UNIVERSAL RED OXIDE PRIMER, DEVOE RUSTGUARD 4140 OR EQUAL, COLOR RED, TO 1.5 MILS DRY FILM THICKNESS. PAINT WITH TWO COATS OF ALKYD ENAMEL, DEVOE SPEEDENAMEL 4318 OR EQUAL, COLOR HAZE GRAY EXCEPT AS NOTED, TO 4 MILS DRY FILM THICKNESS. PAINT CONTINGENCY STORAGE TANKS, STORAGE CONTAINERS, AND SIMILAR STRUCTURES OFF-WHITE TO MATCH TANKS.

PIPING – PAINT ALL ABOVE GRADE PIPE AND FITTINGS WITHIN DIKES, ALL PIPING RUNS TO DISPENSERS AND HOSE STANDS, ALL PIPING ON OR ADJACENT TO DOUBLE WALL TANKS, AND ALL OTHER PIPING AS INDICATED ON DRAWINGS. PRIOR TO SHIPPING, WHEEL ABRADE OR SANDBLAST PIPE TO BARE METAL AND PRIME WITH UNIVERSAL RED OXIDE PRIMER, DEVOE RUSTGUARD 4140 OR EQUAL, COLOR RED, TO 1.5 MILS DRY FILM THICKNESS. AFTER FABRICATION SANDBLAST OR WIRE BRUSH ALL FITTINGS TO CLEAN BARE METAL AND PRIME EQUAL TO PIPE. PAINT WITH TWO COATS OF ALKYD ENAMEL, DEVOE SPEEDENAMEL 4318 OR EQUAL, COLOR HAZE GRAY EXCEPT AS NOTED. PAINT ALL GASOLINE PIPING RED WITHIN DIKED AREAS, ON RUNS TO DISPENSERS AND PUMPS, AND WITHIN 10' OF THE MARINE HEADER.

PIPE AND FITTINGS

PIPE – ASTM A106B SEAMLESS CARBON STEEL PIPE WITH PLAIN BEVEL ENDS, WALL THICKNESS AS FOLLOWS: 3" DIA. AND LARGER WITHIN DIKES AND PROTECTED AREAS SCH 40; 3" DIA. AND LARGER BELOW GRADE OR EXPOSED TO TRAFFIC IN CROSS-COUNTRY RUNS SCH 80; 2" DIA. AND SMALLER SCH 80 EXCEPT FOR 1" PIPE OUTSIDE OF BUILDINGS SCH 160. FINISH IN ACCORDANCE WITH PAINTING SPECIFICATION ABOVE.

COATED PIPE – WHERE INDICATED, PROVIDE PIPE WITH U.V. RESISTANT YELLOW HIGH DENSITY POLYETHYLENE COATING OVER RUBBER/ASPHALT BLEND UNDERCOATING EXTRUDED OVER STEEL SHOT OR GRIT BLAST CLEANED PIPE EXTERIOR IN ACCORDANCE WITH NACE STANDARD RPO 185-85. OREGON SANDBLASTING OR EQUAL. PROVIDE HEAT SHRINKABLE SLEEVES AT ALL STRAIGHT JOINTS, RAYCHEM WPC 60 OR EQUAL. PROVIDE HEAT SHRINKABLE PIPE WRAP TAPE AT ALL BELOW-GRADE WELD FITTINGS, RAYCHEM FLEXCLAD OR EQUAL.

CATHODIC PROTECTION – 17# HIGH POTENTIAL MAGNESIUM ANODE WITH GALVANIZED STEEL CORE AND 10' LONG #12 SOLID COPPER LEAD WIRE PACKAGED IN BENTONITE FILLED BAG.

WELD FITTINGS – PROVIDE BUTT WELD FITTINGS FOR ALL PIPING 2" DIAMETER AND LARGER AND SOCKET WELD FITTINGS FOR ALL PIPING SMALLER THAN 2". ASTM A234 SEAMLESS DOMESTIC BUTT WELD CARBON STEEL FITTINGS. ASTM A105 DOMESTIC FORGED STEEL FLANGES, ANSI 150# RAISED FACE, EXTRA HEAVY/HEAVY BORE ON SCH 80 PIPE. ASTM A105 SOCKET WELD FITTINGS, CLASS 3000 MINIMUM.

NIPPLES – ASTM A53 CARBON STEEL NIPPLES, SCHEDULE AS INDICATED.

FLANGE GASKETS – SPIRAL WOUND METALLIC, LAMONS SPIRASEAL STYLE WR OR EQUAL. WHERE INDICATED DIELECTRIC PROVIDE NON-CONDUCTIVE FUEL RATED FULL FACE FIBER GASKETS WITH NYLON BUSHINGS AND WASHERS, CALPICO EODW OR EQUAL.

THREADED FITTINGS – ASTM A105 FORGED STEEL FITTINGS, CLASS 3000 MINIMUM, UNLESS SPECIFICALLY NOTED OTHERWISE.

WELDED JOINTS – PERFORM ALL WELDING IN ACCORDANCE WITH ASME SECTION IX AND API 1104 FOR WELDING PROCEDURE AND PERFORMANCE QUALIFICATION. VISUALLY INSPECT WELD JOINTS IN ACCORDANCE WITH API 1104.

THREADED JOINTS – PRIOR TO ASSEMBLY, THOROUGHLY COAT MALE END WITH PIPE JOINT COMPOUND, HERCULES GRIP, NO SUBSTITUTES.

FLANGED JOINTS – COAT METALLIC GASKETS WITH ANTI SEIZE COMPOUND PRIOR TO ASSEMBLY.

TESTING – PRIOR TO PAINTING OR INSTALLATION OF SHRINK SLEEVES, TEST ALL PIPING JOINTS WITH MINIMUM 125 PSIG AIR WITH EACH JOINT SOAKED WITH A FOAMING SOAPY WATER SOLUTION, AND VISUALLY INSPECT EACH JOINT FOR LEAKS. ALL WELDS THAT FAIL INSPECTION SHALL BE CUT OUT, REWELDED AND RETESTED.

BELOW GRADE PIPING – ALL PIPING INSTALLED BELOW GRADE TO BE COATED AS SPECIFIED ABOVE AND PROVIDED WITH CATHODIC PROTECTION. INSTALL HEAT SHRINK SLEEVES AND PIPE WRAP TAPE IN STRICT ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS. CLEAN EXPOSED STEEL AND ADJACENT COATING AND PRE-HEAT PIPE PRIOR TO INSTALLATION. HEAT COVERING SLOWLY AND UNIFORMLY TO ACHIEVE A SMOOTH, TIGHT FIT. OVERLAP A MINIMUM OF 4" ONTO ADJACENT PIPING COATING AND EXTEND COATING A MINIMUM OF 1' ABOVE GRADE. INSTALL SACRIFICIAL ANODES IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS. INSTALL AT SAME DEPTH AS PIPE AND WITHIN 3' TO 5' OF PIPELINE. ATTACH LEAD WIRE TO PIPE BY THERMITE BRAZING, CADWELD OR EQUAL. INSTALL HEAT SHRINK SLEEVE OR PIPE WRAP TAPE OVER LEAD WIRE AND SEAL TIGHT.

INSTALL DIELECTRIC FLANGE SETS BETWEEN ABOVE AND BELOW GRADE SECTIONS OF PIPE. GROUND ALL ABOVE GRADE PIPE SECTIONS.

SUPPORT PIPING AND EQUIPMENT AS SHOWN ON PLANS USING SPECIFIED SUPPORTS AND FASTENERS. IF NOT DETAILED ON PLANS, SUPPORT FROM STRUCTURAL MEMBERS WITH PIPE HANGERS, CLAMPS, OR PIPE STRAPS SPECIFICALLY INTENDED FOR THE APPLICATION. DO NOT SUPPORT PIPING FROM CONNECTIONS TO EQUIPMENT. INDEPENDENTLY SUPPORT PUMPS AND EQUIPMENT.

SUPPORTS AND FASTENERS

STRUT – COLD FORMED MILD STEEL CHANNEL STRUT, HOT DIPPED GALVANIZED FINISH AND SLOTTED BACK UNLESS SPECIFICALLY INDICATED OTHERWISE. STANDARD STRUT – 12 GA, 1-5/8" x 1-5/8", UNISTRUT P-1000T (HG) OR EQUAL. DOUBLE STRUT – 12 GA, 1-5/8" x 3-1/4", UNISTRUT P-1001T (HG) OR EQUAL. SHALLOW STRUT – 14 GA, 1-5/8" x 13/16", UNISTRUT P-4100T (HG) OR EQUAL. WHERE STRUT IS WELDED TO TANKS OR STRUCTURES PROVIDE PLAIN (UN-FINISHED BLACK) SOLID BACK STRUT – 12 GAUGE, 1-5/8" x 1-5/8", UNISTRUT P-1000 (PL) OR EQUAL.

FITTINGS AND ACCESSORIES – PROVIDE CARBON STEEL FITTINGS, BRACKETS, CHANNEL NUTS, AND ACCESSORIES DESIGNED SPECIFICALLY FOR USE WITH SPECIFIED CHANNEL STRUT. GALVANIZED OR ZINC-PLATED FINISH.

PIPE CLAMPS – GALVANIZED CARBON STEEL TWO-PIECE PIPE CLAMP DESIGNED TO SUPPORT PIPE TIGHT TO STRUT. UNISTRUT P-11## OR EQUAL.

PIPE STRAPS – CARBON STEEL TWO-HOLE PIPE STRAP. UNISTRUT P-2558 NO SUBSTITUTES.

FASTENERS – ALL BOLTS, NUTS, AND WASHERS GALVANIZED OR ZINC PLATED CARBON STEEL UNLESS SPECIFICALLY INDICATED AS STAINLESS STEEL. ALL LAGS HOT DIPPED GALVANIZED UNLESS SPECIFICALLY INDICATED AS STAINLESS STEEL. ALL STAINLESS STEEL FASTENERS TYPE 304. DO NOT USE STAINLESS STEEL IN CONTACT WITH GALVANIZED ITEMS.

EPOXY – TWO PART HIGH STRENGTH EPOXY SPECIALLY FORMULATED FOR ANCHORING INTO CONCRETE AND MASONRY, ASTM C881-90, TYPE IV, GRADE 3, CLASS A, B, AND C. EPCON CERAMIC 6 OR EQUAL. INSTALL IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS, ALLOW TO CURE 5 HOURS MINIMUM PRIOR TO TIGHTENING FASTENERS.

TOUCH UP – FINISH ALL CUT ENDS AND DAMAGED SURFACES OF GALVANIZED AND ZINC PLATED SUPPORTS AND FASTENERS WITH SPRAY ON COLD GALVANIZING COMPOUND, ZRC OR EQUAL.

VALVES

FLANGED GATE VALVES – CARBON STEEL BODY, ANSI 150# RF FLANGED ENDS, FLEXIBLE DISC, STEEL TRIM, 150 PSIG MINIMUM WORKING PRESSURE. CRANE CLASS 150 NO. 47 OR EQUAL.

FLANGED SWING CHECK VALVES (2" AND LARGER) – CARBON STEEL BODY, ANSI 150# RF FLANGED ENDS, STEEL DISC AND TRIM, 150 PSIG MINIMUM WORKING PRESSURE. CRANE CLASS 150 NO. 147 OR EQUAL.

FLANGED PISTON CHECK VALVES (SMALLER THAN 2") – CARBON STEEL BODY, ANSI 150# RF FLANGED ENDS, STAINLESS STEEL TRIM AND SEATS, 150 PSIG MINIMUM WORKING PRESSURE. BONNEY FORGE L1-41 OR EQUAL.

FLANGED BALL VALVES – REDUCED PORT CARBON STEEL UNI-BODY, ANSI 150# RF FLANGED ENDS, STAINLESS STEEL BALL AND TRIM, GLASS FILLED TEFLON SEAT, GRAPHITE SEALS, LOCKABLE HANDLE, 150 PSIG MINIMUM WORKING PRESSURE, NACE MR0175 CONFORMANCE, FIRE SAFE PER API 607. PBV C-5410-31-2236-GLNL, NO SUBSTITUTES.

THREADED BALL VALVES – CARBON STEEL BODY, THREADED ENDS, STAINLESS STEEL BALL AND TRIM, PTFE SEAT, GRAPHITE SEALS, LOCKABLE HANDLE, 150 PSIG MINIMUM WORKING PRESSURE, NACE MR0175 CONFORMANCE, FIRE SAFE PER API 607. PBV C-5312-38-2236-TL-NC, NO SUBSTITUTES.

THREADED CHECK VALVES – BRONZE BODY, THREADED ENDS, SWING CHECK STYLE, 150 PSIG MINIMUM WORKING PRESSURE. MILWAUKEE 510-S OR HAMMOND EQUAL, DOMESTIC ONLY.

FLANGED PRESSURE RELIEF VALVES – STEEL BODY, ANSI 150# RAISED FACE FLANGE INLET AND OUTLET, 1/2" SOFT SEAT ORIFICE. CLOSED CAP, SIZE AND PRESSURE SETTING AS INDICATED. HYDROSEAL 1FLARV00 OR EQUAL.

THREADED PRESSURE RELIEF VALVES – STEEL BODY, MPT INLET X FPT OUTLET, 1/2" SOFT SEAT ORIFICE, CLOSED CAP, SIZE AND PRESSURE SETTING AS INDICATED. HYDROSEAL 4FRV00 OR EQUAL.

ANTI-SIPHON VALVES – 2" FPT INLET AND OUTLET, ANGLE TYPE DUCTILE IRON BODY, BRASS CAP AND SEAT, VITON DISC, SPRING LOADED, 8 PSI OPENING PRESSURE. MORRISON FIGURE 910ER-7215 AP SPECIAL WITH 25 PSI EXPANSION RELIEF.

SHEAR/FUSIBLE LINK VALVES – TOP PORTION OF VALVE TO SHEAR OFF ON IMPACT. VALVE TO AUTOMATICALLY CLOSE ON FAILURE OF FUSIBLE LINK. CAST IRON BODY, 1-1/2" FPT INLET, 1-1/2" MPT OUTLET, VITON DISC AND O- RINGS. MORRISON FIGURE 636M OR EQUAL. PROVIDE WITH U-BOLT FOR MOUNTING AND ALLEN WRENCH FOR INSTALLATION AND REMOVAL.

FUSIBLE LINK VALVES – BRASS BODY, FPT ENDS, 165F FUSIBLE HEAD. FIROMATIC 200F FOR 1/2", FIROMATIC 400F FOR 1", OR EQUAL.

SOLENOID VALVES – 1/2" THREADED ENDS, JUNCTION BOX WITH SPADE CONNECTIONS, 120VAC, BRASS BODY, SS CORE, MOLDED EPOXY COIL ENCLOSURE, INTERNAL PILOT OPERATED, 150 PSI DIFFERENTIAL OPENING PRESSURE, LIQUID TIGHT AND FULL MODULATION AT 0 PSI DIFFERENTIAL, NORMALLY CLOSED – ASCO CAT. NO. JSF8210G94, NO SUBSTITUTES, NORMALLY OPEN – ASCO CAT. NO. JSF8210G34, NO SUBSTITUTES.

ELECTRIC ACTUATOR VALVES – 1" LOW TEMP BALL VALVE, 150# RF FLANGED ENDS, 151 IN-LB OPERATING TORQUE @ -50 DEG F. 150 PSIG MINIMUM WORKING PRESSURE. NUTRON MODEL T3-R10RD1LT, NO SUBSTITUTES. ELECTRIC ACTUATOR – NEMA 4 ENCLOSURE WITHOUT MANUAL OVERRIDE SHAFT EXTENSION. PTC SELF REGULATING HEATER, EXXON BEACON 325 SEVERE COLD LUBRICANT, 115 VAC, 350 IN-LBS TORQUE, 10 SECOND STROKE TIME, RATED TO -50 DEG F. RCS MODEL SXR-0897, NO SUBSTITUTES. ACTUATOR COUPLING BRACKET, SHAFT, AND FASTENERS – TYPE 304 STAINLESS STEEL. CONFIGURE COUPLING TO ALLOW WRENCH ACCESS FOR MANUAL OPERATION OF VALVE WITHOUT REMOVING ACTUATOR.

PUMPS

SUBMERSIBLE PUMPS – SUBMERSIBLE MULTI-STAGE PUMP FOR PETROLEUM SERVICE, UL LISTED FOR GASOLINE (CLASS I GROUP D LOCATIONS) AND DIESEL FUELS, 4"x7" RISER NIPPLE, 2" NPT DISCHARGE OUTLET. CAST IRON MANIFOLD AND DISCHARGE HEAD WITH BRASS CHECK VALVE SEAT, STAINLESS STEEL PUMP MOTOR OUTER SHELL, STATOR, AND ROTOR SHAFT, THERMOPLASTIC IMPELLER AND DIFFUSER, CARBON MOTOR BEARINGS. PERMANENT SPLIT-PHASE CAPACITOR START EXPLOSION PROOF MOTOR, BAYONET-TYPE EXPLOSION PROOF ELECTRIC DISCONNECT, BUILT-IN THERMAL OVERCURRENT PROTECTION, 3/4HP, 230V, 1PH, 60HZ. 10 GPM @ 94' TDH. RED JACKET P75-S1 OR FE PETRO STP 75. FURNISH WITH STAINLESS STEEL INTAKE SCREEN, TRAPPER OR EQUAL.

CENTRIFUGAL PUMPS – CAST IRON SELF-PRIMING CENTRIFUGAL PUMP FOR PETROLEUM SERVICE. 1-1/4" FPT INLET AND OUTLET, BRONZE IMPELLER, OPTIONAL BUNA-N SELF-LUBRICATED MECHANICAL SEAL RATED TO -40F, 25 PSIG MAXIMUM WORKING PRESSURE. CLOSE COUPLED TO 3450 RPM TOTALLY ENCLOSED NON-VENTILATED EXPLOSION PROOF CAPACITOR START MOTOR, BUILT-IN THERMAL OVERCURRENT PROTECTION, 1/2HP, 230V, 1 PH, 60HZ. 40 GPM @ 21' TDH. GORMAN-RUPP 81-1/4A3X.50 WITH OPTIONAL PUMP SEAL #25271-824 NO SUBSTITUTES.

DAY TANK PUMPS – ROTARY GEAR PUMP, 3/8" FPT INLET AND OUTLET, BRONZE CONSTRUCTION WITH STAINLESS STEEL SHAFTS, SPRING-LOADED BUNA-N LIP SEAL, SELF-LUBRICATING CARBON BEARINGS, DIRECT FLEX COUPLED TO 1725 RPM OPEN DRIP-PROOF THERMALLY PROTECTED, AUTO RESET MOTOR, 1/3 HP, 115V, 1PH, 60 HZ. 1.98 GPM @ 20 PSIG TDH. OBERDORFER N991-32M F01 NO SUBSTITUTES.

HAND PRIMING PUMP – PISTON HAND PUMP, 1" FPT SUCTION, 3/4" FPT DISCHARGE, STAINLESS STEEL INNER LINER, ANTI-SIPHONING DEVICE, 12' MINIMUM SUCTION LIFT. FILL-RITE MODEL FR152 OR EQUAL.

DISPENSERS, METERS, AND ACCESSORIES

MECHANICAL DISPENSER FOR USE WITH REMOTE SUBMERSIBLE PUMP, U.L. LISTED FOR GASOLINE AND DIESEL FUELS. MECHANICAL REGISTER WITH GALLONS AND TENTHS UP TO 999.9 GALLONS, NON-RESET TOTALIZER, 110VAC, FLUORESCENT LIGHT, 10:1 PULSERS, AND INTERNAL 30 MICRON SPIN-ON FILTER ELEMENTS. ONE-HOSE, ONE-PRODUCT – GASBOY 9152AXCXFL, NO SUBSTITUTES. PROVIDE WITH 30 MICRON SPIN-ON FILTER ELEMENTS, 3/4" X 15' L HOSES AND DISPENSING NOZZLES AS SPECIFIED BELOW. PROVIDE 10 SPARE 30 MICRON SPIN-ON FILTER ELEMENTS, AND 1 EACH COMPLETE REPLACEMENT SET OF EVERY LIGHT BULB/LAMP IN DISPENSER. PROVIDE COMPLETE WIRING DIAGRAMS AND INSTALLATION INSTRUCTIONS.

KEY CONTROL SYSTEM – MULTIPLE POSITION KEY LOCK SYSTEM TO CONTROL ABOVE SPECIFIED DISPENSER. NON-RESET MECHANICAL COUNTERS CAPABLE OF REGISTERING UP TO 99,999.9 GALLONS, LOST KEY LOCK OUT, TWO KEY LOCK OUT, TURN-ON DELAY, MISSING PULSE DETECTOR, 110VAC. OPTIONAL VISIBLE COUNTERS, HEATER, WEATHERSHIELD, AND BUZZER TO INDICATE KEY LEFT IN UNIT AFTER FUELING. PETRO VEND KEEGARD K-095 OR EQUAL. SEE DRAWINGS FOR NUMBER OF POSITIONS. DISPENSER AND KEY CONTROL SYSTEM SHALL BE FULLY COMPATIBLE. PROVIDE COMPLETE WIRING DIAGRAMS AND INSTALLATION INSTRUCTIONS TO THE ENGINEER FOR APPROVAL.

3/4" HOSES – ARCTIC-GRADE FUEL-RATED HOSE WITH STATIC WIRE AND BRASS MALE SCOVILLE FITTINGS EACH END, GOODYEAR ARCTIC SOFTWALL PLUS OR EQUAL. LENGTH AS INDICATED. PROVIDE MULTI-PLANE SWIVELS AT EACH END, HUSKY 0350 OR EQUAL. PROVIDE DOUBLE VALVE SAFETY BREAK, 250# MAXIMUM SEPARATION PULL FORCE, HUSKY 3360 WITH 2274 BREAKAWAY HOSE OR EQUAL.

DISPENSING NOZZLES – AUTOMATIC SHUTOFF NOZZLES FOR PRE-PAY, SELF-SERVICE DISPENSING WITH HOLD-OPEN RACK AND BLOCKER LEVER, AND AUTOMATIC SHUTOFF ON LOSS OF PRESSURE, OPW 11B OR EQUAL. PROVIDE WITH RED HANDLE AND 13/16" O.D. SPOUT FOR GASOLINE.

OVERHEAD SPRING HOSE RETRACTOR – GALVANIZED STEEL REEL AND BASE, EPOXY COATED METAL COVER, SELF LUBRICATING BRONZE BUSHINGS, RATED FOR RETRACTION OF UP TO 20' OF 3/4" FUEL HOSE, PROVIDE WITH GALVANIZED STEEL BRACKET FOR MOUNTING TO OVERHEAD HORIZONTAL STRUT. RED JACKET MODEL 884-034-5 WITH #14 ANGLE BRACKET OR EQUAL.

1-1/4" HOSES – ARCTIC-GRADE FUEL-RATED HOSE WITH BRASS MALE SCOVILLE FITTINGS EACH END, GOODYEAR ARCTIC ORTAC OR EQUAL, LENGTH AS INDICATED. PROVIDE STRAIGHT SWIVELS, OPW 25 OR EQUAL, AND 1-1/2" BY 1-1/4" BRASS BUSHINGS ON EACH END. PROVIDE 1-1/2" DOUBLE VALVE SAFETY BREAK, 250# MAXIMUM SEPARATION PULL FORCE, OPW 66SP OR EQUAL WITH 1' LONG SECTION OF 1-1/2" ARCTIC ORTAC HOSE WITH BRASS MALE SCOVILLE FITTINGS EACH END.

DISPENSERS, METERS, AND ACCESSORIES (CONTINUED)

BULK TRANSFER NOZZLES – AUTOMATIC SHUTOFF NOZZLES WITH HOLD-OPEN RACK AND BLOCKER LEVER. FOR 1-1/2" SERVICE USE OPW MODEL 1290 OR EQUAL. COLOR CODE HANDLE GREEN FOR #1 DIESEL FUEL.

STATIC GROUNDING REEL – ENAMEL COATED STEEL FRAME AND REEL WITH PERMANENTLY SEALED SPRING RETURN. PROVIDE WITH 50' OF 1/8" GALVANIZED CARBON STEEL CABLE, MINIMUM 100 AMPERE GROUNDING CLIP, AND STOP BALL. HANNAY GR75 OR EQUAL.

CUSTODY TRANSFER METERS – SIZE AND DIRECTION OF FLOW AS INDICATED ON DRAWINGS. COMPLETE ASSEMBLY WITH METER, COUNTER, PRINTER, AND 1-1/2" SLIP-ON WELD COMPANION FLANGES. PROVIDE WITH OPTIONAL BUNA-N PACKING GLAND. MUST MEET N.I.S.T. CALIBRATION STANDARDS WITH METER CALIBRATION ADJUSTMENT DEVICE EXTERNALLY ACCESSIBLE. 150 PSIG WORKING PRESSURE AND 60 GPM FLOW CAPACITY. LIQUID CONTROLS MODEL M5E OR EQUAL. PROVIDE WITH SPARE BUNA-N COMPANION FLANGE GASKET SET.

DAY TANK METER – BRASS BODY AND WORKING CHAMBER, ANODIZED ALUMINUM PISTON, 300 PSIG MAXIMUM OPERATING PRESSURE, 3/4" MPT INLET AND OUTLET, ACCURATE TO +/-1% AT 8 GPH, MAXIMUM CONTINUOUS FLOW OF 265 GPH, O-RINGS AND SEALS COMPATIBLE WITH #1 DIESEL FUEL. ABB 20 OR EQUAL.

TANK AND PIPING SPECIALTIES

MANHOLES – 5/16" STEEL LID (SINGLE PUNCH), 1/4" MILD STEEL RING WITH 7" RISER HEIGHT. PROVIDE COMPLETE SET OF BOLTS AND BUNA-N GASKET FOR LID. 24" MANHOLE NOMINAL SIZE. CLAY & BAILEY MR820-D600 OR EQUAL.

PRESSURE/VACUUM WHISTLE VENTS – ALUMINUM BODY AND HOOD, STAINLESS STEEL SCREENS AND FLOAT, BRASS INTERNALS, VITON SEALS. 2" FPT CONNECTION, 8 OZ/SQUARE INCH PRESSURE SETTING, 1 OZ/SQUARE INCH VACUUM SETTING. HIGH INTENSITY WHISTLE ALARM ON RISE OF FLOAT AT ADJUSTABLE LEVEL. MORRISON FIGURE 922 OR EQUAL.

EMERGENCY VENTS – ALUMINUM BODY, CAST IRON COVER, 16 OZ/SQUARE INCH PRESSURE SETTING, FLANGED CONNECTION. 8" SIZE – 465,000 CFH RELIEF CAPACITY AT 2.5 PSIG, 10" SIZE – 576,000 CFH RELIEF CAPACITY AT 2.5 PSIG. MORRISON FIGURE 244-F OR EQUAL.

VENT CAPS – ALUMINUM BODY, STAINLESS STEEL SCREEN, 2" FPT CONNECTION. MORRISON FIGURE 155 OR EQUAL.

GAUGE HATCH – BRASS CAP AND CHAIN, BUNA-N GASKET, 2" FPT CONNECTION. MORRISON FIGURE 307 OR EQUAL.

CLOCK-TYPE LIQUID LEVEL GAUGE – ALUMINUM BODY, 2" MPT CONNECTION, STAINLESS STEEL FLOAT SIZED TO PASS THROUGH 2" BUNG OPENING, CLOCK-STYLE GAUGE WITH READOUT IN FEET AND INCHES UP TO 12 FEET, ACCURATE WITHIN 1/4" OVER FULL SCALE. MORRISON FIGURE 818 OR EQUAL.

DAY TANK GAUGE – MAGNETIC OPERATED SPIRAL GAUGE FOR #1 DIESEL FUEL, DIE-CAST ZINC HEAD, 1-1/2" MPT CONNECTION, ZINC-PLATED STEEL GUIDE ROD, BRASS CENTER SHAFT, EPOXY COATED CORK FLOAT, HERMETICALLY SEALED SIDE-VIEW DIAL, 25 PSIG MAXIMUM OPERATING PRESSURE, GUIDE ROD (OPERATING) LENGTH AS INDICATED ON DRAWINGS. ROCHESTER MODEL 8680 WITH SIDE-VIEW DIAL #5025S00570.

FILL LIMITERS – 2" FPT FLOAT-TYPE MECHANICAL SHUT-OFF VALVE. ALUMINUM BODY, CLOSED CELL BUNA-N FLOAT, BRASS PLUNGER, STAINLESS STEEL TRIM, 100 PSIG SHUT-OFF PRESSURE. MORRISON FIGURE 9095-A OR EQUAL. PROVIDE WITH 2" ALUMINUM DROP TUBE CUT TO LENGTH AT 45 DEGREES AS REQUIRED TO TERMINATE WITHIN 6" ABOVE TANK BOTTOM.

QUICK-CONNECT COUPLINGS – ALUMINUM BODY CAM AND GROOVE FITTING WITH DUST CAP. MALE FITTING WITH ANSI 150# FLANGED, MPT OR FPT CONNECTION, AS SPECIFIED, 150 PSIG MINIMUM WORKING PRESSURE. PT COUPLING OR EQUAL.

FLEXIBLE CONNECTORS – TYPE 304 STAINLESS STEEL CORRUGATED HOSE, TYPE 304 STAINLESS STEEL WIRE DOUBLE BRAIDED OUTER SHIELD. SCH 80 MPT OR 150# ANSI FLANGED ENDS (FIXED OR FLOATING AS INDICATED) 150 PSIG MINIMUM WORKING PRESSURE, DIAMETER AND LIVE (HOSE) OR OVERALL LENGTH AS INDICATED. METRAFLEX MM OR EQUAL. FURNISH WITH CERTIFICATION OF 150 PSIG PRESSURE TEST.

STRAINERS – CARBON STEEL BODY, ANSI 150# RAISED FACE FLANGED ENDS, 20 MESH STAINLESS STEEL SCREEN, 150 PSIG WORKING PRESSURE. MUELLER #761 OR EQUAL.

PIPELINE FILTER – SINGLE ELEMENT FILTER, EPOXY COATED CARBON STEEL HOUSING, BOLT-ON COVER WITH BUNA-N GASKET, 1/2" FPT DRAIN PORTS, 2" FPT INLET/OUTLET, 100 PSIG MAXIMUM WORKING PRESSURE, 60 GPM FLOW CAPACITY. CIM-TEK GENERAL I FILTER (#40149), NO SUBSTITUTES. PROVIDE SIX 30 MICRON HYDROSORB II FILTER CARTRIDGES (#30037) AND TWO SPARE BUNA-N COVER GASKETS (#90137) FOR EACH FILTER.

DAYTANK FILTERS – ZINC TOP, 1" FPT CONNECTIONS, IMPACT RESISTANT "SEE-THRU" BOWL, 150 PSIG WORKING PRESSURE, GOLDEN ROD MODEL NO. 495 – NO SUBSTITUTES. USE STANDARD 10 MICRON FILTER ELEMENT, NO. 470-5. PROVIDE WITH FUEL FILTER WRENCH NO. 491.

STEVEN A. STASSEL
ME 8801
6/4/02

REDUCED PLOT - HALF SCALE

ISSUED FOR CONSTRUCTION JUNE 4, 2002

State of Alaska
Department of Community and Economic Development
AIDEA/AEA
Rural Energy Group
813 West Northern Lights Blvd.
Anchorage, Alaska 99503

ALASKA ENERGY AUTHORITY

PROJECT: NIKOLAI BULK FUEL STORAGE CONSOLIDATION & UPGRADE

TITLE: SPECIFICATIONS

ALASKA ENERGY AND ENGINEERING, INC
P.O. BOX 111405 ANCHORAGE, ALASKA 99511-1405 PHONE (907) 349-0100

DRAWN BY: TDK	SCALE: AS NOTED	FILE NAME: NIKOBFM12	SHEET: M12 OF 12
DESIGNED BY: SJS	DATE: 5/31/02	PROJECT NUMBER: 99-06-9691	

APPENDIX F: PHOTOGRAPHS

TANKS

FIGURE 1: THREE REFURBISHED DIESEL TANKS FROM THE ORIGINAL TANK FARM (C5, C6 AND S1)

FIGURE 2: NEW DIESEL TANK (C4)

FIGURE 3: NEW DIESEL TANK LEFT (C3), NEW GASOLINE DISPENSING TANK RIGHT (C2)

FIGURE 4: NEW GASOLINE DISPENSING TANK RIGHT (C1), CONTINGENCY TANK IN BACKGROUND.

FIGURE 5: REFURBISHED TANKS SHOWING COATINGS FAILURES DUE TO UV DEGRADATION

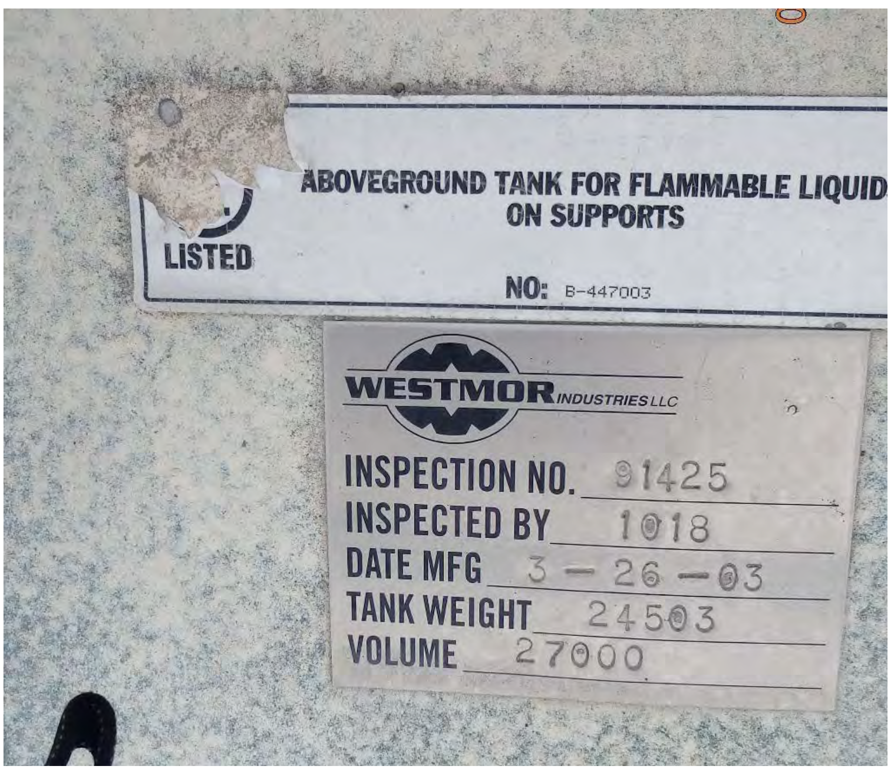


FIGURE 6: UL LISTING INFORMATION FOR TANK C1, GASOLINE STORAGE TANK

FIGURE 7: UL LISTING INFORMATION FOR TANK C2, GASOLINE DISPENSER TANK

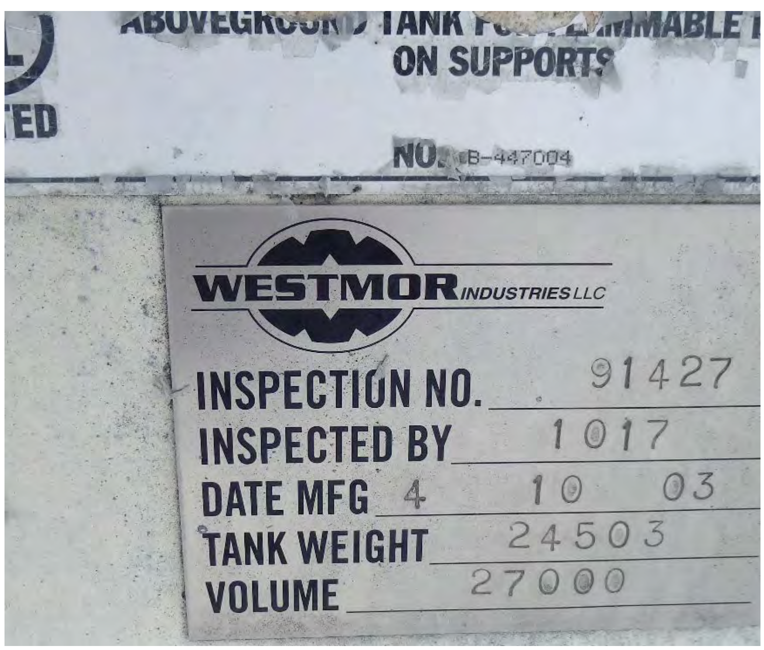


FIGURE 8: UL LISTING INFORMATION FOR TANK C4, DIESEL STORAGE TANK

FIGURE 9: TYPICAL TANK SUPPORTS AND CONCRETE PIER FOUNDATIONS.

PIPING

FIGURE 10: 3-INCH BARGE HEADER RISERS IN TANK FARM. GASOLINE ON LEFT, DIESEL ON RIGHT. GROUNDING ROD CONNECTED TO TANK FARM SIDE OF ISOLATION FLANGES.

FIGURE 11: 2-INCH SERVICE LINE RISERS IN TANK FARM. GASOLINE ON LEFT, DIESEL (X2) ON RIGHT. GROUNDING ROD CONNECTED TO TANK FARM SIDE OF ISOLATION FLANGES.

FIGURE 12: 2-INCH SERVICE LINE RISERS IN TANK FARM. GASOLINE ON LEFT, DIESEL (X2) ON RIGHT. 18-INCH DEEP EXCAVATION TO ASSESS COATING CONDITION.

FIGURE 13: GASOLINE DISPENSER ADJACENT TO TANK FARM.

FIGURE 14: GASOLINE DISPENSER RISER.

FIGURE 15: GASOLINE DISPENSER RISER 18-INCH DEEP EXCAVATION. COATING IN EXCELLENT CONDITION.

FIGURE 16: TYPICAL CONDITION FOR WELD ZONES, FITTINGS AND FLANGES ON THE DIESEL PIPING.

FIGURE 17: TYPICAL CONDITION FOR WELD ZONES, FITTINGS AND FLANGES ON THE GASOLINE PIPING.

FIGURE 18: HEADER PIPING AT TRUCK RACK. NOTE FUEL HOSE FOR OFFLOADING AIRCRAFT IS LEFT ATTACHED AND EXPOSED BETWEEN FUEL DELIVERIES. NOTE GEOGRID FORMWORK IS EXPOSED.

FIGURE 19: GALVANIZED UNI-STRUT AND PIPE CLAMP HANGERS/SUPPORTS. POSSIBILITY FOR DISSIMILAR METALS CORROSION IF PIPE COATINGS FAIL.

FIGURE 20: TANK FARM CONTROL PANEL.

FIGURE 21: CATCHMENT ADJACENT TO AIRCRAFT HEADER AND DIESEL DISPENSER. FUEL SHEEN ON WATER.

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APPENDIX D

THERMOSYPHON INSPECTION REPORT

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ARCTIC FOUNDATIONS, INC.

September 04, 2018

Ahtna Environmental, Inc.
110 West 38th Avenue, Suite 200B
Anchorage, AK 99503

Attn: Heather Williams, PMP
Senior Project Manager

Re: Thermosyphon Inspections
Powerhouses and Bulk Fuel Tank Farms
Kwigillingok and Chefornak, Alaska

Between August 14 and August 16, 2018, Jason Zottola of Arctic Foundations, Inc. visited various powerhouse and bulk fuel tank farm sites in Kwigillingok and Chefornak, Alaska as part of an effort to assess the existing conditions of the facilities. Arctic Foundations, Inc., Ahtna Environmental, Inc. and Taku Engineering worked together on the project, funded by the Denali Commission. Jason's portion of the work included inspecting the thermosyphons installed for subgrade cooling at each site. Jason measured the internal pressure of the thermosyphons using a Wika 0-600 psig range test gauge.

Kwigillingok – Marina Bulk Fuel Tank Farm

There are 12 thermosyphons located at the bulk fuel tank farm and two more located at the generator building located just north of the tank farm. These 14 thermosyphons were installed in the late 1990s. Each unit is constructed of 3.5" OD steel pipe with a 70SF condenser and a 42-ft sloping evaporator. Internal pressures of the thermosyphons ranged from 481 psig to 485 psig. From the pressure data, the internal temperatures of the thermosyphon evaporators were computed and ranged from 30.7°F to 31.3°F. The pressure data verify that all 14 units were operational at the time of the inspection. Jason observed corrosion on the full length of the finned condenser on all 14 thermosyphons (Figure 1). Removal of the corrosion and a repair of the coating would make for a more efficient thermosyphon. This could be done by cleaning the corrosion with a high-pressure wash. After allowing the steel to dry, it can be covered with a coat of epoxy. This can be done in coordination with other maintenance painting.

Jason observed cavities in the soil around the thermosyphon riser pipe (Figure 2). These cavities are assumed to be caused by slumping of the pad in these locations (Figures 3 and 4). No water was visible inside the cavities, however it is assumed that water does penetrate the cavities, ponds, and then seeps through the pad. It is recommended that a maintenance program be established to fill these cavities with fine-grained soil and keep them filled.

Kwigillingok – Powerhouse and Tank Farm

There are six thermosyphons located at the powerhouse, three at a tank adjacent to the powerhouse and eight located at a small tank farm just north of the powerhouse. These 17 thermosyphons were installed in 2003. Each unit is constructed of 3.5" OD steel pipe with a 70SF condenser and a 26-ft evaporator. Each unit is embedded approximately 20 feet. Typically, thermosyphons are installed into pre-drilled holes, however, these units were designed to be driven into the ground, and were installed in this manner.

Internal pressures of the thermosyphons ranged from 461 psig to 479 psig. From the pressure data, the internal temperatures of the thermosyphon evaporators were computed and ranged from 27.9°F to 30.4°F. The pressure data verify that 13 of the units were operational at the time of the inspection.

Unit #7 had a sheared valve (Figure 5). The primary part of the valve is sheared off and the threaded portion of the valve is still installed. Unit #8 had zero pressure. Unit #11 had low pressure. It's likely that impact during installation may have caused a slight leak on unit #11. All three of these units are not operational.

Note that hearsay from the past tells us that at least one of these Thermoprobes was unable to be driven to depth and that a steam probe was used to thaw the soil to make driving easier. This steam probe overheated at least one of the Thermoprobes and the safety rupture disk performed its function. AFI was never formally notified to repair the discharged Thermoprobe.

Unit #1, located at the SE corner of the powerhouse was not inspected. Power lines wrapped around the condenser made it unsafe to inspect (Figure 6). Also note, Unit #5, located on the west side of the powerhouse, is leaning (Figure 7). This unit was originally installed vertically (Figure 8). Sometime after the completion of the original construction someone added a hood on the outside of the module, which required bending of the thermosyphon. The thermosyphon has maintained its integrity as evidenced by the adequate internal pressure.

It is recommended that unit #s 7, 8, and 11 be repaired by replacing the valves and recharging the thermosyphons. At this time, the valve and the above-ground welds can be bubble tested to ensure that no above-ground pressure leaks exist. An internal pressure measurement of unit #1 can be taken at this time, if safe conditions exist.

Chefornak – Old Powerhouse

There are four thermopiles located below the old powerhouse, installed in the late 1980s. A new powerhouse was built just east of this facility, in the mid-2000s. The old powerhouse has since been converted to a temporary washeteria, to be used until the new washeteria is completed, just north of the new powerhouse. Each of the four piles is constructed with 6" NPS steel pipe and fitted with 10 plate fins on the above ground portion of the pile. Each pile is embedded 14 feet.

Internal pressures of the thermopiles ranged from 479 psig to 482 psig. From the pressure data, the internal temperatures of the thermopile evaporators were computed and ranged from 30.4°F to 30.9°F. The pressure data verify that three of the units were fully operational at the time of the inspection. Unit #2 had an internal pressure of 363 psig. It is assumed that this low pressure is not indicative of the temperature, but rather it is low due to partial discharge. All four units had extensive corrosion throughout the length of the above-ground portion of the thermopile (Figure 9). To enhance the efficiency of the thermopiles, the corrosion should be removed and the steel recoated with epoxy. Unit #2 could be repaired by replacing the valve and recharging the thermopile. This will ensure maximum heat transfer efficiency.

Chefornak – New Powerhouse and Tank

There are 18 thermopiles installed below the new powerhouse and six installed below the 27,000-gallon fuel tank, located just north of the main powerhouse facility. These thermopiles were installed in the mid-2000s. Each is constructed of 12” NPS steel pipe and is embedded approximately 20 feet.

Internal pressures of the thermopiles ranged from 469 psig to 478 psig. From the pressure data, the internal temperatures of the thermopile evaporators were computed and ranged from 29.1°F to 30.3°F. The pressure data verify that all 24 thermopiles were fully operational at the time of the inspection.

Water-filled depressions at the ground surface were observed around the circumference of nearly all the thermopiles (Figure 10). Thermopile unit #s 21 and 22 were located in an area of extensive ponded water, nearly a foot deep (Figure 11). It is recommended to establish positive drainage away from all the piles to prevent ponded water.

Chefornak – Bulk Fuel Tank Farm

There are nine thermosyphons located around the two new tanks at the northwest corner of the tank farm. The units were manufactured in 2010 and are embedded approximately 25 feet. They are constructed of 3.5” OD steel pipe and are fitted with 70SF condensers.

Internal pressures of the thermosyphons ranged from 452 psig to 466 psig. From the pressure data, the internal temperatures of the thermosyphon evaporators were computed and ranged from 26.7°F to 28.6°F. The pressure data verify that all nine units were fully operational at the time of the inspection.

The data verify that there were operational thermosyphons at each site, however, at the time of the inspections the ambient air temperature was approximately 50-55°F, therefore the thermosyphons were not operating. The thermosyphons will not operate when the ambient air temperature is greater than that of the soil. When the winter season returns and the ambient air temperatures once again dip below the soil temperatures, then the thermosyphons will operate and begin passively removing heat from the soil and releasing it to the air.

Field data for this work are attached. Field photos and thermosyphon location maps are also included. Should you require additional information, please contact us at your convenience.

Very truly yours,

Jason T. Zottola
E.I.T.

Edward Yarmak, P.E.
President

Attachment: Field Inspection Data
Thermosyphon Location Maps
Photos

Marina Bulk Fuel Tank Farm - Thermosyphons
Kwigillingok, Alaska
08/14/2018 Inspection

Unit #	Pressure (psig)	Computed Internal Temp (°F)	Operational?	Comments/Notes
1	483	31.0	Yes	
2	481	30.7	Yes	
3	482	30.9	Yes	
4	481	30.7	Yes	
5	481	30.7	Yes	
6	483	31.0	Yes	
7	484	31.1	Yes	
8	483	31.0	Yes	
9	482	30.9	Yes	
10	482	30.9	Yes	
11	482	30.9	Yes	
12	483	31.0	Yes	
13	485	31.3	Yes	
14	484	31.1	Yes	

Powerhouse - Thermosyphons
Kwigillingok, Alaska
08/15/2018 Inspection

Unit #	Pressure (psig)	Computed Internal Temp (°F)	Operational?	Comments/Notes
1	--	n/a	Unknown	Power lines wrapped around unit; unsafe for pressure measurement
2	468	28.9	Yes	
3	471	29.3	Yes	
4	470	29.2	Yes	
5	469	29.1	Yes	
6	468	28.9	Yes	
7	--	n/a	No	Valve missing
8	0	n/a	No	No pressure, unit not operational
9	476	30.0	Yes	
10	479	30.4	Yes	
11	182	n/a	No	Low pressure, unit not operational
12	478	30.3	Yes	
13	475	29.9	Yes	Water-filled depression around thermosyphon at the ground surface
14	476	30.0	Yes	
15	461	27.9	Yes	
16	478	30.3	Yes	
17	479	30.4	Yes	

Old Powerhouse - Thermosyphons
Chefornak, Alaska
08/16/2018 Inspection

Unit #	Pressure (psig)	Computed Internal Temp (°F)	Operational?	Comments/Notes
1	482	30.9	Yes	
2	363	n/a	Marginally	Low pressure; unit only marginally operational
3	479	30.4	Yes	
4	481	30.7	Yes	

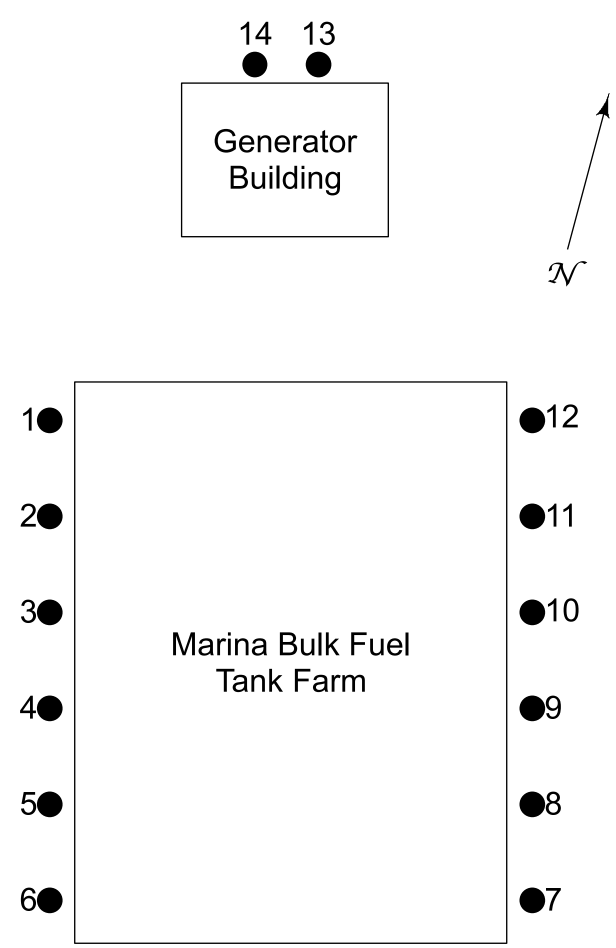
New Powerhouse - Thermosyphons
Chefornak, Alaska
08/16/2018 Inspection

Unit #	Pressure (psig)	Computed Internal Temp (°F)	Operational?	Comments/Notes
1	478	30.3	Yes	Bent valve guard
2	474	29.8	Yes	
3	475	29.9	Yes	
4	476	30.0	Yes	Bent valve guard
5	477	30.2	Yes	
6	476	30.0	Yes	
7	474	29.8	Yes	
8	470	29.2	Yes	
9	469	29.1	Yes	
10	469	29.1	Yes	
11	470	29.2	Yes	
12	472	29.5	Yes	Bent valve guard
13	474	29.8	Yes	
14	471	29.3	Yes	
15	469	29.1	Yes	Bent valve guard
16	470	29.2	Yes	
17	470	29.2	Yes	
18	476	30.0	Yes	
19	476	30.0	Yes	
20	473	29.6	Yes	
21	470	29.2	Yes	Extensive ponded water around thermopile
22	473	29.6	Yes	Extensive ponded water around thermopile
23	473	29.6	Yes	
24	477	30.2	Yes	Bent valve guard

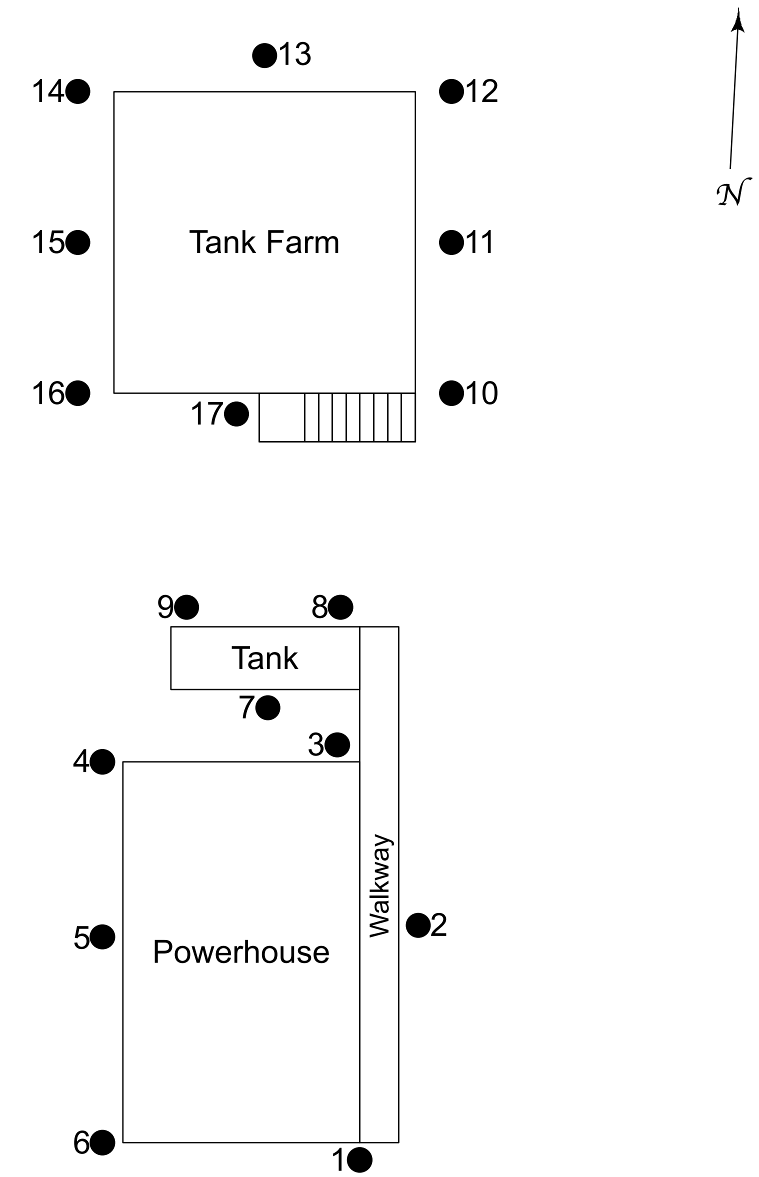
Bulk Fuel Tank Farm - Thermosyphons
Chefornak, Alaska
08/16/2018 Inspection

Unit #	Pressure (psig)	Computed Internal Temp (°F)	Operational?	Comments/Notes
1	463	28.2	Yes	
2	458	27.5	Yes	
3	466	28.6	Yes	
4	460	27.8	Yes	
5	452	26.7	Yes	
6	459	27.7	Yes	
7	464	28.4	Yes	
8	463	28.2	Yes	
9	466	28.6	Yes	

Thermosyphon Location Map - Kwigillingok

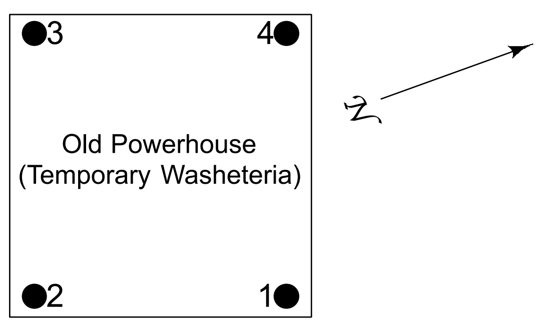


Kwigillingok Marina Bulk Fuel Tank Farm
No Scale

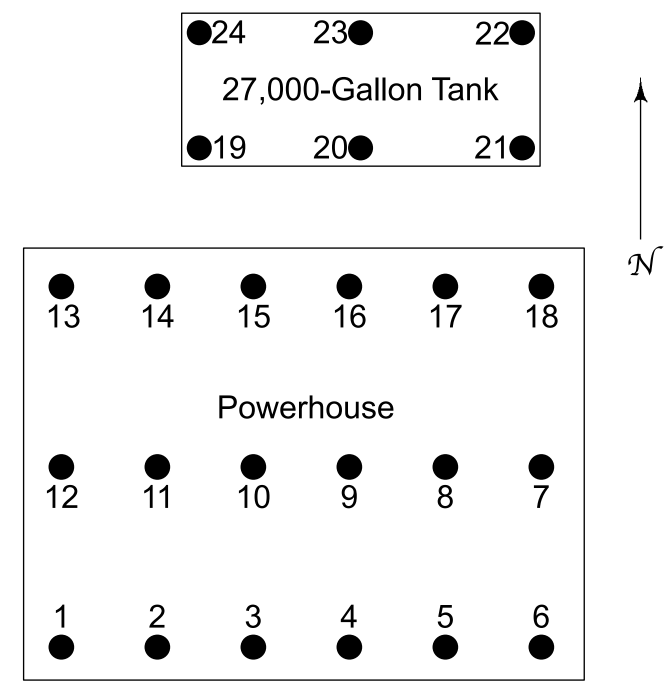


Kwigillingok Powerhouse and Tank Farm
No Scale

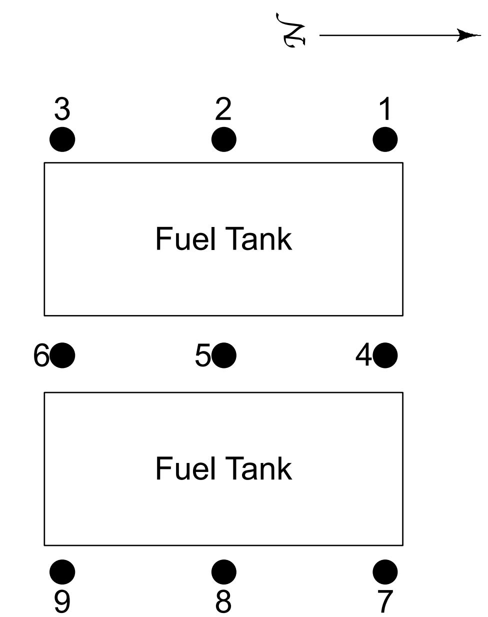
Thermosyphon Location Map - Chefornak



Chefornak Old Powerhouse
No Scale



Chefornak New Powerhouse and Tank
No Scale



Chefornak Bulk Fuel Tank Farm
No Scale

Kwigillingok Marina Bulk Fuel Tank Farm

Figure 1: Finned Condenser Corrosion

Figure 2: Ground Surface Cavities

Figure 3: Pad slumping

Kwigillingok Marina Bulk Fuel Tank Farm

Figure 4: Southwest corner of bulk fuel tank farm (typical of all four corners)

Kwigillingok Power House and Tank Farm

Figure 5: Missing valve on Unit #7

Figure 6: Cables wrapped around Unit #1

Figure 7: Unit #5 leaning

Kwigillingok Power House and Tank Farm

Figure 8: Thermosyphon #5 not leaning.

Chefornak Power Houses


Figure 9: Corrosion, Old Power House


Figure 10: Water-filled depressions


Figure 11: Extensive ponded water around piles under fuel tank at New Power House

Chefornak Bulk Fuel Farm

Figure 12: Westernmost thermosyphons

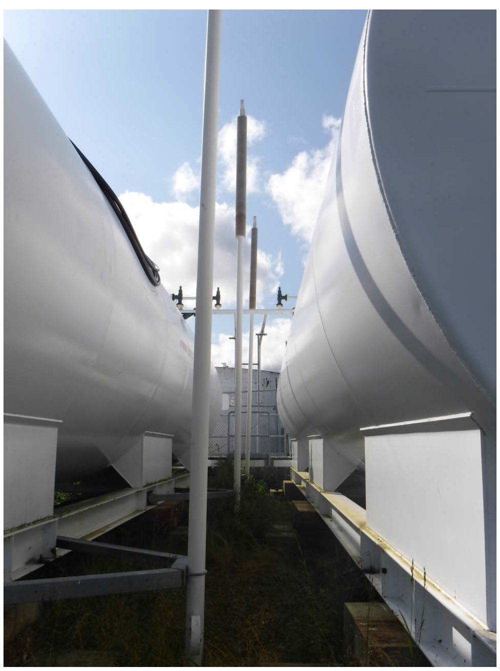


Figure 13: Thermosyphons between the tanks

Figure 14: Easternmost thermosyphons

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APPENDIX E

FUEL TRANSFER PRACTICE INTERVIEW FORMS

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Ahtna Environmental, Inc.

COMMUNICATION RECORD

JOB NUMBER: 05170.003

PHONE IN ☒ PHONE OUT ☒ MEETING ☐ OTHER ☐ PROSPECTIVE JOB ☐ CURRENT JOB MARKETING ☐ PAST JOB ☐ ADMIN ☐

ROUTE TO:

DATE: 11/27/18

FILE NAME (OWNER):

TIME: 1107 ☒ AM ☐ PM

PERSON: CHIEF HOWARD

FIRM: USCG

PHONE NUMBER: 907-428-4137

RECORDED BY: Baley Lenhart

SUBJECT: Bulk Fuel Transfer Practices in Rural Alaska

REMARKS:

1. • TRAINING, RELY ON BARGE OPERATOR (NOT LEGALLY OK)
2. • ANNUAL TESTING ON PIPES AND VALVES
3. • RECOMMEND THIRD PARTY INSPECTIONS

- TRAINING ON-SITE : - INCORPORATE HAZWOPER
  - AT LEAST 2-3 DAYS
- PREFER SORBENT BOOM OVER HARD BOOM
- TRAINING FOR SPILL RESPONSE IS LACKING

- harry.w.howard@uscg.mil

CONTINUED ☐

Ahtna Environmental, Inc.

COMMUNICATION RECORD

JOB NUMBER: 05170.003			
PHONE IN ☐ MEETING ☐ PROSPECTIVE JOB ☐ PAST JOB ☐ PHONE OUT ☒ OTHER ☐ CURRENT JOB MARKETING ☐ ADMIN ☐		ROUTE TO	DATE: 10/17/2018
FILE NAME (OWNER)			TIME: 11:15 ☒ AM ☐ PM
PERSON: BOB WHITTIER	FIRM: EPA	PHONE NUMBER: 907-271-3247	RECORDED BY: Baley Lenhart

SUBJECT: Bulk Fuel Transfer Practices in Rural Alaska

REMARKS:

- INTEGRITY TESTING
- RECORD
- VEGETATION
- AUTOMATIC SHUTOFF

- MAJOR ISSUES WITH INTEGRITY TESTING, MAKING SURE OVERFILL SHUTOFFS WORK, COMMUNICATION w/ BARGE WHEN FILLING

- LACK OF RECORDS WHEN PUMPING OUT DIKES AND SPILLS

- THINKS ON-SITE TRAINING WOULD BE USEFUL

- VEGETATION GROWING WITHIN SECONDARY CONTAINMENT

- LACK OF KEEPING RECORDS IN GENERAL

- LARGELY FOCUS ON OVERFILL PROTECTION / LACK OF

CONTINUED ☐

Ahtna
Environmental, Inc.

COMMUNICATION RECORD

JOB NUMBER 05170.003			
PHONE IN ☐ MEETING ☐ PROSPECTIVE JOB ☐ PAST JOB ☐ PHONE OUT ☒ OTHER ☐ CURRENT JOB MARKETING ☐ ADMIN ☐	ROUTE TO		DATE ~~11/27/18~~ 10/17/18
FILE NAME (OWNER)			TIME 1130 ☒ AM ☐ PM
PERSON JOHN SLIWINSKI SARAH HOUCHEN	FIRM ALASKA AIR FUEL	PHONE NUMBER 907-317-5368	RECORDED BY Baley Lenhart

SUBJECT: Bulk Fuel Transfer Practices in Rural Alaska

REMARKS:

SARAH@AKAIRFUEL.COM

- THE OWNER WASN'T AROUND BUT WILL ANSWER VIA EMAIL

JOHN SLIWINSKI

- TRAINING OF OPERATORS IS A COMMON PROBLEM
- ON-SITE TRAINING WOULD BE BENEFITIAL
- OPERATOR TURNOVER IS ALSO AN ISSUE
- CLEANLINESS WITHIN CONTAINMENT AREAS CAN IMPROVE
- OVERFILLINR/NO SYSTEM OF FILLING IS AN ISSUE

CONTINUED ☐

Ahtna
Environmental, Inc.

COMMUNICATION RECORD

JOB NUMBER: 05170.003			
PHONE IN ☐ PHONE OUT ☐ MEETING ☐ OTHER ☒ PROSPECTIVE JOB ☐ CURRENT JOB MARKETING ☐ PAST JOB ☐ ADMIN ☐	ROUTE TO		DATE: 9/18/18
FILE NAME (OWNER)			TIME: 11:40 ☒ AM ☐ PM
PERSON: CARRIE GODDEN	FIRM: CROWLEY FUELS LLC	PHONE NUMBER: 907-777-5461	RECORDED BY: Baley Lenhart

SUBJECT: Bulk Fuel Transfer Practices in Rural Alaska

REMARKS: CARRIE GODDEN IS THE DIRECTOR OF FACILITIES ENGINEERING w/ CROWLEY FUELS. SHE DIDN'T OFFER MUCH INSIGHT INTO TRANSFER PRACTICES, BUT DID HAVE COMMENTS AS TO THE DESIGN OF EXISTING TANKS

– "THE CRITERIA THAT I WOULD RECOMMEND ARE ALREADY BUILT INTO STANDARD GUIDANCE AND API CRITERIA. THE PROBLEM IS THAT MANY ALASKA FACILITIES ARE AGING AND THEY WERE BUILT WHEN THE CRITERIA WAS NOT REQUIRED. CRITERIA I AM REFERRING TO INCLUDE, SECONDARY CONTAINMENT AREAS, LEAK DETECTION, CATHODIC PROTECTION OF TANKS AND CATHODIC PROTECTION OF PIPELINES AS A FEW EXAMPLES. THERE ARE INSPECTION REQUIREMENTS AND PROGRAMS THAT MITIGATE MUCH OF THE RISK POSED BY A LACK OF THESE REQUIREMENTS, HOWEVER I AM NOT CONVINCED THAT THESE ARE REGULATORY ENFORCED/REQUIRED EQUALLY ACROSS TANK FARMS AS I AM ONLY FAMILIAR WITH THE COMMERCIAL SIDE."

CONTINUED ☐

Ahtna Environmental, Inc.

COMMUNICATION RECORD

JOB NUMBER: 05170.003

PHONE IN ☐ MEETING ☐ PROSPECTIVE JOB ☐ PAST JOB ☐ PHONE OUT ☐ OTHER ☐ CURRENT JOB MARKETING ☐ ADMIN ☐	ROUTE TO	DATE	
FILE NAME (OWNER)		TIME ☐ AM ☐ PM	
PERSON: [redacted]	FIRM: ADEC	PHONE NUMBER: 907-465-5239	RECORDED BY: Baley Lenhart

SUBJECT: Bulk Fuel Transfer Practices in Rural Alaska

REMARKS: • DEL CONRADS – RURAL ALASKA FUEL SERVICES

1) HOW DENALI COMMISSION HANDS OVER TANK FARMS
- UNREALISTIC TO EXPECT SMOOTH OPERATION

2) ON SITE TRAINING
- (R+R FUND) INCENTIVES
- ACCOUNTABILITY CHECKINS (QUARTERLY)?

3) FINANCIAL RESPONSIBILITY IS LACKING

4) HAND-OFF OF FARMS NEED A TRANSITIONARY PERIOD

5) SEE ATTACHED EMAIL EXCHANGES FOR FURTHER DETAIL

CONTINUED ☐

From:	Compton, Amanda T (DEC)
To:	Baley Lenhart
Subject:	contacts
Date:	Tuesday, December 11, 2018 2:36:42 PM
Attachments:	image001.png

David E. Cooper dcooper@hdlalaska.com
Engineer, oversees completion inspections of new tank farms, and is involved in many design aspects. Super nice but not a man of many words, so you may need to formulate some questions and direction for any discussion ahead of time.
907-564-2161 (Office)
907-230-4211 (Cell)

Del Conrad, founder/owner of Rural Alaska Fuel Services. Been in business for decades, knows a lot, doesn't have to answer to anyone so you might get some straight talk, but he also does a lot of the boss-type stuff now so you might get more detailed information from his son, Cullen.
562-0285 (wk); 227-1498 (cell)
dconrad@rafs.net

Cullen Conrad: 764-2531, cullen@rafs.net

John Nickels, Div. of Community and Regional Affairs. DCRA staff oversee the loan program for fuel, and were tasked (starting last year) with writing assessments of the financial management of around 25 communities. They provide quarterly write-ups for the communities visited and established a grading system, where each tank farm gets points if they, say, have financial records and records of meetings, etc. But the DCRA is not equipped to provide any technical assistance, so it's not like they were offering suggestions on ways to address corrosion on their visits, they were more assessments on the operation and management. John was the supervisor on this project, is the supervisor, as I believe the project extended through 2018. And Brenda, below, has been working on the followup project to financial assessments.
269-4564, john.nickels@alaska.gov

Brenda Hewitt: Brenda is working to design a 2-day class on financial management. I don't know if she'll have much information for you since I don't think she's actually visiting any tank farm. I could be wrong. And John might send you to her anyway.
brenda.hewitt@alaska.gov, (907) 269-5939

David Lockard, dlockard@akenergyauthority.org, 771-3062
David's like the tank farm guru. He's been working with the Alaska Energy Authority (AEA, formally known as AIDEA) for decades and knows everything about them. But he'll also be a bit biased, as in, he's not going to admit that their hands-off attitude after construction results in any problems. He's probably not even in agreement that they they're not that involved. Regardless, he knows a LOT more than I do and is in a much better position to talk about what the hurdles are that the communities face.

He may push you to someone else, like Don Antrobus, another PE at AEA.

That's it for now.

Amanda Compton
Class 2 facilities
(907) 465-5237
dec.spar.class2@alaska.gov

From: Baley Lenhart [mailto:blenhart@ahtna.net]
Sent: Tuesday, December 4, 2018 11:51 AM
To: Moore, Sarah C (DEC) <sarah.moore@alaska.gov>
Cc: Compton, Amanda T (DEC) <amanda.compton@alaska.gov>
Subject: RE: Bulk Fuel Facility Operations

Hi Sarah and Amanda,

Thanks for the response. Sometime after the 10th will work. If it would be possible to schedule a time in that week, it would be best as we are attempting to get the deliverable out before the end of the year.

Thank you,

Baley Lenhart
Environmental Engineer I
907-644-0760 (work) | 307-751-2104 (cell) | blenhart@ahtna.net

---

From: Moore, Sarah C (DEC) <sarah.moore@alaska.gov>
Sent: Monday, December 3, 2018 4:59 PM
To: Baley Lenhart <blenhart@ahtna.net>
Cc: Compton, Amanda T (DEC) <amanda.compton@alaska.gov>; Moore, Sarah C (DEC) <sarah.moore@alaska.gov>
Subject: RE: Bulk Fuel Facility Operations

Baley,
I apologize for the tardiness of my response, especially since I see you also sent me an email in October. I am very interested in providing some of the Department's insights on spill prevention and spill response at tank farms. I have an employee, Amanda Compton (included on this email), who works full time on a department prevention initiative centered on tank farms containing less than 420,000 gallons of refined fuel. I believe she is the best point of contact for your project with our Program. She is currently on AL, will it work with your schedule if she contacts you sometime after December 10th to discuss at greater lengths the focus of your project?
Thanks for your patience,
Sarah

From: Baley Lenhart [mailto:blenhart@ahtna.net]
Sent: Monday, November 26, 2018 9:36 AM
To: Moore, Sarah C (DEC) <sarah.moore@alaska.gov>
Subject: Bulk Fuel Facility Operations

Hello,

Our company has been contracted by the Denali Commission to provide an assessment of some the fuel tank farms they funded in the late 90's and early 2000's. With this contract we are also trying to identify areas in which operation and design of these tank farms can be bettered in the future. This is where I could use your help. I was hoping you could offer some insight for issues your agency commonly sees in the:

- Operation of the tank farm
- Training of the operator
- Design of the tank farm
- Practices in fuel transfers from barge (or plane)

Any help would be appreciated.

Thank you,

Baley Lenhart
Environmental Engineer

Ahtna
Environmental, Inc.

Ahtna Environmental, Inc.
110 West 38th Avenue, Suite 200B, Anchorage, AK 99503
907-771-4415 (work) | 307-751-2104 (cell) | blenhart@ahtna.net

From:	Compton, Amanda T (DEC)
To:	Baley Lenhart
Subject:	RE: Bulk Fuel Facility Operations
Date:	Tuesday, December 11, 2018 2:41:32 PM
Attachments:	image001.png

Also, I think that savings accounts for each tank farm should, somehow, be mandatory, and managed by a third party. I don't' know how that would work, but Del, with RAFS, works with communities on how to price their fuel to allow for enough cash flow into a savings account that would accommodate maintenance and repairs. I don't know how you would oversee this, but if there was a way to have maintenance funds managed by an entity located outside of that community, perhaps financed through the fuel pricing structure, that would be great.

And on that note, having the biannual fuel price audited by someone like RAFS, so it's reassessed, would be a good idea too. If there was an on-site training for tank farm operators, having it include fuel pricing would be awesome.

Amanda

From: Baley Lenhart [mailto:blenhart@ahtna.net]
Sent: Tuesday, December 4, 2018 11:51 AM
To: Moore, Sarah C (DEC) <sarah.moore@alaska.gov>
Cc: Compton, Amanda T (DEC) <amanda.compton@alaska.gov>
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Thank you,

Baley Lenhart
Environmental Engineer I
907-644-0760 (work) | 307-751-2104 (cell) | blenhart@ahtna.net

From: Moore, Sarah C (DEC) <sarah.moore@alaska.gov>
Sent: Monday, December 3, 2018 4:59 PM
To: Baley Lenhart <blenhart@ahtna.net>
Cc: Compton, Amanda T (DEC) <amanda.compton@alaska.gov>; Moore, Sarah C (DEC) <sarah.moore@alaska.gov>
Subject: RE: Bulk Fuel Facility Operations

Baley,
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Sarah

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Sent: Monday, November 26, 2018 9:36 AM
To: Moore, Sarah C (DEC) <sarah.moore@alaska.gov>
Subject: Bulk Fuel Facility Operations

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- Training of the operator
- Design of the tank farm
- Practices in fuel transfers from barge (or plane)

Any help would be appreciated.

Thank you,

Baley Lenhart
Environmental Engineer

Ahtna
Environmental, Inc.

Ahtna Environmental, Inc.
110 West 38th Avenue, Suite 200B, Anchorage, AK 99503
907-771-4415 (work) | 307-751-2104 (cell) | blenhart@ahtna.net

From: Compton, Amanda T (DEC)
To: Baley Lenhart
Subject: one more thing
Date: Wednesday, December 12, 2018 1:47:23 PM

I'm currently working with tank farm stakeholders in Unalakleet and in a predicament I can't solve and was brainstorming why. This tank farm is 10 years old, all four co-owners are responsible and have been properly maintaining their respective tanks. BUT, they don't have any fund saved up, individually or collectively. The City of Unalakleet, who does NOT own any tanks in the tank farm, acted as the responsible party or grantee for the Commission's tank farm grant. They haven't encouraged the four tank farm owners to contribute to any savings account nor have they pursued any legal actions to remove themselves from being associated with the property.

The tank farm operators want to start what's called an R&R fund but don't know how. I tried to figure it out but it's confusing and difficult. I did ask for some of AEA's time and did get a meeting with some of their more financially-savvy staff but the ball was decidedly still in my court. I followed up with an email to the City of Unalakleet's City Manager CC'ing someone at AEA who had been at the meeting and someone who works at RAFS asking for assistance and to the best of my knowledge no one's touched base with the City Manager.

This is a good example of what I think is one of the biggest issues – the lack of assistance in transitioning from a new tank farm to properly managing it. And I think one reason why some of my contacts aren't exactly jumping out of their seats to help me with it is because they have no budget for their time. So I think setting aside some of the grant specifically for a couple years of transition following tank farm completion would be really beneficial, if this money would allow for AEA staff, for example, to actually start the savings account and transfer it, or have the ability to set aside dedicated time to work on tank farm management. Right now they're just building these tank farms, handing over instructions, and then throwing more money at this situation by hiring people to perform financial audits, things that just high light that a problem exists, instead of actually solving it.

Amanda Compton
Class 2 facilities
(907) 465-5237
dec.spar.class2@alaska.gov

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APPENDIX F

PHOTOS AND VIDEOS (electronic only)

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