November 9, 2017
Revised November 17, 2017

City of Valdez – Capital Facilities
PO Box 307
Valdez, AK 99686

ATTENTION: Laura Langdon

Dear Laura,

REFERENCE: Valdez Container Terminal & Small Boat Harbor Electrical Upgrades Electrical Engineering Site Visit Report and Recommendations

On Wednesday, October 27, 2017 I visited the Valdez Container Terminal (VCT) and Valdez Small Boat Harbor (SBH) to review existing conditions of the electrical systems and to discuss potential upgrades for each site. Onsite at the VCT I met with you, Codi Allen, Jeremy Talbott, and Jake Meadows. Below is a summary of the various upgrades we discussed, a brief overview of the site conditions, and RSA's recommendations for proceeding with design and construction of each element. Attachment 1 is added to the end of this report to provide a list of figures for reference only (*November 16, 2017 revisions are denoted with italic font below).*

A. Valdez Container Terminal (VCT)

1. Refrigerated Container (Reefer) Receptacles

   i. Description of Upgrade – The City of Valdez (COV) would like to double the existing capacity of reefer receptacles at the facility, to bring their total receptacle count from 180 to 360. The 180 new receptacles will be 32A, 480V, 3-Phase rated and provided in *18* banks of 10 receptacles for each pedestal to match the existing configuration. The exact location of the new receptacles is to be determined, however, onsite discussions mentioned a location west of the existing receptacle pedestals.

   ii. Existing Conditions – There are currently 18 reefer pedestals on site. Each pedestal contains 10 receptacles each, for a total receptacle count of 180 (Figures 1 and 2). The pedestals, or Power Modules, are manufactured by ESL Power Systems out of Corona, CA. Each pedestal sits on a concrete base and is protected by four bollards surrounding the equipment. Per the as-built drawings of the facility, 17 of the pedestals/receptacles operate at 480V, 3-phase and one pedestal/receptacles operates at 208V, 3-phase (although the breaker feeding the 208V receptacles does not appear to be operating as it was in the off position during the site visit). All pedestals are fed from the main Electrical Building via underground conduits. The electrical distribution equipment that feeds the existing pedestals is described in further detail under Part A.2 below.

   iii. Recommendations – RSA recommends that the new 180 receptacles match the configuration of the existing pedestals and receptacles to standardize on equipment and provide ease of maintenance. This includes concrete bases and bollards for protection. All new receptacles will be 480V, 3-Phase unless the COV has a need for additional 208V, 3-Phase receptacles. The new pedestals will be fed from new electrical distribution equipment, which is described in further detail in Part A.2

below. The exact location of the new *18* pedestals (*with 10 receptacles each)* will be determined in coordination with the COV during future design phases.

2. Electrical Distribution Equipment

   i. Description of Upgrade – Due to the age of the existing electrical distribution equipment, availability of new/spare components, and on-going maintenance issues, the COV would like to replace the main electrical distribution equipment within the main Electrical Building. This replacement primarily focuses on Switchboards ‘1L’, ‘2L’, ‘1H’ and ‘2H’ which are described in further detail below.

   ii. Existing Conditions – The electrical system for the facility is fed from Copper Valley Electric Association’s (CVEA) medium voltage distribution system, originating out at Mineral Creek Loop Road. The medium voltage system is fed underground to two main exterior switch cabinets located on the west side of the main Electrical Building. These switch cabinets then feed four adjacent exterior padmounted step down transformers, two at 480V, 3-Phase and two at 208V, 3-Phase (Figure 3). The two 480V transformers feed Switchboards ‘1H’ and ‘2H’. The two 208V transformers feed Switchboards ‘1L’ and ‘2L’.

   Switchboards ‘1H’ and ‘2H’ are both 900A, 277/480V, 3-Phase, 4-Wire, GTE Sylvania switchboards with 900A main breakers and connected together via a 900A tie breaker (Figure 4). These switchboards feed the majority of the facility loads including the 480V reefer receptacles and high mast lighting. These switchboards are beyond their useful life and replacement breakers are no longer available from local distributors.

   Switchboards ‘1L’ and ‘2L’ are both 1200A, 120/208V, 3-Phase, 4-Wire, GTE Sylvania switchboards with 1200A main breakers and connected together via a 800A tie breaker (Figure 5). In the past, these switchboards fed all of the 208V reefer receptacles, but the majority (if not all) of those have since been removed and all conduit/wire has been abandoned in place underground. The only load that appears to be powered from this 208V system is a 100A, 3-Pole breaker presently labeled “Northstar”. RSA assumes this is the main maintenance building near the dock, however, this was not able to be verified during our site visit. Switchboards ‘1L’ and ‘2L’ are beyond their useful life and replacement breakers are no longer available from local distributors.

   There is no existing power factor correction equipment at the facility, which is not typical for container terminal facilities. The refrigerated connexes are known for their inefficiencies when operating, and utility companies typically penalize those that do not compensate for these inefficiencies with power factor correction equipment. CVEA is not currently penalizing the VCT, however, they have started to require power factor correction on other large projects in the Valdez area.

   iii. Recommendations – RSA recommends demolishing the 480V switchboards and providing a single 480V main distribution switchboard sized to accommodate the existing and new loads. Based upon the existing peak demand of the facility and the anticipated 180 additional reefer van receptacles, this new switchboard would be rated 2500A, 277/480V, 3-Phase, 4-Wire. The exact size and configuration of the switchboard would be determined during future design phases.

   Based upon our preliminary site investigation, there does not appear to be a need for the large 208V, 3-Phase switchboards. RSA recommends demolishing those switchboards and not replacing them. Any existing to remain or new 208V loads can be fed via dry-type step-down transformers fed from the upgraded 480V system.

RSA also recommends demolishing the four exterior padmount transformers and providing one new pad mount transformer to accommodate the new, larger 480V service. Preliminary calculations require a 2000kVA transformer, which will also be verified during the design phases.

The existing switchboards utilize a main-tie-main configuration, which is a typical installation for critical facilities requiring full redundancy of operations. At this time, RSA does not recommend providing the new equipment with a main-tie-main configuration as we do not see a justification for the added cost that is associated with this type of installation. This can be discussed in further detail during future design phases.

Lastly, RSA recommends providing power factor correction equipment to compensate for the inefficiencies of the reefer loads. The power factor correction equipment can be placed in the main Electrical Building with the other new equipment.

3. Standby Diesel Generator

   i. Description of Upgrade - The COV desires a standby diesel generator sized to accommodate half (180) of the reefer receptacles at the facility.

   ii. Existing Conditions – The existing diesel generator is a 45kW, 277/480V, 3-Phase, 4-Wire, McGraw-Edison Onan indoor genset (Figure 6). The generator is connected to back up a small portion of the facility lighting load, generator accessory loads, heat trace and other miscellaneous critical loads. The exact age of the generator was not verified during the site visit; however, it is assumed to be part of the original construction of the facility in the early 1980s and is most likely approaching the end of its useful life.

   iii. Recommendations – RSA recommends demolishing the existing 45kW generator (and all associated appurtenances), and providing a new diesel generator sized to accommodate half of all reefer receptacles, as well as all other remaining loads at the facility. The new diesel generator should be provided within an exterior, weatherproof enclosure and placed adjacent to the Electrical Building. Per COV requests, the packaged generator would be provided with a sub-based fuel tank capable of holding up to 48 hours of fuel at full load. An automatic load bank should be provided and sized to maintain a minimum 50% load on the diesel generator at all times. The new generator would be placed on a new concrete housekeeping pad and protected with bollards. New Automatic Transfer Switches (ATS) will be added to switch the loads on to the generator during utility outages. The ATSs are described in more detail in the next section.

4. Transfer Switch Scheme

   i. Description of Upgrade - The COV would like the ability to provide power to all reefer receptacles during extended utility outages. The desire is to employ a manual transfer scheme such that half of the receptacles would be powered at one time, then an operator could manually switch the load to the other half of the receptacles. This allows for a smaller generator, yet still provides the capability of maintaining refrigerated connex temperatures during long outages.

ii. Existing Conditions – There is one existing ATS (Figure 7) that would be demolished if the COV elects to pursue our recommendation within Part A.3.iii above.

iii. Recommendations – RSA recommends the addition of three ATSs and one load transfer type Manual Transfer Switch (MTS) to accommodate this upgrade. One ATS will cover all non-reefer receptacle loads (high mast lighting, dock, buildings, etc.). The second ATS will be connected to half of the reefer receptacles and the third ATS will connect to the other half of the reefer receptacles. Upstream of the second and third ATSs will be the MTS that allows the operator to select which half of the receptacle load will be powered at any given time. In this scheme, when the utility loses power, the generator will start and automatically transfer power to all non-reefer receptacle loads via the first ATS and half of the reefer receptacles via either the second or third ATS (depending on the position of the MTS).

The above scheme is the simplest and least costly method to accommodate the COV's request, however, it is not the only method. A Programmable Logic Controller (PLC) could be utilized in conjunction with electronically operated circuit breakers to automatically open and close the breakers feeding the reefer pedestals, however, the costs and complexities associated with this type of fully automatic system may not be desirable by the COV. Alternative options can be discussed during future design phases.

5. LED High Mast Lighting

i. Description of Upgrade – The COV would like to replace all existing High-Pressure Sodium (HPS) fixtures on the high mast lights with newer, energy efficient Light Emitting Diode (LED) type fixtures.

ii. Existing Conditions – There are six high mast poles in the main container yard (Figure 8). These high masts are roughly 85' tall and contain ten, 1000W HPS fixtures each. These poles and fixtures were installed in 2011 and are in good condition.

There are three high mast poles on the shore side near the dock (Figure 9). These high masts are roughly 85' tall and contain nine, 1000W HPS fixtures each. These poles and fixtures are assumed to have been installed in the early 2000s and are in good condition.

There are two high mast poles on the dock, one at each end (Figure 10). These poles are roughly 40' tall and contain six, 1000W HPS fixtures each. The poles and fixtures are assumed to have been installed in the early 2000s and are in good condition.

iii. Recommendations – RSA recommends replacing all HPS fixtures with equivalent LED fixtures for maximum energy savings. The high mast poles all appear to be in good condition and are recommended to remain, however, we would like to have further discussions with the COV and maintenance personnel to verify this prior to proceeding with design

There were discussions during the site visit about not replacing the light fixtures on the six high masts in the yard area since they are relatively new. The typically life for a HPS lamp is approximately 12,000 hours, after which time LED replacement becomes a cost preferred option. Assuming a conservative annual operation of 2000 hours per year, these HPS lamps have already reached their end of life. LED replacement is recommended.

6. NFPA 70E Arc Flash Study

   i. Description of Upgrade – The COV would like to perform a Flash Hazard Analysis and provide proper Arc Flash labeling of their electrical equipment at the facility.

   ii. Existing Conditions – To our knowledge, an analysis of the existing electrical distribution system has not been performed. There are no Arc Flash labels on the existing equipment.

   iii. Recommendations – RSA recommends a Flash Hazard analysis be performed for all NEW equipment recommended within Part A.2.iii above. The requirements to perform this study would be written into the Contract Documents (drawings and specifications) for the Contractor to provide. This is an easy, cost-effective way to perform these studies as the Contractor has a direct link to the supplier(s) and manufacturer(s) providing the equipment. These manufacturers have personnel on staff and the required software and tools at the ready to perform these studies for their equipment.

7. Miscellaneous

   i. Project Phasing – Per request from the COV, the above VCT upgrades should be split into separate projects or phases. One project will be the LED High Mast lighting replacement described in Part A.5 above. The second project should include all remaining upgrades within Parts A.1, A.2, A.3, A.4 and A.6. If funding limitations do not allow for all of that work to be completed in the second project, it can be split out into separate phases to accommodate the budget. Important note, the additional 180 reefer receptacles within Part A.1 cannot be installed until the distribution equipment upgrades within Part A.2 are installed as the existing system does not have adequate capacity to accommodate the new load. *See Part A.7.v below for RSA recommendations on prioritizing of items.*

   ii. Grain Silos – During the site visit it was noted that any new work performed at the VCT cannot negatively affect the existing Grain Silos. RSA understands this to mean that adequate electrical capacity must remain on the distribution system in the event the Grain Silos are ever required to operate. No new work is anticipated in the Grain Silo area. RSA has already contacted CVEA to determine the size and capacity of the existing medium voltage system. We will inform the COV as soon as we hear back from CVEA on this item.

   iii. *Dock Electrical – There is an existing stainless steel electrical enclosure on the west end of the dock that has visible arc-fault damage on the cover of the enclosure (Figure 11). Jake and I opened the enclosure during the site visit and it was clear that the fault was caused by wiring being pinched between the enclosure door and a motor starter within the enclosure. The wires faulted and burned a hole through the enclosure cover. This enclosure is too small for the amount of equipment within and needs to be replaced with a listed assembly prior to operating. The equipment being fed from this enclosure was not able to be determined during the site visit, but can and will be verified during a future design site visit.*

   RSA recommends a thorough investigation of all remaining electrical equipment on the dock to ensure no other safety hazards exist. Equipment deemed unsafe should be replaced as soon as possible to prevent injury to personnel and/or damage to equipment.

iv. *Maintenance Building Exterior Electrical Equipment – The electrical disconnect and meterbase on the exterior of the Maintenance Building's east side is showing major signs of corrosion and should be replaced (Figure 12).*

v. Electrical Upgrades Prioritization – Below is RSA's recommendations to prioritizing the various electrical upgrades for the VCT, starting with the most important safety related items:

a. Priority #1 – Dock Electrical (Part A.7.iii above) – This item was the only visual safety concern noted during the site visit. A design site visit will determine any additional dock safety concerns and they can be addressed accordingly.

b. Priority #2 – Electrical Distribution Equipment (Part A.2.iii above) – Due to the maintenance issues and age of equipment, the main electrical distribution equipment should be replaced prior to the remaining upgrades below. There have been discussions between myself and the COV as to whether or not the replacement equipment for Panels '1H', '2H', '1L' and '2L' can be split into separate phases, assumingly to address possibly budget constraints. This is not a practical or feasible option as the existing equipment is taking up the valuable "real estate" needed to make the new electrical distribution equipment installation neat, clean and seamless. It is RSA's opinion that attempting to break this item up into separate phases will end up costing much more than just replacing all at once.

c. Priority #3 – NFPA 70E Arc Flash Study (Part A.7.iii above) – This item should be performed at the same time as the Priority #2 items above to limit the costs associated with the study. Costs associated with delaying this item to a later date will be significantly higher than having the installing Contractor (for the new Electrical Distribution Equipment) perform the study. It should be noted that the National Electrical Code (NEC) does not yet require an arc-flash study to be performed, however, local jurisdictional and/or OSHA requirements may differ.

d. Priority #4 – Maintenance Building Exterior Electrical Equipment (Part A.7.iv above) – This item is prioritized due to the visible corrosion on the equipment. Due to its assumed limited use, it is not as high of a priority as the above two items, but the cost of replacement is small enough to justify replacement sooner than later.

e. Priority #5 – Additional Reefer Receptacles (Part A.1.iii above) – This item provides operational and monetary benefits to the COV. Regardless of when this item is installed, the Priority #2 Electrical Distribution Equipment upgrades need to happen first. This item could be split into phases if budget prohibits all 18 banks of 10 receptacles each being installed at one time.

f. Priority #6 – LED High Mast Lighting (Part A.5.iii above) – This item will reduce operation and maintenance costs to the COV.

g. Priority #7 – Standby Diesel Generator (Part A.3.iii above) – This item provides reliability benefits to the COV. This item could be installed prior to the additional reefer receptacles, if desired by the COV, but *should not be installed prior to the Priority #2 Electrical Distribution Equipment upgrades.*

h. Priority #8 – Transfer Switch Scheme (Part A.4.iii above) – This item provides operational reliability to the COV.

B. Valdez Small Boat Harbor (SBH)

1. LED High Mast Lighting

   i. Description of Upgrade - The COV would like to replace all existing High-Pressure Sodium (HPS) fixtures on the high mast lights with newer, energy efficient Light Emitting Diode (LED) type fixtures.

   ii. Existing Conditions – There are nine high mast poles surrounding the SBH (Figure *13*), four on the north side (labeled *west to east* N1, N2, N3 and N4), four on the south side (labeled *west to east* S1, S2, S3 and S4) and one on the *northwest* side near the entrance to the harbor (labeled SS).

   The four *eastern*-most high masts (N3, N4, S3 and S4) are 160' tall. N3 and N4 contain six, 1000W HPS fixtures each. S3 and S4 contain four, 1000W HPS fixtures each. These poles and fixtures were installed in 2010 and appear to be in good condition (Figures *14* and *15*).

   The five *western*-most high masts (N1, N2, S1, S2 and SS) are roughly 160' tall. N1, N2 and S2 contain four, 1000W HPS fixtures each. S1 and SS contain three, 1000W HPS fixtures each. The date of installation for these high mast poles and fixtures is unknown, however, they appear to be slightly older than the *eastern*-most high masts described above. Poles and fixtures both appear to be in fair to good condition (Figures *16* and *17*).

   iii. Recommendations – RSA recommends replacing all HPS fixtures with equivalent LED fixtures for maximum energy savings. The high mast poles all appear to be in good condition and are recommended to remain, however, we would like to have further discussions with the COV and maintenance personnel to verify this prior to proceeding with design.

If the above recommendations are satisfactory to the City of Valdez, we will provide engineering design proposals to accommodate the work. If you have any questions concerning the above, please do not hesitate to call me.

Sincerely,

Davin Blubaugh, PE
Senior Engineer

dkb/hhm
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Attachment

Attachment 1 – List of Figures

Figure 1 – VCT Reefer Receptacle Pedestal

Figure 2 – VCT Reefer Receptacle Pedestal

Figure 3 – VCT Padmounted Distribution Transformers & Medium Voltage Switch

Figure 4 – VCT Main 480V Switchboards ‘1H’ & ‘2H’


Figure 5 – VCT Main 208V Switchboards ‘1L’ & ‘2L’


Figure 6 – VCT Diesel Generator

Figure 7 – VCT ATS

Figure 8 – VCT Yard Area High Masts (Installed in 2011)

Figure 9 – VCT Shore Side High Masts (Installed in the early 2000s)

Figure 10 – VCT Dock High Mast (Installed in the early 2000s)


Figure 11 – VCT Dock Electrical Equipment (Arrow pointing to arc-fault damage)


Figure 12 – VCT Maintenance Building Corroded Electrical Equipment

Figure *13* – SBH High Masts

Figure *14* – SBH High Mast Base (Installed in 2010)

Figure *15* – SBH High Mast Lights (Installed in 2010)

Figure *16* – SBH High Mast Base (Older – Installation date unknown)

Figure *17* – SBH High Mast Lights (Older – Installation data unknown)