NAVFAC EXWC CONTRACT N39430-15-D-1678, DELIVERY ORDER 0011

TANK 5
API 653 OUT-OF-SERVICE INSPECTION AND SUITABILITY FOR SERVICE EVALUATION
FINAL CONDITION ASSESSMENT REPORT (PRE-REPAIR)

Joint Base Pearl Harbor-Hickam, HI (JBPHH)

August 20, 2020

Date of Inspection: October 2017 - January 2018

Contract Agency

Naval Facilities Engineering and Expeditionary
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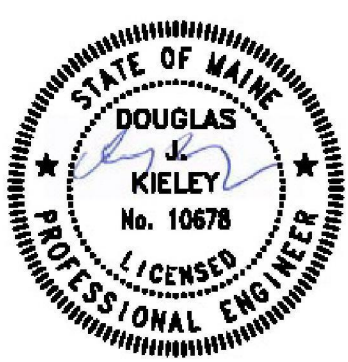

Submitted By

Stephen S. Brooks, P.E.
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EEI Project No. 8877

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ENTERPRISE ENGINEERING, INC.

SUITABILITY FOR SERVICE TESTAMENT
TANK 5

Enterprise Engineering, Inc. (EEI) completed a comprehensive, out-of-service, external and internal integrity inspection and suitability for service evaluation of Tank 5 at the Red Hill Fuel Storage Facility, NAVSUP FLC, Pearl Harbor, HI. The inspection was performed from October 2017 through January 2018. The inspection was performed in accordance with the applicable criteria of API Standard 653, UFC 3-460-01, UFC 3-460-03, the Statement of Work and the project's approved Inspection and Testing Plan.

The EEI inspection and evaluation found conditions that affect the hydraulic integrity of the tank. These conditions must be addressed prior to returning the tank to service.

This report provides inspection findings, tank suitability for service evaluation, conclusions, and recommendations for repair. Recommendations for continued long-term service are also provided.

EEI recommends the next internal out-of-service inspection be scheduled no later than January 2038 (20 years from 2018 inspection), or sooner if a change in condition has occurred.

In accordance with API Standard 653, this report satisfies the requirement for an out-of-service, integrity inspection and as such, should remain available as a historical record for future reference.

I hereby acknowledge that being familiar with the provisions of API Standard 653, the inspection and evaluation was performed in accordance with the provisions of API Standard 653 and good engineering practices, and with the exercise of usual and customary care.

This tank inspection has determined that mandatory repairs are required prior to return to service. Tank 5 may not be returned to service at this time. Recommended repairs have been identified, and if possible, should also be completed before returning the tank to service.

8/27/2020

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SUITABILITY FOR SERVICE EVALUATION
RED HILL FUEL STORAGE FACILITY, NAVSUP FLC, JOINT BASE PEARL HARBOR-HICKAM, HI (JBPHH)

1.0 SUMMARY

Enterprise Engineering, Inc. (EEI) has completed a comprehensive, out-of-service internal integrity inspection and suitability for service evaluation of Tank 5 at the Red Hill Fuel Storage Facility, Naval Supply (NAVSUP) Fleet Logistics Center (FLC) Pearl Harbor, Hawaii under contract to Naval Facilities Engineering and Expeditionary Warfare Center (NAVFAC EXWC). The inspection was performed between October 2017 and January 2018. The inspection was performed in accordance with the applicable criteria of API Standard 653, UFC 3-460-01, UFC 3-460-03, the Statement of Work, and the approved project Inspection and Testing Plan.

Tank 5 is a mined underground storage tank consisting of an upper dome, barrel, and lower dome. The tank was constructed between 1940 and 1943 and is comprised of a reinforced concrete shell with a welded steel liner. As the reinforced concrete shell provides tank structural integrity and the steel plates serve as a shell liner, the entire tank (upper dome, barrel, lower dome) follows the requirements of API 653 for tank floors. Tank 5 is 100 feet in diameter, has an overall height of 250 feet, 6 inches, and has a nominal capacity of 300,000 bbl.

All accessible surfaces of the tank steel liner and plate butt welds were inspected by TesTex, Inc. (TesTex) using Low-Frequency Electromagnetic (LFET) (liner plates) and Balanced Field Electromagnetic (BFET) (welds) testing methods. The findings from the initial TesTex scanning were further evaluated (prove-up) by EEI through visual (VT), magnetic particle (MT), and phased array ultrasonic (PAUT) inspection techniques. In addition, EEI performed 100% visual inspection on all accessible tank shell liner plates and welds to confirm findings and identify additional indications. Further inspection was performed using vacuum box techniques on various components including the base of the tower legs, and the welds on the adjustment plate and expansion joint.

Common weld discontinuities that were identified included: porosity, undercut, lack of fusion, and incomplete fill. The majority of weld defects originate from the original construction and are located in the upper dome and extension ring plates. Other weld defects are a result of cover channel construction. More specifically, these defects were located on the fillet welds of the cover channels of the above-mentioned areas in the tank. The upper dome inspection also identified several dent and gouge defects that require repair. These dent/gouge types of defects are presumed to be from contact from the boom end or other machinery and the tank shell.

Backside corrosion appears to be present within Tank 5. Defects were found in course A, B, C, and D of the upper dome, the extension ring, and barrel courses. However, it should be noted that most of the lower thicknesses in these areas were a result of grinding by a previous contractor under a separate contract, and not directly related to backside corrosion. Several large repair patch plates will be required to remediate the affected areas in the upper dome course A and extension ring areas of the tank. Repairs for each indication meeting or exceeding the repair threshold were determined during inspection of the tank. The repairs fall under two categories: weld repair or patch plate. Weld repairs will include grinding of the existing weld until the defect is no longer present and then rewelding of the area to meet weld profile and

penetration criteria. Patch plates are generally designed per API 653 requirements (with some clearance exceptions) and will be fillet welded to the existing tank steel liner.

Because the structural integrity of the tank is provided by the reinforced concrete shell and the steel tank plates serve as a liner for the concrete, patch plate repair design and weld spacing for all areas of Tank 5 (upper dome, barrel, lower dome) follow the requirements of API 653 for tank floors.

The following table displays the number of shell repairs that fall under the categories of weld repairs and patch plate repairs.

Table 1-1 Shell Repair Requirements Summary

Repair Type	No. of Repairs	Linear Feet of Weld	Area of Patch Plate (sq. ft.)	No. of Patch Plates <= 2 sq. ft.	No. of Patch Plates > 2 sq. ft.
Weld Repairs	333	173			
Patch Plate Repairs	81		80	70	11
Totals	**414**	**173**	**80**	**70**	**11**

The two nozzles on Tank 5 passed the strength (pressure) and leak-tests at 225 psig with water. A full visual inspection was performed on the 32-inch nozzle (man entry) as well as a 100% PAUT inspection of the girth welds. The visual examinations performed on the 32-inch issue/receipt line revealed that the line will require some weld repairs to the internal welds but that pipe wall thickness was measured and found acceptable for the entire length of the pipe (indicates no backside corrosion). A pipe visual inspection camera was used to exam the 18-inch issue/receipt line. The camera examination of the 18-inch revealed multiple weld issues such as lack of fusion on the welds. Camera evaluation does not provide the same visual inspection capability that man entry into pipe provides because pipe wall thickness can only be verified at the accessible ends of the pipes which limits the information on possible backside corrosion. Based on limited camera examination capabilities and the inability to obtain pipe wall thickness reading for the entire lengths of the 18-inch pipe, EEI recommends the 18-inch pipe be taken out of service.

Additional mandatory repairs are described later in this report. Based on the findings during the inspection, repairs are required before returning Tank 5 back to service.

2.0 INSPECTION ASSESSMENT

A comprehensive table identifying tank features with findings and conclusions as appropriate is included as Attachment F. Attachment F also contains several tables with full reporting of data obtained. The following discussion only addresses key integrity issues.

The tank inspection revealed that mandatory repairs are required to return the tank to service. Mandatory Repairs are considered actions necessary to preserve or restore the structural and hydraulic integrity of the tank. This includes any condition which has or may breach the hydraulic or structural integrity of the tank prior to the next integrity inspection.

Hydraulic Integrity

Hydraulic integrity is the ability of the tank to hold product (until the next inspection) without compromising the boundaries of the floor, shell, and dome, and the piping to the first valve outside of the tank. The identified areas within the tank that affect the hydraulic integrity of the tank include the following:

- Previously ground areas where the remaining wall thickness was below the repair threshold.
- Backside corrosion over localized areas of the tank shell and upper dome.
- Multiple rounded or linear weld defects which could be less than recommended repair thickness.
- The condition of the circumferential welds on the 32-inch product line.

Structural Integrity

Structural integrity is the capability of the tank to remain freestanding, with or without product, under the conditions of its design basis. Structural attributes include the floor, shell, upper dome, and their attachments.

Inspection of the tank shell, bottom cone and floor, and the upper dome found no indications of damaged or deteriorated base structure of the tank. There were no other indications in the shell areas which may have indicated that there was an underlying structural issue with the tank.

A full tower inspection was performed by Hawaii Engineering Group (HEG). The inspection determined that the tower structure was suitable for continued service under the intended operating conditions once minor repairs were completed. Minor repairs included replacing missing bolts and tightening existing hardware.

Next Inspection

Based upon API 653 criteria, upon successful completion of mandatory repairs, Tank 5 must receive its next internal out of service inspection in 2038. The current tank shell liner corrosion assessment identified repairs that will result in a remaining metal thickness equal to or greater than 100 mil (one mil is one thousandth of an inch) at the next inspection. The 20-year interval is based on the date of the most recent corrosion scan, and not the return to service date.

3.0 INSPECTION METHODOLOGY

API 653 inspection criteria was followed in terms of procedure and evaluation to the greatest extent possible. Tank inspection included assessment of the upper dome, extension ring, under catwalk, entire

course shells (barrel section), lower dome, floor appurtenances, access ways, and vents. All accessible interior surfaces of the upper and lower domes, floor, shell, and all welds were examined by one or more nondestructive testing (NDT) methods. NDT methods included:

- Electromagnetic Testing methods:

  Low-Frequency Electromagnetic Testing (LFET) (utilized on liner plate surfaces)

  Balanced Field Electromagnetic Testing (BFET) (utilized on liner plate welds)

- Ultrasonic Testing methods:

  Straight-beam, Longitudinal Wave, Pulse-Echo Method (UT)

  Phased Array Ultrasonic Testing (PAUT)

- Visual Testing (VT)
- Magnetic Particle Testing (MT)

TesTex Scanning

Initial inspection of Tank 5was performed by TesTex as a subcontractor to APTIM. The inspection can be broken down into three parts:

- Scanning 100% of accessible shell plates utilizing LFET technology
- Scanning 100% of accessible welds using BFET technology
- Visual inspection of accessible shell plates and welds

LFET was used to detect discontinuities caused by backside corrosion. While scanning the shell plates, technicians marked locations of discontinuities found using LFET. They then used UT to determine remaining wall thickness in the area. The threshold for remaining wall thickness was set as 200 mil and less.

BFET was used to detect surface and near surface discontinuities in the liner plate welds.

VT was performed to detect discontinuities in liner plate surfaces and welds. Discontinuities detected by VT were evaluated as porosity, undercut, lack-of-fusion, incomplete fill, dents, gouges, and bulges.

All relevant indications observed by TesTex were documented and provided to EEI for further investigation. Relevant indications were assigned unique identifiers for tracking purposes.

TesTex Personnel Qualifications

TesTex technicians performed a "blind" test consistent with API 653 Annex G requirements using the LFET equipment. Each technician scanned coated and uncoated test plates containing known defects. Discontinuity location was recorded and flaw characterization using UT was performed. All technicians passed the tests given to them. Test results are provided in Attachment K of this report.

EEI Prove-up (Flaw Characterization)

EEI provided an API 653 certified inspector during the Tank 5 inspection phase. During this time, the inspector reviewed all data provided by TesTex and performed a visual inspection of 100% of the accessible tank shell liner plates and welds. Prove-up of non-destructive examination (NDE) indications reported by TesTex was performed to verify the location and characterization of the indication and to collect any additional information required to provide a repair recommendation.

Flaw characterization was performed to verify size, shape, location, and to verify interpretation (relevant, nonrelevant, or false) of each reported relevant indication. Repair recommendations were made when discontinuities were evaluated as defects.

For relevant indications associated with backside corrosion, flaw characterization was performed with PAUT. The PAUT transducers utilized were specifically designed to examine backside surfaces for corrosion damage. The areas of concern were scanned to determine the remaining wall thickness. Repairs were recommended for any area thinner than the repair threshold of 160 mil.

In areas where repairs were recommended due to backside corrosion, the surrounding areas of liner plate were also scanned to verify the area identified was correct and to determine the size of patch plate. Patch plates were designed to cover the entire defect as well as meet API 653 criteria for weld clearances and intersection requirements.

Discontinuities in welds identified by BFET were reported by TesTex and were inspected by EEI with MT to verify the extent of the discontinuity. During follow up investigations it was found that many of the discontinuities reported could be detected using VT. If the discontinuity was found visually and could be evaluated, no further inspection was performed. Weld repairs were designed and recorded for discontinuities evaluated as defects.

For all instances of backside corrosion, repairs were determined based on the repair threshold for remaining wall thickness. Many other repair recommendations were based on this same criterion, however, in some cases, exceptions occurred as described below.

Porosity and Undercut: Repairs were recommended for discontinuities where the bottom of the discontinuity was visually obscured or otherwise unable to be characterized. Areas lacking coating or where coating was present but damaged (peeling, blistering, or not tightly adhered) were also recommended for repair. Further discussion of discontinuities caused by rounded indications and acceptance criteria are provided in Attachment C.

Dents and Bulges: Repairs were recommended for discontinuities caused by sharp profile changes or creases that create a point of stress concentration. Repairs were not recommended for shallow, smooth profile discontinuities. The bulges reported by TesTex were found to have smooth transitions across the shell liner plate welds, were distributed uniformly around the tank, and presented with similar appearance (size and shape) in each shell course. It is thought that these features are artifacts of the original construction process.

Weld Defects: Both full penetration butt welds and fillet welds were evaluated. Common weld discontinuities that were identified in both types of welds included: porosity, undercut, lack of fusion, and incomplete fill. Discontinuity depth was evaluated where possible, that is, where the configuration of the defect or presence of coating did not significantly obscure the measurement. The criteria used to evaluate liner thickness was based on remaining thickness of the liner plate, as outlined in Attachment C. Locations called out for repair having porosity, incomplete fill, undercut, and other damage related to plate thickness did not meet the remaining thickness requirements for the required service interval.

In addition to the discontinuities reported by TesTex, EEI found defects based on the criteria and methods mentioned above. All relevant indication data (by both TesTex and EEI) were recorded for each plate and given a unique identifier locating the area relative to the lower left corner of the plate. A table of relevant indications and resulting defects is provided in Attachment F.

API 653 Inspection

EEI performed a modified API 653 out-of-service inspection of Tank 5 in terms of procedure and evaluation to the greatest extent possible. The API 653 checklist was used to the extent of relevant content. The API 653 checklist was used to the extent of relevant content. The checklist is provided in Attachment A.

The nozzles at the top of the tank were visually inspected. The 24-inch vent line connects from the top of the tank to the ventilation system in the upper tunnel. An inspection of the vent line utilizing a motorized camera was performed because the majority of the line between the tank and upper tunnel is encased in concrete, which would otherwise limit visual inspection. The vent line is generally in good condition and no repairs to the vent line are recommended.

Tank 5 contains 32-inch and 18-inch product lines. These product lines were inspected via either direct or camera visual inspection. PAUT was performed in the 32-inch line. Internal pitting and weld quality were evaluated. The conditions of the lines were recorded in videos and photos.

Hansa Consult of North America, LLC (HCNA) performed a hydrostatic strength test of the 32-inch, 18-inch, and 18-inch casing tank nozzles. HCNA provided precision leak testing using a third-party certified procedure to test each of the lines from the tank. EEI provided quality assurance (QA) of the process. The HCNA test report has been included in Attachment J of this report.

Additional vacuum box and magnetic particle testing was performed on critical areas of Tank 5. Testing was done in accordance with API 653 specifications.

- Custom vacuum boxes were fabricated to examine 100% of the welds around the expansion joint, adjustment plate, strain gauge pipe cap covers, 8-inch drain cap, and center tower leg bases.
- Magnetic particle testing was utilized to inspect 100% of the strain gauge pipe cap covers as well as 50 expansion joint plug welds. Any indications that were found were recorded and a repair designated.

4.0 INSPECTION FINDINGS

All instances of discontinuities resulting in relevant indications and recommended weld and patch plate repairs that were reported during the inspection phase are provided in Attachment F. Vacuum Box and MT test reports are provided in Attachment H. PAUT examination results are Provided in Attachment I.

Tank Nozzles

Visual inspection of the large bore product lines was conducted. The intent of the inspection was to provide condition information, quantify internal pitting, identify substandard girth welds, substantiate longitudinal weld conditions, identify backside corrosion (where possible), and establish geometric data for the inaccessible piping. The 32-inch line was physically accessed to look for pitting and to examine weld quality and suitability of prior repairs made by others. The 18-inch product line was not directly accessed. It was visually examined using remote video. To the greatest extent possible, the 18-inch and 32-inch nozzles were examined utilizing ultrasound techniques for presence of backside corrosion, and quality of girth and longitudinal manufacturing seams. Examination of the 18-inch line was limited to what can be accessed from each end of the line.

EEI has adopted the following numbering scheme for the purposes of locating pipe welds: girth weld numbering referenced in the following discussion starts at first flange outside the tank and increases toward the tank. Clock positions place 12 o'clock at the top of the pipe and 3 o'clock 90 degrees to the right when facing toward the tank.

The 32-inch line was inspected visually and with PAUT. Visual inspection of the 32-inch pipe found widely spaced pitting in the internal face of the pipe wall between Girth Welds 3 and 5. The pitting extended from the 5 o'clock to 7 o'clock positions. However, pit depths were shallow and did not require repair. PAUT was utilized to inspect 100% of the girth welds inside the pipe. Girth Weld 2 contained 7 inches of weld defects requiring repair. Girth Weld 3 contained 3 inches of weld defects requiring repair. Girth Weld 4 contained 14 inches of weld defects requiring repair. No indications were found in Girth Welds 5, 6, and 7. Defects found with PAUT included lack of fusion and linear indications.

The 18-inch product line was inspected with a remote video unit. Inspection of the 18-inch pipe found the following: Girth Welds 1 and 2 contained underfilled welds that would require repair. Since weld repair is not possible inside this line it is recommended to abandon the line. It should be noted that the recommendation to remove this line from service was based on visual evaluation of welds, as there was no remaining pipe wall thickness data collected for the line. An inline intelligent inspection tool (smart pig) was not run in the line to develop pipe wall information.

The 18-inch line and 32-inch line were hydrostatically tested by HCNA. Precision temperature compensated tests at 225 psig pressure for four-hour duration were performed. This strength test was chosen over specified 162.5 psig eight-hour duration test specified in scope of work because it provides more meaningful test parameters. In addition, a leak detection test in accordance with National Work Group on Leak Detection Evaluations (NWGLDE) was performed. Both lines passed the strength and leak tests. A test report for this examination is provided in Attachment J.

Tank Interior

Two types of welds were evaluated in relation to the hydraulic boundary of the tank. Full penetration butt welds connect the shell plates to each other to form the continuous steel liner. Penetrations through the liner (nozzles, for example) and insert plates are also welded to the liner with a full thickness weld. Fillet welds were utilized as the final interior seal between nozzle penetrations and patch plates to the interior

liner. The original construction of the tank called for the liner plates of the upper dome to be joined by a full penetration butt weld with a backing bar located on the inside of the tank. The backing bars were subsequently fillet welded to the liner plates. While the full penetration butt weld would normally represent the hydraulic boundary of the liner, the configuration of the joint with a backing bar prohibits an examination of the weld from the inside of the tank. For this reason, the fillet weld joining the backing bars to the liner plates was evaluated as if it were a hydraulic boundary. This approach is conservative in that a breach in the fillet weld does not necessarily confirm a path through the liner of the tank.

Table 4-1 Tank Repairs by Area Summary

Category	Basis for Percentage (Tank or Region)		Lower Dome	Barrel	Extension Ring	Upper Dome
	Tank	Region				
Percent of total relevant indications reported for assessment in Tank 5	X		3%	26%	10%	61%
Percent of relevant indications that required repair (defects)		X	86%	83%	68%	47%
Percent of the total repairs recommended in Tank 5	X		4%	36%	12%	48%
Percent of repairs due to backside corrosion in given area (lower dome, extension ring, upper dome or barrel)		X	0%	4.6%	34%	18.7%

Lower Dome

The lower dome of Tank 5 was inspected using LFET, BFET, and visual techniques. Inspection of the lower dome identified 3% of the reportable indications in the tank. Flaw characterization resulted in 86% of the reported indications meeting repair criteria (defects), accounting for 4% of the total repairs in the tank. No defects due to backside corrosion were found in the lower dome. The repairs consist of weld and patch plates. See Attachment F for repair quantities in lower dome.

Vacuum Box testing was performed on the four center tower legs. Custom vacuum boxes were fabricated to fit the floor to leg welds. No relevant indications were found from the inspection. The 8-inch drain (slop) line cover plate was inspected by visual, vacuum box, and magnetic particle methods to verify the integrity of the seal welds. Defects were found that require repair by welding.

EEI also performed visual coating inspection and hammer testing on the floor of Tank 5. The coating was in good condition at the time of inspection. The hammer testing results were inconclusive. The test was very subjective but there appeared to be some hollow-sounding spots around the nozzles. Follow up ultrasonic thicknesses of the "hollow" areas surrounding the nozzles did not reveal any corrosion in these areas.

Barrel

Tank 5 barrel was inspected using LFET, BFET, and visual techniques. Inspection of the barrel plates identified 26% of the relevant indications in the tank. Flaw characterization resulted in 83% of the relevant indications meeting repair criteria (defects), accounting for 36% of all repairs in the tank. Repair methods include weld and patch plate repair. Approximately 4.6% of repairs are areas of backside corrosion. See Attachment F for locations and quantities.

EEI inspected the existing strain gauge nozzles. These nozzles are approximately 3-inch diameter and extend 3 inches from the tank shell. Vacuum Box and Magnetic Particle testing was performed for this inspection. No relevant indications were found.

Extension Ring

Tank 5 extension ring was inspected using LFET, BFET, and visual techniques. Inspection of the extension ring identified 10% of the relevant indications in the tank. Flaw characterization resulted in 68% of the indications requiring repair (defects), accounting for 12% of all repairs in the tank. The repairs consist of weld, patch plates, and pipe cap repairs. Approximately 34% of repairs are areas of backside corrosion. See Attachment F for repair quantities in upper dome.

Plug welds located on the upper and lower expansion joint ribs were inspected with magnetic particle methods. One hundred percent of the upper and lower expansion joint rib welds were leak tested using vacuum box apparatus.

The MT of the plug welds resulted in one required repair.

Vacuum Box testing of the expansion joint and adjustment plate welds produced no relevant indications.

Upper Dome

Tank 5 upper dome was inspected using LFET, BFET, and visual techniques. Inspection of the upper dome identified 61% of the relevant indications in the tank. Flaw characterization resulted in 47% of these indications requiring repair (defects), accounting for 48% of the repairs in the tank. The repairs consist of weld, and patch plate repairs. Approximately 18.7% of repairs are areas of backside corrosion. See Attachment F for repair quantities in upper dome.

Other Items of Concern

Product and/or water entrapment areas that can support corrosion were found. This occurred where the support brackets for sampling lines are not seal welded to the floor and at a section of an old stilling well that remains welded to the floor. All support brackets are recommended to be seal welded to prevent fuel from entering this area where direct inspection is not possible. The piece of old stilling well should be removed and a patch plate welded over the area.

There is minor damage to the lower dome coating in Tank 5. It is recommended to perform repairs to the coating at the bottom of the tank.

5.0 REPAIR ITEMS

Based upon the API field inspection, engineering judgment, and knowledge of funding practices, repairs developed are listed below in the following tables as required (mandatory), non-mandatory and recommended for long term serviceability. Refer to Attachment B, "Assessment of Compliance with Military Criteria" for comprehensive comments and recommendations of the tank's compliance with military criteria.

Standard of Care

All repairs must meet the requirements of API 650 and API 653 regarding material, welding procedures, qualification of welders, and weld NDE and testing requirements. Obtaining hot work permits and developing the appropriate hot work procedure for the tank floor is the responsibility of the repair contractor and must consider that the tank has been in petroleum fuel service.

Mandatory Repairs

Table 5-1 Mandatory Repairs

Finding	Repair	Photo
Mandatory repairs are repairs that are critical to the hydraulic and structural integrity of the tank and are required to return the tank to service.		
1. Defects found requiring patch plate repairs are: • Backside Corrosion • Dents	Provide patch plate repairs. Plate size, location in tank, and overall quantities can be found in Attachment F.	 
2. Thinning of 3-inch pipe caps covering the existing grout pipe and strain gauge at 5 locations was found in the extension ring.	Remove existing 3-inch pipe caps and provide patch plates. See Attachment F for quantity and locations	

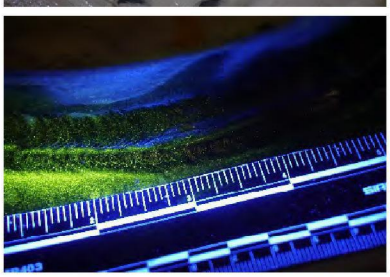
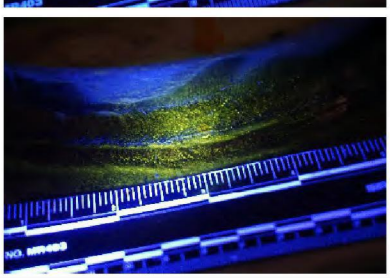
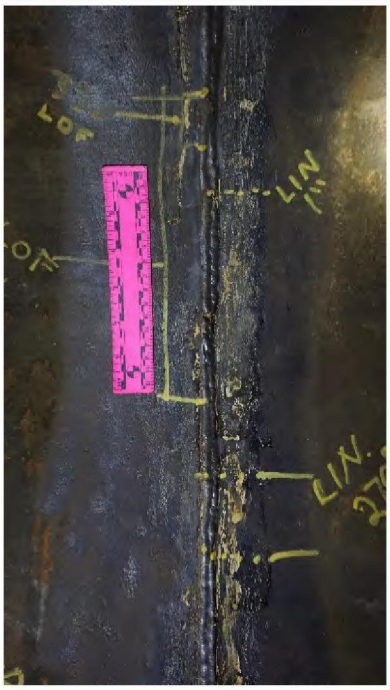
Table 5-1 Mandatory Repairs		
Finding	**Repair**	**Photo**
3. Defects found requiring weld repairs are: • Weld Indications • Porosity/Rounded Indications • Lack of Fusion • Insufficient Fill • Gouges • Undercut • Other shell topside indications	Provide weld to repair defects. Weld length, location in tank, and overall quantities can be found in Attachment F.	
4. The 8-inch drain line cover plate had 4 linear weld defects. The defects were found at the 3, 4, 6 and 10 o'clock positions and were approximately 1/8-inch in length.	Grind out defects and provide weld repair.	  

Table 5-1 Mandatory Repairs		
Finding	**Repair**	**Photo**
5. The 32-inch product line contains 10 linear weld defects throughout the line in its girth welds.	Grind out defects and provide weld repair.	 

Non-Mandatory Repairs

Table 5-2 Non-Mandatory Repairs		
Finding	**Repair**	**Photo**
The repairs listed below are not mandatory per API 653 or for structural and hydraulic integrity of the tank but should be performed if approved by the Government for the long-term preservation and integrity of the tank.		
1. Approximately 6 inches of the old stilling well is still welded to the floor.	Cut off the old stilling well flush with the tank floor and provide a 6-inch patch plate over the location.	
2. The 18-inch tank product line passed strength and leak tightness tests, but the pipe wall thickness could not be evaluated for the entire pipe length. Welds could only be examined using a camera.	Remove 18-inch line from service. Modify piping in lower tunnel to reconnect tank 32-inch line to tunnel 18-inch line. Provide half-inch closure plate inside tank to isolate 18-inch tank line from tank	
3. The steel channel supports for the drain line and sample piping are not welded to the tank all the way around the support. This allows product to fill under this area and is not accessible to inspect.	Seal weld all supports to the tank.	

Repairs for Long Term Serviceability

Table 5-3 Repairs For Long Term Serviceability		
Finding	**Repair**	**Photo**
1. The grout nozzles and strain gauges are covered by 3-inch pipe caps instead of ½-inch patch plates as noted on design drawings.	Remove pipe caps and provide patch plates to cover all locations. Location in tank, and overall quantities can be found in Attachment F.	

Table 5-3 Repairs For Long Term Serviceability		
Finding	**Repair**	**Photo**
2. The inside of the 32-inch line is not currently coated.	Once the 32-inch line is repaired, coat the inside of the line with Polysulfide modified Epoxy Novolac coating system used for lower dome coating. By doing so the line will be subject to less corrosion potential.	

Shell Repairs - General

Generally, welding repairs require surface preparation followed by welding of a tank seam or placement of a patch plate depending on the nature of the defect being repaired. Repairs by welding that involve the placement of a patch plate are further divided into two categories based on the patch size. Patches of a surface area of 2 square feet or less can be manipulated by hand utilizing the existing means of tank shell access. It is important to note that patch plates larger than 2 square feet will require additional consideration to both the means of moving and positioning the patch in place prior to welding and may also require further considerations regarding attachment to the underlying tank structure.

Instances of multiple defects in close proximity to each other that were reported and verified individually in the inspection process are combined into a single repair at some locations. This grouping of individual defects into single repairs is necessary to facilitate weld spacing requirements. The grouping of defects into a single repair may also provide a considerable time and material savings over addressing each indication separately. The approach for repair types are discussed below.

The overall repair methodology utilized in the determinations of repairs are outlined in API 653 and were utilized to the greatest extent possible.

Defects Caused by Rounded Indications

The recommended repair for these areas is to grind the affected area and apply a weld bead (or beads) to replace the deficient weld. Individual instances of porosity may be addressed by as little as 2 to 4 inches of weld repair while larger areas with numerous indications requiring several inches or more of repair.

Defects Caused by Dents, Gouges, Tear-Outs and Dent/Gouge Combinations

Repairs associated with these defects will be addressed with one of two methods depending on the severity and size of the defect. Tear-outs from the removal of temporary welds in the manufacture of the tank (or later) are typically repaired by filling the affected area with weld and then grinding the welded area to a flush condition with the surrounding plate. It is anticipated that these areas will require relatively short lengths of weld to correct the underlying discontinuity. The recommended repair for dents, gouges, and dent/gouge combinations is to apply a patch plate over the affected area and seal weld the patch to the surrounding plate with a multiple-pass fillet weld.

BFET Indications

When the lateral extent of the defect could be seen, relevant indications identified by BFET methods were characterized by visual methods. BFET indications of discontinuities that were not easily characterized by visual methods were added to the repair list without further inspection. It was determined that further inspecting the weld requires a greater effort to definitively examine and characterize than would be required to provide a repair. These efforts include coating removal and grinding prior to evaluation. A typical repair involves preparation of the affected area by grinding followed by re-welding.

Local Backside Corrosion

Localized backside corrosion limited to an area that can be repaired with a smaller sized patch plate and is discussed within this section.

The recommended repair is the placement of a lap patch sized sufficiently to overlap affected area by at least 2 inches in all directions. In some instances, this overlap spacing requirement is not attainable within a single shell plate while maintaining weld-to-weld spacing requirements per the requirements outlined in API 653 for floor plate patch repairs. There are varied approaches that are recommended based on the situation.

In the presence of significant thickness loss in close proximity to a butt-welded seam, the patch is forced to extend onto the adjacent plate. In this case, the weld spacing requirements API 653 for lap patches on floors have been adopted.

When the patch plate is near or abuts a backing bar (a flat steel bar installed on the tank exterior, or the backside of the weld), the recommendation is to provide a tombstone shaped patch plate with sides of the plate intersecting the backing bar fillet weld at approximately 90 degrees. The size of the patch plate will influence the method by which it is positioned for welding.

General Backside Corrosion

General backside corrosion is such that the area affected is much larger than a localized corrosion area and requires a repair that is larger in size. Within Tank 5, there are approximately 37 repairs that fall under this category, and it is recommended to repair an area greater than 2 square feet in area for each location. Several of these repairs are full plate replacement repairs.

These repairs will be unlike any previous repairs done at the Red Hill Facility and will require extensive design and construction considerations. Repairs could include the removal of existing shell plates and inserting new plate or welding patch plates to cover the affected areas.

6.0 COATING SYSTEM

Coating Requirements

EEI surveyed the floor coating condition and found the coating to be acceptable. Under a separate contract, APTIM is responsible for obtaining the services of an SSPC QP-5 certified firm, to provide a NACE Level 3 Coating Inspector to perform a coating condition survey. Results of this survey will be utilized to determine coating repair requirements.

7.0 SUITABILITY FOR SERVICE EVALUATION

Historical Inspection Information

Previous inspection reports were available for review. Past repair documentation includes:

- Willbros Government Services, LLC (WGS) Tank Inspection & Integrity Report dated November 22, 2010.
- WGS Warranty Repair & NDE Inspection Certification Report dated September 15, 2016.

Corrosion Rates

Corrosion rates were calculated per plate and full results are in Attachment G. Each rate is based on UT data collected in the field. The maximum corrosion rates for a single plate found in each tank section are as follows:

Upper Dome:	1.789 mils per year
Extension Ring:	1.842 mils per year
Barrel:	1.724 mils per year
Lower Dome:	0.658 mils per year
Floor:	Negligible – Plate thickness is within mill tolerance

The corrosion rates were calculated using an assumed original metal thickness of 250 mil, the remaining wall thickness and 75 years in service (1942 construction). The numbers listed above are the largest corrosion rate in each area. Please note that remaining wall thickness may have been a result of excessive grinding within the tank instead of corrosion. Utilizing these areas to calculate corrosion rate provides the most conservative rate calculation.

8.0 CLOSURE

Conclusions

Mandatory repairs were identified that need to be performed prior to return-to-service. Pending completion of the mandatory repair items noted, Tank 5 will be suitable to return to service.

The repairs to Tank 5 primarily include weld and patch plate repairs. The patch plate repair designs should account for the grinding and removal of material which were completed by previous contractor.

Project Organization

Prime Contractor	Enterprise Engineering, Inc.
Tank Inspection	Enterprise Engineering, Inc.
Tank Scanning	TesTex, Inc.
Pressure Testing	Hansa Consult North America, LLC
Coating Assessment	FeO, Inc. (under separate contract)
Electrical Assessment	BSE Engineering
Mechanical Services	APTIM

EEI Project Team

Site Team

Doug J. Kieley, P.E.	Project Manager, Inspector of Record API 653 AST Inspector Certificate No. 40281 API 570 Piping Inspector Certificate No. 23161
Karl R. Schlenker	Senior Mechanical Integrity Engineer, API 653 AST Inspector Certificate No. 40225 API 570 Piping Inspector Certificate No. 41177
Curtiss M. Hallock	Mechanical Integrity Engineer, API 653 AST Inspector Certificate No. 72319
Aaron K. Dahlstrom	Mechanical Integrity Technician, API 653 AST Inspector Certificate No. 43654 API 570 Piping Inspector Certificate No. 39718
Shaun C. Wilson	Mechanical Engineer, API 653 AST Inspector Certificate No. 60045 API 570 Piping Inspector Certificate No. 47576
Jacob M. Sylvain	Mechanical Integrity Engineer, API 570 Piping Inspector Certificate No. 77282
Adam Simpson	Mechanical Integrity Engineer
Joseph G. Miller, III	Mechanical Integrity Technician, API 570 Piping Inspector Certificate No. 80768
Brian R. Ayotte	Mechanical Integrity Technician, API 653 AST Inspector Certificate No. 65052 API 570 Piping Inspector Certificate No. 64916

Support Team

Stephen S. Brooks, P.E.	Principal-in-Charge/ QA Review API 653 AST Inspector Certificate No. 17 API 570 Piping Inspector No. 23663
Steve J. DiGregorio, P.E.	Chief Structural Engineer, API 653 AST Inspector Certificate No. 1113

ATTACHMENT A
TANK INSPECTION DATA SHEET AND EVALUATION ITEMS

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DLA ENERGY TANK CMP CONDITION FORM

TANK INSPECTION SUMMARY SHEET

Tank Location (Site Code):	Red Hill Fuel Storage Facility, NAVSUP FLC, Joint Base Pearl Harbor-Hickam, Hawaii (JBPHH)
Tank No.:	5
Facility No.:	N/A
Inspection Date(s):	October 2017 to January 2018
Tank Type:	Mined Underground Storage Tank
Type of Inspection:	Internal w/ Suitability for Service Evaluation
Contract Number, Task Order:	N38430-15-D-1678, Task Order 0011
Prime Contractor Name:	Enterprise Engineering, Inc. 400 US Route 1, North Suite B Falmouth, ME 04105 (207) 869-8006
Inspector, Certificate No:	Douglas J. Kieley, P.E. API-653 AST Inspector Certificate No. 40281
Inspection Company:	Enterprise Engineering, Inc. 400 US Route 1, North Suite B Falmouth, ME 04105 (207) 869-8006
Manufacturer, Date, Design Standard	Morrison Knudsen, 1942, Not Specified
Diameter:	100'-0"
Shell Height:	250'-6"
Product, Specific Gravity:	JP-5, 0.82
Design Pressure / Temperature:	96.9 psi / 50 degrees F
Gross Capacity / Nominal Capacity:	300,000 Bbls
Safe Fill Height:	Top of Shell Course A in the Upper Dome
GPS Latitude & Longitude:	8 Deg 43' 38.04" N, 167 Deg 44' 15.57" E (Source – Google Earth)
Foundation Configuration:	Concrete / Gunite encasement with embedded rebar & I-beams
Shell Configuration:	Upper Dome: 5 courses, Butt Welded w/ Backing Bars Extension Ring: 4 courses, Butt Welded w/ Backing Bars Barrel: 28 courses, Butt Welded Lower Dome: 4 Courses, Butt Welded
Roof:	Dome with Structural Steel
Floating Pan:	Not Applicable
Cathodic Protection:	None – Not Applicable
Stilling Wells:	None, 6-inch ATG
Last Inspection (Type, Date):	Out-of-Service, September 2010 by Wilbros Government Services, LLC
Last Coated Internally (Product):	1983 (Lower Dome only re-coated in 2010)
Last Coated Externally (Product):	Not coated Externally

INSPECTION RESULTS

Can tank return to service?:	No.
Deficiencies identified as mandatory repairs:	Yes, see paragraph titled "Mandatory Repairs" in body of report
Deficiencies identified as recommended repairs:	Yes, see paragraph titled "Non-Mandatory Repairs" in body of report.
Deficiencies identified as long term repairs:	Yes, see paragraph titled "Long Term Repairs" in body of report.
Next Scheduled API Inspections (Type, Date):	API 653 Out-of-Service: 2038 (20 Years)
Next Scheduled Tank Cleaning (UFC 3-460-03, 2016):	Army, Navy, Marine Corps Tank (During OOS Inspection Unless Required More Frequently due to Potential Fuel Quality Issues): January 2038 Date

ADDITIONAL ITEMS

Change in Service:	None
As-Built Drawings, Specifications:	Yes

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ATTACHMENT B
ASSESSMENT OF COMPLIANCE WITH MILITARY CRITERIA

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ASSESSMENT OF COMPLIANCE WITH MILITARY CRITERIA

UFC 3-460-01, Table 8-1

(Complete UFC available at www.wbdg.org)

Requirements for Vertical Underground Storage Tank (V-U) Only

ITEM	APPURTENANCE (UFC REQUIREMENT)	COMPLIANT		COMMENTS/RECOMMENDATION (A blank in comments column indicates UFC compliance)
		YES	NO	
MANHOLE				
a	A 30-inch diameter manhole, a minimum of one manhole for tanks between 1,000 gallons and 5,000 gallons capacity, and a minimum of two manholes (both are to be at least 36 inches), for tanks larger than 5,000 gallons capacity.		**X**	Tank is equipped with one 24-inch and 8 foot manhole at the Upper Tunnel level and one 30-inch manhole on top of the tank. It is not compelling to provide 36-inch manholes.
LADDER/STAIRS				
i	Internal ladders (in accordance with OSHA criteria) for tanks of 5,000 gallons or larger with floating pans.	X		Internal ladder in good condition and compliant from bottom of tank to the top inside center tower.
LEVEL ALARMS				
l	An individual automatic level alarm system, independent of the gauging device or system for each tank. Include high, high-high, low and low-low level alarms.	X		Tank contains high level and high-high level alarms which alarm separate from ATG system. The remainder of the Alarms are compliant with NAVSUP requirements for the Red Hill Facility.
VENTS				
m	Open atmospheric vents with weather hoods and bird screens or pressure/vacuum vents in lieu of open vents. Comply with NFPA 30, host nation requirements, Chapter 2 of this UFC, API Std 650, API Std 2000, 29 CFR Part 1910.106, and DoD Standard Design AW 78-24-27, where applicable.	X		Tank contains a single 24-inch spiral welded vent line from the top of the tank to the Upper Tunnel Vent spool. The remaining portions of the requirements are not applicable to Red Hill Tanks.
n	Emergency relief venting with capacity in accordance with NFPA 30 and UL 142, as applicable or a weak roof-to-shell seam, as specified in API Std 650.	X		No emergency relief venting required for Red Hill Tanks.
GAUGE/GAUGE HATCH/STILLING WELLS				
o	A liquid level gauge calibrated in 1/16-inch graduations mounted at 60 inches above the walking surface.	X		Tank is outfitted with an ATG system on the top of the tank.
p	Automatic Tank Gauging (ATG) for all tanks with fuel managed through the Defense Logistics Agency's Business Modernization {BSM Enterprise Resource Programs (ERP) - Fuels section}, that complies with API MPMS Chapter 3.	X		Tank is outfitted with an ATG system on the top of the tank.
q	A 4-inch gauge hatch with drop tube to within 3 inches of the bottom of the tank (lowest point in the tank, not the sump). A second 4-inch opening without a drop tube or gauge hatch.	X		Tank does contain a gauge hatch, but does not have a drop tube. Tank is compliant with NAVSUP requirements.

ASSESSMENT OF COMPLIANCE WITH MILITARY CRITERIA

UFC 3-460-01, Table 8-1

(Complete UFC available at www.wbdg.org)

Requirements for Vertical Underground Storage Tank (V-U) Only

ITEM	APPURTENANCE (UFC REQUIREMENT)	COMPLIANT		COMMENTS/RECOMMENDATION (A blank in comments column indicates UFC compliance)
		YES	NO	
r	One 10-inch roof flanged nozzle with an 8-inch aluminum, fully slotted, stilling well for ATG near the edge of the roof near the top of the stairway platform.	X		A 6-inch Aluminum ATG system probe is mounted on a 10-inch nozzle. Tank is compliant with NAVSUP requirements.
s	One 8-inch roof flanged nozzle with a 6-inch aluminum, fully slotted, stilling well for temperature and water bottom sensor, as close to or in the tank sump as possible. See DoD Standard Design AW 78-24-27.	X		There is no separate stilling well for temperature and water bottom sensor. Tank is compliant with NAVSUP requirements.
t	One 10-inch roof nozzle and an aluminum, slotted stilling well extended to within 3 inches of the bottom of the tank* for gauging and sampling. A datum plate to establish a gauging zero point.	X		There is no stilling well for manual tank gauging. Tank is compliant with NAVSUP requirements.
PIPE CONNECTION				
w	Inlet fill pipe with horizontal exit perpendicular to a tank radial. Discharge is approximately 4 inches above tank floor and enlarged to reduce fuel velocity. An inverted trap is placed in the line to serve as a liquid lock to prevent entry of fire or an explosion from outside the fill pipe.		X	32-inch pipe exits perpendicular to tank floor. 18-inch pipe exits perpendicular to tank radial at 2 feet above tank floor. No trap is placed in line. Design is Standard for Red Hill Tanks.
OVERFILL PROTECTION				
x	Overfill protection with a hydraulically operated diaphragm control valve.		X	Not applicable to Red Hill Tanks.
WATER DRAW-OFF				
dd	A central sump pump.	X		Tank is equipped with a 4-inch drain in center of tank. Drain line rises 10 feet to new 20-inch tank penetration pipe.
STRIKER PLATES				
gg	Striker plates under all openings used for manual gauging in steel tanks and all openings in fiberglass tanks.	X		No striker plate installed in Tank 5.
Additional Military Criteria Items, Comments or Notes: None.				

END OF DATA

ATTACHMENT C
NON-DESTRUCTIVE EXAMINATION (NDE) AND EVALUATION CRITERIA

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OUT-OF-SERVICE INSPECTION

CODES AND STANDARDS

API Standard 653, 5th Edition, November 2014

API Standard 650, 12th Edition, March 2013, Addendum 2, January 2016

UFC 3-301-01 Structural Engineering, September 2016

NON DESTRUCTIVE EXAMINATION (NDE)

Tank Inspection (General)

API Standard 653 as applicable.

Visual Inspection

1. Inspection Items
   - In accordance with API Standard 653 and EEI STD for API 653 Out-of-Service Inspection
   - Floor, shell and upper dome welded joints (where accessible).
   - Floor, shell and upper dome surfaces.
   - Items affecting structural and hydraulic integrity
2. Method
   - In accordance with API Standard 653.
   - Special considerations for rounded indications:

     Rounded indications are defined as surface-penetrating discontinuities whose length is less than three times the width. Rounded indications in existing work are subject to further examination when they are obscured by coating and/or debris or if, for any reason, the full extent of the included surface is obscured. Cleaning the area of interest to bare metal is performed prior to re-evaluation of the indication. Removal of coating, serves multiple purposes, such as:
     - Length and width can be accurately measured without the inclusion of an unknown coating thickness;
     - False positive indications caused solely by coating defect can be easily evaluated;
     - Other forms of indication or defect (slag inclusions, for example) can often be hidden by coating and cause the appearance of rounded indications in the coating.
   - Remaining thickness-based criteria for evaluation of indications.

     It is common practice to only bring historically constructed and service-tested equipment into compliance with current code when repair, upgrade or other new construction is performed. For this reason, criteria presented here for surface penetrating (but non-crack forming) indications that have a length component in the through-thickness direction are based on the calculated minimum remaining wall thickness. It is the goal of this criteria to identify and reject any

discontinuity that penetrates the steel to a depth such that the remaining wall thickness is thinner than the calculated minimum based on the calculations presented in Attachment G.

3. Acceptance Criteria

   Acceptance criteria are from the applicable clause in AWS D1.1 and section in API 650:

Indication Type	Acceptance Criteria
Crack	Unacceptable, regardless of size or location
Weld/Base Metal Fusion	Complete fusion shall exist between adjacent layers of weld metal and between weld metal and base metal.
Crater Cross Section	All craters shall be filled to provide the specified weld size, except for the ends of intermittent fillet welds outside of their effective length.
Weld Profiles	Must confirm to AWS D1.1 Subclause 5.23
Undersize Welds	The size of a fillet weld in any continuous weld may be less than the ¼-inch nominal size without correction by 3/32-inch. In all cases, the undersize portion of the weld shall not exceed 10% of the weld length.
Undercut	For existing welds (welds that have previously been in-service) the acceptance criteria for depth of undercut will be based on remaining wall thickness criteria, as calculated in Attachment G.
Porosity, Rounded Indications	Piping shall have no visible porosity. For all other welds porosity shall not exceed 1 indication in 4 inches and the maximum diameter shall not exceed 3/32-inch. In addition, acceptance criteria for depth of the discontinuity will be based on remaining wall thickness criteria, as calculated in Attachment G.

Ultrasonic Testing (UT)

Ultrasonic thickness measurements were taken to establish end of nozzle and floor plate thicknesses.

1. Inspection Items
   - In accordance with EEI NDE Procedure, EEI-UT-002, Ultrasonic Thickness Examination.
   - Floor plates
   - End of nozzles
2. Equipment
   - Olympus 38DL Plus / Olympus 45 MG
3. Method
   - Perform on a spot basis to determine thickness.
   - Perform as follow-up to LFET indications to determine the remaining wall thickness.
4. Acceptance Criteria

   Planar indications such as laminations shall be reported to the inspector of record for further review.

Dual Linear Phased Array UT

Quantitative assessment of the tank shell and floor.

1. Inspection Items
   - In accordance with EEI NDE Procedure, EEI-PAUT-001, Ultrasonic Thickness Examination.
   - Shell plates
   - Upper dome plates
   - Floor plates (to prove up any findings from the LFET)
2. Equipment
   - Olympus OmniScan SX with 7.5 MHz Dual Linear Array Probe for corrosion inspection.
3. Method
   - Perform at follow-up to LFET indications found by TesTex to determine the nature of the indication.
   - Echo/Echo (E/E) or Thru Coat mode for determining metal thickness and backside corrosion on coated surfaces without including thickness of coating in reading.
4. Acceptance Criteria

   Planar indications such as laminations shall be reported to the inspector of record for further review.

Phased Array UT

Quantitative assessment of welds.

1. Inspection Items
   - In accordance with EEI NDE Procedure, EEI-PAUT-002.
   - Circumferential welds of the 32-inch piping.
2. Equipment
   - Olympus OmniScan SX with 5MHz angle beam probe.
3. Method
   - Perform double-sided angle beam inspections of circumferential welds according to established scan plans developed for addressing the piping thickness and weld orientation.
4. Acceptance Criteria
   - ASME B31.3
   - A linear-type discontinuity is unacceptable if the amplitude of the indication exceeds the reference level and its length exceeds ¼ in. for pipe thickness less than or equal to ¾ in.

Low Frequency Electromagnetic Technique (LFET)

1. Inspection Items
   - In accordance with TesTex Inspection Procedure.

2. Equipment

   - FALCON S (8-Channel), 18.10 KHz

   The equipment utilizes magnetizing core that acts as a DC electromagnet to generate a strong magnetic field. The saturation lowers the permeability of the ferromagnetic material which allows the Eddy Current field to penetrate deeper into the material being tested. Any wall loss will result in a concentration of the magnetic field in the remaining wall, resulting in an increased magnetic flux density around and under the defect. The distortion of the magnetic field is measured as a change of phase and amplitude in the secondary voltage generated by the material. The signal amplitude of the defect indication is in direct proportion to the volume of the defect. The signal phase of the defect indication is used to differentiate top side or bottom side defects

3. Detection Capability

   The equipment is calibrated on a 1/4-inch thick function test plate with three machined metal loss defects:

   - 1/8-inch diameter hole in 1/4-inch thick plate
   - A tapered hole drilled 40% backside metal loss of plate thickness on surface opposite the detection equipment
   - A machined notch across the width of the function test plate

   Any signal that can be clearly distinguished from background noise during floor scanning is marked for follow-up testing by ultrasonic A-Scan.

4. Acceptance Criteria

   - Indication - Full screen LED display in "red" zone requires follow-up ultrasonic testing to determine nature of the indication.

5. Areas Not Accessible to Scanning

   - Within 1-inch of tank shell
   - Within 1-inch of welded joints
   - Floor areas below interior piping and appurtenances where the equipment cannot fit
   - Sumps
   - Below column bases and pipe supports
   - Patch plates

Balanced Field Electromagnetic Technique (LFET)

1. Inspection Items
   - In accordance with TesTex Inspection Procedure.
2. Equipment
   - FALCON S (8-Channel), 18.10 KHz
   - Hawkeye probe

   The Hawkeye probe creates a balanced field in which small changes in the electromagnetic field can be detected by reducing the noise through phase rotation of the horizontal and vertical component of the signal. This allows the Hawkeye probe to detect surface and subsurface cracking.
3. Detection Capability
   - The equipment is calibrated to TesTex standards.
4. Acceptance Criteria
   - Indication - The flaw will appear as a differential signal

Pit Survey

1. Inspection Items
   - Tank floor
   - Tank shell
   - Tank Upper Dome
2. Equipment
   - Mechanical pit gauges

Magnetic Particle Testing (MT)

1. Inspection items
   - In accordance with EEI NDE Procedure, EEI-NDE-001
   - Mitered welds in the 32-inch
   - 8-inch drain cap
   - TesTex weld BFET indications
   - Plug welds in the adjustment plate and expansion joint
   - Strain gauges
2. Equipment
   - Magnaflux Y-1

   The Magnaflux Y-1 is AC electromagnetic yoke.

3. Method

   - The application of wet visible or fluorescent particles shall be by spraying or flowing the medium under the continuous magnetization technique; i.e., the magnetizing current remains on while the examination medium is being applied and while excess of the examination medium is being removed.
   - At least two separate examinations shall be carried out at each location. During the second examination, the lines of magnetic flux shall be approximately perpendicular to those used during the first examination.

4. Acceptance Criteria

   All surfaces to be examined shall be free of:

   - Relevant linear indications;
   - Relevant rounded indications greater than 3/16-inch;
   - Four or more relevant rounded indications in a line separated by 3/16-inch or less, edge to edge.

Vacuum Box Testing (VBT)

1. Inspection Items

   - 8-inch drain cap
   - Strain gauges
   - Adjustment plate welds
   - Expansion joint welds
   - Tower leg welds

2. Equipment

   - Custom vacuum boxes built in situ for different welds.

3. Method

   - The application of a soap film solution is applied in accordance with API 650.
   - Initial pressure of between 21 and 35 kPa in which the vacuum is formed.
   - Increase and test under 56 to 70 kPa

4. Acceptance Criteria

   - Indications - The continuous formation or growth of bubbles produced by air passing through the thickness is a through thickness leak indication. A large opening leak is indicated by the quick bursting bubbles or spitting response at initial pressure of vacuum.

Coating Thickness Measurements

1. Equipment

   - PosiTector 6000 Thickness Gauge

ATTACHMENT D
TANK DRAWINGS

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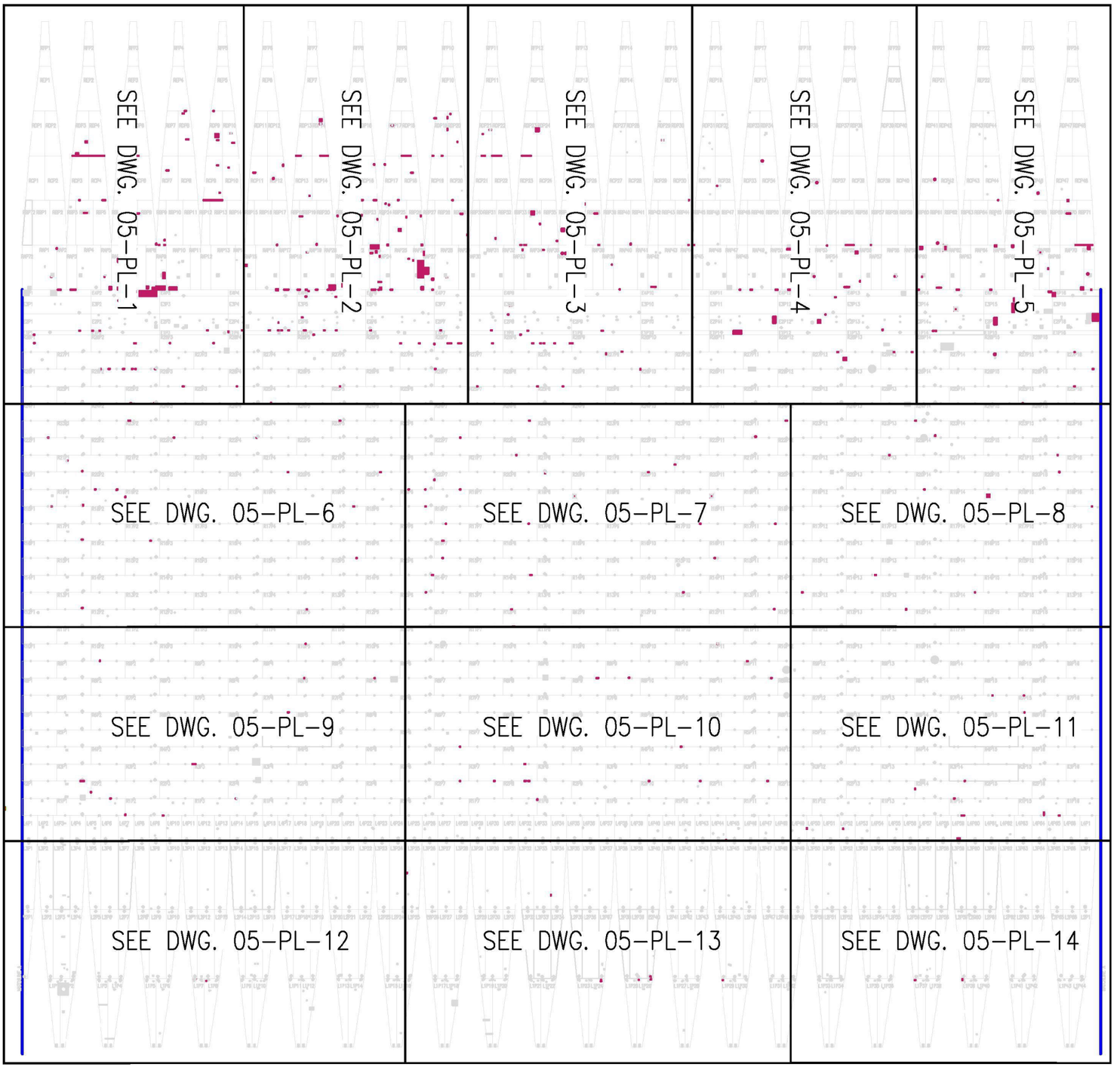


MASTER PLATE LAYOUT

SCALE: N.T.S.

REVISION A
SHEET - OF -
PLATE NO. 05-PL-0
BOARD AS NOTED

PROJECT STATION/INSTALLATION: PEARL HARBOR, HAWAII

TANK 5 REPAIRS RED HILL COMPLEX
FLC PEARL HARBER JBPHH, HAWAII

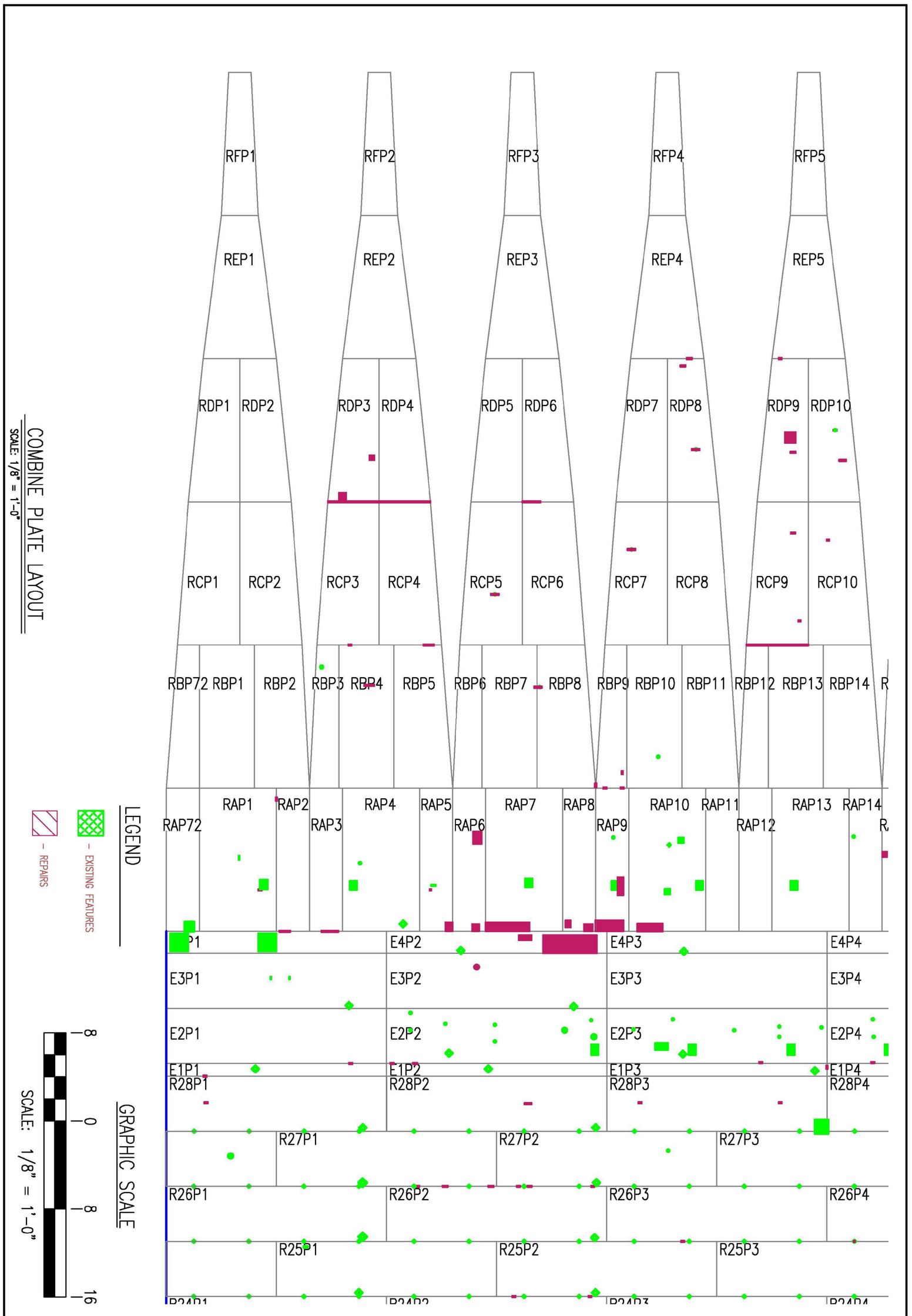
MASTER PLATE LAYOUT

APPD XXXX 04/12/18
CK XXXX
DES ??? DWN ??? CHK ???

CONTRACT N 39430-15-D-1632 TO 5 8877
EFD PROJECT NO.

ENTERPRISE
ENGINEERING, INC.
400 US ROUTE 1
NORTH SUITE B
FALMOUTH, ME 04105
TEL. (207) 869-8006
FAX (207) 869-8015
2525 GAMBELL STREET
SUITE 200
ANCHORAGE, AK 99503
TEL. (907) 563-3835
FAX (907) 563-3817
PRIME CONTRACTOR

SYM	DESCRIPTION	DATE	APPR
A	FOR REVIEW	06/18/18	DJK



PROJECT STATION/INSTALLATION: PEARL HARBOR, HAWAII

TANK 5 REPAIRS RED HILL COMPLEX
FLC PEARL HARBER JBPHH, HAWAII

PLATE REPAIRS

REVISION: A
SHEET: - OF -
PLATE NO.: 05-PL-1
BOARD: AS NOTED
APP'D: XXXX
DATE: 04/12/18
CONTRACT NO.: N 39430-15-D-1632 TO 5
EFD PROJECT NO.: 8877

ENTERPRISE
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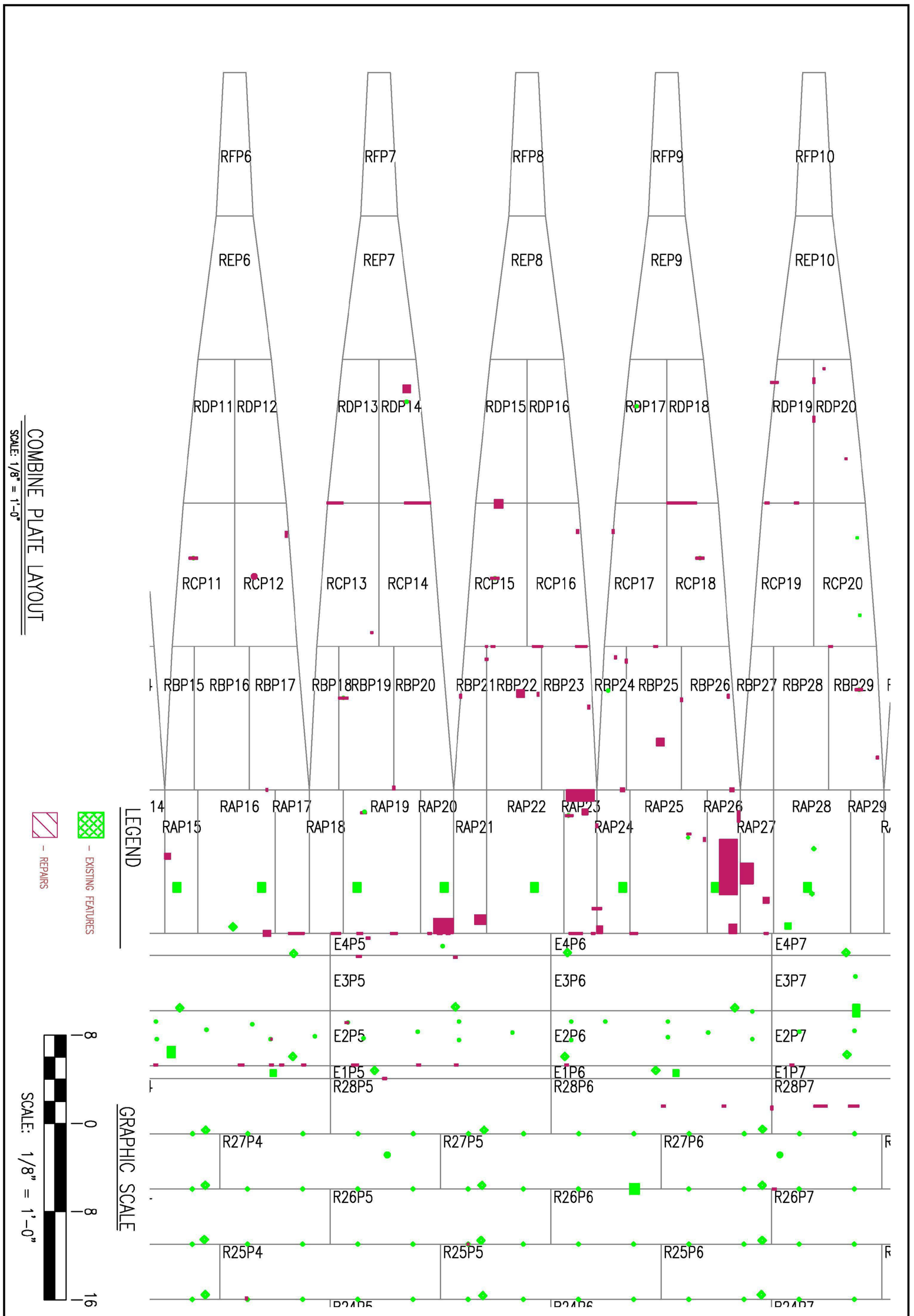

REVISION A	SHEET - OF -	SCALE AS NOTED	PLATE NO. 05-PL-2

PROJECT STATION/INSTALLATION: PEARL HARBOR, HAWAII

TANK 5 REPAIRS RED HILL COMPLEX
FLC PEARL HARBER JBPHH, HAWAII

PLATE REPAIRS

DES ???? CHK ????
APP'D XXXX
DATE 04/12/18

CONTRACT N 39430-15-D-1632 TO 5
EFD PROJECT NO.: 8877

ENTERPRISE
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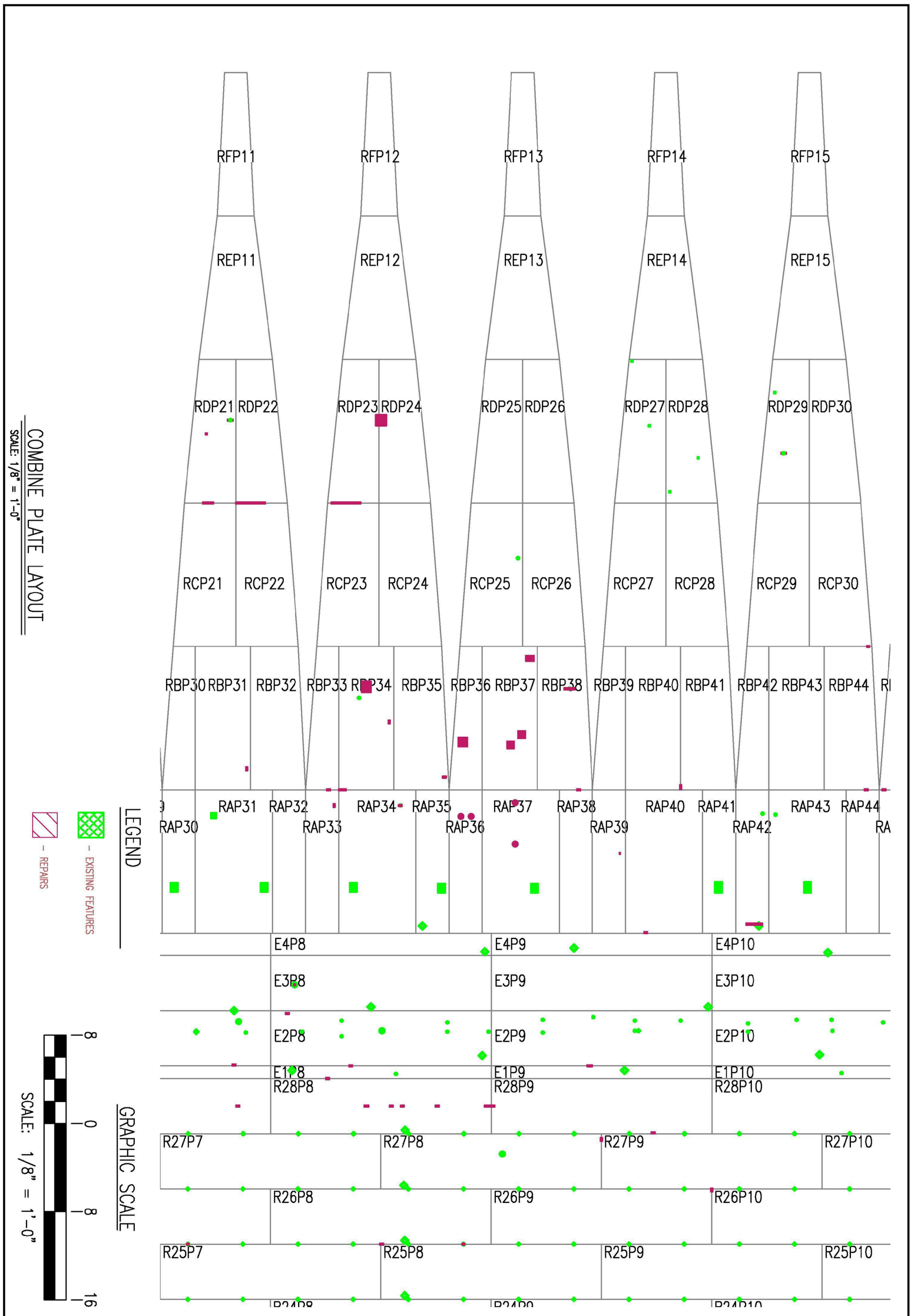
A	FOR REVIEW	06/18/18	DJK



REVISION A	SHEET - OF -	BOARD AS NOTED	PROJECT STATION/INSTALLATION: PEARL HARBOR, HAWAII	CONTRACT N 39430-15-D-1632 TO 5
	PLATE NO. 05-PL-3		TANK 5 REPAIRS RED HILL COMPLEX FLC PEARL HARBER JBPHH, HAWAII	DES 7777 DWN 7777 CHK 7777
			PLATE REPAIRS	APPD XXXX DATE 04/12/18 CK XXXX EDS PROJECT NO. 88177

ENTERPRISE
ENGINEERING, INC.
400 US ROUTE 1
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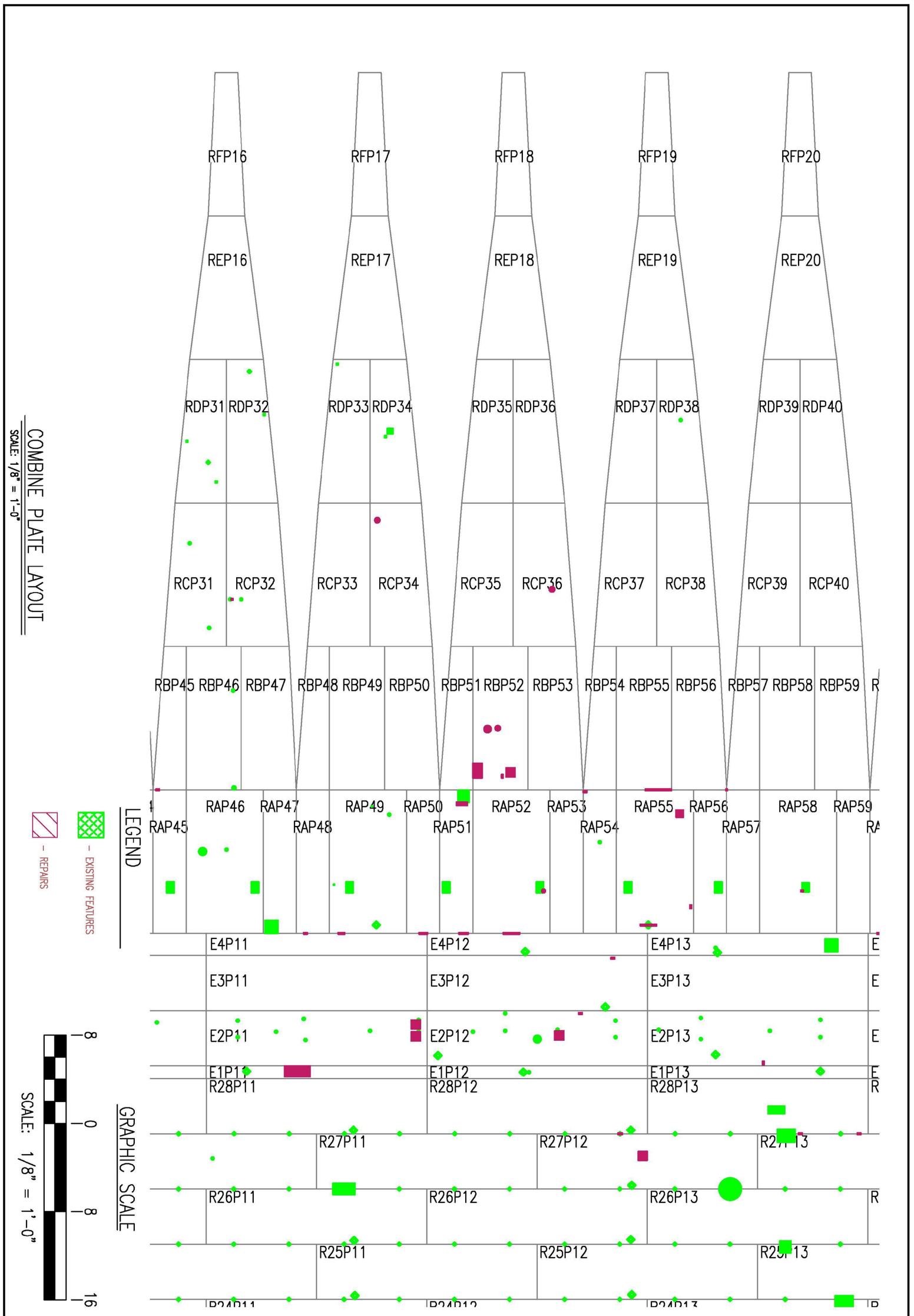
2525 CAMBELL STREET
SUITE 200
ANCHORAGE, AK 99503
TEL. (907) 563-3835
FAX (907) 563-3817
PRIME CONTRACTOR

SYM	DESCRIPTION	DATE	APPR
A	FOR REVIEW	06/18/18	DJK



REVISION A	SHEET - OF -	SHEET NO. 05-PL-4	BOARD AS NOTED

PROJECT STATION/INSTALLATION: PEARL HARBOR, HAWAII

TANK 5 REPAIRS RED HILL COMPLEX
FLC PEARL HARBER JBPHH, HAWAII

PLATE REPAIRS

APPD	XXXX	CHK	???
DES	???	DWN	???

CONTRACT N 39430-15-D-1632 TO 5 8877

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ENGINEERING, INC.
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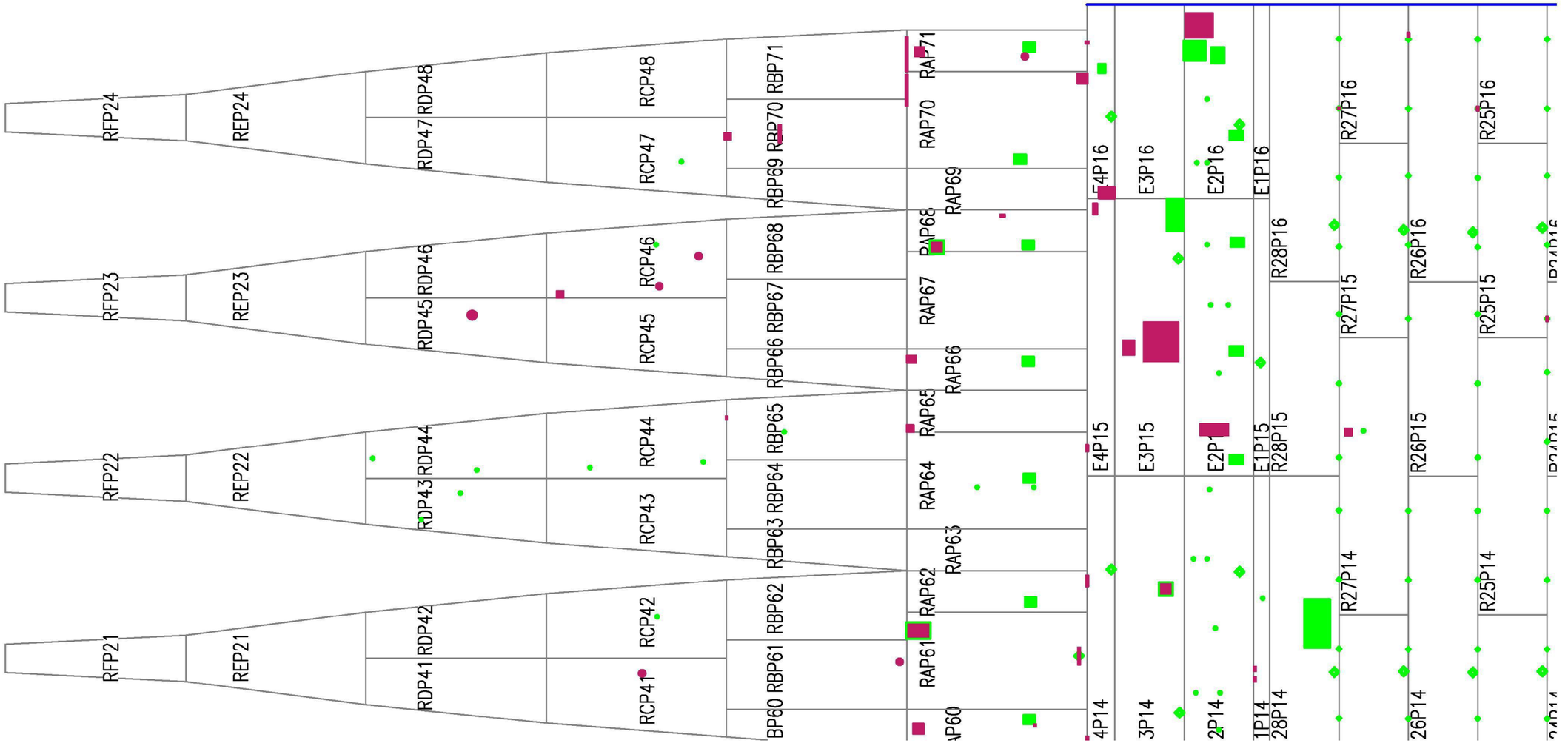
PRIME CONTRACTOR

SYM	DESCRIPTION	DATE	APPR
A	FOR REVIEW	06/18/18	DJK



LEGEND

– EXISTING FEATURES

– REPAIRS

GRAPHIC SCALE

8 0 8 16

SCALE: 1/8" = 1'-0"

COMBINE PLATE LAYOUT

SCALE: 1/8" = 1'-0"

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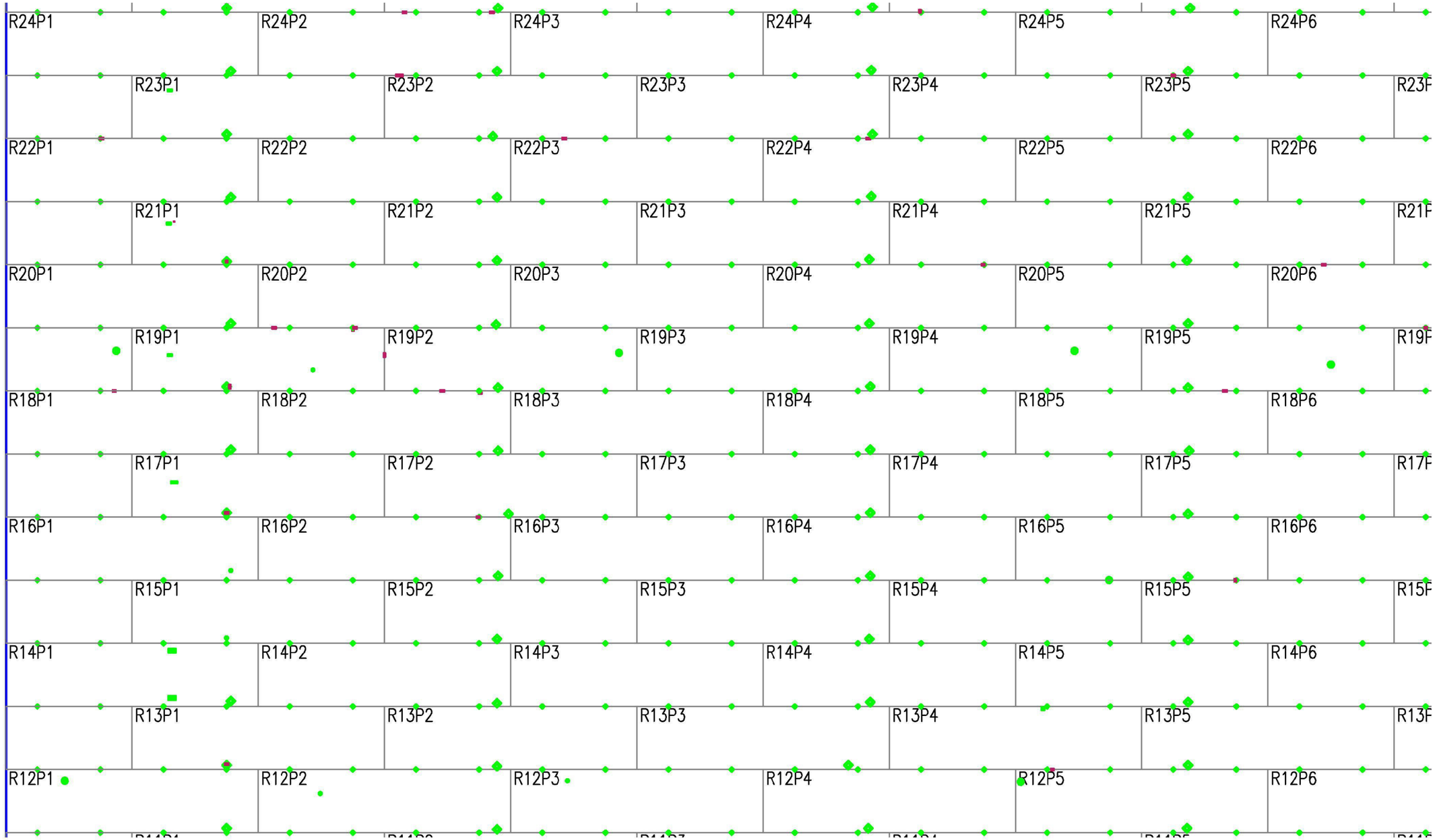
STM	DESCRIPTION	DATE	APPR
A	FOR REVIEW	06/18/18	DJK

CONTRACT 8877
N 39430-15-D-1632 TO 5
EED PROJECT NO.:
DES ??? DRN ??? CHK ???
QA XXXX
APVD XXX
DATE 04/12/18

PROJECT STATION/INSTALLATION
PEARL HARBOR, HAWAII
TANK 5 REPAIRS RED HILL COMPLEX
FLC PEARL HARBER JBPHH, HAWAII

PLATE REPAIRS

SCALE: AS NOTED
PLATE NO. 05-PL-5
SHEET - OF -
REVISION A



LEGEND

– EXISTING FEATURES

– REPAIRS

GRAPHIC SCALE

8 0 8 16

SCALE: 1/8" = 1'-0"

COMBINE PLATE LAYOUT

SCALE: 1/8" = 1'-0"

A	FOR REVIEW		06/19/18	DJK
STM	DESCRIPTION		DATE	APPR

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CONTRACT 8877
N 39430-15-D-1632 TO 5
EEI PROJECT NO.:

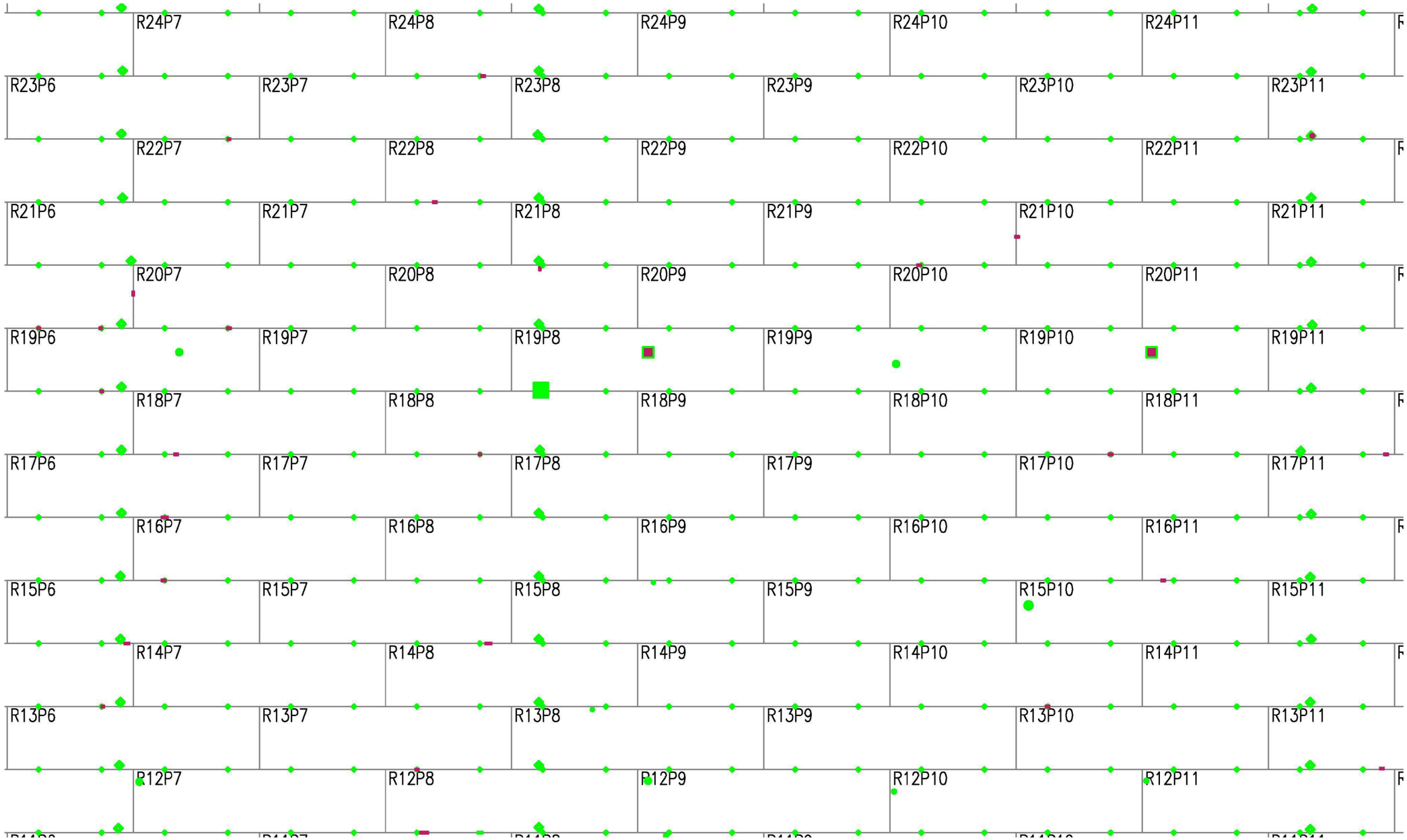
DES. ??? DRW ??? CHK ???
QA XXXX
APVD XXX
DATE 04/12/18

PROJECT STATION/INSTALLATION
PEARL HARBOR, HAWAII

TANK 5 REPAIRS RED HILL COMPLEX
FLC PEARL HARBER JBPHH, HAWAII

PLATE REPAIRS

SCALE: AS NOTED
PLATE NO. 05-PL-6
SHEET - OF -
REVISION A



COMBINE PLATE LAYOUT

SCALE: 1/8" = 1'-0"

LEGEND

- EXISTING FEATURES
- REPAIRS

GRAPHIC SCALE

8 0 8 16

SCALE: 1/8" = 1'-0"

A	FOR REVIEW	06/19/18	DJK
STM	DESCRIPTION	DATE	APPR

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CONTRACT 8877
N 39430-15-D-1632 TO 5
EED PROJECT NO.:

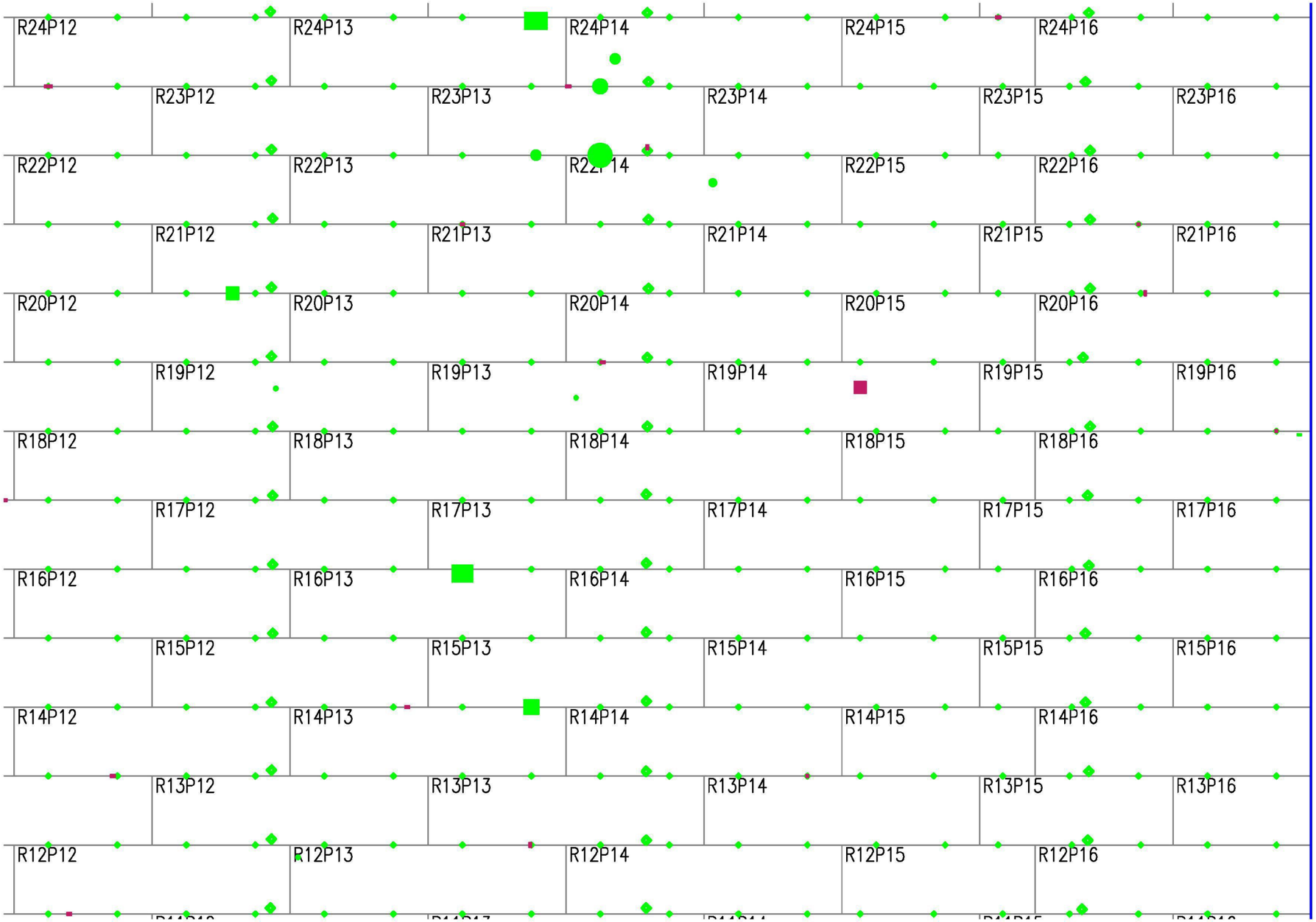
DES: ??? DRN: ??? CHK: ???
QA: XXXX
APVD: XXX
DATE: 04/12/18

PROJECT STATION/INSTALLATION: PEARL HARBOR, HAWAII

TANK 5 REPAIRS RED HILL COMPLEX
FLC PEARL HARBER JBPHH, HAWAII

PLATE REPAIRS

SCALE: AS NOTED
PLATE NO. 05-PL-7
SHEET - OF -
REVISION A



COMBINE PLATE LAYOUT

SCALE: 1/8" = 1'-0"

LEGEND

– EXISTING FEATURES

– REPAIRS

GRAPHIC SCALE

8 0 8 16

SCALE: 1/8" = 1'-0"

A	FOR REVIEW		06/18/18	DJK
STM	DESCRIPTION		DATE	APPR

ENTERPRISE
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ANCHORAGE, AK 99503
TEL. (907) 563-3835
FAX (907) 563-3817

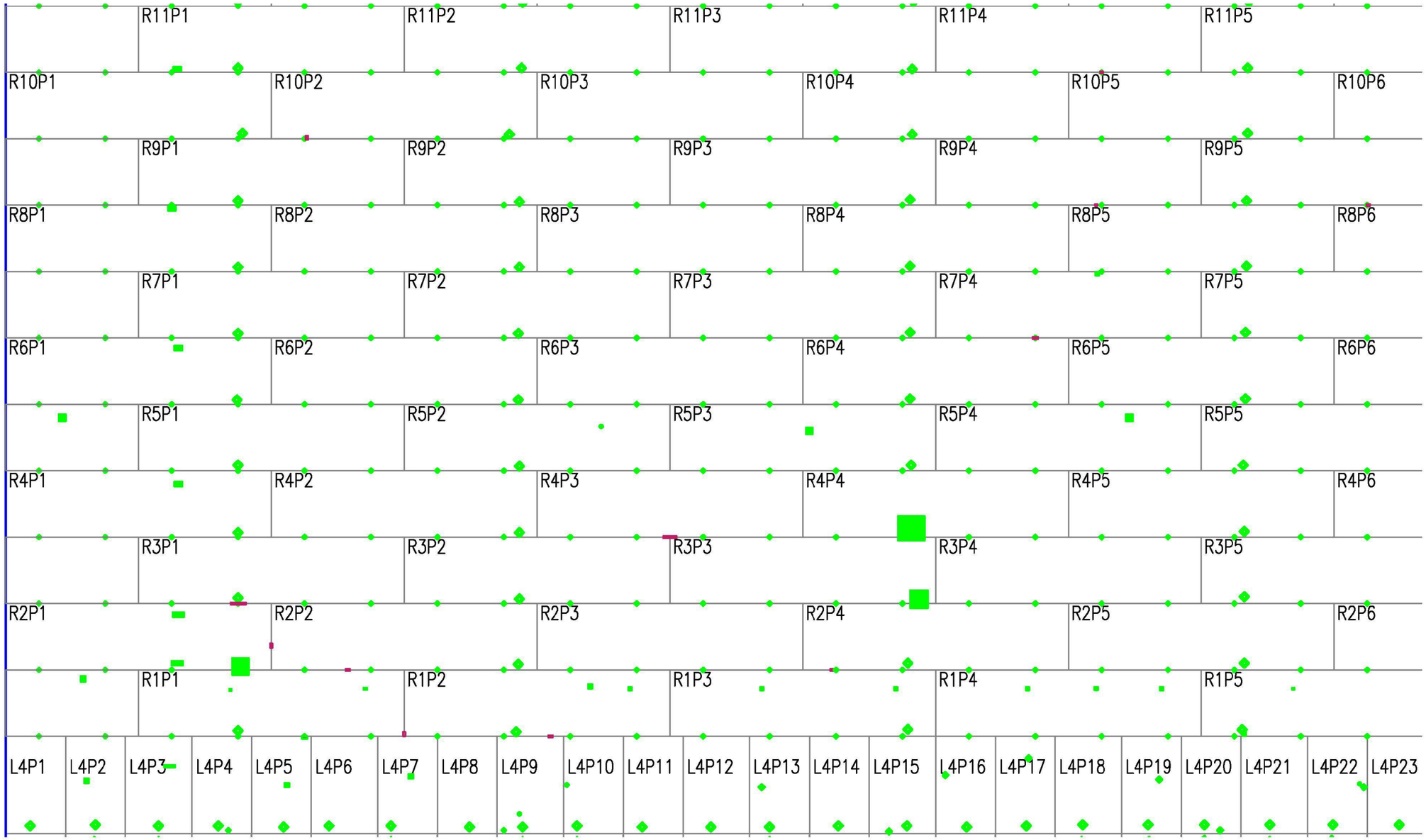
COMMENT 8877
N 39430-15-D-1632 TO 5
EED PROJECT NO.:
DES ??? DRWN ??? CHK ???
QA XXXX
APVD XXX
DATE 04/12/18

PROJECT STATION/INSTALLATION
PEARL HARBOR, HAWAII

TANK 5 REPAIRS RED HILL COMPLEX
FLC PEARL HARBER JBPHH, HAWAII

PLATE REPAIRS

SCALE AS NOTED
PLATE NO. 05-PL-8
SHEET – OF –
REVISION A



LEGEND

– EXISTING FEATURES

– REPAIRS

GRAPHIC SCALE

8 0 8 16

SCALE: 1/8" = 1'-0"

COMBINE PLATE LAYOUT

SCALE: 1/8" = 1'-0"

NO.	DESCRIPTION	DATE	APPR
A	FOR REVIEW	06/18/18	DJK

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SUITE 200
ANCHORAGE, AK 99503
TEL. (907) 563-3835
FAX (907) 563-3817

CONTRACT 8877
N 39430-15-D-1632 TO 5
EIS PROJECT NO.:

DES ??? DRN ??? CHK ???
QA: XXXX
APVD: XXX
DATE 04/12/18

PROJECT STATION/INSTALLATION
PEARL HARBOR, HAWAII
TANK 5 REPAIRS RED HILL COMPLEX
FLC PEARL HARBER JBPHH, HAWAII

PLATE REPAIRS

SCALE: AS NOTED
PLATE NO. 05-PL-9
SHEET – OF –
REVISION A

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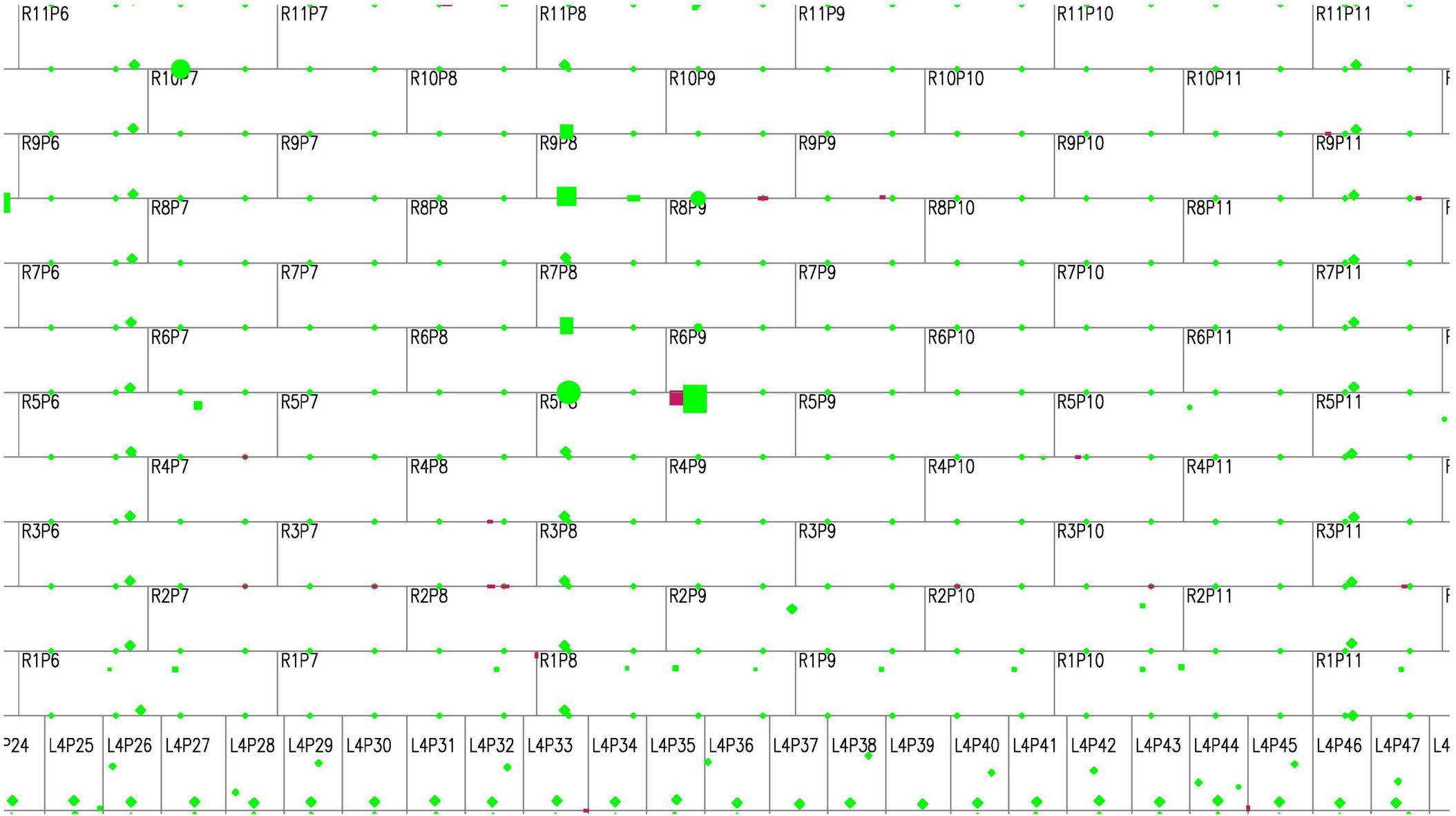
BWS032195



COMBINE PLATE LAYOUT

SCALE: 1/8" = 1'-0"

LEGEND

– EXISTING FEATURES

– REPAIRS

GRAPHIC SCALE

8 0 8 16

SCALE: 1/8" = 1'-0"

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STM	DESCRIPTION	DATE	APPR

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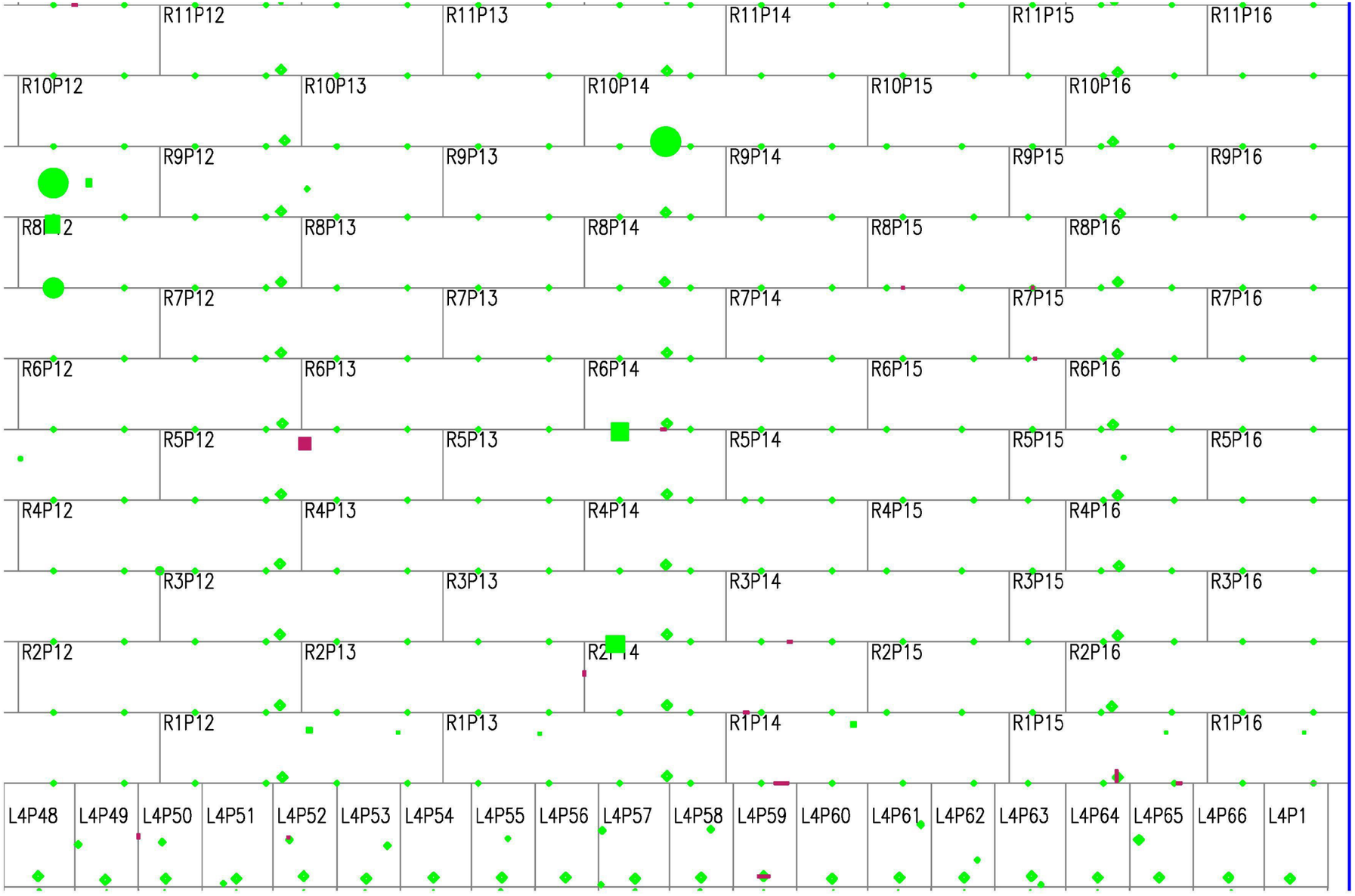
CONTRACT 8877
N 39430-15-D-1632 TO 5
EIS PROJECT NO.:
DES ??? DRN ??? CHK ???
QA: XXXX
APVD: XXX
DATE 04/12/18

PROJECT STATION/INSTALLATION
PEARL HARBOR, HAWAII
TANK 5 REPAIRS RED HILL COMPLEX
FLC PEARL HARBER JBPHH, HAWAII

PLATE REPAIRS

SCALE: AS NOTED
PLATE NO. 05-PL-10
SHEET – OF –
REVISION A

RDHLCC0028665
BWS032196



COMBINE PLATE LAYOUT

SCALE: 1/8" = 1'-0"

LEGEND

- EXISTING FEATURES
- REPAIRS

GRAPHIC SCALE

8 0 8 16

SCALE: 1/8" = 1'-0"

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STM	DESCRIPTION	DATE	APPR

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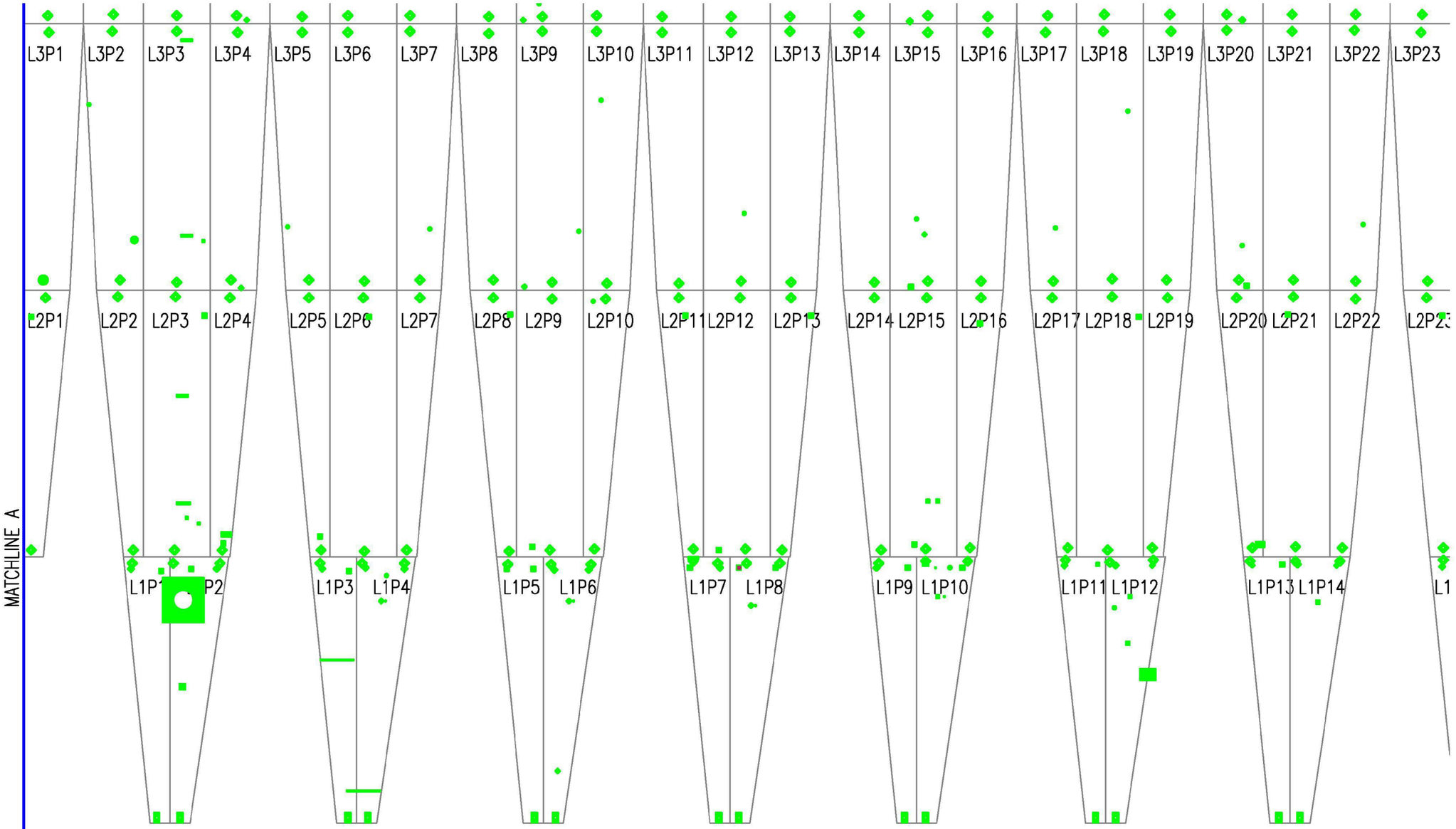
CONTRACT 8877
N 39430-15-D-1632 TO 5
EIS PROJECT NO.:
DES ??? DRN ??? CHK ???
QA: XXXX
APVD: XXX
DATE 04/12/18

PROJECT STATION/INSTALLATION
PEARL HARBOR, HAWAII
TANK 5 REPAIRS RED HILL COMPLEX
FLC PEARL HARBER JBPHH, HAWAII

PLATE REPAIRS

SCALE: AS NOTED
PLATE NO. 05-PL-11
SHEET - OF -
REVISION A



COMBINE PLATE LAYOUT

SCALE: 1/8" = 1'–0"

REV	DESCRIPTION	DATE	APPR
A	FOR REVIEW	06/19/18	DJK

ENTERPRISE
ENGINEERING, INC.
400 US ROUTE 1 NORTH SUITE B FALMOUTH, ME 04105 TEL. (207) 869-9006 FAX (207) 869-9015
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COMMENT 8877
N 39430-15-D-1632 TO 5
EDS PROJECT NO.:
DES ??? DRN ??? CHK ???
QA: XXXX
APVD: XXX
DATE 04/12/18

PROJECT STATION/INSTALLATION: PEARL HARBOR, HAWAII
TANK 5 REPAIRS RED HILL COMPLEX
FLC PEARL HARBER JBPHH, HAWAII

PLATE REPAIRS

SCALE: AS NOTED
PLATE NO. 05-PL-12
SHEET – OF –
REVISION A

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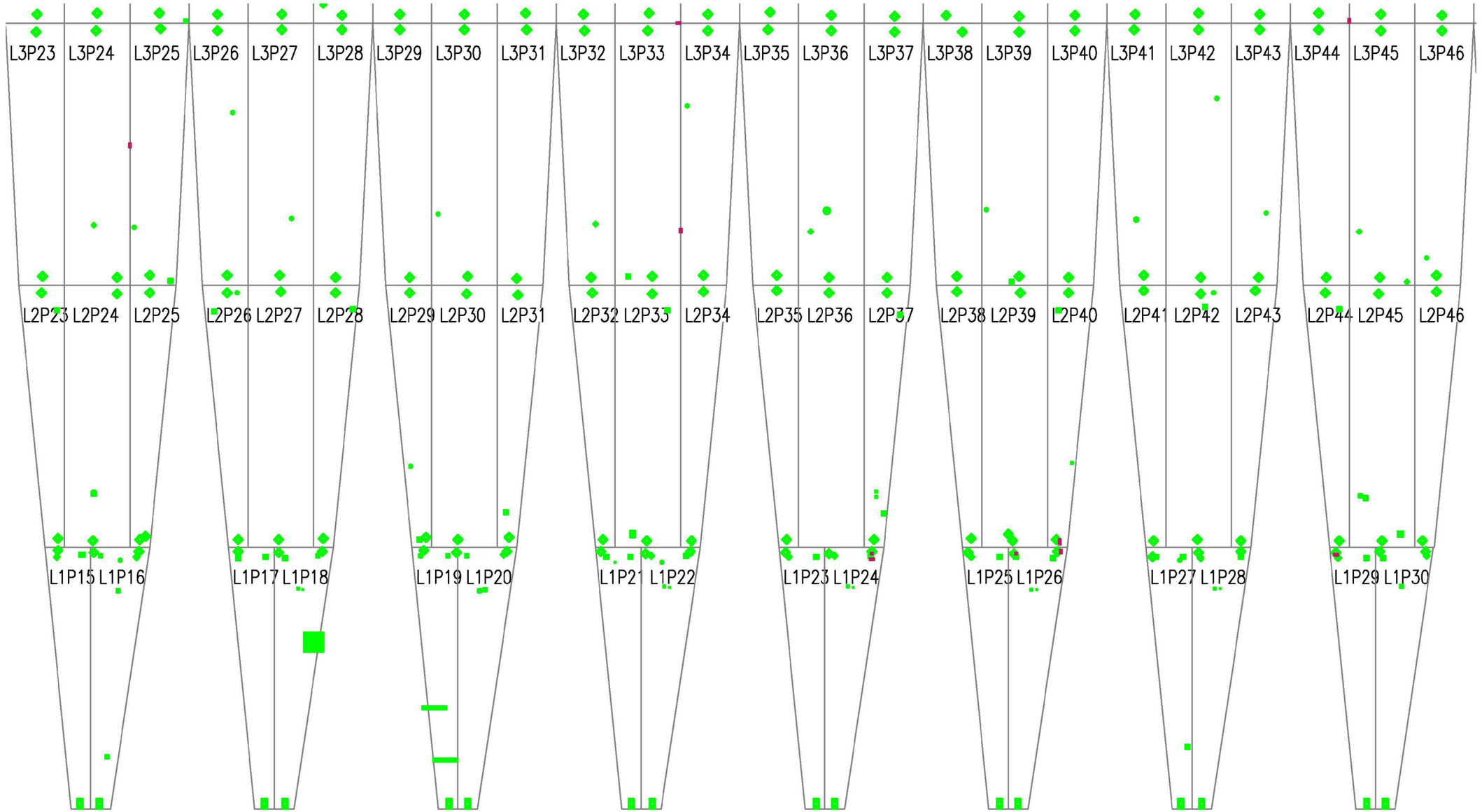
BWS032198



COMBINE PLATE LAYOUT

SCALE: 1/8" = 1'-0"

LEGEND

– EXISTING FEATURES

– REPAIRS

GRAPHIC SCALE

8 0 8 16

SCALE: 1/8" = 1'-0"

REVISIONS			
STM	DESCRIPTION	DATE	APPR
A	FOR REVIEW	06/19/18	DJK

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CONTRACT 8877
N 39430-15-D-1632 TO 5
EIG PROJECT NO.:

DES: ??? DRN: ??? CHK: ???
QA: XXXX
APVD: XXX
DATE 04/12/18

PROJECT STATION/INSTALLATION: PEARL HARBOR, HAWAII

TANK 5 REPAIRS RED HILL COMPLEX
FLC PEARL HARBER JBPHH, HAWAII

PLATE REPAIRS

SCALE: AS NOTED
PLATE NO. 05-PL-13
SHEET - OF -
REVISION A

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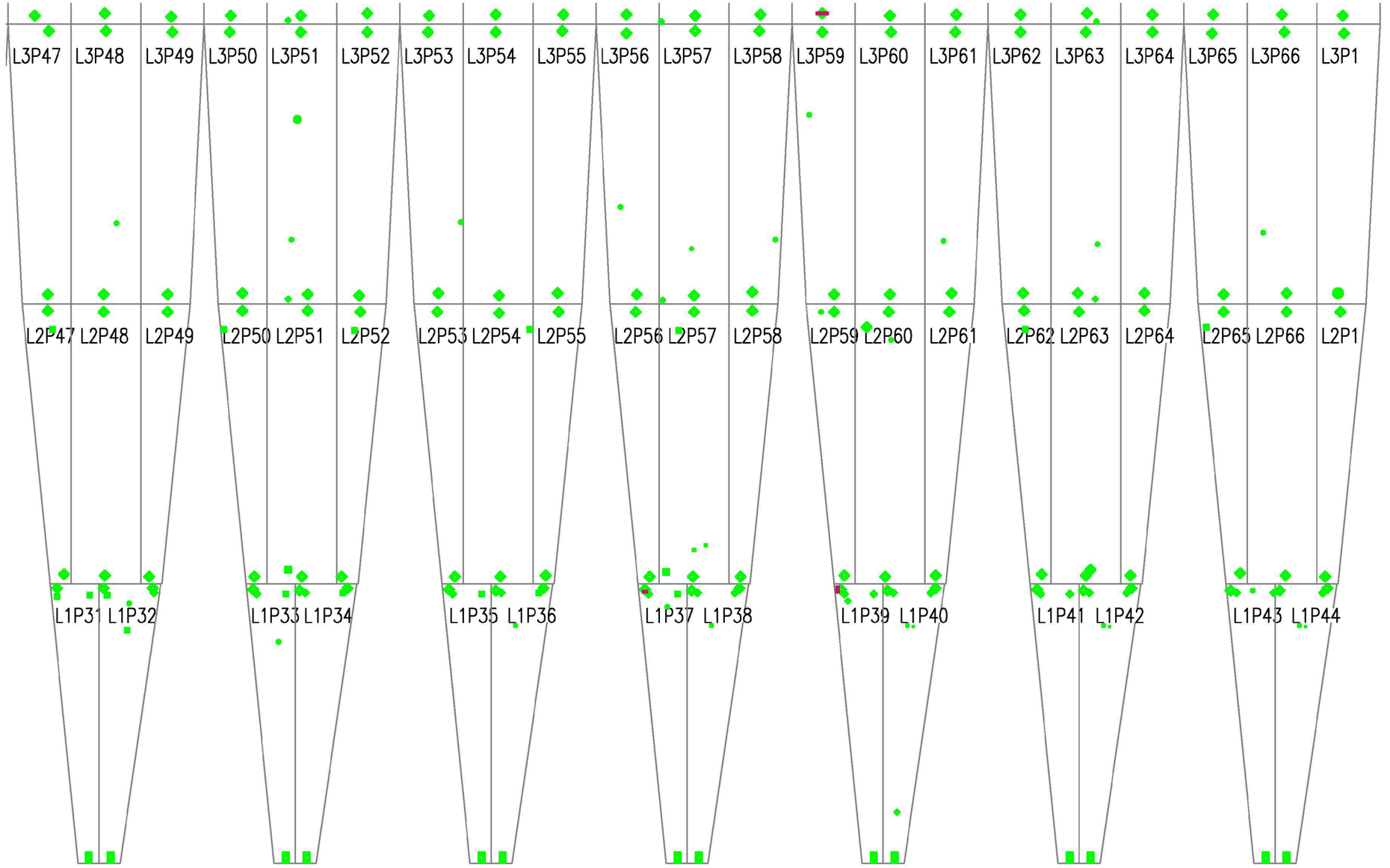

COMBINE PLATE LAYOUT

SCALE: 1/8" = 1'-0"

LEGEND

- EXISTING FEATURES
- REPAIRS

GRAPHIC SCALE

8 0 8 16

SCALE: 1/8" = 1'-0"

REVISION	STM	DESCRIPTION	DATE	APPR
A		FOR REVIEW	06/19/18	DJK

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CONTRACT 8877
N 39430-15-D-1632 TO 5
EIS PROJECT NO.:

DES: ??? DRN: ??? CHK: ???
QA: XXXX
APVD: XXX
DATE 04/12/18

PROJECT STATION/INSTALLATION
PEARL HARBOR, HAWAII
TANK 5 REPAIRS RED HILL COMPLEX
FLC PEARL HARBER JBPHH, HAWAII

PLATE REPAIRS

SCALE: AS NOTED
PLATE NO. 05-PL-14
SHEET - OF -
REVISION A

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ATTACHMENT E
TANK PHOTOGRAPHS

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Photo 1: Upper Tunnel Manway

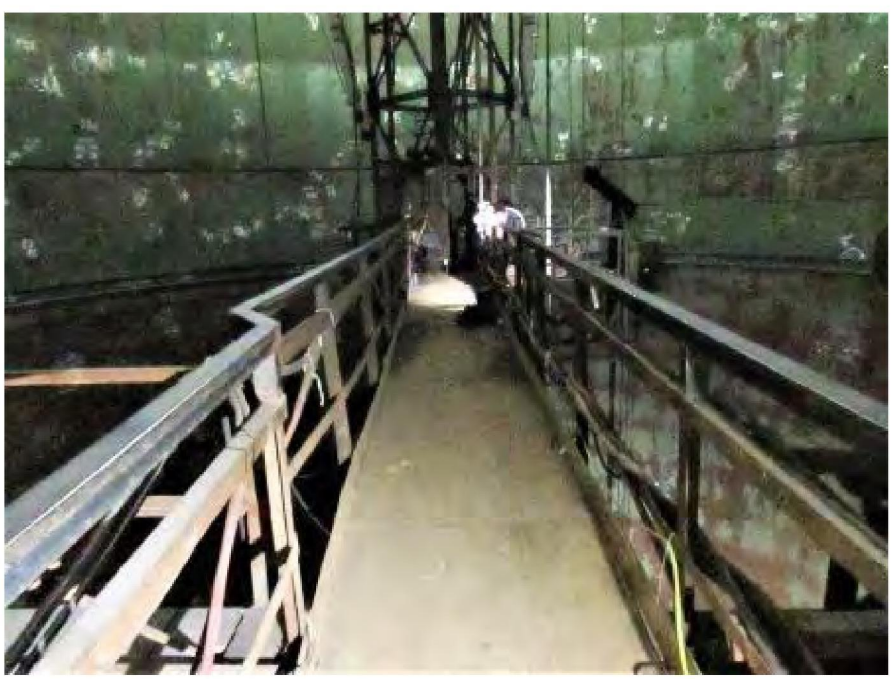

Photo 2: Catwalk and Center Tower

Photo 3: Tank Upper Dome

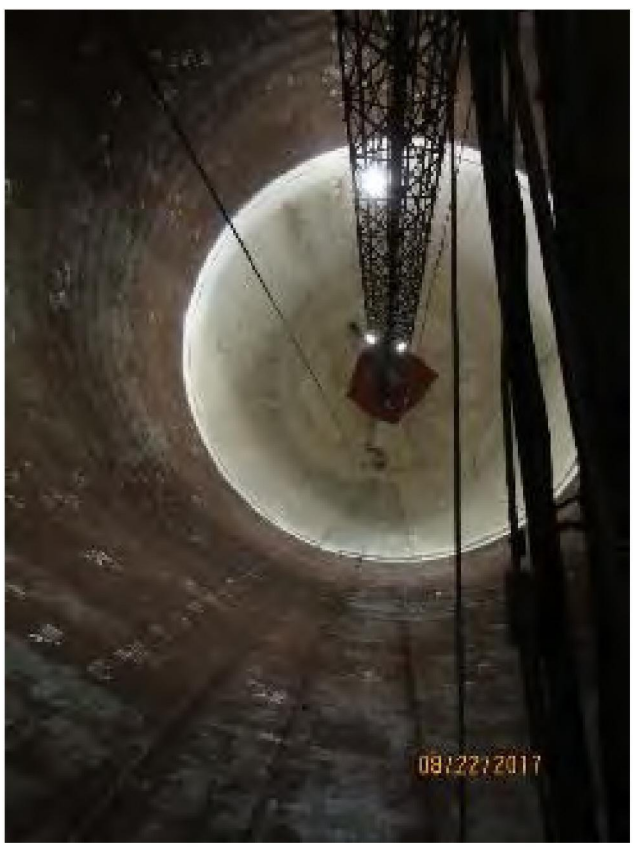

Photo 4: Tank Lower Dome & Barrel

Photo 5: Tank Floor

Photo 6: Tank Floor

Photo 7: Tank Drain Line Cap
(Note: Indications found with Magnetic Particle Testing).

Photo 8: Drain and Sample Lines from new Tank Penetration

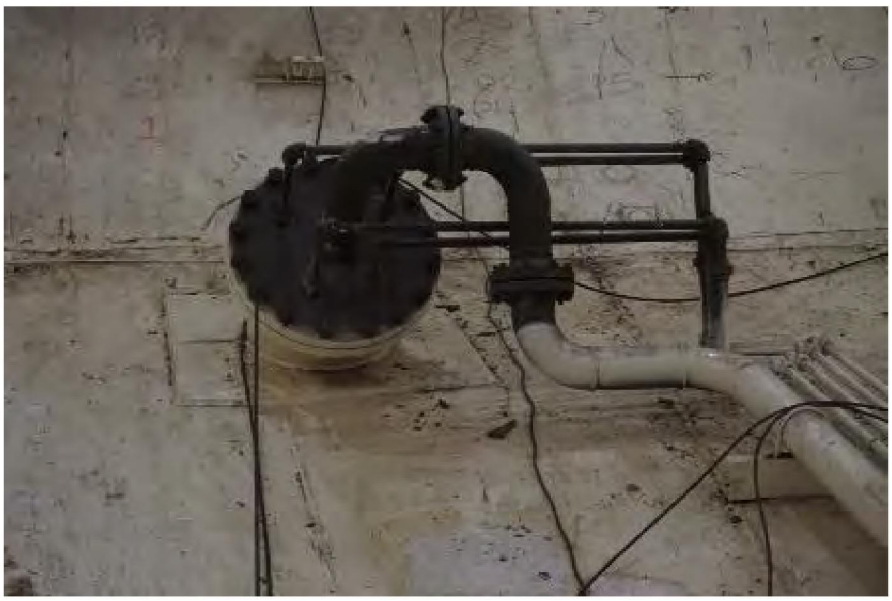

Photo 9: Tank Drain and Sample Lines

Photo 10: Sample Lines
(Note: Supports not seal welded to tank floor).

Photo 11: Old stilling well still welded to floor

Photo 12: ATG Probe

Photo 13: Internal 18-inch Piping

Photo 14: Internal 32-inch Piping

Photo 15: Lower Tunnel Pipe Penetrations

Photo 16: 32-inch piping interior pitting

Photo 17: 32-inch pipe circumferential weld defects

Photo 18: 32-inch pipe with Insert Patch Plate

Photo 19: Tank Upper Access Area

Photo 20: Upper Access Manway

Photo 21: Roof Manhole with ATG

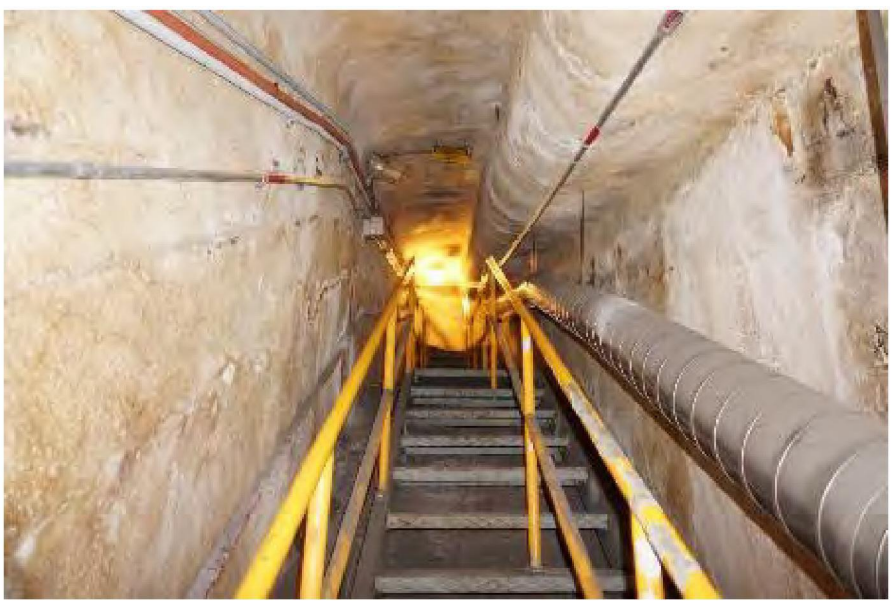

Photo 22: Upper Access Stairway
(Note: Vent Pipe encased in concrete).

Photo 23: Upper Dome Course B

Photo 24: Upper Dome Course C

Photo 25: Upper Dome Course D

Photo 26: Extension Ring Plug Welds

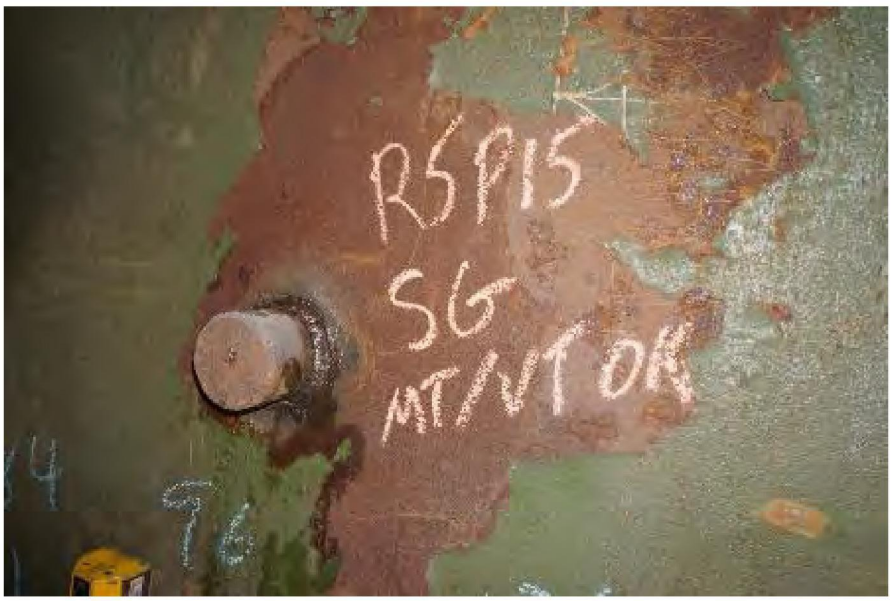

Photo 27: Barrel Strain Gauge Pipe Cap

Photo 28: Backside Corrosion on existing ground areas

Photo 29: Backside Corrosion around existing patch plates

Photo 30: Multiple Backside Corrosion Indications on B Course Plate

Photo 31: Typical Backside Corrosion Indication in D Course

Photo 32: Larger Backside Corrosion Indications in Extension Ring Plates

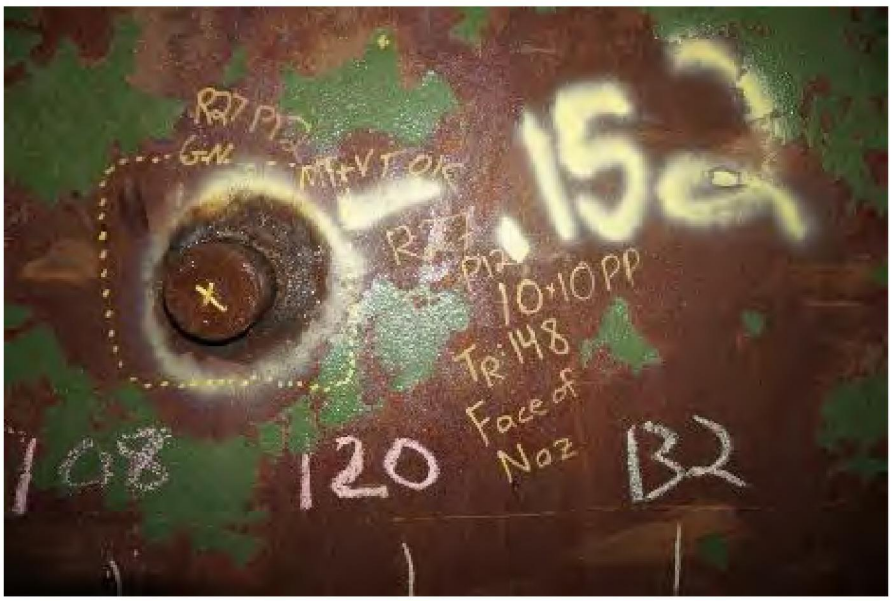

Photo 33: Pipe Cap covering existing grout nozzle with Backside Corrosion

Photo 34: Dent requiring repair in A Course

Photo 35: Undercut Indication in A Course

Photo 36: Rounded Indication

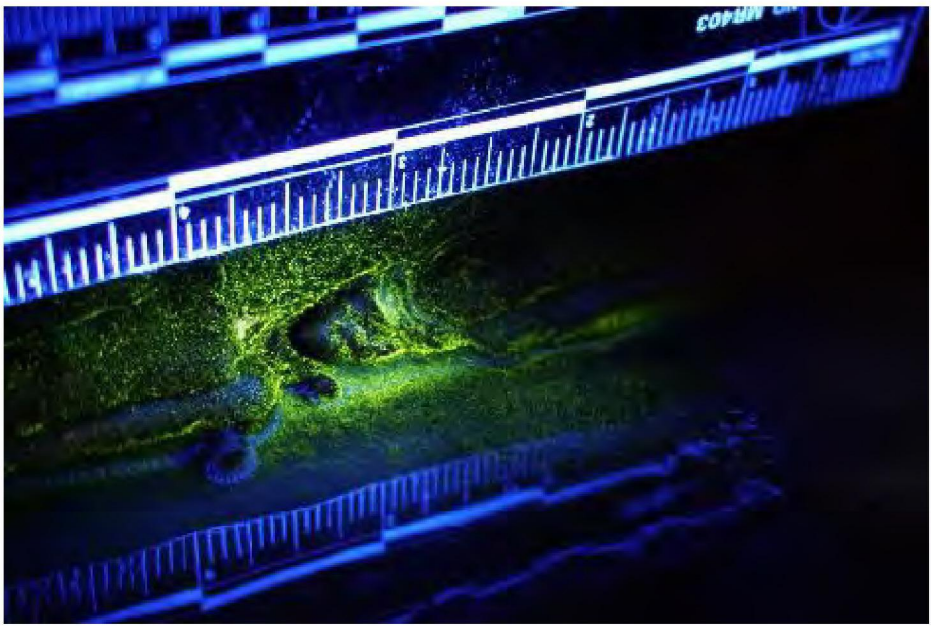

Photo 37: MT black light photo

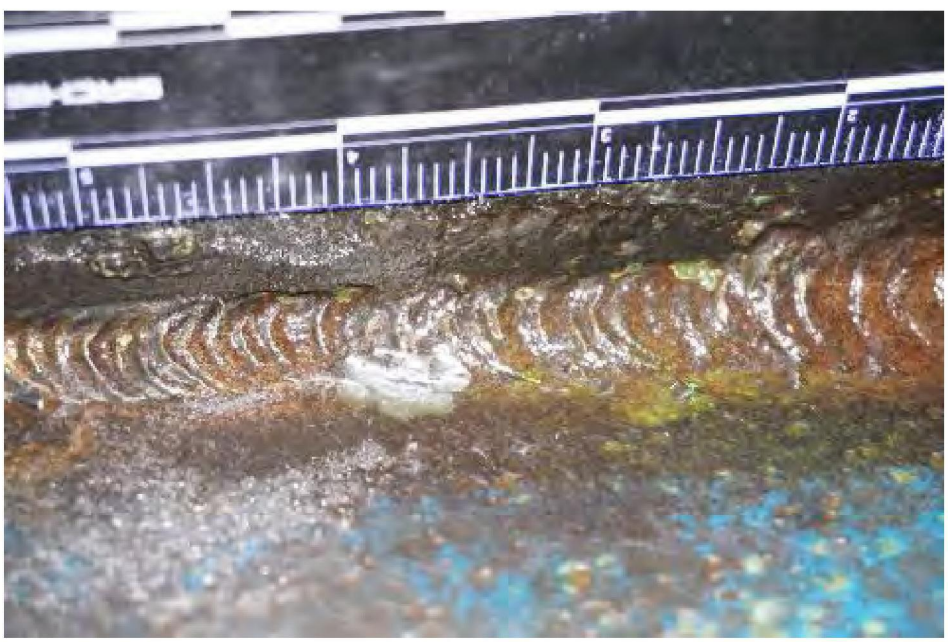

Photo 38: Burred out weld for MT Inspection

Photo 39: Vacuum Box EEI-001 for linear weld testing

Photo 40: Vacuum Box EEI-006 for small Patch Plate weld testing

ATTACHMENT F
EEI/TESTEX MASTER SPREADSHEET OF FINDINGS AND REPAIRS

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			Recommended Repairs				
			Number of Repairs	Linear Feet of Weld	Area of Patch Plate (sq. ft.)	Number of Patch Plates <= 2 sq. ft.	Number of Patch Plates > 2 sq. ft.
	Upper Dome Course D	Weld Repairs	15	9			
		Patch Plate Repairs	6	17	3	6	0
	Upper Dome Course C	Weld Repairs	27	38			
		Patch Plate Repairs	7	13	2	7	0
	Upper Dome Course B	Weld Repairs	38	20			
		Patch Plate Repairs	13	35	6	13	0
	Upper Dome Course A	Weld Repairs	58	38			
		Patch Plate Repairs	33	127	35	26	7
	Extension Ring	Weld Repairs	32	11			
		Patch Plate Repairs	15	73	28	11	4
	Barrell	Weld Repairs	144	50			
		Patch Plate Repairs	7	23	5	7	0
	Lower Dome	Weld Repairs	19	8			
		Patch Plate Repairs	0	0	0	0	0
	Floor	Weld Repairs	0	0			
		Patch Plate Repairs	0	0	0	0	0

	Summary of Recommended Repairs				
	Number of Repairs	Linear Feet of Weld	Area of Patch Plate (sq. ft.)	Number of Patch Plates <= 2 sq. ft.	Number of Patch Plates > 2 sq. ft.
Weld Repairs	333	173			
Patch Plate Repairs	81		80	70	11
Totals	414	173	80	70	11

TOTAL RECOMMENDED REPAIRS	
Patch Plates	81
Weld Repairs	333
TOTAL	414

PROVE UP AND RESULTS	REPORTED BY TESTEX	POST-EEI PROVE-UP AND INSPECTION
Number of indications reported by TesTex	395	109
Total repairs of **individual indications** recommended by EEI after prove up (including TesTex reported indications)		423
BC below reporting minimum	200	60
Weld Indications	12	9
Bulges	4	0
Dents	24	21
Gouges	1	5
Other topside indications	10	6

Insufficient Fill	2	21
Lack of Fusion	3	52
Porosity (and/or Rounded Indications)	21	203
Undercut	7	46

Number of indications EEI validated for repair	109
Number of additional indications by EEI resulting in repair	314
Total Indications Requiring Repairs*	423

* Several indications in close proximity were combined into a single repair - See Summary of Recommended Repairs for Final Repair count.

General Tank Info		Shell Location			TesTex NDE							EEI PROVE UP								Recommended Repairs								Repair Type
Tank No.	Overall ID	General Location			TesTex Indication ID on Plate	TexTex Reported Indication Location		TesTex NDE		SIMPLIFIED INDICATION TYPE	Minimum Wall Thickness (in)	Depth of Topside Indication(in)	Center of Indication: X (in)	Center of Indication: Y (in)	Method	Indication Type	SIMPLIFIED INDICATION TYPE	EEI Recommendation (Repair or No	Minimum Thickness (in)	Depth (in)	Center of Repair: X (in)	Center of Repair: Y (in)	Width or Dia (in)	Height (in)	Length of Weld (in)	Area of PP (sq in)	EEI repair No.	Repair No. on Plate	Repair Type (Patch, Weld, Other)
		Location in Tank	Shell Course	Plate Number		X Coordinate (in)	Y Coordinate (in)	Method	Indication Type																			
5	5-UD-D-3-55-48	UD	D	3	2	55	48	VT	DENT	D			55	48	VT	DENT	D	R			48	48	6	6	24	36	5-UD-D-3-48-48-1	1	TSPP
5	5-UD-D-3-16-6	UD	D	3	3	16	6	UT	GA	BC	0.102		16	6	PAUT	GA	BC	R	0.121		16	6	8	8	32.00	64.00	5-UD-D-3-16-6-2	2	TSPP
5	5-UD-D-8-31-57	UD	D	8									31	57	VT	LOF	LOF	R			31	57	9	0	9		5-UD-D-8-31-57-1	1	WR
5	5-UD-D-8-17-148	UD	D	8									17	148	VT	UC	UC	R			17	148	6	0	6		5-UD-D-8-17-148-2	2	WR
5	5-UD-D-8-24-156	UD	D	8									24	156	VT	UC	UC	R			24	156	6	0	6		5-UD-D-8-24-156-3	3	WR
5	5-UD-D-9-36-70	UD	D	9	3	36	70	VT	DENT	D			36	70	VT	DENT	D	R			36	70	12	12	48.00	144.00	5-UD-D-9-36-70-1	1	PP
5	5-UD-D-9-9-156	UD	D	9									9	156	VT	UC	UC	R			9	156	4	0	4		5-UD-D-9-9-156-2	2	WR
5	5-UD-D-9-39-54	UD	D	9									39	54	VT	UC	UC	R			39	54	9	0	9		5-UD-D-9-39-54-3	3	WR
5	5-UD-D-10-29-78	UD	D	10									29	78	VT	UC	UC	R			29	78	4	0	4		5-UD-D-10-29-78-1	1	WR
5	5-UD-D-10-37-45	UD	D	10									37	45	VT	POR	RI	R			37	45	8	0	8		5-UD-D-10-37-45-2	2	WR
5	5-UD-D-14-30-120	UD	D	14	2	30	120	VT	GA				30	120	VT	GA	GA	R	0.158		30	124	8	8	32.00	64.00	5-UD-D-14-30-124-1	1	PP
5	5-UD-D-14-30-110	UD	D	14									30	110	VT	UC	UC	R			30	110	9	0	9		5-UD-D-14-30-110-2	2	WR
5	5-UD-D-17-23-105	UD	D	17									23	105	VT	UC	UC	R			23	105	8	0	8		5-UD-D-17-23-105-1	1	WR
5	5-UD-D-19-13-131	UD	D	19									13	131	VT	TSP	TS	R			13	131	8	0	8		5-UD-D-19-13-131-1	1	WR
5	5-UD-D-19-56-91	UD	D	19									56	91	VT	UC	UC	R			56	91	0	6	6		5-UD-D-19-56-91-2	2	WR
5	5-UD-D-20-0-133	UD	D	20									0	133	VT	POR	RI	R			0	133	0	6	6		5-UD-D-20-0-133-1	1	WR
5	5-UD-D-21-50-90	UD	D	21									50	90	VT	LOF	LOF	R			50	90	9	0	9		5-UD-D-21-50-90-1	1	WR
5	5-UD-D-21-24-75	UD	D	21									24	75	VT	POR	RI	R			24	75	2	0	2		5-UD-D-21-24-75-2	2	WR
5	5-UD-D-24-2-90	UD	D	24	1	2	90	VT	DENT	D			2	90	VT	DENT	D	R			2	90	12	12	48	144	5-UD-D-24-2-90-1	1	TSPP
5	5-UD-D-29-28-54	UD	D	29									28	54	VT	POR	RI	R			28	54	10	0	10		5-UD-D-29-28-54-1	1	WR
5	5-UD-D-45-41-64	UD	D	45	2	41	64	VT	DENT	D		0.160	41	64	VT	DENT	D	R			41	64	8	0	25.13	50.27	5-UD-D-45-41-64-1	1	PP
5	5-UD-C-3-28-156	UD	C	3									28	156	VT	LOF	LOF	R			28	156	56	0	56		5-UD-C-3-28-156-1	1	WR
5	5-UD-C-3-36-0	UD	C	3									36	0	VT	UC	UC	R			36	0	4	0	4		5-UD-C-3-36-0-2	2	WR
5	5-UD-C-4-54-0	UD	C	4									54	0	VT	UC	UC	R			54	0	12	0	12		5-UD-C-4-54-0-1	1	WR
5	5-UD-C-4-28-156	UD	C	4									28	156	VT	LOF	LOF	R			28	156	56	0	56		5-UD-C-4-28-156-2	2	WR
5	5-UD-C-5-38-55	UD	C	5									38	55	VT	LOF	LOF	R			38	55	9	0	9		5-UD-C-5-38-55-1	1	WR
5	5-UD-C-6-10-156	UD	C	6									10	156	VT	LOF	LOF	R			10	156	20	0	20		5-UD-C-6-10-156-1	1	WR
5	5-UD-C-7-29-104	UD	C	7									29	104	VT	LOF	LOF	R			29	104	9	0	9		5-UD-C-7-29-104-1	1	WR
5	5-UD-C-9-51-122	UD	C	9									51	122	VT	LOF	LOF	R			51	122	5	0	5		5-UD-C-9-51-122-1	1	WR
5	5-UD-C-9-58-26	UD	C	9									58	26	VT	LOF	LOF	R			58	26	3	0	3		5-UD-C-9-58-26-2	2	WR
5	5-UD-C-9-34-0	UD	C	9									34	0	VT	LOF	LOF	R			34	0	68	0	68		5-UD-C-9-34-0-3	3	WR
5	5-UD-C-10-21-114	UD	C	10	2	21	114	VT	TC	TS		0.094	21	114	VT	TC	TS	R		0.125	21	114	2	0	2		5-UD-C-10-21-114-1	1	WR
5	5-UD-C-11-23-96	UD	C	11									23	96	VT	LOF	LOF	R			23	96	9	0	9		5-UD-C-11-23-96-1	1	WR
5	5-UD-C-12-21-76	UD	C	12									21	76	VT	DENT	D	R			21	76	6	0	18.85	28.27	5-UD-C-12-21-76-1	1	PP
5	5-UD-C-12-56-122	UD	C	12									56	122	VT	POR	RI	R			56	122	0	6	6		5-UD-C-12-56-122-2	2	WR
5	5-UD-C-13-8-156	UD	C	13									8	156	VT	UC	UC	R			8	156	17	0	17		5-UD-C-13-8-156-1	1	WR
5	5-UD-C-13-60-15	UD	C	13									60	15	VT	TSP	TS	R			60	15	2	0	2		5-UD-C-13-60-15-2	2	WR
5	5-UD-C-14-42-156	UD	C	14									42	156	VT	UC	UC	R			42	156	28	0	28		5-UD-C-14-42-156-1	1	WR
5	5-UD-C-15-37-155	UD	C	15	1	37	155	VT	DENT	D			37	155	VT	DENT	D	R			37	155	9	9	36	81	5-UD-C-15-37-155-1	1	TSPP
5	5-UD-C-15-33-74	UD	C	15									33	74	VT	LOF	LOF	R			33	74	9	0	9		5-UD-C-15-33-74-2	2	WR
5	5-UD-C-16-55-125	UD	C	16	5	55	125	BFET	WI	WI			55	125	VT	WI	WI	R			55	125	0	4	4		5-UD-C-16-55-125-1	1	WR
5	5-UD-C-17-0-125	UD	C	17									0	125	VT	POR	RI	R			0	125	0	4	4		5-UD-C-17-0-125-1	1	WR
5	5-UD-C-18-36-96	UD	C	18									36	96	VT	LOF	LOF	R			36	96	9	0	9		5-UD-C-18-36-96-1	1	WR
5	5-UD-C-18-16-156	UD	C	18									16	156	VT	POR	RI	R			16	156	32	0	32		5-UD-C-18-16-156-2	2	WR
5	5-UD-C-19-5-156	UD	C	19									5	156	VT	POR	RI	R			5	156	4	0	4		5-UD-C-19-5-156-1	1	WR
5	5-UD-C-19-37-156	UD	C	19									37	156	VT	LOF	LOF	R			37	156	4	0	4		5-UD-C-19-37-156-2	2	WR
5	5-UD-C-21-38-156	UD	C	21									38	156	VT	UC	UC	R			38	156	12	0	12		5-UD-C-21-38-156-1	1	WR
5	5-UD-C-22-16-156	UD	C	22									16	156	VT	LOF	LOF	R			16	156	32	0	32		5-UD-C-22-16-156-1	1	WR
5	5-UD-C-23-32-156	UD	C	23									32	156	VT	UC	UC	R			32	156	32	0	32		5-UD-C-23-32-156-1	1	WR
5	5-UD-C-32-6-51	UD	C	32									6	51	VT	RI	RI	R			6	51	2	0	2		5-UD-C-32-6-51-1	1	WR
5	5-UD-C-34-8-137	UD	C	34									8	137	VT	DENT	D	R			8	137	6	0	18.85	28.27	5-UD-C-34-8-137-1	1	PP
5	5-UD-C-41-54-73	UD	C	41	3	51-56	73	LFET	BC	BC	0.177		54	73	PAUT	BC	BC	R	0.154		55	73	6	0	18.85	28.27	5-UD-C-41-55-73-1	1	PP
5	5-UD-C-46-36-24	UD	C	46	1	33-39	24	VT	DENT	D		0.040	36	24	VT	DENT	D	R			36	24	6	0	18.85	28.27	5-UD-C-46-36-24-1	1	PP
5	5-UD-C-46-7-60	UD	C	46	2	4-10	60	LFET	BC	BC	0.178		7	60	PAUT	BC	BC	R	0.149		10	58	6	0	18.85	28.27	5-UD-C-46-10-58-2	2	PP

General Tank Info		Shell Location			TesTex NDE								EEI PROVE UP								Recommended Repairs								Repair Type
Tank No.	Overall ID	General Location			TesTex Indication ID on Plate	TexTex Reported Indication Location		TesTex NDE		SIMPLIFIED INDICATION TYPE	Minimum Wall Thickness (in)	Depth of Topside Indication(in)	Center of Indication: X (in)	Center of Indication: Y (in)	Method	Indication Type	SIMPLIFIED INDICATION TYPE	EEI Recommendation (Repair or No	Minimum Thickness (in)	Depth (in)	Center of Repair: X (in)	Center of Repair: Y (in)	Width or Dia (in)	Height (in)	Length of Weld (in)	Area of PP (sq in)	EEI repair No.	Repair No. on Plate	Repair Type (Patch, Weld, Other)
		Location in Tank	Shell Course	Plate Number		X Coordinate (in)	Y Coordinate (in)	Method	Indication Type																				
5	5-UD-C-46-3-144	UD	C	46									3	144	VT	TSP	TS	R		0.14	3	144	6	6	24	36	5-UD-C-46-3-144-3	3	TSPP
5	5-UD-B-4-33-112	UD	B	4									33	112	VT	LOF	LOF	R			33	112	11	0	11		5-UD-B-4-33-112-1	1	WR
5	5-UD-B-8-1-110	UD	B	8	2	1	110	VT	POR	P			1	110	VT	RI	RI	R			1	110	9	0	9		5-UD-B-8-1-110-1	1	WR
5	5-UD-B-9-29-17	UD	B	9									29	17	VT	RI	RI	R			29	17	0	4	4		5-UD-B-9-29-17-1	1	WR
5	5-UD-B-9-10-0	UD	B	9									10	0	VT	UC	UC	R			10	0	4	0	4		5-UD-B-9-10-0-2	2	WR
5	5-UD-B-9-0-3	UD	B	9									0	3	VT	POR	RI	R			0	3	0	5	5		5-UD-B-9-0-3-3	3	WR
5	5-UD-B-17-19-0	UD	B	17									19	0	VT	RI	RI	R			19	0	0	3	3		5-UD-B-17-19-0-1	1	WR
5	5-UD-B-19-5-100	UD	B	19									5	100	VT	LOF	LOF	R			5	100	10	0	10		5-UD-B-19-5-100-1	1	WR
5	5-UD-B-20-0-2	UD	B	20									0	2	VT	LOF	LOF	R			0	2	0	4	4		5-UD-B-20-0-2-1	1	WR
5	5-UD-B-21-0-102	UD	B	21									0	102	VT	LOF	LOF	R			0	102	0	4	4		5-UD-B-21-0-102-1	1	WR
5	5-UD-B-22-0-156	UD	B	22									0	156	VT	LOF	LOF	R			0	156	2	2	4		5-UD-B-22-0-156-1	1	WR
5	5-UD-B-22-9-156	UD	B	22									9	156	VT	LOF	LOF	R			9	156	4	0	4		5-UD-B-22-9-156-2	2	WR
5	5-UD-B-22-54-156	UD	B	22									54	156	VT	LOF	LOF	R			54	156	8	0	8		5-UD-B-22-54-156-3	3	WR
5	5-UD-B-22-0-142	UD	B	22									0	142	VT	LOF	LOF	R			0	142	3	0	3		5-UD-B-22-0-142-4	4	WR
5	5-UD-B-22-37-105	UD	B	22									37	105	VT	DENT	D	R			37	105	8	8	32	64	5-UD-B-22-37-105-5	5	PP
5	5-UD-B-22-56-104	UD	B	22									56	104	VT	POR	RI	R			56	104	0	4	4		5-UD-B-22-56-104-6	6	WR
5	5-UD-B-23-43-156	UD	B	23									43	156	VT	LOF	LOF	R			43	156	12	0	12		5-UD-B-23-43-156-1	1	WR
5	5-UD-B-23-0-156	UD	B	23									0	156	VT	POR	RI	R			0	156	2	2	4		5-UD-B-23-0-156-2	2	WR
5	5-UD-B-23-51-90	UD	B	23									51	90	VT	POR	RI	R			51	90	0	4	4		5-UD-B-23-51-90-3	3	WR
5	5-UD-B-24-20-144	UD	B	24									20	144	VT	POR	RI	R			20	144	0	3	3		5-UD-B-24-20-144-1	1	WR
5	5-UD-B-24-28-0	UD	B	24									28	0	VT	POR	RI	R			28	0	4	4	8		5-UD-B-24-28-0-2	2	WR
5	5-UD-B-25-0-140	UD	B	25									0	140	VT	LOF	LOF	R			0	140	1	4	5		5-UD-B-25-0-140-1	1	WR
5	5-UD-B-25-32-156	UD	B	25									32	156	VT	LOF	LOF	R			32	156	4	0	4		5-UD-B-25-32-156-2	2	WR
5	5-UD-B-25-37-52	UD	B	25									37	52	VT	DENT	D	R			37	52	8	8	32	64	5-UD-B-25-37-52-3	3	PP
5	5-UD-B-26-55-0	UD	B	26									55	0	VT	UC	UC	R			55	0	4	4	8		5-UD-B-26-55-0-1	1	WR
5	5-UD-B-26-0-98	UD	B	26									0	98	VT	POR	RI	R			0	98	0	4	4		5-UD-B-26-0-98-2	2	WR
5	5-UD-B-26-51-102	UD	B	26									51	102	VT	POR	RI	R			51	102	0	4	4		5-UD-B-26-51-102-3	3	WR
5	5-UD-B-29-2-156	UD	B	29									2	156	VT	POR	RI	R			2	156	4	0	4		5-UD-B-29-2-156-1	1	WR
5	5-UD-B-29-33-109	UD	B	29									33	109	VT	LOF	LOF	R			33	109	8	0	8		5-UD-B-29-33-109-2	2	WR
5	5-UD-B-29-33-35	UD	B	29									33	35	VT	LOF	LOF	R			33	35	0	3	3		5-UD-B-29-33-35-3	3	WR
5	5-UD-B-31-56-23	UD	B	31									56	23	VT	POR	RI	R			56	23	4	0	4		5-UD-B-31-56-23-1	1	WR
5	5-UD-B-34-4-8	UD	B	34									4	8	VT	POR	RI	R			4	8	8	0	8		5-UD-B-34-4-8-1	1	WR
5	5-UD-B-34-30-112	UD	B	34									30	112	VT	POR	RI	R			30	112	12	10	44	120	5-UD-B-34-30-112-2	2	PP
5	5-UD-B-34-33-74	UD	B	34									33	74	VT	POR	RI	R			33	74	0	4	4		5-UD-B-34-33-74-3	3	WR
5	5-UD-B-35-55-14	UD	B	35									55	14	VT	POR	RI	R			55	14	4	0	4		5-UD-B-35-55-14-1	1	WR
5	5-UD-B-36-15-52	UD	B	36	2	15	52	VT	DENT	D			15	52	VT	DENT	D	R			15	52	10	10	40	100	5-UD-B-36-15-52-1	1	PP
5	5-UD-B-37-52-141	UD	B	37	1	49-55	141	LFET	BC	BC	0.194		52	141	PAUT	BC	BC	R	0.144		52	143	9	6	30	54	5-UD-B-37-52-143-1	1	PP
5	5-UD-B-37-31-49	UD	B	37	2	30-32	49	VT	DENT	D		0.140	31	49	VT	DENT	D	R			31	49	8	8	32	64	5-UD-B-37-31-49-2	2	PP
5	5-UD-B-37-43-60	UD	B	37	3	42-44	60	VT	DENT	D		0.125	43	60	VT	DENT	D	R			43	60	8	8	32	64	5-UD-B-37-43-60-3	3	PP
5	5-UD-B-38-35-110	UD	B	38									35	110	VT	LOF	LOF	R			35	110	12	0	12		5-UD-B-38-35-110-1	1	WR
5	5-UD-B-41-0-3	UD	B	41									0	3	VT	POR	RI	R			0	3	0	5	5		5-UD-B-41-0-3-1	1	WR
5	5-UD-B-44-48-156	UD	B	44									48	156	VT	POR	RI	R			48	156	3	0	3		5-UD-B-44-48-156-1	1	WR
5	5-UD-B-52-15-70	UD	B	52	2	10-20	70	LFET	BC	BC	0.169		15	70	PAUT	BC	BC	R	0.154		16	66	8	0	25.132741	50.26548	5-UD-B-52-16-66-1	1	PP
5	5-UD-B-52-27-72	UD	B	52	3	22-32	72	LFET	BC	BC	0.170		27	72	PAUT	BC	BC	R	0.149		27	67	6	0	18.849556	28.27433	5-UD-B-52-27-67-2	2	PP
5	5-UD-B-52-4-21	UD	B	52	5	1-7	18-24	LFET	BC	BC	0.178		4	21	PAUT	BC	BC	R	< 0.160		5	21	10	16	52	160	5-UD-B-52-5-21-3	3	PP
5	5-UD-B-52-41-19	UD	B	52									41	19	PAUT	BC	BC	R	0.144		41	19	10	10	40	100	5-UD-B-52-41-19-4	4	PP
5	5-UD-B-52-32-15	UD	B	52									32	15	VT	GOUGE	G	R			32	15	0	2	2		5-UD-B-52-32-15-5	5	WR
5	5-UD-B-55-44-0	UD	B	55									44	0	VT	UC	UC	R			44	0	25	0	25		5-UD-B-55-44-0-1	1	WR
5	5-UD-B-61-41-18	UD	B	61	1	37-55	12-24	LFET	BC	BC	0.152		41	18	PAUT	BC	BC	R	0.144		41	6	6	0	18.849556	28.27433	5-UD-B-61-41-6-1	1	PP
5	5-UD-B-65-36-156	UD	B	65									36	156	VT	POR	RI	R			36	156	4	0	4		5-UD-B-65-36-156-1	1	WR
5	5-UD-B-70-30-110	UD	B	70									30	110	VT	UF	IF	R			30	110	16	0	16		5-UD-B-70-30-110-1	1	WR
5	5-UD-B-70-28-155	UD	B	70									28	155	VT	UF	IF	R			28	155	6	6	24	36	5-UD-B-70-28-155-2	2	TSPP
5	5-UD-A-1-66-45	UD	A	1									66	45	VT	UF	IF	R			66	45	4	0	4		5-UD-A-1-66-45-1	1	WR
5	5-UD-A-2-0-144	UD	A	2									0	144	VT	UC	UC	R			0	144	0	4	4		5-UD-A-2-0-144-1	1	WR
5	5-UD-A-2-9-0	UD	A	2									9	0	VT	UC	UC	R			9	0	12	0	12		5-UD-A-2-9-0-2	2	WR

General Tank Info		Shell Location			TesTex NDE							EEI PROVE UP								Recommended Repairs								Repair Type
		General Location				TexTex Reported Indication Location		TesTex NDE																				
Tank No.	Overall ID	Location in Tank	Shell Course	Plate Number	TesTex Indication ID on Plate	X Coordinate (in)	Y Coordinate (in)	Method	Indication Type	SIMPLIFIED INDICATION TYPE	Minimum Wall Thickness (in)	Depth of Topside Indication(in)	Center of Indication: X (in)	Center of Indication: Y (in)	Method	Indication Type	SIMPLIFIED INDICATION TYPE	EEI Recommendation (Repair or No	Minimum Thickness (in)	Depth (in)	Center of Repair: X (in)	Center of Repair: Y (in)	Width or Dia (in)	Height (in)	Length of Weld (in)	Area of PP (sq in)	EEI repair No.	Repair No. on Plate	Repair Type (Patch, Weld, Other)
5	5-UD-A-3-22-0	UD	A	3									22	0	VT	UC	UC	R			22	0	19	0	19		5-UD-A-3-22-0-1	1	WR
5	5-UD-A-5-31-7	UD	A	5	3	31	7	LFET	BC	BC	0.18		31	7	PAUT	BC	BC	R	< 0.160		32	5	8	10	36	80	5-UD-A-5-32-5-1	1	PP
5	5-UD-A-5-12-45	UD	A	5									12	45	VT	RI	RI	R			12	45	2	0	2		5-UD-A-5-12-45-2	2	WR
5	5-UD-A-6-27-102	UD	A	6	1	27	102	LFET	BC	BC	0.152		27	102	PAUT	BC	BC	R	< 0.160		27	101	10	14	48	140	5-UD-A-6-27-101-1	1	PP
5	5-UD-A-6-32-1	UD	A	6	2	32	1	LFET	BC	BC	0.174		32	1	PAUT	BC	BC	R	< 0.160		25	4	8	8	32	64	5-UD-A-6-25-4-2	2	PP
5	5-UD-A-6-27-102	UD	A	6									27	102	VT	RI	RI	R			27	101	10	14	48	140	5-UD-A-6-27-101-1	1	PP
5	5-UD-A-7-4-2	UD	A	7	1	4	2	LFET	BC	BC	0.168		4	2	PAUT	BC	BC	R	< 0.160		24	5	48	10	116	480	5-UD-A-7-24-5-1	1	PP
5	5-UD-A-7-41-2	UD	A	7	2	41	2	LFET	BC	BC	0.1		41	2	PAUT	BC	BC	R	< 0.160		24	5	48	10	116	480	5-UD-A-7-24-5-1	1	PP
5	5-UD-A-8-7-4	UD	A	8	1	0-15	4	LFET	BC	BC	0.17		7	4	PAUT	BC	BC	R	< 0.160		8	4	6	8	28	48	5-UD-A-8-8-4-1	1	TSPP
5	5-UD-A-8-32-1	UD	A	8	2	32	0-3	LFET	BC	BC	0.15		32	1	PAUT	BC	BC	R	< 0.160		28	4	10	8	36	80	5-UD-A-8-28-4-2	2	PP
5	5-UD-A-9-18-51	UD	A	9	1	4-32	42-60	LFET	BC	BC	0.17		18	51	PAUT	BC	BC	R	< 0.160		27	49	7	20	54	140	5-UD-A-9-27-49-1	1	PP
5	5-UD-A-9-10-4	UD	A	9	2	2-18	0-8	LFET	BC	BC	0.17		10	4	PAUT	BC	BC	R	< 0.160		15	6	31	12	86	372	5-UD-A-9-15-6-2	2	PP
5	5-UD-A-9-30-5	UD	A	9	3	26-34	0-10	LFET	BC	BC	0.105		30	5	PAUT	BC	BC	R	< 0.160		15	6	31	12	86	372	5-UD-A-9-15-6-2	2	PP
5	5-UD-A-9-29-156	UD	A	9									29	156	VT	RI	RI	R			29	156	4	0	4		5-UD-A-9-29-156-3	3	WR
5	5-UD-A-10-33-6	UD	A	10	1	0-66	0-12	LFET	BC	BC	0.15		33	6	PAUT	BC	BC	R	< 0.160		23	4	28	9	74	252	5-UD-A-10-23-4-1	1	PP
5	5-UD-A-15-6-84	UD	A	15	1	6	84	VT	DENT	D			6	84	VT	DENT	D	R			3	84	6	6	24	36	5-UD-A-15-3-84-1	1	TSPP
5	5-UD-A-16-75-2	UD	A	16	1	72-78	0-4	LFET	BC	BC	0.168		75	2	PAUT	BC	BC	R	0.140		75	0	8	6	28	48	5-UD-A-16-75-0-1	1	TSPP
5	5-UD-A-16-75-0	UD	A	16	3	74-76	0	VT	UC	UC		0.094	75	0	VT	UC	UC	R			75	0	8	6	28	48	5-UD-A-16-75-0-1	1	TSPP
5	5-UD-A-17-22-0	UD	A	17	1	22	0	VT	UC	UC		0.094	22	0	VT	UC	UC	R			23	0	17	0	17		5-UD-A-17-23-0-1	1	WR
5	5-UD-A-17-31-0	UD	A	17	2	31	0	BFET	WI	WI			31	0	VT	WI	WI	R			23	0	17	0	17		5-UD-A-17-23-0-1	1	WR
5	5-UD-A-18-26-0	UD	A	18	2	26	0	BFET	WI	WI			26	0	VT	WI	WI	R			29	0	10	0	10		5-UD-A-18-29-0-1	1	WR
5	5-UD-A-19-25-0	UD	A	19	1	16-34	0	VT	UC	UC		0.094	25	0	VT	UC	UC	R			18	0	6	0	6		5-UD-A-19-18-0-1	1	WR
5	5-UD-A-19-57-0	UD	A	19	2	53-60	0	VT	UC	UC		0.094	57	0	VT	UC	UC	R			55	0	7	0	7		5-UD-A-19-55-0-2	2	WR
5	5-UD-A-19-22-131	UD	A	19									22	131	VT	POR	RI	R			22	131	6	0	6		5-UD-A-19-22-131-3	3	WR
5	5-UD-A-20-18-7	UD	A	20	1	0-36	7	LFET	BC	BC	0.137		18	7	PAUT	BC	BC	R	< 0.160		25	8	21	16	74	336	5-UD-A-20-25-8-1	1	PP
5	5-UD-A-20-10-0	UD	A	20	2	10	0	BFET	WI	WI			10	0	VT	WI	WI	R			10	0	4	0	4		5-UD-A-20-10-0-2	2	WR
5	5-UD-A-20-21-0	UD	A	20	3	21	0	VT	UC	UC		0.094	21	0	VT	UC	UC	R			21	0	5	0	5		5-UD-A-20-21-0-3	3	WR
5	5-UD-A-20-30-0	UD	A	20									30	0	VT	UC	UC	R			30	0	4	0	4		5-UD-A-20-30-0-4	4	WR
5	5-UD-A-21-14-18	UD	A	21	1	10-18	7-29	LFET	BC	BC	0.178		14	18	PAUT	BC	BC	R	< 0.160		29	15	12	10	44	120	5-UD-A-21-29-15-1	1	PP
5	5-UD-A-23-6-0	UD	A	23	1	6	0	BFET	WI	WI			6	0	VT	WI	WI	R			13	0	14	0	14		5-UD-A-23-13-0-1	1	WR
5	5-UD-A-23-12-0	UD	A	23	2	12	0	VT	UC	UC		0.094	12	0	VT	UC	UC	R			13	0	14	0	14		5-UD-A-23-13-0-1	1	WR
5	5-UD-A-23-32-0	UD	A	23	3	32	0	BFET	WI	WI			32	0	VT	WI	WI	R			32	0	4	0	4		5-UD-A-23-32-0-2	2	WR
5	5-UD-A-23-18-140	UD	A	23	5	0-36	126-154	LFET	BC	BC	0.147		18	140	PAUT	BC	BC	R	< 0.160		18	150	30	12	84	360	5-UD-A-23-18-150-3	3	PP
5	5-UD-A-23-6-128	UD	A	23	6	6	128	BFET	WI	WI			6	128	VT	WI	WI	R			6	128	8	0	8		5-UD-A-23-6-128-4	4	WR
5	5-UD-A-23-23-132	UD	A	23	7	23	132	VT	DENT	D			23	132	VT	DENT	D	R			23	132	6	6	24	36	5-UD-A-23-23-132-5	5	PP
5	5-UD-A-23-0-24	UD	A	23									0	24	VT	RI	RI	R			0	24	0	4	4		5-UD-A-23-0-24-6	6	WR
5	5-UD-A-24-1-1	UD	A	24	1	1	1	LFET	BC	BC	0.179		1	1	PAUT	BC	BC	R	< 0.160		3	4	6	8	28	48	5-UD-A-24-3-4-1	1	PP
5	5-UD-A-24-0-27	UD	A	24	2	0	27	BFET	WI	WI			0	27	VT	WI	WI	R			0	27	10	0	10		5-UD-A-24-0-27-2	2	WR
5	5-UD-A-24-0-117	UD	A	24									0	117	VT	POR	RI	R			0	117	0	4	4		5-UD-A-24-0-117-3	3	WR
5	5-UD-A-25-64-108	UD	A	25	2	64	108	VT	UC	UC		0.094	64	108	VT	UC	UC	R			64	108	4	0	4		5-UD-A-25-64-108-1	1	WR
5	5-UD-A-25-4-0	UD	A	25									4	0	VT	UC	UC	R			4	0	8	0	8		5-UD-A-25-4-0-2	2	WR
5	5-UD-A-25-81-102	UD	A	25									81	102	VT	RI	RI	R			81	102	0	4	4		5-UD-A-25-81-102-3	3	WR
5	5-UD-A-26-30-5	UD	A	26	1	24-36	0-10	LFET	BC	BC	0.129		30	5	PAUT	BC	BC	R	< 0.160		28	5	8	10	36	80	5-UD-A-26-28-5-1	1	PP
5	5-UD-A-26-20-71	UD	A	26	2	7-34	45-97	LFET	BC	BC	0.138		20	71	PAUT	BC	BC	R	< 0.160		23	72	19	60	158	1140	5-UD-A-26-23-72-2	2	PP
5	5-UD-A-26-34-127	UD	A	26	3	34	122-132	BFET	WI	WI			34	127	VT	WI	WI	R			34	127	0	12	12		5-UD-A-26-34-127-3	3	WR
5	5-UD-A-27-28-36	UD	A	27	2	28	36	VT	DENT	D			28	36	VT	DENT	D	R			28	36	6	6	24	36	5-UD-A-27-28-36-1	1	PP
5	5-UD-A-27-6-68	UD	A	27	3	2-10	60-76	LFET	BC	BC	0.158		6	68	PAUT	BC	BC	R	< 0.160		7	65	14	22	72	308	5-UD-A-27-7-65-2	2	PP
5	5-UD-A-27-28-0	UD	A	27									28	0	VT	UC	UC	R			28	0	4	0	4		5-UD-A-27-28-0-3	3	WR
5	5-UD-A-28-42-43	UD	A	28									42	43	VT	LOF	LOF	R			42	43	4	0	4		5-UD-A-28-42-43-1	1	WR
5	5-UD-A-33-25-156	UD	A	33									25	156	VT	RI	RI	R			25	156	4	0	4		5-UD-A-33-25-156-1	1	WR
5	5-UD-A-33-31-139	UD	A	33									31	139	VT	RI	RI	R			31	139	0	4	4		5-UD-A-33-31-139-2	2	WR
5	5-UD-A-34-67-139	UD	A	34									67	139	VT	POR	RI	R			67	139	4	0	4		5-UD-A-34-67-139-1	1	WR
5	5-UD-A-36-12-134	UD	A	36	1	12	134	LFET	BC	BC	0.18		12	134	PAUT	BC	BC	R	0.154		13	127	6	6	37.7	28.27433	5-UD-A-36-13-127-1	1	PP
5	5-UD-A-36-22-128	UD	A	36	2	22	128	LFET	BC	BC	0.178		22	128	PAUT	BC	BC	R	0.114		24	127	6	6	37.7	28.27433	5-UD-A-36-24-127-2	2	PP
5	5-UD-A-37-36-142	UD	A	37	1	36-37	142	VT	DENT	D		0.06	36	142	VT	DENT	D	R			36	142	6	6	18.849556	28.27433	5-UD-A-37-36-142-1	1	PP

General Tank Info		Shell Location			TesTex NDE								EEI PROVE UP								Recommended Repairs							Repair Type	
Tank No.	Overall ID	General Location			TesTex Indication ID on Plate	TexTex Reported Indication Location		TesTex NDE			Minimum Wall Thickness (in)	Depth of Topside Indication(in)	Center of Indication: X (in)	Center of Indication: Y (in)	Method	Indication Type	SIMPLIFIED INDICATION TYPE	EEI Recommendation (Repair or No	Minimum Thickness (in)	Depth (in)	Center of Repair: X (in)	Center of Repair: Y (in)	Width or Dia (in)	Height (in)	Length of Weld (in)	Area of PP (sq in)	EEI repair No.	Repair No. on Plate	Repair Type (Patch, Weld, Other)	
		Location in Tank	Shell Course	Plate Number		X Coordinate (in)	Y Coordinate (in)	Method	Indication Type	SIMPLIFIED INDICATION TYPE																			
5	5-UD-A-37-36-97	UD	A	37									36	97	VT	DENT	D	R			36	97	6	6	18.849556	28.27433	5-UD-A-37-36-97-2	2	PP
5	5-UD-A-38-21-156	UD	A	38									21	156	VT	RI	RI	R			21	156	4	0	4		5-UD-A-38-21-156-1	1	WR
5	5-UD-A-39-30-87	UD	A	39	1	30	87	VT	TS	TS		0.125	30	87	VT	GOUGE	G	R			30	87	1	0	1		5-UD-A-39-30-87-1	1	WR
5	5-UD-A-40-22-1	UD	A	40	1	22	1	VT	LF	IF			22	1	VT	LF	IF	R			22	1	4	0	4		5-UD-A-40-22-1-1	1	WR
5	5-UD-A-42-20-10	UD	A	42	1	20	10	VT	POR	P			20	10	VT	POR	RI	R			20	10	18	0	18		5-UD-A-42-20-10-1	1	WR
5	5-UD-A-44-22-156	UD	A	44									22	156	VT	RI	RI	R			22	156	4	0	4		5-UD-A-44-22-156-1	1	WR
5	5-UD-A-45-5-156	UD	A	45									5	156	VT	RI	RI	R			5	156	4	0	4		5-UD-A-45-5-156-1	1	WR
5	5-UD-A-48-10-0	UD	A	48									10	0	VT	UC	UC	R			10	0	4	0	4		5-UD-A-48-10-0-1	1	WR
5	5-UD-A-49-13-0	UD	A	49									13	0	VT	UC	UC	R		0.125	13	0	7	0	7		5-UD-A-49-13-0-1	1	WR
5	5-UD-A-50-18-0	UD	A	50									18	0	VT	UC	UC	R			18	0	9	0	9		5-UD-A-50-18-0-1	1	WR
5	5-UD-A-51-25-135	UD	A	51	1	19-30	130-140	LFET	BC	BC	0.15		25	135	PAUT	BC	BC	R	0.159		24	141	12	4	32	48	5-UD-A-51-24-141-1	1	PP
5	5-UD-A-51-26-0	UD	A	51									26	0	VT	UC	UC	R			26	0	10	0	10		5-UD-A-51-26-0-2	2	WR
5	5-UD-A-52-77-46	UD	A	52									77	46	VT	POR	RI	R			77	46	3	3	6		5-UD-A-52-77-46-1	1	WR
5	5-UD-A-52-42-0	UD	A	52									42	0	VT	UC	UC	R			42	0	18	0	18		5-UD-A-52-42-0-2	2	WR
5	5-UD-A-54-2-154	UD	A	54	1	2	154	VT	POR	P			2	154	VT	POR	RI	R			2	154	4	0	4		5-UD-A-54-2-154-1	1	WR
5	5-UD-A-55-69-130	UD	A	55	1	109	130	VT	DENT	D		0.05	69	130	VT	DENT	D	R			69	130	8	8	32	64	5-UD-A-55-69-130-1	1	PP
5	5-UD-A-55-35-9	UD	A	55									35	9	VT	LOF	LOF	R			35	9	18	0	18		5-UD-A-55-35-9-2	2	WR
5	5-UD-A-55-81-29	UD	A	55									81	29	VT	POR	RI	R			81	29	0	4	4		5-UD-A-55-81-29-3	3	WR
5	5-UD-A-55-55-156	UD	A	55									55	156	VT	RI	RI	R			55	156	10	0	10		5-UD-A-55-55-156-4	4	WR
5	5-UD-A-57-0-156	UD	A	57									0	156	VT	RI	RI	R			0	156	2	0	2		5-UD-A-57-0-156-1	1	WR
5	5-UD-A-58-46-46	UD	A	58									46	46	VT	LOF	LOF	R			46	46	3	0	3		5-UD-A-58-46-46-1	1	WR
5	5-UD-A-58-53-46	UD	A	58									53	46	VT	RI	RI	R			53	46	2	0	2		5-UD-A-58-53-46-2	2	WR
5	5-UD-A-60-16-147	UD	A	60	1	13-20	147	LFET	BC	BC	0.174		16	147	PAUT	BC	BC	R	0.119		19	146	9	9	36	81	5-UD-A-60-19-146-1	1	PP
5	5-UD-A-60-10-0	UD	A	60									10	0	VT	UC	UC	R			10	0	5	0	5		5-UD-A-60-10-0-2	2	WR
5	5-UD-A-60-22-45	UD	A	60									22	45	VT	RI	RI	R			22	45	2	0	2		5-UD-A-60-22-45-3	3	WR
5	5-UD-A-61-69-146	UD	A	61	1	63-75	142-149	LFET	BC	BC	0.14		69	146	PAUT	BC	BC	R	0.145		68	146	14	21	70	294	5-UD-A-61-68-146-1	1	PP
5	5-UD-A-61-46-7	UD	A	61									46	7	VT	IF	IF	R			46	7	15	0	15		5-UD-A-61-46-7-2	2	WR
5	5-UD-A-62-27-0	UD	A	62									27	0	VT	UC	UC	R			27	0	10	0	10		5-UD-A-62-27-0-1	1	WR
5	5-UD-A-64-70-0	UD	A	64									70	0	VT	RI	RI	R			70	0	6	0	6		5-UD-A-64-70-0-1	1	WR
5	5-UD-A-65-2-154	UD	A	65	1	0-4	154	LFET	BC	BC	0.19		2	154	PAUT	BC	BC	R	< 0.160		3	153	6	6	24	36	5-UD-A-65-3-153-1	1	PP
5	5-UD-A-66-27-154	UD	A	66	1	25-29	154	LFET	BC	BC	0.181		27	154	PAUT	BC	BC	R	< 0.160		27	152	6	8	28	48	5-UD-A-66-27-152-1	1	PP
5	5-UD-A-68-4-130	UD	A	68									4	130	VT	LOF	LOF	R			4	130	12	12	24		5-UD-A-68-4-130-1	1	WR
5	5-UD-A-68-31-73	UD	A	68									31	73	VT	POR	RI	R			31	73	0	4	4		5-UD-A-68-31-73-2	2	WR
5	5-UD-A-70-74-5	UD	A	70	1	74	5-6	LFET	BC	BC	0.135		74	5	PAUT	BC	BC	R	0.119		78	4	9	9	36	81	5-UD-A-70-78-4-1	1	PP
5	5-UD-A-70-68-156	UD	A	70									68	156	VT	CL	IF	R			68	156	27	0	27		5-UD-A-70-68-156-2	2	WR
5	5-UD-A-71-17-145	UD	A	71	1	15-18	145-146	VT	DENT	D		0.187	17	145	VT	DENT	D	R			17	145	8	8	32	64	5-UD-A-71-17-145-1	1	PP
5	5-UD-A-71-12-53	UD	A	71	2	10-14	51-56	LFET	BC	BC	0.154		12	53	PAUT	BC	BC	R	0.154		13	54	6	0	18.849556	28.27433	5-UD-A-71-13-54-2	2	PP
5	5-UD-A-71-25-54	UD	A	71									25	54	VT	GOUGE	G	R			25	54	0	3	3		5-UD-A-71-25-54-3	3	WR
5	5-UD-A-71-15-156	UD	A	71									15	156	VT	CL	IF	R			15	156	30	0	30		5-UD-A-71-15-156-4	4	WR
5	5-ER-4-2-150-23	ER	4	2	1	150	23	LFET	BC	BC	0.184		150	23	PAUT	BC	BC	R	0.110		151	17	14	6	40.00	84.00	5-ER-4-2-151-17-1	1	TSPP
5	5-ER-4-2-200-12	ER	4	2	2	180-210	1-24	LFET	BC	BC	0.157		200	12	PAUT	BC	BC	R	0.114		200	10	59	20	158.00	1180.00	5-ER-4-2-200-10-2	2	PP
5	5-ER-4-5-41-19	ER	4	5									41	19	VT	RI	RI	R			41	19	4	0	4		5-ER-4-5-41-19-1	1	WR
5	5-ER-4-15-228-16	ER	4	15	1	228	14-18	LFET	BC	BC	0.16		228	16	PAUT	BC	BC	R	0.139		231	17	10	4	28.00	40.00	5-ER-4-15-231-17-1	1	PP
5	5-ER-4-16-170-15	ER	4	16	3	170	15	LFET	BC	BC	0.181		170	15	PAUT	BC	BC	R	0.156		178	18	8	6	28.00	48.00	5-ER-4-16-178-18-1	1	PP
5	5-ER-3-2-100-50	ER	3	2	1	100	50	LFET	BC	BC	0.197		100	50	PAUT	BC	BC	R	0.154		98	45	6	0	18.85	28.27	5-ER-3-2-98-45-1	1	PP
5	5-ER-3-5-31-59	ER	3	5									31	59	VT	UC	UC	R			31	59	5	0	5		5-ER-3-5-31-59-1	1	WR
5	5-ER-3-5-136-58	ER	3	5									136	58	VT	UC	UC	R			136	58	4	0	4		5-ER-3-5-136-58-2	2	WR
5	5-ER-3-8-26-28	ER	3	8	1	26	28	VT	TS	TS		0.094	26	28	VT	DENT	D	R			26	28	6	0	18.85	28.27	5-ER-3-8-26-28-1	1	PP
5	5-ER-3-12-202-57	ER	3	12									202	57	VT	LOF	LOF	R			202	57	4	0	4		5-ER-3-12-202-57-1	1	WR
5	5-ER-3-14-142-14	ER	3	14	2	142	14	LFET	BC	BC	0.187		142	14	PAUT	BC	BC	R	0.150		147	16	12	12	48.00	144.00	5-ER-3-14-147-16-1	1	PP
5	5-ER-3-15-120-21	ER	3	15	1	96-144	5-38	LFET	BC	BC	0.19		120	21	PAUT	BC	BC	R	0.139		116	20	34	30	128.00	1020.00	5-ER-3-15-116-20-1	1	PP
5	5-ER-3-15-114-49	ER	3	15	2	114	47-52	LFET	BC	BC	0.16		114	49	PAUT	BC	BC	R	0.160		111	48	13	10	46.00	130.00	5-ER-3-15-111-48-2	2	PP
5	5-ER-2-4-176-29	ER	2	4	1	176	29	VT	TS	TS		0.094	176	29	VT	GOUGE	G	R			176	29	1	0	1		5-ER-2-4-176-29-1	1	WR
5	5-ER-2-5-18-47	ER	2	5									18	47	VT	RI	RI	R			18	47	4	0	4		5-ER-2-5-18-47-1	1	WR
5	5-ER-2-8-8-57	ER	2	8									8	57	VT	RI	RI	R			8	57	4	0	4		5-ER-2-8-8-57-1	1	WR

General Tank Info		Shell Location			TesTex NDE							EEI PROVE UP								Recommended Repairs								Repair Type
		General Location				TexTex Reported Indication Location		TesTex NDE																				
Tank No.	Overall ID	Location in Tank	Shell Course	Plate Number	TesTex Indication ID on Plate	X Coordinate (in)	Y Coordinate (in)	Method	Indication Type	SIMPLIFIED INDICATION TYPE	Minimum Wall Thickness (in)	Depth of Topside Indication(in)	Center of Indication: X (in)	Center of Indication: Y (in)	Method	Indication Type	SIMPLIFIED INDICATION TYPE	EEI Recommendation (Repair or No	Minimum Thickness (in)	Depth (in)	Center of Repair: X (in)	Center of Repair: Y (in)	Width or Dia (in)	Height (in)	Length of Weld (in)	Area of PP (sq in)	EEI repair No.	Repair No. on Plate	Repair Type (Patch, Weld, Other)
5	5-ER-2-8-87-0	ER	2	8									87	0	VT	RI	RI	R			87	0	4	0	4		5-ER-2-8-87-0-2	2	WR
5	5-ER-2-11-228-45	ER	2	11	1	228	45	UT	BC	BC	0.143		228	45	UT	BC	BC	R	0.139		228	45	10	10	40.00	100.00	5-ER-2-11-228-45-1	1	PP
5	5-ER-2-11-228-32	ER	2	11	2	228	32	UT	BC	BC	0.152		228	32	UT	BC	BC	R	0.143		228	32	10	10	40.00	100.00	5-ER-2-11-228-32-2	2	PP
5	5-ER-2-12-144-33	ER	2	12	1	144	33	UT	BC	BC	0.15		144	33	UT	BC	BC	R	0.146		144	33	10	10	40.00	100.00	5-ER-2-12-144-33-2	2	PP
5	5-ER-2-12-167-57	ER	2	12									167	57	VT	RI	RI	R			167	57	4	0	4		5-ER-2-12-167-57-1	1	WR
5	5-ER-2-13-126-3	ER	2	13									126	3	VT	POR	RI	R			126	3	0	4	4		5-ER-2-13-126-3-1	1	WR
5	5-ER-2-15-36-33	ER	2	15	1	36	33	UT	BC	BC	0.158		40	41	UT	BC	BC	R	0.145		40	34	10	24	68.00	240.00	5-ER-2-15-40-34-1	1	PP
5	5-ER-2-15-36-21	ER	2	15	2	36	21	UT	BC	BC	0.19		40	28	UT	BC	BC	R	0.144		40	34	10	24	68.00	240.00	5-ER-2-15-40-34-1	1	PP
5	5-ER-2-16-147-36	ER	2	16	3	147	31-40	LFET	BC	BC	0.188		147	36	PAUT	BC	BC	R	0.150		150	47	21	24	90.00	504.00	5-ER-2-16-150-47-1	1	PP
5	5-ER-2-16-137-43	ER	2	16	4	137	34-53	LFET	BC	BC	0.14		137	43	PAUT	BC	BC	R	0.150		150	47	21	24	90.00	504.00	5-ER-2-16-150-47-1	1	PP
5	5-ER-1-1-42-0	ER	1	1									42	0	VT	RI	RI	R			42	0	4	0	4		5-ER-1-1-42-0-1	1	WR
5	5-ER-1-1-201-14	ER	1	1									201	14	VT	RI	RI	R			201	14	4	0	4		5-ER-1-1-201-14-2	2	WR
5	5-ER-1-2-6-14	ER	1	2									6	14	VT	RI	RI	R			6	14	4	0	4		5-ER-1-2-6-14-1	1	WR
5	5-ER-1-2-31-14	ER	1	2									31	14	VT	RI	RI	R			31	14	5	0	5		5-ER-1-2-31-14-2	2	WR
5	5-ER-1-3-168-15	ER	1	3									168	15	VT	RI	RI	R			168	15	4	0	4		5-ER-1-3-168-15-1	1	WR
5	5-ER-1-4-0-10	ER	1	4	1	0	10	VT	POR	P			0	10	VT	POR	RI	R			0	10	0	4	4		5-ER-1-4-0-10-1	1	WR
5	5-ER-1-4-50-15	ER	1	4									50	15	VT	RI	RI	R			50	15	4	0	4		5-ER-1-4-50-15-2	2	WR
5	5-ER-1-4-143-15	ER	1	4									143	15	VT	RI	RI	R			143	15	6	0	6		5-ER-1-4-143-15-3	3	WR
5	5-ER-1-4-211-15	ER	1	4									211	15	VT	RI	RI	R			211	15	4	0	4		5-ER-1-4-211-15-4	4	WR
5	5-ER-1-4-187-15	ER	1	4									187	15	VT	RI	RI	R			187	15	4	0	4		5-ER-1-4-187-15-5	5	WR
5	5-ER-1-4-176-15	ER	1	4									176	15	VT	RI	RI	R			176	15	4	0	4		5-ER-1-4-176-15-6	6	WR
5	5-ER-1-5-27-15	ER	1	5									27	15	VT	RI	RI	R			27	15	7	0	7		5-ER-1-5-27-15-1	1	WR
5	5-ER-1-5-96-15	ER	1	5									96	15	VT	RI	RI	R			96	15	4	0	4		5-ER-1-5-96-15-2	2	WR
5	5-ER-1-5-59-0	ER	1	5									59	0	VT	RI	RI	R			59	0	4	0	4		5-ER-1-5-59-0-3	3	WR
5	5-ER-1-5-137-15	ER	1	5									137	15	VT	RI	RI	R			137	15	4	0	4		5-ER-1-5-137-15-4	4	WR
5	5-ER-1-6-17-15	ER	1	6									17	15	VT	RI	RI	R			17	15	4	0	4		5-ER-1-6-17-15-1	1	WR
5	5-ER-1-7-22-15	ER	1	7									22	15	VT	RI	RI	R			22	15	4	0	4		5-ER-1-7-22-15-1	1	WR
5	5-ER-1-7-200-15	ER	1	7									200	15	VT	RI	RI	R			200	15	4	0	4		5-ER-1-7-200-15-2	2	WR
5	5-ER-1-8-62-0	ER	1	8									62	0	VT	RI	RI	R			62	0	4	0	4		5-ER-1-8-62-0-1	1	WR
5	5-ER-1-9-107-14	ER	1	9									107	14	VT	RI	RI	R			107	14	6	0	6		5-ER-1-9-107-14-1	1	WR
5	5-ER-1-11-98-2	ER	1	11	1	98	1-4	LFET	BC	BC	0.158		98	2	PAUT	BC	BC	R	< 0.160		99	8	28	12	80.00	336.00	5-ER-1-11-99-8-1	1	PP
5	5-ER-1-14-64-13	ER	1	14									64	13	VT	RI	RI	R			64	13	4	0	4		5-ER-1-14-64-13-1	1	WR
5	5-ER-1-14-73-13	ER	1	14									73	13	VT	RI	RI	R			73	13	4	0	4		5-ER-1-14-73-13-2	2	WR
5	5-BA-28-1-43-31	BA	28	1									43	31	VT	RI	RI	R			43	31	4	0	4		5-BA-28-1-43-31-1	1	WR
5	5-BA-28-2-154-30	BA	28	2	3	154	30	VT	POR	P			154	30	VT	LOF	LOF	R			154	30	8	0	8		5-BA-28-2-154-30-1	1	WR
5	5-BA-28-3-36-31	BA	28	3									36	31	VT	LOF	LOF	R			36	31	4	0	4		5-BA-28-3-36-31-1	1	WR
5	5-BA-28-3-189-31	BA	28	3									189	31	VT	RI	RI	R			189	31	4	0	4		5-BA-28-3-189-31-2	2	WR
5	5-BA-28-6-188-30	BA	28	6	1	188	30	VT	POR	P			188	30	VT	POR	RI	R			188	30	4	0	4		5-BA-28-6-188-30-1	1	WR
5	5-BA-28-6-122-30	BA	28	6									122	30	VT	RI	RI	R			122	30	4	0	4		5-BA-28-6-122-30-2	2	WR
5	5-BA-28-7-0-28	BA	28	7									0	28	VT	RI	RI	R			0	28	0	4	4		5-BA-28-7-0-28-1	1	WR
5	5-BA-28-7-53-30	BA	28	7									53	30	VT	RI	RI	R			53	30	14	0	14		5-BA-28-7-53-30-2	2	WR
5	5-BA-28-7-89-30	BA	28	7									89	30	VT	UF	IF	R			89	30	11	0	11		5-BA-28-7-89-30-3	3	WR
5	5-BA-28-7-204-30	BA	28	7									204	30	VT	RI	RI	R			204	30	4	0	4		5-BA-28-7-204-30-4	4	WR
5	5-BA-28-8-104-30	BA	28	8									104	30	VT	LOF	LOF	R			104	30	5	0	5		5-BA-28-8-104-30-1	1	WR
5	5-BA-28-8-131-30	BA	28	8									131	30	VT	RI	RI	R			131	30	4	0	4		5-BA-28-8-131-30-2	2	WR
5	5-BA-28-8-143-30	BA	28	8									143	30	VT	RI	RI	R			143	30	4	0	4		5-BA-28-8-143-30-3	3	WR
5	5-BA-28-8-181-30	BA	28	8									181	30	VT	RI	RI	R			181	30	4	0	4		5-BA-28-8-181-30-4	4	WR
5	5-BA-28-8-238-30	BA	28	8									238	30	VT	RI	RI	R			238	30	11	0	11		5-BA-28-8-238-30-5	5	WR
5	5-BA-28-9-176-1	BA	28	9	1	176	1	VT	POR	P			176	1	VT	POR	RI	R			176	1	4	0	4		5-BA-28-9-176-1-1	1	WR
5	5-BA-28-12-210-0	BA	28	12									210	0	VT	UF	IF	R			210	0	5	0	5		5-BA-28-12-210-0-1	1	WR
5	5-BA-28-13-166-0	BA	28	13									166	0	VT	RI	RI	R			166	0	4	0	4		5-BA-28-13-166-0-1	1	WR
5	5-BA-28-13-230-0	BA	28	13									230	0	VT	RI	RI	R			230	0	4	0	4		5-BA-28-13-230-0-2	2	WR
5	5-BA-28-16-150-0	BA	28	16									150	0	VT	RI	RI	R			150	0	2	0	2		5-BA-28-16-150-0-1	1	WR
5	5-BA-27-1-154-0	BA	27	1									154	0	VT	POR	RI	R			154	0	4	0	4		5-BA-27-1-154-0-1	1	WR
5	5-BA-27-1-184-0	BA	27	1									184	0	VT	POR	RI	R			184	0	6	0	6		5-BA-27-1-184-0-2	2	WR

General Tank Info		Shell Location			TesTex NDE							EEI PROVE UP								Recommended Repairs								Repair Type
		General Location				TexTex Reported Indication Location		TesTex NDE																				
Tank No.	Overall ID	Location in Tank	Shell Course	Plate Number	TesTex Indication ID on Plate	X Coordinate (in)	Y Coordinate (in)	Method	Indication Type	SIMPLIFIED INDICATION TYPE	Minimum Wall Thickness (in)	Depth of Topside Indication(in)	Center of Indication: X (in)	Center of Indication: Y (in)	Method	Indication Type	SIMPLIFIED INDICATION TYPE	EEI Recommendation (Repair or No	Minimum Thickness (in)	Depth (in)	Center of Repair: X (in)	Center of Repair: Y (in)	Width or Dia (in)	Height (in)	Length of Weld (in)	Area of PP (sq in)	EEI repair No.	Repair No. on Plate	Repair Type (Patch, Weld, Other)
5	5-BA-27-1-234-0	BA	27	1									234	0	VT	CL	IF	R			234	0	6	0	6		5-BA-27-1-234-0-3	3	WR
5	5-BA-27-2-24-0	BA	27	2									24	0	VT	RI	RI	R			24	0	4	0	4		5-BA-27-2-24-0-1	1	WR
5	5-BA-27-2-36-0	BA	27	2									36	0	VT	RI	RI	R			36	0	5	0	5		5-BA-27-2-36-0-2	2	WR
5	5-BA-27-2-105-0	BA	27	2									105	0	VT	POR	RI	R			105	0	4	0	4		5-BA-27-2-105-0-3	3	WR
5	5-BA-27-6-123-0	BA	27	6									123	0	VT	RI	RI	R			123	0	4	0	4		5-BA-27-6-123-0-1	1	WR
5	5-BA-27-9-0-54	BA	27	9									0	54	VT	RI	RI	R			0	54	0	4	4		5-BA-27-9-0-54-1	1	WR
5	5-BA-27-12-115-36	BA	27	12									115	36	UT	BC	BC	R	0.148		115	36	10	10	40.00	100.00	5-BA-27-12-115-36-1	1	PP
5	5-BA-27-14-158-52	BA	27	14	1	158	52	LFET	BC	BC	0.146		158	52	PAUT	BC	BC	R	0.119		158	52	6	6	24.00	36.00	5-BA-27-14-158-52-1	1	TSPP
5	5-BA-27-16-94-0	BA	27	16									94	0	VT	RI	RI	R			94	0	4	0	4		5-BA-27-16-94-0-1	1	WR
5	5-BA-26-3-83-0	BA	26	3									83	0	VT	RI	RI	R			83	0	4	0	4		5-BA-26-3-83-0-2	2	WR
5	5-BA-26-4-30-0	BA	26	4									30	0	VT	RI	RI	R			30	0	2	0	2		5-BA-26-4-30-0-1	1	WR
5	5-BA-26-5-150-0	BA	26	5									150	0	VT	RI	RI	R			150	0	2	0	2		5-BA-26-5-150-0-1	1	WR
5	5-BA-26-7-150-0	BA	26	7									150	0	VT	RI	RI	R			150	0	3	0	3		5-BA-26-7-150-0-1	1	WR
5	5-BA-26-8-121-0	BA	26	8									121	0	VT	RI	RI	R			121	0	4	0	4		5-BA-26-8-121-0-1	1	WR
5	5-BA-26-8-210-0	BA	26	8									210	0	VT	LOF	LOF	R			210	0	0	3	3		5-BA-26-8-210-0-2	2	WR
5	5-BA-26-10-0-59	BA	26	10									0	59	VT	RI	RI	R			0	59	0	4	4		5-BA-26-10-0-59-1	1	WR
5	5-BA-26-16-150-0	BA	26	16									150	0	VT	RI	RI	R			150	0	4	0	4		5-BA-26-16-150-0-1	1	WR
5	5-BA-25-1-90-5	BA	25	1									90	5	VT	UF	IF	R			90	5	0	5	5		5-BA-25-1-90-5-1	1	WR
5	5-BA-25-2-19-0	BA	25	2									19	0	VT	RI	RI	R			19	0	4	0	4		5-BA-25-2-19-0-1	1	WR
5	5-BA-25-2-102-0	BA	25	2									102	0	VT	RI	RI	R			102	0	4	0	4		5-BA-25-2-102-0-2	2	WR
5	5-BA-25-4-29-1	BA	25	4									29	1	VT	RI	RI	R			29	2	0	3	3		5-BA-25-4-29-2-1	1	WR
5	5-BA-25-15-16-0	BA	25	15									16	0	VT	RI	RI	R			16	0	4	0	4		5-BA-25-15-16-0-1	1	WR
5	5-BA-24-2-134-0	BA	24	2									134	0	VT	UC	UC	R			134	0	7	0	7		5-BA-24-2-134-0-1	1	WR
5	5-BA-24-5-150-0	BA	24	5									150	0	VT	POR	RI	R			150	0	4	0	4		5-BA-24-5-150-0-1	1	WR
5	5-BA-24-8-93-0	BA	24	8									93	0	VT	RI	RI	R			93	0	4	0	4		5-BA-24-8-93-0-1	1	WR
5	5-BA-24-12-30-0	BA	24	12									30	0	VT	RI	RI	R			30	0	6	0	6		5-BA-24-12-30-0-1	1	WR
5	5-BA-24-14-2-0	BA	24	14									2	0	VT	RI	RI	R			2	0	4	0	4		5-BA-24-14-2-0-1	1	WR
5	5-BA-23-2-171-0	BA	23	2									171	0	VT	RI	RI	R			171	0	4	0	4		5-BA-23-2-171-0-1	1	WR
5	5-BA-23-3-220-0	BA	23	3									220	0	VT	LOF	LOF	R			220	0	4	0	4		5-BA-23-3-220-0-2	2	WR
5	5-BA-23-6-211-0	BA	23	6									211	0	VT	RI	RI	R			211	0	3	0	3		5-BA-23-6-211-0-1	1	WR
5	5-BA-23-11-42-3	BA	23	11									42	3	VT	RI	RI	R			42	3	4	0	4		5-BA-23-11-42-3-1	1	WR
5	5-BA-23-13-191-7	BA	23	13									191	7	VT	RI	RI	R			191	7	0	3	3		5-BA-23-13-191-7-1	1	WR
5	5-BA-23-16-211-0	BA	23	16									211	0	VT	LOF	LOF	R			211	0	4	0	4		5-BA-23-16-211-0-1	1	WR
5	5-BA-22-8-47-0	BA	22	8									47	0	VT	RI	RI	R			47	0	4	0	4		5-BA-22-8-47-0-1	1	WR
5	5-BA-22-13-150-0	BA	22	13									150	0	VT	RI	RI	R			150	0	3	0	3		5-BA-22-13-150-0-1	1	WR
5	5-BA-22-16-90-0	BA	22	16									90	0	VT	RI	RI	R			90	0	2	0	2		5-BA-22-16-90-0-1	1	WR
5	5-BA-21-1-40-41	BA	21	1									40	41	VT	GOUGE	G	R			40	41	1	0	1		5-BA-21-1-40-41-1	1	WR
5	5-BA-21-1-90-3	BA	21	1									90	3	VT	UF	IF	R			90	3	0	2	2		5-BA-21-1-90-3-2	2	WR
5	5-BA-21-4-89-0	BA	21	4									89	0	VT	RI	RI	R			89	0	0	3	3		5-BA-21-4-89-0-1	1	WR
5	5-BA-21-5-173-0	BA	21	5									173	0	VT	RI	RI	R			173	0	4	0	4		5-BA-21-5-173-0-1	1	WR
5	5-BA-21-9-148-0	BA	21	9									148	0	VT	RI	RI	R			148	0	4	0	4		5-BA-21-9-148-0-1	1	WR
5	5-BA-21-10-1-27	BA	21	10	1	1	26-27	VT	LOF	LOF			1	27	VT	LOF	LOF	R			1	27	4	0	4		5-BA-21-10-1-27-1	1	WR
5	5-BA-21-15-144-0	BA	21	15									144	0	VT	RI	RI	R			144	0	0	4	4		5-BA-21-15-144-0-1	1	WR
5	5-BA-20-2-15-0	BA	20	2									15	0	VT	RI	RI	R			15	0	4	0	4		5-BA-20-2-15-0-1	1	WR
5	5-BA-20-2-92-0	BA	20	2									92	0	VT	RI	RI	R			102	0	4	0	4		5-BA-20-2-102-0-2	2	WR
5	5-BA-20-6-150-0	BA	20	6									150	0	VT	RI	RI	R			150	0	3	0	3		5-BA-20-6-150-0-1	1	WR
5	5-BA-20-6-209-0	BA	20	6									209	0	VT	RI	RI	R			209	0	3	0	3		5-BA-20-6-209-0-2	2	WR
5	5-BA-20-7-0-33	BA	20	7	1	0	33	VT	POR	P			0	33	VT	POR	RI	R			0	33	0	4	4		5-BA-20-7-0-33-1	1	WR
5	5-BA-20-7-91-0	BA	20	7									91	0	VT	RI	RI	R			91	0	4	0	4		5-BA-20-7-91-0-2	2	WR
5	5-BA-20-8-147-57	BA	20	8									147	57	VT	RI	RI	R			147	57	0	4	4		5-BA-20-8-147-57-1	1	WR
5	5-BA-20-14-32-0	BA	20	14									32	0	VT	RI	RI	R			32	0	3	0	3		5-BA-20-14-32-0-1	1	WR
5	5-BA-19-1-93-4	BA	19	1									93	4	VT	UF	IF	R			93	4	0	4	4		5-BA-19-1-93-4-1	1	WR
5	5-BA-19-1-210-58	BA	19	1									210	58	VT	POR	RI	R			210	58	2	0	2		5-BA-19-1-210-58-2	2	WR
5	5-BA-19-2-0-34	BA	19	2	1	0	34	LFET	WI	WI			0	34	VT	UC	UC	R			0	34	0	4	4		5-BA-19-2-0-34-1	1	WR
5	5-BA-19-2-55-0	BA	19	2									55	0	VT	RI	RI	R			55	0	4	0	4		5-BA-19-2-55-0-2	2	WR

General Tank Info		Shell Location			TesTex NDE							EEI PROVE UP								Recommended Repairs								Repair Type
		General Location				TexTex Reported Indication Location		TesTex NDE																				
Tank No.	Overall ID	Location in Tank	Shell Course	Plate Number	TesTex Indication ID on Plate	X Coordinate (in)	Y Coordinate (in)	Method	Indication Type	SIMPLIFIED INDICATION TYPE	Minimum Wall Thickness (in)	Depth of Topside Indication(in)	Center of Indication: X (in)	Center of Indication: Y (in)	Method	Indication Type	SIMPLIFIED INDICATION TYPE	EEI Recommendation (Repair or No	Minimum Thickness (in)	Depth (in)	Center of Repair: X (in)	Center of Repair: Y (in)	Width or Dia (in)	Height (in)	Length of Weld (in)	Area of PP (sq in)	EEI repair No.	Repair No. on Plate	Repair Type (Patch, Weld, Other)
5	5-BA-19-5-79-0	BA	19	5									79	0	VT	RI	RI	R			79	0	4	0	4		5-BA-19-5-79-0-1	1	WR
5	5-BA-19-6-90-0	BA	19	6									90	0	VT	RI	RI	R			90	0	3	0	3		5-BA-19-6-90-0-1	1	WR
5	5-BA-19-8-130-37	BA	19	8	1	130	37	UT	BC	BC	0.155		130	37	UT	BC	BC	R	< 0.160		130	37	10	10	40.00	100.00	5-BA-19-8-130-37-1	1	PP
5	5-BA-19-10-126-38	BA	19	10	1	126	38	UT	BC	BC	0.151		126	38	UT	BC	BC	R	< 0.160		126	38	10	10	40.00	100.00	5-BA-19-10-126-38-1	1	PP
5	5-BA-19-14-136-38	BA	19	14	1	136	38	UT	BC	BC	0.155		136	38	UT	BC	BC	R	< 0.160		136	38	10	10	40.00	100.00	5-BA-19-14-136-38-1	1	PP
5	5-BA-19-16-90-0	BA	19	16									90	0	VT	RI	RI	R			90	0	2	0	2		5-BA-19-16-90-0-1	1	WR
5	5-BA-19-16-223-0	BA	19	16									223	0	VT	UF	IF	R			223	0	3	0	3		5-BA-19-16-223-0-2	2	WR
5	5-BA-18-2-211-58	BA	18	2									211	58	VT	RI	RI	R			211	58	2	0	2		5-BA-18-2-211-58-2	2	WR
5	5-BA-18-7-41-0	BA	18	7									41	0	VT	RI	RI	R			41	0	4	0	4		5-BA-18-7-41-0-1	1	WR
5	5-BA-18-8-90-0	BA	18	8									90	0	VT	UF	IF	R			90	0	3	0	3		5-BA-18-8-90-0-1	1	WR
5	5-BA-18-10-210-0	BA	18	10									210	0	VT	LOF	LOF	R			210	0	4	0	4		5-BA-18-10-210-0-1	1	WR
5	5-BA-18-11-232-0	BA	18	11									232	0	VT	RI	RI	R			232	0	4	0	4		5-BA-18-11-232-0-1	1	WR
5	5-BA-17-1-90-4	BA	17	1									90	4	VT	UF	IF	R			90	4	3	0	3		5-BA-17-1-90-4-2	2	WR
5	5-BA-17-2-89-0	BA	17	2									89	0	VT	RI	RI	R			89	0	0	3	3		5-BA-17-2-89-0-2	2	WR
5	5-BA-17-6-150-0	BA	17	6	1	150	0	VT	POR	P			150	0	VT	POR	RI	R			150	0	6	0	6		5-BA-17-6-150-0-1	1	WR
5	5-BA-16-5-209-0	BA	16	5									209	0	VT	LOF	LOF	R			209	0	0	3	3		5-BA-16-5-209-0-1	1	WR
5	5-BA-16-7-29-0	BA	16	7									29	0	VT	RI	RI	R			29	0	4	0	4		5-BA-16-7-29-0-1	1	WR
5	5-BA-16-11-20-0	BA	16	11									20	0	VT	RI	RI	R			20	0	4	0	4		5-BA-16-11-20-0-1	1	WR
5	5-BA-15-6-114-0	BA	15	6									114	0	VT	LOF	LOF	R			114	0	4	0	4		5-BA-15-6-114-0-1	1	WR
5	5-BA-15-7-218-0	BA	15	7									218	0	VT	LOF	LOF	R			218	0	6	0	6		5-BA-15-7-218-0-1	1	WR
5	5-BA-14-6-211-0	BA	14	6									211	0	VT	RI	RI	R			211	0	3	0	3		5-BA-14-6-211-0-1	1	WR
5	5-BA-14-10-150-0	BA	14	10									150	0	VT	RI	RI	R			150	0	4	0	4		5-BA-14-10-150-0-1	1	WR
5	5-BA-14-12-86-0	BA	14	12									86	0	VT	RI	RI	R			86	0	4	0	4		5-BA-14-12-86-0-1	1	WR
5	5-BA-14-13-102-60	BA	14	13	1	102	60	VT	POR	P			102	60	VT	POR	RI	R			102	60	4	0	4		5-BA-14-13-102-60-1	1	WR
5	5-BA-14-14-210-0	BA	14	14									210	0	VT	RI	RI	R			210	0	2	0	2		5-BA-14-14-210-0-1	1	WR
5	5-BA-13-1-90-5	BA	13	1									90	5	VT	UF	IF	R			90	5	4	0	4		5-BA-13-1-90-5-1	1	WR
5	5-BA-13-4-155-0	BA	13	4									155	0	VT	RI	RI	R			155	0	3	0	3		5-BA-13-4-155-0-1	1	WR
5	5-BA-13-7-210-0	BA	13	7									210	0	VT	RI	RI	R			210	0	0	4	4		5-BA-13-7-210-0-1	1	WR
5	5-BA-13-11-108-1	BA	13	11	1	108	1	VT	POR	P			108	1	VT	POR	RI	R			108	1	4	0	4		5-BA-13-11-108-1-1	1	WR
5	5-BA-13-13-89-0	BA	13	13									89	0	VT	RI	RI	R			89	0	0	4	4		5-BA-13-13-89-0-1	1	WR
5	5-BA-12-8-37-0	BA	12	8									37	0	VT	LOF	LOF	R			37	0	8	0	8		5-BA-12-8-37-0-1	1	WR
5	5-BA-12-12-48-0	BA	12	12									48	0	VT	RI	RI	R			48	0	4	0	4		5-BA-12-12-48-0-1	1	WR
5	5-BA-11-4-150-0	BA	11	4									150	0	VT	RI	RI	R			150	0	3	0	3		5-BA-11-4-150-0-1	1	WR
5	5-BA-11-10-150-0	BA	11	10									150	0	VT	RI	RI	R			150	0	4	0	4		5-BA-11-10-150-0-1	1	WR
5	5-BA-10-2-32-1	BA	10	2									32	1	VT	RI	RI	R			32	1	0	4	4		5-BA-10-2-32-1-2	2	WR
5	5-BA-10-11-33-60	BA	10	11	1	33	60	VT	TS	TS		0.19	33	60	VT	TS	TS	R			33	60	4	0	4		5-BA-10-11-33-60-1	1	WR
5	5-BA-10-11-134-0	BA	10	11									134	0	VT	RI	RI	R			134	0	4	0	4		5-BA-10-11-134-0-2	2	WR
5	5-BA-9-3-220-5	BA	9	3									220	5	VT	LOF	LOF	R			220	5	5	0	5		5-BA-9-3-220-5-1	1	WR
5	5-BA-9-4-145-0	BA	9	4									145	0	VT	RI	RI	R			145	0	2	0	2		5-BA-9-4-145-0-1	1	WR
5	5-BA-9-5-151-0	BA	9	5									151	0	VT	RI	RI	R			151	0	0	3	3		5-BA-9-5-151-0-1	1	WR
5	5-BA-9-8-208-0	BA	9	8									208	0	VT	UF	IF	R			208	0	4	0	4		5-BA-9-8-208-0-1	1	WR
5	5-BA-9-8-212-0	BA	9	8									212	0	VT	UC	UC	R			212	0	4	0	4		5-BA-9-8-212-0-2	2	WR
5	5-BA-9-9-81-1	BA	9	9									81	1	VT	RI	RI	R			81	1	4	0	4		5-BA-9-9-81-1-1	1	WR
5	5-BA-9-11-98-0	BA	9	11									98	0	VT	RI	RI	R			98	0	4	0	4		5-BA-9-11-98-0-1	1	WR
5	5-BA-8-15-140-0	BA	8	15									140	0	VT	RI	RI	R			140	0	2	0	2		5-BA-8-15-140-0-1	1	WR
5	5-BA-8-15-30-0	BA	8	15									30	0	VT	RI	RI	R			30	0	2	0	2		5-BA-8-15-30-0-2	2	WR
5	5-BA-7-4-90-0	BA	7	4									90	0	VT	RI	RI	R			90	0	5	0	5		5-BA-7-4-90-0-1	1	WR
5	5-BA-7-15-22-0	BA	7	15									22	0	VT	RI	RI	R			22	0	2	0	2		5-BA-7-15-22-0-1	1	WR
5	5-BA-6-14-67-0	BA	6	14									67	0	VT	RI	RI	R			67	0	4	0	4		5-BA-6-14-67-0-1	1	WR
5	5-BA-5-6-210-0	BA	5	6									210	0	VT	RI	RI	R			210	0	3	0	3		5-BA-5-6-210-0-1	1	WR
5	5-BA-5-8-137-56	BA	5	8	2	137	56	LFET	BC	BC	0.184		137	56	PAUT	BC	BC	R	0.149		130	55	12	12	48.00	144.00	5-BA-5-8-130-55-1	1	PP
5	5-BA-5-10-22-0	BA	5	10									22	0	VT	RI	RI	R			22	0	4	0	4		5-BA-5-10-22-0-1	1	WR
5	5-BA-5-12-123-48	BA	5	12	1	123	48	UT	BC	BC	0.155		123	48	UT	BC	BC	R	< 0.160		123	48	10	10	40.00	100.00	5-BA-5-12-123-48-2	2	PP
5	5-BA-5-12-123-48	BA	5	12									123	48	VT	POR	RI	R			123	48	10	10	40.00	100.00	5-BA-5-12-123-48-2	2	PP
5	5-BA-4-3-120-0	BA	4	3									120	0	VT	UC	UC	R			120	0	12	0	12		5-BA-4-3-120-0-1	1	WR

General Tank Info		Shell Location			TesTex NDE							EEI PROVE UP								Recommended Repairs								Repair Type
		General Location				TexTex Reported Indication Location		TesTex NDE																				
Tank No.	Overall ID	Location in Tank	Shell Course	Plate Number	TesTex Indication ID on Plate	X Coordinate (in)	Y Coordinate (in)	Method	Indication Type	SIMPLIFIED INDICATION TYPE	Minimum Wall Thickness (in)	Depth of Topside Indication(in)	Center of Indication: X (in)	Center of Indication: Y (in)	Method	Indication Type	SIMPLIFIED INDICATION TYPE	EEI Recommendation (Repair or No	Minimum Thickness (in)	Depth (in)	Center of Repair: X (in)	Center of Repair: Y (in)	Width or Dia (in)	Height (in)	Length of Weld (in)	Area of PP (sq in)	EEI repair No.	Repair No. on Plate	Repair Type (Patch, Weld, Other)
5	5-BA-4-8-77-0	BA	4	8									77	0	VT	RI	RI	R			77	0	4	0	4		5-BA-4-8-77-0-1	1	WR
5	5-BA-3-1-90-0	BA	3	1									90	0	VT	LOF	LOF	R			90	0	14	0	14		5-BA-3-1-90-0-1	1	WR
5	5-BA-3-6-210-0	BA	3	6									210	0	VT	LOF	LOF	R			210	0	3	0	3		5-BA-3-6-210-0-1	1	WR
5	5-BA-3-7-90-0	BA	3	7									90	0	VT	RI	RI	R			90	0	4	0	4		5-BA-3-7-90-0-1	1	WR
5	5-BA-3-7-198-0	BA	3	7									198	0	VT	RI	RI	R			198	0	6	0	6		5-BA-3-7-198-0-2	2	WR
5	5-BA-3-7-211-0	BA	3	7									211	0	VT	LOF	LOF	R			211	0	6	0	6		5-BA-3-7-211-0-3	3	WR
5	5-BA-3-9-210-0	BA	3	9									210	0	VT	RI	RI	R			210	0	4	0	4		5-BA-3-9-210-0-1	1	WR
5	5-BA-3-10-90-0	BA	3	10									90	0	VT	RI	RI	R			90	0	4	0	4		5-BA-3-10-90-0-1	1	WR
5	5-BA-3-11-85-0	BA	3	11									85	0	VT	RI	RI	R			85	0	4	0	4		5-BA-3-11-85-0-1	1	WR
5	5-BA-3-14-54-0	BA	3	14									54	0	VT	RI	RI	R			54	0	4	0	4		5-BA-3-14-54-0-1	1	WR
5	5-BA-2-2-0-22	BA	2	2									0	22	VT	POR	RI	R			0	22	0	4	4		5-BA-2-2-0-22-1	1	WR
5	5-BA-2-2-69-0	BA	2	2									69	0	VT	RI	RI	R			69	0	4	0	4		5-BA-2-2-69-0-2	2	WR
5	5-BA-2-4-27-0	BA	2	4									27	0	VT	RI	RI	R			27	0	4	0	4		5-BA-2-4-27-0-1	1	WR
5	5-BA-2-14-137-0	BA	2	14									137	0	VT	RI	RI	R			137	0	4	0	4		5-BA-2-14-137-0-1	1	WR
5	5-BA-2-14-0-33	BA	2	14									0	33	VT	UF	IF	R			0	33	0	4	4		5-BA-2-14-0-33-2	2	WR
5	5-BA-1-2-0-2	BA	1	2									0	2	VT	RI	RI	R			0	0	0	4	4		5-BA-1-2-0-0-1	1	WR
5	5-BA-1-2-132-0	BA	1	2									132	0	VT	RI	RI	R			132	0	4	0	4		5-BA-1-2-132-0-2	2	WR
5	5-BA-1-8-0-56	BA	1	8									0	56	VT	RI	RI	R			0	56	0	4	4		5-BA-1-8-0-56-1	1	WR
5	5-BA-1-15-144-0	BA	1	15									144	0	VT	RI	RI	R			144	0	4	0	4		5-BA-1-15-144-0-1	1	WR
5	5-BA-1-15-91-6	BA	1	15									91	6	VT	IF	IF	R			91	6	0	10	10		5-BA-1-15-91-6-2	2	WR
5	5-LD-4-5-48-87	LD	4	5									48	87	VT	RI	RI	R			48	87	5	0	5		5-LD-4-5-48-87-1	1	WR
5	5-LD-4-33-58-0	LD	4	33									58	0	VT	RI	RI	R			58	0	4	0	4		5-LD-4-33-58-0-1	1	WR
5	5-LD-4-45-0-2	LD	4	45									0	2	VT	RI	RI	R			0	2	0	4	4		5-LD-4-45-0-2-1	1	WR
5	5-LD-4-50-0-43	LD	4	50									0	43	VT	RI	RI	R			0	43	0	4	4		5-LD-4-50-0-43-1	1	WR
5	5-LD-4-52-13-42	LD	4	52									13	42	VT	RI	RI	R			13	42	2	2	4		5-LD-4-52-13-42-1	1	WR
5	5-LD-4-59-26-9	LD	4	59									26	9	VT	IF	IF	R			26	9	10	0	10		5-LD-4-59-26-9-1	1	WR
5	5-LD-4-59-41-88	LD	4	59									41	88	VT	RI	RI	R			41	88	12	0	12		5-LD-4-59-41-88-2	2	WR
5	5-LD-3-25-0-128	LD	3	25									0	128	VT	RI	RI	R			0	128	0	4	4		5-LD-3-25-0-128-1	1	WR
5	5-LD-3-34-0-50	LD	3	34									0	50	VT	RI	RI	R			0	50	0	4	4		5-LD-3-34-0-50-1	1	WR
5	5-LD-2-40-11-7	LD	2	40									11	7	VT	RI	RI	R			11	7	0	5	5		5-LD-2-40-11-7-1	1	WR
5	5-LD-1-7-9-239	LD	1	7									9	239	VT	UC	UC	R			9	239	9	0	9		5-LD-1-7-9-239-1	1	WR
5	5-LD-1-8-8-230	LD	1	8									8	230	VT	POR	RI	R			8	230	0	2	2		5-LD-1-8-8-230-1	1	WR
5	5-LD-1-24-43-234	LD	1	24									43	234	VT	LOF	LOF	R			43	234	2	0	2		5-LD-1-24-43-234-1	1	WR
5	5-LD-1-24-43-229	LD	1	24									43	229	VT	UC	UC	R			43	229	4	0	4		5-LD-1-24-43-229-2	2	WR
5	5-LD-1-26-7-234	LD	1	26									7	234	VT	RI	RI	R			7	234	0	2	2		5-LD-1-26-7-234-1	1	WR
5	5-LD-1-26-48-236	LD	1	26									48	236	VT	RI	RI	R			48	236	0	4	4		5-LD-1-26-48-236-2	2	WR
5	5-LD-1-29-6-233	LD	1	29									6	233	VT	LOF	LOF	R			6	233	4	0	4		5-LD-1-29-6-233-1	1	WR
5	5-LD-1-37-6-233	LD	1	37									6	233	VT	RI	RI	R			6	233	4	0	4		5-LD-1-37-6-233-1	1	WR
5	5-LD-1-39-3-235	LD	1	39									3	235	VT	UC	UC	R			3	235	0	6	6		5-LD-1-39-3-235-1	1	WR

Glossary of Abbreviations used in the Master Table

BA	Barrell
BB	Backing Bar
BC	Bottom or back side corrosion indication
BFET	Balanced Field Electromagnetic Testing (an eddy current technique, TexTex occasionally referrs to this as "Hawkeye" after their instrumentation model that utilizes the technique)
B, Bulge	Bulge
Bracket	Existing bracket
Dent	Dent
ER	Extension Ring
G	Gouge
GA	"Ground Area" Areas found to be cleared of coating by grinding.
IF	Incomplete Fill
IP	Incomplete Penetration
L, Linear	Linear indication having length greater than three times width
LAM, Lamination	Lamination (original plate manufacture defect)
LD	Lower Dome
LFET	Low Frequency Electromagnetic Testing (an eddy current technique)
LOF	Lack of Fusion
MT	Magnetic Particle Testing
N	Nozzle (A Pipe Cap installed over an original construction feature such as grout nozzle, strain gauge nozzle, etc.)
N/A	Not Applicable
NR	As found in EEI Recommendation Column: "No Repair" An indication that met reporting criteria but, following prove-up, did not meet criteria for providing a repair.
NRI	No Recordable Indication
P	Porosity (also denoted by "POR")
PA	Plate Anchor
PAUT	Phased Array Ultrasound Testing
PC	Pipe Cap: A method repair by which a short length of pipe with an attached end cap is placed over the affected area and welded in place around the circumference with a full fillet weld. Existing repairs of this type are marked "N" in the Master Table.
POR	Porosity (also denoted by "P")
PP	Patch Plate (see also TSPP)
R	As found in EEI Recommendation Column: "Repair" An indication that met reporting criteria and, following prove-up, met criteria for providing a repair.
RI	Rounded Indication (width to length ratio 3 or less)
SG	Strain Gauge Fitting
SP	Shell Plate
TC	Top side corrosion
TO	Tear or Tear Out
TS	Top Side indication: a general term to identify an indication on the surface facing the examiner.
TSP	Top Side Pit
TSPP	Tombstone patch plate, as described in API 653
TTH	Telltale Penetration
UC	Undercut
UD	Upper Dome
UF	"under fill", also see IF
UT	Ultrasound Testing
VB	Vacuum Box Testing
VT	Visual Testing
W	Weld
WC	Weld Cover: often an channel section placed over backing bars in the upper dome
WI	Weld Indication: A generic term reported by TesTex to identify an indication found in a weld, typically found with an eddy current method
WR	Weld Repair: A repair made solely by the application of weld filler and appropriate grinding. No patch plate or other additional metal other than filler is added.

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ATTACHMENT G
CALCULATIONS

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1.0 TANK 5 CORROSION RATES

Overview

EEI is providing the information below as formulas for calculating corrosion rates for the steel liner. See Clean Inspect Repair TANKS 4 AND 13 (TO 004) Clean Inspect Repair Tanks 14, 17, AND 18 (TO 005) Design Analysis – Basis of Design document, Rev 3.0 dated October 2017 which establishes remaining minimum remaining wall thickness accept/reject criteria.

Record drawings of the Red Hill tanks indicate the steel liner plates in the upper dome, barrel, and lower dome in all of the tanks are 250 mils thick plate nominal. The floor (referred to as "base plate" on record drawings) of the lower dome in all of the tanks is indicated as 500 mils thick plate. Record drawings indicate formed cover plates were installed circa 2002 over the backing bars of the upper dome welds. This document prepared by EEI provides a calculation of corrosion rates for 250 mils thick steel liner plates and formed cover plates of the upper dome.

2.0 MAXIMUM CALCULATED CORROSION RATES FOR TANK 5

Maximum calculated corrosion rates for Tank 5 based on wall plate with least remaining wall thickness is as follows:

Upper Dome – Maximum wall loss was 134 mils of metal which occurred in 75 years of service making the corrosion rate:

- Corrosion Rate = 134 mils / 75 years = 1.789 mils / year

Extension Ring – Maximum wall loss was 138.15 mils of metal which occurred in 75 years of service making the corrosion rate:

- Corrosion Rate = 138.15 mils / 75 years = 1.842 mils / year

Barrel – Maximum wall loss was 129.3 mils of metal which occurred in 75 years of service making the corrosion rate:

- Corrosion Rate = 129.3 mils / 75 years = 1.724 mils / year

Lower Dome – Maximum wall loss was 49.35 mils of metal which occurred in 75 years of service making the corrosion rate:

- Corrosion Rate = 49.35 mils / 75 years = 0.658 mils / year

Floor – Negligible – measured plate thickness was within mill tolerance.

See attached shell roll out for location in tank.

Tank 5 corrosion rate by plate.
All rates are in mils per year

Legend

= Thickness of plate greater than 0.200"
= Measureable corrosion
= No Plate Exists in this Shell Course

	Column1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
Upper Dome	A				0.65789474	1.18421053	1.1842105	1.1842105	1.184210526	1.184210526	1.18421053	1.1842105	1.18421053				1.4473684				1.18421053	1.1842105	0.92105263	1.18421	1.184211	0.65789474	1.1842105	1.18421053					
Extension Ring	E4		1.84210526											1.18421053	1.1842105	1.46052632	1.2368421																
	E3		1.26315789												1.3157895	1.46052632																
	E2									0.657894737	0.65789474	1.4605263	1.36842105			1.39473684	1.3157895															
	E1											1.1842105	0.90789474																			
Barrel	28																															
	27												1.34210526		1.7236842		0.6578947															
	26	1.1842105																														
	25													0.80263158																		
	24																															
	23																															
	22									1.184210526																						
	21																															
	20																															
	19								1.184210526		1.18421053				1.1842105																	
	18																															
	17																															
	16																															
	15																															
	14																															
	13								1.184210526																							
	12																															
	11								1.184210526																							
	10								1.184210526						0.8026316																	
	9																															
	8																															
	7								1.184210526																							
	6								1.184210526																							
	5								1.328947368				1.18421053																			
	4																															
	3																															
	2									1.184210526																						
	1																															
Lower Dome	4																															
	3															0.65789474																
	2																															
	1																															
	Floor																															

33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72
			1.789473684											1.1842105	1.1842105			1.1973684	1.1842105				1.1842105		1.18421053		1.723684211	1.381578947	1.18421053	1.18421053	1.1842105	1.18421053	1.1842105	1.1842105	1.18421053	1.184211	1.7236842	1.2631579	

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ATTACHMENT H
VBT/MT REPORTS

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ENTERPRISE ENGINEERING, INC.

EEI-MT-001
ATTACHMENT 1

MAGNETIC PARTICLE EXAMINATION REPORT			NDE REPORT NO.:	
PROJECT NO.	CLIENT		CLIENT REF. NO.	PAGE
8877	NAVFAC EXWC		N39430-15-D-1678, TO 0011	1 OF 3
IDENTIFICATION			DRAWING NO.	DATE
8" Drain Cap			N/A	1/5/2018
LOCATION	PART/WELD NO.		EQUIPMENT MODEL & S/N	CAL DUE DATE
Red Hill Tank 5	Various		Magnaflux Y-1	Done on Day of Use
METHOD			EXAMINATION	PROCEDURE NO.
☑ WET ☑ AC ☑ YOKE			☑ INITIAL	EEI-MT-001
☐ DRY ☐ DC ☐ OTHER:			☐ REPAIR NO.	CODE/SPEC
				ASME Section V, Article 7

DESCRIPTION

Testing

Welds examined in both longitudinal and transverse directions.
Black lights utilized for inspection.

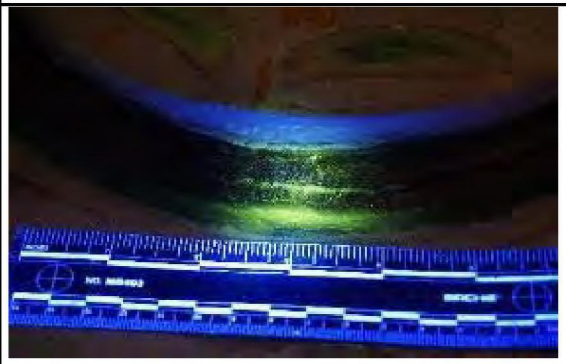
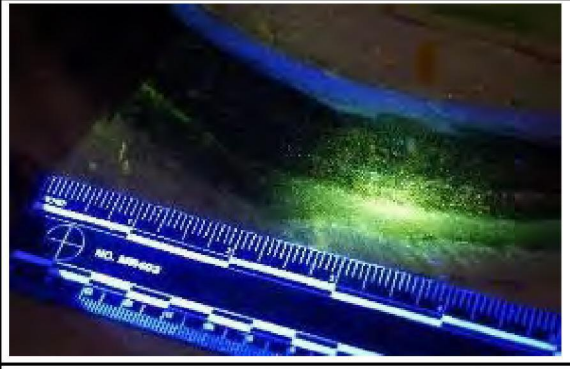
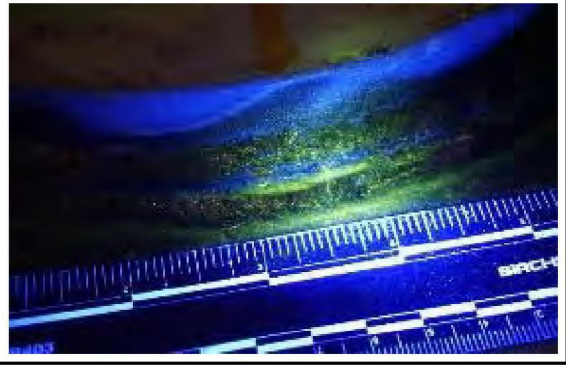
Material

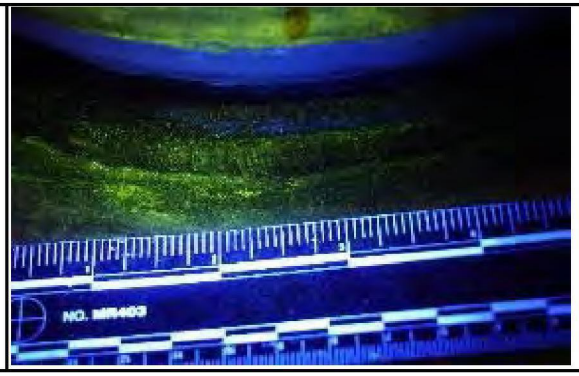
8" circular 1/2" thick plate

RESULTS: ☐ ACCEPT ☑ REJECT ☑ FOR INFORMATION ONLY

TECHNICIAN		CERTIFIED TO	LEVEL	CLIENT REPRESENTATIVE	DATE
NAME:	DJK	ASNT-SNT-TC-1A	II		
SIGNATURE:	DJK	DATE: 1/5/2018		AUTHORIZED INSPECTOR	DATE
REVIEWED BY:		DATE:		DJK	1/5/2018

8" Drain Cap

ID #	Location	Photos	MT Results	Indication info	Repair Details	Extra Comments
N/A	3:00		R	1/8" LW	Grind out and re-weld if need be	
N/A	4:00		R	1/8" LT	Grind out and re-weld if need be	
N/A	6:00		R	1/8" LW	Grind out and re-weld if need be	

N/A	10:00		R	1/8" LT	Grind out and re-weld if need be	

Glossary
R: Reject A: Accept L: Longitudinal T: Toe of Weld W:Within weld

ENTERPRISE ENGINEERING, INC.

EEI-MT-002
ATTACHMENT 1

MAGNETIC PARTICLE EXAMINATION REPORT		NDE REPORT NO.:	
PROJECT NO.	CLIENT	CLIENT REF. NO.	PAGE
8877	NAVFAC EXWC	N39430-15-D-1678, TO 0011	1 OF 6
IDENTIFICATION		DRAWING NO.	DATE
Strain Gauges		N/A	1/15/2018
LOCATION	PART/WELD NO.	EQUIPMENT MODEL & S/N	CAL DUE DATE
Red Hill Tank 5	Various	Magnaflux Y-1	Done on Day of Use
METHOD		EXAMINATION	PROCEDURE NO.
☑ WET ☑ AC ☑ YOKE		☑ INITIAL	EEI-MT-001
☐ DRY ☐ DC ☐ OTHER: _____		☐ REPAIR NO.	CODE/SPEC
			ASME Section V, Article 7

DESCRIPTION

Testing

Welds examined in both longitudinal and transverse directions.
Black lights utilized for inspection.

Material

3 1/2" pipe, with plate welded at end
Some pipes had been replaced by 6" circle Patch Plates

RESULTS: ☑ ACCEPT ☐ REJECT ☑ FOR INFORMATION ONLY

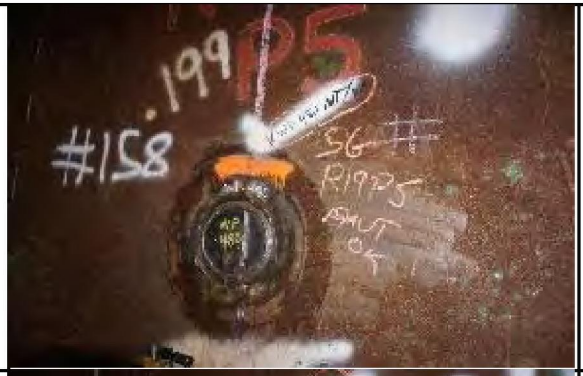
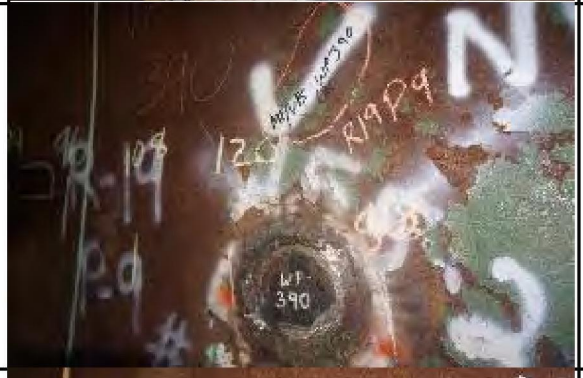
TECHNICIAN		CERTIFIED TO	LEVEL	CLIENT REPRESENTATIVE	DATE
NAME:	JMS	ASNT-SNT-TC-1A	II		
SIGNATURE:	JMS	DATE: 1/15/2018		AUTHORIZED INSPECTOR	DATE
REVIEWED BY:		DATE:		DJK	1/15/2018

Strain Gauges

ID #	Location	Photos	MT Results	Indication info	Repair Details	Extra Comments
TK5-SG-R5P3	R5P3		N/A	N/A	NR	Already MT under WGS warrenty work
TK5-SG-R5P7	R5P7		N/A	N/A	NR	Already MT under WGS warrenty work
TK5-SG-R5P11	R5P11		A	N/A	NR	

TK5-SG-R5P15	R5P15		A	N/A	NR	
TK5-SG-R12P2	R12P2		A	N/A	NR	
TK5-SG-R12P6	R12P6		N/A	N/A	NR	Already MT under WGS warrenty work

TK5-SG-R12P10	R12P10		A	N/A	NR	
TK5-SG-R12P13	R12P13		A	N/A	NR	
TK5-SG-R19P1	R19P1		A	N/A	NR	

TK5-SG-R19P5	R19P5		N/A	N/A	NR	Already MT under WGS warrenty work
TK5-SG-R19P9	R19P9		N/A	N/A	NR	Already MT under WGS warrenty work
TK5-SG-R19P13	R19P13		A	N/A	NR	

Glossary
R: Reject A: Accept L: Longitudinal T: Toe of Weld W:Within weld NR: No Repair N/A: Not Applicable NRI: No Reported Indications

MAGNETIC PARTICLE EXAMINATION REPORT		NDE REPORT NO.:	
PROJECT NO.	CLIENT	CLIENT REF. NO.	PAGE
8877	NAVFAC EXWC	N39430-15-D-1678, TO 0011	1 OF 15
IDENTIFICATION		DRAWING NO.	DATE
Plug Welds		N/A	1/15/2018
LOCATION	PART/WELD NO.	EQUIPMENT MODEL & S/N	CAL DUE DATE
Red Hill Tank 5	Various	Magnaflux Y-1	Done on Day of Use
METHOD		EXAMINATION	PROCEDURE NO.
☑ WET ☑ AC ☑ YOKE		☑ INITIAL	EEI-MT-001
☐ DRY ☐ DC ☐ OTHER:		☐ REPAIR NO.	CODE/SPEC
			ASME Section V, Article 7

DESCRIPTION

Testing

Welds examined in both longitudinal and transverse directions.
Black lights utilized for inspection.

Material

1 1/2" by 1 1/2" plates welded on the expansion joint

RESULTS: ☑ ACCEPT ☑ REJECT ☑ FOR INFORMATION ONLY

TECHNICIAN		CERTIFIED TO	LEVEL	CLIENT REPRESENTATIVE	DATE
NAME:	JMS	ASNT-SNT-TC-1A	II		
SIGNATURE:	JMS	DATE: 1/15/2018		AUTHORIZED INSPECTOR	DATE
REVIEWED BY:		DATE:		DJK	1/15/2018

Plug Welds

ID #	Location	Photos	MT Results	Indication info	Repair Details	Extra Comments
TK5-PW-2	EXPANSION JOINT		A	N/A	NR	
TK5-PW-3	EXPANSION JOINT		A	N/A	NR	
TK5-PW-8	EXPANSION JOINT		A	N/A	NR	

TK5-PW-9	EXPANSION JOINT		A	N/A	NR	
TK5-PW-13	EXPANSION JOINT		A	N/A	NR	
TK5-PW-14	EXPANSION JOINT		A	N/A	NR	

TK5-PW-19	EXPANSION JOINT		A	N/A	NR	
TK5-PW-24	EXPANSION JOINT		A	N/A	NR	
TK5-PW-26	EXPANSION JOINT		A	N/A	NR	

TK5-PW-34	EXPANSION JOINT		A	N/A	NR	
TK5-PW-35	EXPANSION JOINT		A	N/A	NR	
TK5-PW-36	EXPANSION JOINT		A	N/A	NR	

TK5-PW-40	EXPANSION JOINT		A	N/A	NR	
TK5-PW-41	EXPANSION JOINT		A	N/A	NR	
TK5-PW-52	EXPANSION JOINT		A	N/A	NR	

TK5-PW-53	EXPANSION JOINT		A	N/A	NR	
TK5-PW-63	EXPANSION JOINT		A	N/A	NR	
TK5-PW-64	EXPANSION JOINT		A	N/A	NR	

TK5-PW-70	EXPANSION JOINT		A	N/A	NR	
TK5-PW-71	EXPANSION JOINT		A	N/A	NR	
TK5-PW-71B	EXPANSION JOINT		A	N/A	NR	

TK5-PW-76	EXPANSION JOINT		A	N/A	NR	
TK5-PW-77	EXPANSION JOINT		A	N/A	NR	
TK5-PW-77B	EXPANSION JOINT		A	N/A	NR	

TK5-PW-82	EXPANSION JOINT		A	N/A	NR	
TK5-PW-83	EXPANSION JOINT		A	N/A	NR	
TK5-PW-83B	EXPANSION JOINT		A	N/A	NR	

TK5-PW-88	EXPANSION JOINT		A	N/A	NR	
TK5-PW-89	EXPANSION JOINT		A	N/A	NR	
TK5-PW-94	EXPANSION JOINT		A	N/A	NR	

TK5-PW-95	EXPANSION JOINT		A	N/A	NR	
TK5-PW-101	EXPANSION JOINT		A	N/A	NR	
TK5-PW-102	EXPANSION JOINT		A	N/A	NR	

TK5-PW-103B	EXPANSION JOINT		R	Multiple L W Cracks	Grind and Re-weld 6" WR	Located on E1 P9
TK5-PW-121	Adjustment Plate		A	N/A	NR	
TK5-PW-139	Adjustment Plate		A	N/A	NR	

TK5-PW-156	Adjustment Plate		A	N/A	NR	
TK5-PW-192	Adjustment Plate		A	N/A	NR	
TK5-PW-210	Adjustment Plate		A	N/A	NR	

TK5-PW-228	Adjustment Plate		A	N/A	NR	

Glossary
R: Reject
A: Accept
L: Longitudinal
T: Toe of Weld
W:Within weld
NR: No Repair
N/A: Not Applicable
NRI: No Reported Indications

ENTERPRISE ENGINEERING, INC.

EEI-MT-005
ATTACHMENT 1

MAGNETIC PARTICLE EXAMINATION REPORT		NDE REPORT NO.:	
PROJECT NO.	CLIENT	CLIENT REF. NO.	PAGE
8877	NAVFAC EXWC	N39430-15-D-1678, TO 0011	1 OF 2
IDENTIFICATION		DRAWING NO.	DATE
Miter Welds in 32" pipe		N/A	1/17/2018
LOCATION	PART/WELD NO.	EQUIPMENT MODEL & S/N	CAL DUE DATE
Red Hill Tank 5	Various	Magnaflux Y-1	Done on Day of Use
METHOD		EXAMINATION	PROCEDURE NO.
☑ WET ☑ AC ☑ YOKE		☑ INITIAL	EEI-MT-001
☐ DRY ☐ DC ☐ OTHER: ____		☐ REPAIR NO.	CODE/SPEC
			ASME Section V, Article 7

DESCRIPTION

Testing

Welds examined in both longitudinal and transverse directions.
Black lights utilized for inspection.

Material

Welds located in the Miter bend on the 32" pipe.

RESULTS: ☑ ACCEPT ☐ REJECT ☑ FOR INFORMATION ONLY

TECHNICIAN		CERTIFIED TO	LEVEL	CLIENT REPRESENTATIVE	DATE
NAME:	JMS	ASNT-SNT-TC-1A	II		
SIGNATURE:	JMS	DATE: 1/17/2018		AUTHORIZED INSPECTOR	DATE
REVIEWED BY:	KRS	DATE: 1/17/2018		DJK	1/17/2018

Miter Welds

ID #	Location	Photos	MT Results	Indication info	Repair Details	Extra Comments
N/A	32" pipe		A	N/A	NR	

Glossary

R: Reject
A: Accept
L: Longitudinal
T: Toe of Weld
W:Within weld
N/A: not applicable
NR: no repair

ENTERPRISE ENGINEERING, INC.

EEI-MT-004
ATTACHMENT 1

MAGNETIC PARTICLE EXAMINATION REPORT		NDE REPORT NO.:	
PROJECT NO.	CLIENT	CLIENT REF. NO.	PAGE
8877	NAVFAC EXWC	N39430-15-D-1678, TO 0011	1 OF 5
IDENTIFICATION		DRAWING NO.	DATE
TesTex Weld Indications		N/A	1/5/2018
LOCATION	PART/WELD NO.	EQUIPMENT MODEL & S/N	CAL DUE DATE
Red Hill Tank 5	Various	Magnaflux Y-1	Done on Day of Use
METHOD		EXAMINATION	PROCEDURE NO.
☑ WET ☑ AC ☑ YOKE		☑ INITIAL	EEI-MT-001
☐ DRY ☐ DC ☐ OTHER: ____		☐ REPAIR NO.	CODE/SPEC
			ASME Section V, Article 7

DESCRIPTION

Testing

Welds examined in both longitudinal and transverse directions.
Black lights utilized for inspection.

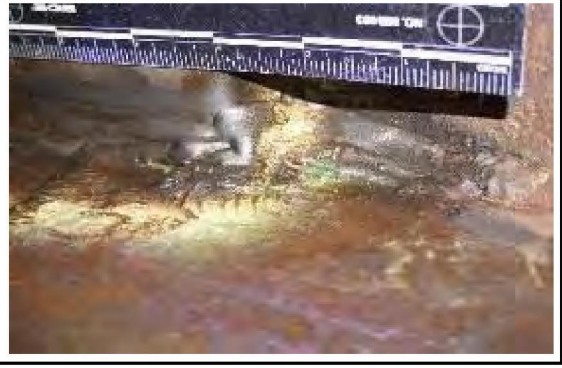
Material

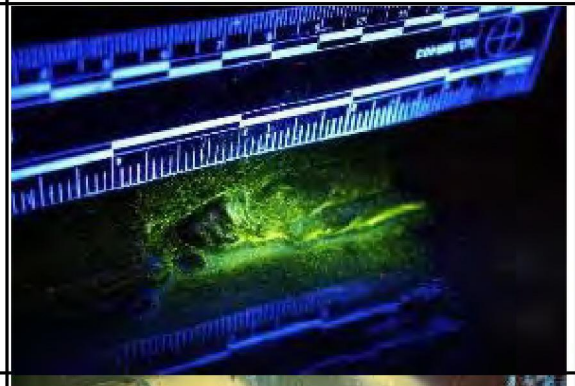
Weld indications were reported by Testex after using the Hawkeye system

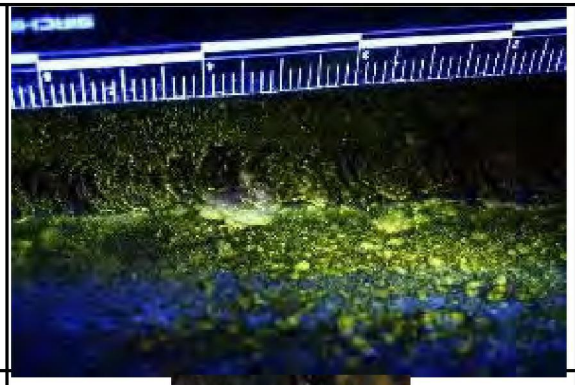
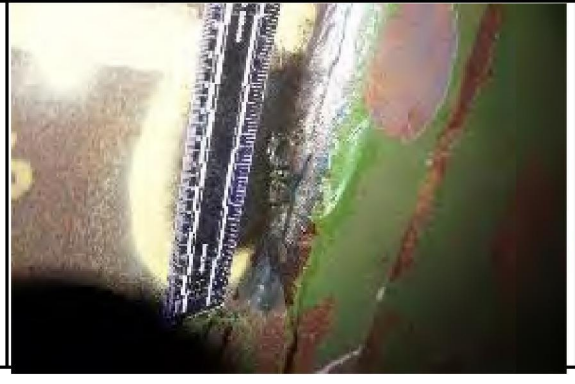
RESULTS: ☑ ACCEPT ☐ REJECT ☑ FOR INFORMATION ONLY

TECHNICIAN		CERTIFIED TO	LEVEL	CLIENT REPRESENTATIVE	DATE
NAME:	JGM	ASNT-SNT-TC-1A	II		
SIGNATURE:	JGM	DATE: 1/5/2018		AUTHORIZED INSPECTOR	DATE
REVIEWED BY:		DATE:		DJK	1/5/2018

Weld Indications

ID #	Location	Photos	MT Results	Indication info	Repair Details	Extra Comments
5-BA-19-2-0-34	R19P2		A		Visual examination found UF and UC present	
5-UD-A-17-31-0	A17		A		Grind out and re-weld failed on visual	
5-UD-A-18-0-0	A18		A		Grind out and re-weld failed on visual	

5-UD-A-18-26-0	A18		A		Grind out and re-weld failed on visual	
5-UD-A-20-10-0	A20		A		Grind out and re-weld failed on visual	
5-UD-A-23-6-128	A23		R	1/8" LW	Grind out and re-weld nozzle, failed on visual	Small indication, went away after burring out

5-UD-A-24-0-27	A24		R	1/4" LT	Grind out and re-weld	Still present after burring out
5-UD-A-26-34-127	A26		A		Grind out and re-weld	
5-UD-C-16-55-125	C16		A		Grind out and re-weld	

Glossary
R: Reject A: Accept L: Longitudinal T: Toe of Weld W:Within weld

ENTERPRISE ENGINEERING, INC.

EEI-VBT-005
ATTACHMENT 1

VACUUM BOX TESTING REPORT		NDE REPORT NO.:	
PROJECT NO.	CLIENT	CLIENT REF. NO.	PAGE
8877	NAVFAC EXWC	N39430-15-D-1678, TO 0011	1 OF 2
IDENTIFICATION		DRAWING NO.	DATE
8" Drain Cap		N/A	1/20/2018
LOCATION	PART/WELD NO.	EQUIPMENT MODEL & S/N	CAL DUE DATE
Red Hill Tank 5	Various	EEI CUSTOM BOX #006	N/A
METHOD		EXAMINATION	PROCEDURE NO.
☑ SOAP ☑ 21 kPa ☐ 56 kPa		☑ INITIAL	EEI-VBT-001
☐ LD ☐ 35 Kpa ☑ 70 kPa		☐ REPAIR NO.	CODE/SPEC
			API 650 SECTION 8.6

DESCRIPTION

Testing

Test was conducted at intial pressure between 21 and 35 kPa in which the vacuum was formed. Pressured was increased to between 56 and 70 kPa. Material was then tested at the higher pressure.
A soap film solution was used for the all testing with vacuum box.

Material

The weld of the 8" Drain cap and re-pad

RESULTS: ☑ ACCEPT ☐ REJECT ☐ FOR INFORMATION ONLY

TECHNICIAN		CERTIFIED TO	LEVEL	CLIENT REPRESENTATIVE	DATE
NAME:	ADS	ASNT-SNT-TC-1A	II		
SIGNATURE:	ADS	DATE: 1/20/2018		AUTHORIZED INSPECTOR	DATE
REVIEWED BY:	SCW	DATE: 1/20/2018		DJK	1/20/2018

8" Drain Cap

ID #	Location	Photos	VBT Results	Indication info	Repair Details	Extra Comments
TK5-8"DC	Floor		A	N/A	Grind out and re-weld if need be	Repair due to failed MT

Glossary

R: Reject
A: Accept
NR: No Repair
N/A: Not Applicable
NRI: No Reported Indications

ENTERPRISE ENGINEERING, INC.

EEI-VBT-002
ATTACHMENT 1

VACUUM BOX TESTING REPORT		NDE REPORT NO.:	
PROJECT NO.	CLIENT	CLIENT REF. NO.	PAGE
8877	NAVFAC EXWC	N39430-15-D-1678, TO 0011	1 OF 3
IDENTIFICATION		DRAWING NO.	DATE
Adjustment Plate		N/A	1/23/2018
LOCATION	PART/WELD NO.	EQUIPMENT MODEL & S/N	CAL DUE DATE
Red Hill Tank 5	Various	EEI CUSTOM BOXS #001,#003	N/A
METHOD		EXAMINATION	PROCEDURE NO.
☑ SOAP ☑ 21 kPa ☐ 56 kPa		☑ INITIAL	EEI-VBT-001
☐ LD ☐ 35 Kpa ☑ 70 kPa		☐ REPAIR NO.	CODE/SPEC
			API 650 SECTION 8.6

DESCRIPTION

Testing

Test was conducted at intial pressure between 21 and 35 kPa in which the vacuum was formed. Pressured was increased to between 56 and 70 kPa. Material was then tested at the higher pressure.
A soap film solution was used for the all testing with vacuum box.

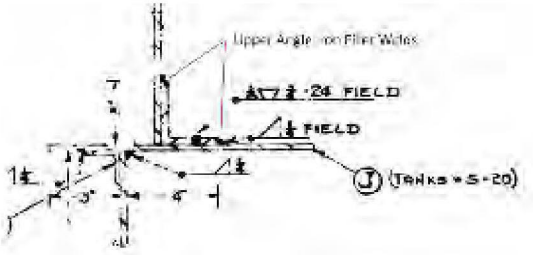
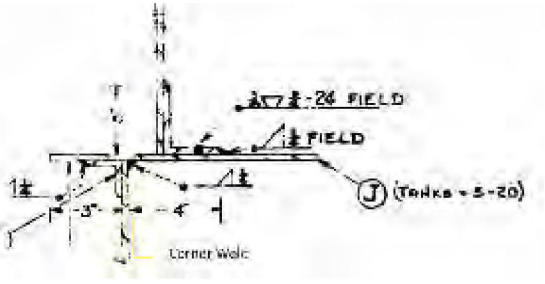
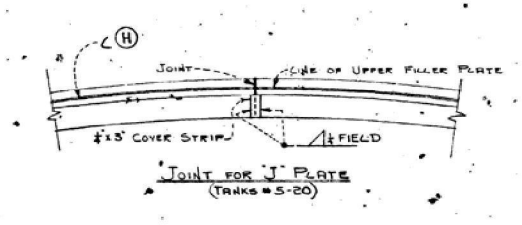
Material

The top and bottom of the 2 1/2"x 3"x 5/16" angle iron for a total of two filet welds.
Angle weld on the bottom of Adjustment Plate.
All three welds travel around the entire tank resulting in 942' of weld.
Plug Welds and Joint Plates are located all along the Adjustment Plate

RESULTS: ☑ ACCEPT ☐ REJECT ☐ FOR INFORMATION ONLY

TECHNICIAN		CERTIFIED BY	LEVEL	CLIENT REPRESENTATIVE	DATE
NAME:	ADS	ASNT-SNT-TC-1A	II		
SIGNATURE:	ADS	DATE: 1/23/2018		AUTHORIZED INSPECTOR	DATE
REVIEWED BY:	JGM	DATE: 1/23/2018		DJK	1/23/2018

Adjustment Plate

ID #	Location	Photos	MT Results	Indication info	Repair Details	Extra Comments
N/A	Upper Angle Iron Fillet welds		A	N/A	NR	
N/A	Corner Weld Under the Adjustment Plate		A	N/A	NR	
N/A	Plug Welds and Joint Plates		A	N/A	NR	Some Plug Welds were not tested due to geometric constrants

Glossary
R: Reject A: Accept NR: No Repair N/A: Not Applicable

VACUUM BOX TESTING REPORT		NDE REPORT NO.:	
PROJECT NO.	CLIENT	CLIENT REF. NO.	PAGE
8877	NAVFAC EXWC	N39430-15-D-1678, TO 0011	1 OF 3
IDENTIFICATION		DRAWING NO.	DATE
Expansion Joint Filet Welds		N/A	1/24/2018
LOCATION	PART/WELD NO.	EQUIPMENT MODEL & S/N	CAL DUE DATE
Red Hill Tank 5	Various	EEI CUSTOM BOXS #001,#002	N/A
METHOD		EXAMINATION	PROCEDURE NO.
☑ SOAP ☑ 21 kPa ☐ 56 kPa		☑ INITIAL	EEI-VBT-001
☐ LD ☐ 35 Kpa ☑ 70 kPa		☐ REPAIR NO.	CODE/SPEC
			API 650 SECTION 8.6

DESCRIPTION

Testing

Test was conducted at intial pressure between 21 and 35 kPa in which the vacuum was formed. Pressured was increased to between 56 and 70 kPa. Material was then tested at the higher pressure.
A soap film solution was used for the all testing with vacuum box.

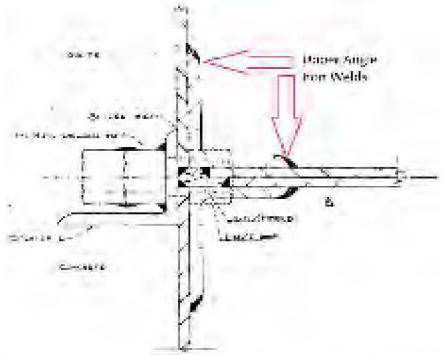
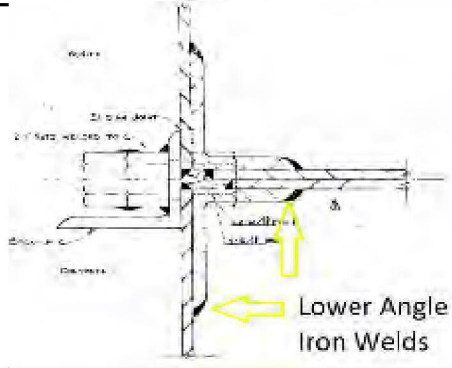
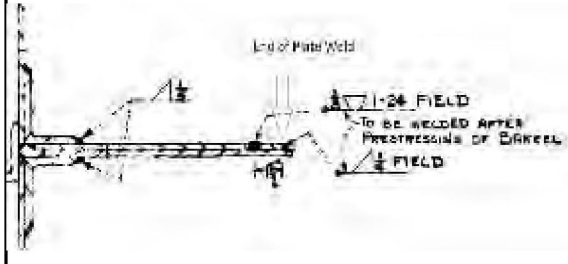
Material

The top and bottom of the upper and lower 2 1/2"x 3"x 5/16" angle iron for a total of four filet welds
A filet weld at the end of the expasion joint plates.
All five welds travel around the entire tank resulting in 1570' of weld.
Plug welds are located all along the Expansion joint.

RESULTS: ☑ ACCEPT ☐ REJECT ☐ FOR INFORMATION ONLY

TECHNICIAN		CERTIFIED BY	LEVEL	CLIENT REPRESENTATIVE	DATE
NAME:	ADS	ASNT-SNT-TC-1A	II		
SIGNATURE:	ADS	DATE: 1/24/2018		AUTHORIZED INSPECTOR	DATE
REVIEWED BY:	JGM	DATE: 1/24/2018		DJK	1/23/2018

Expansion Joint

ID #	Location	Photos	MT Results	Indication info	Repair Details	Extra Comments
N/A	Upper Angle Iron Fillet welds		A	N/A	NR	
N/A	Lower Angle Iron Filet welds		A	N/A	NR	
N/A	End of Plate Filet Weld		A	N/A	NR	

N/A	Plug Welds		A	N/A	NR	

Glossary
R: Reject A: Accept NR: No Repair N/A: Not Applicable

VACUUM BOX TESTING REPORT		NDE REPORT NO.:	
PROJECT NO.	CLIENT	CLIENT REF. NO.	PAGE
8877	NAVFAC EXWC	N39430-15-D-1678, TO 0011	1 OF 6
IDENTIFICATION		DRAWING NO.	DATE
Strain Gauges		N/A	1/18/2018
LOCATION	PART/WELD NO.	EQUIPMENT MODEL & S/N	CAL DUE DATE
Red Hill Tank 5	Various	EEI CUSTOM BOXS #004	N/A
METHOD		EXAMINATION	PROCEDURE NO.
☑ SOAP ☑ 21 kPa ☐ 56 kPa		☑ INITIAL	EEI-VBT-001
☐ LD ☐ 35 Kpa ☑ 70 kPa		☐ REPAIR NO.	CODE/SPEC
			API 650 SECTION 8.6

DESCRIPTION

Testing

Test was conducted at intial pressure between 21 and 35 kPa in which the vacuum was formed. Pressured was increased to between 56 and 70 kPa. Material was then tested at the higher pressure.
A soap film solution was used for the all testing with vacuum box.

Material

12 Strain gauges were examined.
5 Strain gauges were already Vacuum Box Tested from the warrenty work done previously.

RESULTS: ☑ ACCEPT ☐ REJECT ☐ FOR INFORMATION ONLY

TECHNICIAN		CERTIFIED TO	LEVEL	CLIENT REPRESENTATIVE	DATE
NAME:	AKD	ASNT-SNT-TC-1A	II		
SIGNATURE:	AKD	DATE: 1/18/2018		AUTHORIZED INSPECTOR	DATE
REVIEWED BY:		DATE:		DJK	1/18/2018

Strain Gauges

ID #	Location	Photos	VBT Results	Indication info	Repair Details	Extra Comments
TK5-SG-R5P3	R5P3		N/A	N/A	NR	Already VBT under WGS warrenty work
TK5-SG-R5P7	R5P7		N/A	N/A	NR	Already VBT under WGS warrenty work
TK5-SG-R5P11	R5P11		A	N/A	NR	

TK5-SG-R5P15	R5P15		A	N/A	NR	
TK5-SG-R12P2	R12P2		A	N/A	NR	
TK5-SG-R12P6	R12P6		N/A	N/A	NR	Already VBT under WGS warrenty work

TK5-SG-R12P10	R12P10		A	N/A	NR	
TK5-SG-R12P13	R12P13		A	N/A	NR	
TK5-SG-R19P1	R19P1		A	N/A	NR	

TK5-SG-R19P5	R19P5		N/A	N/A	NR	Already VBT under WGS warrenty work
TK5-SG-R19P9	R19P9		N/A	N/A	NR	Already VBT under WGS warrenty work
TK5-SG-R19P13	R19P13		A	N/A	NR	

Glossary
R: Reject A: Accept NR: No Repair N/A: Not Applicable NRI: No Reported Indications

ENTERPRISE ENGINEERING, INC.

EEI-VBT-004
ATTACHMENT 1

VACUUM BOX TESTING REPORT		NDE REPORT NO.:	
PROJECT NO.	CLIENT	CLIENT REF. NO.	PAGE
8877	NAVFAC EXWC	N39430-15-D-1678, TO 0011	1 OF 3
IDENTIFICATION		DRAWING NO.	DATE
Tower Legs		N/A	1/26/2018
LOCATION	PART/WELD NO.	EQUIPMENT MODEL & S/N	CAL DUE DATE
Red Hill Tank 5	Various	EEI CUSTOM BOX #005	N/A
METHOD		EXAMINATION	PROCEDURE NO.
☑ SOAP ☑ 21 kPa ☐ 56 kPa		☑ INITIAL	EEI-VBT-001
☐ LD ☐ 35 Kpa ☑ 70 kPa		☐ REPAIR NO.	CODE/SPEC
			API 650 SECTION 8.6

DESCRIPTION

Testing

Test was conducted at intial pressure between 21 and 35 kPa in which the vacuum was formed. Pressured was increased to between 56 and 70 kPa. Material was then tested at the higher pressure.
A soap film solution was used for the all testing with vacuum box.

Material

The weld attaching the tower legs to the repad and the welds attaching the repds to the floor were tested for all four Tower Legs.

RESULTS: ☑ ACCEPT ☐ REJECT ☐ FOR INFORMATION ONLY

TECHNICIAN		CERTIFIED BY	LEVEL	CLIENT REPRESENTATIVE	DATE
NAME:	ADS	ASNT-SNT-TC-1A	II		
SIGNATURE:	ADS	DATE: 1/26/2018		AUTHORIZED INSPECTOR	DATE
REVIEWED BY:	SCW	DATE: 1/26/2018		DJK	1/26/2018

Tower Legs

ID #	Location	Photos	VBT Results	Indication info	Repair Details	Extra Comments
TK5-TL-1	Floor		A	N/A	NR	
TK5-TL-2	Floor		A	N/A	NR	
TK5-TL-3	Floor		A	N/A	NR	

TK5-TL-4	Floor		A	N/A	NR	

Glossary

R: Reject
A: Accept
NR: No Repair
N/A: Not Applicable
NRI: No Reported Indications

ENTERPRISE ENGINEERING, INC.

VACUUM BOX #001

VACUUM BOX REPORT		NDE REPORT NO.:	
PROJECT NO. *8877*	CLIENT *NAVFAC EXWC*	CLIENT REF. NO. *N39430-15-D-1678, TO 0011*	PAGE 1 OF 1
IDENTIFICATION *Red Hill Tank 5*		VACUUM BOX NO. *EEI-001*	DATE OF COMPLETION 1/15/18
DIMENSIONS L: 24" W: 6" H: N/A			BUILDER INTIALS CMH

DESCRIPTION
Flat weld box
24"x6"
1 ¼" foam on the bottom
3/8" acrylic sheet

ENTERPRISE ENGINEERING, INC.

ENTERPRISE ENGINEERING, INC.

VACUUM BOX #002

VACUUM BOX REPORT		NDE REPORT NO.:	
PROJECT NO. *8877*	CLIENT *NAVFAC EXWC*	CLIENT REF. NO. *N39430-15-D-1678, TO 0011*	PAGE 1 OF 1
IDENTIFICATION *Red Hill Tank 5*		VACUUM BOX NO. *EEI-002*	DATE OF COMPLETION 1/16/18
DIMENSIONS L: 24" W: 4"		H: 4"	BUILDER INTIALS CMH

DESCRIPTION
Angle weld box
24"x4"x4"
2" foam on bottom
3/4" acrylic sheet

ENTERPRISE ENGINEERING, INC.

ENTERPRISE ENGINEERING, INC.

VACUUM BOX #003

VACUUM BOX REPORT		NDE REPORT NO.:	
PROJECT NO. *8877*	CLIENT *NAVFAC EXWC*	CLIENT REF. NO. *N39430-15-D-1678, TO 0011*	PAGE 1 OF 1
IDENTIFICATION *Red Hill Tank 5*		VACUUM BOX NO. *EEI-003*	DATE OF COMPLETION 1/16/18
DIMENSIONS L: 24" W: 12" H: 3 ½"			BUILDER INTIALS CMH

DESCRIPTION
Expansion joint weld box
24"x12"x3 ½"
1 ½" foam on bottom
3/8" acrylic sheet

ENTERPRISE ENGINEERING, INC.

ENTERPRISE ENGINEERING, INC.

VACUUM BOX #004

VACUUM BOX REPORT		NDE REPORT NO.:	
PROJECT NO. *8877*	CLIENT *NAVFAC EXWC*	CLIENT REF. NO. *N39430-15-D-1678, TO 0011*	PAGE 1 OF 1
IDENTIFICATION *Red Hill Tank 5*		VACUUM BOX NO. *EEI-004*	DATE OF COMPLETION 1/12/18
DIMENSIONS L: 12" W: 12" H: 6 ½"			BUILDER INTIALS CMH

DESCRIPTION
Strain Gauge box
12"x12" with 9"x9" x6 ½" cube on top
2" foam on bottom
3/8" acrylic sheet

ENTERPRISE ENGINEERING, INC.

ENTERPRISE ENGINEERING, INC.

VACUUM BOX #005

VACUUM BOX REPORT		NDE REPORT NO.:	
PROJECT NO. *8877*	CLIENT *NAVFAC EXWC*	CLIENT REF. NO. *N39430-15-D-1678, TO 0011*	PAGE 1 OF 1
IDENTIFICATION *Red Hill Tank 5*		VACUUM BOX NO. *EEI-005*	DATE OF COMPLETION 1/18/18
DIMENSIONS L: 15" W: 15" H: 5 ½"			BUILDER INTIALS CMH

DESCRIPTION
Tower Leg box
15"x15"x5 ½"
1 ¼" foam
¾" acrylic sheet

ENTERPRISE ENGINEERING, INC.

ENTERPRISE ENGINEERING, INC.

VACUUM BOX #006

VACUUM BOX REPORT		NDE REPORT NO.:	
PROJECT NO. *8877*	CLIENT *NAVFAC EXWC*	CLIENT REF. NO. *N39430-15-D-1678, TO 0011*	PAGE 1 OF 1
IDENTIFICATION *Red Hill Tank 5*		VACUUM BOX NO. *EEI-006*	DATE OF COMPLETION 1/9/18
DIMENSIONS L: 24"	W: 24"	H: N/A	BUILDER INTIALS CMH

DESCRIPTION
8" Drain Cap box
24" x24"
2" foam
3/8" acrylic sheet

ENTERPRISE ENGINEERING, INC.

ATTACHMENT I
PHASED ARRAY REPORT FOR THE 32-INCH PRODUCT LINE WELDS

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PAUT ANGLE BEAM EXAMINATION REPORT

NDE REPORT NO.: PAUT 8877

PROJECT NO.:	CLIENT:	CLIENT REF. NO.:	
8877	NAVFAC EXWC		

IDENTIFICATION:	DRAWING NO.:	DATE:
Normal Fluid Service Piping Welds	N/A	1/17/2018

LOCATION:	PART/WELD NO.:	MATERIAL:	PROCEDURE:	TECHNIQUE:	CODE/SPEC:
Red Hill Tank 5	Various	Carbon Steel	EEI-PAUT-01	45° to 70° PAUT	B31.3

CONDITION:	TEMPERATURE:	DIAMETER:	THICKNESS:	SENSITIVITY:	RANGE:	COUPLANT:
Non-coated	☑ AMBIENT ☐ HOT	32-inch	.375-inch	TCG	1.8"	SONOSAFE

TRANSDUCER: ID No. / FREQ / ELEMENTS / PITCH	INSTRUMENT		CAL. BLOCK TYPE	CAL. BLOCK SERIAL NO.
5L16A10 / 5 MHz / 16 element / 0.6 mm	MODEL:	Omniscan SX	NAVSHIP	
	S/N:	QC-001865		
			EXAMINATION: ☑ INITIAL ☐ REPAIR No. _____	

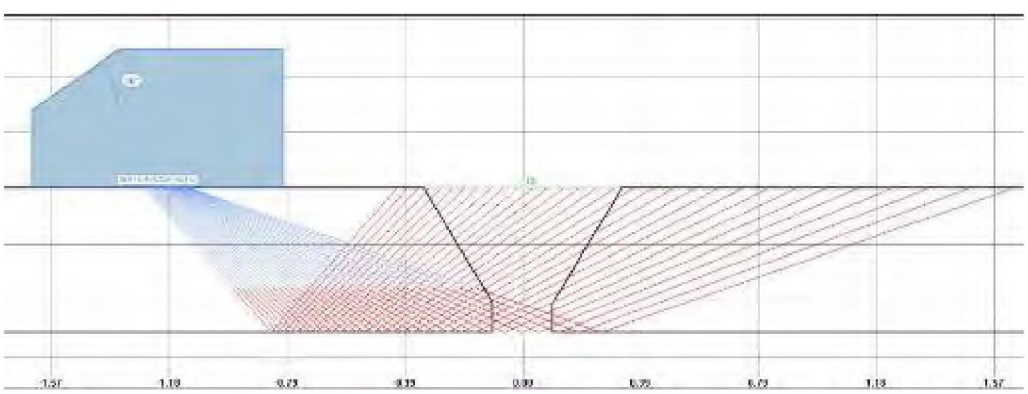
DESCRIPTION:

1. Circumferential welds were examined along entrie length of 32-inch product line
2. 10 indications discovered throughout line.

SCAN PLAN:

Probe ID	Wedge ID	Beam Angles (deg.)				Probe Offset (in.)	Weld Angle (deg.)	Material Thickness (in.)
5L16	N55S-A10	MIN	40	MAX	70	0.800	30	0.375

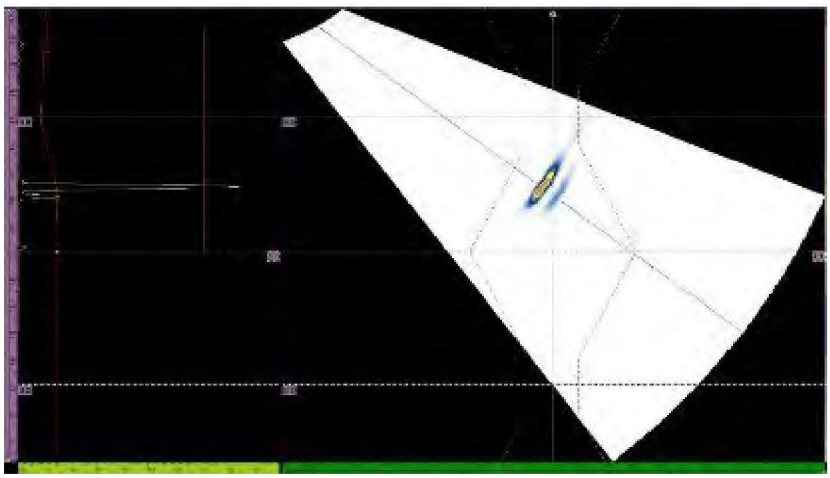
Note: Plan for 32-inch pipe.



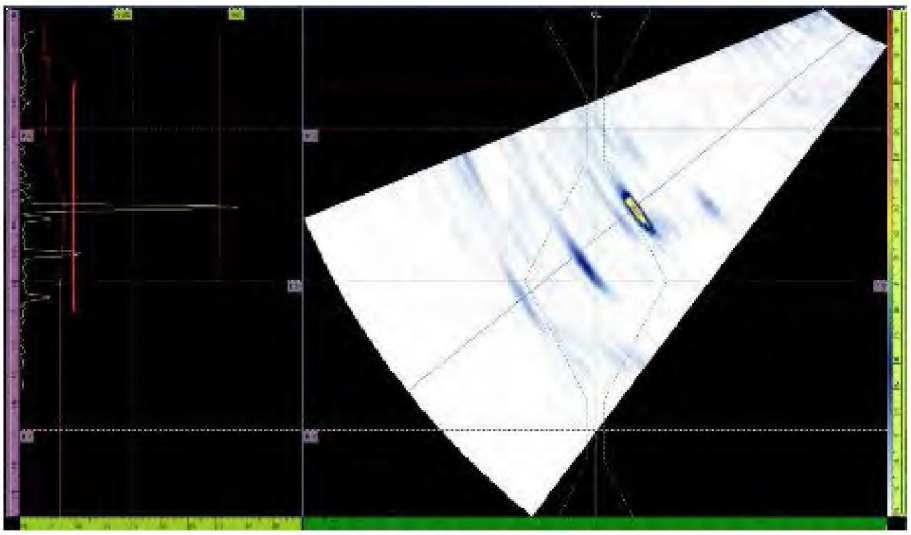
RESULTS: ☐ ACCEPT ☐ REJECT ☑ FOR INFORMATION ONLY

TECHNICIAN	QC REVIEW	CLIENT REPRESENTATIVE
NAME/LEVEL: Jake Sylvainr / Level II PAUT	NAME: Karl Schlenekr	NAME: Andrew Bishop
SIGNATURE:	SIGNATURE:	DATE:
DATE: 1/17/2018	DATE: 1/17/2018	

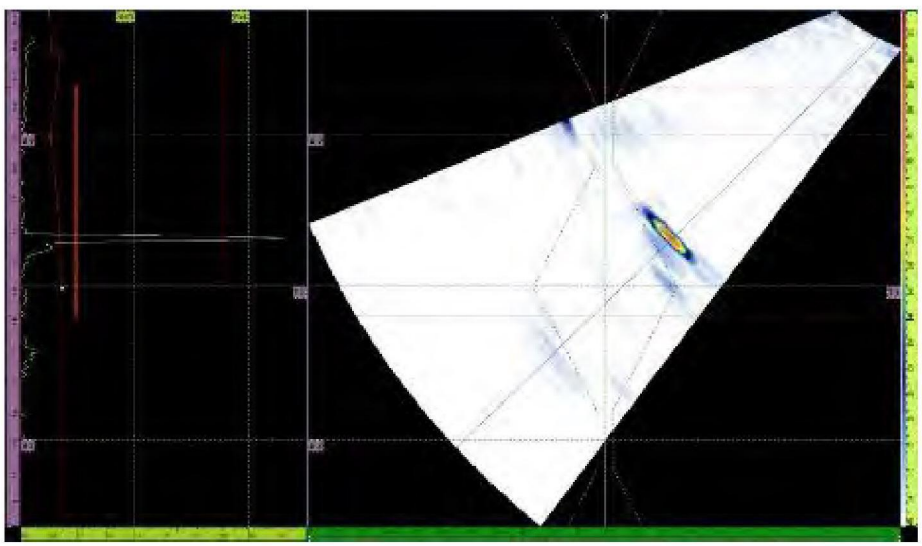
Calibration screen capture showing reference gain being set on NAVSHIP calibration block.



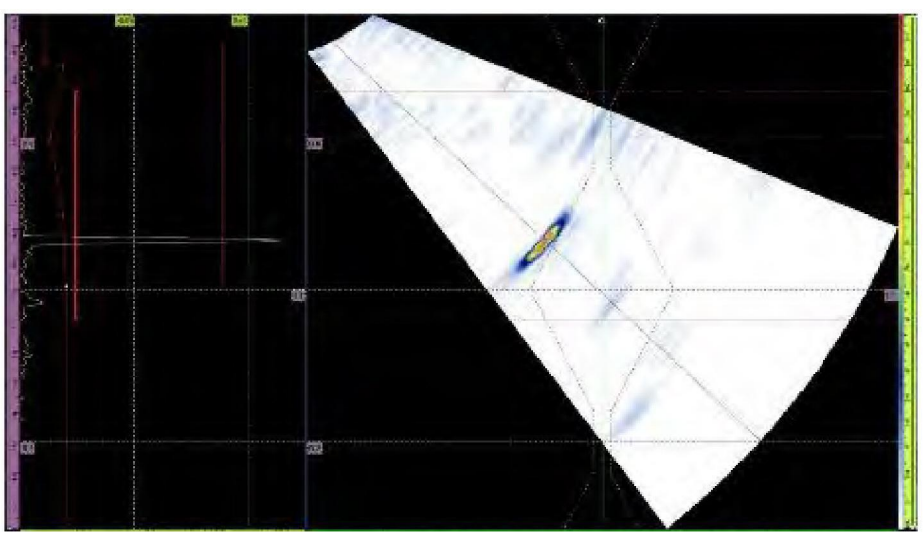
Weld C2
LOF @ 0 deg x 2"



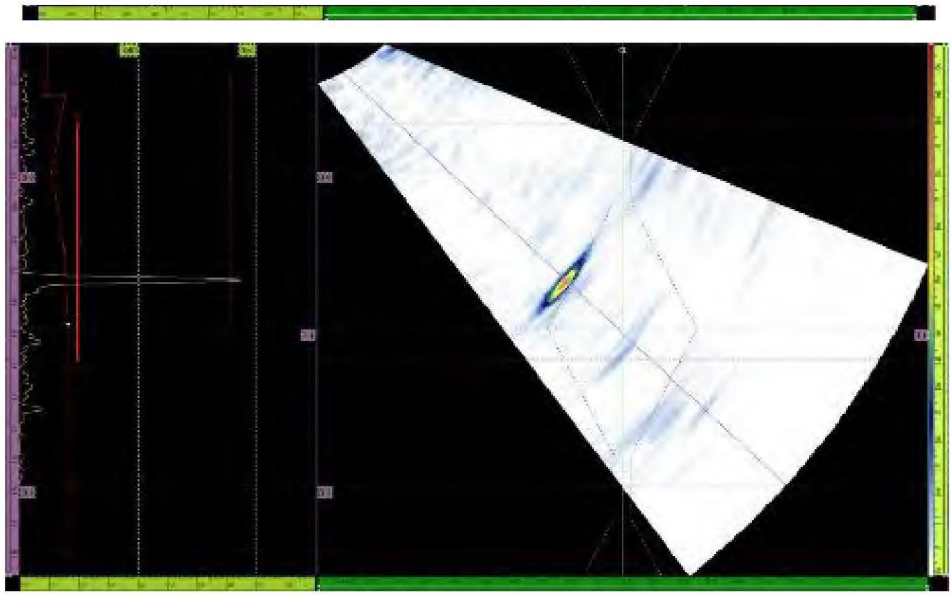
Weld C2
LOF @ 30 deg x 3"



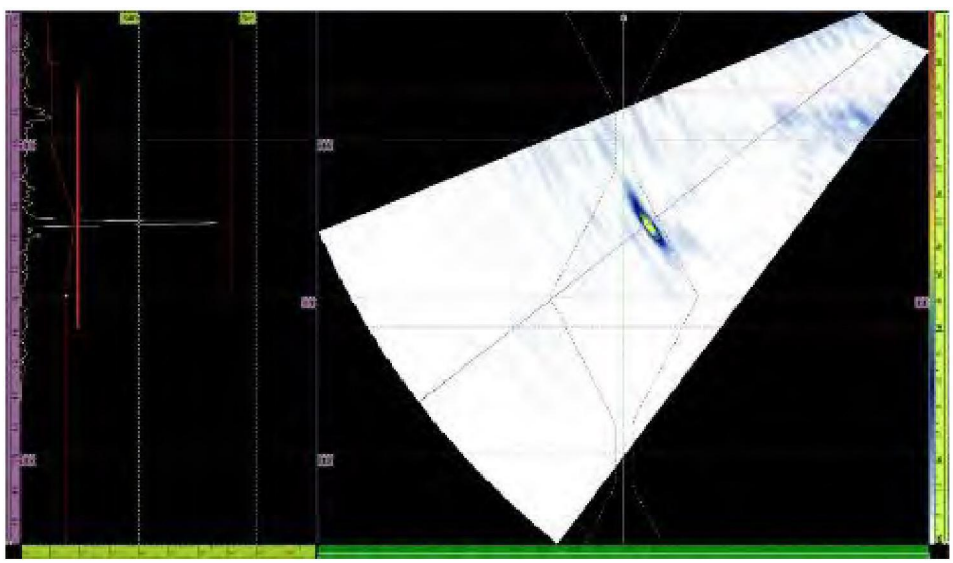
Weld C2
LOF @ 350 deg x 1"



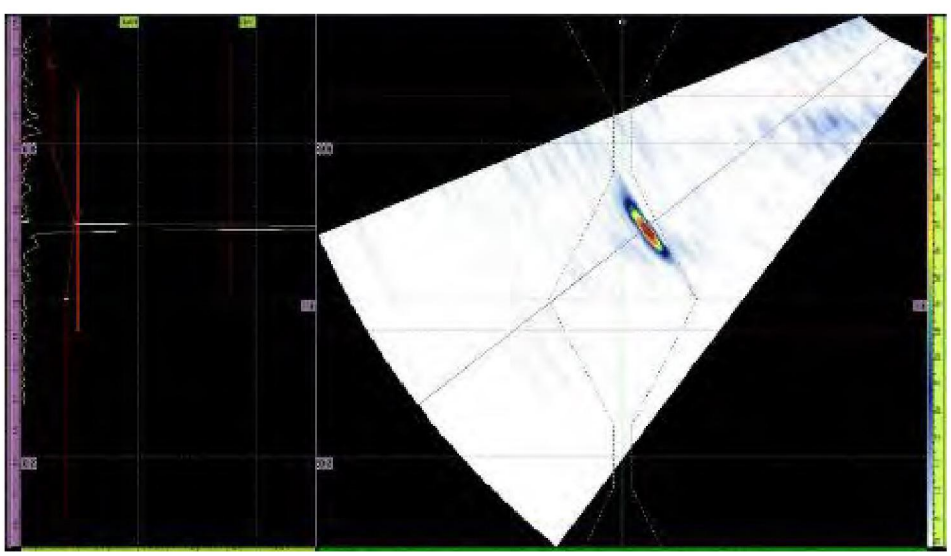
Weld C2
LOF @ 180 deg x 1"



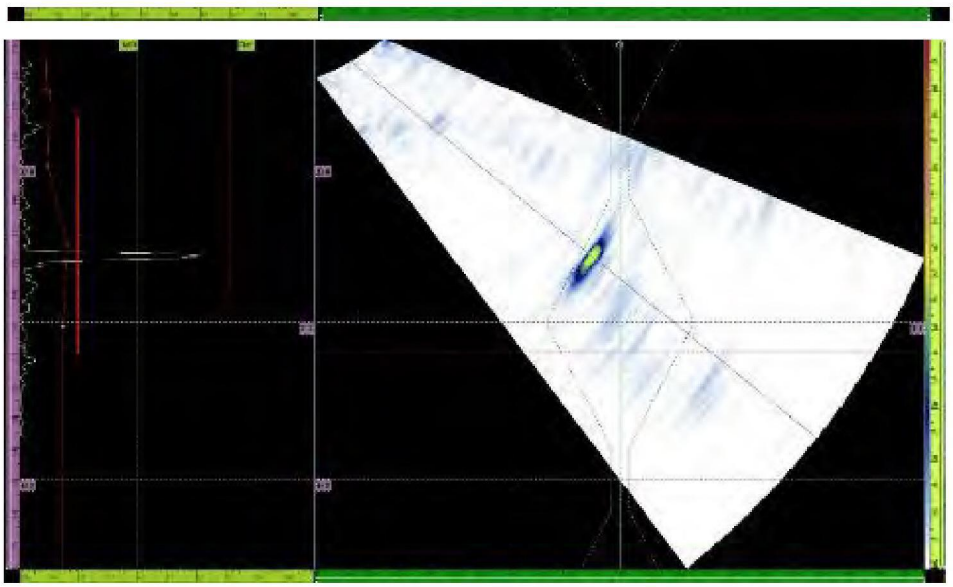
Weld C3
LOF @ 330 deg x 1"



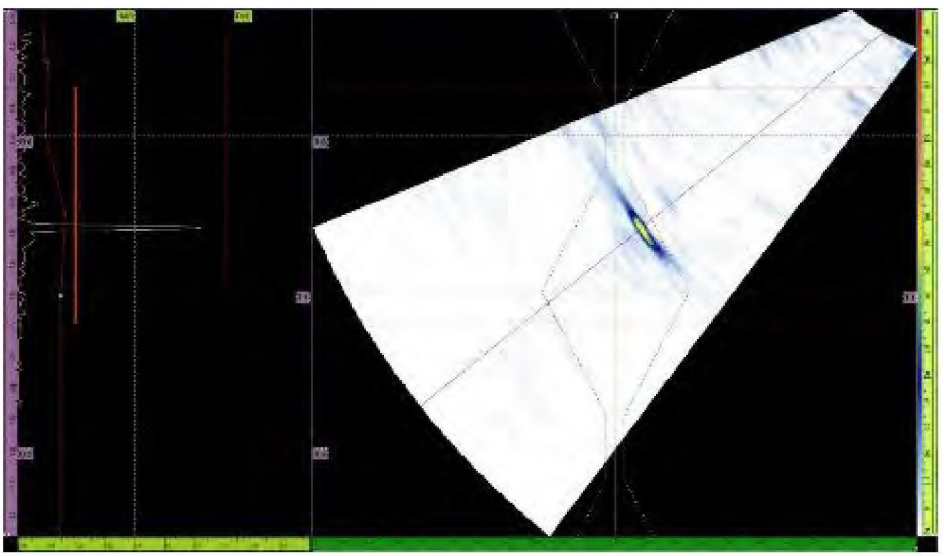
Weld C3
LOF @ 315 deg x 1"



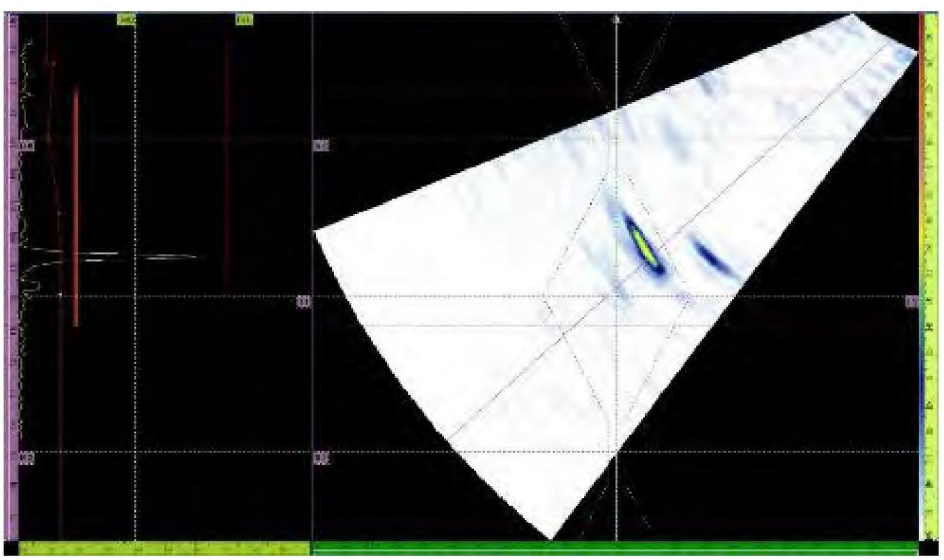
Weld C4
LOF @ 210 deg x 2"



Weld C4
LOF @ 260 deg x 1"

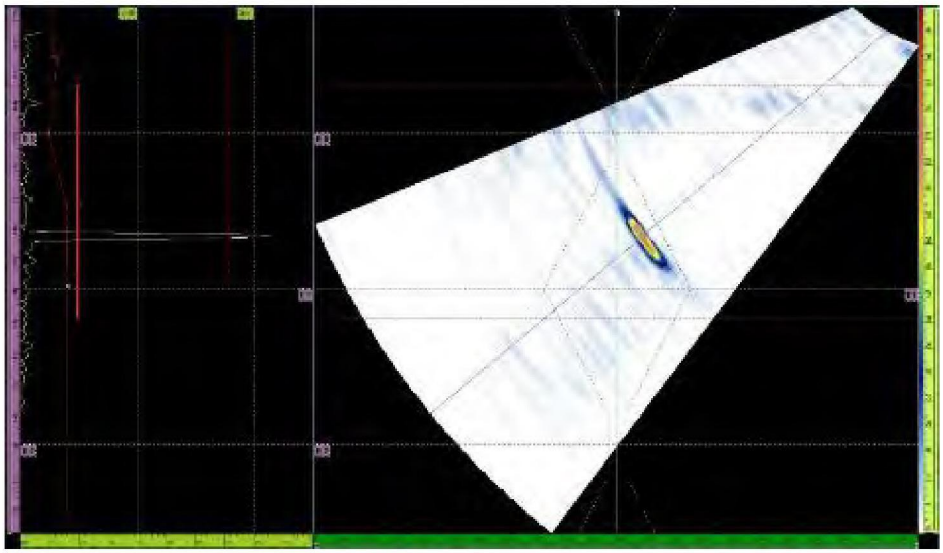


Weld C4
LIN @ 270 deg x 2.5"



Weld C4

LOF @ 315 deg x 8"



ATTACHMENT J
NOZZLE PRESSURE TEST REPORT

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Perform Hydrostatic Pipeline Pressure Testing at Red Hill - Tank 5, FLC Pearl Harbor, HI

HCNA Leak Detection System

Report – January 2018

CNIC Commander, Navy Region Hawaii

TEST REPORT

Submitted To: Enterprise Engineering, Inc.

Prime Contract: N39430-15-D-1678

Task Order Number: HCNA 15-D-1678 DO 011

January 19, 2018

NAVSUP Naval Supply Systems Command Fleet Logistics Center Pearl Harbor

ENTERPRISE ENGINEERING, INC.

Submitted by:
Hansa Consult of North America, LLC
200 International Drive, Bldg. 120
Portsmouth, N.H. 03801
info@hcna-llc.com
www.hcna-llc.com

Hansa Consult of North America, LLC
Red Hill - Tank 5, FLC Pearl Harbor, HI

January 19, 2018

Prepared for:

ENTERPRISE ENGINEERING, INC.

400 US Route 1 North, Suite B
Falmouth, ME 04105

Telephone: 207-869-8006

Prepared and Submitted by:

HCNA HANSACONSULT NORTH AMERICA

200 International Drive
Building 120
Portsmouth, N.H. 03801

Telephone: 603.422.8833
FAX: 603.422.8865

LIST OF CONTENTS

APPENDICES

1 INTRODUCTION

Hansa Consult of North America, LLC (HCNA) has been tasked by Enterprise Engineering, Inc. (EEI) to perform mechanical integrity assessment testing at Red Hill - Tank 5, FLC Pearl Harbor, HI. Testing is conducted under prime contract(s) N39430-15-D-1678 (NAVFAC EXWC SB A/E IDQ) and N39430 -15-D-1697 (NAVFAC EXWC LB A/E IDQ) and EEI order number HCNA 15-D-1678 DO 011. This subcontract provides for HCNA to conduct Hydrostatic and leak integrity testing of Tank 5 – Nozzle pipelines at Red Hill - Tank 5, FLC Pearl Harbor, HI, in accordance with the NAVFAC EXWC requirements for Conduct Modified API 653 OOS Inspection and established master service agreement. The final testing and certification for piping was conducted December 12 - 14, 2017 with passing results.

1.1 Purpose of Inspection

The purpose of the testing was to perform hydrostatic pressure testing in accordance with specified A/E engineering services including planning, design and mechanical integrity assessment as described at Red Hill - Tank 5, FLC Pearl Harbor, HI

1.2 Testing Criteria

The current scope is for HCNA to conduct four (4) hour pressure testing of piping system with ***water*** at 225 psig in accordance requirements – specifically HCNA Red Hill Mobile Testing Proposal r1 – dated 7 FEB 2016. HCNA Pressure-Step tightness testing to certify the section as "*tight*" shall occur following 4-hour pressure testing. Water as a test medium shall be furnished by EEI.

2 SITE AND EQUIPMENT DESCRIPTION

2.1 Test Procedures

HCNA provided testing of the pressurized sections at Red Hill - Tank 5, FLC Pearl Harbor, HI (See Table 1 for details). All test section pipe dimensions and volumes were reviewed and confirmed with EEI and AMPTIM personnel and validated by HCNA staff during the testing event. Line pressures were initially established by APTIM personnel. HCNA established test connection and a visual inspection was conducted. Prior to the start of recorded test, a "pre-stress" soak period was conducted for each section to allow the lines to stabilize at the final test pressures. During testing, visual inspections of the test sections were conducted at periodic intervals. A general description of the piping layout is provided in Section 2.4.

2.2 Test Sections

The test segment number and associated pipeline description for the test sections were as follows:

SECTION NO.	DESIGNATION	PIPELINE MATERIAL	PIPELINE SCHEDULE	PIPELINE LENGTH [ft]						TOTAL LENGTH [ft]
				6"	8"	12"	18"	20"	32"	
1	Tank 5 - 32" Nozzle Line	CS	STD.	0	0	0	0	5	44.2	49.2
2	Tank 5 - 18" Nozzle Line	CS	STD.	0	0	5	60.5	0	0	65.5
TOTAL:				0	0	5	60.5	5	44.2	114.7

Table 1: General Pipeline Configuration Data of Tested Piping @ Red Hill - Tank 5, FLC Pearl Harbor, HI

Legend: ***CS: Carbon Steel***

2.3 Test Fluid Specifications

Water was used as the test medium for all static pressure testing during this event at Red Hill - Tank 5, FLC Pearl Harbor, HI.

2.4 Description of Facility

The testing at Red Hill - Tank 5, FLC Pearl Harbor, HI was conducted in accordance with NAVFAC EXWC requirements for A/E engineering services including planning, design and mechanical integrity assessment. The fuel system Red Hill FLC Pearl Harbor, HI consists of twenty (20) bulk field constructed underground storage tanks (BFCUSTs), pump shelter, transfer line, an eastern hydrant loop and a western hydrant loop. Currently, Red Hill - Tank 5, FLC Pearl Harbor, HI is out-of-service and undergoing required inspections. As part of the inspection, a Hydrostatic test of 32 & 18-inch nozzle lines of the Tank 5 fuel system were required with water followed by 3rd – party certification integrity testing. Since Tank 5 is out-of-service, nozzle pipelines were flanged on each end of the pipeline. Each section of pipeline was flanged on the interior of the tank and exits the tank wall into a tunnel, where the pipeline was flanged, and test connections established.

The length of the pipeline was calculated from provided documents as well as on-site personnel knowledge and shorter sections of pipe were measured by HCNA personnel. The piping diameter for the entire piping system ranges from 12" to 32".

2.5 Set-up and Testing

The test set-up, execution, and dismantling were conducted on December 12 - 14, 2017. Specific tables and photographs detail each section and are provided in Appendix A.

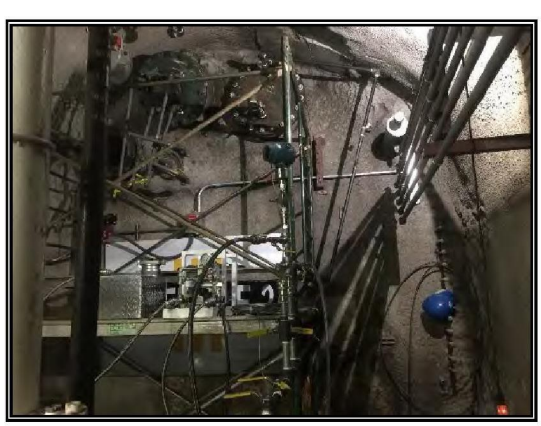


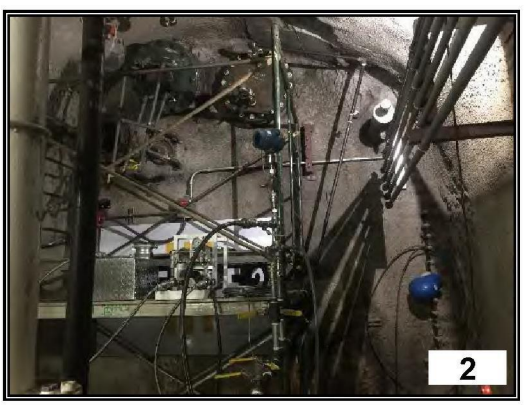
Figure 1: HCNA Pier Typical Test Setup Located at Red Hill - Tank 5, FLC Pearl Harbor, HI.

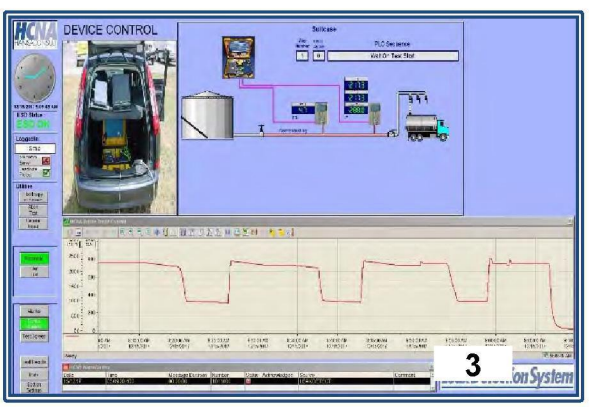
- Equipment required to conduct the HCNA Leak Detection System tightness test was shipped to the facility, and pressure recording equipment was installed on the test section, (please refer to figures 2-7). HCNA equipment includes: portable pump, connection hoses, pressure transmitter, data interface, the control and evaluation unit, laptop computer, as well as fuel holding tank for test segment pressurization/depressurization.

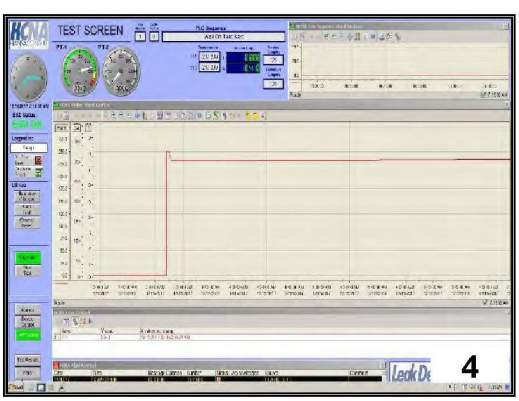
  All electrical components associated with the trailer and permanent skid are explosion-proof (Class I Div I) from the National Electrical Code (NEC), and the trailer is equipped with an onboard generator to provide power for all components. The trailer unit was independent from the local infrastructure during the tests. Fuel quality is guaranteed by the fact that all metal parts are made of stainless steel. (Please see Figures 2-7.)

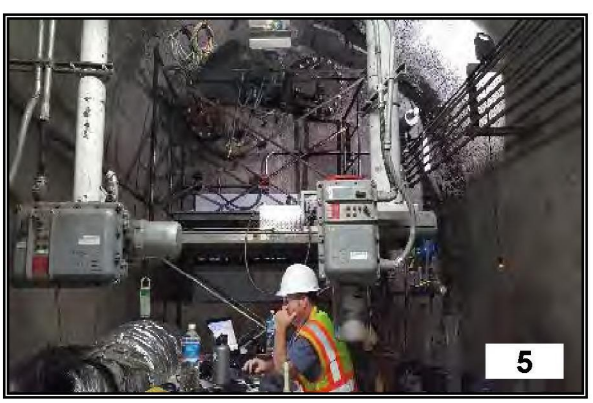
- Using the pump provided in the trailer or on the permanent skid, the test sections were pressurized to the high cycle test pressure in 50 psi intervals, and the system was visually inspected for leaks. No drips, seeps, *etc.* were identified and HCNA static pressure testing commenced after the test section pressures stabilized. A similar procedure was performed for each individual test section. Accordingly, the valve configuration used for each can be assumed satisfactory; otherwise there would have been symptoms of pressure decay during the test.
- Following the static pressure testing for each section, test equipment was disconnected and all fluid from hose connections was collected. Lastly, site personnel were notified at the completion of the testing and insured all valves were returned to their original positions.
- Detailed test section specifications, results, and photographs are provided in Appendices A-E. The information is presented and delineated by test section.

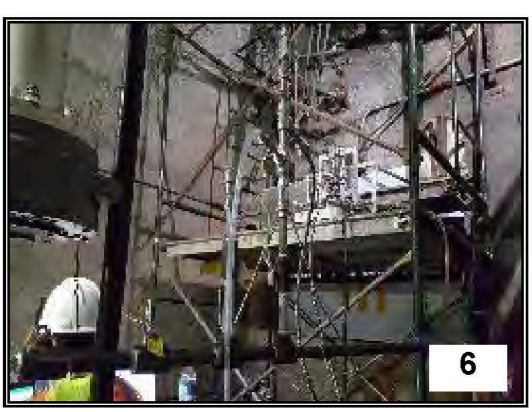
Description		Figure
HCNA LDS Portable Pump, Tank, and Pressure Device		2
HCNA LDS Suitcase - Test Control Screen		3
HCNA LDS Suitcase – Pressure Trend Screen		4
HCNA LDS Suitcase - Laptop and Printer		5
"Typical" Trailer Test Connection		6
Mobile Test Cart "Typical" Trailer Leak Simulation Test Connection		7

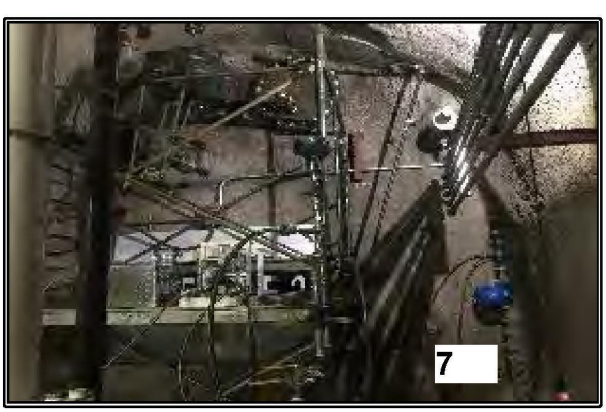












3 HCNA HYDROSTATIC LIQUID PRESSURE TEST PROTOCOL

3.1 Testing Protocols:

- California State Fire Marshal (CSFM): Pressure Testing Requirements for Hazardous Liquid Pipelines.
- American Petroleum Institute—Recommended Practice RP-1110: Pressure Testing of Liquid Petroleum Pipelines (with approved alternates as noted) and ASME B31.3.
- Test conducted with water as test medium.
- Pipeline test sections that were above ground were visually monitored for leaks during testing.
- Test sections were free of entrapped air as confirmed by bleeding of all high point vents.
- Proper spill response equipment and personnel were available during testing.
- HCNA portable equipment and tank provided adequate makeup and water recovery capacity.
- Pressure Transmitter(s) calibrated within the past 12 months utilized to measure test pressures. (Approved alternate to deadweight tester, calibration certificates attached in Appendix C)
- PLC based propriety software/visualization provided a permanent record of pressure/temperature vs. time.
- Test calculations, charts, and records comply with or are equivalent to those provided in API RP-1110.

3.2 Tester Qualification:

- HCNA personnel Michael Sherlock conducted the onsite testing and are listed as approved testers by CSFM.

4 RESULTS / CONCLUSIONS

4.1 Test Assessment Methods

The pipeline test sections were assessed by the following methods:

4.1.1 Visual Inspection

Test section above ground exposed piping, fittings and other appurtenances were visually inspected and there was no evidence of external leakage.

4.1.2 Test Results

Testing was per contract specification piping system with ***water*** at 225 psig in accordance with the stated test equipment requirements/procedures and accepted industry practices. This testing comprised 4-hour hydrostatic strength testing followed by certified HCNA LDS activities utilizing the HCNA Pressure Step Test Methodology. Certificate pages are provided in Appendix C. The overall piping and test medium physical characteristics are evaluated using these collective techniques and meets the requirements for a combination "stress and strength" test.

The HCNA Leak Detection System Version 2.1 is capable of detecting a leak of 0.068 gallons per hour or 0.002% of line volume, with a probability of detection (P_D) > 95% and probability of false alarm (P_{FA}) < 5% at a reference pressure of 145 psi; as per Ken Wilcox Associates, Inc. Third Party Certifications. In accordance with the above stated "Criteria for Classification of Tightness", the results of all of the sections are summarized and provided below:

All test sections were successfully tested and passed based on the criteria established above.

Section No.	Designation	Section Volume [gal]	Reference Pressure [PSI]	Total Length [ft]	Test Pressure (min to max) [psi]	Test Date	Result
1	Tank 5 - 32" Nozzle Line	1,837	225	49.2	231.7 – 231.8.	12/13/2017	WITHIN ACCEPTABLE LIMITS
2	Tank 5 - 18" Nozzle Line	764	225	65.5	231.8 – 234.0	12/14/2017	WITHIN ACCEPTABLE LIMITS

Table 2: Hydrostatic Pressure Testing Section Results @ Red Hill - Tank 5, FLC Pearl Harbor, HI

Section No.	Designation	Section Volume [gal]	Reference Pressure [PSI]	Certified MDLR [gal/h]	Recorded Leak Rate [gal/h]	Test Date	Test Result
1	Tank 5 - 32" Nozzle Line	1,837	225	0.07	-0.01	12/13/2017	PASS
2	Tank 5 - 18" Nozzle Line	764	225	0.07	0.00	12/14/2017	PASS

Table 3: Leak Detection Sections Test Results @ Red Hill - Tank 5, FLC Pearl Harbor, HI.

4.2 Problems Encountered

None.

5 RECOMMENDATIONS

See Appendix B.

6 HCNA TECHNOLOGY APPROVALS

The HCNA Leak Detection System technology has been recognized and approved by the following authorities:

- U.S. EPA Third Party Certification: Ken Wilcox Associates Evaluation of the Hansa Consult of North America, LLC Pipeline Leak Detection System, Version 2.0—Final Report. December 15, 2005

- Listing by the National Work Group on Leak Detection Evaluations (NWGLDE): for Pipeline Leak Detection Applications: HCNA Pressure Step Leak Detection System Listing. HCNA Pipeline Leak Detection System Version 2.0 Approval Letter, Issue Date March 7, 2006.

- U.S. EPA Third Party Certification: Ken Wilcox Associates Evaluation of the Hansa Consult of North America, LLC Pipeline Leak Detection System, Version 2.1—Final Report. May 24, 2010.

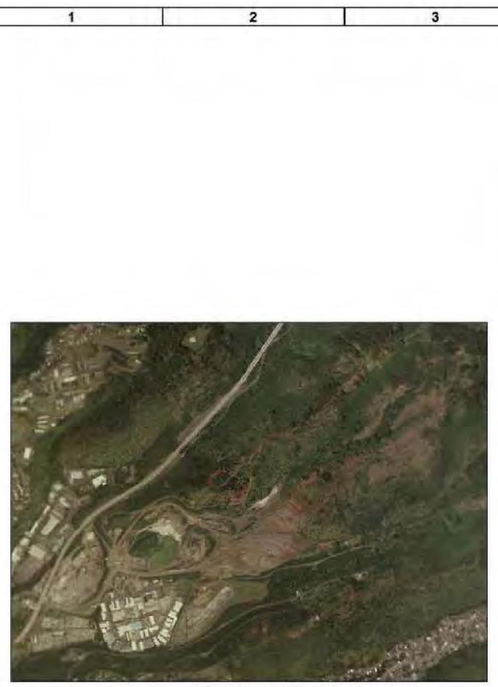
- Listing by the National Work Group on Leak Detection Evaluations (NWGLDE): for Pipeline Leak Detection Applications: HCNA Pressure Step Leak Detection System Listing. HCNA Pipeline Leak Detection System Version 2.1 – LINE TIGHTNESS TEST METHOD. Approval Letter, Issue Date February 17, 2011.

- Listing by the National Work Group on Leak Detection Evaluations (NWGLDE): for Pipeline Leak Detection Applications: HCNA Pressure Step Leak Detection System Listing. HCNA Pipeline Leak Detection System Version 2.1 – LARGE DIAMETER LINE LEAK DETECTION METHOD (6 Inches Diameter or Above). Approval Letter, Issue Date February 17, 2011.

- California Department of Forestry and Fire Protection--Office of the State Fire Marshal--Pipeline Safety Division: Hydrostatic Testing Company Approved to Test Hazardous Liquid Pipelines, HCNA Listing Expires June 30, 2016. http://osfm.fire.ca.gov/pipeline/pdf/hydrotest/approhydro.p

APPENDIX A: TEST SECTION DETAILS

LOCATION/COMMENTS - Red Hill - Tank 5, FLC Pearl Harbor, HI	
Site Overview	Figure 8



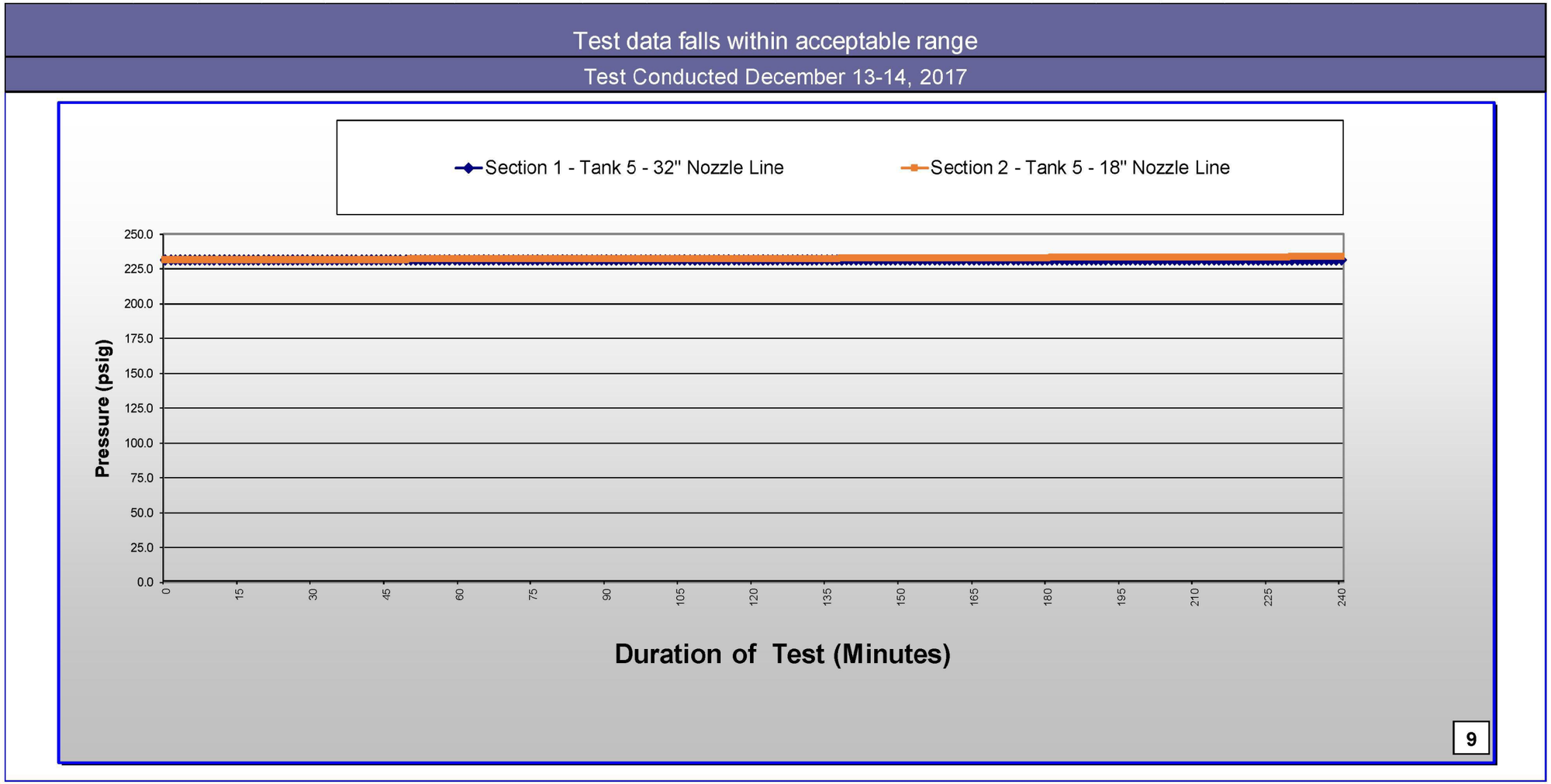
AERIAL VIEW

ISOMETRIC VIEW

8

	DATE	NAME					ENTERPRISE ENGINEERING, INC.	HCNA Leak Detection System	RED HILL - TANK 5 FLC PEARL HARBOR, HI HCNA MOBILE TESTING	OVERVIEW DRAWING			
DESIGNED	2/2/2018	S.MCGLAUFLIN								DWG NO.	REVISION	SHEET	OF
DRAWN										REDHILL_OVERVIEW	0	1	1
CHECKED			REV.	DESCRIPTION	DATE	NAME							

LOCATION/COMMENTS - Red Hill - Tank 5, FLC Pearl Harbor, HI	
32” & 18“ Nozzle Lines – 4-Hour Hydrostatic Pressure Test Data	Figure 9



HCNA HANSACONSULT

200 International Drive
Bldg. 120

Tel: (603) 422-8833
Fax: (603) 422-8865

Red Hill, FLC Pearl Harbor, HI, Oahu - Tank 5

Perform Hydrostatic Pressure Test

Date / Time / Section:	20171213 S01	**User:**	HCNA
Test Section:	Section 1 - Tank 5 - 32" Nozzle Line	**Date:**	December 13, 2017
		HCNA Project Number:	2017-1076

Pipe Segment Specification

Pipe Segment	Nominal Dia. (in.)	w.t. (in.)	Length (ft) Total	Volume (gal)
1	1.9000	3.9116	0.00	0.00
2	2.3750	3.9116	0.00	0.00
3	6.6250	7.1120	0.00	0.00
4	12.7500	9.5250	0.00	0.00
5	16.0000	9.5250	0.00	0.00
6	18.0000	9.5250	0.00	0.00
7	20.0000	9.5250	5.00	75.60
8	32.0000	9.5250	44.20	1761.28
9	0.0000	0.0000	0.00	0.00
10	0.0000	0.0000	0.00	0.00
		Totals:	*49.20*	*1,836.88*

HCNA Engineer: Michael Sherlock
Notes:

Equipment:	Manufacturer/Model
Pressure Recorder	Rosemount 305 S
Data Interface	HCNA LDS Version 2.0
Automated Pressure Test Equipment	HCNA LDS Version 2.0
Temperature Recorder	N/A
Temperature Transmitter	N/A
Mechanical Equipment	HCNA LDS - SC3

Test Data:

Sample Number	Time	Transmitter Pressure - HCNA-SC-8 (psig)					Remarks (weather conditions or test activities)
1	8:00	231.8					Testing with water.
2	8:01	231.8					
3	8:02	231.8					Pipeline system was @ 231.8 psig when test
4	8:03	231.8					connection was completed.
5	8:04	231.8					
6	8:05	231.8					
7	8:06	231.8					
8	8:07	231.8					
9	8:08	231.8					
10	8:09	231.8					
11	8:10	231.8					
12	8:11	231.8					
13	8:12	231.8					
14	8:13	231.8					
15	8:14	231.8					
16	8:15	231.8					
17	8:16	231.8					
18	8:17	231.8					
19	8:18	231.8					
20	8:19	231.8					

Test Data:

Sample Number	Time	Transmitter Pressure - HCNA SC-8 (psig)					Remarks (weather conditions or test activities)
21	8:20	231.8					
22	8:21	231.8					
23	8:22	231.8					
24	8:23	231.8					
25	8:24	231.8					
26	8:25	231.8					
27	8:26	231.8					
28	8:27	231.8					
29	8:28	231.8					
30	8:29	231.8					
31	8:30	231.8					
32	8:31	231.8					
33	8:32	231.8					
34	8:33	231.8					
35	8:34	231.8					
36	8:35	231.8					
37	8:36	231.8					
38	8:37	231.8					
39	8:38	231.8					
40	8:39	231.8					
41	8:40	231.8					
42	8:41	231.8					
43	8:42	231.8					
44	8:43	231.8					
45	8:44	231.8					
46	8:45	231.8					
47	8:46	231.8					
48	8:47	231.8					
49	8:48	231.8					
50	8:49	231.8					
51	8:50	231.8					
52	8:51	231.8					
53	8:52	231.8					
54	8:53	231.8					
55	8:54	231.8					
56	8:55	231.8					
57	8:56	231.8					
58	8:57	231.8					
59	8:58	231.8					
60	8:59	231.8					
61	9:00	231.8					
62	9:01	231.8					
63	9:02	231.8					
64	9:03	231.8					
65	9:04	231.8					
66	9:05	231.8					
67	9:06	231.8					
68	9:07	231.8					
69	9:08	231.8					
70	9:09	231.8					
71	9:10	231.8					
72	9:11	231.8					
73	9:12	231.8					
74	9:13	231.8					

Test Data:

Sample Number	Time	Transmitter Pressure - HCNA SC-8 (psig)					Remarks (weather conditions or test activities)
75	9:14	231.8					
76	9:15	231.8					
77	9:16	231.8					
78	9:17	231.8					
79	9:18	231.8					
80	9:19	231.8					
81	9:20	231.8					
82	9:21	231.8					
83	9:22	231.8					
84	9:23	231.8					
85	9:24	231.8					
86	9:25	231.8					
87	9:26	231.8					
88	9:27	231.8					
89	9:28	231.8					
90	9:29	231.8					
91	9:30	231.8					
92	9:31	231.8					
93	9:32	231.8					
94	9:33	231.8					
95	9:34	231.8					
96	9:35	231.8					
97	9:36	231.8					
98	9:37	231.8					
99	9:38	231.8					
100	9:39	231.8					
101	9:40	231.8					
102	9:41	231.8					
103	9:42	231.8					
104	9:43	231.8					
105	9:44	231.8					
106	9:45	231.8					
107	9:46	231.8					
108	9:47	231.8					
109	9:48	231.8					
110	9:49	231.8					
111	9:50	231.8					
112	9:51	231.8					
113	9:52	231.8					
114	9:53	231.8					
115	9:54	231.8					
116	9:55	231.8					
117	9:56	231.8					
118	9:57	231.8					
119	9:58	231.8					
120	9:59	231.8					
121	10:00	231.8					
122	10:01	231.8					
123	10:02	231.8					
124	10:03	231.8					
125	10:04	231.8					
126	10:05	231.8					
127	10:06	231.8					
128	10:07	231.8					

Test Data:

Sample Number	Time	Transmitter Pressure - HCNA SG-8 (psig)					Remarks (weather conditions or test activities)
129	10:08	231.7					
130	10:09	231.7					
131	10:10	231.7					
132	10:11	231.7					
133	10:12	231.7					
134	10:13	231.7					
135	10:14	231.7					
136	10:15	231.7					
137	10:16	231.7					
138	10:17	231.7					
139	10:18	231.7					
140	10:19	231.7					
141	10:20	231.7					
142	10:21	231.7					
143	10:22	231.7					
144	10:23	231.7					
145	10:24	231.7					
146	10:25	231.7					
147	10:26	231.7					
148	10:27	231.7					
149	10:28	231.7					
150	10:29	231.7					
151	10:30	231.7					
152	10:31	231.7					
153	10:32	231.7					
154	10:33	231.7					
155	10:34	231.7					
156	10:35	231.7					
157	10:36	231.7					
158	10:37	231.7					
159	10:38	231.7					
160	10:39	231.7					
161	10:40	231.7					
162	10:41	231.7					
163	10:42	231.7					
164	10:43	231.7					
165	10:44	231.7					
166	10:45	231.7					
167	10:46	231.7					
168	10:47	231.7					
169	10:48	231.7					
170	10:49	231.7					
171	10:50	231.7					
172	10:51	231.7					
173	10:52	231.7					
174	10:53	231.7					
175	10:54	231.7					
176	10:55	231.7					
177	10:56	231.7					
178	10:57	231.7					
179	10:58	231.7					
180	10:59	231.7					
181	11:00	231.7					
182	11:01	231.7					

Test Data:

Sample Number	Time	Transmitter Pressure - HCNA SC-8 (psig)					Remarks (weather conditions or test activities)
183	11:02	231.7					
184	11:03	231.7					
185	11:04	231.7					
186	11:05	231.7					
187	11:06	231.7					
188	11:07	231.7					
189	11:08	231.7					
190	11:09	231.7					
191	11:10	231.7					
192	11:11	231.7					
193	11:12	231.7					
194	11:13	231.7					
195	11:14	231.8					
196	11:15	231.8					
197	11:16	231.8					
198	11:17	231.8					
199	11:18	231.8					
200	11:19	231.8					
201	11:20	231.8					
202	11:21	231.8					
203	11:22	231.8					
204	11:23	231.8					
205	11:24	231.8					
206	11:25	231.8					
207	11:26	231.8					
208	11:27	231.8					
209	11:28	231.8					
210	11:29	231.8					
211	11:30	231.8					
212	11:31	231.8					
213	11:32	231.8					
214	11:33	231.8					
215	11:34	231.8					
216	11:35	231.8					
217	11:36	231.8					
218	11:37	231.8					
219	11:38	231.8					
220	11:39	231.8					
221	11:40	231.8					
222	11:41	231.8					
223	11:42	231.8					
224	11:43	231.8					
225	11:44	231.8					
226	11:45	231.8					
227	11:46	231.8					
228	11:47	231.8					
229	11:48	231.8					
230	11:49	231.8					
231	11:50	231.8					
232	11:51	231.8					
233	11:52	231.8					
234	11:53	231.8					
235	11:54	231.8					
236	11:55	231.8					

Test Data:

Sample Number	Time	Transmitter Pressure - HCNA SC-8 (psig)					Remarks (weather conditions or test activities)
237	11:56	231.8					
238	11:57	231.8					
239	11:58	231.8					
240	11:59	231.8					
241	12:00	231.8					

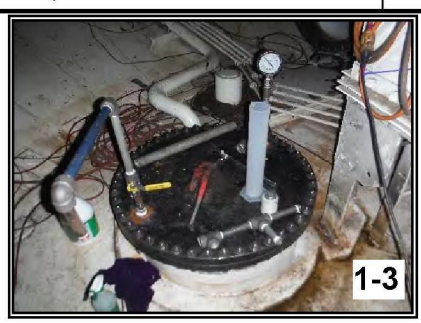
Additional Notes/Comments:
No product added/removed during four (4) hour testing event.

SECTION 1: TANK 5 - 32" NOZZLE LINE

ISOLATION	OPEN	CLOSED	LOCATION/COMMENTS	FIGURE
Interior Tank 5		Flanged	Interior Tank 5	1-1
Nozzle Pipeline		Flanged	Interior Tank 5	1-2
Isolation Flange – Interior Tank 5		Flanged	Interior Tank 5	1-3
Isolation Flange – Interior Tank 5		Flanged	Interior Tank 5	1-4
Test Connection and Water Fill Flange		Flanged	Tank 5 – Tunnel	1-5
Test Equipment on Scaffold		Flanged	Tank 5 – Tunnel	1-6
TEST CONNECTION				**FIGURE**
Connection for HCNA LDS Suitcase test equipment – PC, pump, pressure transmitter, and portable PLC.				1-7

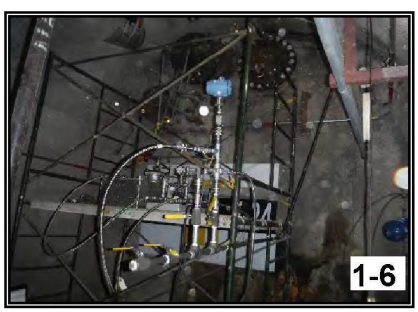

1-1


1-2


1-3


1-4


1-5


1-6


1-7

See below Appendix B.

HCNA HANSACONSULT
200 International Drive
Bldg. 120
Tel: (603) 422-8833
Fax: (603) 422-8865

Red Hill, FLC Pearl Harbor, HI, Oahu - Tank 5

Perform Hydrostatic Pressure Test

Date / Time / Section:	20171214 S02	User:	HCNA
Test Section:	Section 2 - Tank 5 - 18" Nozzle Line	Date:	December 14, 2017
		HCNA Project Number:	2017-1076

Pipe Segment Specification

Pipe Segment	Nominal Dia. (in.)	w.t. (in.)	Length (ft) Total	Volume (gal)
1	1.9000	3.9116	0.00	0.00
2	2.3750	3.9116	0.00	0.00
3	6.6250	7.1120	0.00	0.00
4	12.7500	9.5250	5.00	29.38
5	16.0000	9.5250	0.00	0.00
6	18.0000	9.5250	60.50	734.58
7	20.0000	9.5250	0.00	0.00
8	32.0000	9.5250	0.00	0.00
9	0.0000	0.0000	0.00	0.00
10	0.0000	0.0000	0.00	0.00
		Totals:	*65.50*	*763.96*

HCNA Engineer: Michael Sherlock
Notes:

Equipment	Manufacturer/Model
Pressure Recorder	Rosemount 3051S
Data Interface	HCNA LDS Version 2.0
Automated Pressure Test Equipment	HCNA LDS Version 2.0
Temperature Recorder	N/A
Temperature Transmitter	N/A
Mechanical Equipment	HCNA LDS - SC8

Test Data:

Sample Number	Time	Transmitter Pressure - HCNA SC-8 (psig)					Remarks (weather conditions or test activities)
1	7:15	231.8					Testing with water.
2	7:16	231.8					
3	7:17	231.8					Pipeline system was @ 250.3 psig when test
4	7:18	231.8					connection was completed.
5	7:19	231.8					
6	7:20	231.8					Test section pressure lowered to 231.8 psig
7	7:21	231.8					and testing commenced.
8	7:22	231.8					
9	7:23	231.8					
10	7:24	231.8					
11	7:25	231.8					
12	7:26	231.8					
13	7:27	231.9					
14	7:28	231.9					
15	7:29	231.9					
16	7:30	231.9					
17	7:31	231.9					
18	7:32	231.9					
19	7:33	231.9					
20	7:34	231.9					
21	7:35	231.9					
22	7:36	231.9					

Test Data:

Sample Number	Time	Transmitter Pressure - HCNA SC-8 (psig)					Remarks (weather conditions or test activities)
23	7:37	231.9					
24	7:38	231.9					
25	7:39	231.9					
26	7:40	231.9					
27	7:41	231.9					
28	7:42	231.9					
29	7:43	231.9					
30	7:44	231.9					
31	7:45	231.9					
32	7:46	231.9					
33	7:47	231.9					
34	7:48	231.9					
35	7:49	232.0					
36	7:50	232.0					
37	7:51	232.0					
38	7:52	232.0					
39	7:53	232.0					
40	7:54	232.0					
41	7:55	232.0					
42	7:56	232.0					
43	7:57	232.0					
44	7:58	232.0					
45	7:59	232.0					
46	8:00	232.0					
47	8:01	232.0					
48	8:02	232.0					
49	8:03	232.0					
50	8:04	232.0					
51	8:05	232.1					
52	8:06	232.1					
53	8:07	232.1					
54	8:08	232.1					
55	8:09	232.1					
56	8:10	232.1					
57	8:11	232.1					
58	8:12	232.1					
59	8:13	232.1					
60	8:14	232.1					
61	8:15	232.1					
62	8:16	232.1					
63	8:17	232.1					
64	8:18	232.1					
65	8:19	232.1					
66	8:20	232.1					
67	8:21	232.1					
68	8:22	232.2					
69	8:23	232.2					
70	8:24	232.2					
71	8:25	232.2					
72	8:26	232.2					
73	8:27	232.2					
74	8:28	232.2					
75	8:29	232.2					
76	8:30	232.2					
77	8:31	232.2					
78	8:32	232.2					

Test Data:

Sample Number	Time	Transmitter Pressure - HCNA SC-8 (psig)					Remarks (weather conditions or test activities)
79	8:33	232.2					
80	8:34	232.2					
81	8:35	232.2					
82	8:36	232.2					
83	8:37	232.2					
84	8:38	232.2					
85	8:39	232.2					
86	8:40	232.2					
87	8:41	232.2					
88	8:42	232.2					
89	8:43	232.2					
90	8:44	232.2					
91	8:45	232.3					
92	8:46	232.3					
93	8:47	232.3					
94	8:48	232.3					
95	8:49	232.3					
96	8:50	232.3					
97	8:51	232.3					
98	8:52	232.3					
99	8:53	232.3					
100	8:54	232.3					
101	8:55	232.3					
102	8:56	232.3					
103	8:57	232.3					
104	8:58	232.3					
105	8:59	232.3					
106	9:00	232.3					
107	9:01	232.3					
108	9:02	232.3					
109	9:03	232.3					
110	9:04	232.3					
111	9:05	232.3					
112	9:06	232.3					
113	9:07	232.3					
114	9:08	232.3					
115	9:09	232.3					
116	9:10	232.4					
117	9:11	232.4					
118	9:12	232.4					
119	9:13	232.4					
120	9:14	232.4					
121	9:15	232.4					
122	9:16	232.4					
123	9:17	232.4					
124	9:18	232.4					
125	9:19	232.5					
126	9:20	232.5					
127	9:21	232.5					
128	9:22	232.5					
129	9:23	232.6					Small weep at 2" connection used by APTIM
130	9:24	232.6					to fill line with water. HCNA further tightened
131	9:25	232.6					connection and weep no longer evident.
132	9:26	232.6					
133	9:27	232.6					
134	9:28	232.6					

Test Data:

Sample Number	Time	Transmitter Pressure - HCNA SC-8 (psig)					Remarks (weather conditions or test activities)
135	9:29	232.6					
136	9:30	232.6					
137	9:31	232.6					
138	9:32	232.6					
139	9:33	232.7					
140	9:34	232.7					
141	9:35	232.7					
142	9:36	232.7					
143	9:37	232.7					
144	9:38	232.7					
145	9:39	232.8					
146	9:40	232.8					
147	9:41	232.8					
148	9:42	232.8					
149	9:43	232.8					
150	9:44	232.8					
151	9:45	232.8					
152	9:46	232.8					
153	9:47	232.8					
154	9:48	232.8					
155	9:49	232.9					
156	9:50	232.9					
157	9:51	232.9					
158	9:52	232.9					
159	9:53	232.9					
160	9:54	232.9					
161	9:55	233.0					
162	9:56	233.0					
163	9:57	233.0					
164	9:58	233.0					
165	9:59	233.0					
166	10:00	233.0					
167	10:01	233.1					
168	10:02	233.1					
169	10:03	233.1					
170	10:04	233.1					
171	10:05	233.1					
172	10:06	233.1					
173	10:07	233.1					
174	10:08	233.1					
175	10:09	233.1					
176	10:10	233.1					
177	10:11	233.2					
178	10:12	233.2					
179	10:13	233.2					
180	10:14	233.2					
181	10:15	233.2					
182	10:16	233.3					
183	10:17	233.3					
184	10:18	233.3					
185	10:19	233.3					
186	10:20	233.3					
187	10:21	233.3					
188	10:22	233.3					
189	10:23	233.3					
190	10:24	233.3					

Test Data:

Sample Number	Time	Transmitter Pressure - HCNA SC-8 (psig)					Remarks (weather conditions or test activities)
191	10:25	233.3					
192	10:26	233.4					
193	10:27	233.4					
194	10:28	233.4					
195	10:29	233.4					
196	10:30	233.4					
197	10:31	233.4					
198	10:32	233.4					
199	10:33	233.5					
200	10:34	233.5					
201	10:35	233.5					
202	10:36	233.5					
203	10:37	233.5					
204	10:38	233.5					
205	10:39	233.5					
206	10:40	233.6					
207	10:41	233.6					
208	10:42	233.6					
209	10:43	233.6					
210	10:44	233.6					
211	10:45	233.6					
212	10:46	233.6					
213	10:47	233.6					
214	10:48	233.6					
215	10:49	233.6					
216	10:50	233.6					
217	10:51	233.7					
218	10:52	233.7					
219	10:53	233.7					
220	10:54	233.7					
221	10:55	233.7					
222	10:56	233.7					
223	10:57	233.8					
224	10:58	233.8					
225	10:59	233.8					
226	11:00	233.8					
227	11:01	233.8					
228	11:02	233.8					
229	11:03	233.8					
230	11:04	233.8					
231	11:05	233.9					
232	11:06	233.9					
233	11:07	233.9					
234	11:08	233.9					
235	11:09	233.9					
236	11:10	233.9					
237	11:11	233.9					
238	11:12	233.9					
239	11:13	233.9					
240	11:14	234.0					
241	11:15	234.0					

Additional Notes/Comments:
Test Section increased 2.2 psig during during four (4) hour testing event - start pressure 231.8 and final pressure 234.0, no product added/removed .

SECTION 2: TANK 5 - 18" NOZZLE LINE

ISOLATION	OPEN	CLOSED	LOCATION/COMMENTS	FIGURE
Interior Tank 5		Flanged	Interior Tank 5	1-1
Nozzle Pipeline		Flanged	Interior Tank 5	1-2
Isolation Flange – Interior Tank 5		Flanged	Interior Tank 5	1-3
Isolation Flange – Interior Tank 5		Flanged	Interior Tank 5	1-4
Power Connectivity – Interior Tank 5		Flanged	Interior Tank 5	1-5
Test Connection and Water Fill Flange		Flanged	Tank 5 – Tunnel	1-6

TEST CONNECTION	FIGURE
Connection for HCNA LDS Suitcase test equipment – PC, pump, pressure transmitter, and portable PLC.	1-7


1-1


1-2


1-3


1-4


1-5


1-6


1-7

See below Appendix B.

APPENDIX B: SITE SPECIFIC INFORMATION

HCNA Representative(s):	Karl Overman, Michael Sherlock, and Douglas Vorderbruggen	Date of Service	December 12 - 14, 2017

Task Order Number:	HCNA 15-D-1678 DO 011	
Primary/Site Contact (EEI)	Telephone	Email:
Douglas Kieley, P.E	Cell Phone: (207) 838-1250	kieleyd@eeiteam.com
Kit Dahlstrom	Cell Phone: (907) 529-7827	dahlstromka@eeiteam.com

Project Comments

December 10-12, 2017

On December 10th, HCNA engineers mobilized to Oahu, HI. On December 11th, HCNA contacted EEI representative Mr. Kit Dahlstrom regarding HCNA LDS test equipment. Mr. Dahlstrom confirmed receipt of equipment and we coordinated kick-off and safety meeting for December 12th. On December 12th, HCNA personnel Karl Overman, Michael Sherlock, and Douglas Vorderbruggen meet with Mr. Dahlstrom at Red Hill fuel facility, then proceeded to FLC Pearl Harbor to completed required badging process. Once badging was completed, all returned to Red Hill facility and completed required site-specific health and safety program. HCNA LDS test equipment was moved to lower-level tunnel access outside tank 5 valving and piping. Test section was previously isolated and pressurized with water, HCNA LDS test equipment was unpacked and connected test section 1 – 32" Nozzle line.

December 13, 2017

On December 13th, HCNA engineers arrived at Red Hill - Tank 5, FLC Pearl Harbor, HI for 0600 safety meeting. Following meeting, HCNA meet with EEI representative(s) Mr. Douglas Kieley and Mr. Kit Dahlstrom regarding testing schedule. Additionally, we meet with APTIM representative Mr. Eric Yatabe, who is coordinating required mechanical and packing of test sections for EEI. We meet at upper-level Tank 5, had another safety brief, confirmed test activities, which included Doug Vorderbruggen gaining access to the inside of Tank 5 to inspect test section flange isolation. We again proceeded lower-level tunnel access outside tank 5 and finalized HCNA LDS test set-up. Pressure still remained on test section 1 – 32" Nozzle line, piping was inspected for leaks, once satisfied, test was started at approximately 0800. Additionally, we meet with APTIM representative Mr. Eric Yatabe, who is coordinating required mechanical and packing of test sections for EEI. HCNA performed 4-hour stress, several LDS tests, and leak simulations, with satisfactory results. Once required testing was complete, system was depressurized, hoses were disconnected, and equipment was stowed/packed for testing of test section 2 – 18" Nozzle line. APTIM personnel still needed to isolate, fill, and pressurize the next section. We coordinated schedule for December 14 – 0600 safety meeting - and departed site.

December 14, 2017

On December 14th, HCNA engineers arrived at Red Hill - Tank 5, FLC Pearl Harbor, HI for 0600 safety meeting. Following meeting, HCNA meet with EEI representative(s) Mr. Douglas Kieley and Mr. Kit Dahlstrom regarding testing schedule. We meet AMPTIM and EEI personnel at upper-level Tank 5, had another safety brief, confirmed test activities, which included Doug Vorderbruggen gaining access to the inside of Tank 5 to inspect test section flange isolation. We again proceeded lower-level tunnel access outside tank 5 and finalized HCNA LDS test set-up. Pressure still remained on test section 2 – 18" Nozzle line, piping was inspected for leaks, once satisfied, test was started at approximately 0715. HCNA performed 4-hour stress, several LDS tests, and leak simulations, with satisfactory results. Once required testing was complete, system was depressurized, hoses were disconnected, and equipment was packed in HCNA vehicle for return shipment to HCNA office. We provided out-brief to EEI personnel and departed site. On December 15th, HCNA personnel shipped HCNA LDS equipment and demobilized from Oahu, HI.

APPENDIX C: TEST CERTIFICATION REPORTS

HCNA HANSACONSULT

200 International Drive
Bldg. 129
Portsmouth, NH 03801

Tel +1 - 603 - 422 8833
Fax +1 - 603 - 422 8865
E-Mail info@hcna-llc.com
Internet www.hcna-llc.com

HCNA Leak Detection System

Leak Detection Certification

Location: Red Hill - Tank 5, FLC Pearl Harbor, HI **Date:** December 14, 2017
Customer: Enterprise Engineering, Inc. Project No.: 2017 1076

Project: HCNA Pipeline Pressure/Leak Integrity Testing
NAVFAC EXWC

General Pipeline Configuration Data:

Section No.	Designation	Pipeline Material	Pipeline Schedule	Pipeline Length [ft] 6"	8"	12"	18"	20"	32"	Total Length [ft]
1	Tank 5 - 32" Nozzle Line	CS	STD.	0	0	0	0	5	44.2	49.2
2	Tank 5 - 18" Nozzle Line	CS	STD.	0	0	5	60.5	0	0	65.5
Legend: SS: Stainless Steel CS: Carbon Steel CP: Copper STD: Standard Schedule										
	TOTAL:			0	0	5	60.5	5	44.2	114.7

Table 1: General Pipeline Configuration Data of Tested Fuel System @ Red Hill - Tank 5, FLC Pearl Harbor, HI

HCNA HANSACONSULT

200 International Drive
Bldg. 120
Portsmouth, NH 03801

Tel +1 - 603 - 422 8833
Fax +1 - 603 - 422 8865
E-Mail info@hcna-llc.com
Internet www.hcna-llc.com

HCNA Leak Detection System

Leak Detection Certification

Certification Test Data:

Section No.	Designation	Section Volume [gal]	Reference Pressure [PSI]	Certified MDLR [gal/h]	Recorded Leak Rate [gal/h]	Test Date	Test Result
1	Tank 5 - 32" Nozzle Line	1,837	225	0.07	-0.01	12/13/2017	PASS
2	Tank 5 - 18" Nozzle Line	764	225	0.07	0.00	12/14/2017	PASS

Table 2: Leak Detection Sections' Results of Tested Fuel System @ Red Hill - Tank 5, FLC Pearl Harbor, HI

Result Criteria:
PASS: Test results were within the stated MDLR.
FAIL: Test results exceed the stated MDLR.

Hansa Consult of North America, LLC (HCNA) certifies that the piping listed in the above table has been tested by means of the HCNA Leak Detection System, which meets the criteria set forth in U.S. EPA/530/UST-90/010 for precision leak test.

The HCNA Leak Detection System method is capable of detecting leaks of 0.068 gallons per hour or 0.002% of line volume at a reference pressure of 145 psi, with a probability of detection (PD) > 95% and a probability of false alarm (PFA) < 5%; as per Ken Wilcox Associates, Inc. Third Party Certifications.

In accordance with the above stated "Criteria for Classification of Tightness", HCNA hereby certifies that this piping was tested on the date(s) and with the result(s) at the respective reference pressure stated in the above table.

Portsmouth, New Hampshire, December 14, 2017

HCNA HANSACONSULT

Joerg Hechler
Principal

APPENDIX D: INSTRUMENT CALIBRATION CERTIFICATES

EMERSON. Process Management

Asset Optimization Services
Instrument & Valve Services

Calibration Report

Request Number: 1620218

Customer:	Hansa Consult North America	Date:	Aug 28,2017
Location:	Portsmouth, NH	Application:	Fuel Trailer Spare pressure
Manufacturer:	Rosemount	Tag Number:	PT-SPARE-sn821117
Model Number:	3051S1TG3A2A11A1AE5M5	Serial Number:	821117
Range:	0-800	Units:	PSIG

Measurement Standards:

Model:	Serial Number:	Calibration Date:	Calibration Due:
Fluke 754 Calibrator	3462002	30-July-17	8-Aug-18
Fluke 700P08 pressure module	98850802	18-Nov-16	25-Nov-17

- **Environmental / Ambient Conditions: 20deg C, and 30%RH**

Transmitter Calibration Data:

Input Data, in PSIG:		Transfer Function/Output Type: Linear		
		Output Data, in milliAmps DC::		
Percent of Span:	Applied Value:	As Found:	Nominal:	As Left:
0.00%	0.00	3.997	4.000	3.997
20.00%	160.00	7.194	7.200	7.194
40.00%	320.00	10.394	10.400	10.394
60.00%	480.00	13.595	13.600	13.595
80.00%	640.00	16.793	16.800	16.793
100.00%	800.00	19.993	20.000	19.993

Certification of Traceability to NIST:
This calibration is traceable to the National Institute of Standards and Technology, or to national, international, or intrinsic standards of measurement, with supportive data available at Rosemount Inc. for audit verification. This report shall not be reproduced except in full.

Comments/Notes:

1. Within spec as found, with less than 0.03% error. No adjustment necessary. Found set to 0 to 800 psig

Accuracy Specification: ±0.25 % of Span	**Result: Meets applicable specifications**

A. Variano
Service Engineer

8/28/17
Date:

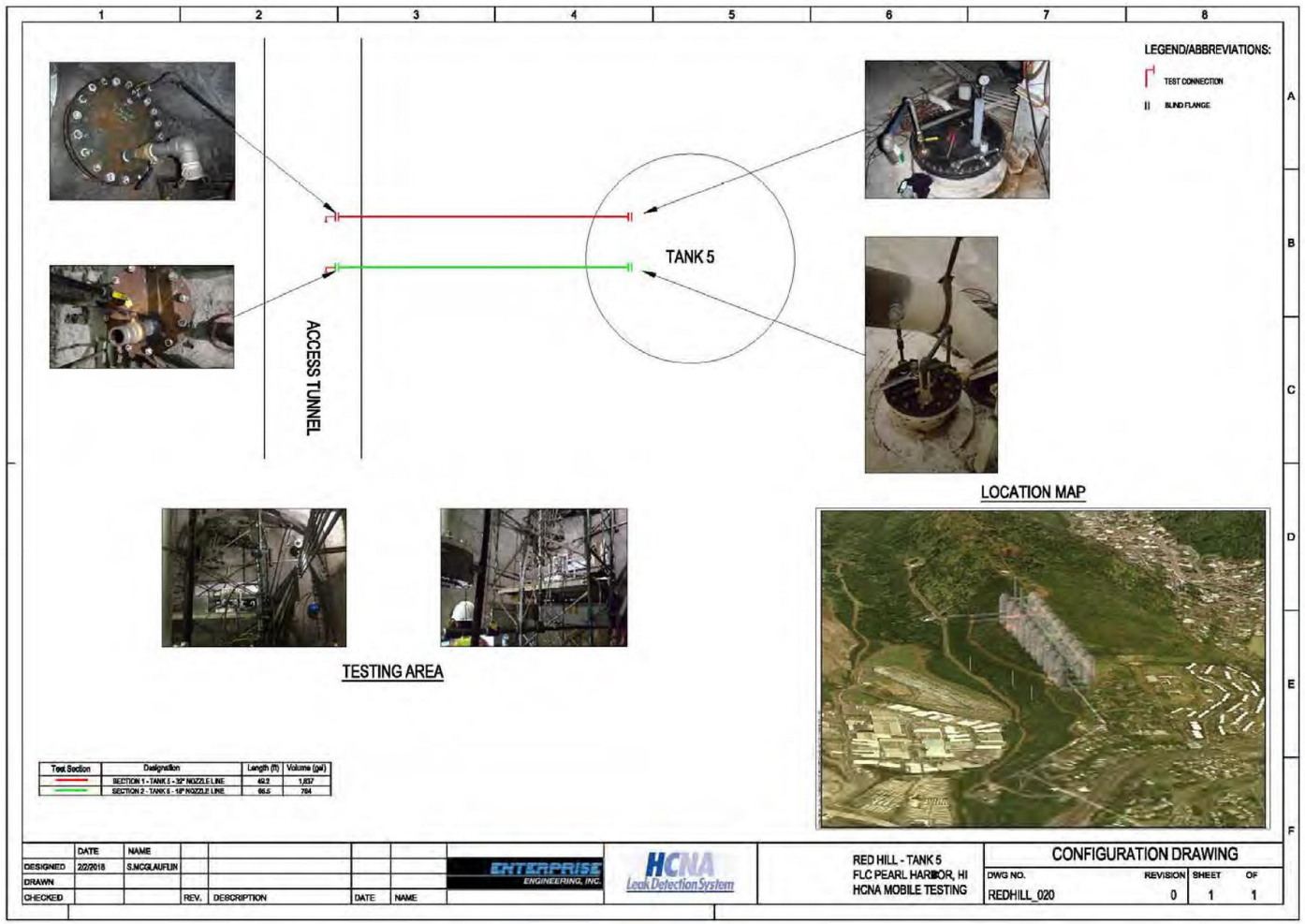
ROSEMOUNT

Emerson Process Management
12001 Technology Drive
Eden Prairie, MN 55344
USA
T 1-800-654-7768
F 1-952-828-3344

APPENDIX E: CONFIGURATION DRAWINGS

LOCATION/COMMENTS - Red Hill - Tank 5, FLC Pearl Harbor, HI

Configuration Drawing



APPENDIX F: CA. OFFICE OF THE STATE FIRE MARSHAL - APPROVAL

California Department of Forestry and Fire Protection
Office of the State Fire Marshal
Pipeline Safety Division

Approved Hydrostatic Testing Companies

LIST EXPIRES June 30, 2018

The following companies have met minimum requirements and are approved to hydrostatically test hazardous liquid pipelines in California for the period specified. The California State Fire Marshal makes no recommendations and has no information or involvement in the charges for such testing. **Testing may be witnessed or certified only by the individual employees as specified on the individual company pages.**

CURRENT AS OF 08/21/2017

AHS Construction/Century Calibrating
Akri Hydrotesting
ARB
Baker Hughes Process and Pipeline Service LLC
Barnard Pipeline, Inc.
Brothers Pipeline Corp
Brown Integrity, LLC
CCI - Antioch
CCI - Visalia
CMAC
Coastal Chemical Co., LLC
Doty Bros. Construction Company
Goldsmith Construction Company, Inc.
Hansa Consult of North America, LLC (HCNA)
Harder Mechanical Contractors, Inc.
Interspec LLC
Milbar Hydro-Test, Inc.
NAVFAC Engineering &Expeditionary Warfare Ctr
Performance Mechanical, Inc.
Pipeline Petroleum Services, Inc.
PROS, Inc.
PSI Pipeline Services
Underground Construction Company, Inc.
Vista Precision Solutions, Inc.
Westex Company

Office of the State Fire Marshal
Approved Hydrostatic Testing Companies
Details of Company Approval
Page 15 of 26

List is Current as of: 08/21/2017
List Expires: 06/30/2018

Company Name	Hansa Consult of North America, LLC (HCNA)		
Address	200 International Drive, Bldg. 120 Portsmouth, NH 03801		
Business Phone	603/422-8833		
Business Fax	603/422-8865		
Email Address	cfenton@hcna-llc.com		
Employees Approved to WITNESS Testing Activities	Charles Fenton Logan Phelps	Daryl Vorderbruggen Michael Sherlock	Joerg Hoehner Walter Phelps
Employees Approved to CERTIFY Test Results	Joerg Hoehner		

Hansa Consult of North America, LLC appreciates the opportunity to be of service to your organization. Because we are constantly striving to improve our service to you, we welcome any comments or suggestions you may have about how we can be more responsive to the needs of your organization. If you have any questions about the testing, analytical results, or this report, please give us a call at 1-888-MY-HANSA.

ATTACHMENT K
TESTEX API 653 PERSONNEL TESTING

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NAME: Agustin Nava

DATE: 12/4/17

TOP-SIDE PITTING

PLATE NUMBER	INCHES FROM LOWER RIGHT CORNER MARKED "TOP"				
	X	Y			
001					

BOTTOM-SIDE PITTING

PLATE NUMBER	INCHES FROM LOWER RIGHT CORNER MARKED "TOP"				
	X	Y			
003	7	15			
	8	8	?		
	4	18	?		
	7	8			
	2	18			
	4	14			
	1.5	9.5			

TOP-SIDE PITTING

PLATE NUMBER	INCHES FROM LOWER RIGHT CORNER MARKED "TOP"				
	X	Y			
004	10	14 ✓			
	9.5	10 ✓			
	8	4 ✓			
	15	6.5 ✓	7.5	18.5	
	5	8 ✓	7.5	4	
	2	7 ✓	2	16	
	4	20			

BOTTOM-SIDE PITTING

PLATE NUMBER	INCHES FROM LOWER RIGHT CORNER MARKED "TOP"				
	X	Y			
004					

testex

NAME: Scott Kellar

DATE: 12/4/17

TOP-SIDE PITTING

PLATE NUMBER	INCHES FROM LOWER RIGHT CORNER MARKED "TOP"				
	X	Y			
001					

TOP-SIDE PITTING

PLATE NUMBER	INCHES FROM LOWER RIGHT CORNER MARKED "TOP"				
	X	Y			
002					

BOTTOM-SIDE PITTING

PLATE NUMBER	INCHES FROM LOWER RIGHT CORNER MARKED "TOP"				
	X	Y			
003	2	18			
	4	14			
	2	8			
	8	15			
	8	8			
	4-5	14			
	7	8-9			

BOTTOM-SIDE PITTING

PLATE NUMBER	INCHES FROM LOWER RIGHT CORNER MARKED "TOP"				
	X	Y			
004	3-4	20			
	2	16			
	2	7			
	9	14			
	9	10			
	9	4			
	1	18			

NAME: Andrew Kim

DATE: 10-25-17

TOP-SIDE PITTING					
PLATE NUMBER	INCHES FROM LOWER RIGHT CORNER MARKED "TOP"				
	X	Y			
001	2 3/8"	3 3/4"			
	1"	19 1/2"			
	7 1/2"	9 3/4"			
	4 1/4"	16 1/8"			
	7 1/2"	3 3/4"			
	10"	12 1/4"			
	8 1/2"	20 1/8"			

TOP-SIDE PITTING					
PLATE NUMBER	INCHES FROM LOWER RIGHT CORNER MARKED "TOP"				
	X	Y			
002	4 1/2"	8 1/2"			
	4"	12 1/2"			
	3 1/2"	19"			
	7 1/8"	13 3/4"			
	9 3/4"	2 3/4"			
	11"	9 1/4"			
	9 7/8	20 1/2"			

BOTTOM-SIDE PITTING					
PLATE NUMBER	INCHES FROM LOWER RIGHT CORNER MARKED "TOP"				
	X	Y			
003	2 1/2"	17 5/8"			
	4 3/8"	13 3/8"			
	1 3/4"	5 1/2"			
	8 1/4"	7 3/4"			
	7 3/4"	15"			
	7- 8 1/2"	8 1/8"			
	11"	12 1/4"			
	8 1/4"	15"			

BOTTOM-SIDE PITTING					
PLATE NUMBER	INCHES FROM LOWER RIGHT CORNER MARKED "TOP"				
	X	Y			
004	2 1/4"	7"			
	4"	20"			
	6 1/4"	15"			
	5"	20"			
	6 3/8"	15"			
	8"	18"			
	7 1/2"	14"			
	7 1/2"	10"			
	8 1/2"	4"			
	10 1/2"	14"			
	9 1/2"	10 1/4"			

NAME: Emmanuel Ugochukwu

TOP-SIDE PITTING

PLATE NUMBER	INCHES FROM LOWER RIGHT CORNER MARKED "TOP"		DIA.	DEPTH	REMAINING WALL (APPROX.)
	X	Y			
001	8 1/2	20			
	1	19			
	4 1/2	16			
	10	12			
	4 1/2	10			
	7 1/2	5			
	2 1/2	4			

TOP-SIDE PITTING

PLATE NUMBER	INCHES FROM LOWER RIGHT CORNER MARKED "TOP"		DIA.	DEPTH	REMAINING WALL (APPROX.)
	X	Y			
7 x VT	10	3			
	5	9			
	10	9			
	4	12 1/2			
002	8	14			
5 x LEET	3 1/2	19			
	10	20 1/2			

BOTTOM-SIDE PITTING

PLATE NUMBER	INCHES FROM LOWER RIGHT CORNER MARKED "TOP"		DIA.	DEPTH	REMAINING WALL (APPROX.)
	X	Y			
003	3	8	—	—	240
	2	14	—	—	237
	4	18 1/2	—	—	242
*	7 1/2	5 1/2	—	—	240
	6	8 1/2	—	—	104
	6	14	—	—	240
	8 1/2	9	—	—	242
	9	15 1/2	—	—	135

BOTTOM-SIDE PITTING

PLATE NUMBER	INCHES FROM LOWER RIGHT CORNER MARKED "TOP"		DIA.	DEPTH	REMAINING WALL (APPROX.)
	X	Y			
004	5	7	—	—	230
	5	20	—	—	160
	8	8	—	—	233
	4	16	—	—	230
	9	16	—	—	235
	6 1/2	19	—	—	236
	11	10	—	—	236
	—	—	—	—	—
	7 1/2	14	—	—	232

NAME: Brad

TOP-SIDE PITTING					
PLATE NUMBER	INCHES FROM LOWER RIGHT CORNER MARKED "TOP"		DIA.	DEPTH	REMAINING WALL (APPROX.)
	X	Y			
001	1	19			
	2	4			
	4	9½			
	4	15			
	7½	5			
	8½	20			

TOP-SIDE PITTING					
PLATE NUMBER	INCHES FROM LOWER RIGHT CORNER MARKED "TOP"		DIA.	DEPTH	REMAINING WALL (APPROX.)
	X	Y			
7 x VT	~~3~~ 4	19			
	4½	8½			
	4	12			
	8	14			
002	9½	3			
5 x LEET	10	20½			
	11	9			

BOTTOM-SIDE PITTING					
PLATE NUMBER	INCHES FROM LOWER RIGHT CORNER MARKED "TOP"		DIA.	DEPTH	REMAINING WALL (APPROX.)
	X	Y			
003	5	5			
	7	8			
	5	14			
	6	20			
	7	8			
	8½	15			
	2½	8½			
	4	14			
	2	14			

BOTTOM-SIDE PITTING					
PLATE NUMBER	INCHES FROM LOWER RIGHT CORNER MARKED "TOP"		DIA.	DEPTH	REMAINING WALL (APPROX.)
	X	Y			
004	.75	7	2/7		.125
	2½	16			.204
	4	8			.198
	7½	15			238
	8	18½			.115
	6	18½			.230
	7½	10			—
	10	10	9/10		.119
	10½	13½	10/14		.103
	10½	17½			
	10	21	10/22		.123
	9	4			.161
	4	19½	3½/19½		.204

BASE 0.223

FALSE Plate Defect

NAME: Kyle

TOP-SIDE PITTING

PLATE NUMBER	INCHES FROM LOWER RIGHT CORNER MARKED "TOP"		DIA.	DEPTH	REMAINING WALL (APPROX.)
	X	Y			
001	2 1/2	3 1/2			
	7 1/2	4			
	4 1/2	9 1/2			
	10	12 1/2			
	4 1/2	16			
	1	19 1/2			
	8 1/2	20			

TOP-SIDE PITTING

PLATE NUMBER	INCHES FROM LOWER RIGHT CORNER MARKED "TOP"		DIA.	DEPTH	REMAINING WALL (APPROX.)
	X	Y			
002	10	3			
	4.5	8.5			
	11	9.5			
	4	12.5			
	8	14			
	3.5	19			
	10	20.5			

BOTTOM-SIDE PITTING

PLATE NUMBER	INCHES FROM LOWER RIGHT CORNER MARKED "TOP"		DIA.	DEPTH	REMAINING WALL (APPROX.)
	X	Y			
003	4	8 1/2			
	3	18 1/2			
	6	14 1/2			
	9	8 1/2			
	9 1/2	15 1/2			
	10 1/2	8 1/2			
	1	8 1/2			
	5	5 1/2			
	4 1/2	14 1/2			
	8	8 1/2			
	8	15 1/2			
	11	12			

BOTTOM-SIDE PITTING

PLATE NUMBER	INCHES FROM LOWER RIGHT CORNER MARKED "TOP"		DIA.	DEPTH	REMAINING WALL (APPROX.)
	X	Y			
004	3	7			
	2	16			
	5	8			
	4	15			
	4	20			
	9	10			
	9	14			
	8	18			
	9	9			

NAME: Joe Stanishewski

TOP-SIDE PITTING					
PLATE NUMBER	INCHES FROM LOWER RIGHT CORNER MARKED "TOP"		DIA.	DEPTH	REMAINING WALL (APPROX.)
	X	Y			
001	2 5/16"	3 5/8"			
	7 1/2"	3 7/8"			
	4 1/2"	9 3/4"			
	10 1/16"	12 1/4"			
	4 3/8"	16 1/8"			
	1"	19 1/2"			
	8 5/8"	20 1/8"			

TOP-SIDE PITTING					
PLATE NUMBER	INCHES FROM LOWER RIGHT CORNER MARKED "TOP"		DIA.	DEPTH	REMAINING WALL (APPROX.)
	X	Y			
002	9 7/8"	3 3/4			
	4 1/2"	8 9/16"			
	10 5/16"	9 1/4"			
	4 1/8"	12 3/8"			
	7 7/8"	13 7/8"			
	3 1/2"	19 1/16"			
	9 7/8"	20 5/8"			

BOTTOM-SIDE PITTING					
PLATE NUMBER	INCHES FROM LOWER RIGHT CORNER MARKED "TOP"		DIA.	DEPTH	REMAINING WALL (APPROX.)
	X	Y			
003	2	18			
	5	14			
	1	8			
	3	3			
	8	15			
	7	8			
	6	11			
	9	7			

BOTTOM-SIDE PITTING					
PLATE NUMBER	INCHES FROM LOWER RIGHT CORNER MARKED "TOP"		DIA.	DEPTH	REMAINING WALL (APPROX.)
	X	Y			
004	6	20			
	2	16			
	3	7			
	4	3			
	7	18			
	7	15			
	5	8			
	8-9	4			
	10	14			
	9	10			

NAME: TOM HARDIN

TOP-SIDE PITTING					
PLATE NUMBER	INCHES FROM LOWER RIGHT CORNER MARKED "TOP"		DIA.	DEPTH	REMAINING WALL (APPROX.)
	X	Y			
001	3"	2.5"			
	7.5"	1"			
	10"	4.5"			
	16"	4.5"			
	4"	7.5"			
	12"	10"			
	20"	8.5"			

TOP-SIDE PITTING					
PLATE NUMBER	INCHES FROM LOWER RIGHT CORNER MARKED "TOP"		DIA.	DEPTH	REMAINING WALL (APPROX.)
	X	Y			
003 ~~002~~	8"	9"			
	4"	14"			
	6	21"			
	1"	19"			
	2"	23"			
	7"	8"			
	7"	15"			
	11"	12"			

BOTTOM-SIDE PITTING					
PLATE NUMBER	INCHES FROM LOWER RIGHT CORNER MARKED "TOP"		DIA.	DEPTH	REMAINING WALL (APPROX.)
	X	Y			
002 ~~003~~	4.5"	8.5"			
	4"	12.5"			
	3.5"	19"			
	8"	14"			
	10"	3"			
	11"	9.5"			
	10"	21"			

BOTTOM-SIDE PITTING					
PLATE NUMBER	INCHES FROM LOWER RIGHT CORNER MARKED "TOP"		DIA.	DEPTH	REMAINING WALL (APPROX.)
	X	Y			
004	2"	8"			
	4"	21"			
	8"	10"			
	10"	14"			
	4"	7"			
	6"	16"			
	8"	21"			

NAME: Joseph Miller

TOP-SIDE PITTING					
PLATE NUMBER	INCHES FROM LOWER RIGHT CORNER MARKED "TOP"		DIA.	DEPTH	REMAINING WALL (APPROX.)
	X	Y			
001	2 1/4	3 1/2			
	7 1/2	3 3/4			
	4 1/2	9 3/4			
	10	17 1/4			
	4 1/2	16 1/4			
	1	19 1/2			
	8 1/2	20 1/4			

TOP-SIDE PITTING					
PLATE NUMBER	INCHES FROM LOWER RIGHT CORNER MARKED "TOP"		DIA.	DEPTH	REMAINING WALL (APPROX.)
	X	Y			
002	3	10			
	4 1/2	8 1/2			
	11	9			
	4	12			
	8	14			
	3	19			
	10	21			

BOTTOM-SIDE PITTING					
PLATE NUMBER	INCHES FROM LOWER RIGHT CORNER MARKED "TOP"		DIA.	DEPTH	REMAINING WALL (APPROX.)
	X	Y			
003	1	9			
	5	14			
	2	18			
	7	8			
	8	8			
	11	12			
	8	15			

BOTTOM-SIDE PITTING					
PLATE NUMBER	INCHES FROM LOWER RIGHT CORNER MARKED "TOP"		DIA.	DEPTH	REMAINING WALL (APPROX.)
	X	Y			
004	2	7			
	2	16			
	4	20			
	5	6			
	7	15			
	9	10			
	10	14			
	11 1/2	16			
	7	19			

AME: RON ALLEN

TOP-SIDE PITTING

PLATE NUMBER	INCHES FROM LOWER RIGHT CORNER MARKED "TOP"		DIA.	DEPTH	REMAINING WALL (APPROX.)
	X	Y			
001	2 1/2	3 1/2			
	7 1/2	4			
	4 1/2	10			
	10	12			
	4 1/2	16			
	1	19 1/2			
	5 1/2	20			

TOP-SIDE PITTING

PLATE NUMBER	INCHES FROM LOWER RIGHT CORNER MARKED "TOP"		DIA.	DEPTH	REMAINING WALL (APPROX.)
	X	Y			
002	10"	3"			
	4 1/2	8 1/2			
	11	9 1/4			
	4	12 1/2			
	8	14			
	3 1/2	19			
	10	20 1/2			

BOTTOM-SIDE PITTING

PLATE NUMBER	INCHES FROM LOWER RIGHT CORNER MARKED "TOP"		DIA.	DEPTH	REMAINING WALL (APPROX.)
	X	Y			
003	2	9			
	3 1/2	14			
	3	19			
	8	9			
	8	15			
	5	5			

BOTTOM-SIDE PITTING

PLATE NUMBER	INCHES FROM LOWER RIGHT CORNER MARKED "TOP"		DIA.	DEPTH	REMAINING WALL (APPROX.)
	X	Y			
004	2 1/2	7			
	4	20			
	5	7			
	3	15			
	7	7			
	7	15			
	7	19			
	9	10			
	9	14			

NAME: Dennis Stefanko

TOP-SIDE PITTING					
PLATE NUMBER	INCHES FROM LOWER RIGHT CORNER MARKED "TOP"		DIA.	DEPTH	REMAINING WALL (APPROX.)
	X →	Y ↑			
001	2 3/8	3 3/4			
	7 1/2	4			
	4 1/2	9 3/4			
	10	12 1/2			
	4 1/4	16 1/2			
	1	19 1/2			
	8 1/2	20 1/2			

TOP-SIDE PITTING					
PLATE NUMBER	INCHES FROM LOWER RIGHT CORNER MARKED "TOP"		DIA.	DEPTH	REMAINING WALL (APPROX.)
	X	Y			
002	9 3/4	2 3/4			
	4 1/2	8 1/2			
	11	9 1/4			
	4 1/4	12 1/2			
	8	14			
	3 1/2	19			
	10	20 1/2			

BOTTOM-SIDE PITTING					
PLATE NUMBER	INCHES FROM LOWER RIGHT CORNER MARKED "TOP"		DIA.	DEPTH	REMAINING WALL (APPROX.)
	X	Y			
003	2 1/2	18			
	2	8 1/4			
	2	3 3/4			
	4 1/2	14			
	5	5			
	5	3 1/2	END of plate		
	8	15			
	7 1/2	8			
	9	4			
	9 1/2	3 1/4			
	11	12			

BOTTOM-SIDE PITTING					
PLATE NUMBER	INCHES FROM LOWER RIGHT CORNER MARKED "TOP"		DIA.	DEPTH	REMAINING WALL (APPROX.)
	X	Y			
004	3	20			
	2	7			
	3	5			
	4	20			
	5	15			
	5	8			
	5	4			
	8	19			
	7 1/2	14			
	9	10			
	8	4			

NAME: Bill

TOP-SIDE PITTING					
PLATE NUMBER	INCHES FROM LOWER RIGHT CORNER MARKED "TOP"		DIA.	DEPTH	REMAINING WALL (APPROX.)
	X	Y			
All located 001 VT +3 ET	3	2			
	7	1			
	10	4			
	17	5			
	5	8			
	12	10			
	20	8			

TOP-SIDE PITTING					
PLATE NUMBER	INCHES FROM LOWER RIGHT CORNER MARKED "TOP"		DIA.	DEPTH	REMAINING WALL (APPROX.)
	X	Y			
7 x VT 5 x ET 002	9	2			
	10	9			
	4	12			
	7	13			
	4	8			
	3	19			
	9	20			

BOTTOM-SIDE PITTING					
PLATE NUMBER	INCHES FROM LOWER RIGHT CORNER MARKED "TOP"		DIA.	DEPTH	REMAINING WALL (APPROX.)
	X	Y			
003	2 1/2	18 1/2	—	—	242
	5	14	—	—	245
	2	8 1/2	—	—	242
	8 1/4	15	—	—	245
	4	14	—	—	246
	8	8	—	—	169
	5	5	—	—	185
	7 1/2	15	—	—	129
	11 1/2	12	—	—	170
	7	8 1/2	—	—	186

BOTTOM-SIDE PITTING					
PLATE NUMBER	INCHES FROM LOWER RIGHT CORNER MARKED "TOP"		DIA.	DEPTH	REMAINING WALL (APPROX.)
	X	Y			
004	2	7			
	2	15			
	4	19			
	5	9			
	7	15			
	9	11			
	9.5	14			
	11	16			
	7	19			

NAME: Mark

TOP-SIDE PITTING

PLATE NUMBER	INCHES FROM LOWER RIGHT CORNER MARKED "TOP"		DIA.	DEPTH	REMAINING WALL (APPROX.)
	X	Y			
11 x VT LF 3x ET	2	3½			
	7	5			
	4	9¾			
	10	12			
001	4	16			
	1	19½			
	8	20			

TOP-SIDE PITTING

PLATE NUMBER	INCHES FROM LOWER RIGHT CORNER MARKED "TOP"		DIA.	DEPTH	REMAINING WALL (APPROX.)
	X	Y			
7 x VT 5 x LF ET	10	3			
	5	9			
	11	9			
	4	12½			
002	8	14			
	4	19			
	10	20½			

BOTTOM-SIDE PITTING

PLATE NUMBER	INCHES FROM LOWER RIGHT CORNER MARKED "TOP"		DIA.	DEPTH	REMAINING WALL (APPROX.)
	X	Y			
	1	14	—	—	240
	3½	18½	—	—	238
	5	8¾	—	—	216
	7	9	—	—	240
	6½	15	—	—	243
	8	15	—	—	242
003	12	12	—	—	174

BOTTOM-SIDE PITTING

PLATE NUMBER	INCHES FROM LOWER RIGHT CORNER MARKED "TOP"		DIA.	DEPTH	REMAINING WALL (APPROX.)
	X	Y			
	2	7			
	2	16			
	4	20			
	5	3			
	6	15			
	9	10			
004	10	14			
	7	19			

TOP-SIDE PITTING					
PLATE NUMBER	INCHES FROM LOWER RIGHT CORNER MARKED "TOP"		DIA.	DEPTH	REMAINING WALL (APPROX.)
	X	Y			
001	2 3/8	3 5/8	0.250	0.060	0.190
	7 1/2	4 7/8	0.250	0.068	0.182
	4 1/2	9 3/4	0.375	0.145	0.105
	10 1/16	12 1/4	0.375	0.125	0.125
	4 3/8	16 1/8	0.250	0.085	0.165
	1	19 1/2	0.250	0.091	0.159
	8 5/8	20 1/8	0.375	0.153	0.097

BOTTOM-SIDE PITTING					
PLATE NUMBER	INCHES FROM LOWER RIGHT CORNER MARKED "TOP"		DIA.	DEPTH	REMAINING WALL (APPROX.)
	X	Y			
003	2 1/2	3 3/16	0.500	0.178	0.072
	9 3/4	2 3/16	0.375	0.145	0.105
	5 1/4	5 1/4	0.250	0.083	0.167
	7 7/16	8 1/8	0.500	0.170	0.080
	1 5/16	8 3/8	0.375	0.142	0.108
	10 7/8	12 1/8	0.250	0.098	0.152
	4 7/16	13 7/8	0.500	0.210	0.040
	7 3/16	15 1/16	0.375	0.123	0.127
	2 1/8	18 5/16	0.375	0.138	0.112
	9 5/8	21 1/8	0.500	0.160	0.090
	5	21 3/4	0.375	0.130	0.120

TOP-SIDE PITTING					
PLATE NUMBER	INCHES FROM LOWER RIGHT CORNER MARKED "TOP"		DIA.	DEPTH	REMAINING WALL (APPROX.)
	X	Y			
002	9 7/8	2 3/4	0.375	0.123	0.127
	4 9/16	8 9/16	0.375	0.169	0.081
	10 15/16	9 1/4	0.250	0.090	0.160
	4 1/8	12 3/8	0.250	0.083	0.167
	7 7/8	13 7/8	0.375	0.128	0.122
	3 7/16	19 1/8	0.250	0.083	0.167
	9 13/16	20 5/8	0.250	0.084	0.166

BOTTOM-SIDE PITTING					
PLATE NUMBER	INCHES FROM LOWER RIGHT CORNER MARKED "TOP"		DIA.	DEPTH	REMAINING WALL (APPROX.)
	X	Y			
004	3 1/16	3	0.500	0.180	0.070
	7 7/8	4	0.500	0.190	0.060
	2	7	0.375	0.162	0.088
	5 3/16	7 15/16	0.250	0.098	0.152
	9	10	0.375	0.155	0.095
	10	13 15/16	0.500	0.195	0.055
	6 1/16	14 13/16	0.375	0.150	0.100
	2	15 7/8	0.250	0.083	0.167
	7 5/16	18 9/16	0.375	0.150	0.100
	4	20 15/16	0.500	0.195	0.055
	10	21 15/16	0.375	0.152	0.098

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