ALPHA TECHNICAL GROUP INC.
Consulting Engineers
2929 N.W. 29th Avenue, Portland, OR. 97210
Phone (503) 227-3317 Fax (503) 227-3244

Pacterm- Portland Terminal
Seismic Vulnerability Assessment (SVA)
Phase 1

Rev Date: May 30, 2024

PRELIMINARY

EXPIRES 12/31/25

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Appendix

1.0 Introduction & Scope

This report summarizes the results of the preliminary Seismic Vulnerability Assessment (Phase 1) performed to date for the Pacterm Portland Terminal located at 7900 NW St. Helens Road at in Portland Oregon. All infrastructure (tanks/dock/buildings/etc.) and property are owned by Northwest Natural Gas Inc. who then leases it to Centerline Logistics Inc. who is the operator of the facility.

The assessment team is led by Alpha Technical Group Inc (ATGI). Other team members include MISTRAS (Tank Structural Engineer) and a Geotechnical Engineering Firm (note we have received two proposals for geotechnical engineering support and will make final selection soon).

This report was prepared following the roadmap developed by the Oregon DEQ for facilities to use to develop seismic vulnerability assessments to comply with the Oregon DEQ's Fuel Tank Seismic Stability (FTSS) Program rules per Oregon Administrative Rules Chapter 340 Division 300 (OAR 340-300). The rules state that their purpose is to protect public health, life safety and environmental safety against release of fuel products and fires. The FTSS Program rules were adopted on September 14, 2023, and a roadmap with corresponding checklist forms 1-9 was issued by DEQ in mid-March 2024. Since this is the first draft of the DEQ Rules it's likely to be interpreted differently by various engineers, and the Rules may change going forward. Due to these uncertainties, we have used a phased approach for the initial Seismic Vulnerability Assessment submittal. This way we can get clarification from DEQ review on specific details and any needs for more analysis.

The purpose of this report is to provide the preliminary results of the seismic vulnerability assessment performed to date for the Facility and include a summary of remaining work to be completed and the corresponding proposed schedule for the next phase.

2.0 General Site Information

The Facility currently provides storage and distribution of petroleum products including blended fuel oils and marine diesel (all combustibles-no flammables). The existing infrastructure includes a marine dock for ship unloading and loading, a railcar offloading spur, a truck loading facility (currently not in service), and (6) above ground product storage tanks which are all connected to the product piping systems. The site also has other minor structures including an office, shop and warehouse, control room, and boiler building.

3.0 Seismic Vulnerability Assessment Checklist Forms

The Oregon DEQ's roadmap includes nine (9) checklist forms that provide suggested guidance for the seismic vulnerability assessments on various components, that include: geotechnical assessment, tanks, pipelines, piers and wharves, liquefied natural gas (LNG) tanks and pipelines, berms and dikes, building and building structures, fire detection and suppression, and control systems. ATGI has provided past engineering support on the Facility's Spill Prevention Countermeasure and Controls (SPCC) Plan, Facility Response Plan (FRP), and Stormwater Pollution Control Plan (SWPCP). One of the primary requirements of the new DEQ Rules is to limit the Maximum Allowable Uncontained Spill (MAUS) outside of secondary containment to 42 gallons.

This section summarizes the preliminary results of seismic vulnerability assessments completed to date for various components following the nine checklist forms.

3.1 Geotechnical Assessment

This site has had extensive soil borings and testing that have been performed primarily under the direction of Northwest Natural Gas Inc. This past information can help provide valuable geotechnical information for the Seismic Vulnerability Assessment (Phase 1). Pacterm (Centerline Logistics Inc) has requested this information and is currently waiting for results from Northwest Natural Gas Inc. The site is located in an area known to be subject to lateral spread and liquefaction from the Cascadia Earthquake event specified in the DEQ rules.

Requests for Proposals (RFQs) have been sent to geotechnical engineering firms. The selected geotechnical engineering firm will provide a more detailed geotechnical analysis and report as required by the ODEQ rules. This information will be used by the design team to do further seismic analysis on all tanks, berms, piping systems, and building type structures. A geotechnical site plan is located in Appendix A1.

3.2 Tanks

Tanks 1, 2, 3, 4, and 5 are atmospheric vertical steel storage tanks originally designed per API 650 methods, which is the most commonly used design method for these types of storage tanks. Tank 7 is an atmospheric horizontal steel storage tank and appears to have been designed to UL 142 standards which is the most commonly used design method for these types of storage tanks (currently not in service). The vertical storage tanks are inspected and maintained in accordance with API 653 standards. All of the vertical storage tanks are unanchored.

All structures designed in accordance with ASCE 7 must be assigned a Risk Category. ASCE 7 describes risk categories in relation to the risk to human life, health, and welfare that would be caused by a structure's damage or failure. Therefore, the nature of a structure's use dictates its Risk Category. These code documents have four risk category levels defined as Risk Category I, Risk Category II, Risk Category III and Risk Category IV. Higher risk categories reflect structures with more relative risk. For example, Risk Category IV structures include "essential facilities" like hospitals and emergency shelters, whereas Risk Category I structures include generally unoccupied structures such as agriculture barns or storage facilities. Most typical structures (such as office buildings, homes, restaurants, retail stores, etc.) are assigned to Risk Category II.

For the seismic design and analysis of structures, the Risk Category dictates the Seismic Importance Factor used for a structure. Risk Category I and II structures are assigned a Seismic Importance Factor of 1.0, Risk Category III structures are assigned a Seismic Importance Factor of 1.25 and Risk Category IV structures are assigned a Seismic Importance Factor of 1.5. In the determination of design seismic forces on a structure, the Seismic Importance Factor has the effect of causing structures with a higher importance factor to be designed for larger seismic forces. (i.e. 25% higher for Rick Category III and 50% higher for risk category IV structures). All of the tanks at this facility were determined to be risk category II structures since they do not contain highly toxic or highly explosive substances (i.e. marine diesel and blended fuel oils do not meet definition of highly toxic or highly explosive substances).

No records on the original tank and foundation construction were available at the time of this report. Reference drawings for the tanks along with copies of the most recent inspection records are located in Appendix A2.

Detailed seismic analyses are not included for the tanks in this phase of the study. Structural analyses will be completed by the design team for the next phase of the study after the estimated seismic ground deformations are better understood.

3.3 Piping

No inspection records/ drawings of the piping systems were available at the time of report. A conceptual routing plan of the piping systems located in Appendix A3.

Detailed seismic/pipe stress analyses of the piping and supports were not performed in this phase of the study. These analyses will be completed by the design team for the next phase of the study after the estimated seismic ground deformations are better understood

3.4 Marine Dock

The Marine Dock is used to offload marine diesel products using the pumps on the barge itself. Blended fuel oil products are also loaded onto barges via the facility's pumps and piping systems, including flexible cargo hoses between the vessels and the piping risers. The risers are connected to the storage tanks within the tank farms through a combination of above and below ground piping.

The main approach pier consists of steel pipe piling and steel framing and extends from shore out to the vessel berthing area. This section supports product piping and foot traffic from operations (no vehicle access). Dolphin Structures are used to secure the vessels during berthing and mooring operations. The dolphins consist of steel piles and concrete caps.

No inspection reports of the dock structures were available at the time of report. Reference drawings for the marine dock are located in Appendix A4.

Detailed seismic analyses are not included for dock structural elements in this phase of the study. Structural analyses will be completed by the design team for the next phase of the study after the estimated seismic ground deformations are better understood.

3.5 LNG Tanks & Pipelines

The facility does not contain liquefied natural gas components and so this checklist is not included in this report. Northwest Natural Gas is completing a separate Seismic Vulnerability Assessment for its LNG facilities adjacent to Pacterm.

3.6 Dikes & Berms

The Facility has two separate containment dike/berm areas at the Old Tank Farm and New tank Farm. The New Tank Farm berms are of all earthen construction. The ground was excavated approximately 10 deep prior to constructing tanks and foundations. This was likely done to obtain better soil bearing capacity and then the unexcavated ground remaining after construction served as the containment berm.

The Old Tank Farm berms are a combination of concrete dike walls and earthen construction. The ground was excavated approximately 10 deep prior to constructing tanks and foundations. This was likely done to obtain better soil bearing capacity and then the unexcavated ground remaining after construction served as the containment berm. The concrete dike wall is located near the river as shown on site plan drawings,

The earth berms and concrete dike walls currently meet containment volume requirements of the Facility's Spill Prevention Countermeasure and Controls (SPCC) Plan.

No records on the original earth berms or concrete dike construction were available at the time of this report. Reference drawings for the dikes and earth berms are located in Appendix A6.

Detailed seismic vulnerability analyses are not included for the dikes and earth berms in this phase of the study. Analyses will be completed by the design team for the next phase of the study after the estimated seismic ground deformations are better understood.

3.7 Buildings and Building Type structures

The Facility includes the following buildings and building type structures:

-office (wood frame construction)
-truck load rack (steel frame construction-currently out of service)
-shop/warehouse (steel frame construction)
-control room/ boiler buildings (steel frame construction)

These buildings were all determined to be risk category II structures (see section 3.2 discussion). If a seismic failure occurred in these buildings, there does not appear to be a possibility of having any increased possibility of a MAUS in excess of 42 gallons. Current OSSC building codes do not require seismic strengthening of an existing structure as long as there is no change in occupancy. We have assumed the DEQ Rules do require any further analysis of these buildings since don't appear to have any effect on spill potential.

No records of the original building's construction were available at the time of this report. Reference drawings for the buildings and building type structures are located in Appendix A7.

Detailed seismic vulnerability analyses are not included for the buildings and building type structures in this phase of the study. Analyses will be completed by the design team for the next phase of the study after the estimated seismic ground deformations are better understood (if required per DEQ review).

3.8 Fire Detection and Suppression

The terminals' fire detection and suppression system consist of fire hydrants, fire department connections (FDC's) and fire hoses and hose connections at the marine dock. The risk of fire is inherently low due to the fact that the terminal only handles combustible liquids (not flammables). Specific comments are provided below:

3.8.1 Tanks -Upon Initial review per NFPA 30 codes it appears no special fire protection measures or foam are required since these combustible storage tanks.

3.8.2 Truck Rack – Truck Rack is currently out of service. Upon Initial review per NFPA 30 codes it appears no special fire protection measures are required as long as only combustible products are handled in future.

3.8.3 Rail Offload - Upon Initial review per NFPA 30 codes it appears no special fire protection measures are required since these combustible products. Will research further and update as needed.

3.8.3 Dock Loading/Unloading - Upon Initial review per NFPA 30 codes it appears no special fire protection measures are required since these combustible products. Will research further and update as needed.

No records on the original fire detection and suppression system construction were available at the time of this report. Reference drawings are located in Appendix A8.

Detailed seismic vulnerability analyses are not included for the fire protection components in this phase of the study. Analyses will be completed by the design team for the next phase of the study after the estimated seismic ground deformations are better understood.

3.9 Control Equipment

The terminal has minimal control systems that allow for manual control only of various pumps, valves, and related equipment. There is no automated control of equipment using programmable logic controllers (PLC) or similar.

No records on the original control system construction were available at the time of this report. Reference drawings for the control systems are located in Appendix A8.

Detailed seismic vulnerability analyses are not included for the control system components in this phase of the study. Analyses will be completed by the design team for the next phase of the study after the estimated seismic ground deformations are better understood (if required per DEQ review).

4.0 Remaining Work and Proposed Schedule

This section summarizes the remaining work and proposed schedule.

4.1 Additional Geotechnical Assessment

Perform an initial geotechnical seismic vulnerability assessment of the existing facility in accordance with OAR 340-300-0003 including:

- Review relevant, readily available geologic maps and geotechnical reports that cover the site vicinity and nearby to evaluate geologic hazards, regional soil mapping, and local soil and groundwater conditions.
- Perform a site visit to assess surface conditions with respect to geologic and seismic hazard evaluations.
- Review project plans and historical aerial photographs for information regarding historical site developments.
- Conduct preliminary geotechnical engineering analyses including evaluating seismic design parameters, seismic settlement, liquefaction potential, and lateral spread potential to evaluate the expected seismic performance of the Facility in accordance with OAR 340-300-0003 and based on existing soils data.
- Prepare a preliminary geotechnical assessment report outlining our geotechnical findings, including information related to the following:
  1. Subsurface soil and groundwater conditions.
  2. Seismic design criteria.
  3. Seismic hazards evaluations (e.g., liquefaction, settlement, and lateral spreading); and
  4. Expected seismic performance of site soils and slopes.

4.2 Additional Structural Analysis & Evaluations

Upon completion of the more detailed geotechnical assessment above, additional analysis and assessment will be completed and sections 3.2 through 3.9 of this report will be updated accordingly (i.e. Tanks/Piping/Dock/Dike & Berms/Buildings/Fire Protection/Controls)

4.3 Proposed Schedule

- Complete Additional Geotech Assessment -estimate 6 months after DEQ approval to proceed with this approach
- Complete Additional Structural Analysis & Evaluations - estimate 10 months after DEQ approval to proceed with this approach
- Finalize updated Seismic Vulnerability Report- estimate 12 months after DEQ approval to proceed with this approach

5.0 Analysis and Report Limitations

The engineering services described in this report were performed based on limited information available at this time. No detailed investigation or destructive testing was performed to qualify as built conditions or verify the quality of materials and workmanship. This report provides an overview of a preliminary structural seismic vulnerability assessment report and does not address any portions of structures, buildings, equipment, or systems other than those mentioned, nor does it provide any warranty, either expressed or implied, for any portion of the facility. This report has been prepared for the exclusive use of Centerline Logistics and is not intended for use by other parties.

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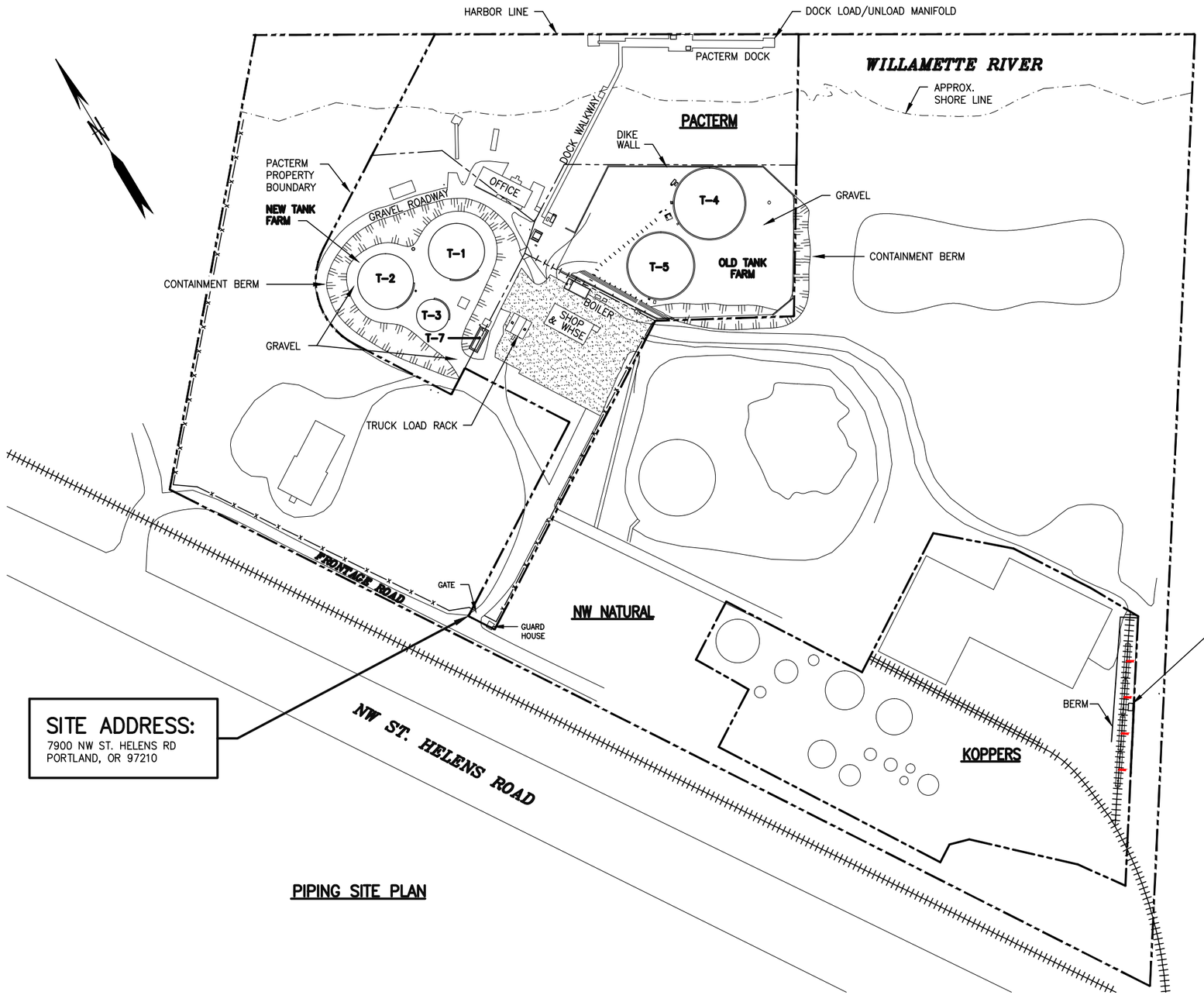
Appendix 1

- Geotechnical Site Plan



SITE ADDRESS:
7900 NW ST. HELENS RD
PORTLAND, OR 97210

PIPING SITE PLAN

TANK DATA					
TANK NO.	DIAMETER	HEIGHT	TYPE	SHELL CAPACITY (BBLS)	SERVICE
1	95'-0"	48'-0"	CONE ROOF	60,567	IFO
2	95'-0"	48'-0"	CONE ROOF	60,567	MDO
3	55'-0"	48'-0"	CONE ROOF	20,301	#6 FO
4	117'-2"	42'-0"	CONE ROOF	80,613	IFO
5	114'-6"	30'-0"	CONE ROOF	54,990	CUTTER
7	10'-0"	35'-1"	HORIZONTAL	501	FO
N/A	500 GALLON BOILER FUEL TANK (DIESEL, ABOVE GROUND - NEAR TO BOILER BUILDING)				

LEGEND

- G — GEOTECH BORING
- CPT — GEOTECH CPT

NOTES:

1. MANY GEOTECH BORINGS/MONITORING WELLS/CPT HAVE BEEN DONE AT THIS SITE. PACTERM HAS REQUESTED RECORDS FROM NW NATURAL GAS. NEW BORINGS & CPT WILL BE DONE IN MITIGATION PHASE.

50' 0' 100' 200'
SCALE: 1"=100' (22x34)
SCALE: 1"=200' (11x17)

ALPHA TECHNICAL GROUP INC.
2929 NW 29th AVE, PORTLAND, OR. 97210
Tel:(503)227-3317/Fax:(503)227-3244

ATGI PROJECT NUMBER: 19-13

DRAWING NO.	REFERENCE DRAWINGS	REV.	DATE	REVISED	DRAWN	CKD.	CIV/STRL	MECH/PIPING	ELEC/INST	SAFETY	P.E.
		A	05/24/24	FOR REVIEW & COMMENT	HVT	JPD					

PACIFIC TERMINAL SERVICES, INC.
7900 St. Helens Rd., Portland, Oregon 97210

CLIENT APPROVALS		
REV	BY	DATE

SCALE:AS NOTED		DATE
DRAWN BY	HVT	05/24/24
DESIGNED BY	JPD	
CHECKED BY	JPD	
WORK ORDER		
DATE		
05/24/24		

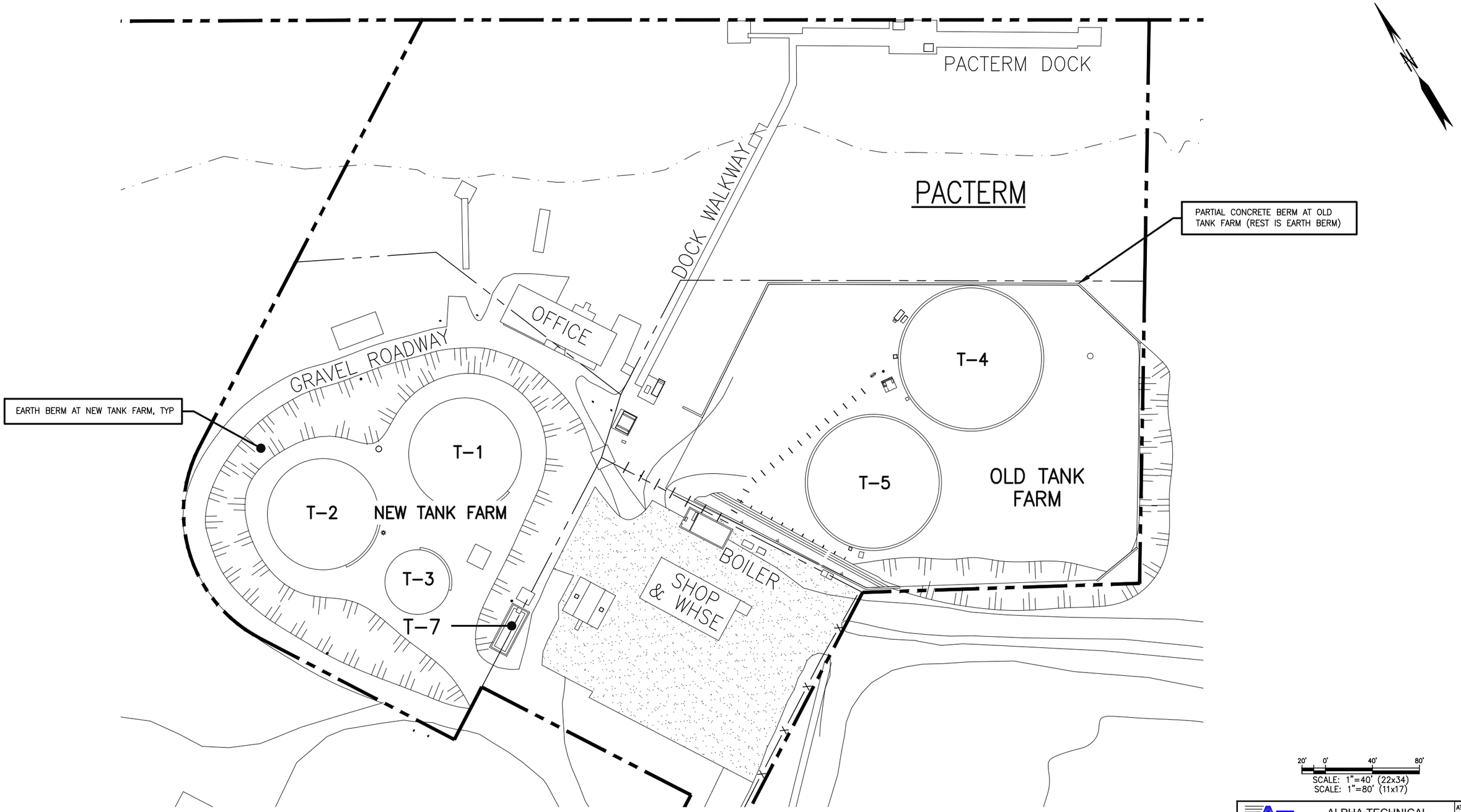
PORTLAND TERMINAL
PORTLAND, OREGON

SITE PLAN
GEOTECHNICAL

DRAWING NO.	SHEET	REV.
19-13-GEO-01	1 OF 1	A

Appendix 2

- Tanks Site Plan
- Tank Inspection Reports



TANKS SITE PLAN

DRAWING NO.	REFERENCE DRAWINGS	REV.	DATE	REVISED	DRAWN	CKD.	CIV/STRL	MECH/PIPING	ELEC/INST	SAFETY	P.E.
		A	05/24/24	FOR REVIEW & COMMENT	HVT	JPD					

PACIFIC TERMINAL SERVICES, INC.
7900 St. Helens Rd., Portland, Oregon 97210

CLIENT APPROVALS		
REV	BY	DATE

ALPHA TECHNICAL GROUP INC.
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Tel:(503)227-3317/Fax:(503)227-3244

ATGI PROJECT NUMBER: 19-13

SCALE:AS NOTED		DATE
DRAWN BY	HVT	05/24/24
DESIGNED BY	JPD	
CHECKED BY	JPD	
WORK ORDER		
DATE		
05/24/24		

PORTLAND TERMINAL
PORTLAND, OREGON
TANK SITE PLAN

DRAWING NO.	SHEET	REV.
19-13-TANK-01	1 OF 1	A

PHOTO #1 – TANK 5 & FOUNDATION

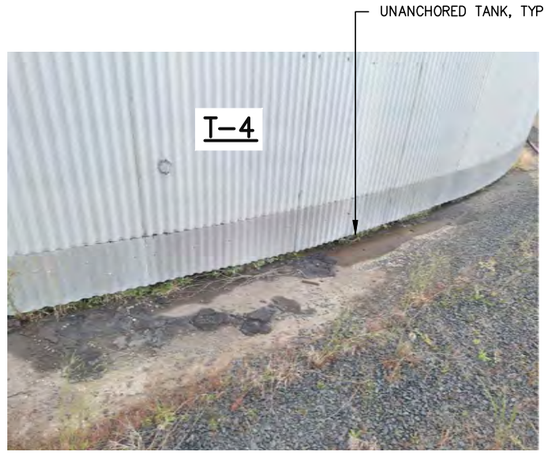


PHOTO #2 – TANK 4 & FOUNDATION

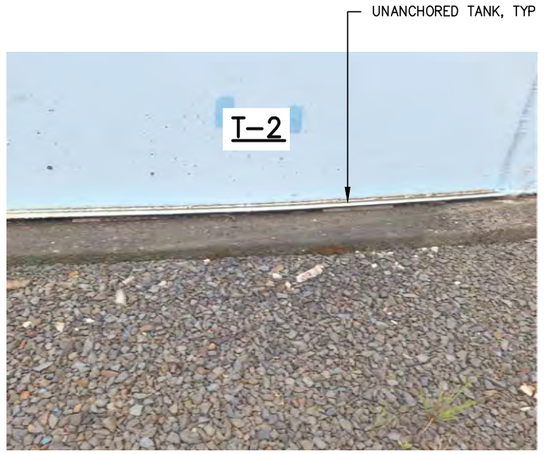


PHOTO #3 – TANK 2 & FOUNDATION

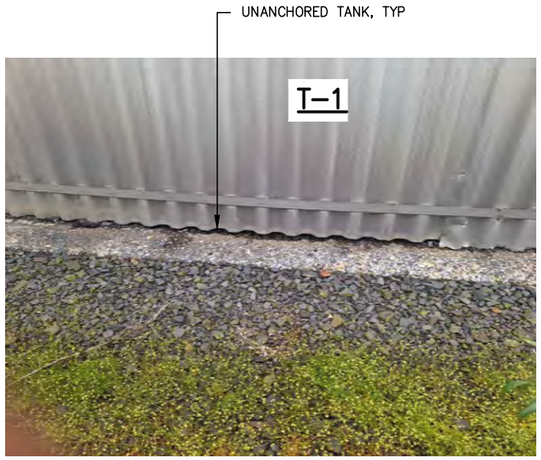


PHOTO #4 – TANK 1 & FOUNDATION

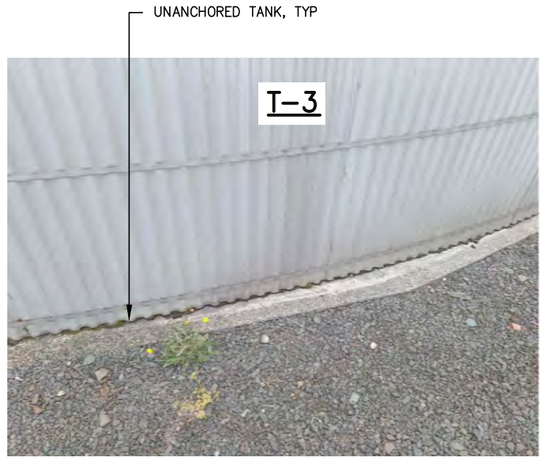


PHOTO #5 – TANK 3 & FOUNDATION

PHOTO #6 – TANK 4 BASE

PHOTO #7 – TANK 5 BASE

ALPHA TECHNICAL GROUP INC.
2929 NW 29th AVE, PORTLAND, OR. 97210
Tel:(503)227-3317/Fax:(503)227-3244

ATGI PROJECT NUMBER: 19-13

DRAWING NO.	REFERENCE DRAWINGS	REV.	DATE	REVISED	DRAWN	CKD.	CIV/STRL	MECH/PIPING	ELEC/INST	SAFETY	P.E.
		A	05/24/24	FOR REVIEW & COMMENT	HVT	JPD					

PACIFIC TERMINAL SERVICES, INC.
7900 St. Helens Rd., Portland, Oregon 97210

CLIENT APPROVALS		
REV	BY	DATE

SCALE:AS NOTED		DATE
DRAWN BY	HVT	05/24/24
DESIGNED BY	JPD	
CHECKED BY	JPD	
WORK ORDER		
DATE		05/24/24

PORTLAND TERMINAL
PORTLAND, OREGON

TANK DETAILS

DRAWING NO.	SHEET	REV.
19-13-TANK-02	1 OF 1	A

Above Ground Storage Tank Inspection Report

In accordance with API 653

Pacific Terminal (Centerline Logistics)

Tank 1

In Service Inspection

Portland, OR

January 11, 2021 to January 12, 2021

Report Number 40891089-1

Prepared By :
7820 South 212th St. St. 110
Kent, WA, 98032

www.mistrasgroup.com

MISTRAS A World of NDT Solutions | Services Division

Inspection Date
January 12, 2021

Table of Contents

1.0 Job Information

Job Location :	Pacific Terminal (Centerline Logistics) 7900 NW St. Helens Road Portland, OR 97210 USA
Customer Representative :	Phillip Jordan
Customer Phone Number :	503 341 1639
Job Charge Number :	48213
Report Number :	40891089-1
Mistras Work Order Number :	T68586-40891089-1
Inspection Personnel Provided :	Byron Johnson API 653 Certified Inspector API 653 (33622)/API 570 (38126)/UTT/PT/MFL/MT
	Kathrine Brux NDE Assistant

2.0 Tank Inspection Data Sheet

General :

Tank Number	1
Owner	Pacific Terminal (Centerline Logistics)
Design Standard	API 650
Tank Location	Portland, OR
Product	Fuel Oil
Specific Gravity	0.9895
Manufacturer	Pittsburg Des Moines Steel Co.
Manufacture Date	1980
Cathodic Protection	No
Data Plate Present	No
Data Plate Condition	N/A

Dimensions :

Diameter (ft)	95.00
Height (ft)	48.00
Capacity Gross (bbl (oil))	59,335.89
Capacity Nominal (bbl (oil))	60,598.38

Geometry :

Foundation	Concrete Ringwall
Bottom	Lap Welded
Shell	Butt Welded
Fixed Roof Type	Cone

Access :

Stairway	Spiral Type
Roof Access	Yes

Coatings :

Bottom	Unknown
Shell	Insulated
Roof	Insulated

3.0 Inspection Summary

Pacific Terminal (Centerline Logistics) has contracted Mistras Group, Inc. to perform an in service inspection on Tank 1 located in Portland, OR. This inspection was performed in accordance with the current criteria set forth in API Standard 653 (5th Edition, November 2014, Addendum 1, April 2018).

Tank 1 is an above ground storage tank in fuel oil service. This tank is 95.00 ft in diameter, and 48.00 ft in height and has a Cone fixed roof. The tank was built in 1980 by Pittsburg Des Moines Steel Co. to API standard 650. The tank was last inspected on May 21st 2014.

Foundation

Tank 5 sits on a concrete ringwall. Evaluation of the shell settlement could not be conducted due to insulation however visually there does not appear to be any settlement issues at this time. The ring wall appears to be in good condition. The ground around the slopes gently away from the tank. The dike drain appears to be functioning well there was heavy rainfall during the inspection.

A fair amount of vegetation was found growing at the base of the tank.

Shell

Evaluation of the shell was limited due to insulation however the insulation jacket is in good condition and there are no obvious signs of dents or bulging. The shell as viewed through the UT inspection ports appears to be coated and showed no signs of oxidation.

Calculations based on shell UT readings found the shell to be suitable for continued service. The course with the lowest projected remaining life span is the 2nd course with a recorded low of 0.445” compared the original nominal thickness of 0.465”. The 2nd course a computed corrosion rate of 0.00049 inches per year with a projected life expectancy of 27.79 years.

The next Visual inspection should be conducted on or before 1/12/2026.
The next UT inspection should be conducted on or before 1/12/2036.

Shell appurtenances

Again inspection of the shell appurtenances was limited due to insulation. All nozzles, including manways, were square with no evidence of distortion.

Nozzle D was found to have numerous bolts with short thread protrusion on nozzle flange bolts. Per API a minimum of two (2) threads should extend beyond the outer face of the nut.

It would appear that the caulking which protects the insulation from the incursion of rain water was found to aged and cracking.

Roof

The tank is equipped with an insulated fixed cone roof. The roof has adequate slope for good drainage and there are no low spots or waviness of the roof plates. The roof found it to be safe for access. The insulation appears to be in adequate condition for continued service.

UT testing was not performed due to insulation.

The roof appurtenances were found to be in good serviceable condition. Several flanges displayed light to moderate coating failure and rust with no active corrosion. The stairway and handrails are in good condition.

4.0 Summarized Recommendations

INSPECTION RECOMMENDATIONS	
Recommendation ID	REC - 1
Component	Foundation
Recommendation Headline	Vegetation
Recommendation Description	**Findings:** A fair amount of vegetation was found growing at the base of the tank. **Recommendations:** It is recommended that the vegetation be sprayed with an approved defoliant or the vegetation be removed manually. **Post Actions:**
Recommendation Priority	Optional
Author Name	Byron Johnson API 653 Certification No. 33622 Byron D. Johnson

Status	This optional repair had not been addressed as of 1/22/2021

BEFORE		AFTER
		

INSPECTION RECOMMENDATIONS	
Recommendation ID	REC - 2
Component	Nozzles and appurtenances
Recommendation Headline	Insulation Jacket Seals
Recommendation Description	**Findings:** It would appear that the caulking which protects the insulation from the incursion of rain water was found to aged and cracking. **Recommendations:** It is recommended that the nozzle the insulation interface be re-caulked. **Post Actions:**
Recommendation Priority	Optional
Author Name	Byron Johnson API 653 Certification No. 33622 Byron D. Johnson

Status	This optional repair had not been addressed as of 1/22/2021

BEFORE		AFTER
		

INSPECTION RECOMMENDATIONS	
Recommendation ID	REC - 3
Component	Nozzles and appurtenances
Recommendation Headline	Short thread protrusion on nozzle flange bolts.
Recommendation Description	**Findings:** Nozzle D was found to have numerous bolts with short thread protrusion on nozzle flange bolts. Per API A minimum of two (2) threads should extend beyond the outer face of the nut. **Recommendations:** It is recommended that, one at a time the all-thread be replaced with a long enough piece so that proper thread protrusion can be achieved. **Post Actions:**
Recommendation Priority	Mandatory
Author Name	Byron Johnson API 653 Certification No. 33622 Byron D. Johnson

Status	This mandatory repair has been addressed as of 1/22/2021 and is acceptable.

BEFORE		AFTER
		

All repairs/modifications should be made in accordance with API Standard 653. After repairs/modifications have been made, they should be inspected by the methods described in API 653.

Inspectors Signature: 

Byron D. Johnson
API 653 Certification No. 33622 Exp. 11/30/2022
STI SP001Certification No. AC-21710 Exp. 06/15/2025

Reviewed by:

George Roni, PE
API 653 Cert. No. 2042, Exp. 4/30/2023

Mistras Services has evaluated the condition of this tank based on the observations and measurements made by the tank Inspector. While our evaluation accurately describes the condition of the tank at the time of inspection, the tank owner/operator must independently assess the inspection information/report provided by Mistras Services and any conclusions reached by the tank owner/operator and any action taken or omitted to be taken are the sole responsibility of the owner/operator. With respect to inspection and testing, Mistras Services warrants only that the services have been performed in accordance with accepted industry practice. If any such services fail to meet the foregoing warranty, Mistras Services shall re-perform the service to the same extent and on the same conditions as the original service.

The preceding paragraph sets forth the exclusive remedy for claims based on failure or of defect in materials or services, whether such claim is made in contract or tort (including negligence) and however instituted, and, upon expiration of the warranty period, all such liability shall terminate. The foregoing warranty is exclusive and in lieu of all other warranties, whether written, oral, implied or statutory. NO IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR PURPOSE SHALL APPLY, nor shall Mistras Services be liable for any loss or damage whatsoever by reason of its failure to discover, report, repair or modify latent defects or defects inherent in the design of any tank inspected. In no event, whether a result of breach of contract, warranty or tort (including negligence) shall Mistras Services be liable for any consequential or incidental damages including, but not limited to,

5.0 API 653 Checklists

Pacific Terminal (Centerline Logistics) has contracted Mistras Group, Inc. to perform an in service inspection on Tank 1 located in Portland, OR. This inspection was performed in accordance with the current criteria set forth in API Standard 653 (5th Edition, November 2014, Addendum 1, April 2018).

Tank 1 is an above ground storage tank in fuel oil service. This tank is 95.00 ft in diameter, and 48.00 ft in height and has a Cone fixed roof.

The following details all inspection findings and recommendations.

C.1.1 FOUNDATION

ALL				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.1	Measure foundation levelness and bottom elevations (see Appendix B for extent of measurements).	N/A	There was no access to the chime due to insulation.	

Concrete Ring				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.1.1a	Inspect for broken concrete, spalling, and cracks, particularly under backup bars used in welding butt welded annular rings under the shell.	Satisfactory	The ring wall appears to be in good condition	
C.1.1.1b	Inspect drain openings in ring, back of water draw basins and top surface of ring for indications of bottom leakage.	N/A	There are no water draw basins.	
C.1.1.1c	Inspect for cavities under foundation and vegetation against bottom of tank.	Optional	A fair amount of vegetation was found growing at the base of the tank.	It is recommended that the vegetation be sprayed with an approved defoliant or the vegetation be removed manually.
C.1.1.1d	Check that runoff rainwater from the shell drains away from tank.	Satisfactory	Drainage appeared to be satisfactory	
C.1.1.1e	Check for settlement around perimeter of tank.	Satisfactory	None noted.	

Site Drainage				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.1.5.a	Check site drainage away from the tank and associated piping & manifolds.	Satisfactory		
C.1.1.5.b	Check operation of dike drains.	Satisfactory		
C.1.1.5.c	Check for settling of tank into asphalt base, oiled dirt or sand which would direct runoff rain water under the tank instead of away from it.	Satisfactory	None noted.	

Housekeeping				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.1.6	Inspect the area for buildup of trash, vegetation, and other inflammables buildup.	Optional	See item C.1.1.1.c	

Cathodic Protection				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.1.7	Review cathodic potential readings	N/A	The tank does not have a cathodic protection system.	

C.1.2 SHELLS

External Visual Inspection				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.2.1.a	Visually inspect for paint failures, pitting, and corrosion.	N/A	No Access, Insulated	
C.1.2.1.b	Clean off the bottom angle area (chime) and inspect for corrosion and thinning on plate and weld.	N/A	No Access, Insulated.	

C.1.2.1.b (1)	Obtain thickness readings on the chime. One reading shall be obtained every 10 feet. Reading No. 1 shall be located at the centerline of manway A.	N/A	No Access, insulated.	
C.1.2.1.b (2)	Record the minimum and maximum chime widths. The measurements shall be made from the toe of the shell to chime weld to the edge.	N/A	No Access, Insulated.	
C.1.2.1.c	Inspect the bottom-to-foundation seal, if any.	N/A	None noted.	
C.1.2.1.d	UT the shell plates to verify remaining thickness. Using a crawler, obtain a minimum of 4 equally spaced drops around the tank, readings shall be obtained on all courses. At a minimum, readings should be taken on all courses from the ladder or stairs.	Satisfactory	See shell UT data.	

C.1.3 SHELL APPURTENANCES

Manways and Nozzles				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.3.1a	Inspect for corrosion, cracks or signs of leakage on weld joint at nozzles, manways and reinforcing plates.	Satisfactory	None noted. However, access was limited due to insulation.	
C.1.3.1b	Inspect for shell plate dimpling around nozzles, caused by excessive pipe deflection.	N/A	No Access due to insulation.	

C.1.3.1c	Inspect for flange leaks around bolting and leaking threaded connections on shell couplings and nipples.	Mandatory	Nozzle D was found to have numerous bolts with short thread protrusion on nozzle flange bolts. Per API A minimum of two (2) threads should extend beyond the outer face of the nut.	It is recommended that, one at a time the all-thread be replaced with a long enough piece so that proper thread protrusion can be achieved.
C.1.3.1d	Inspect sealing of insulation around manways and nozzles.	Optional	It would appear that the caulking which protects the insulation from the incursion of rain water was found to aged and cracking.	It is recommended that the nozzle the insulation interface be re-caulked.
C.1.3.1e	Check for inadequate manway flange and cover thickness on mixer manways.	N/A	The tank is not equipped with a mixer.	
C.1.3.1f	Record all nozzle and appurtenance information on the "Shell Nozzle & Appurtenance Table". The station, heights, pipe size, repad size, repad type, weld spacing and distance from shell to flange face shall be recorded.	Satisfactory	See the nozzle and appurtenances table.	
C.1.3.1g	UT all shell nozzles and manways. Record one reading on the top, right, bottom and lefts sides of each neck. Also, record one reading on each repad, cover plate and flange.	Satisfactory	See Nozzle UT data.	

Tank Piping Manifolds				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.3.2a	Inspect manifold piping, flanges, and valves for leaks.	Satisfactory	No leaks noted.	
C.1.3.2b	Inspect firefighting system components.	N/A	The tank is not equipped with a fire suppression system.	

C.1.3.2c	Check for anchored piping which would be hazardous to the tank shell or bottom connections during the earth movement.	Satisfactory	The piping is properly supported.	
C.1.3.2d	Check for adequate thermal pressure relief of piping to the tank.	Satisfactory		
C.1.3.2e	Check operation of regulators for tanks with purge gas systems.	N/A	The tank is not equipped with a purge gas system.	
C.1.3.2f	Check sample connections for leaks and for proper valve operation.	Satisfactory		
C.1.3.2g	Check for damage and test the accuracy of temperature indicators. Record the brand, model and range of temperature indicators.	Satisfactory	Thermowell L is equipped with an Ashcroft 0° F to 200° F gauge, Thermowell S-1 is equipped with the same.	
C.1.3.2h	Check welds on shell-mounted davit clips above valves 6 in. and larger	N/A	There are no davits.	

Autogauge System				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.3.3a	Inspect autogauge tape guide and lower sleeve housing (floating swings) for leaks.	Satisfactory	No leaks noted.	
C.1.3.3b	Inspect autogauge head for damage. (Note Brand, Model No. and Serial No.)	Satisfactory	Varec 2500B S/N 77259	
C.1.3.3c	Bump the checker on autogauge head for proper movement of tape.	Satisfactory		
C.1.3.3f	Compare actual product level to the reading on the autogauge (maximum variation is 2 in).	Satisfactory		
C.1.3.3h	Inspect condition of board and legibility of board-type autoguages.	N/A	The tank is not equipped with a board type autogauge.	

C.1.3.3i	Test freedom of movement of marker and float.	N/A		

C.1.4 ROOFS

Deck Plate Internal Corrosion				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.4.1a	For safety, before accessing roof, check with ultrasonic instrument or lightly use a ball peen hammer to test the deck plate near the edge of the roof for thinning. (Corrosion normally attacks the deck plate at the edge of a fixed roof and at the rafters in the center of the roof first.)	Satisfactory	The roof was found to be safe to access.	
C.1.4.1b	UT the roof plates. Record 5 readings per plate, one in each corner and one in the center of each plate.	N/A	No access, Insulated.	

Deck Plate External corrosion				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.4.2	Visually inspect for paint failure, holes, pitting, and corrosion product on the roof deck.	N/A	No Access, Insulated	

Roof Deck Drainage				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.4.3	Look for indication of standing water. (Significant sagging of fixed roof deck indicates potential rafter failure. Large standing water areas on a floating roof indicate inadequate drainage design or, if to one side, a non-level roof with possible leaking pontoons.)	Satisfactory	The roof slope is adequate for proper drainage.	

Roof Insulation				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.4.6a	Visually inspect for cracks or leaks in the insulation weather coat where runoff rain water could penetrate the insulation.	Satisfactory	The roof insulation is in fair condition.	
C.1.4.6b	Inspect for wet insulation and check roof deck for corrosion and holes near the edge of the insulated area.	Satisfactory	None noted.	
C.1.4.6c	Remove small test sections of insulation and check roof deck for corrosion and holes near the edge of the insulated area.	N/A	Not Required.	

C.1.5 Roof Appurtenances

Sample Hatch				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.5.1a	Inspect condition and functioning of sample hatch cover.	Satisfactory		

C.1.5.1b	On tanks governed by Air Quality Monitoring district rules, check for the condition of seal inside hatch cover.	N/A	Not required.	
C.1.5.1c	Check for corrosion and plugging on thief and gauge hatch cover.	N/A	The tank is not equipped with a thief type gauge hatch.	
C.1.5.1d	Where sample hatch is used to reel gauge stock level, check for marker and tab stating hold-off distance.	N/A	No gauge data plate or information was found.	
C.1.5.1e	Check for reinforcing pad where sample hatch pipe penetrates the roof deck.	N/A	No access, Insulated.	
C.1.5.1g	Test operation of system.	Satisfactory		
C.1.5.1h	On ultra clean stocks such as JP4, check for presence and condition of protective coating or liner inside sample hatch (preventing rust from pipe getting into sample).	N/A	Not required.	

Breathers and Vents				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.2.7.3.a	Inspect and service the breather.	Satisfactory		
C.2.7.3.b	Inspect screens on vents and breathers.	Satisfactory		

Roof Nozzles and Manways				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.5.14	UT all roof nozzles and manways (if couplings are present, obtain readings on pipe adjacent to the coupling, note "readings on pipe" on data sheet). Record one reading on the north, east, south and west side of the neck.	Satisfactory	See roof appurtenance table.	

C.2.12 ACCESS STRUCTURES

Handrails				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.2.12.1a	Identify and report type (steel pipe, galvanized pipe, square tube, or angle) and size of handrails and handrail heights.	Satisfactory	The handrails are made from 3" angle 42.0" high with 12.0", 22.5" and 32.75" midrails and a 4.0" toe plate.	
C.2.12.1.b	Inspect for pitting and holes, paint failure.	Satisfactory	None noted.	
C.2.12.1.c	Inspect attachment welds.	Satisfactory		
C.2.12.1.d	Identify cold joints and sharp edges. Inspect the handrails and mid-rails.	Satisfactory	None noted.	
C.2.12.1.e	Inspect safety drop bar (or safety chain) for corrosion, functioning, and length.	N/A	Not Equipped.	

Platform Frame				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.2.12.2.a	Inspect frame for corrosion and paint failure.	Satisfactory	None Noted.	
C.2.12.2.b	Inspect the attachment of frame to supports and supports to tank for corrosion and weld failure.	Satisfactory		
C.2.12.2.c	Check reinforcing pads where supports are attached to shell or roof.	N/A	No access, insulated.	
C.2.12.2.d	Inspect the surface that deck plate or grating rests on, for thinning and holes.	Satisfactory	None noted.	
C.2.12.2.e	Check that flat-surface-to-flat-surface junctures are seal-welded.	Satisfactory		

Deck Plate and Grating				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.2.12.3.a	Inspect deck plate for corrosion-caused thinning or holes (not drain holes) and paint failure.	Satisfactory		
C.2.12.3.b	Inspect plate-to-frame weld for rust scale buildup.	Satisfactory	None noted.	
C.2.12.3.c	Inspect grating for corrosion-caused thinning of bars and failure of welds.	Satisfactory	None noted.	
C.2.12.3.d	Check grating tie down clips. Where grating retrofitted to replace plate, measure the rise of the step below and above the grating surface and compare with other risers on the stairway.	N/A	There are no tie down clips.	

Stairway Stringers				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.2.12.4.a	Inspect spiral stairway stringers for corrosion, paint failure, and weld failure. Inspect attachment of stairway treads to stringer.	Satisfactory		
C.2.12.4.b	Inspect stairway supports to shell welds and reinforcing pads.	Satisfactory	No access, insulated.	
C.2.12.4.c	Inspect steel support attachment to concrete base for corrosion.	N/A	The stairway does not make contact with the ground.	

6.0 Calculations

6.1 Minimum Thickness Calculations - One Foot

The minimum acceptable shell plate thickness for tank with a diameter equal to or less than 200 ft is calculated as follows:

$$t_{min} = \frac{2.6(H-1)DG}{SE}$$

Using the shell thickness measurements obtained during this inspection, the shell thickness calculations indicate that the maximum fill height of 46.00 ft can be utilized with product specific gravity up to 0.990.
Please note that these calculations do not take into consideration operational restrictions imposed by such items as a floating roof, overflow lines, high level alarm or vents and seals. These items will need to be taken into consideration when calculating the actual safe fill height.

Reference: API 653, 4th Edition, Add. 1, Aug. 2010, Paragraph 4.3.3.1

Course	Course Height (ft)	Diameter (ft)	Product Height (ft)	Allowable Stress (psi)	Joint Efficiency	Specific Gravity	Minimum Actual Thickness (in)	t_{min} Required Thickness (in)	Results
5	9.600	95	7.600	26000	0.85	0.990	0.254	0.100	**PASS**
4	9.600	95	17.200	26000	0.85	0.990	0.261	0.179	**PASS**
3	9.600	95	26.800	26000	0.85	0.990	0.372	0.285	**PASS**
2	9.600	95	36.400	23600	0.85	0.990	0.445	0.431	**PASS**
1	9.600	95	46.000	23600	0.85	0.990	0.562	0.548	**PASS**

6.2 Allowable Hydrostatic Test Height

The hydrostatic Height is calculated as follows :

$$H_t = \frac{S_t E t_{\min}}{2.6D} + 1$$

Reference: API 653, 4th Edition, Add. 1, Aug. 2010, Paragraph 4.3.3.2

Course	D Tank Diameter (ft)	S_t Allowable Hydrostatic Stress (psi)	E Joint Efficiency	t_{min} Required Thickness (in)	H_t Calculated Hydrotest Height (ft)
5	95	27000	0.850	0.100	10.292
4	95	27000	0.850	0.179	17.646
3	95	27000	0.850	0.285	27.511
2	95	26000	0.850	0.431	39.591
1	95	26000	0.850	0.548	50.056

7.0 Remaining Life Calculations

7.1 Shell Plates Remaining Life

Reference: API 653, 4th Edition, Add. 1, Aug. 2010, Paragraph 4.3.3.1

Course	$t_{previous}$ Previous Thickness (in)	Year Obtained	t_{actual} Actual Thickness (in)	Year Obtained	C_r Corrosion Rate (in/yr.)	t_{min} Minimum Allowable Thickness (in)	R_L Remaining Life (yr.)
5	0.265	15-Jun-80	0.254	12-Jan-21	0.00027	0.100	568.10
4	0.265	15-Jun-80	0.261	12-Jan-21	0.00010	0.179	830.27
3	0.375	15-Jun-80	0.372	12-Jan-21	0.00007	0.285	1172.39
2	0.465	15-Jun-80	0.445	12-Jan-21	0.00049	0.431	27.79
1	0.563	15-Jun-80	0.562	12-Jan-21	0.00002	0.548	557.13

8.0 Inspection Interval Calculations

8.1 Period Until Next External Inspection

$$RCA/4N \text{ years}$$

Reference: API 653, 4th Edition, Add. 1, Aug. 2010, Paragraph 6.3.2.1

Remaining Corrosion Allowance (RCA):	0.01369441	(in)
Current Thickness (Mst):	0.445	(in)
Required Thickness (Tmin):	0.431	(in)
Corrosion Rate (N):	0.00049	(in/yr.)
Course Number with Shorter Life:	2	

Calculated Interval: **5 Year(s)**

Next Inspection Date: **January 12, 2026**

Note: External Visual Inspection shall not exceed 5 years

8.2 Period Until Next External UT Inspection

$$RCA/2N \text{ years}$$

Reference: API 653, 4th Edition, Add. 1, Aug. 2010, Paragraph 6.3.3.2

Remaining Corrosion Allowance (RCA):	0.01369441	(in)
Current Thickness (Mst):	0.445	(in)
Required Thickness (Tmin):	0.431	(in)
Corrosion Rate (N):	0.00049	(in/yr.)
Course Number with Shorter Life:	2	

Calculated Interval: **14 Year(s)**

Next Inspection Date: **January 12, 2035**

Note: External UT inspection shall not exceed 15 years for known corrosion rate or 5 years for unknown corrosion rate.

$RCA =$ Difference between the measured shell thickness and the minimum required thickness in inches.

$N =$ Shell corrosion rate in inches per year.

$t_{min} =$ The minimum acceptable thickness, in inches for each course as calculated from API 653 4.3.3; however, t_{min} shall not be less than 0.100 inches for any tank course.

$M_{st} =$ The minimum measured shell plate thickness in inches.

10.0 Brittle Fracture Assessment

Inspector	B. Johnson
Date Built	12-Jun-1980
Last Repair Date	
Hydro Test Date	

A)	Is there a record of Hydro test?		Yes, go to B	x	No, go to C
B)	Have repairs been made since Hydro test?		Yes, go to C	x	No, Use tank

C)
- [ ] Tank meets API 650 (7th Edition or later) or API 650 Appendix G (5th or 6th edition). Go To 2
- [ ] Tank does not meets API 650 (1980) or API 650 Appendix G (5th or 6th edition). Go To 5
- [ ] After hydro test or rerate due to brittle fracture assessment. Go To 2

1)	Do repairs meet API 653?		Yes, use tank		No, Go to 5
2)	Does Tank continue to operate in same service?		Yes, use tank		No, continue
3)	Is the service more severe?		Yes, Continue		No, use tank
4)	Does the tank meet the requirements of API 650 or equal?		Yes, use tank		No, use tank
5)	Is the tank full at lowest one day temperature per API 650 Fig. 2.2?		Yes, use tank		No, use tank
6)	Is tank thickness 0.5” or less?		Yes, use tank		No, use tank
7)	Does tank operate at metal temperature above 60F?		Yes, use tank		No, use tank
8)	Is membrane stress below 7 ksi?		Yes, use tank		No, use tank
9)	Is tank steel exempt from impact testing, API 650 Fig. 2.1 or API 653 Fig. 5.2?		Yes, use tank		No, use tank
10)	Is tank full at lowest one day temperature per API 650 Fig. 2.2?		Yes, continue to use tank		No, Hydro test or Rerate tank

11.0 Ultrasonic Thickness Data

11.1 Shell Plates UT

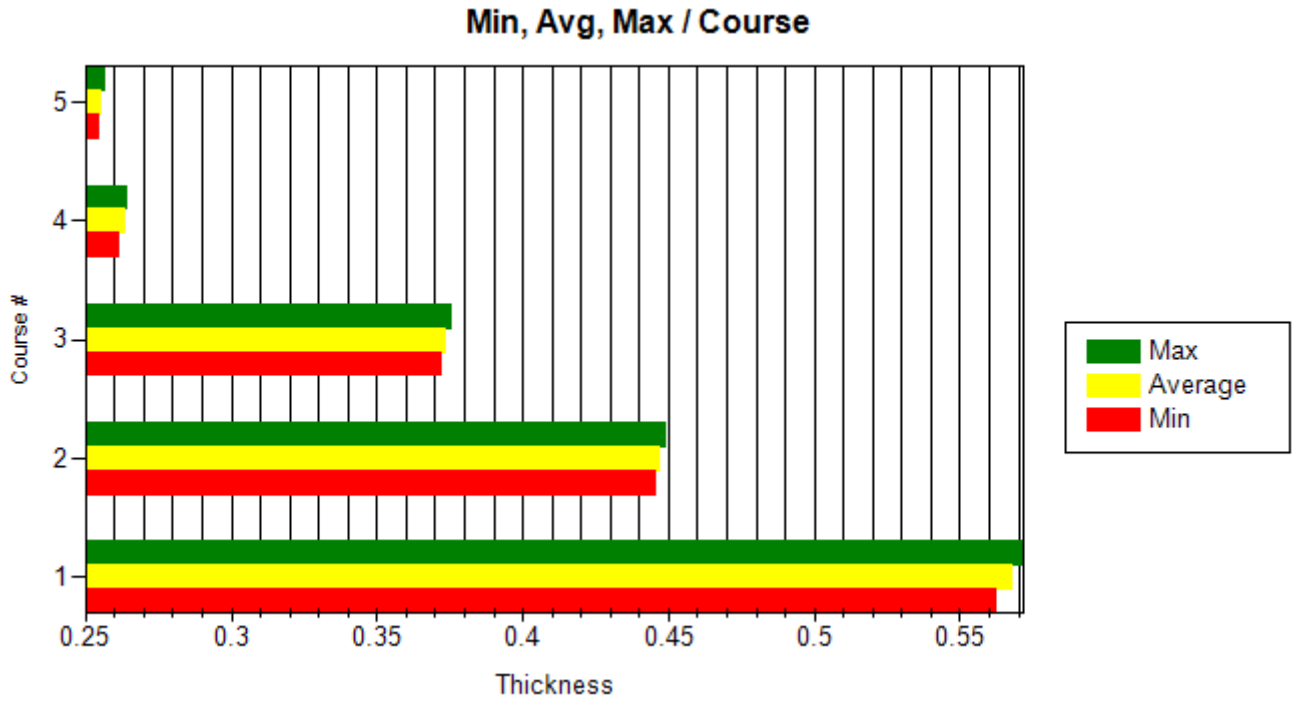
The following table details all readings (in) from the shell UT survey. All scan drops were taken though inspection ports up the stairway.

Data and Statistics		1
Course 5	3	0.255
	2	0.256
	1	0.254
Course 4	3	0.261
	2	0.264
	1	0.264
Course 3	3	0.372
	2	0.373
	1	0.375
Course 2	3	0.445
	2	0.449
	1	0.445
Course 1	3	0.569
	2	0.562
	1	0.572
Scan Line Average		0.381

The tables below presents the statistics of the thickness readings (in) obtained on the Shell plates.

Course #	Min	Avg	Max
5	0.254	0.255	0.256
4	0.261	0.263	0.264
3	0.372	0.373	0.375
2	0.445	0.446	0.449
1	0.562	0.568	0.572
Global	0.254	0.381	0.572

The following chart depicts the average thickness reading (in) on the shell plates versus the course number.



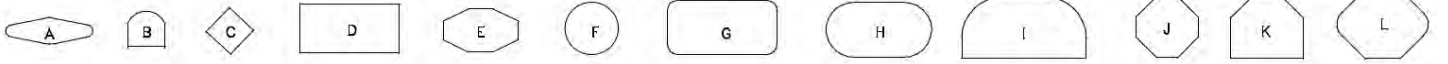
11.2 Shell Nozzle and Appurtenance Table

Item	Type	Service	Pipe Size (in)	Station (ft)	Center Line Elevation (in)	API Allowable Elevation (in)	Repad Width (in)	Repad Height (in)	Tell Tale Hole	Repad Shape	Weld Spacing (in)	Distance From Shell to Flange Face (in)
A	Manway	Access	30.0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
B	Ground Stud	Electrical Ground	N/A	69.3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C	Manway	Access	30.0	154.3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
D	Nozzle	Blinded	12.0	171.9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
E	Mixer Nozzle	No Motor	12.0	190.8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
F	Nozzle	Transfer	8.0	206	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
G	Mixer Nozzle	No motor	12.0	210.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
H	Nozzle	Transfer	12.0	216	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
I	Ground Stud	Electrical Ground	N/A	218.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
J	Nozzle	Transfer	6.0	224.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
K	Nozzle	Hose Fitting	2.0	228	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
L	Coupling	Thermowell, Temp Gauge	0.75	229.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
M	Nozzle	Heater Line	4.0	232.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
N	Nozzle	Heater Line	2.0	232	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
O	Nozzle	Heater Line	4.0	234	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
P	Nozzle	Heater Line	2.0	234	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Q	Autogauge	Gauging	N/A	239.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
R	Bottom of Stairway	Roof Access	N/A	246.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
S	Nozzle	Air Line	10.0	271.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
T	Top of Stairway	Roof Access	N/A	292.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
U	Ground Stud	Electrical Ground	N/A	297.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
U-1	Coupling	Thermowell, Temp	0.75	271.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

		Gauge										

Note: The data represented in the weld spacing column is the minimum spacing measured. H, V, or N indicates which is the minimum distance from the nozzle measured. (H=Horizontal Weld, V=Vertical Weld, N=Nozzle Weld)

Repad Shapes



11.3 Shell Nozzle UT

Item	Type	Service	Pipe Size (in)	Top (in)	Bottom (in)	Right (in)	Left (in)	Repad Thickness (in)	Flange Thickness (in)	Cover Thickness (in)	Comments
A	Manway	Access	30.0	0.551	0.549	0.551	0.548	N/A	N/A	0.749	
C	Manway	Access	30.0	0.548	0.547	0.552	0.55	N/A	0.55	0.55	
D	Nozzle	Blinded	12.0	0.49	0.492	0.495	0.489	N/A	1.304	1.312	
E	Nozzle	Blinded	12.0	0.496	0.497	0.493	0.496	N/A	1.404	1.295	
F	Nozzle	Transfer	8.0	0.458	0.4	0.357	0.488	N/A	1.094	N/A	
G	Nozzle	Blinded	12.0	0.497	0.493	0.492	0.494	N/A	1.314	1.287	
H	Nozzle	Transfer	12.0	0.493	0.492	0.493	0.494	N/A	1.298	N/A	
I	Nozzle	Transfer	6.0	0.348	0.345	0.344	0.345	N/A	1.024	N/A	
K	Nozzle	Sample Draw	2.0	0.221	0.212	0.212	0.224	N/A	0.71	N/A	
S	Nozzle	Hose Fitting	10.0	0.494	0.494	0.496	0.494	N/A	1.166	1.244	

11.4 Fixed Roof Nozzle UT

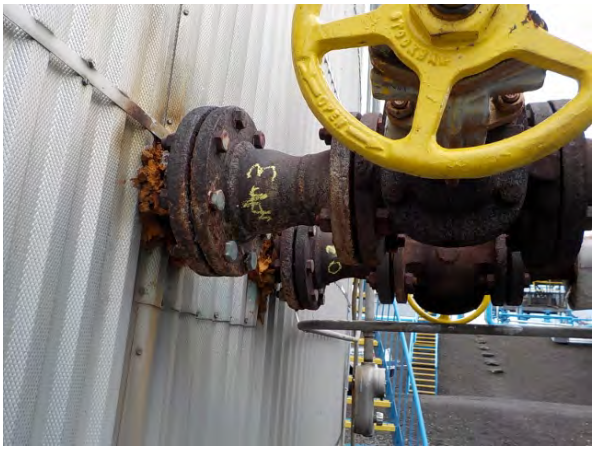
Item	Type	Service	Pipe Size (in)	North (in)	South (in)	East (in)	West (in)	Comments
AA	Nozzle	Center Vent	24.0	0.257	0.266	0.258	0.261	
AB	Coupling	Probe	1.0	N/A	N/A	N/A	N/A	
AC	Manway	Radar Gauge	24.0	0.247	0.26	0.263	0.233	
AD	Gauge Hatch	Sample	8.0	N/A	N/A	N/A	N/A	
AE	Vent	Venting	N/A	N/A	N/A	N/A	N/A	
AF	Pipe Nipple	Autogauge Float Anchor	N/A	N/A	N/A	N/A	N/A	
AG	Pipe Nipple	Autogauge Tape Guide Tube	N/A	N/A	N/A	N/A	N/A	
AH	Pipe Nipple	Autogauge Float Anchor	N/A	N/A	N/A	N/A	N/A	

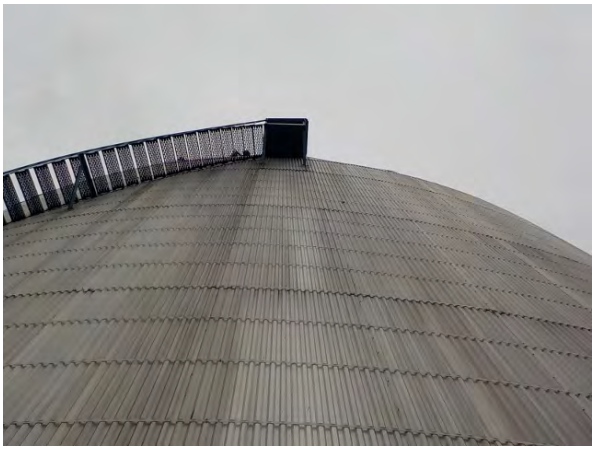
12.0 Photographs

North	East
	
South	**West**
	
Manway A	**ground B**
	

Ground b-1	Manway C
	
Nozzle D	**Short Bolts**
	
Insulation seal	**Nozzle E**
	

Nozzle F	Nozzle F
	
Nozzle G	**Nozzle H**
	
Nozzle I	**Ground J**
	

Nozzle K	Nozzle K
	
Thermowell L	Nozzles M & O
	
Nozzles O & P	Autogauge Q
	

Autogauge Data Plate	Bottom of Stairway R
	
Nozzle S	**Ground U**
	
Top of Stairway T	**Dike drain**
	

Tank Piping	Thermowell S-1
	
Inspection Port	**Roof Standoff**
	
Roof Standoff	**Roof Standoff**
	

Vent AA

Coupling AB & Manway AC

Gauge Hatch AD

Autogauge Appurtenances

Gauging Area

13.0 NDE Equipment Used

The equipment utilized for the inspection of the tank included of the following :

Survey Level

Manufacturer	Model	Serial No
Topcon	GPT-3105W	8R2165

Pit Gauge

Manufacturer	Model	Serial No
W.R. Thorpe	1	1.979.912

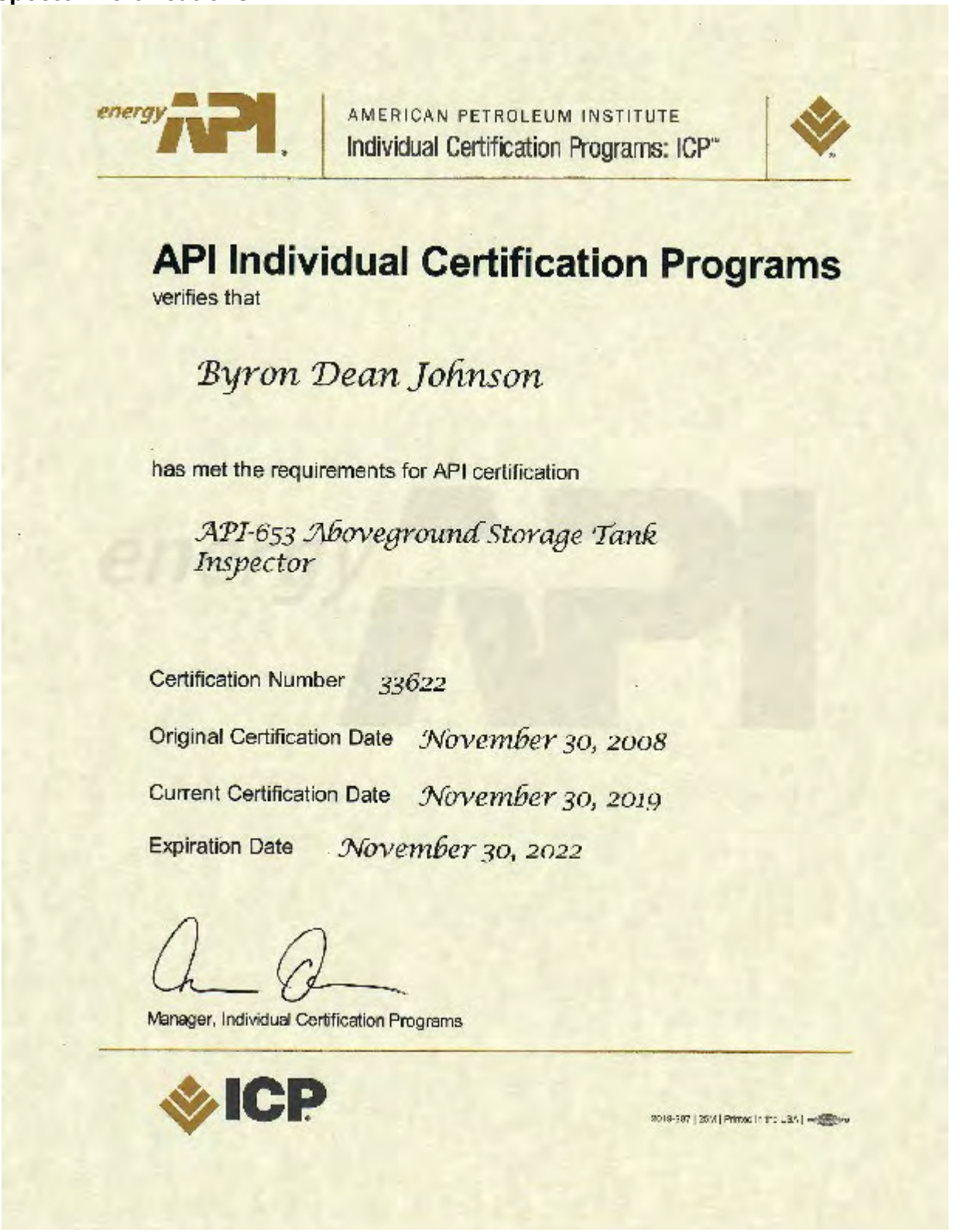
Ultrasonic Transducers

Manufacturer	Model	Serial No	MHz	Diameter
Olympus	D790-SM	865199	5	0.375

UT Equipment

Manufacturer	Model	Serial No
Mistras Cal. Block	0.100" to 0.500"	147
Olympus	38DL Plus	130573601

14.0 Inspector Certifications



energy API | AMERICAN PETROLEUM INSTITUTE
Individual Certification Programs: ICP™

API Individual Certification Programs

verifies that

Byron Dean Johnson

has met the requirements for API certification

API-653 Aboveground Storage Tank Inspector

Certification Number 33622

Original Certification Date November 30, 2008

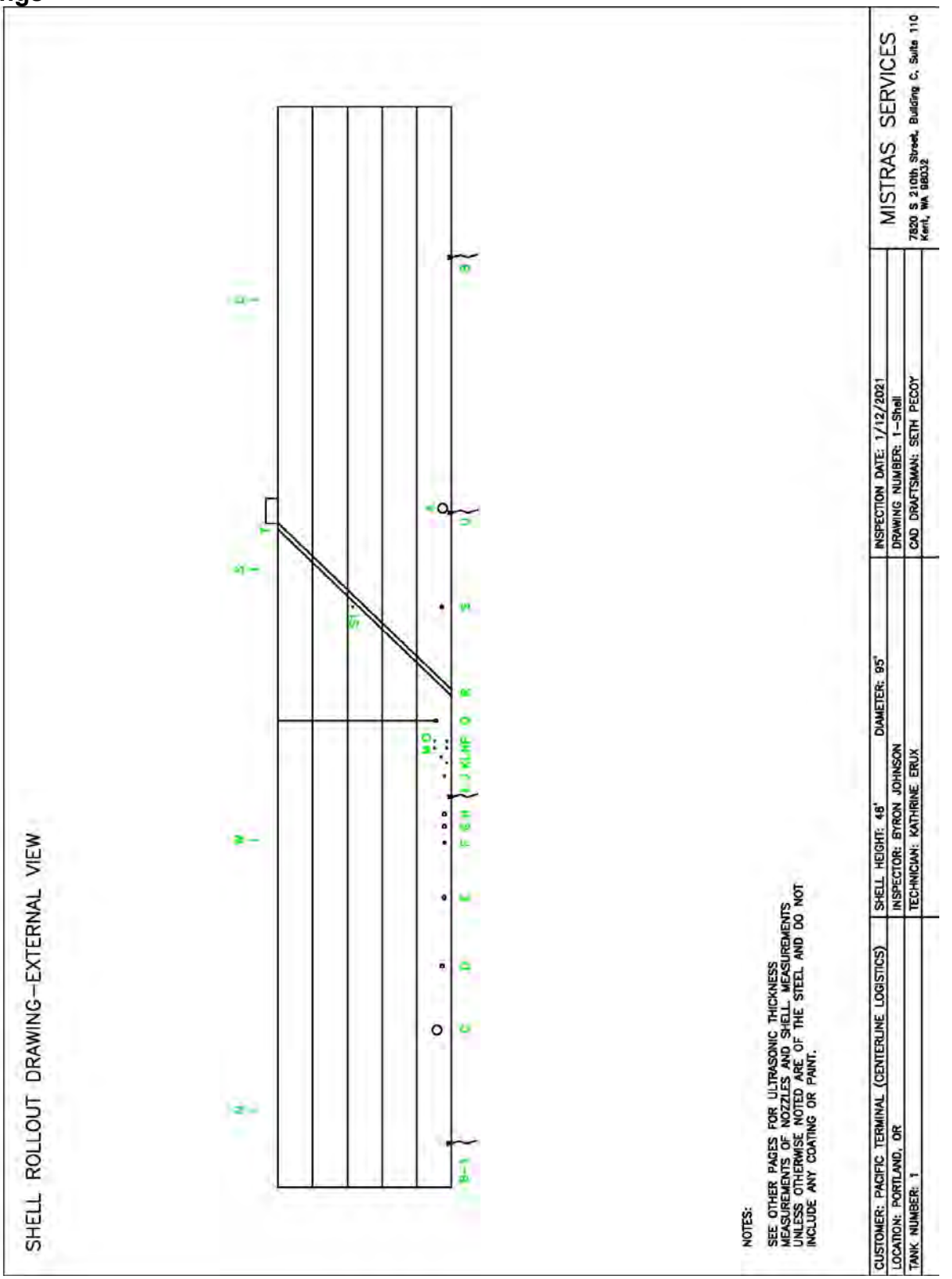
Current Certification Date November 30, 2019

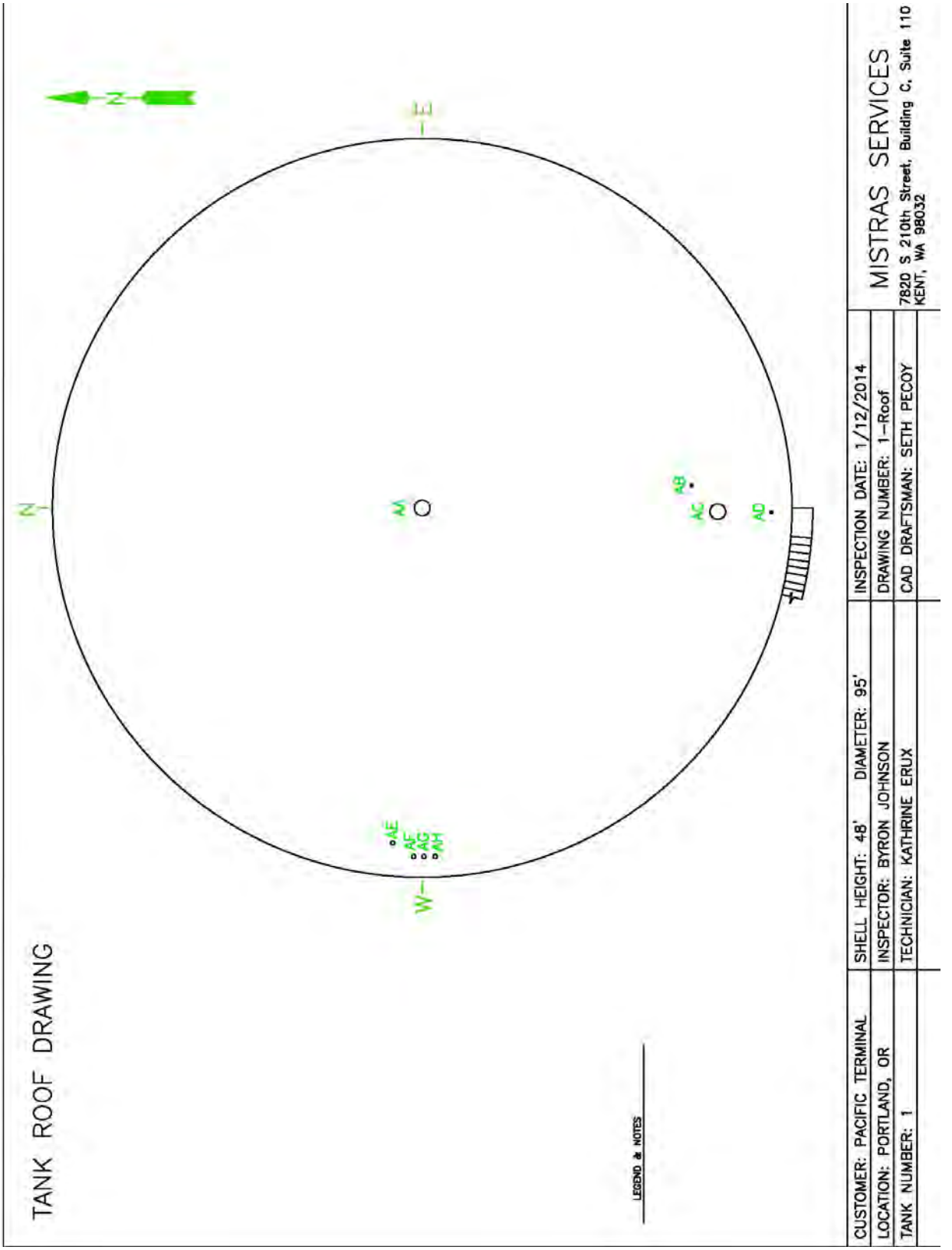
Expiration Date November 30, 2022

Manager, Individual Certification Programs

ICP

15.0 Drawings




TANK ROOF DRAWING
N
E
S
W
AA
AB
AC
AD
AE
AF
AG
AH
LEGEND & NOTES
CUSTOMER: PACIFIC TERMINAL
LOCATION: PORTLAND, OR
TANK NUMBER: 1
SHELL HEIGHT: 48'
DIAMETER: 95'
INSPECTOR: BYRON JOHNSON
TECHNICIAN: KATHRINE ERUX
INSPECTION DATE: 1/12/2014
DRAWING NUMBER: 1-Roof
CAD DRAFTSMAN: SETH PECOY
MISTRAS SERVICES
7820 S 210th Street, Building C, Suite 110
KENT, WA 98032

Above Ground Storage Tank Inspection Report

In accordance with API 653

Pacific Terminal (Centerline Logistics)

Tank 2

In Service Inspection

Portland, OR

January 11, 2021 to January 11, 2021

Report Number 40891089-2

Prepared By :
7820 South 212th St. St. 110
Kent, WA, 98032

www.mistrasgroup.com

MISTRAS A World of NDT Solutions Services Division

Inspection Date
January 11, 2021

Table of Contents

1.0 Job Information

Job Location :	Pacific Terminal (Centerline Logistics) 7900 NW St. Helens Road Portland, OR 97210 USA
Customer Representative :	Phillip Jordan
Customer Phone Number :	503 341 1639
Job Charge Number :	48213
Report Number :	40891089-2
Mistras Work Order Number :	T68586-40891089-2
Inspection Personnel Provided :	Byron Johnson API 653 Certified Inspector API 653 (33622)/API 570 (38126)/UTT/PT/MFL/MT
	Kathrine Brux Level II Technician NDE Assistant

2.0 Tank Inspection Data Sheet

General :

Tank Number	2
Owner	Pacific Terminal (Centerline Logistics)
Design Standard	API 650
Tank Location	Portland, OR
Product	Marine Diesel
Specific Gravity	0.86
Manufacturer	Pittsburg Des Moines Steel Co.
Manufacture Date	1980
Cathodic Protection	Unknown
Data Plate Present	Yes
Data Plate Condition	Good Condition

Dimensions :

Diameter (ft)	95.00
Height (ft)	48.00
Capacity Gross (bbl (oil))	58,073.42
Capacity Nominal (bbl (oil))	60,000.00

Geometry :

Foundation	Concrete Ringwall
Bottom	Lap Welded
Shell	Butt Welded
Fixed Roof Type	Fixed Cone

Access :

Stairway	Spiral Type
Roof Access	Yes

Coatings :

Bottom	Unknown
Shell	External Light Blue
Roof	External Light Blue

3.0 Inspection Summary

Pacific Terminal (Centerline Logistics) has contracted Mistras Group, Inc. to perform an in service inspection on Tank 2 located in Portland, OR. This inspection was performed in accordance with the current criteria set forth in API Standard 653 (5th Edition, November 2014, Addendum 1, April 2018).

Tank 2 is an Above Ground Storage Tank in Marine Diesel service. This tank is 95.00 ft in diameter, and 48.00 ft in height and has a Fixed Cone fixed roof. Tank 2 was built in 1980 by the Pittsburg Des Moines Steel Co. the tank was last inspected on 5/21/2014.

Foundation

Tank 2 sits on a concrete ringwall. Evaluation of the shell to be satisfactory. The ring wall appears to be in good condition. The ground around the slopes gently away from the tank. The dike drain appears to be functioning well there was heavy rainfall during the inspection. The area around the tank was free of vegetation and debris.

Shell

The shell of tank 2 is made up of 5 butt welded courses. It appears to be in good condition with no significant dents or distortions. The coating is in overall good condition however, the shell was found to have large amounts of mildew present which if left un-checked could harm the coating.

Calculations based on shell UT readings found the shell to be suitable for continued service. The course with the lowest projected remaining life span is the 3rd course with a recorded low of 0.360” compared the original nominal thickness of 0.375”. The 3rd course a computed corrosion rate of 0.00037 inches per year with a projected life expectancy of 303.20 years.

The next visual inspection should be conducted on or before 1/12/2026.
The next UT inspection should be conducted on or before 1/12/2036.

Shell appurtenances

All nozzles, including manways, were square with no evidence of distortion. Nozzle L was found to have numerous bolts with short thread protrusion on nozzle flange bolts. Per API a minimum of two (2) threads should extend beyond the outer face of the nut.

Roof

The tank is equipped with a fixed cone roof. The roof has adequate slope for good drainage and there are no low spots or waviness of the roof plates. The roof found it to be safe for access. The insulation appears to be in adequate condition for continued service. The coating was found to be in worn but still serviceable condition with some minor chip and scratches.

The UT inspection found the roof plates to be in good condition. The lowest remaining thickness at 0.175” and a calculated remaining life of 255.47 years and a calculated corrosion rate of 0.00033” per year.

The roof appurtenances were found to be in good serviceable condition. Several flanges displayed light to moderate coating failure and rust with no active corrosion. The stairway and handrails are in good condition.

4.0 Summarized Recommendations

INSPECTION RECOMMENDATIONS	
Recommendation ID	REC - 1
Component	Nozzles and appurtenances
Recommendation Headline	Short thread protrusion on nozzle flange bolts.
Recommendation Description	**Findings:** Nozzle L was found to have numerous bolts with short thread protrusion on nozzle flange bolts. Per API A minimum of two (2) threads should extend beyond the outer face of the nut. **Recommendations:** It is recommended that, one at a time the all-thread be replaced with a long enough piece so that proper thread protrusion can be achieved. **Post Actions:**
Recommendation Priority	Mandatory
Author Name	Byron Johnson API 653 Certification No. 33622 Byron D. Johnson

Status	This mandatory repair has been addressed as of 1/22/2021 and is acceptable.

BEFORE		AFTER
		

INSPECTION RECOMMENDATIONS	
Recommendation ID	REC - 2
Component	Shell
Recommendation Headline	Coating
Recommendation Description	**Findings:** The shell was found to have large amounts of mildew present which if left un-checked could harm the coating. **Recommendations:** It is recommended that the roof and shell receive a light hydro wash to remove the mildew. **Post Actions:**
Recommendation Priority	Optional
Author Name	Byron Johnson API 653 Certification No. 33622 Byron D. Johnson

Status	This optional repair had not been addressed as of 1/22/2021

BEFORE		AFTER
		

All repairs/modifications should be made in accordance with API Standard 653. After repairs/modifications have been made, they should be inspected by the methods described in API 653.

Inspectors Signature: 

Byron D. Johnson
API 653 Certification No. 33622 Exp. 11/30/2022
STI SP001 Certification No. AC-21710 Exp. 06/15/2025

Reviewed by:

George Roni, PE
API 653 Cert. No. 2042, Exp. 4/30/2023

Mistras Services has evaluated the condition of this tank based on the observations and measurements made by the tank Inspector. While our evaluation accurately describes the condition of the tank at the time of inspection, the tank owner/operator must independently assess the inspection information/report provided by Mistras Services and any conclusions reached by the tank owner/operator and any action taken or omitted to be taken are the sole responsibility of the owner/operator. With respect to inspection and testing, Mistras Services warrants only that the services have been performed in accordance with accepted industry practice. If any such services fail to meet the foregoing warranty, Mistras Services shall re-perform the service to the same extent and on the same conditions as the original service.

The preceding paragraph sets forth the exclusive remedy for claims based on failure or of defect in materials or services, whether such claim is made in contract or tort (including negligence) and however instituted, and, upon expiration of the warranty period, all such liability shall terminate. The foregoing warranty is exclusive and in lieu of all other warranties, whether written, oral, implied or statutory. NO IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR PURPOSE SHALL APPLY, nor shall Mistras Services be liable for any loss or damage whatsoever by reason of its failure to discover, report, repair or modify latent defects or defects inherent in the design of any tank inspected. In no event, whether a result of breach of contract, warranty or tort (including negligence) shall Mistras Services be liable for any consequential or incidental damages including, but not limited to,

5.0 API 653 Checklists

Pacific Terminal (Centerline Logistics) has contracted Mistras Group, Inc. to perform an in service inspection on Tank 2 located in Portland, OR. This inspection was performed in accordance with the current criteria set forth in API Standard 653 (5th Edition, November 2014, Addendum 1, April 2018).

Tank 2 is an Above Ground Storage Tank in Marine Diesel service. This tank is 95.00 ft in diameter, and 48.00 ft in height and has a fixed roof.

The following details all inspection findings and recommendations.

C.1.1 FOUNDATION

ALL				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.1	Measure foundation levelness and bottom elevations (see Appendix B for extent of measurements).	Satisfactory	See settlement data.	

Concrete Ring				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.1.1a	Inspect for broken concrete, spalling, and cracks, particularly under backup bars used in welding butt welded annular rings under the shell.	Satisfactory	None noted.	
C.1.1.1b	Inspect drain openings in ring, back of water draw basins and top surface of ring for indications of bottom leakage.	N/A	There are no water draw basins.	
C.1.1.1c	Inspect for cavities under foundation and vegetation against bottom of tank.	Satisfactory		
C.1.1.1d	Check that runoff rainwater from the shell drains away from tank.	Satisfactory	Drainage appeared to be satisfactory	
C.1.1.1e	Check for settlement around perimeter of tank.	Satisfactory	None noted.	

Site Drainage				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.1.5.a	Check site drainage away from the tank and associated piping & manifolds.	Satisfactory	Dike drainage appears to be adequate.	
C.1.1.5.b	Check operation of dike drains.	Satisfactory		
C.1.1.5.c	Check for settling of tank into asphalt base, oiled dirt or sand which would direct runoff rain water under the tank instead of away from it.	Satisfactory		

Housekeeping				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.1.6	Inspect the area for buildup of trash, vegetation, and other inflammables buildup.	Satisfactory	None noted.	

Cathodic Protection				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.1.7	Review cathodic potential readings	N/A	The tank does not have a cathodic protection system.	

C.1.2 SHELLS

External Visual Inspection				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.2.1.a	Visually inspect for paint failures, pitting, and corrosion.	Optional	The shell was found to have large amounts of mildew present which if left un-checked could harm the coating.	It is recommended that the roof and shell receive a light hydro wash to remove the mildew.

C.1.2.1.b	Clean off the bottom angle area (chime) and inspect for corrosion and thinning on plate and weld.	Satisfactory	Some loss due to corrosion noted.	
C.1.2.1.b (1)	Obtain thickness readings on the chime. One reading shall be obtained every 10 feet. Reading No. 1 shall be located at the centerline of manway A.	Satisfactory	See Chime UT data.	
C.1.2.1.b (2)	Record the minimum and maximum chime widths. The measurements shall be made from the toe of the shell to chime weld to the edge.	Satisfactory	See Chime data.	
C.1.2.1.c	Inspect the bottom-to-foundation seal, if any.	N/A	None noted.	
C.1.2.1.d	UT the shell plates to verify remaining thickness. Using a crawler, obtain a minimum of 4 equally spaced drops around the tank, readings shall be obtained on all courses. At a minimum, readings should be taken on all courses from the ladder or stairs.	Satisfactory	See shell UT data.	

C.1.3 SHELL APPURTENANCES

Manways and Nozzles				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.3.1a	Inspect for corrosion, cracks or signs of leakage on weld joint at nozzles, manways and reinforcing plates.	Mandatory	Nozzle L was found to have numerous bolts with short thread protrusion on nozzle flange bolts. Per API A minimum of two (2) threads should extend beyond the outer face of the nut.	It is recommended that, one at a time the all-thread be replaced with a long enough piece so that proper thread protrusion can be achieved.

C.1.3.1b	Inspect for shell plate dimpling around nozzles, caused by excessive pipe deflection.			
C.1.3.1c	Inspect for flange leaks around bolting and leaking threaded connections on shell couplings and nipples.			
C.1.3.1d	Inspect sealing of insulation around manways and nozzles.			
C.1.3.1e	Check for inadequate manway flange and cover thickness on mixer manways.			
C.1.3.1f	Record all nozzle and appurtenance information on the "Shell Nozzle & Appurtenance Table". The station, heights, pipe size, repad size, repad type, weld spacing and distance from shell to flange face shall be recorded.			
C.1.3.1g	UT all shell nozzles and manways. Record one reading on the top, right, bottom and lefts sides of each neck. Also, record one reading on each repad, cover plate and flange.			

Tank Piping Manifolds				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.3.2a	Inspect manifold piping, flanges, and valves for leaks.	Satisfactory	No leaks noted.	
C.1.3.2b	Inspect firefighting system components.	N/A	The tank is not equipped with a fire suppression system.	

C.1.3.2c	Check for anchored piping which would be hazardous to the tank shell or bottom connections during the earth movement.	Satisfactory	The piping is properly supported.	
C.1.3.2d	Check for adequate thermal pressure relief of piping to the tank.	Satisfactory	The valves are equipped with appropriate PRV piping.	
C.1.3.2e	Check operation of regulators for tanks with purge gas systems.	N/A	The tank is not equipped with a purge gas system.	
C.1.3.2f	Check sample connections for leaks and for proper valve operation.	N/A	None Noted.	
C.1.3.2g	Check for damage and test the accuracy of temperature indicators. Record the brand, model and range of temperature indicators.	N/A	Not Equipped	
C.1.3.2h	Check welds on shell-mounted davit clips above valves 6 in. and larger	N/A	There are no davits.	

Autogauge System				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.3.3a	Inspect autogauge tape guide and lower sleeve housing (floating swings) for leaks.	Satisfactory	No leaks noted.	
C.1.3.3b	Inspect autogauge head for damage. (Note Brand, Model No. and Serial No.)	Satisfactory	Varec 2500 S/N 106421	
C.1.3.3c	Bump the checker on autogauge head for proper movement of tape.	Satisfactory		
C.1.3.3f	Compare actual product level to the reading on the autogauge (maximum variation is 2 in).	Satisfactory		
C.1.3.3h	Inspect condition of board and legibility of board-type autoguages.	N/A	The tank is not equipped with a board type autogauge.	

C.1.3.3i	Test freedom of movement of marker and float.	N/A		

C.1.4 ROOFS

Deck Plate Internal Corrosion				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.4.1a	For safety, before accessing roof, check with ultrasonic instrument or lightly use a ball peen hammer to test the deck plate near the edge of the roof for thinning. (Corrosion normally attacks the deck plate at the edge of a fixed roof and at the rafters in the center of the roof first.)	Satisfactory	The roof was found to be safe to access.	
C.1.4.1b	UT the roof plates. Record 5 readings per plate, one in each corner and one in the center of each plate.	Satisfactory	See roof UT data.	

Deck Plate External corrosion				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.4.2	Visually inspect for paint failure, holes, pitting, and corrosion product on the roof deck.	Satisfactory	The roof coating is in fair condition.	

Roof Deck Drainage				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.4.3	Look for indication of standing water. (Significant sagging of fixed roof deck indicates potential rafter failure. Large standing water areas on a floating roof indicate inadequate drainage design or, if to one side, a non-level roof with possible leaking pontoons.)	Satisfactory	The roof slope is adequate for proper drainage.	

C.1.5 Roof Appurtenances

Sample Hatch				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.5.1a	Inspect condition and functioning of sample hatch cover.	Satisfactory		
C.1.5.1b	On tanks governed by Air Quality Monitoring district rules, check for the condition of seal inside hatch cover.	N/A	Not required.	
C.1.5.1c	Check for corrosion and plugging on thief and gauge hatch cover.	N/A	The tank is not equipped with a thief type gauge hatch.	
C.1.5.1d	Where sample hatch is used to reel gauge stock level, check for marker and tab stating hold-off distance.	N/A	No gauge data plate or information was found.	
C.1.5.1e	Check for reinforcing pad where sample hatch pipe penetrates the roof deck.	Satisfactory	Repad is present.	
C.1.5.1g	Test operation of system.	Satisfactory		

C.1.5.1h	On ultra clean stocks such as JP4, check for presence and condition of protective coating or liner inside sample hatch (preventing rust from pipe getting into sample).	N/A	Not required.	

Breathers and Vents				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.2.7.3.a	Inspect and service the breather.	Satisfactory	The tank is equipped with an atmospheric vent.	
C.2.7.3.b	Inspect screens on vents and breathers.	Satisfactory	The Vent screens appear to be in good condition.	

Autogauge: Inspection Hatch and Guides (fixed Roofs)				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.5.4a	Check the hatch for corrosion and missing bolts.	Satisfactory		
C.1.5.4b	Look for corrosion on the tape guide's wire anchors.	Satisfactory	Some oxidation.	

Roof Nozzles and Manways				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.5.14	UT all roof nozzles and manways (if couplings are present, obtain readings on pipe adjacent to the coupling, note "readings on pipe" on data sheet). Record one reading on the north, east, south and west side of the neck.	Satisfactory	See roof appurtenance table.	

C.2.12 ACCESS STRUCTURES

Handrails				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.2.12.1a	Identify and report type (steel pipe, galvanized pipe, square tube, or angle) and size of handrails and handrail heights.	Satisfactory	The handrails are made from 3" angle 42.0" high with 12.0", 22.5", & 33.0" midrails and a 4.0" toe plate	
C.2.12.1.b	Inspect for pitting and holes, paint failure.	Satisfactory	No significant Issues were noted.	
C.2.12.1.c	Inspect attachment welds.	Satisfactory		
C.2.12.1.d	Identify cold joints and sharp edges. Inspect the handrails and mid-rails.	Satisfactory	None noted.	
C.2.12.1.e	Inspect safety drop bar (or safety chain) for corrosion, functioning, and length.	N/A	Not Equipped.	

Platform Frame				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.2.12.2.a	Inspect frame for corrosion and paint failure.	Satisfactory		
C.2.12.2.b	Inspect the attachment of frame to supports and supports to tank for corrosion and weld failure.	Satisfactory	None noted.	
C.2.12.2.c	Check reinforcing pads where supports are attached to shell or roof.	N/A	None Installed	
C.2.12.2.d	Inspect the surface that deck plate or grating rests on, for thinning and holes.	Satisfactory	None noted.	
C.2.12.2.e	Check that flat-surface-to-flat-surface junctures are seal-welded.	Satisfactory	The platform is formed from a single piece of diamond plate steel.	

Deck Plate and Grating				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.2.12.3.a	Inspect deck plate for corrosion-caused thinning or holes (not drain holes) and paint failure.	Satisfactory	None Noted.	
C.2.12.3.b	Inspect plate-to-frame weld for rust scale buildup.	Satisfactory	None noted.	
C.2.12.3.c	Inspect grating for corrosion-caused thinning of bars and failure of welds.	N/A	The platform is formed from a single piece of diamond plate steel.	
C.2.12.3.d	Check grating tie down clips. Where grating retrofitted to replace plate, measure the rise of the step below and above the grating surface and compare with other risers on the stairway.	N/A		

Stairway Stringers				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.2.12.4.a	Inspect spiral stairway stringers for corrosion, paint failure, and weld failure. Inspect attachment of stairway treads to stringer.	Satisfactory	None noted.	
C.2.12.4.b	Inspect stairway supports to shell welds and reinforcing pads.	Satisfactory		
C.2.12.4.c	Inspect steel support attachment to concrete base for corrosion.	N/A	The stairway does not make contact with the ground.	

6.0 Calculations

6.1 Minimum Thickness Calculations - One Foot

The minimum acceptable shell plate thickness for tank with a diameter equal to or less than 200 ft is calculated as follows:

$$t_{min} = \frac{2.6(H-1)DG}{SE}$$

Using the shell thickness measurements obtained during this inspection, the shell thickness calculations indicate that the maximum fill height of 46.00 ft can be utilized with product specific gravity up to 0.860.
Please note that these calculations do not take into consideration operational restrictions imposed by such items as a floating roof, overflow lines, high level alarm or vents and seals. These items will need to be taken into consideration when calculating the actual safe fill height.

Reference: API 653, 4th Edition, Add. 1, Aug. 2010, Paragraph 4.3.3.1

Course	Course Height (ft)	Diameter (ft)	Product Height (ft)	Allowable Stress (psi)	Joint Efficiency	Specific Gravity	Minimum Actual Thickness (in)	t_{min} Required Thickness (in)	Results
5	9.600	95	7.600	26000	0.85	0.860	0.251	0.100	**PASS**
4	9.600	95	17.200	26000	0.85	0.860	0.260	0.156	**PASS**
3	9.600	95	26.800	26000	0.85	0.860	0.360	0.248	**PASS**
2	9.600	95	36.400	23600	0.85	0.860	0.445	0.375	**PASS**
1	9.600	95	46.000	24900	0.85	0.860	0.559	0.452	**PASS**

6.2 Allowable Hydrostatic Test Height

The hydrostatic Height is calculated as follows :

$$H_t = \frac{S_t E t_{\min}}{2.6D} + 1$$

Reference: API 653, 4th Edition, Add. 1, Aug. 2010, Paragraph 4.3.3.2

Course	D Tank Diameter (ft)	S_t Allowable Hydrostatic Stress (psi)	E Joint Efficiency	t_{min} Required Thickness (in)	H_t Calculated Hydrotest Height (ft)
5	95	27000	0.850	0.100	10.292
4	95	27000	0.850	0.156	15.468
3	95	27000	0.850	0.248	24.041
2	95	26000	0.850	0.375	34.540
1	95	27400	0.850	0.452	43.586

7.0 Remaining Life Calculations

The following details the calculated corrosion rates and remaining life based on the findings from this inspection. The following items have been calculated:

$$C_r = \frac{t_{previous} - t_{actual}}{\text{Years between } t_{previous} \text{ and } t_{actual}} \text{ in inches per year}$$

$$R_L = \frac{t_{actual} - t_{min}}{C_r} \text{ in years}$$

C_r = Corrosion Rate in inches per years
R_L = The Remaining Life of a tank component in years.
$t_{previous}$ = Thickness at the same location as t_{actual} measured during a previous inspection or nominal thickness, in inches.
t_{actual} = The thickness measured at the time of inspection for a given location or component used to determine the minimum allowable thickness, in inches.
t_{min} = The minimum allowable thickness for a given location or component, in inches.

7.1 Fixed Roof Plates Remaining Life

Reference: API 653, 4th Edition, Add. 1, Aug. 2010, Paragraph 4.3.3.1

$t_{previous}$ Previous Thickness (in)	Year Obtained	t_{actual} Actual Thickness (in)	Year Obtained	C_r Corrosion Rate (in/yr.)	t_{min} Minimum Allowable Thickness (in)	R_L Remaining Life (yr.)
0.189	15-Jun-80	0.175	11-Jan-21	0.00033	0.090	255.47

7.2 Shell Plates Remaining Life

Reference: API 653, 4th Edition, Add. 1, Aug. 2010, Paragraph 4.3.3.1

Course	$t_{previous}$ Previous Thickness (in)	Year Obtained	t_{actual} Actual Thickness (in)	Year Obtained	C_r Corrosion Rate (in/yr.)	t_{min} Minimum Allowable Thickness (in)	R_L Remaining Life (yr.)
5	0.253	15-Jun-80	0.251	20-Jan-21	0.00005	0.100	3065.34
4	0.265	15-Jun-80	0.260	20-Jan-21	0.00012	0.156	846.84
3	0.375	15-Jun-80	0.360	20-Jan-21	0.00037	0.248	303.20
2	0.453	15-Jun-80	0.445	20-Jan-21	0.00020	0.375	351.58
1	0.563	15-Jun-80	0.559	20-Jan-21	0.00010	0.452	1089.75

8.0 Inspection Interval Calculations

8.1 Period Until Next External Inspection

$$RCA/4N \text{ years}$$

Reference: API 653, 4th Edition, Add. 1, Aug. 2010, Paragraph 6.3.2.1

Remaining Corrosion Allowance (RCA):	0.1120165	(in)
Current Thickness (Mst):	0.360	(in)
Required Thickness (Tmin):	0.248	(in)
Corrosion Rate (N):	0.00037	(in/yr.)
Course Number with Shorter Life:	3	

Calculated Interval: **5 Year(s)**

Next Inspection Date: **January 11, 2026**

Note: External Visual Inspection shall not exceed 5 years

8.2 Period Until Next External UT Inspection

$$RCA/2N \text{ years}$$

Reference: API 653, 4th Edition, Add. 1, Aug. 2010, Paragraph 6.3.3.2

Remaining Corrosion Allowance (RCA):	0.1120165	(in)
Current Thickness (Mst):	0.360	(in)
Required Thickness (Tmin):	0.248	(in)
Corrosion Rate (N):	0.00037	(in/yr.)
Course Number with Shorter Life:	3	

Calculated Interval: **15 Year(s)**

Next Inspection Date: **January 11, 2036**

Note: External UT inspection shall not exceed 15 years for known corrosion rate or 5 years for unknown corrosion rate.

$RCA =$	Difference between the measured shell thickness and the minimum required thickness in inches.
$N =$	Shell corrosion rate in inches per year.
$t_{min} =$	The minimum acceptable thickness, in inches for each course as calculated from API 653 4.3.3; however, t_{min} shall not be less than 0.100 inches for any tank course.
$M_{st} =$	The minimum measured shell plate thickness in inches.

10.0 Settlement Analysis

10.1 Settlement Survey Data

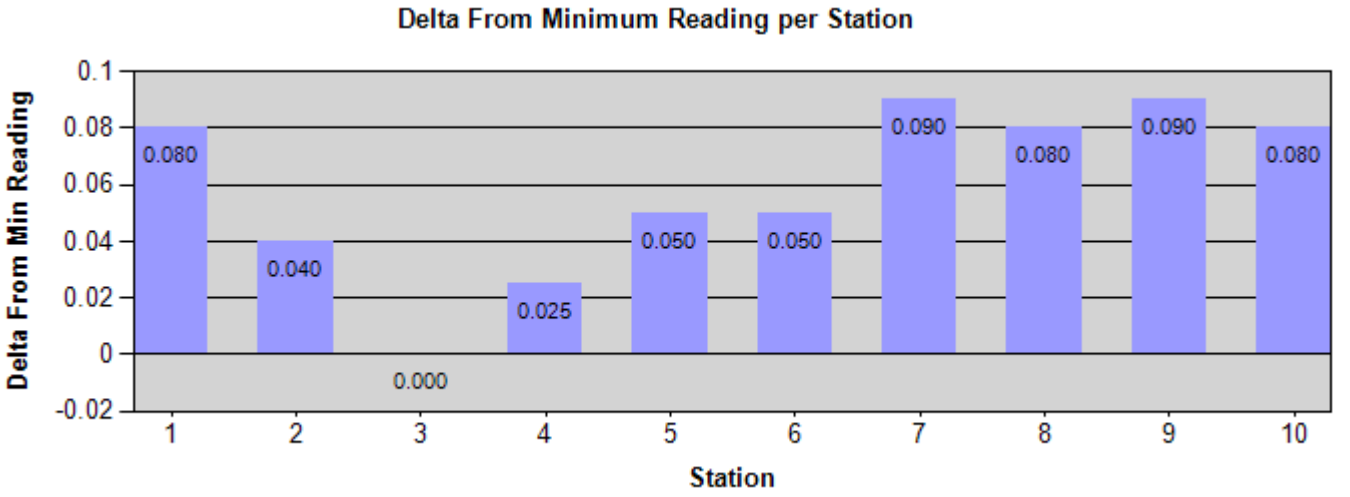
This settlement evaluation consisted taking elevation measurements around the circumference of the tank per API 653 Figure B-1. A total of 10 equally spaced locations were recorded Counter-Clockwise. First Station is located at 3 from the center line of 10.

Station No	Offset from Zero Point (ft)	Reading (ft)	Delta From Min
1	0.000	10.070	0.080
2	29.845	10.030	0.040
3	59.690	9.990	0.000
4	89.535	10.015	0.025
5	119.381	10.040	0.050
6	149.226	10.040	0.050
7	179.071	10.080	0.090
8	208.916	10.070	0.080
9	238.761	10.080	0.090
10	268.606	10.070	0.080

The table below contains the statistics of the obtained readings.

Readings Summary	
Maximum	10.080
Average	10.048
Minimum	9.990
Difference	0.090

The following chart depicts the variation of readings versus the reading station.

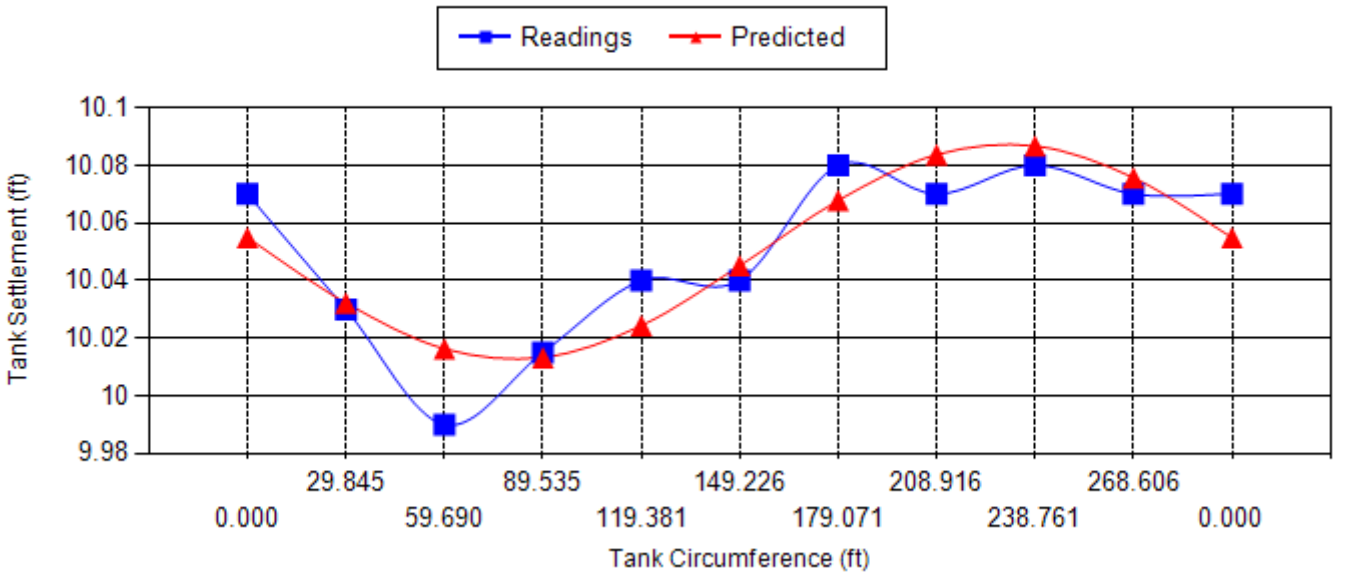


10.2 Shell Settlement Evaluation

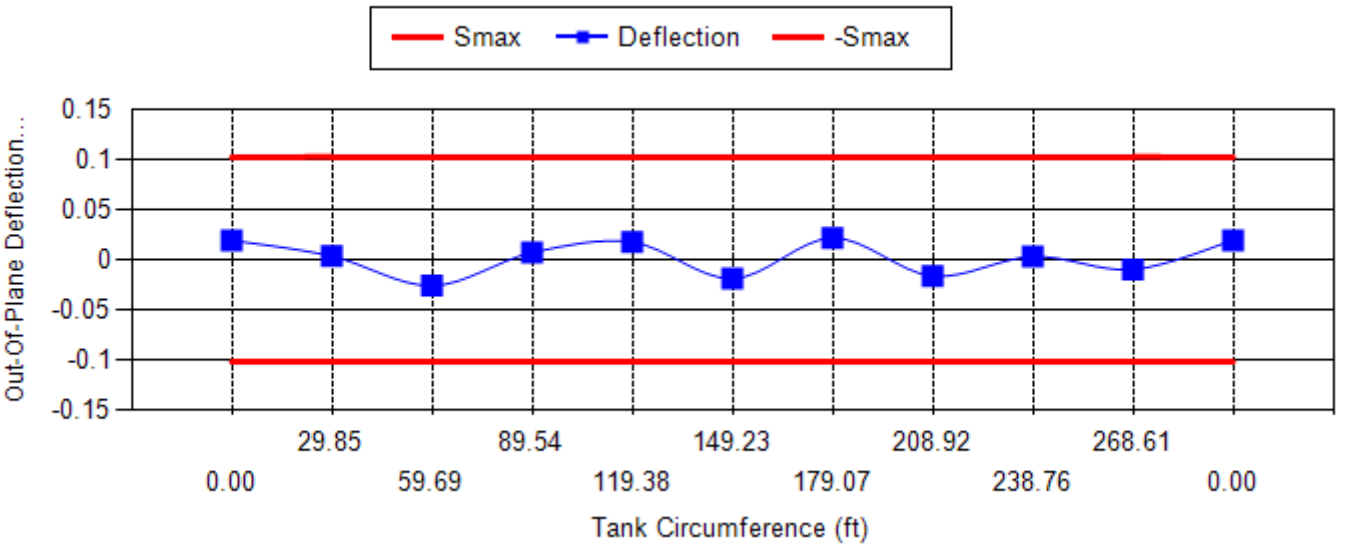
Allowable Stress	30000.00 psi
Modulus of Elasticity	30000000.00 psi
Num. Stations	10

Station	Distance	Survey		Cosine	Out-of-Plane Deflection (ft)		Pass\Fail		Station
	ft	in	ft	ft	Allowable	Calculated	Positive	Negative	
1	0.00	120.84	10.07	10.05	0.102	0.019	Pass	Pass	1
2	29.85	120.36	10.03	10.03	0.102	0.003	Pass	Pass	2
3	59.69	119.88	9.99	10.02	0.102	-0.026	Pass	Pass	3
4	89.54	120.18	10.02	10.01	0.102	0.007	Pass	Pass	4
5	119.38	120.48	10.04	10.02	0.102	0.017	Pass	Pass	5
6	149.23	120.48	10.04	10.05	0.102	-0.019	Pass	Pass	6
7	179.07	120.96	10.08	10.07	0.102	0.022	Pass	Pass	7
8	208.92	120.84	10.07	10.08	0.102	-0.016	Pass	Pass	8
9	238.76	120.96	10.08	10.09	0.102	0.003	Pass	Pass	9
10	268.61	120.84	10.07	10.08	0.102	-0.010	Pass	Pass	10
1	0.00	120.84	10.07	10.05	0.102	0.019	Pass	Pass	1

Best Cosine Curve Fit



Out-of-Plane Deflection



11.0 Brittle Fracture Assessment

Inspector	B. Johnson
Date Built	1980
Last Repair Date	
Hydro Test Date	

A)	Is there a record of Hydro test?		Yes, go to B	x	No, go to C
B)	Have repairs been made since Hydro test?		Yes, go to C		No, Use tank

C)
- [ ] Tank meets API 650 (7th Edition or later) or API 650 Appendix G (5th or 6th edition). Go To 2
- [ ] Tank does not meets API 650 (1980) or API 650 Appendix G (5th or 6th edition). Go To 5
- [ ] After hydro test or rerate due to brittle fracture assessment. Go To 2

1)	Do repairs meet API 653?		Yes, use tank		No, Go to 5
2)	Does Tank continue to operate in same service?		Yes, use tank		No, continue
3)	Is the service more severe?		Yes, Continue		No, use tank
4)	Does the tank meet the requirements of API 650 or equal?		Yes, use tank		No, use tank
5)	Is the tank full at lowest one day temperature per API 650 Fig. 2.2?	x	Yes, use tank		No, use tank
6)	Is tank thickness 0.5” or less?		Yes, use tank		No, use tank
7)	Does tank operate at metal temperature above 60F?		Yes, use tank		No, use tank
8)	Is membrane stress below 7 ksi?		Yes, use tank		No, use tank
9)	Is tank steel exempt from impact testing, API 650 Fig. 2.1 or API 653 Fig. 5.2?		Yes, use tank		No, use tank
10)	Is tank full at lowest one day temperature per API 650 Fig. 2.2?		Yes, continue to use tank		No, Hydro test or Rerate tank

12.0 Ultrasonic Thickness Data

12.1 Shell Plates UT

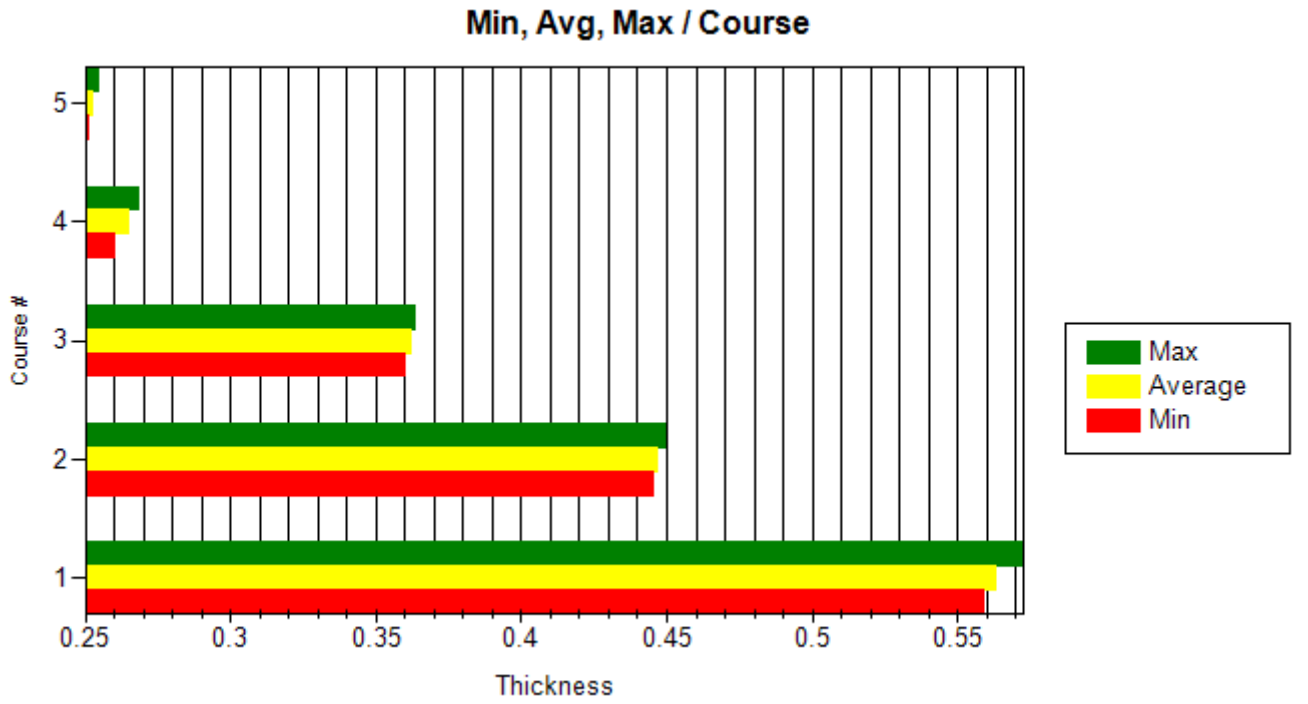
The following table details all readings (in) from the shell UT survey. Scan drops were taken up the stairway.

Data and Statistics		1
Course 5	4	0.251
	3	0.253
	2	0.251
	1	0.254
Course 4	4	0.260
	3	0.266
	2	0.268
	1	0.265
Course 3	4	0.360
	3	0.363
	2	0.361
	1	0.362
Course 2	4	0.446
	3	0.446
	2	0.445
	1	0.449
Course 1	4	0.561
	3	0.559
	2	0.560
	1	0.573

The tables below presents the statistics of the thickness readings (in) obtained on the Shell plates.

Course #	Min	Avg	Max
5	0.251	0.252	0.254
4	0.260	0.265	0.268
3	0.360	0.362	0.363
2	0.445	0.447	0.449
1	0.559	0.563	0.573
Global	0.251	0.378	0.573

The following chart depicts the average thickness reading (in) on the shell plates versus the course number.



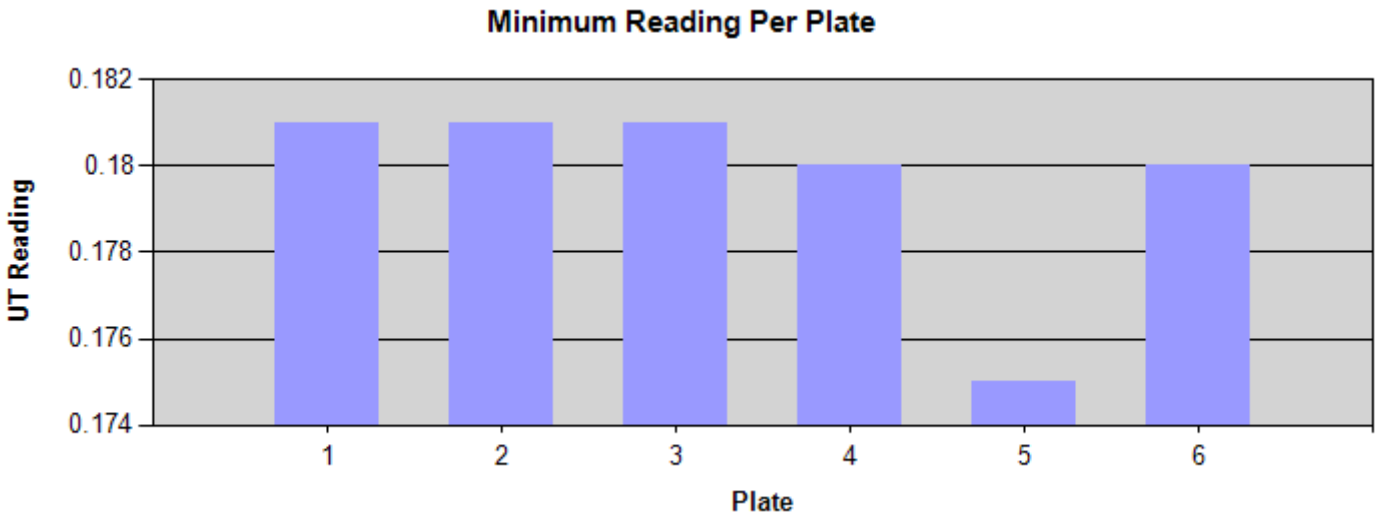
12.2 Fixed Roof Plates UT

The following table details readings (in) obtained on the Fixed Roof plates from the center of the roof to the gauge platform.

Plate ID \ Reading ID	1	2	3	*Avg*
47	0.181	0.182	0.181	0.181
48	0.181	0.213	0.184	0.193
49	0.181	0.184	0.183	0.183
33	0.189	0.183	0.180	0.184
32	0.180	0.175	0.180	0.178
30	0.180	0.189	0.180	0.183
Avg	0.182	0.188	0.181	0.184

The table below presents the statistics of the thickness readings obtained on the roof plates.

UT Summary	
Maximum	0.213
Average	0.184
Minimum	0.175



12.3 Shell Nozzle and Appurtenance Table

Item	Type	Service	Pipe Size (in)	Station (ft)	Center Line Elevation (in)	API Allowable Elevation (in)	Repad Width (in)	Repad Height (in)	Tell Tale Hole	Repad Shape	Weld Spacing (in)	Distance From Shell to Flange Face (in)
A	Manway	Access	26.0	0	30	26.38	65	57	Yes	K	Flush	5.75
A-1	Top of Stairway	Roof Access	N/A	18.9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
B	Nozzle	Transfer	2.0	25.6	21	7.00	N/A	N/A	N/A	N/A	N/A	N/A
C	Autogauge	Gauging	N/A	29.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
D	Nozzle	Transfer	10.0	35.5	18	11.50	29	30	Yes	K	Flush	10
E	Nozzle	Transfer	6.0	43.6	17.5	12.13	20	16	Yes	L	9.0	8.5
F	Nozzle	Blinded	2.0	45.1	8.75	7.00	N/A	N/A	N/A	N/A	7.0	7.25
G	Nozzle	Transfer	3.0	51.4	13.5	5.25	14	19	Yes	K	Flush	7.5
H	Ground Stud	Electrical Ground	N/A	64	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
I	Ground Stud	Electrical Ground	N/A	138.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
J	Manway	Access	26.0	149.3	30	26.38	65	57	Yes	K	Flush	5.75
K	Ground Stud	Electrical Ground	N/A	211.8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
L	Nozzle	Air Line	8.0	252.7	17.5	9.50	27	27.5	Yes	K	Flush	8.75
M	Nozzle	Blinded	12.0	260.8	18.5	13.50	37	33	Yes	K	Flush	9.5
N	Bottom of Stairway	Roof Access	N/A	270.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
O	Ground Stud	Electrical Ground	N/A	287.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Note: The data represented in the weld spacing column is the minimum spacing measured. H, V, or N indicates which is the minimum distance from the nozzle measured. (H=Horizontal Weld, V=Vertical Weld, N=Nozzle Weld)

12.4 Shell Nozzle UT

Item	Type	Service	Pipe Size (in)	Top (in)	Bottom (in)	Right (in)	Left (in)	Repad Thickness (in)	Flange Thickness (in)	Cover Thickness (in)	Comments
A	Manway	Access	26.0	0.556	0.566	0.572	0.562	0.591	0.474	0.612	
B	Nozzle	Transfer	2.0	0.187	N/A	N/A	N/A	N/A	N/A	N/A	
D	Nozzle	Transfer	10.0	0.49	0.489	0.495	0.491	0.598	1.22	N/A	
E	Nozzle	Transfer	10.0	0.432	0.439	0.431	0.447	1.052	1.057	N/A	
F	Nozzle	W/Valve Blinded	2.0	0.218	N/A	N/A	N/A	N/A	N/A	N/A	
G	Nozzle	Transfer	3.0	0.274	0.375	0.31	0.302	0.473	0.922	N/A	
J	26.0	Access	26.0	0.572	0.561	0.561	0.571	0.577	1.459	N/A	
L	Nozzle	Air Line	8.0	0.49	0.494	0.497	0.49	0.574	1.25	1.166	
M	Nozzle	W/Valve Blinded	12.0	0.487	0.484	0.483	0.485	0.578	1.25	N/A	

12.5 Roof Appurtenances

Item	Type	Service	Pipe Size (in)	North (in)	South (in)	East (in)	West (in)	Comments
AA	Vent	Center Vent	28.0	0.205	0.2	0.202	0.202	
AB	Threaded Bracket	N/A	1.25	N/A	N/A	N/A	N/A	
AC	Nozzle	Radar Gauge	8.0	0.338	0.319	0.334	0.296	Saab Radar Gauge
AD	Manway	Access	24.0	0.25	0.252	0.253	0.251	With Probe in cover
AE	Nozzle	Gauge Hatch	8.0	0.352	0.319	0.31	0.291	Varec 8.0" hatch
AF	Hatch	Autogauge Inspection Hatch	8.5 x 21.0	0.248	0.247	0.247	0.247	
AG	Pipe Nipple	Autogauge Float Anchor	1.5	0.132	N/A	N/A	N/A	
AH	Pipe Nipple	Autogauge Tape Guide Tube	2.0	0.137	N/A	N/A	N/A	
AI	Pipe Nipple	Autogauge Float Anchor	1.5	0.137	N/A	N/A	N/A	

12.6 Chime UT Data

The table below details thickness readings obtained on the chime. The total number of Readings is 30. Reading No 1 is located at the center line of Manway A, all readings thereafter are spaced at 10.000 ft intervals.

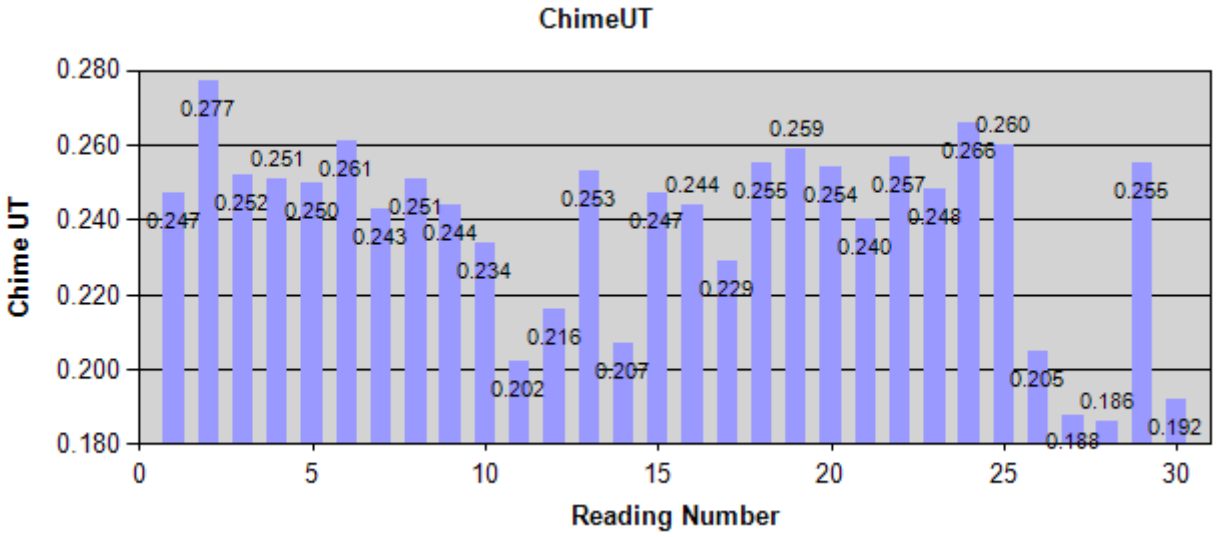
Reading Number	Spacing (ft)	UT (in)
1	0.000	0.247
2	10.000	0.277
3	20.000	0.252
4	30.000	0.251
5	40.000	0.250
6	50.000	0.261
7	60.000	0.243
8	70.000	0.251
9	80.000	0.244
10	90.000	0.234
11	100.000	0.202
12	110.000	0.216
13	120.000	0.253
14	130.000	0.207
15	140.000	0.247
16	150.000	0.244
17	160.000	0.229
18	170.000	0.255
19	180.000	0.259
20	190.000	0.254
21	200.000	0.240
22	210.000	0.257
23	220.000	0.248
24	230.000	0.266
25	240.000	0.260
26	250.000	0.205

27	260.000	0.188
28	270.000	0.186
29	280.000	0.255
30	290.000	0.192

The table below presents the statistics of the thickness readings obtained on the chime.

UT Summary (in)	
Minimum	0.186
Maximum	0.277
Average	0.239

The following chart depicts the thickness reading on the chime versus the reading number.



12.7 Chime Width Data

The table below details width readings obtained on the chime. The total number of Readings is 30. Reading No 1 is located at the center line of Manway A, all readings thereafter are spaced at 10 ft intervals.

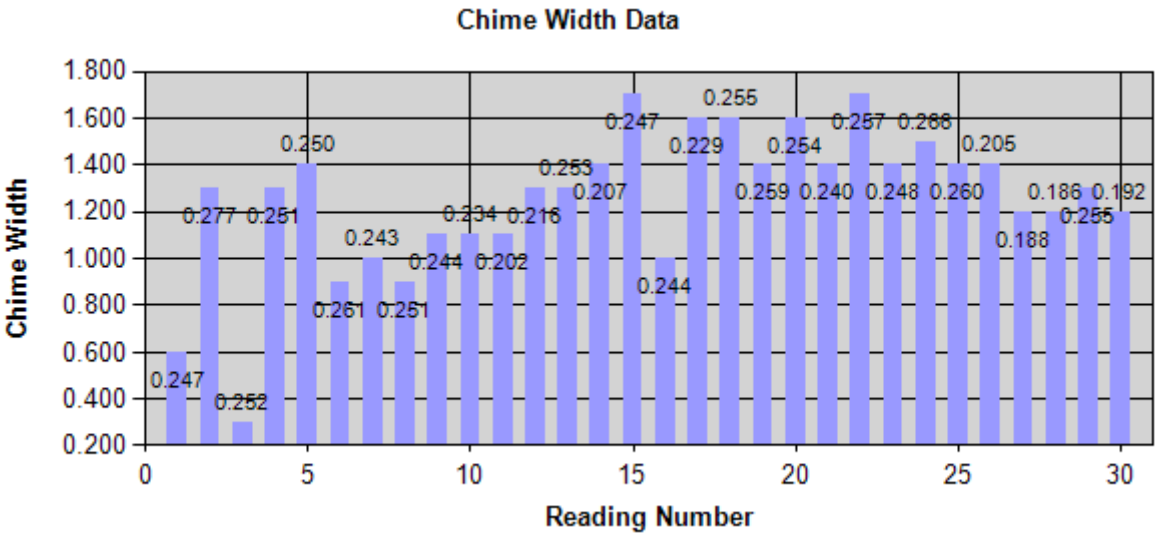
Reading Number	Spacing (ft)	Width (in)
1	0	0.6
2	10	1.3
3	20	0.3
4	30	1.3
5	40	1.4
6	50	0.9
7	60	1
8	70	0.9
9	80	1.1
10	90	1.1
11	100	1.1
12	110	1.3
13	120	1.3
14	130	1.4
15	140	1.7
16	150	1
17	160	1.6
18	170	1.6
19	180	1.4
20	190	1.6
21	200	1.4
22	210	1.7
23	220	1.4
24	230	1.5
25	240	1.4
26	250	1.4
27	260	1.2

28	270	1.2
29	280	1.3
30	290	1.2

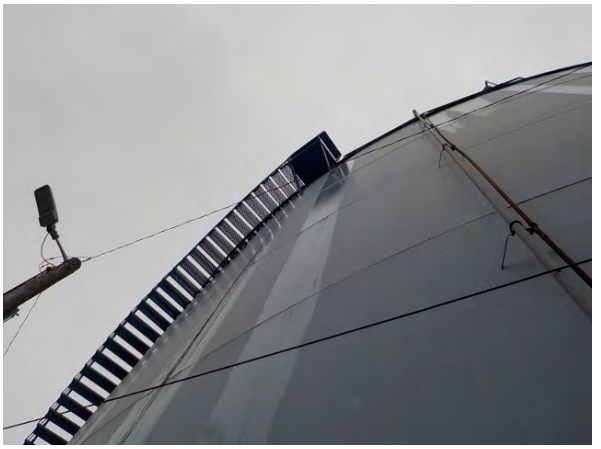
The table below presents the statistics of the thickness readings obtained on the chime.

Width Data Summary (in)	
Minimum	0.300
Maximum	1.700
Average	1.253

The following chart depicts the thickness reading on the chime versus the reading number.



13.0 Photographs

Tank 2	Data Plate
	
Manway A	Coupling B
	
Top of Stairway	Autogauge C
	

Autogauge Data Plate	Nozzle D
	
Nozzles E & F	**Nozzle G**
	
Ground H	**Ground I**
	

Manway J	Ground K
	
Nozzle L	**Nozzle M**
	
Bottom of Stairway	**Stairway**
	

Ground O	Bench Mark
	
Center Vent AA	**Screens**
	
Screens	**Threaded Bracket**
	

Nozzle AC	Manway AD
	
Nozzle AE	**Autogauge Details**
	
Standoff	**Standoff**
	

Standoff

Gauging Area

Short Bolts

14.0 NDE Equipment Used

The equipment utilized for the inspection of the tank included of the following :

Survey Level

Manufacturer	Model	Serial No
Topcon	GPT-3105W	8R2165

Pit Gauge

Manufacturer	Model	Serial No
W.R. Thorpe	1	1.979.912

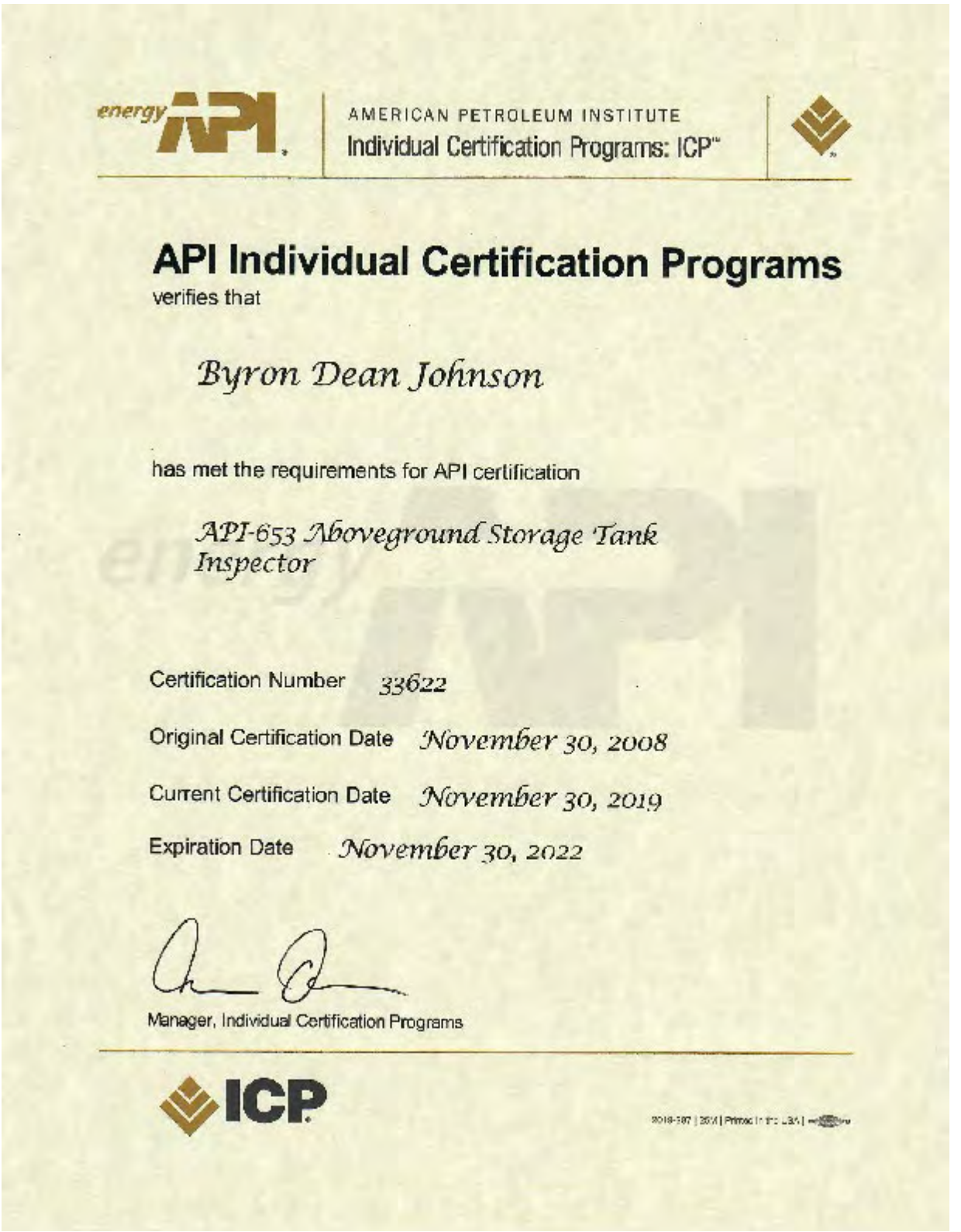
Ultrasonic Transducers

Manufacturer	Model	Serial No	MHz	Diameter
Olympus	D790-SM	865199	5	0.375

UT Equipment

Manufacturer	Model	Serial No
Olympus	38DL Plus	130573601
Mistras Cal. Block	0.100" to 0.500"	147

15.0 Inspector Certifications



energy API

AMERICAN PETROLEUM INSTITUTE
Individual Certification Programs: ICP℠

API Individual Certification Programs

verifies that

Byron Dean Johnson

has met the requirements for API certification

API-653 Aboveground Storage Tank Inspector

Certification Number 33622

Original Certification Date November 30, 2008

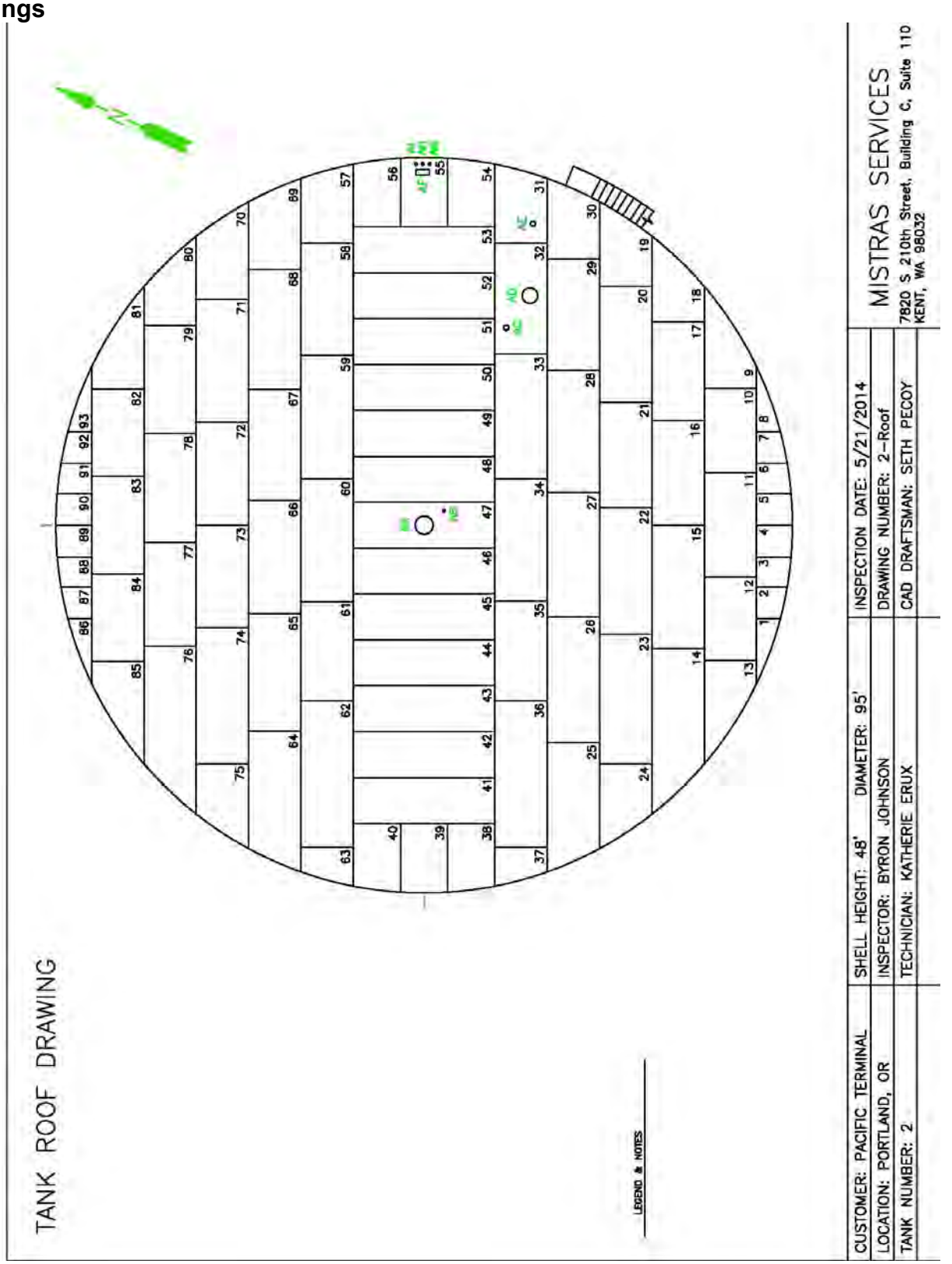
Current Certification Date November 30, 2019

Expiration Date November 30, 2022

Manager, Individual Certification Programs

ICP

16.0 Drawings



SHELL ROLLOUT DRAWING–EXTERNAL VIEW

SHELL NOZZLES & APPURTENANCE TABLE

NO.	SIZE (IN.)	DESCRIPTION
A1	26	MANWAY
B	N/A	TOP OF STAIRS
C	2	NOZZLE
D	N/A	AUTOGAUGE
E	10	NOZZLE
F	6	NOZZLE
G	2	NOZZLE
H	3	NOZZLE
I–J	N/A	GROUND CONNECTION
K	N/A	GROUND CONNECTION
L	26	MANWAY
M	N/A	GROUND CONNECTION
N	8	NOZZLE

NO.	SIZE (IN.)	DESCRIPTION
M	12	NOZZLE
N	N/A	BOTTOM OF STAIRS
O	N/A	GROUND CONNECTION

NOTES:

SEE OTHER PAGES FOR ULTRASONIC THICKNESS MEASUREMENTS OF NOZZLES AND SHELL. MEASUREMENTS UNLESS OTHERWISE NOTED ARE OF THE STEEL AND DO NOT INCLUDE ANY COATING OR PAINT.

CUSTOMER: PACIFIC TERMINAL	SHELL HEIGHT: 48'	DIAMETER: 95'	INSPECTION DATE: 1/11/2021
LOCATION: PORTLAND, OR	INSPECTOR: BYRON JOHNSON		DRAWING NUMBER: 2–Shell
TANK NUMBER: 2	TECHNICIAN:		CAD DRAFTSMAN: SETH PECOY

MISTRAS SERVICES
7820 S 210th Street, Building C, Suite 110
Kent, WA 98032

Above Ground Storage Tank Inspection Report

In accordance with API 653

Harley Marine Service

Tank 3

In Service Inspection

Portland, OR

May 9, 2019 to May 9, 2019

Report Number 40654310-1

Prepared By :
7820 South 212th St. St. 110
Kent, WA, 98032

www.mistrasgroup.com

MISTRAS Services Division
A World of NDT Solutions

Inspection Date
May 9, 2019

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1.0 Job Information

Job Location :	Harley Marine Service 7900 NW St. Helens Road Portland, OR 97210
Customer Representative :	Burt Nye
Customer Phone Number :	503-240-3456
Job Charge Number :	22403
Report Number :	40654310
Mistras Work Order Number :	T60458-40654310
Inspection Personnel Provided :	Alec Arpino API 653 Certified Inspector API 653 (77549) MT

2.0 Tank Inspection Data Sheet

General :

Tank Number	3
Owner	Harley Marine Service
Design Standard	API 650
Tank Location	Portland, OR
Product	#6 Fuel Oil
Specific Gravity	1
Manufacturer	Pittsburg Des Moines Steel Co.
Manufacture Date	1980
Cathodic Protection	No
Data Plate Present	No
Data Plate Condition	N/A

Dimensions :

Diameter (ft)	55.00
Height (ft)	48.00
Capacity Gross (bbl (oil))	19,465.05
Capacity Nominal (bbl (oil))	22,000.00

Geometry :

Foundation	Concrete Ringwall
Bottom	Lap Welded
Shell	Butt Welded
Fixed Roof Type	Cone
Floating Roof Type	None
Primary Seal	Not Applicable
Secondary Seal	Not Applicable

Access :

Stairway	Spiral Type
Roof Access	Yes

Coatings :

Bottom	Unknown
Shell	Insulated
Roof	Insulated

3.0 Inspection Summary

On May 9th, 2019, a limited In-Service Inspection was performed on tank 3, which is a fixed roof tank in #6 Fuel Oil service. The tank was built in 1980 in accordance with API 650 by Pittsburg Des Moines Steel Co. The scope of the evaluation for this tank consisted of a visual inspection only; therefore, ultrasound (UT) and settlement survey were not performed. There were no findings noted at the time of inspection.

4.0 Summarized Recommendations

There are no recommended repairs at this time.

Inspectors Signature:

M. Alec Arpino
API 653
Certification No. 77549 Exp. 12/31/2020

Reviewed by:

George Roni

George Roni, PE
API 653 Cert. No. 2042, Exp. 4/30/17

Mistras Services has evaluated the condition of this tank based on the observations and measurements made by the tank Inspector. While our evaluation accurately describes the condition of the tank at the time of inspection, the tank owner/operator must independently assess the inspection information/report provided by Mistras Services and any conclusions reached by the tank owner/operator and any action taken or omitted to be taken are the sole responsibility of the owner/operator. With respect to inspection and testing, Mistras Services warrants only that the services have been performed in accordance with accepted industry practice. If any such services fail to meet the foregoing warranty, Mistras Services shall re-perform the service to the same extent and on the same conditions as the original service.

The preceding paragraph sets forth the exclusive remedy for claims based on failure or of defect in materials or services, whether such claim is made in contract or tort (including negligence) and however instituted, and, upon expiration of the warranty period, all such liability shall terminate. The foregoing warranty is exclusive and in lieu of all other warranties, whether written, oral, implied or statutory. NO IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR PURPOSE SHALL APPLY, nor shall Mistras Services be liable for any loss or damage whatsoever by reason of its failure to discover, report, repair or modify latent defects or defects inherent in the design of any tank inspected. In no event, whether a result of breach of contract, warranty or tort (including negligence) shall Mistras Services be liable for any consequential or incidental damages including, but not limited to, loss of profit or revenues, loss of use of equipment tested or services by Mistras Services or any associated damage to facilities, down-time costs or claims of other damages.

5.0 API 653 Checklists

Harley Marine Service has contracted Mistras Group, Inc. to perform an in service visual inspection on Tank 3 located in Portland, OR. This inspection was performed in accordance with the current criteria set forth in API Standard 653 (5th Edition, November 2014, Addendum 1, April 2018).

Tank 3 is an Above Ground Storage Tank in #6 Fuel Oil service. This tank is 55.00 ft in diameter, and 48.00 ft in height and has a cone fixed roof.

The following details all inspection findings and recommendations.

C.1.1 FOUNDATION

ALL

Section Name	Description	Condition	Finding	Recommendation
C.1.1	Measure foundation levelness and bottom elevations (see Appendix B for extent of measurements).	N/A	This was a visual only inspection.	

Concrete Ring

Section Name	Description	Condition	Finding	Recommendation
C.1.1.1a	Inspect for broken concrete, spalling, and cracks, particularly under backup bars used in welding butt welded annular rings under the shell.	Satisfactory	None noted.	
C.1.1.1b	Inspect drain openings in ring, back of water draw basins and top surface of ring for indications of bottom leakage.	N/A	There are no water draw basins.	
C.1.1.1c	Inspect for cavities under foundation and vegetation against bottom of tank.	Satisfactory		
C.1.1.1d	Check that runoff rainwater from the shell drains away from tank.	Satisfactory		
C.1.1.1e	Check for settlement around perimeter of tank.	Satisfactory	None noted.	

Asphalt				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.1.2.a	Check for settling of tank into asphalt base which would direct runoff rain water under the tank instead of away from it.	N/A	The tank does not have an asphalt apron.	
C.1.1.2.b	Look for areas where leaching of oil has left rock filler exposed, which indicates hydrocarbon leakage.	N/A		

Rock				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.1.4	Presence of crushed rock under the steel bottom usually results in severe underside corrosion. Make a note to do additional bottom plate examination (MFL, ultrasonic, hammer testing, or turning of coupons) when the tank is out of service.	Satisfactory	None noted.	

Site Drainage				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.1.5.a	Check site drainage away from the tank and associated piping & manifolds.	Satisfactory		
C.1.1.5.b	Check operation of dike drains.	Satisfactory		
C.1.1.5.c	Check for settling of tank into asphalt base, oiled dirt or sand which would direct runoff rain water under the tank instead of away from it.	Satisfactory		

Housekeeping				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.1.6	Inspect the area for buildup of trash, vegetation, and other inflammables buildup.	Satisfactory		

Cathodic Protection				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.1.7	Review cathodic potential readings	N/A	The tank does not have a cathodic protection system.	

C.1.2 SHELLS

External Visual Inspection				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.2.1.a	Visually inspect for paint failures, pitting, and corrosion.	N/A	No Access, Insulated	
C.1.2.1.b	Clean off the bottom angle area (chime) and inspect for corrosion and thinning on plate and weld.	N/A	No Access, Insulated.	
C.1.2.1.b (1)	Obtain thickness readings on the chime. One reading shall be obtained every 10 feet. Reading No. 1 shall be located at the centerline of manway A.	N/A	This is a visual only inspection.	
C.1.2.1.b (2)	Record the minimum and maximum chime widths. The measurements shall be made from the toe of the shell to chime weld to the edge.	N/A	No Access, Insulated.	
C.1.2.1.c	Inspect the bottom-to-foundation seal, if any.	N/A	None noted.	

C.1.2.1.d	UT the shell plates to verify remaining thickness. Using a crawler, obtain a minimum of 4 equally spaced drops around the tank, readings shall be obtained on all courses. At a minimum, readings should be taken on all courses from the ladder or stairs.	N/A	This is a visual only inspection.	

Riveted Shell Inspection				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.2.3.a	Inspect external surface for rivet and seam leaks.	N/A	Appears to be a welded tank.	
C.1.2.3.b	Locate leaks by sketch or photo (location will be lost when shell is abrasive cleaned for painting).	N/A		
C.1.2.3.c	Inspect rivets for corrosion loss and wear.	N/A		
C.1.2.3.d	Inspect vertical seams to see if they have been full fillet-lap welded to increase joint efficiency.	N/A		
C.1.2.3.e	If no records exist of vertical riveted seams, dimension and sketch (or photograph) the rivet pattern: number of rows, rivet size, pitch length and note whether the joint is butt riveted or lap riveted.	N/A		

C.1.3 SHELL APPURTENANCES

Manways and Nozzles				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.3.1a	Inspect for corrosion, cracks or signs of leakage on weld joint at nozzles, manways and reinforcing plates.	N/A	No Access due to insulation.	

C.1.3.1b	Inspect for shell plate dimpling around nozzles, caused by excessive pipe deflection.	N/A	No Access, Insulated.	
C.1.3.1c	Inspect for flange leaks around bolting and leaking threaded connections on shell couplings and nipples.	Satisfactory	None noted.	
C.1.3.1d	Inspect sealing of insulation around manways and nozzles.	Satisfactory		
C.1.3.1e	Check for inadequate manway flange and cover thickness on mixer manways.	Satisfactory	The mixer is adequately supported.	
C.1.3.1f	Record all nozzle and appurtenance information on the "Shell Nozzle & Appurtenance Table". The station, heights, pipe size, repad size, repad type, weld spacing and distance from shell to flange face shall be recorded.	Satisfactory	Inspection limited due to insulation.	
C.1.3.1g	UT all shell nozzles and manways. Record one reading on the top, right, bottom and lefts sides of each neck. Also, record one reading on each repad, cover plate and flange.	N/A	This is a visual only inspection.	

Tank Piping Manifolds				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.3.2a	Inspect manifold piping, flanges, and valves for leaks.	Satisfactory	None noted.	
C.1.3.2b	Inspect firefighting system components.	N/A	The tank is not equipped with a fire suppression system.	
C.1.3.2c	Check for anchored piping which would be	Satisfactory	The piping is properly supported	

	hazardous to the tank shell or bottom connections during the earth movement.			
C.1.3.2d	Check for adequate thermal pressure relief of piping to the tank.	Satisfactory		
C.1.3.2e	Check operation of regulators for tanks with purge gas systems.	N/A	The tank is not equipped with a purge gas system.	
C.1.3.2f	Check sample connections for leaks and for proper valve operation.	N/A	The tank is not equipped with a sample station.	
C.1.3.2g	Check for damage and test the accuracy of temperature indicators. Record the brand, model and range of temperature indicators.	Satisfactory	The tank is equipped with two Ashcroft 0° to 200° F Temperature gauges.	
C.1.3.2h	Check welds on shell-mounted davit clips above valves 6 in. and larger	N/A	There are no davits.	

Autogauge System				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.3.3a	Inspect autogauge tape guide and lower sleeve housing (floating swings) for leaks.	Satisfactory	None noted.	
C.1.3.3b	Inspect autogauge head for damage. (Note Brand, Model No. and Serial No.)	Satisfactory	Varec 2500B S/N 77260	
C.1.3.3c	Bump the checker on autogauge head for proper movement of tape.	Satisfactory		
C.1.3.3f	Compare actual product level to the reading on the autogauge (maximum variation is 2 in).	Satisfactory	No Access	
C.1.3.3h	Inspect condition of board and legibility of board-type autoguages.	N/A	The tank is not equipped with a board type autogauge.	
C.1.3.3i	Test freedom of movement of marker and float.	N/A		

Shell Mounted Sample Stations				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.3.4a	Inspect sample lines for function of valves and plugging of lines, including drain or return-to-tank line.	N/A	The tank is not equipped with a sample station.	
C.1.3.4b	Check circulation pump for leaks and operating problems.	N/A		
C.1.3.4c	Test bracing and supports for sample lines and equipment.	N/A		

Heater (Shell Mounted Manway)				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.3.5	Inspect condensate drain for presence of oil indicating leakage.	N/A	Heating of the tank is not done through the manway.	

Mixer				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.3.6a	Inspect for proper mounting flange and support.	Satisfactory		
C.1.3.6b	Inspect for leakage.	Satisfactory	None noted.	
C.1.3.6c	Inspect condition of power lines and connections to mixer.	Satisfactory	The mixer connections appeared adequate.	

Swing Lines: Winch Operation				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.3.7a	Non-floating. Raise, then lower the swing line with the winch, and check for cable tightness to confirm that swing line lowered properly.	N/A	There is no swing line winch nor is there any external swing line equipment I.E. targets markers etc....	
C.1.3.7b	Floating. With tank half full or more, lower the	N/A		

	swing line, then let out cable and check if swing has pulled cable tight, indicating that the winch is operating properly.			
C.1.3.7c	Indicator. Check that the indicator moves in the proper direction: Floating swing line indicators show a lower level as cable is wound up on the winch. Non-floating swing line indicators show the opposite.	N/A		

Swing Lines: External Guide System				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.3.8	Check for leaks at threaded and flanged joints.	N/A		

Swing Lines: Identify Ballast Varying Need				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.3.9	Check for significant difference in stock specific gravity.	N/A		

Swing Lines: Cable Material and Condition				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.3.10a	For no stainless steel cable, check for corrosion over entire length.	N/A		
C.1.3.10b	All cable: check for wear of fraying.	N/A		

Swing Lines: Product Sample Comparison				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.3.11	Check for water or gravity differences that would indicate a leaking swing joint	N/A		

Swing Lines: Target				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.3.12	Target should indicate direction of swing opening (up or down) and height above bottom where suction will be lost with swing on bottom support.	N/A		

C.1.4 ROOFS

Deck Plate Internal Corrosion				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.4.1a	For safety, before accessing roof, check with ultrasonic instrument or lightly use a ball peen hammer to test the deck plate near the edge of the roof for thinning. (Corrosion normally attacks the deck plate at the edge of a fixed roof and at the rafters in the center of the roof first.)	Satisfactory	The roof was found to be safe to access.	
C.1.4.1b	UT the roof plates. Record 5 readings per plate, one in each corner and one in the center of each plate.	N/A	This is a visual only inspection.	

Deck Plate External corrosion				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.4.2	Visually inspect for paint failure, holes, pitting, and corrosion product on the roof deck.	N/A	No Access, Insulated	

Roof Deck Drainage

Section Name	Description	Condition	Finding	Recommendation
C.1.4.3	Look for indication of standing water. (Significant sagging of fixed roof deck indicates potential rafter failure. Large standing water areas on a floating roof indicate inadequate drainage design or, if to one side, a non-level roof with possible leaking pontoons.)	Satisfactory	The roof slope is adequate for proper drainage.	

Roof Insulation				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.4.6a	Visually inspect for cracks or leaks in the insulation weather coat where runoff rain water could penetrate the insulation.	Satisfactory	Cracks were found in the asphalt roof material which were repaired during the inspection as needed.	
C.1.4.6b	Inspect for wet insulation and check roof deck for corrosion and holes near the edge of the insulated area.	Satisfactory	None noted.	
C.1.4.6c	Remove small test sections of insulation and check roof deck for corrosion and holes near the edge of the insulated area.	N/A	Not Required.	

C.1.5 Roof Appurtenances

Sample Hatch				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.5.1a	Inspect condition and functioning of sample hatch cover.	Satisfactory		
C.1.5.1b	On tanks governed by Air	N/A	Not required.	

	Quality Monitoring district rules, check for the condition of seal inside hatch cover.			
C.1.5.1c	Check for corrosion and plugging on thief and gauge hatch cover.	N/A	The tank is not equipped with a thief type gauge hatch.	
C.1.5.1d	Where sample hatch is used to reel gauge stock level, check for marker and tab stating hold-off distance.	N/A	None noted.	
C.1.5.1e	Check for reinforcing pad where sample hatch pipe penetrates the roof deck.	N/A	No access, Insulated.	
C.1.5.1g	Test operation of system.	Satisfactory		
C.1.5.1h	On ultra clean stocks such as JP4, check for presence and condition of protective coating or liner inside sample hatch (preventing rust from pipe getting into sample).	N/A	Not required.	

Gauge Well

Section Name	Description	Condition	Finding	Recommendation
C.1.5.2a	Inspect visible portion of the gauge well for thinning, size of slots, and cover condition.	Satisfactory		
C.1.5.2b	Check for a hold-off distance marker and tab with hold-off distance (legible).	N/A	None noted.	

Fixed Roof Scaffold Support

Section Name	Description	Condition	Finding	Recommendation
C.1.5.3	Inspect scaffold support for corrosion, wear, and structural soundness.	N/A	There is no roof mounted scaffolding.	

Breathers and Vents

Section Name	Description	Condition	Finding	Recommendation
C.2.7.3.a	Inspect and service the breather.	Satisfactory	The tank is equipped with an atmospheric vent.	
C.2.7.3.b	Inspect screens on vents and breathers.	Satisfactory	The Vent screens appear to be in good condition.	

Emergency P/V Vents				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.2.7.4.a	Inspect and service pressure/vacuum hatches. (Setting should be high enough to prevent chattering of breather during normal operation. See breather manufactures guide)	N/A	The tank is not equipped with a P/V Vent.	
C.2.7.4.b	Inspect liquid seal hatches for corrosion and proper liquid level in the seal.	N/A		

Autogauge: Inspection Hatch and Guides (fixed Roofs)				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.5.4a	Check the hatch for corrosion and missing bolts.	Satisfactory		
C.1.5.4b	Look for corrosion on the tape guide's wire anchors.	Satisfactory		

Gauging Platform Drip Ring				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.5.8	On Fixed roof tanks with drip rings under the gauging platform or sampling area, inspect for plugged drain return into the tank.	N/A	Not Equipped.	

Roof Nozzles and Manways

Section Name	Description	Condition	Finding	Recommendation
C.1.5.14	UT all roof nozzles and manways (if couplings are present, obtain readings on pipe adjacent to the coupling, note "readings on pipe" on data sheet). Record one reading on the north, east, south and west side of the neck.	N/A	This is a visual only inspection.	

C.2.12 ACCESS STRUCTURES

Handrails

Section Name	Description	Condition	Finding	Recommendation
C.2.12.1a	Identify and report type (steel pipe, galvanized pipe, square tube, or angle) and size of handrails and handrail heights.	Satisfactory	The handrails are made from 3" angle 42.0" high with 12.0", 22.5", & 33.0" midrail and a 4.0" toe plate	
C.2.12.1.b	Inspect for pitting and holes, paint failure.	Satisfactory	None noted.	
C.2.12.1.c	Inspect attachment welds.	Satisfactory	The welds are acceptable.	
C.2.12.1.d	Identify cold joints and sharp edges. Inspect the handrails and mid-rails.	Satisfactory	None noted	
C.2.12.1.e	Inspect safety drop bar (or safety chain) for corrosion, functioning, and length.	N/A	Not Equipped.	

Platform Frame

Section Name	Description	Condition	Finding	Recommendation
C.2.12.2.a	Inspect frame for corrosion and paint failure.	Satisfactory		
C.2.12.2.b	Inspect the attachment of frame to supports and supports to tank for corrosion and weld failure.	Satisfactory	None noted.	
C.2.12.2.c	Check reinforcing pads where supports are	N/A	No access, insulated.	

	attached to shell or roof.			
C.2.12.2.d	Inspect the surface that deck plate or grating rests on, for thinning and holes.	Satisfactory	None noted.	
C.2.12.2.e	Check that flat-surface-to-flat-surface junctures are seal-welded.	Satisfactory	The platform is formed from a single piece of diamond plate steel.	

Deck Plate and Grating				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.2.12.3.a	Inspect deck plate for corrosion-caused thinning or holes (not drain holes) and paint failure.	Satisfactory	None Noted.	
C.2.12.3.b	Inspect plate-to-frame weld for rust scale buildup.	Satisfactory	None noted.	
C.2.12.3.c	Inspect grating for corrosion-caused thinning of bars and failure of welds.	Satisfactory	The platform is formed from a single piece of diamond plate steel.	
C.2.12.3.d	Check grating tie down clips. Where grating retrofitted to replace plate, measure the rise of the step below and above the grating surface and compare with other risers on the stairway.	N/A		

Stairway Stringers				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.2.12.4.a	Inspect spiral stairway stringers for corrosion, paint failure, and weld failure. Inspect attachment of stairway treads to stringer.	Satisfactory	None noted.	
C.2.12.4.b	Inspect stairway supports to shell welds and reinforcing pads.	N/A	No access, insulated. The attachment appears sound.	
C.2.12.4.c	Inspect steel support attachment to concrete	N/A	The stairway does not make contact	

	base for corrosion.		with the ground.	

Tank Side Ladders				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C2.12.6.a	Inspect ladder supports to shell welds and reinforcing pads.	N/A	The tank is not equipped with a ladder.	
C2.12.6.b	Inspect ladder cage for corrosion. Inspect attachment welds.	N/A		
C2.12.6.c	Inspect ladder rungs for corrosion and thinning.	N/A		

6.0 Shell Nozzle and Appurtenance Table

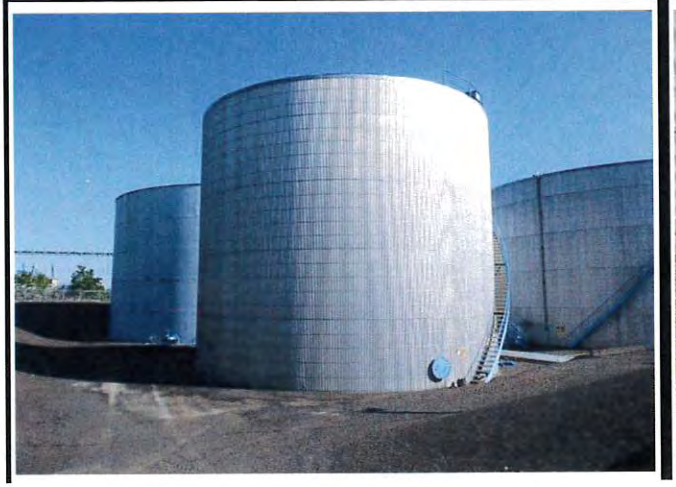
Item	Type	Service	Pipe Size (in)	Station (ft)	Center Line Elevation (ft)	API Allowable Elevation (ft)	Repad Width (in)	Repad Height (in)	Tell Tale Hole	Repad Shape	Weld Spacing (in)	Distance From Shell to Flange Face (in)
A	Manway	Access	30.0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
B	Autogauge	Gauging	N/A	4.9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C	Ground Stud	Electrical Ground	N/A	26.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
D	Ground Stud	Electrical Ground	N/A	67.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
E	Manway	Access	30.0	87.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
F	Bottom of Stairway	Roof Access	N/A	94.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
G	Nozzle	Air Line	8.0	108.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
G-1	Coupling	Thermowell, Temp Gauge	0.75	11.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
H	Ground Stud	Electrical Ground	N/A	113.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
I	Coupling	Thermowell, Temp Gauge	0.75	136.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
I-1	Top of Stairway	Roof Access	N/A	139.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
J	Nozzle	Mixer Nozzle	12.0	141.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
K	Coupling	Probe	N/A	143.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
L	Nozzle	Heater Line	4.0	145.3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
M	Nozzle	Heater Line	2.0	145.3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
N	Nozzle	Heater Line	4.0	146.9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
O	Nozzle	Heater Line	2.0	146.9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
O-1	Coupling	Probe	2.0	139.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
P	Nozzle	Transfer	10.0	153.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Q	Ground Stud	Electrical Ground	N/A	158.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
R	Nozzle	Transfer	6.0	161.8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

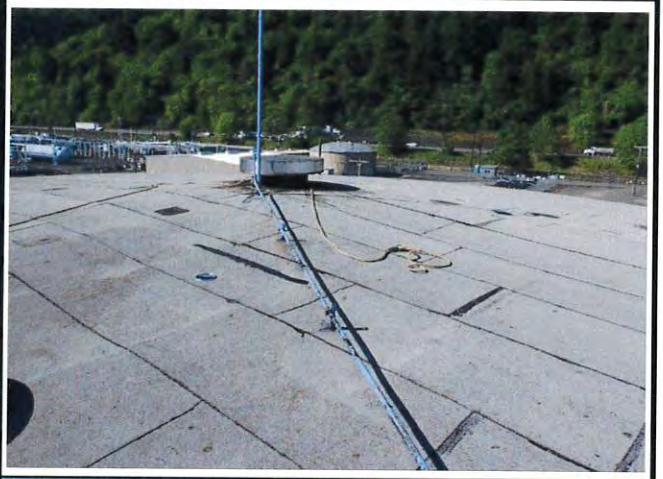
S	Nozzle	Blinded	2.0	163.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
T	Nozzle	Transfer	8.0	165.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

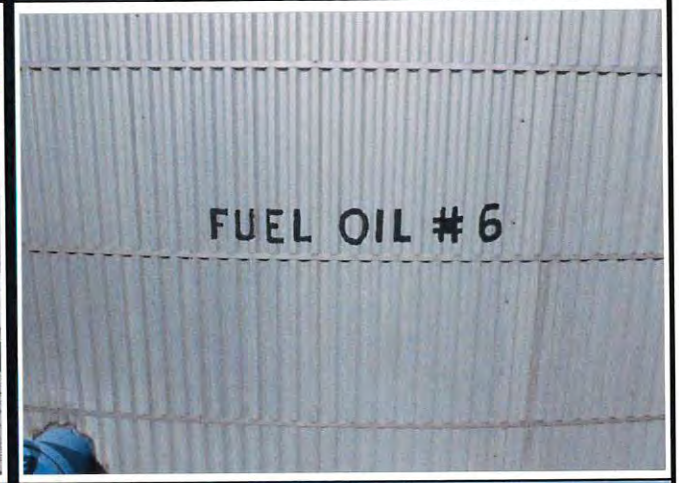
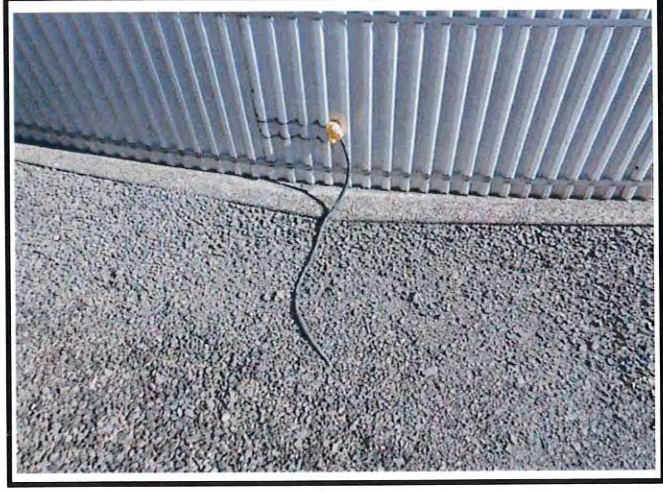
Note: The data represented in the weld spacing column is the minimum spacing measured. H, V, or N indicates which is the minimum distance from the nozzle measured. (H=Horizontal Weld, V=Vertical Weld, N=Nozzle Weld)

Repad Shapes

7.0 Photographs

North	East
	
South	**Foundation (Typical)**
	

Manway A"	General Roof Overview
	
Autogauge	**Containment Drain**
	

Transfer Piping	Tank Contents
	
Ground (Typical)	**Sample Well**
	

8.0 NDE Equipment Used

The equipment utilized for the inspection of the tank included of the following :

Pit Gauge

Manufacturer	Model	Serial No
W.R. Thorpe	1	1.979.912

9.0 Inspector Certifications

energy API | AMERICAN PETROLEUM INSTITUTE
Individual Certification Programs: ICP™

API Individual Certification Programs

verifies that

Michael Alec Arpino

has met the requirements for API certification

API-653 Aboveground Storage Tank Inspector

Certification Number *77549*

Original Certification Date *December 31, 2017*

Current Certification Date *December 31, 2017*

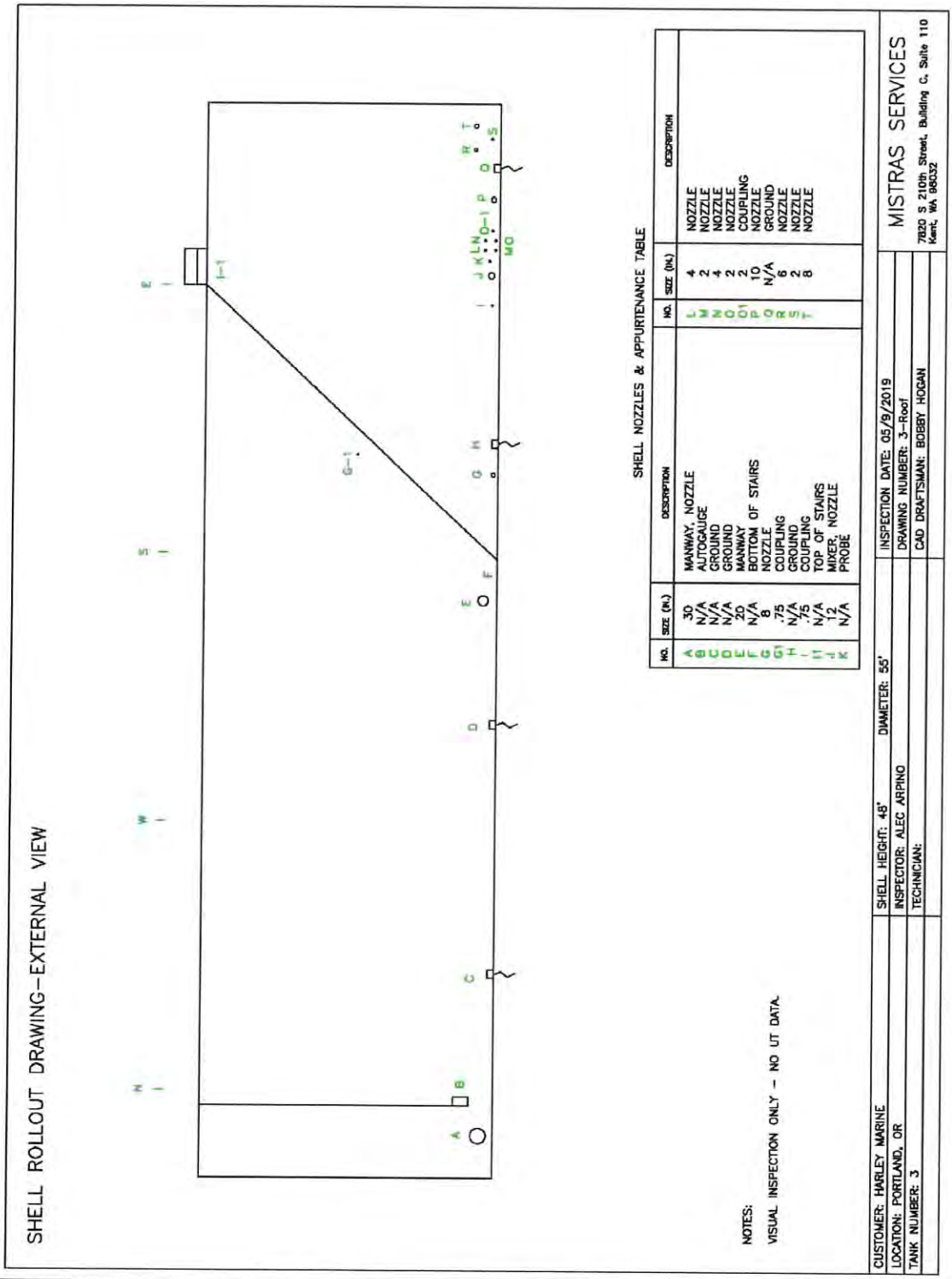
Expiration Date *December 31, 2020*

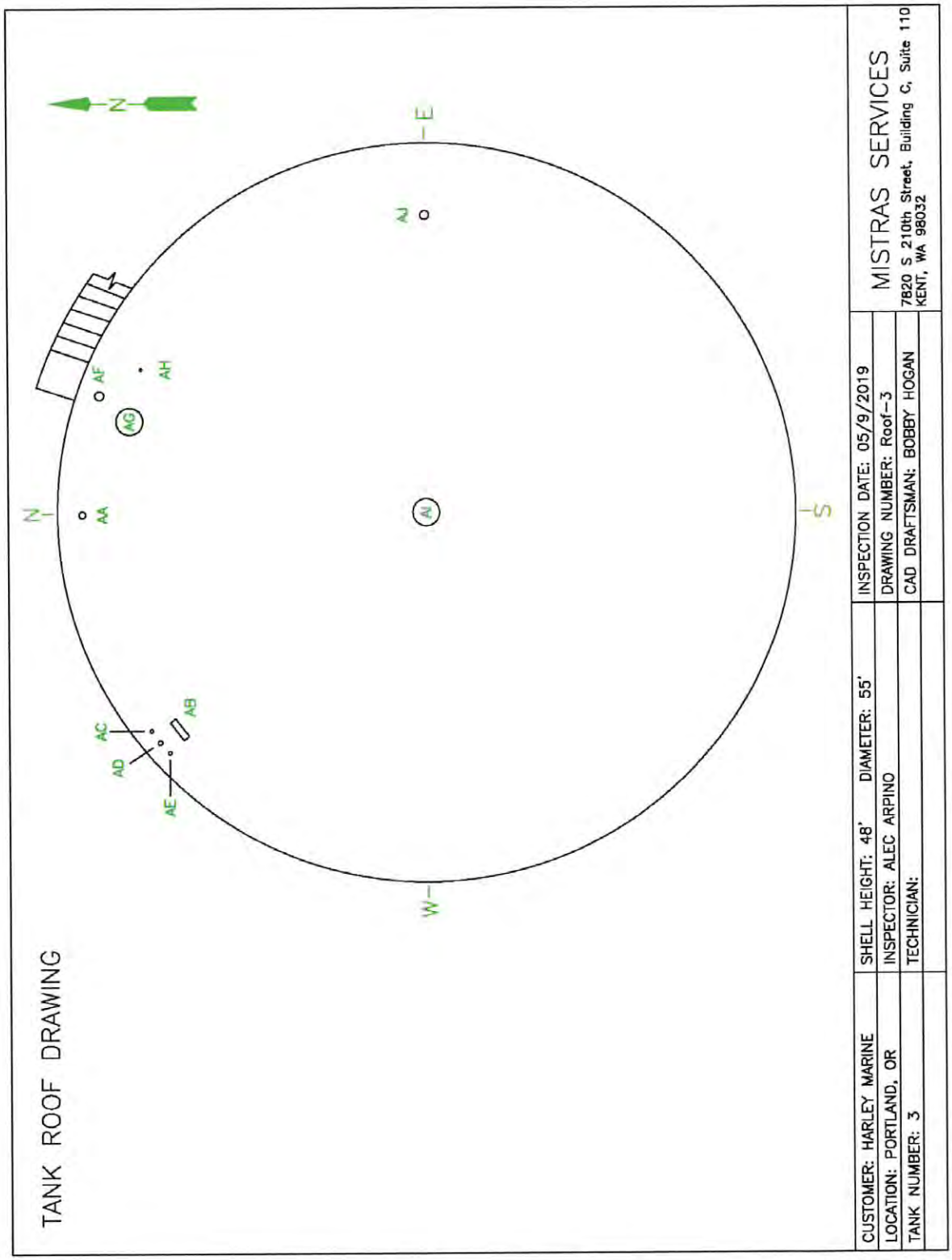
Manager, Individual Certification Programs

ICP

2015-027 | PDF

10.0 Drawings




TANK ROOF DRAWING
N
E
S
W
AA
AB
AC
AD
AE
AF
AG
AH
AJ
AN
CUSTOMER: HARLEY MARINE
LOCATION: PORTLAND, OR
TANK NUMBER: 3
SHELL HEIGHT: 48'
DIAMETER: 55'
INSPECTOR: ALEC ARPINO
TECHNICIAN:
INSPECTION DATE: 05/9/2019
DRAWING NUMBER: Roof-3
CAD DRAFTSMAN: BOBBY HOGAN
MISTRAS SERVICES
7820 S 210th Street, Building C, Suite 110
KENT, WA 98032

Above Ground Storage Tank Inspection Report

In accordance with API 653

Harley Marine Service

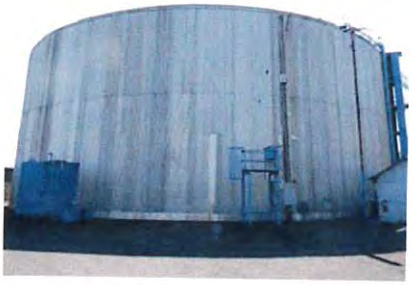
Tank 4

In Service Inspection

Portland, OR

May 9, 2019 to May 9, 2019

Report Number 40654310-2



Prepared By :
7820 South 212th St. St. 110
Kent, WA, 98032

www.mistrasgroup.com

MISTRAS
A World of NDT Solutions
Services Division

Inspection Date
May 9, 2014
2019

Table of Contents

1.0 Job Information

Job Location :	Harley Marine Service
	7900 NW St. Helens Road
	Portland, OR
	97210
Customer Representative :	Burt Nye
Customer Phone Number :	503-240-3456
Job Charge Number :	22403
Report Number :	40654310-2
Mistras Work Order Number :	T60458-40654310
Inspection Personnel Provided :	Alec Arpino
	API 653 Certified Inspector
	API 653 (77549)/ MT

2.0 Tank Inspection Data Sheet

General :

Tank Number	4
Owner	Harley Marine Service
Design Standard	Unknown
Tank Location	Portland, OR
Product	High Sulfur Fuel Oil
Specific Gravity	1.06
Manufacturer	Unknown
Manufacture Date	Circa 1930
Cathodic Protection	No
Data Plate Present	No
Data Plate Condition	N/A

Dimensions :

Diameter (ft)	117.00
Height (ft)	41.52
Capacity Gross (bbl (oil))	76,595.64
Capacity Nominal (bbl (oil))	79,506.31

Geometry :

Foundation	Earthen Pad
Bottom	Riveted
Shell	Riveted
Fixed Roof Type	Cone
Floating Roof Type	None
Primary Seal	Not Applicable
Secondary Seal	Not Applicable

Access :

Stairway	Radial Staircase
Roof Access	Yes

Coatings :

Shell	Insulated
Roof	Insulated

3.0 Inspection Summary

HISTORY

On May 9th, 2019, a limited In-Service Inspection was performed on tank 4, which is a fixed roof tank in #6 Fuel Oil service. The tank was built circa 1930. The manufacturer and construction code are both unknown. Both an In-Service and Out-of Service inspections were performed in 2014. The scope of the evaluation for this tank consisted of a visual inspection only; therefore, ultrasound (UT) and settlement survey were not performed.

FOUNDATION

Tank 4 rests on an earthen foundation within an earthen containment area. The asphalt ring surrounding the tank is sloping inward, directing rain water under the tank and undermining is evident on the northeast side of the tank which should be backfilled.

SHELL

The shell for tank 4 is riveted and insulated. Due to the insulation, the visual inspection of the shell was limited. There are punctures in the aluminum lagging and missing sealant around the shell attachments where the gauging system was removed that should be sealed to mitigate water intrusion.

NOZZLES & APURTENANCES

Due to insulation, a visual inspection of the nozzles and appurtenances was limited. Overall, the nozzles appear to be in serviceable condition. On the west side of the tank, the old sight gauging system was removed and insulation and lagging was installed in its place. There are areas that should be sealed, especially the vertical shell attachments which go through the insulation.

FIXED ROOF

The roof is covered with painted foam insulation. The insulation is blistering is numerous areas allowing rainwater to come in contact with the deck plates. The roof is also distorted and should be monitored during monthly inspections.

4.0 Summarized Recommendations

INSPECTION RECOMMENDATIONS	
Recommendation ID	REC - 1
Component	**C.1.1 FOUNDATION**
Recommendation Headline	C.1.1.1c Undermining
Recommendation Description	**Findings:** There is a cavity present on the northeast side of the tank which extends underneath of the tank. **Recommendations:** The cavity should be backfilled as needed to prevent water from flowing underneath the tank.
Recommendation Priority	Mandatory
Status	
Author Name	Alec Arpino API 653 Certification No. 77549

INSPECTION RECOMMENDATIONS	
Recommendation ID	REC - 2
Component	**C.1.1 FOUNDATION**
Recommendation Headline	C.1.1.2.a Asphalt Ring
Recommendation Description	**Findings:** The asphalt ring surrounding the tank is sloped inward, preventing drainage away from the foundation. **Recommendations:** Modify or replace the asphalt to allow for proper drainage away from the tank.
Recommendation Priority	Optional
Status	
Author Name	Alec Arpino API 653 Certification No. 77549

INSPECTION RECOMMENDATIONS	
Recommendation ID	REC - 3
Component	**C.1.3 SHELL APPURTENANCES**
Recommendation Headline	C.1.3.1d Insulation Sealant
Recommendation Description	**Findings:** There are numerous holes evident through the insulation lagging. Additionally, there is no caulk/ sealant present on the shell attachments on the west side of the tank where the sight gauge system was removed. **Recommendations** Seal or repair the insulation as needed to mitigate water intrusion.
Recommendation Priority	Optional
Status	
Author Name	Alec Arpino API 653 Certification No. 77549

INSPECTION RECOMMENDATIONS	
Recommendation ID	REC - 6
Component	**C.1.4 ROOFS**
Recommendation Headline	C.1.4.6a Roof Insulation
Recommendation Description	**Findings:** There are numerous holes through the foam insulation on the roof. **Recommendations** Seal the holes on the roof to mitigate water intrusion.
Recommendation Priority	Optional
Status	
Author Name	Alec Arpino API 653 Certification No. 77549

All repairs/modifications should be made in accordance with API Standard 653. After repairs/modifications have been made, they should be inspected by the methods described in API 653.

Inspectors Signature:

M. Alec Arpino
API 653
Certification No. 77549 Exp. 12/31/2020

Reviewed by:

George Roni

George Roni, PE
API 653 Cert. No. 2042, Exp. 4/30/17

Mistras Services has evaluated the condition of this tank based on the observations and measurements made by the tank Inspector. While our evaluation accurately describes the condition of the tank at the time of inspection, the tank owner/operator must independently assess the inspection information/report provided by Mistras Services and any conclusions reached by the tank owner/operator and any action taken or omitted to be taken are the sole responsibility of the owner/operator. With respect to inspection and testing, Mistras Services warrants only that the services have been performed in accordance with accepted industry practice. If any such services fail to meet the foregoing warranty, Mistras Services shall re-perform the service to the same extent and on the same conditions as the original service.

The preceding paragraph sets forth the exclusive remedy for claims based on failure or of defect in materials or services, whether such claim is made in contract or tort (including negligence) and however instituted, and, upon expiration of the warranty period, all such liability shall terminate. The foregoing warranty is exclusive and in lieu of all other warranties, whether written, oral, implied or statutory. NO IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR PURPOSE SHALL APPLY, nor shall Mistras Services be liable for any loss or damage whatsoever by reason of its failure to discover, report, repair or modify latent defects or defects inherent in the design of any tank inspected. In no event, whether a result of breach of contract, warranty or tort (including negligence) shall Mistras Services be liable for any consequential or incidental damages including, but not limited to, loss of profit or revenues, loss of use of equipment tested or services by Mistras Services or any associated damage to facilities, down-time costs or claims of other damages.

5.0 API 653 Checklists

Harley Marine Service has contracted Mistras Group, Inc. to perform an in service visual inspection on Tank 4 located in Portland, OR. This inspection was performed in accordance with the current criteria set forth in API Standard 653 (5th Edition, November 2014, Addendum 1, April 2018).

Tank 4 is an Above Ground Storage Tank in High Sulfur Fuel Oil service. This tank is 117.00 ft in diameter, and 41.52 ft in height and has a cone fixed roof.

The following details all inspection findings and recommendations.

C.1.1 FOUNDATION

ALL				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.1	Measure foundation levelness and bottom elevations (see Appendix B for extent of measurements).	N/A	This was a visual only inspection.	

Concrete Ring				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.1.1a	Inspect for broken concrete, spalling, and cracks, particularly under backup bars used in welding butt welded annular rings under the shell.	N/A	The Tank does not have a concrete ring wall. However it does have concrete around a portion of the tank.	
C.1.1.1b	Inspect drain openings in ring, back of water draw basins and top surface of ring for indications of bottom leakage.	Satisfactory	None noted.	
C.1.1.1c	Inspect for cavities under foundation and vegetation against bottom of tank.	Optional	Cavity is evident on the NE side of the tank.	It is recommended that the undermining be backfilled.
C.1.1.1d	Check that runoff rainwater from the shell drains away from tank.	Satisfactory	Asphalt ring needs modifications.	See C.1.1.2.a
C.1.1.1e	Check for settlement around perimeter of tank.	Satisfactory	None noted. Visual Only.	

Asphalt				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.1.2.a	Check for settling of tank into asphalt base which would direct runoff rain water under the tank instead of away from it.	Optional	The asphalt ring around the tank is sloping toward the tank.	The ring should be modified so water drains away from the tank.
C.1.1.2.b	Look for areas where leaching of oil has left rock filler exposed, which indicates hydrocarbon leakage.	N/A		

Rock				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.1.4	Presence of crushed rock under the steel bottom usually results in severe underside corrosion. Make a note to do additional bottom plate examination (MFL, ultrasonic, hammer testing, or turning of coupons) when the tank is out of service.	Satisfactory	The tank appears to be sitting on compacted earth.	

Site Drainage				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.1.5.a	Check site drainage away from the tank and associated piping & manifolds.	Needs Attention	See C.1.1.2.a above.	
C.1.1.5.b	Check operation of dike drains.	Satisfactory		
C.1.1.5.c	Check for settling of tank into asphalt base, oiled dirt or sand which would direct runoff rain water under the tank instead of away from it.	Needs Attention	See Item C.1.1.1.d above.	

Housekeeping				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.1.6	Inspect the area for buildup of trash, vegetation, and other inflammables buildup.	Satisfactory	None noted.	

Cathodic Protection				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.1.7	Review cathodic potential readings	N/A	The tank does not have a cathodic protection system.	

C.1.2 SHELLS

External Visual Inspection				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.2.1.a	Visually inspect for paint failures, pitting, and corrosion.	Satisfactory	Inspection limited due to insulation.	
C.1.2.1.b	Clean off the bottom angle area (chime) and inspect for corrosion and thinning on plate and weld.	N/A	The tank has the original riveted bottom with an inward facing angle.	
C.1.2.1.b (1)	Obtain thickness readings on the chime. One reading shall be obtained every 10 feet. Reading No. 1 shall be located at the centerline of manway A.	N/A		
C.1.2.1.b (2)	Record the minimum and maximum chime widths. The measurements shall be made from the toe of the shell to chime weld to the edge.	N/A		
C.1.2.1.c	Inspect the bottom-to-foundation seal, if any.	N/A		

C.1.2.1.d	UT the shell plates to verify remaining thickness. Using a crawler, obtain a minimum of 4 equally spaced drops around the tank, readings shall be obtained on all courses. At a minimum, readings should be taken on all courses from the ladder or stairs.	N/A	This is a 5 year API Visual Inspection only.	

Riveted Shell Inspection				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.2.3.a	Inspect external surface for rivet and seam leaks.	Satisfactory	Inspection limited due to insulation.	
C.1.2.3.b	Locate leaks by sketch or photo (location will be lost when shell is abrasive cleaned for painting).	Satisfactory	See Above	
C.1.2.3.c	Inspect rivets for corrosion loss and wear.	Satisfactory		
C.1.2.3.d	Inspect vertical seams to see if they have been full fillet-lap welded to increase joint efficiency.	N/A		
C.1.2.3.e	If no records exist of vertical riveted seams, dimension and sketch (or photograph) the rivet pattern: number of rows, rivet size, pitch length and note whether the joint is butt riveted or lap riveted.	N/A	No Access, Insulated.	

C.1.3 SHELL APPURTENANCES

Manways and Nozzles				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.3.1a	Inspect for corrosion, cracks or signs of leakage on weld joint at nozzles, manways and reinforcing plates.	N/A	No Access due to insulation.	
C.1.3.1b	Inspect for shell plate dimpling around nozzles, caused by excessive pipe deflection.	N/A		
C.1.3.1c	Inspect for flange leaks around bolting and leaking threaded connections on shell couplings and nipples.	Satisfactory	None noted. Were accessible.	
C.1.3.1d	Inspect sealing of insulation around manways and nozzles.	Optional	There are numerous punctures in the aluminum lagging.	Seal or repair as needed.
C.1.3.1e	Check for inadequate manway flange and cover thickness on mixer manways.	N/A	The tank is not equipped with a mixer.	
C.1.3.1f	Record all nozzle and appurtenance information on the "Shell Nozzle & Appurtenance Table". The station, heights, pipe size, repad size, repad type, weld spacing and distance from shell to flange face shall be recorded.	Satisfactory	Inspection limited due to insulation.	
C.1.3.1g	UT all shell nozzles and manways. Record one reading on the top, right, bottom and lefts sides of each neck. Also, record one reading on each repad, cover plate and flange.	N/A	This is a 5 year API Visual Inspection only.	

Tank Piping Manifolds				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.3.2a	Inspect manifold piping, flanges, and valves for leaks.	Satisfactory	None noted.	
C.1.3.2b	Inspect firefighting system components.	N/A	The tank is not equipped with a fire suppression system.	
C.1.3.2c	Check for anchored piping which would be hazardous to the tank shell or bottom connections during the earth movement.	Satisfactory		
C.1.3.2d	Check for adequate thermal pressure relief of piping to the tank.	N/A	Not Equipped.	
C.1.3.2e	Check operation of regulators for tanks with purge gas systems.	N/A	The tank is not equipped with a purge gas system.	
C.1.3.2f	Check sample connections for leaks and for proper valve operation.	N/A	The tank is not equipped with a sample station.	
C.1.3.2g	Check for damage and test the accuracy of temperature indicators. Record the brand, model and range of temperature indicators.	Satisfactory	Weston 30° to 120° F Temperature at the time of the inspection was 72° F	
C.1.3.2h	Check welds on shell-mounted davit clips above valves 6 in. and larger	N/A	There are no shell mounted davits.	

Autogauge System				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.3.3a	Inspect autogauge tape guide and lower sleeve housing (floating swings) for leaks.	N/A	The tank is not equipped with an autogauge.	
C.1.3.3b	Inspect autogauge head for damage. (Note Brand	N/A		

	Model No. and Serial No.)			
C.1.3.3c	Bump the checker on autogauge head for proper movement of tape.	N/A		
C.1.3.3f	Compare actual product level to the reading on the autogauge (maximum variation is 2 in).	N/A		
C.1.3.3h	Inspect condition of board and legibility of board-type autoguages.	N/A		
C.1.3.3i	Test freedom of movement of marker and float.	N/A		

Shell Mounted Sample Stations				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.3.4a	Inspect sample lines for function of valves and plugging of lines, including drain or return-to-tank line.	N/A	The tank is not equipped with a sample station.	
C.1.3.4b	Check circulation pump for leaks and operating problems.	N/A		
C.1.3.4c	Test bracing and supports for sample lines and equipment.	N/A		

Heater (Shell Mounted Manway)				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.3.5	Inspect condensate drain for presence of oil indicating leakage.	N/A	Heating of the tank is not done through the manway.	

Mixer				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.3.6a	Inspect for proper mounting flange and support.	N/A	The tank is not equipped with a mixer.	

C.1.3.6b	Inspect for leakage.	N/A		
C.1.3.6c	Inspect condition of power lines and connections to mixer.	N/A		

Swing Lines: Winch Operation				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.3.7a	Non-floating. Raise, then lower the swing line with the winch, and check for cable tightness to confirm that swing line lowered properly.	N/A	There is no swing line winch nor is there any external swing line equipment I.E. targets markers etc....	
C.1.3.7b	Floating. With tank half full or more, lower the swing line, then let out cable and check if swing has pulled cable tight, indicating that the winch is operating properly.	N/A		
C.1.3.7c	Indicator. Check that the indicator moves in the proper direction: Floating swing line indicators show a lower level as cable is wound up on the winch. Non-floating swing line indicators show the opposite.	N/A		

Swing Lines: External Guide System				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.3.8	Check for leaks at threaded and flanged joints.	N/A		

Swing Lines: Identify Ballast Varying Need				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.3.9	Check for significant difference in stock specific gravity.	N/A		

Swing Lines: Cable Material and Condition				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.3.10a	For no stainless steel cable, check for corrosion over entire length.	N/A		
C.1.3.10b	All cable: check for wear of fraying.	N/A		

Swing Lines: Product Sample Comparison				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.3.11	Check for water or gravity differences that would indicate a leaking swing joint	N/A		

Swing Lines: Target				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.3.12	Target should indicate direction of swing opening (up or down) and height above bottom where suction will be lost with swing on bottom support.	N/A		

C.1.4 ROOFS

Deck Plate Internal Corrosion				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.4.1a	For safety, before accessing roof, check with ultrasonic instrument or lightly use a ball peen hammer to test the deck plate near the edge of the roof for thinning. (Corrosion normally attacks the deck plate at the edge of a fixed roof	Satisfactory	The roof was found to be safe to access.	

	and at the rafters in the center of the roof first.)			
C.1.4.1b	UT the roof plates. Record 5 readings per plate, one in each corner and one in the center of each plate.	N/A	This is a 5 year API Visual Inspection only.	

Deck Plate External corrosion				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.4.2	Visually inspect for paint failure, holes, pitting, and corrosion product on the roof deck.	N/A	No Access, Insulated	

Roof Deck Drainage				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.4.3	Look for indication of standing water. (Significant sagging of fixed roof deck indicates potential rafter failure. Large standing water areas on a floating roof indicate inadequate drainage design or, if to one side, a non-level roof with possible leaking pontoons.)	Satisfactory	There was some minor standing water however not significant enough to warrant mechanical repairs.	

Roof Insulation				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.4.6a	Visually inspect for cracks or leaks in the insulation weather coat where runoff rain water could penetrate the insulation.	Optional	There are several punctures through the foam allowing water to penetrate.	Repair as needed to mitigate water intrusion.
C.1.4.6b	Inspect for wet insulation and check roof deck for corrosion and holes near the edge of the insulated area.	Satisfactory	None noted	
C.1.4.6c	Remove small test sections of insulation and check roof deck for	N/A	Not Required.	

	corrosion and holes near the edge of the insulated area.			

C.1.5 Roof Appurtenances

Sample Hatch				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.5.1a	Inspect condition and functioning of sample hatch cover.	Satisfactory		
C.1.5.1b	On tanks governed by Air Quality Monitoring district rules, check for the condition of seal inside hatch cover.	N/A	Not required.	
C.1.5.1c	Check for corrosion and plugging on thief and gauge hatch cover.	N/A	The tank is not equipped with a thief type gauge hatch.	
C.1.5.1d	Where sample hatch is used to reel gauge stock level, check for marker and tab stating hold-off distance.	N/A	None noted.	
C.1.5.1e	Check for reinforcing pad where sample hatch pipe penetrates the roof deck.	N/A	No access, Insulated.	
C.1.5.1g	Test operation of system.	Satisfactory		
C.1.5.1h	On ultra clean stocks such as JP4, check for presence and condition of protective coating or liner inside sample hatch (preventing rust from pipe getting into sample).	N/A	Not required.	

Gauge Well				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.5.2a	Inspect visible portion of the gauge well for thinning, size of slots, and cover condition.	N/A	The tank does not appear to be equipped with a gauge well.	
C.1.5.2b	Check for a hold-off	N/A		

	distance marker and tab with hold-off distance (legible).			

Fixed Roof Scaffold Support				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.5.3	Inspect scaffold support for corrosion, wear, and structural soundness.	N/A	There is no roof mounted scaffolding.	

Breathers and Vents				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.2.7.3.a	Inspect and service the breather.	Satisfactory	The tank is equipped with four atmospheric vents.	
C.2.7.3.b	Inspect screens on vents and breathers.	Satisfactory	The Vent screens appear to be in good condition.	

Emergency P/V Vents				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.2.7.4.a	Inspect and service pressure/vacuum hatches. (Setting should be high enough to prevent chattering of breather during normal operation. See breather manufactures guide)	N/A	The tank is not equipped with a P/V Vent.	
C.2.7.4.b	Inspect liquid seal hatches for corrosion and proper liquid level in the seal.	N/A		

Autogauge: Inspection Hatch and Guides (fixed Roofs)				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.5.4a	Check the hatch for corrosion and missing bolts.	N/A	Not equipped.	
C.1.5.4b	Look for corrosion on the tape guide's wire anchors.	N/A		

Gauging Platform Drip Ring				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.5.8	On Fixed roof tanks with drip rings under the gauging platform or sampling area, inspect for plugged drain return into the tank.	N/A	Not Equipped.	

Roof Nozzles and Manways				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.5.14	UT all roof nozzles and manways (if couplings are present, obtain readings on pipe adjacent to the coupling, note "readings on pipe" on data sheet). Record one reading on the north, east, south and west side of the neck.	Satisfactory	This is a 5 year API Visual Inspection only.	

C.2.12 ACCESS STRUCTURES

Handrails				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.2.12.1a	Identify and report type (steel pipe, galvanized pipe, square tube, or angle) and size of handrails and handrail heights.	Satisfactory	The handrails are made from 2" Pipe 43.0" high with a 25" high mid rail and no toe plate.	
C.2.12.1.b	Inspect for pitting and holes, paint failure.	Satisfactory		

C.2.12.1.c	Inspect attachment welds.	Satisfactory		
C.2.12.1.d	Identify cold joints and sharp edges. Inspect the handrails and mid-rails.	Satisfactory	None noted	
C.2.12.1.e	Inspect safety drop bar (or safety chain) for corrosion, functioning, and length.	N/A	None noted	

Platform Frame				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.2.12.2.a	Inspect frame for corrosion and paint failure.	N/A	The stairway terminates at the roof line with no platform.	
C.2.12.2.b	Inspect the attachment of frame to supports and supports to tank for corrosion and weld failure.	N/A		
C.2.12.2.c	Check reinforcing pads where supports are attached to shell or roof.	N/A		
C.2.12.2.d	Inspect the surface that deck plate or grating rests on, for thinning and holes.	N/A		
C.2.12.2.e	Check that flat-surface-to-flat-surface junctures are seal-welded.	N/A		

Deck Plate and Grating				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.2.12.3.a	Inspect deck plate for corrosion-caused thinning or holes (not drain holes) and paint failure.	N/A		
C.2.12.3.b	Inspect plate-to-frame weld for rust scale buildup.	N/A		
C.2.12.3.c	Inspect grating for corrosion-caused thinning of bars and failure of welds.	N/A		
C.2.12.3.d	Check grating tie down	N/A		

	clips. Where grating retrofitted to replace plate, measure the rise of the step below and above the grating surface and compare with other risers on the stairway.			

Stairway Stringers				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.2.12.4.a	Inspect spiral stairway stringers for corrosion, paint failure, and weld failure. Inspect attachment of stairway treads to stringer.	Satisfactory	The roof is accessed by a radial stairway from the adjacent tank.	
C.2.12.4.b	Inspect stairway supports to shell welds and reinforcing pads.	Satisfactory	No access, insulated. The attachment appears sound.	
C.2.12.4.c	Inspect steel support attachment to concrete base for corrosion.	N/A		

Tank Side Ladders				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C2.12.6.a	Inspect ladder supports to shell welds and reinforcing pads.	Satisfactory	The tank is not equipped with a ladder.	
C2.12.6.b	Inspect ladder cage for corrosion. Inspect attachment welds.	Satisfactory		
C2.12.6.c	Inspect ladder rungs for corrosion and thinning.	Satisfactory	None noted.	

6.0 Nozzle and Appurtenance Tables

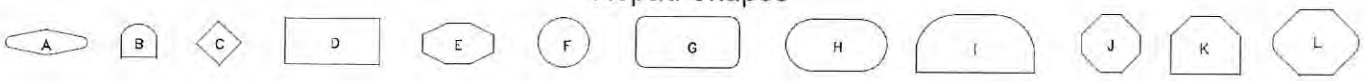
6.1 Shell Nozzle and Appurtenance Table

Item	Type	Service	Pipe Size (in)	Station (ft)	Center Line Elevation (ft)	API Allowable Elevation (ft)	Repad Width (in)	Repad Height (in)	Tell Tale Hole	Repad Shape	Weld Spacing (in)	Distance From Shell to Flange Face (in)
A	Manway	Access	20.0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
B	Nozzle	Transfer	16.0	20.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C	Nozzle	Transfer	20.0	26.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
D	Pipe Nipple	Unknown	2.5	25.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
E	Pipe Nipple	Unknown	2.5	26.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
F	Coupling	Sight Glass	1.0	43.7	4	6.00	N/A	N/A	N/A	N/A	N/A	N/A
G	Coupling	Sight Glass	1.0	45	60	6.00	N/A	N/A	N/A	N/A	N/A	N/A
H	Coupling	Sight Glass	1.0	43.7	73	6.00	N/A	N/A	N/A	N/A	N/A	N/A
I	Coupling	Sight Glass	1.0	43.7	121	6.00	N/A	N/A	N/A	N/A	N/A	N/A
J	Coupling	Sight Glass	1.0	45	133.25	6.00	N/A	N/A	N/A	N/A	N/A	N/A
K	Coupling	Sight Glass	1.0	45	181	6.00	N/A	N/A	N/A	N/A	N/A	N/A
L	Coupling	Sight Glass	1.0	43.7	192.7	6.00	N/A	N/A	N/A	N/A	N/A	N/A
M	Coupling	Sight Glass	1.0	43.7	240.75	6.00	N/A	N/A	N/A	N/A	N/A	N/A
N	Coupling	Sight Glass	1.0	45	252.75	6.00	N/A	N/A	N/A	N/A	N/A	N/A
O	Coupling	Sight Glass	1.0	45	300.75	6.00	N/A	N/A	N/A	N/A	N/A	N/A
P	Coupling	Sight Glass	1.0	43.7	312.75	6.00	N/A	N/A	N/A	N/A	N/A	N/A
Q	Coupling	Sight Glass	1.0	43.7	360.5	6.00	N/A	N/A	N/A	N/A	N/A	N/A
R	Coupling	Sight Glass	1.0	45	373.25	6.00	N/A	N/A	N/A	N/A	N/A	N/A
S	Coupling	Sight	1.0	45	421.25	6.00	N/A	N/A	N/A	N/A	N/A	N/A

		Glass										
T	Coupling	Sight Glass	1.0	43.7	434	6.00	N/A	N/A	N/A	N/A	N/A	N/A
U	Ladder	Roof Access & Sight Glass Access	N/A	49.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
V	Nozzle	Transfer	8.0	88.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
W	Nozzle	Bottom Draw	N/A	95.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Note: The data represented in the weld spacing column is the minimum spacing measured. H, V, or N indicates which is the minimum distance from the nozzle measured. (H=Horizontal Weld, V=Vertical Weld, N=Nozzle Weld)

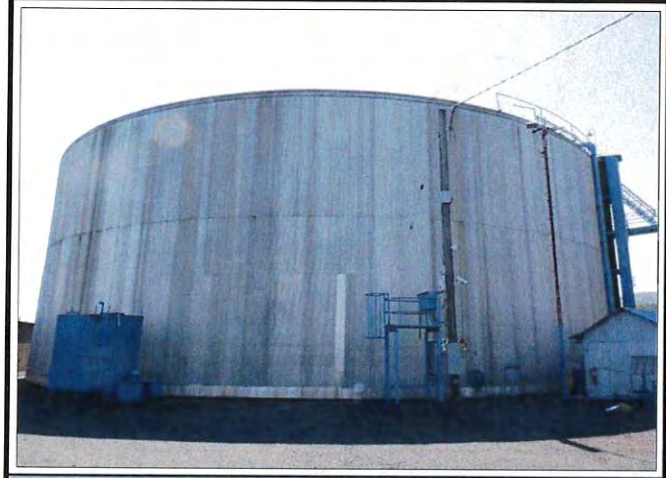
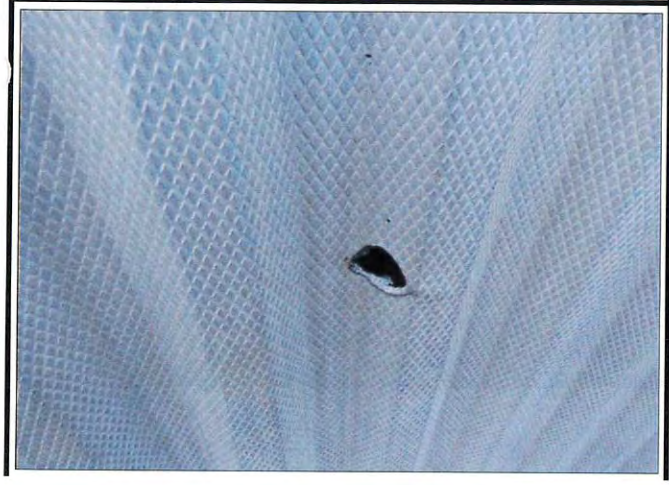
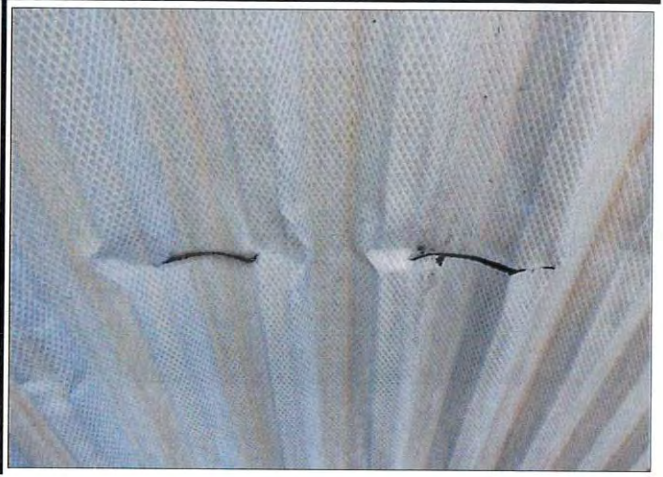
Repad Shapes

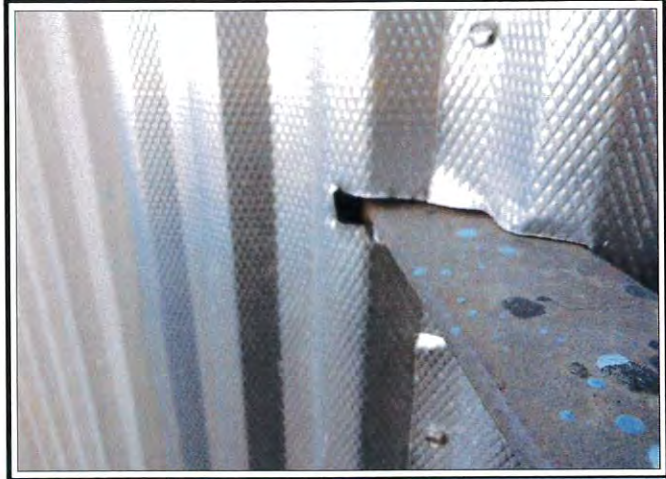


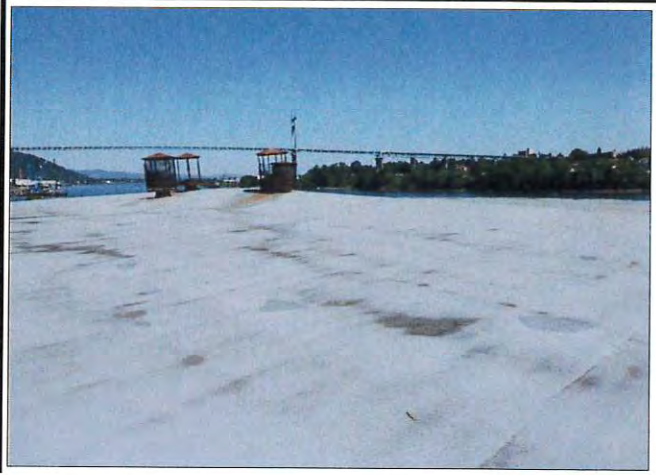
6.2 Roof Nozzle and Appurtenance Table

Item	Type	Service	Pipe Size (in)	Comments
AA	Vent	Venting	8.0	
AB	Vent	Venting	8.0	
AC	Vent	Venting	8.0	
AD	Vent	Venting	8.0	
AE	Hatch	Access	48.0	
AF	Hatch	Access	48.0	
AG	Hatch	Access	48.0	
AH	Stud Pad	Top Fill	10.0	
AI	Gauge Hatch	Product Sampling	8.0	
AJ	Nozzle	Vent	3.0	
AK	Coupling	HLA	2.0	Not Connected
AL	Manway	Access	20.0	Saab Radar Gauge In Cover
AM	Coupling	Probe	2.0	
AN	Pipe Nipple	Unknown	2.0	
AO	Pipe Nipple	Sight Glass	1.0	

7.0 Photographs

North	Tank Labeling
	
Insulation Puncture (Typical)	**Insulation Punctures (Typical)**
	

Shell Attachment	Undermining
	
Asphalt Ring Grading	**Roof Insulation Hole (Typical)**
	

Roof Vent	Roof Vent
	
Saab Radar	Roof Overview
	

8.0 NDE Equipment Used

The equipment utilized for the inspection of the tank included of the following :

Pit Gauge

Manufacturer	Model	Serial No
W.R. Thorpe	1	1.979.912

9.0 Inspector Certifications

energy API | AMERICAN PETROLEUM INSTITUTE
Individual Certification Programs: ICP

API Individual Certification Programs

verifies that

Michael Alec Arpino

has met the requirements for API certification

API-653 Aboveground Storage Tank Inspector

Certification Number *77549*

Original Certification Date *December 31, 2017*

Current Certification Date *December 31, 2017*

Expiration Date *December 31, 2020*

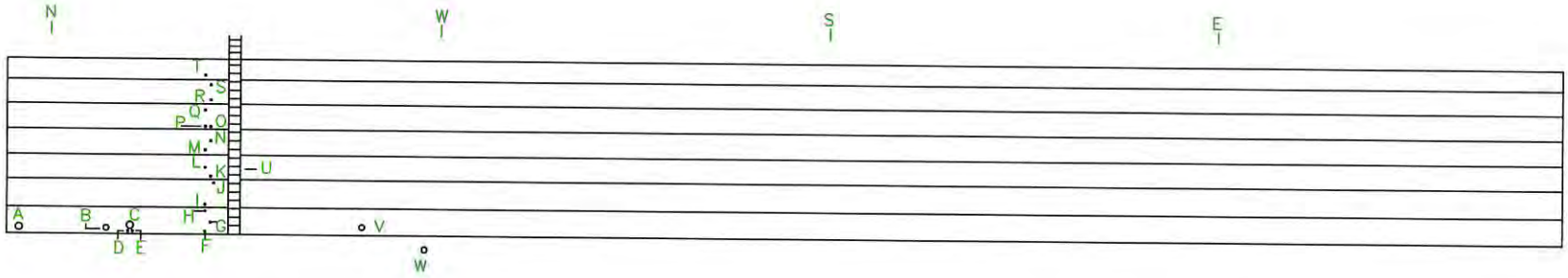
Manager, Individual Certification Programs

ICP

2015-027 | PDF

10.0 Drawings

SHELL ROLLOUT DRAWING–EXTERNAL VIEW



SHELL NOZZLES & APPURTENANCE TABLE

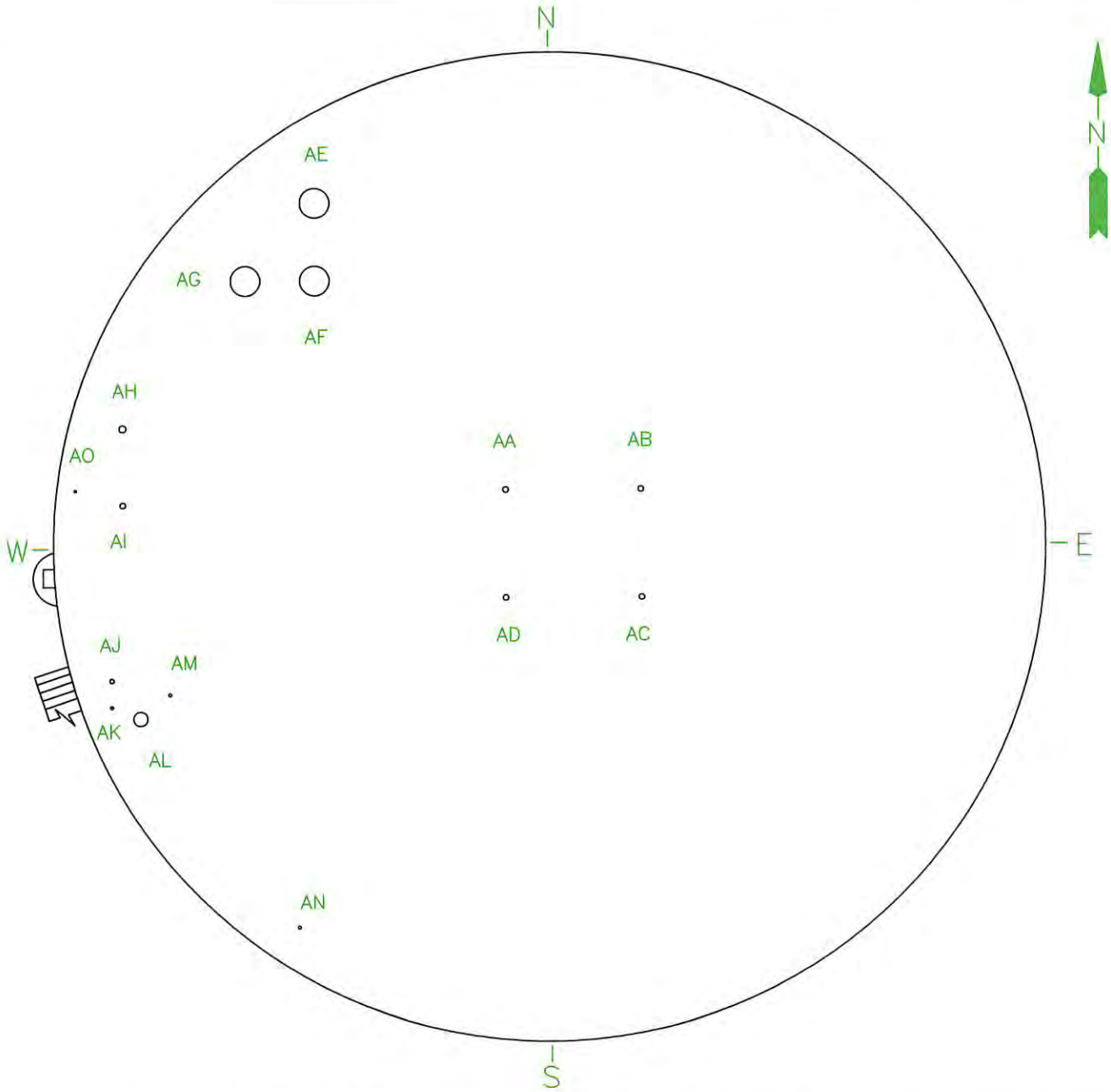
NO.	SIZE (IN.)	DESCRIPTION	NO.	SIZE (IN.)	DESCRIPTION
A	20	MANWAY, NOZZLE	N	1	COUPLING
B	16	NOZZLE	O	1	COUPLING
C	20	NOZZLE	P	1	COUPLING
D	2.5	PIPE NIPPLE	Q	1	COUPLING
E	2.5	PIPE NIPPLE	R	1	COUPLING
F	1	COUPLING	S	1	COUPLING
G	1	COUPLING	T	1	COUPLING
H	1	COUPLING	U	N/A	LADDER
I	1	COUPLING	V	N/A	NOZZLE
J	1	COUPLING	W	N/A	BOTTOM DRAW
K	1	COUPLING			
L	1	COUPLING			
M	1	COUPLING			

NOTES:

VISUAL INSPECTION ONLY – NO UT DATA.

CUSTOMER: PACTERM	SHELL HEIGHT: 41.52' DIAMETER: 117'	INSPECTION DATE: 05/9/2019	MISTRAS SERVICES
LOCATION: PORTLAND, OR	INSPECTOR: ALEC ARPINO	DRAWING NUMBER: 4–Shell	
TANK NUMBER: 4	TECHNICIAN:	CAD DRAFTSMAN: BOBBY HOGAN	7820 S 210th Street, Building C, Suite 110 Kent, WA 98032

TANK ROOF DRAWING



CUSTOMER: HARLEY MARINE	SHELL HEIGHT: 41.52' DIAMETER: 117'	INSPECTION DATE: 05/9/2019	MISTRAS SERVICES
LOCATION: PORTLAND, OR	INSPECTOR: ALEC ARPINO	DRAWING NUMBER: 4–Roof	7820 S 210th Street, Building C, Suite 110 KENT, WA 98032
TANK NUMBER: 4	TECHNICIAN:	CAD DRAFTSMAN: BOBBY HOGAN	

Above Ground Storage Tank Inspection Report

In accordance with API 653

Pacific Terminal (Centerline Logistics)

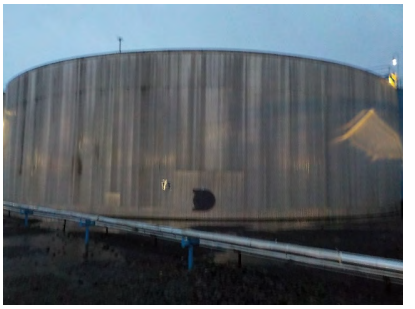
Tank 5

In Service Inspection

Portland, OR

January 12, 2021 to January 12, 2021

Report Number 40891089-3



Prepared By :
7820 South 212th St. St. 110
Kent, WA, 98032

www.mistrasgroup.com

MISTRAS A World of NDT Solutions | Services Division

Inspection Date
January 12, 2021

Table of Contents

1.0 Job Information

Job Location :	Pacific Terminal (Centerline Logistics) 7900 NW St. Helens Road Portland, OR 97210 USA
Customer Representative :	Phillip Jordan
Customer Phone Number :	503 341 1639
Job Charge Number :	48213
Report Number :	40891089-3
Mistras Work Order Number :	T68586-40891089-3
Inspection Personnel Provided :	Byron Johnson API 653 Certified Inspector API 653 (33622)/API 570 (38126)/UTT/PT/MFL/MT
	Kathrine Brux Level II Technician NDE Assistant

2.0 Tank Inspection Data Sheet

General :

Tank Number	5
Owner	Pacific Terminal (Centerline Logistics)
Design Standard	API 650
Tank Location	Portland, OR
Product	Fuel Oil
Specific Gravity	1.0
Manufacturer	Unknown
Manufacture Date	Circa 1930's
Cathodic Protection	Unknown
Data Plate Present	No
Data Plate Condition	N/A

Dimensions :

Diameter (ft)	115.00
Height (ft)	30.00
Capacity Gross (bbl (oil))	53,649.54
Capacity Nominal (bbl (oil))	55,499.53

Geometry :

Foundation	Concrete Ringwall
Bottom	Lap Welded
Shell	Riveted
Fixed Roof Type	Cone

Access :

Stairway	Radial Staircase
Roof Access	Yes

Coatings :

Bottom	Unknown
Shell	Insulated
Roof	Foam Insulation

3.0 Inspection Summary

Pacific Terminal (Centerline Logistics) has contracted Mistras Group, Inc. to perform an in service inspection on Tank 5 located in Portland, OR. This inspection was performed in accordance with the current criteria set forth in API Standard 653 (5th Edition, November 2014, Addendum 1, April 2018).

Tank 5 is an above ground storage tank in fuel oil service. This tank is 115.00 ft in diameter, and 30.00 ft in height and has a cone fixed roof. The tank is of riveted construction and was more than likely built some time in 1930's. The manufacturer could not be determined. The tank was last inspected on February 22nd 2016.

Foundation

Tank 5 sits on a concrete ringwall. Evaluation of the shell settlement could not be conducted due to insulation however visually there does not appear to be any settlement issues at this time. The ring wall appears to be in fair condition however the inspection was limited due to rain water. The second bottom holds the tank above grade even during heavy rain. There was an issue with the dike drain during the inspection however the client had a contractor working on correcting the issue.

The area around the tank was free of vegetation or debris.

Shell

Evaluation of the shell was limited due to insulation however the insulation jacket is in good condition and there are no obvious signs of dents or bulging. The shell UT inspection was conducted up an un-insulated strip adjacent to the ladder. The coating at the un-insulated section is in good condition.

Calculations based on shell UT readings found the shell to be suitable for continued service with a maximum fill height of 25'. The course with the lowest projected remaining life span is the 3rd course with a recorded low of 0.354" compared the original nominal thickness of 0.375". The 3rd course has a computed corrosion rate of 0.00023 inches per year with a projected life expectancy of 93.96 years.

The next visual inspection should be conducted on or before 1/12/2026.
The next UT inspection should be conducted on or before 1/12/2035.

Shell appurtenances

Again inspection of the shell appurtenances was limited due to insulation. All nozzles, including manways, were square with no evidence of distortion or leaks.

Roof

The tank is equipped with an insulated fixed cone roof. The roof has adequate slope for good drainage and there are no low spots or waviness of the roof plates. The roof found it to be safe for access. The spray foam insulation appears to be in adequate condition for continued service.

UT testing was not performed due to insulation.

The roof appurtenances were found to be in good serviceable condition. Several flanges displayed light to moderate coating failure and rust with no active corrosion. The radial stairway and handrails are in good condition.

Note: There are no repair recommendations for tank 5 at this time.

Inspected By:

Inspectors Signature: _____

Byron D. Johnson
API 653 Certification No. 33622 Exp. 11/30/2022
STI SP001 Certification No. AC-21710 Exp. 06/15/2025

Reviewed by:

_____

George Roni, PE
API 653 Cert. No. 2042, Exp. 4/30/2023

Mistras Services has evaluated the condition of this tank based on the observations and measurements made by the tank Inspector. While our evaluation accurately describes the condition of the tank at the time of inspection, the tank owner/operator must independently assess the inspection information/report provided by Mistras Services and any conclusions reached by the tank owner/operator and any action taken or omitted to be taken are the sole responsibility of the owner/operator. With respect to inspection and testing, Mistras Services warrants only that the services have been performed in accordance with accepted industry practice. If any such services fail to meet the foregoing warranty, Mistras Services shall re-perform the service to the same extent and on the same conditions as the original service.

The preceding paragraph sets forth the exclusive remedy for claims based on failure or of defect in materials or services, whether such claim is made in contract or tort (including negligence) and however instituted, and, upon expiration of the warranty period, all such liability shall terminate. The foregoing warranty is exclusive and in lieu of all other warranties, whether written, oral, implied or statutory. NO IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR PURPOSE SHALL APPLY, nor shall Mistras Services be liable for any loss or damage whatsoever by reason of its failure to discover, report, repair or modify latent defects or defects inherent in the design of any tank inspected. In no event, whether a result of breach of contract, warranty or tort (including negligence) shall Mistras Services be liable for any consequential or incidental damages including, but not limited to,

4.0 API 653 Checklists

Pacific Terminal (Centerline Logistics) has contracted Mistras Group, Inc. to perform an in service inspection on Tank 5 located in Portland, OR. This inspection was performed in accordance with the current criteria set forth in API Standard 653 (5th Edition, November 2014, Addendum 1, April 2018).

Tank 5 is an above ground storage tank in fuel oil service. This tank is 115.00 ft in diameter, and 30.00 ft in height and has a cone fixed roof.

The following details all inspection findings and recommendations.

C.1.1 FOUNDATION

ALL				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.1	Measure foundation levelness and bottom elevations (see Appendix B for extent of measurements).	N/A	There was no access to the chime due to insulation.	

Concrete Ring				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.1.1a	Inspect for broken concrete, spalling, and cracks, particularly under backup bars used in welding butt welded annular rings under the shell.	N/A	Limited access due to rain water.	
C.1.1.1b	Inspect drain openings in ring, back of water draw basins and top surface of ring for indications of bottom leakage.	N/A	There are no water draw basins.	
C.1.1.1c	Inspect for cavities under foundation and vegetation against bottom of tank.	Satisfactory	None Noted.	
C.1.1.1d	Check that runoff rainwater from the shell drains away from tank.	Satisfactory	The second bottom is elevated well above grade.	
C.1.1.1e	Check for settlement around perimeter of tank.	Satisfactory	None noted. Visual Only.	

Rock				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.1.4	Presence of crushed rock under the steel bottom usually results in severe underside corrosion. Make a note to do additional bottom plate examination (MFL, ultrasonic, hammer testing, or turning of coupons) when the tank is out of service.			

Site Drainage				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.1.5.a	Check site drainage away from the tank and associated piping & manifolds.	Satisfactory		
C.1.1.5.b	Check operation of dike drains.	Information only	There was an issue with the dike drain during the inspection however the client had a contractor working on correcting the issue.	
C.1.1.5.c	Check for settling of tank into asphalt base, oiled dirt or sand which would direct runoff rain water under the tank instead of away from it.	Satisfactory		

Housekeeping				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.1.6	Inspect the area for buildup of trash, vegetation, and other inflammables buildup.	Satisfactory	None noted.	

Cathodic Protection				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.1.7	Review cathodic potential readings	N/A	The tank does not have a cathodic protection system.	

C.1.2 SHELLS

External Visual Inspection				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.2.1.a	Visually inspect for paint failures, pitting, and corrosion.	N/A	The tank is insulated.	
C.1.2.1.b	Clean off the bottom angle area (chime) and inspect for corrosion and thinning on plate and weld.	N/A	No Access, Insulated.	
C.1.2.1.b (1)	Obtain thickness readings on the chime. One reading shall be obtained every 10 feet. Reading No. 1 shall be located at the centerline of manway A.	N/A	No Access, insulated.	
C.1.2.1.b (2)	Record the minimum and maximum chime widths. The measurements shall be made from the toe of the shell to chime weld to the edge.	N/A	No Access, Insulated.	
C.1.2.1.c	Inspect the bottom-to-foundation seal, if any.	N/A	None noted.	
C.1.2.1.d	UT the shell plates to verify remaining thickness. Using a crawler, obtain a minimum of 4 equally spaced drops around the tank, readings shall be obtained on all courses. At a minimum, readings should be taken on all courses from the ladder or stairs.	Satisfactory	See shell UT data.	

Riveted Shell Inspection				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.2.3.a	Inspect external surface for rivet and seam leaks.	Satisfactory	No Access, Insulated with the exception of a section next to the ladder.	
C.1.2.3.b	Locate leaks by sketch or photo (location will be lost when shell is abrasive cleaned for painting).	Satisfactory	None noted.	
C.1.2.3.c	Inspect rivets for corrosion loss and wear.	Satisfactory	Inspection was limited due to insulation.	
C.1.2.3.d	Inspect vertical seams to see if they have been full fillet-lap welded to increase joint efficiency.	N/A		
C.1.2.3.e	If no records exist of vertical riveted seams, dimension and sketch (or photograph) the rivet pattern: number of rows, rivet size, pitch length and note whether the joint is butt riveted or lap riveted.	Satisfactory	All Seams are Lapped. C1: 3 rows, C2: 3 rows, C3: 2 rows, C4: 2 rows, C5: 2 rows, C6: 2 rows	

C.1.3 SHELL APPURTENANCES

Manways and Nozzles				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.3.1a	Inspect for corrosion, cracks or signs of leakage on weld joint at nozzles, manways and reinforcing plates.	Satisfactory	None noted. However, access was limited due to insulation.	
C.1.3.1b	Inspect for shell plate dimpling around nozzles, caused by excessive pipe deflection.	N/A	No Access, Insulated.	
C.1.3.1c	Inspect for flange leaks around bolting and leaking threaded connections on shell couplings and nipples.	Satisfactory	No Flange leaks were noted.	

C.1.3.1d	Inspect sealing of insulation around manways and nozzles.	Satisfactory		
C.1.3.1e	Check for inadequate manway flange and cover thickness on mixer manways.	N/A	The tank is not equipped with a mixer.	
C.1.3.1f	Record all nozzle and appurtenance information on the "Shell Nozzle & Appurtenance Table". The station, heights, pipe size, repad size, repad type, weld spacing and distance from shell to flange face shall be recorded.	Satisfactory	The inspection was limited due to insulation.	
C.1.3.1g	UT all shell nozzles and manways. Record one reading on the top, right, bottom and lefts sides of each neck. Also, record one reading on each repad, cover plate and flange.	Satisfactory	See Nozzle UT data. Note: access to most of the nozzles was limited due to insulation.	

Tank Piping Manifolds				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.3.2a	Inspect manifold piping, flanges, and valves for leaks.	Satisfactory	No leaks noted. Inspection was limited due to insulation.	
C.1.3.2b	Inspect firefighting system components.	N/A	The tank is not equipped with a fire suppression system.	
C.1.3.2c	Check for anchored piping which would be hazardous to the tank shell or bottom connections during the earth movement.	Satisfactory	The piping is properly supported.	
C.1.3.2d	Check for adequate thermal pressure relief of piping to the tank.	Satisfactory		
C.1.3.2e	Check operation of regulators for tanks with purge gas systems.	Satisfactory		

C.1.3.2f	Check sample connections for leaks and for proper valve operation.	Optional	The tank is not equipped with a sample station.	
C.1.3.2g	Check for damage and test the accuracy of temperature indicators. Record the brand, model and range of temperature indicators.	N/A	Not Equipped	
C.1.3.2h	Check welds on shell-mounted davit clips above valves 6 in. and larger	N/A	There are no shell mounted davits.	

Autogauge System				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.3.3a	Inspect autogauge tape guide and lower sleeve housing (floating swings) for leaks.	N/A	The tank is not equipped with an autogauge. The tank is equipped with a roof mounted radar unit.	
C.1.3.3b	Inspect autogauge head for damage. (Note Brand, Model No. and Serial No.)	N/A		
C.1.3.3c	Bump the checker on autogauge head for proper movement of tape.	N/A		
C.1.3.3f	Compare actual product level to the reading on the autogauge (maximum variation is 2 in).	N/A		
C.1.3.3h	Inspect condition of board and legibility of board-type autoguages.	N/A		
C.1.3.3i	Test freedom of movement of marker and float.	N/A		

C.1.4 ROOFS

Deck Plate Internal Corrosion				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.4.1a	For safety, before accessing roof, check with ultrasonic instrument or lightly use a ball peen hammer to test the deck plate near the edge of the roof for thinning. (Corrosion normally attacks the deck plate at the edge of a fixed roof and at the rafters in the center of the roof first.)	Satisfactory	The roof was found to be safe to access.	
C.1.4.1b	UT the roof plates. Record 5 readings per plate, one in each corner and one in the center of each plate.	N/A	No access, Insulated.	

Roof Deck Drainage				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.4.3	Look for indication of standing water. (Significant sagging of fixed roof deck indicates potential rafter failure. Large standing water areas on a floating roof indicate inadequate drainage design or, if to one side, a non-level roof with possible leaking pontoons.)	Satisfactory	The roof slope is adequate for proper drainage.	

Roof Insulation				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.4.6a	Visually inspect for cracks or leaks in the insulation weather coat where runoff rain water could penetrate the insulation.	Satisfactory	The spray foam insulation is in serviceable condition.	

C.1.4.6b	Inspect for wet insulation and check roof deck for corrosion and holes near the edge of the insulated area.	Satisfactory		
C.1.4.6c	Remove small test sections of insulation and check roof deck for corrosion and holes near the edge of the insulated area.	N/A	Not Required.	

C.1.5 Roof Appurtenances

Sample Hatch				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.5.1a	Inspect condition and functioning of sample hatch cover.	Satisfactory		
C.1.5.1b	On tanks governed by Air Quality Monitoring district rules, check for the condition of seal inside hatch cover.	N/A	Not required.	
C.1.5.1c	Check for corrosion and plugging on thief and gauge hatch cover.	N/A	The tank is not equipped with a thief type gauge hatch.	
C.1.5.1d	Where sample hatch is used to reel gauge stock level, check for marker and tab stating hold-off distance.	Optional	No gauge data plate or information was found.	
C.1.5.1e	Check for reinforcing pad where sample hatch pipe penetrates the roof deck.	N/A	No access, Insulated.	
C.1.5.1g	Test operation of system.	Satisfactory		
C.1.5.1h	On ultra clean stocks such as JP4, check for presence and condition of protective coating or liner inside sample hatch (preventing rust from pipe getting into sample).	N/A	Not required.	

Breathers and Vents				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.2.7.3.a	Inspect and service the breather.	Satisfactory		
C.2.7.3.b	Inspect screens on vents and breathers.	Satisfactory	The Vent screens appear to be in fair condition.	

Roof Nozzles and Manways				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.1.5.14	UT all roof nozzles and manways (if couplings are present, obtain readings on pipe adjacent to the coupling, note "readings on pipe" on data sheet). Record one reading on the north, east, south and west side of the neck.	Satisfactory	Inspection limited due to insulation.	

C.2.12 ACCESS STRUCTURES

Handrails				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.2.12.1a	Identify and report type (steel pipe, galvanized pipe, square tube, or angle) and size of handrails and handrail heights.	Satisfactory		
C.2.12.1.b	Inspect for pitting and holes, paint failure.	Satisfactory	Some coating flaws noted.	
C.2.12.1.c	Inspect attachment welds.	Satisfactory	The welds are acceptable.	
C.2.12.1.d	Identify cold joints and sharp edges. Inspect the handrails and mid-rails.	Satisfactory	None noted.	
C.2.12.1.e	Inspect safety drop bar (or safety chain) for corrosion, functioning, and length.	Optional	Not Equipped.	

Stairway Stringers				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C.2.12.4.a	Inspect spiral stairway stringers for corrosion, paint failure, and weld failure. Inspect attachment of stairway treads to stringer.	Satisfactory	The roof is accessed via a radial stairway from the top of the dike wall.	
C.2.12.4.b	Inspect stairway supports to shell welds and reinforcing pads.	N/A		
C.2.12.4.c	Inspect steel support attachment to concrete base for corrosion.	N/A		

Tank Side Ladders				
Section Name	**Description**	**Condition**	**Finding**	**Recommendation**
C2.12.6.a	Inspect ladder supports to shell welds and reinforcing pads.	N/A	No access, Insulated.	
C2.12.6.b	Inspect ladder cage for corrosion. Inspect attachment welds.	Satisfactory		
C2.12.6.c	Inspect ladder rungs for corrosion and thinning.	Satisfactory		

5.0 Calculations

5.1 Minimum Thickness Calculations - One Foot

The minimum acceptable shell plate thickness for tank with a diameter equal to or less than 200 ft is calculated as follows:

$$t_{min} = \frac{2.6(H-1)DG}{SE}$$

Using the shell thickness measurements obtained during this inspection, the shell thickness calculations indicate that the maximum fill height of **25.00 ft** can be utilized with product specific gravity up to 1.000.

Please note that these calculations do not take into consideration operational restrictions imposed by such items as a floating roof, overflow lines, high level alarm or vents and seals. These items will need to be taken into consideration when calculating the actual safe fill height.

Reference: API 653, 4th Edition, Add. 1, Aug. 2010, Paragraph 4.3.3.1

Course	Course Height (ft)	Diameter (ft)	Product Height (ft)	Allowable Stress (psi)	Joint Efficiency	Specific Gravity	Minimum Actual Thickness (in)	t_{min} Required Thickness (in)	Results
6	5.000	115	0.000	21000	0.6	1.000	0.185	0.100	**PASS**
5	5.000	115	5.000	21000	0.6	1.000	0.249	0.100	**PASS**
4	5.000	115	10.000	21000	0.6	1.000	0.301	0.214	**PASS**
3	5.000	115	15.000	21000	0.6	1.000	0.354	0.332	**PASS**
2	5.000	115	20.000	21000	0.7	1.000	0.468	0.386	**PASS**
1	5.000	115	25.000	21000	0.7	1.000	0.541	0.488	**PASS**

5.2 Allowable Hydrostatic Test Height

The hydrostatic Height is calculated as follows :

$$H_t = \frac{S_t E t_{\min}}{2.6D} + 1$$

Reference: API 653, 4th Edition, Add. 1, Aug. 2010, Paragraph 4.3.3.2

Course	D Tank Diameter (ft)	S_t Allowable Hydrostatic Stress (psi)	E Joint Efficiency	t_{min} Required Thickness (in)	H_t Calculated Hydrotest Height (ft)
6	115	21000	0.6	0.100	4.161
5	115	21000	0.6	0.221	8.000
4	115	21000	0.6	0.285	13.000
3	115	21000	0.6	0.346	18.000
2	115	21000	0.7	0.418	23.000
1	115	21000	0.7	0.513	28.000

6.0 Remaining Life Calculations

6.1 Shell Plates Remaining Life

Reference: API 653, 4th Edition, Add. 1, Aug. 2010, Paragraph 4.3.3.1

Course	$t_{previous}$ Previous Thickness (in)	Year Obtained	t_{actual} Actual Thickness (in)	Year Obtained	C_r Corrosion Rate (in/yr.)	t_{min} Minimum Allowable Thickness (in)	R_L Remaining Life (yr.)
6	0.188	15-Jun-30	0.185	21-Jan-21	0.00003	0.100	2567.15
5	0.267	15-Jun-30	0.249	21-Jan-21	0.00020	0.100	750.01
4	0.313	15-Jun-30	0.301	21-Jan-21	0.00013	0.214	660.12
3	0.375	15-Jun-30	0.354	21-Jan-21	0.00023	0.332	93.96
2	0.500	15-Jun-30	0.468	21-Jan-21	0.00035	0.386	230.87
1	0.563	15-Jun-30	0.541	21-Jan-21	0.00024	0.488	217.60

7.0 Inspection Interval Calculations Byron redo these

7.1 Period Until Next External Inspection

$$RCA/4N \text{ years}$$

Reference: API 653, 4th Edition, Add. 1, Aug. 2010, Paragraph 6.3.2.1

Remaining Corrosion Allowance (RCA):	0.02177781	(in)
Current Thickness (Mst):	0.354	(in)
Required Thickness (Tmin):	0.332	(in)
Corrosion Rate (N):	0.00023	(in/yr.)
Course Number with Shorter Life:	3	

Calculated Interval: **5 Year(s)**

Next Inspection Date: **January 12, 2026**

Note: External Visual Inspection shall not exceed 5 years

7.2 Period Until Next External UT Inspection

$$RCA/2N \text{ years}$$

Reference: API 653, 4th Edition, Add. 1, Aug. 2010, Paragraph 6.3.3.2

Remaining Corrosion Allowance (RCA):	0.02177781	(in)
Current Thickness (Mst):	0.354	(in)
Required Thickness (Tmin):	0.332	(in)
Corrosion Rate (N):	0.00023	(in/yr.)
Course Number with Shorter Life:	3	

Calculated Interval: **15 Year(s)**

Next Inspection Date: **January 12, 2036**

Note: External UT inspection shall not exceed 15 years for known corrosion rate or 5 years for unknown corrosion rate.

$RCA =$	Difference between the measured shell thickness and the minimum required thickness in inches.
$N =$	Shell corrosion rate in inches per year.
$t_{min} =$	The minimum acceptable thickness, in inches for each course as calculated from API 653 4.3.3; however, t_{min} shall not be less than 0.100 inches for any tank course.
$M_{st} =$	The minimum measured shell plate thickness in inches.

9.0 Brittle Fracture Assessment

Inspector	B. Johnson
Date Built	01-Jan-1930
Last Repair Date	
Hydro Test Date	

A)	Is there a record of Hydro test?		Yes, go to B	x	No, go to C
B)	Have repairs been made since Hydro test?		Yes, go to C		No, Use tank

C)		Tank meets API 650 (7th Edition or later) or API 650 Appendix G (5th or 6th edition). Go To 2
	x	Tank does not meets API 650 (1980) or API 650 Appendix G (5th or 6th edition). Go To 5
		After hydro test or rerate due to brittle fracture assessment. Go To 2

1)	Do repairs meet API 653?		Yes, use tank		No, Go to 5
2)	Does Tank continue to operate in same service?		Yes, use tank		No, continue
3)	Is the service more severe?		Yes, Continue		No, use tank
4)	Does the tank meet the requirements of API 650 or equal?		Yes, use tank		No, use tank
5)	Is the tank full at lowest one day temperature per API 650 Fig. 2.2?		Yes, use tank	x	No, use tank
6)	Is tank thickness 0.5” or less?		Yes, use tank	x	No, use tank
7)	Does tank operate at metal temperature above 60F?	x	Yes, use tank		No, use tank
8)	Is membrane stress below 7 ksi?		Yes, use tank		No, use tank
9)	Is tank steel exempt from impact testing, API 650 Fig. 2.1 or API 653 Fig. 5.2?		Yes, use tank		No, use tank
10)	Is tank full at lowest one day temperature per API 650 Fig. 2.2?		Yes, continue to use tank		No, Hydro test or Rerate tank

10.0 Ultrasonic Thickness Data

10.1 Shell Plates UT

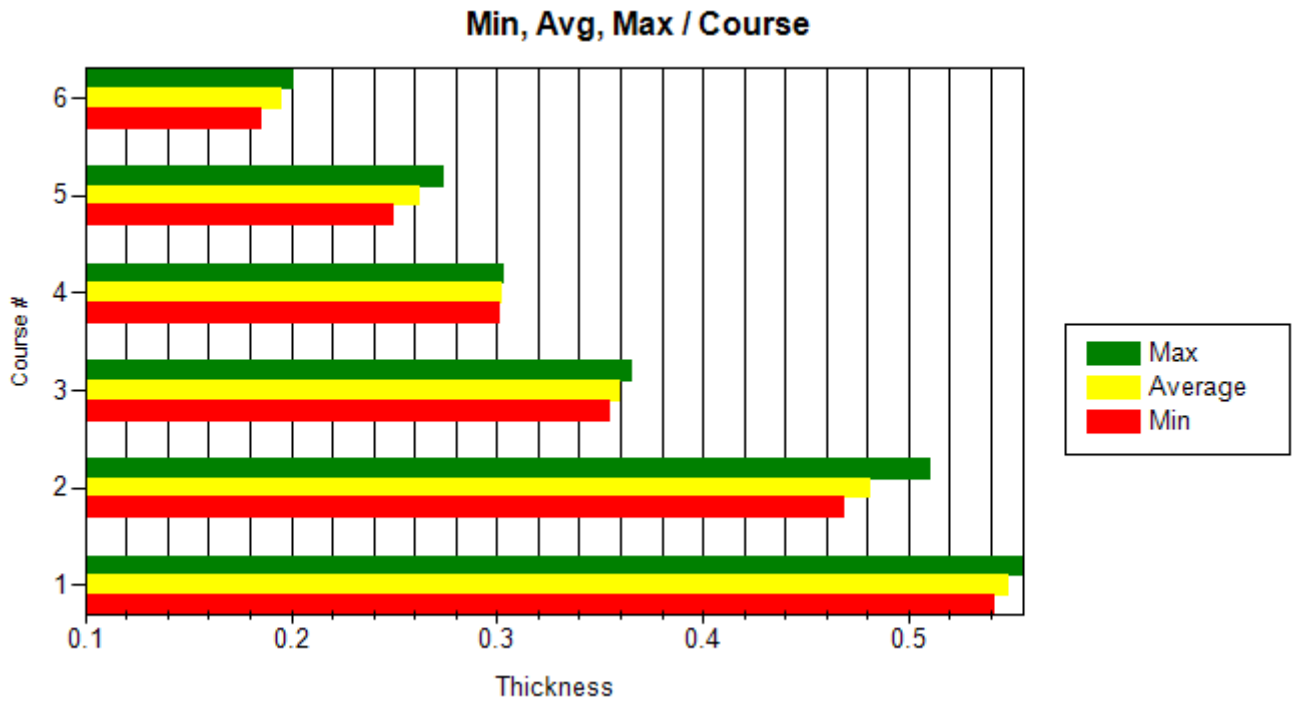
The following table details all readings (in) from the shell UT survey.

Data and Statistics		1
Course 6	4	0.194
	3	0.198
	2	0.200
	1	0.185
Course 5	4	0.273
	3	0.266
	2	0.260
	1	0.249
Course 4	4	0.301
	3	0.303
	2	0.303
	1	0.301
Course 3	4	0.354
	3	0.357
	2	0.365
	1	0.360
Course 2	4	0.468
	3	0.469
	2	0.510
	1	0.475
Course 1	4	0.556
	3	0.541
	2	0.542
	1	0.552
Scan Line Average		0.358

The tables below presents the statistics of the thickness readings (in) obtained on the Shell plates.

Course #	Min	Avg	Max
6	0.185	0.194	0.200
5	0.249	0.262	0.273
4	0.301	0.302	0.303
3	0.354	0.359	0.365
2	0.468	0.480	0.510
1	0.541	0.548	0.556
Global	0.185	0.358	0.556

The following chart depicts the average thickness reading (in) on the shell plates versus the course number.



10.2 Shell Nozzle and Appurtenance Table

Item	Type	Service	Pipe Size (in)	Station (ft)	Center Line Elevation (in)	API Allowable Elevation (in)	Repad Width (in)	Repad Height (in)	Tell Tale Hole	Repad Shape	Weld Spacing (in)	Distance From Shell to Flange Face (in)
A	Manway	Access	36	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
B	Ladder	Roof Access	N/A	54	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C	Nozzle	Transfer	8.0	57	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
D	Nozzle	Swing Line	18.0	66	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
E	Nozzle	W/Valve Blinded	4.0	201	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
F	Nozzle	Transfer	10.0	263	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
G	Nozzle	Transfer	6.0	267.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
H	Coupling	Air Line	1.5	271	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
I	Coupling	PRV	1.5	271	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
J	Manway	Access	24.0	284.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Note: The data represented in the weld spacing column is the minimum spacing measured. H, V, or N indicates which is the minimum distance from the nozzle measured. (H=Horizontal Weld, V=Vertical Weld, N=Nozzle Weld)

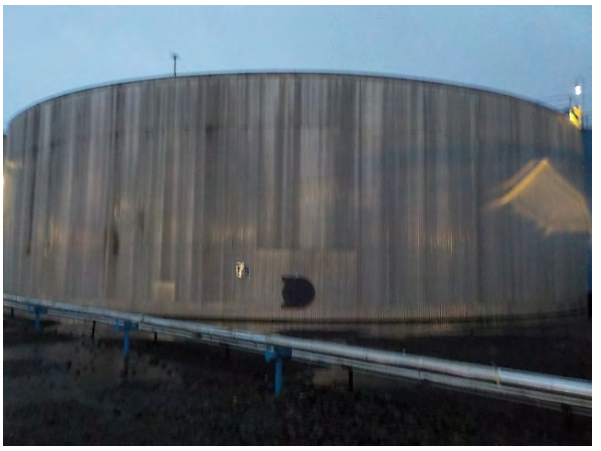
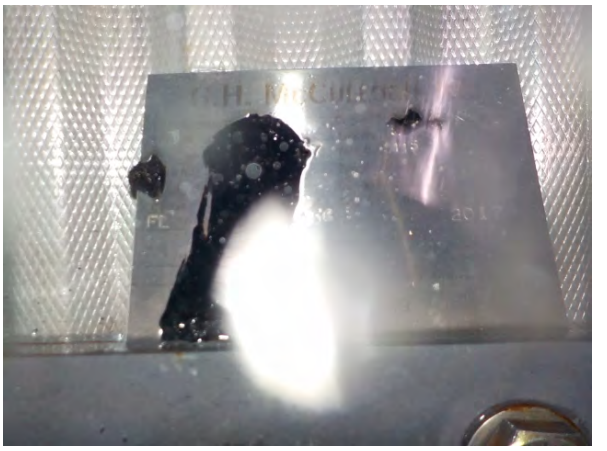
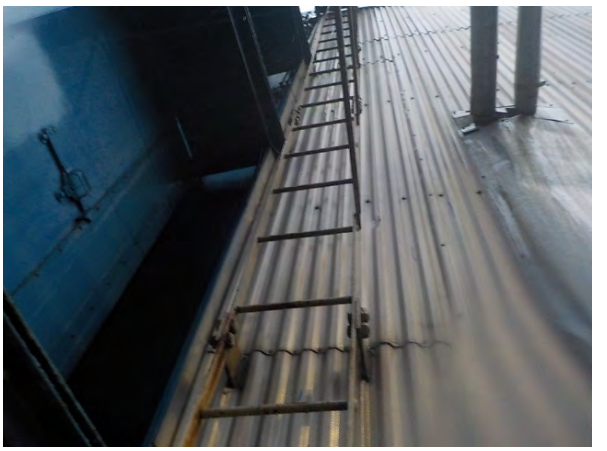
10.3 Shell Nozzle UT

Item	Type	Service	Pipe Size (in)	Top (in)	Bottom (in)	Right (in)	Left (in)	Repad Thickness (in)	Flange Thickness (in)	Cover Thickness (in)	Comments
A	Manway	Access	36	0.307	0.389	0.372	0.37	N/A	N/A	0.629	
C	Nozzle	Transfer	8.0	0.399	N/A	0.41	N/A	N/A	N/A	N/A	
D	Nozzle	Swing Line	18.0	0.528	0.439	0.48	0.494	N/A	1.039	N/A	
F	Nozzle	Transfer	10.0	0.585	0.55	0.55	0.559	N/A	N/A	N/A	
G	Nozzle	Transfer	6.0	0.337	0.339	0.346	0.328	N/A	N/A	N/A	
J	Manway	Access	24.0	0.607	0.58	0.688	0.605	N/A	1.85	1.8	

10.4 Fixed Roof Nozzle UT

Item	Type	Service	Pipe Size (in)	North (in)	South (in)	East (in)	West (in)	Comments
AA	Nozzle	Top Fill	6.0	N/A	N/A	N/A	N/A	Foam Insulation
AB	Nozzle	Vapor recovery	8.0	0.314	N/A	0.319	0.352	
AC	Coupling	Probe	2.0	N/A	N/A	N/A	N/A	
AD	Nozzle	Gauge Hatch	8.0	0.161	0.161	0.155	0.145	
AE	Hatch	Access	37 x 37	0.190	N/A	N/A	N/A	
AF	Nozzle	Radar Gauge	6.0	N/A	N/A	N/A	N/A	Foam Insulation
AG	Pipe Nipple	Probe	2.0	N/A	N/A	N/A	N/A	Foam Insulation
AH	Vent	Atmospheric	8.0	N/A	N/A	N/A	N/A	Foam Insulation
AI	Vent	Atmospheric	8.0	N/A	N/A	N/A	N/A	Foam Insulation
AJ	Coupling	Valve Control	N/A	N/A	N/A	N/A	N/A	Foam Insulation
AK	Nozzle	Blinded	10.0	N/A	N/A	N/A	N/A	Foam Insulation
AL	Hatch	Access	19 x 19	0.2	N/A	N/A	N/A	

11.0 Photographs

Standoff	Data Plate
	
Manway A	**Ground**
	
Leak Detection Port	**Ladder B**
	

Nozzle C	Nozzle D
	
Ground	Ground
	
Nozzle E	Nozzle F
	

Nozzle G	Couplings H & I
	
Manway J	**Ground**
	
Tank Piping	**Nozzles AA & AB**
	

Coupling AC	Gauge Hatch AD
	
Hatch AE	**Nozzle AF & Coupling AG**
	
Vent AH	**Vent AI**
	

Nozzle AK	Hatch AL
	

Handle AJ


12.0 NDE Equipment Used

The equipment utilized for the inspection of the tank included of the following :

Pit Gauge

Manufacturer	Model	Serial No
W.R. Thorpe	1	1.979.912

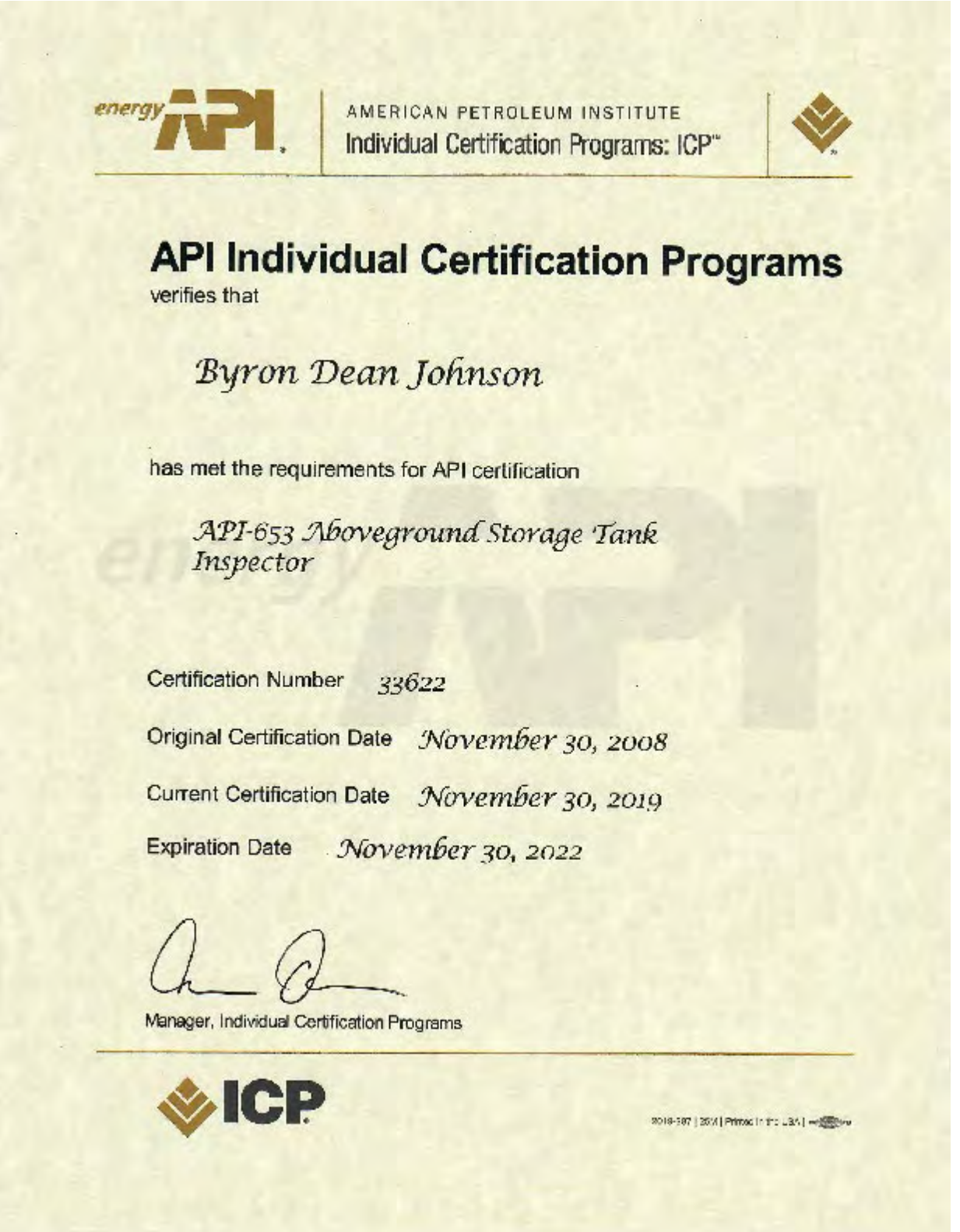
Ultrasonic Transducers

Manufacturer	Model	Serial No	MHz	Diameter
Olympus	D790-SM	865199	5	0.375

UT Equipment

Manufacturer	Model	Serial No
Olympus	38DL Plus	130573601
Mistras Cal. Block	0.100" to 0.500"	147

13.0 Inspector Certifications



energy API

AMERICAN PETROLEUM INSTITUTE
Individual Certification Programs: ICP™

API Individual Certification Programs

verifies that

Byron Dean Johnson

has met the requirements for API certification

API-653 Aboveground Storage Tank Inspector

Certification Number 33622

Original Certification Date November 30, 2008

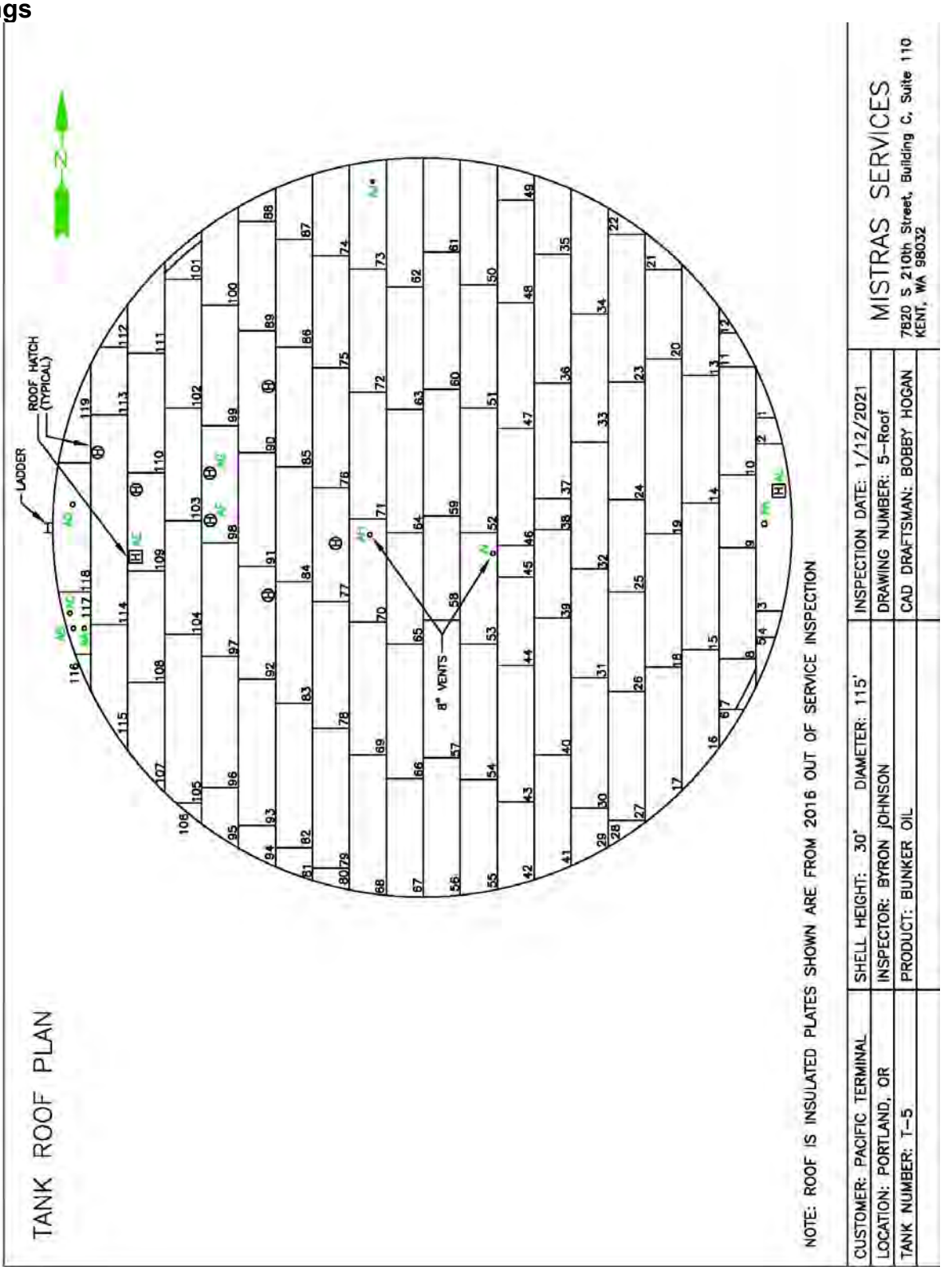
Current Certification Date November 30, 2019

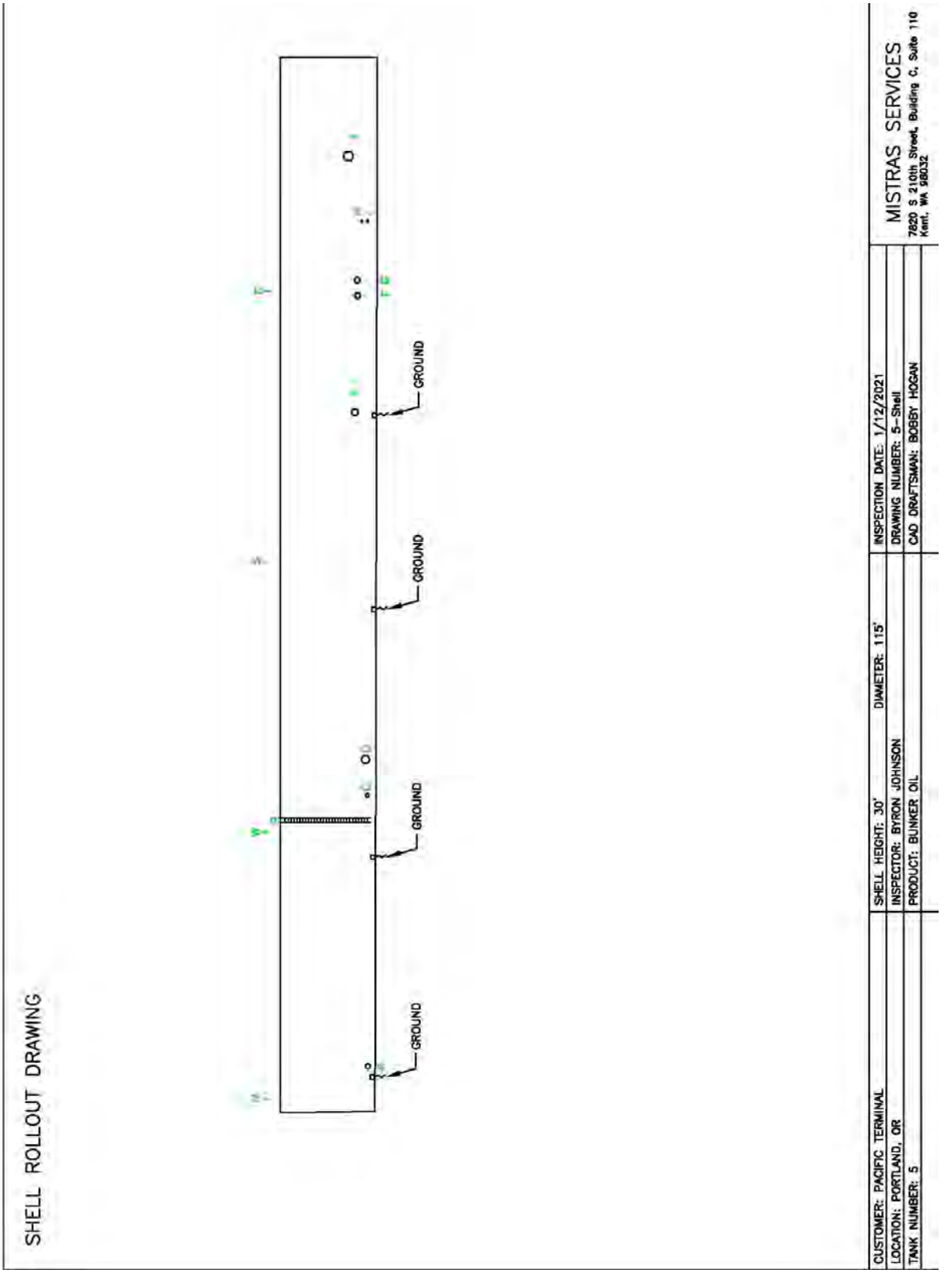
Expiration Date November 30, 2022

Manager, Individual Certification Programs

ICP

14.0 Drawings




SHELL ROLLOUT DRAWING
GROUND
GROUND
GROUND
GROUND
CUSTOMER: PACIFIC TERMINAL
LOCATION: PORTLAND, OR
TANK NUMBER: 5
SHELL HEIGHT: 30'
DIAMETER: 115'
INSPECTOR: BYRON JOHNSON
PRODUCT: BUNKER OIL
INSPECTION DATE: 1/12/2021
DRAWING NUMBER: 5-Shell
CAD DRAFTSMAN: BOBBY HOGAN
MISTRAS SERVICES
7820 S 210th Street, Building C, Suite 110
Kent, WA 98032

Above Ground Storage Tank Inspection Report

In accordance with API 653

Harley Marine Service

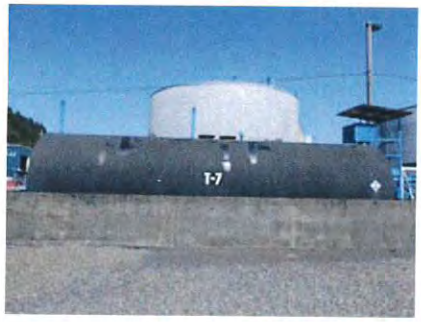
Tank 7

In Service Inspection

Portland, OR

May 9, 2019 to May 9, 2019

Report Number 40654310-3



Prepared By :
7820 South 212th St. St. 110
Kent, WA, 98032

www.mistrasgroup.com

MISTRAS Services Division
A World of NDT Solutions

Inspection Date
May 9, 2019

Table of Contents

1.0 Job Information

Job Location :	Harley Marine Service 7900 NW St. Helens Road Portland, OR 97210
Customer Representative :	Burt Nye
Customer Phone Number :	503-240-3456
Job Charge Number :	22403
Report Number :	40654310-3
Mistras Work Order Number :	T60458-40654310
Inspection Personnel Provided :	Alec Arpino API 653 Certified Inspector API 653 (77549)/ MT

2.0 Tank Inspection Data Sheet

General :

Tank Number	7
Owner	Harley Marine Service
Design Standard	UL 142
Tank Location	Portland, OR
Product	PS-300 (Currently Out of Service)
Specific Gravity	0.94
Manufacturer	Ace Tank
Manufacture Date	1992
Cathodic Protection	No
Data Plate Present	Yes
Data Plate Condition	Fair Condition

Dimensions :

Diameter (ft)	10.00
Length (ft)	35.21
Capacity Gross (bbl (oil))	480.00
Capacity Nominal (bbl (oil))	498.60

Geometry :

Foundation	Steel Saddles/ Concrete Pad
Shell	Butt Welded
Heads	One Piece Flat

Access :

Stairway	Radial Staircase To Platform
Roof Access	To Gauge Hatch Only

Coatings :

Internal	Unknown
Shell	External Black
Roof	External Black

3.0 Inspection Summary

Harley Marine Service has contracted Mistras Group, Inc. to perform an in service visual inspection on Tank 7 located in Portland, OR. This inspection was performed in accordance with the current criteria set forth in API Standard 653 (5th Edition, November 2014, Addendum 1, April 2018).On May 9th, 2019, a limited In-Service Inspection was performed on tank 7, which is a horizontal tank previously in PS-300 service. The tank was empty at the time of inspection. The tank was built in 1992 in accordance with UL 142 by Ace Tank. This tank is 10.00' in diameter, and 35' in length with flat one piece heads. The scope of the evaluation for this tank consisted of a visual inspection only; therefore, ultrasonic testing (UT) was not performed.

Foundation

This tank was constructed on a set of four saddles which are attached to two 6" high X 8" wide X 35' long skids which are anchored to a Concrete Pad by eight 0.75" bolts. The skids, support saddles and bolts are in acceptable condition.

Shell

The shell on Tank T7 consists of 6 courses and all joints are Butt Welded. A visual inspection examination of the shell was conducted, the following details all findings. The shell is appears to be in good condition with no unusual deformations. There are some isolated spots of corrosion which should be addressed. The shell welds appear to be in good condition.

Shell Nozzles

A visual inspection of all accessible shell nozzles and manways was conducted to evaluate the current condition of each nozzle. All nozzles, couplings, and manways appear to be in good condition. There are no repairs required at this time.

Heads

This horizontal tank is equipped with flat dish type heads which are butt welded to the shell. Both heads appear to be in good condition. There are no repairs required at this time.

Access & Hand Rails

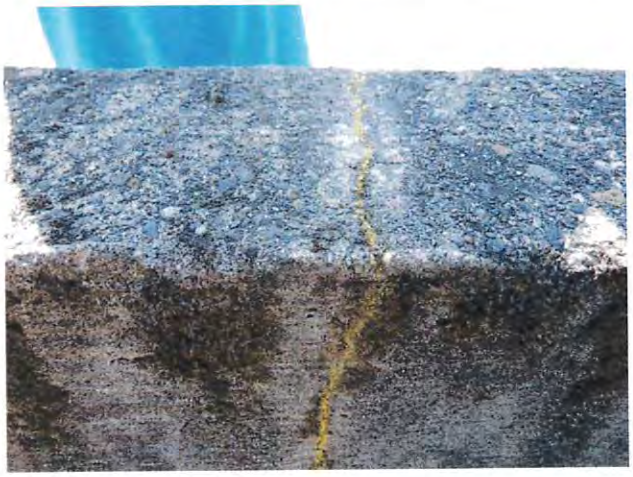
The gauging platform and stairs are in good condition overall. The hand rails and most of the structure are built from 1.5" X 1.5" boxed steel. The hand rails are 43.75" high with a 22.0" mid rail and 4.0" toe plates. All attachment welds are in serviceable condition.

Secondary containment

The secondary containment consists of a concrete walled area 42' long X 17' wide X 4' 7" high with a 6" thick wall thickness. This containment appears to be in good condition, except one crack was found that should be repaired. The dike drain appears to be functioning correctly.

4.0 Inspection Recommendations

INSPECTION RECOMMENDATIONS	
Recommendation ID	REC - 1
Component	**Shells**
Recommendation Headline	Secondary Containment
Recommendation Description	**Findings:** There is a crack in the southern containment wall which ranges from the top of the wall to the containment floor. **Recommendations** The crack should be prepped and repaired with an appropriate sealant in order to prevent further damage and to maintain an effective barrier in the event of a tank release.
Recommendation Priority	Mandatory
Status	
Author Name	Alec Arpino API 653 Certification No. 77549



INSPECTION RECOMMENDATIONS	
Recommendation ID	REC - 2
Component	**Shells**
Recommendation Headline	Coating
Recommendation Description	**Findings:** Some minor coating failure in the form of paint blistering with rust pitting was noted on the shell. **Recommendations** It is recommended that the shell coating be repaired as needed.
Recommendation Priority	Optional
Status	
Author Name	Alec Arpino API 653 Certification No. 77549

All repairs/modifications should be made in accordance with API Standard 653. After repairs/modifications have been made, they should be inspected by the methods described in API 653.

Inspectors Signature:

M. Alec Arpino
API 653
Certification No. 77549 Exp. 12/31/2020

Reviewed by:

George Roni

George Roni, PE
API 653 Cert. No. 2042, Exp. 4/30/17

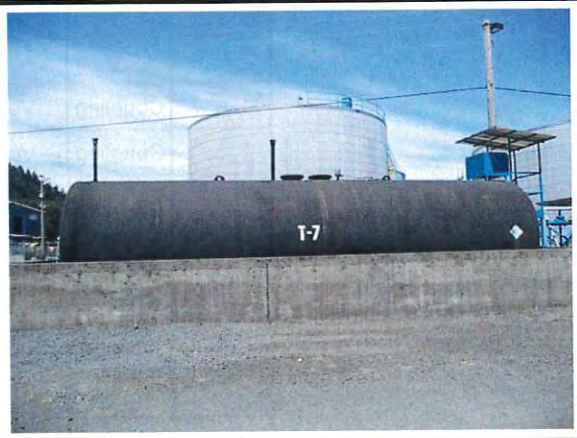
Mistras Services has evaluated the condition of this tank based on the observations and measurements made by the tank Inspector. While our evaluation accurately describes the condition of the tank at the time of inspection, the tank owner/operator must independently assess the inspection information/report provided by Mistras Services and any conclusions reached by the tank owner/operator and any action taken or omitted to be taken are the sole responsibility of the owner/operator. With respect to inspection and testing, Mistras Services warrants only that the services have been performed in accordance with accepted industry practice. If any such services fail to meet the foregoing warranty, Mistras Services shall re-perform the service to the same extent and on the same conditions as the original service.

The preceding paragraph sets forth the exclusive remedy for claims based on failure or of defect in materials or services, whether such claim is made in contract or tort (including negligence) and however instituted, and, upon expiration of the warranty period, all such liability shall terminate. The foregoing warranty is exclusive and in lieu of all other warranties, whether written, oral, implied or statutory. NO IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR PURPOSE SHALL APPLY, nor shall Mistras Services be liable for any loss or damage whatsoever by reason of its failure to discover, report, repair or modify latent defects or defects inherent in the design of any tank inspected. In no event, whether a result of breach of contract, warranty or tort (including negligence) shall Mistras Services be liable for any consequential or incidental damages including, but not limited to, loss of profit or revenues, loss of use of equipment tested or services by Mistras Services or any associated damage to facilities, down-time costs or claims of other damages.

5.0 Nozzle and Appurtenance Table

Item	Type	Service	Pipe Size (in)	Comments
A	Coupling	Vent	3.0	
B	Coupling	Vent	3.0	
C	Manway	Pressure Vent	18.0	
D	Manway	Pressure Vent	18.0	
E	Coupling	HLA	3.0	
F	Gauge Hatch		4.0	
G	Nozzle	Heater Line	3.0	
H	Nozzle	Transfer	4.0	
I	Coupling	Plugged	2.5	
J	Nozzle	Transfer	4.0	
K	Nozzle	Heater Line	3.0	
L	Coupling	Transfer	2.5	
M	Coupling	Plugged	2.5	

6.0 Photographs

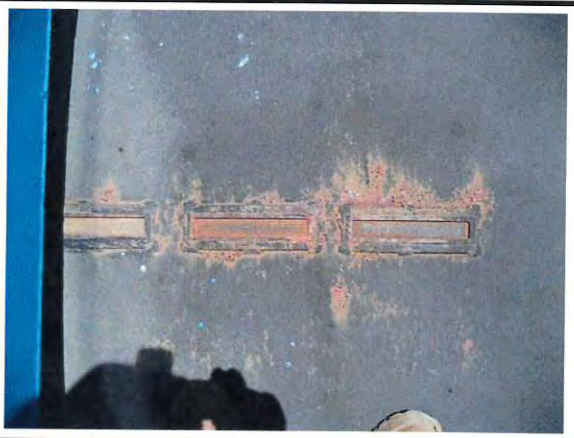
North	South
	
Top	**Foundation (North)**
	

Containment Wall Crack

Containment Wall Crack (Top View)

Dike Drain

Data Plate



West Head

Coating Failure 1

7.0 NDE Equipment Used

The equipment utilized for the inspection of the tank included of the following :

Pit Gauge

Manufacturer	Model	Serial No
W.R. Thorpe	1	1.979.912

8.0 Inspector Certifications

energy API | AMERICAN PETROLEUM INSTITUTE
Individual Certification Programs: ICP™

API Individual Certification Programs

verifies that

Michael Alec Arpino

has met the requirements for API certification

API-653 Aboveground Storage Tank Inspector

Certification Number *77549*

Original Certification Date *December 31, 2017*

Current Certification Date *December 31, 2017*

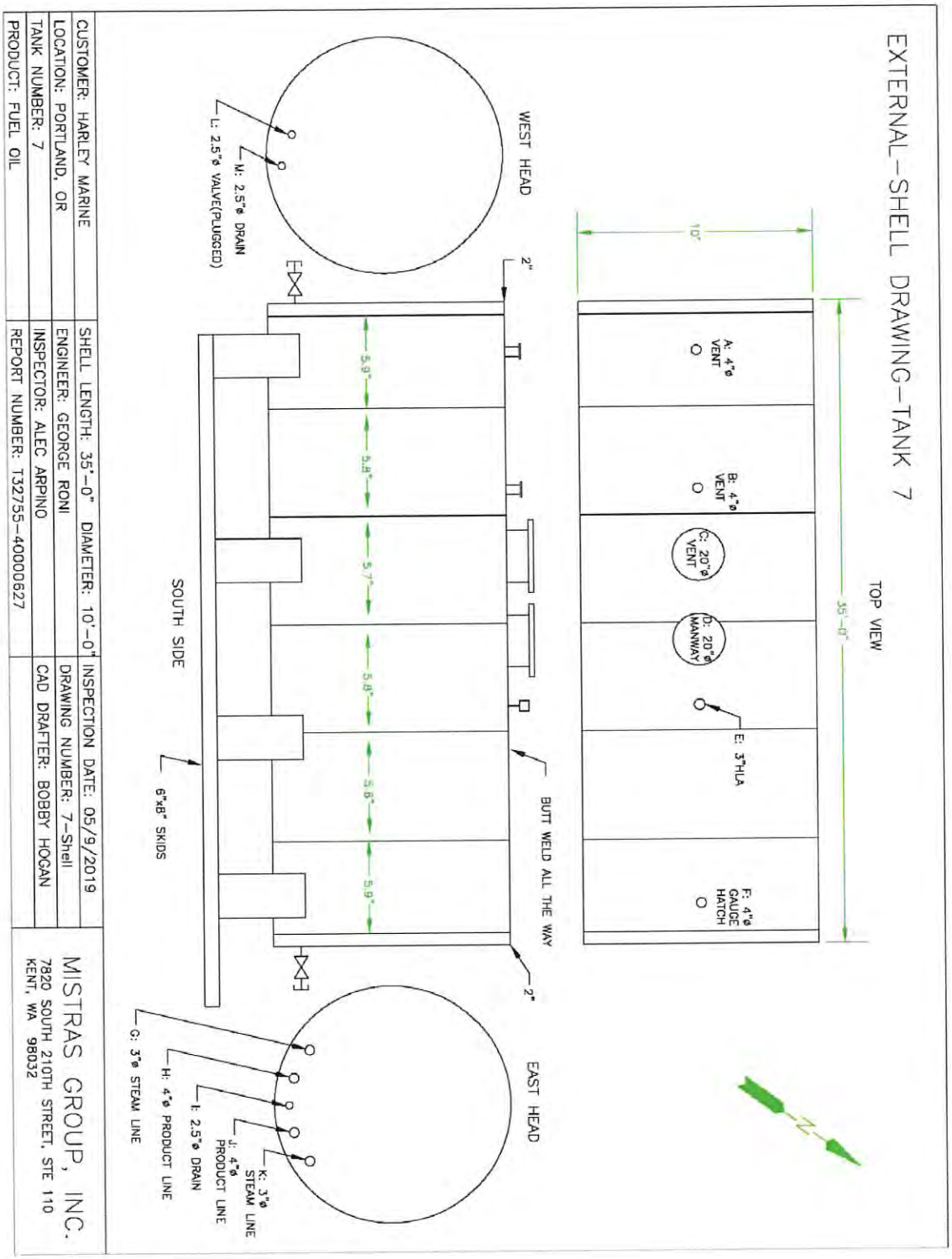
Expiration Date *December 31, 2020*

Manager, Individual Certification Programs

ICP

2015-027 | PDF

9.0 Drawings



CUSTOMER: HARLEY MARINE	SHELL LENGTH: 35'–0"	DIAMETER: 10'–0"	INSPECTION DATE: 05/9/2019
LOCATION: PORTLAND, OR	ENGINEER: GEORGE RONI		DRAWING NUMBER: 7–Shell
TANK NUMBER: 7	INSPECTOR: ALEC ARPINO		CAD DRAFTER: BOBBY HOGAN
PRODUCT: FUEL OIL	REPORT NUMBER: T32755–40000627		

MISTRAS GROUP, INC.
7820 SOUTH 210TH STREET, STE 110
KENT, WA 98032

DAILY TUG LOG

Company: OTB Portland **Tug:** Willamette Champion
Master: Justin Todd **Barge:**
Log Date: June 13, 2019 Equipment Tests Performed Per 33CFR164.80

Log Approvals Next Unapproved

- Dispatch Approval
- Port Captain Approval
- GM Approval
- Billing Approval

MAINTENANCE

VHF Radio	Engine Alarms	Navigation Lights	Publications Updated	Gyro	Radar(s)	NTM'S	
Search Light(s)	Charts Updated	Joysticks/Wheel	Depth Indicator	Thrust Angle	Compass	Bilge Alarm	
Steering System	GPS	General Alarm	Whistle(s)	Towlines/Wires Inspected	Engine Gauges	Auto Pilot	

VGP

Were any deficiencies noted? No If yes, were the Corrective actions completed? No

Coastal Designation

Coastal voyages on log? No Near coastal voyages on log? No

EVENT LOG

Start Time	Stop Time	Job #	Remark	Channel	Coding
00:00	00:01		Standby at Spud, security check ok		Security Round Time Non-Billable Time
00:01	00:01		Daily Radio Log		Radio Logbook Entry Reporting
00:01	23:00		Daily Engine Room		Daily Engine Room V3 Reporting
02:00	02:00		Security check ok		Security Round Time Non-Billable Time
04:00	04:00		Security check ok		Security Round Time Non-Billable Time
06:00	06:00		Change of watch, security check ok		Change of Watch: Vessel Not Underway V3 Reporting
07:20	13:00		R.Denton off to Clinic due to illness		Crew Change Time Non-Billable Time
08:00	08:00	OTB-P-21877	Depart L/B for Ashgrove North		Inroute Time Job Times
08:00	08:00		Security check ok		Security Round Time Non-Billable Time
08:30	08:30		Pre Depart		Pre-Departure/Arrival Conference V2 Reporting
08:30	08:40	OTB-P-21877	Arrived at Ash North, make up to Barge		Job Job Times
08:40	08:40	OTB-P-21877	Depart for Ashgrove Rivergate w/SS 251		Job Job Times
09:40	09:40		Pre Arrival		Pre-Departure/Arrival Conference V2 Reporting
09:55	09:55	OTB-P-21877	Arrived at Ashgrove, 1st line		1st Line Time Job Times
10:00	10:00		Security check ok		Security Round Time Non-Billable Time
10:10	10:15	OTB-P-21877	All secure at Ashgrove Rivergate, Depart L/B for Spud		All Secure Time Job Times
10:40	10:40	OTB-P-21877	All secure at spud, standby for next job (Used 130 gallons of fuel)		Job Job Times
11:00	11:00	OTB-P-21872	Depart L/B for Hampton		Inroute Time Job Times
11:30	11:30	OTB-P-21872	Arrived at Hampton, standby Until Maxim Tankerman leaves to shift Global Seattle to Fred Devine		Job Job Times
11:43	11:43		Change of watch, security check ok		Change of Watch: Vessel Not Underway V3 Reporting
11:45	11:45	OTB-P-21872	Depart for Fred Devine		Depart Time Job Times
11:50	11:50		Pre arrival		Pre-Departure/Arrival Conference V2 Reporting
12:10	12:20	21872	A/S A/F @ Fred Devine w/G Seattle on spot for loading		Job Job Times
12:20	12:45	21872	Lite to OTB		Inroute Time Job Times
14:00	14:00		Security check		Security Round Time Non-Billable Time
16:00	16:00		Security check		Security Round Time Non-Billable Time
18:00	18:00		Watch change. Justin on. Sam off. Security check		Change of Watch: Vessel Not Underway V3 Reporting
20:00	20:00		Security check		Security Round Time Non-Billable Time
22:00	22:00		Security check		Security Round Time Non-Billable Time
23:59	23:59		Watch change. Justin off. Sam on. Security check		Change of Watch: Vessel Not Underway V3 Reporting

CREW

Name	Position	Start Time	Stop Time	Hours
Charles Lakin	Deckhand	00:00	23:59	12
Rest Hours: 1R - 11.98 | 7R - 83.86 | MINR - 0				
Work Hours: *None Listed*				
Justin Todd	Captain	00:01	23:59	12
Rest Hours: 1R - 12 | 7R - 84 | MINR - 0				
Work Hours: *None Listed*				
Samuel Williams	Captain	00:00	23:59	12
Rest Hours: 1R - 11.98 | 7R - 83.86 | MINR - 0				
Work Hours: *None Listed*				
Ryan Johnson	AB Deckhand	00:00	23:59	12
Rest Hours: 1R - 12 | 7R - 84 | MINR - 0				
Work Hours: *None Listed*				
Cory Verbeck	AB Deck Tankerman	00:00	23:59	12
Rest Hours: 1R - 11.98 | 7R - 131.86 | MINR - 0				
Work Hours: *None Listed*				

Miles Day:
Avg. Speed Day:
Distance To Go:
Detention Day:
Barge #1 FWD:
Barge #2 FWD:
Barge #3 FWD:
Barge #4 FWD:
Tug #1 FWD:

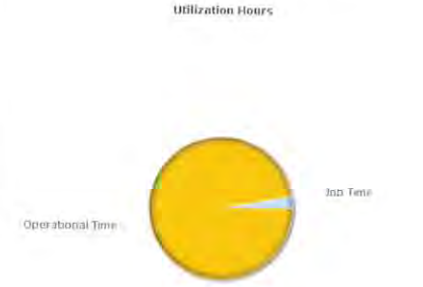
OFFSHORE REPORT

Miles Trip:
Avg. Speed Trip:
Hours Run Trip:
Tow Wire Hours:
#1 AFT:
#2 AFT:
#3 AFT:
#4 AFT:
#1 AFT:

FUEL USED

Fuel Used: 195 Fuel O/B: 10356 Lube Used: 7 Lube O/B: 217

Utilization



FUEL TRANSFERS & PURCHASES

Type	Fuel/Lubo	Vessel From	Vessel To	Gallons	PO #

Oily Waste Movements

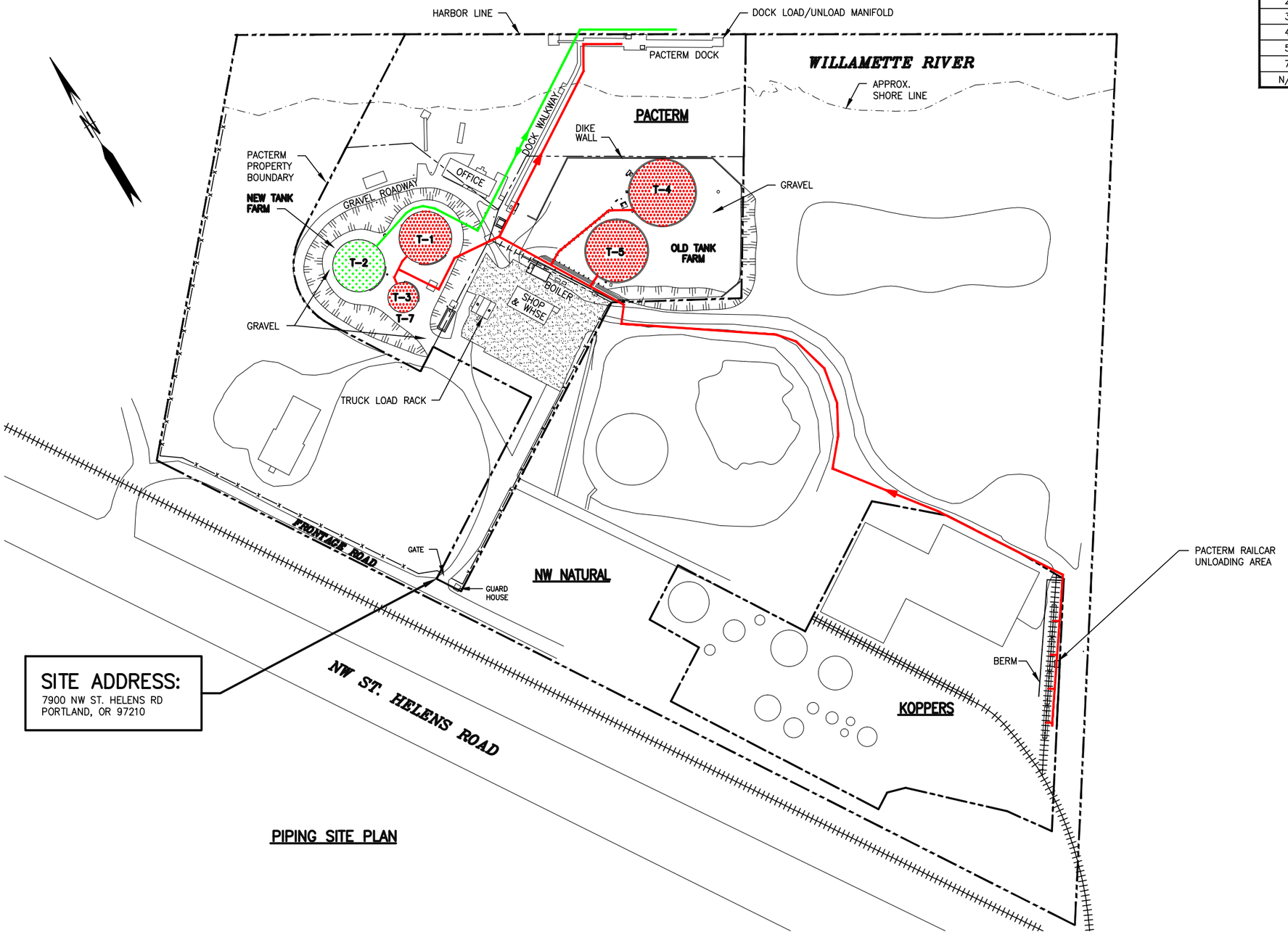
Starting Bilge Waste:	12	Ending Bilge Waste:	0	Waste Bags:		Starting Waste Oil :	52	Ending Waste Oil:	0

Time	Type	Action	Tank Name	Discharge location	Remarks	Bags/Gallons
15:00:00.0000000	Bilge Waste	Discharged	Bilge Waste	Spud Barge PDX		-12
15:00:00.0000000	Waste Oil	Discharged	slop barrel	Spud Barge PDX		-52

Masters Signature: Digitally Signed - Justin Todd Date: 6/13/2019

Appendix 3

- Piping Site Plan



SITE ADDRESS:
7900 NW ST. HELENS RD
PORTLAND, OR 97210

PIPING SITE PLAN

TANK DATA

TANK NO.	DIAMETER	HEIGHT	TYPE	SHELL CAPACITY (BBLS)	SERVICE
1	95'-0"	48'-0"	CONE ROOF	60,567	IFO
2	95'-0"	48'-0"	CONE ROOF	60,567	MDO
3	55'-0"	48'-0"	CONE ROOF	20,301	#6 FO
4	117'-2"	42'-0"	CONE ROOF	80,613	IFO
5	114'-6"	30'-0"	CONE ROOF	54,990	CUTTER
7	10'-0"	35'-1"	HORIZONTAL	501	FO
N/A	500 GALLON BOILER FUEL TANK (DIESEL, ABOVE GROUND - NEAR TO BOILER BUILDING)				

LEGEND

- BLENDED BLACK OILS ("IFO" AND SIMILAR)
- DIESEL (MARINE DIESEL "MDO")

NOTE

1. ALL PIPING ARE APPROXIMATE.

50' 0' 100' 200'
SCALE: 1"=100' (22x34)
SCALE: 1"=200' (11x17)

ALPHA TECHNICAL GROUP INC.
2929 NW 29th AVE, PORTLAND, OR. 97210
Tel:(503)227-3317/Fax:(503)227-3244

ATGI PROJECT NUMBER: 19-13

DRAWING NO.	REFERENCE DRAWINGS	REV.	DATE	REVISED	DRAWN	CKD.	CIV/STRL	MECH/PIPING	ELEC/INST	SAFETY	P.E.
		A	05/24/24	FOR REVIEW & COMMENT	HVT	JPD					

PACIFIC TERMINAL SERVICES, INC.
7900 St. Helens Rd., Portland, Oregon 97210

CLIENT APPROVALS		
REV	BY	DATE

SCALE:AS NOTED		DATE
DRAWN BY	HVT	05/24/24
DESIGNED BY	JPD	
CHECKED BY	JPD	
WORK ORDER		
DATE		
05/24/24		

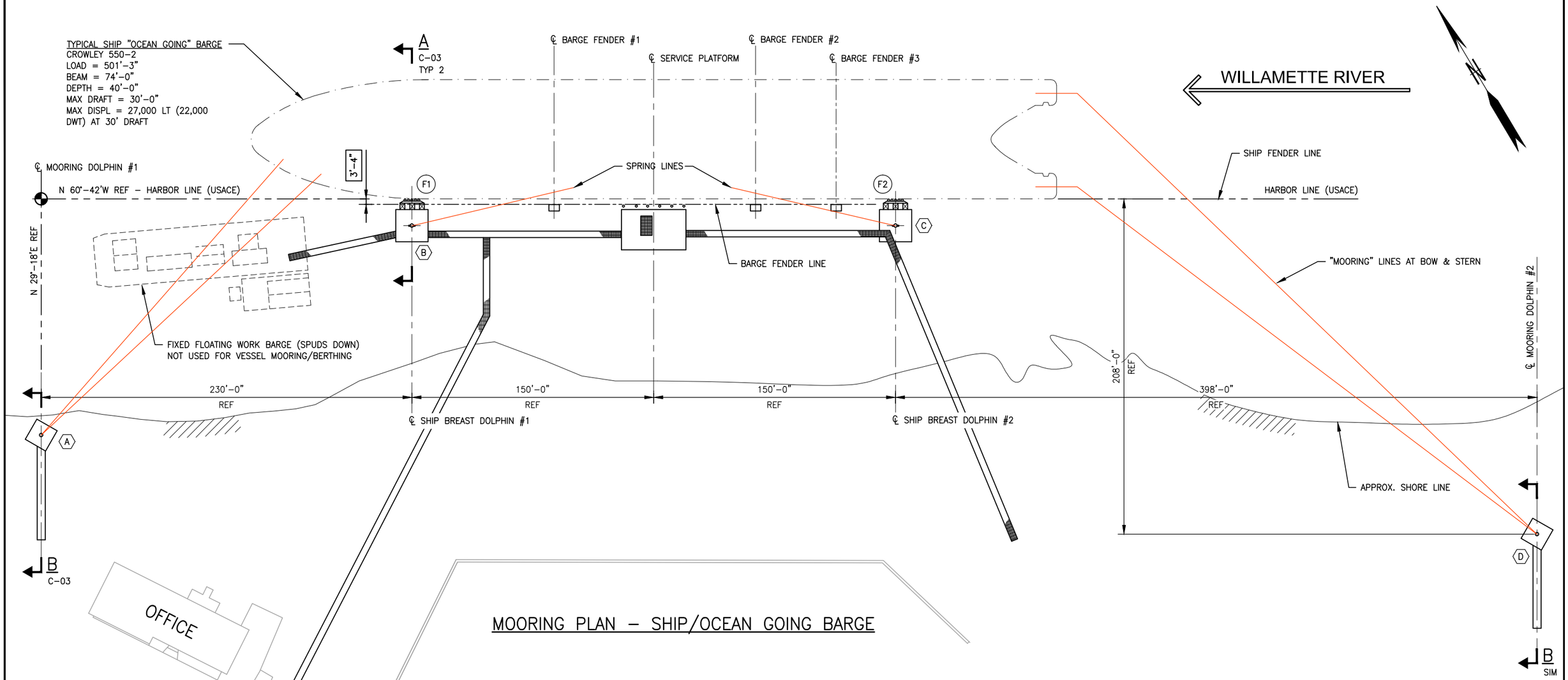
PORTLAND TERMINAL
PORTLAND, OREGON

PRODUCT PIPING GENERAL ROUTING SITE PLAN

DRAWING NO.	SHEET	REV.
19-13-P-01	1 OF 1	A

Appendix 4

- Dock Site Plan



MOORING PLAN – SHIP/OCEAN GOING BARGE

LEGEND:

- MOORING LINES
- (A) BOLLARD ALLOW LINE PULL = 215 KIPS
- (B) (C) BOLLARD ALLOW LINE PULL = 150 KIPS ANY DIRECTION
- (D) SINGLE BIT BOLLARD ALLOW LINE PULL = 215 KIPS
- (F1) (F2) RUBBER ENERGY ABSORBING FENDER SYSTEM WITH WOOD FENDER PILES
  1. MAX ALLOW APPROACH VELOCITY = 0.4 FT/SEC

BERTHING LIMITS/RESTRICTIONS:

1. NO BERTHING ALLOWED IN SUSTAINED WINDS > 60 MPH (ANY DIRECTION).
2. NO RESTRICTIONS FOR CURRENT SPEEDS (HISTORICAL MAXIMUM CURRENT VELOCITY = 5 FTS
3. LIMIT APPROACH VELOCITY = 0.4 FT/SEC DURING ALL CONDITIONS.

15' 0' 30' 60'
SCALE: 1"=30' (22x34)
SCALE: 1"=60' (11x17)

ALPHA TECHNICAL GROUP INC.
2929 NW 29th AVE, PORTLAND, OR. 97210
Tel:(503)227-3317/Fax:(503)227-3244

ATGI PROJECT NUMBER: 19-11

DRAWING NO.	REFERENCE DRAWINGS	REV.	DATE	REVISED	DRAWN	CKD.	CIV/STRL	MECH/PIPING	ELEC/INST	SAFETY	P.E.
		A	01/09/18	REPORT ISSUE	HVT	JPD					

PACIFIC TERMINAL SERVICES, INC.
7900 St. Helens Rd., Portland, Oregon 97210

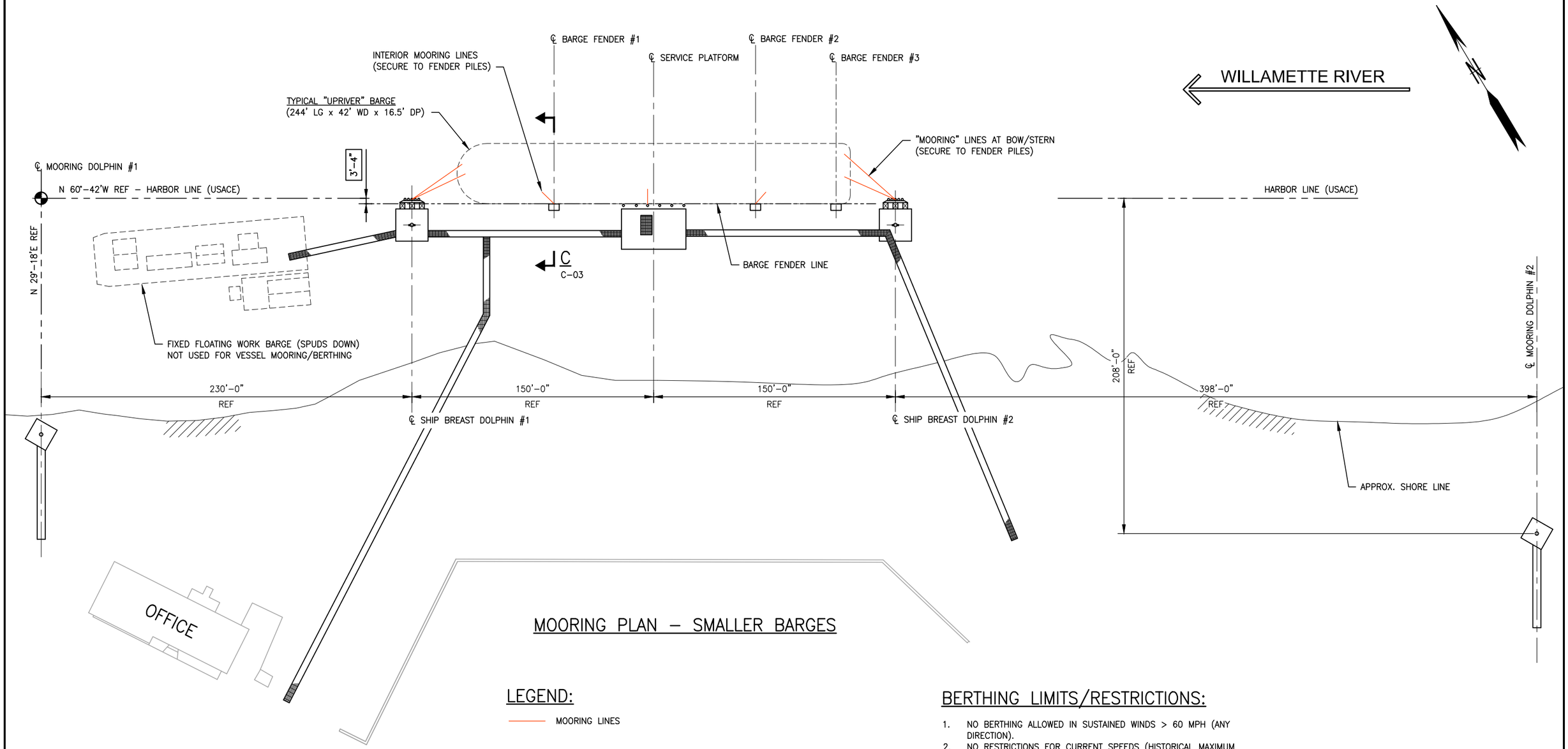
CLIENT APPROVALS		
REV	BY	DATE

SCALE:AS NOTED		DATE
DRAWN BY	HVT	12/15/17
DESIGNED BY	JPD	
CHECKED BY	JPD	
WORK ORDER		22x34
DATE		11/22/17

PORTLAND TERMINAL
PORTLAND, OREGON

MOORING PLAN
SHIP/OCEAN GOING BARGES

DRAWING NO.	SHEET	REV.
1911-C-01	1 OF 1	A



MOORING PLAN – SMALLER BARGES

LEGEND:

MOORING LINES

BERTHING LIMITS/RESTRICTIONS:

1. NO BERTHING ALLOWED IN SUSTAINED WINDS > 60 MPH (ANY DIRECTION).
2. NO RESTRICTIONS FOR CURRENT SPEEDS (HISTORICAL MAXIMUM CURRENT VELOCITY = 5 FTS
3. LIMIT APPROACH VELOCITY = 0.4 FT/SEC DURING ALL CONDITIONS.

15' 0' 30' 60'

SCALE: 1"=30' (22x34)
SCALE: 1"=60' (11x17)

ALPHA TECHNICAL GROUP INC.
2929 NW 29th AVE, PORTLAND, OR. 97210
Tel:(503)227-3317/Fax:(503)227-3244

ATGI PROJECT NUMBER: 19-11

DRAWING NO.	REFERENCE DRAWINGS	REV.	DATE	REVISED	DRAWN	CKD.	CIV/STRL	MECH/PIPING	ELEC/INST	SAFETY	P.E.
		A	01/09/18	REPORT ISSUE	HVT	JPD					

PACIFIC TERMINAL SERVICES, INC.
7900 St. Helens Rd., Portland, Oregon 97210

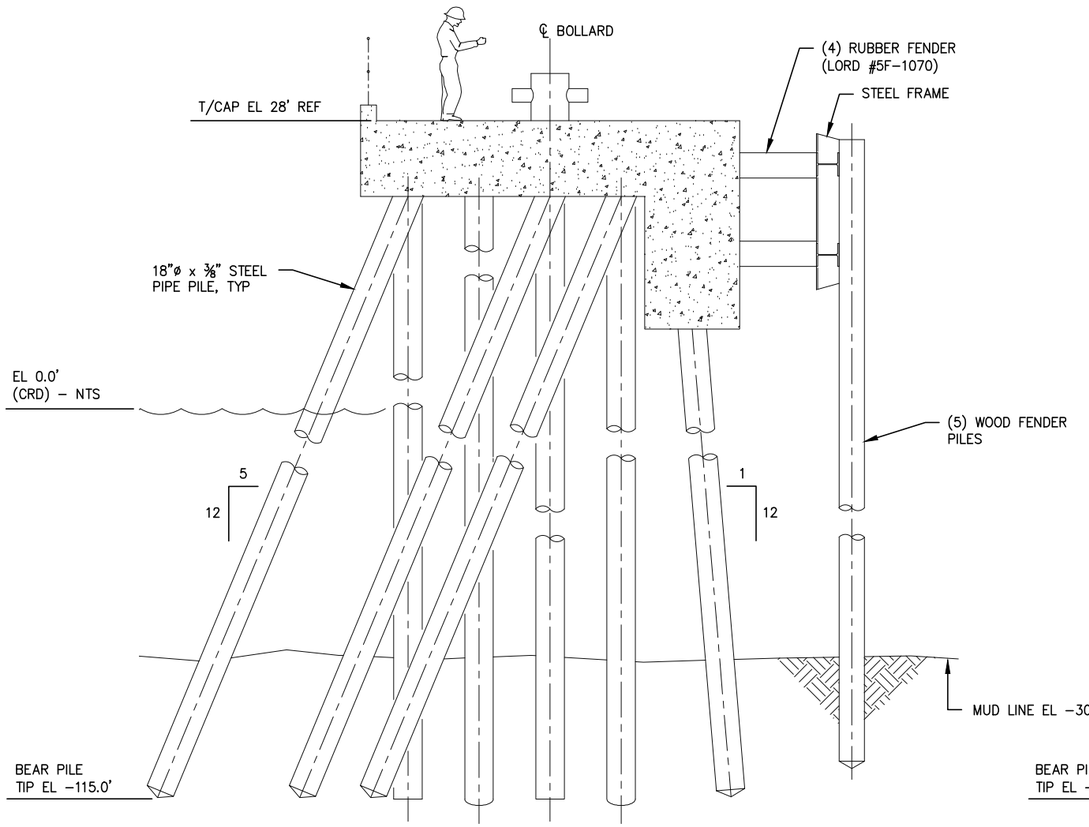
CLIENT APPROVALS		
REV	BY	DATE

SCALE:AS NOTED		DATE
DRAWN BY	HVT	12/15/17
DESIGNED BY	JPD	
CHECKED BY	JPD	
WORK ORDER		22x34
DATE		
11/22/17		

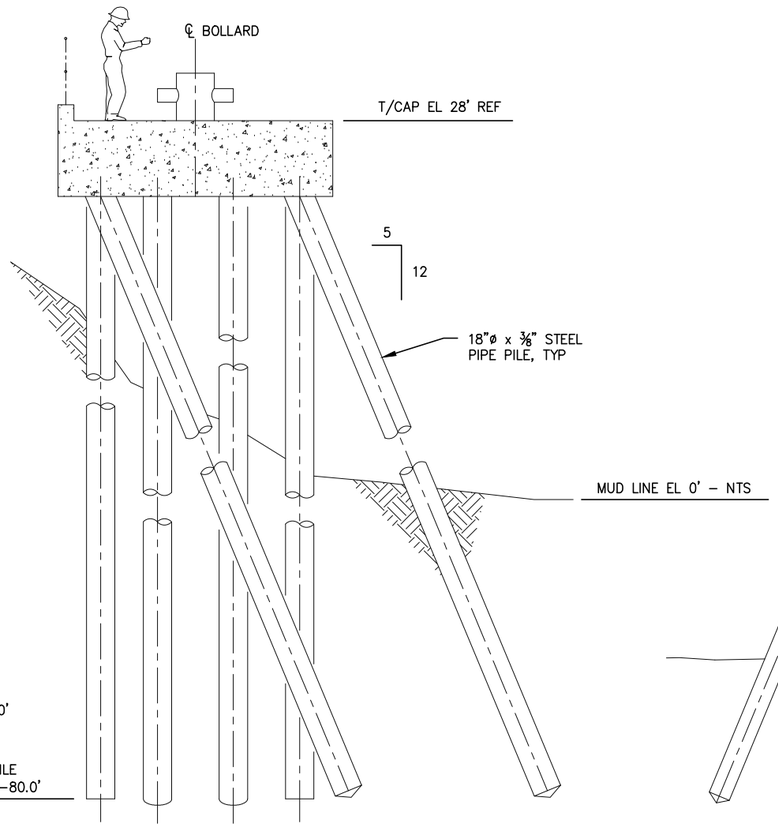
PORTLAND TERMINAL
PORTLAND, OREGON

MOORING PLAN
SMALLER BARGES

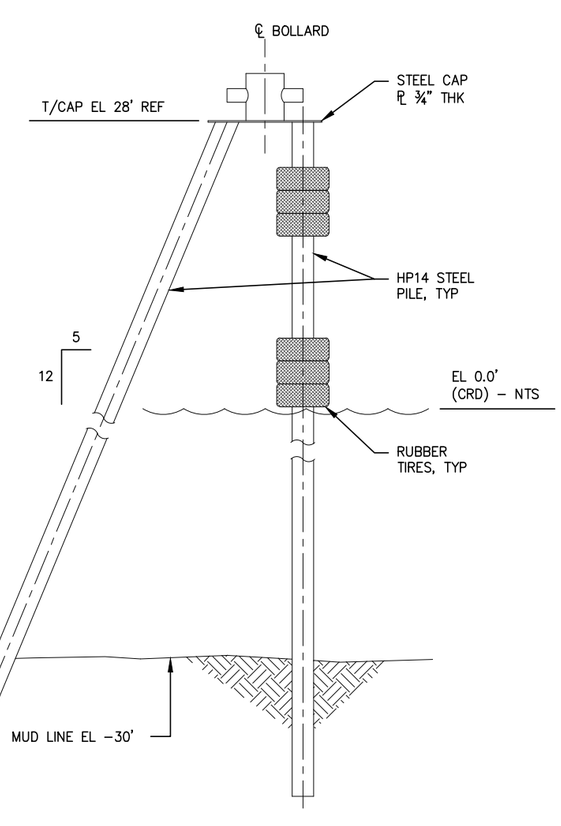
DRAWING NO.	SHEET	REV.
1911-C-02	1 OF 1	A



SECTION A
1/4"=1'-0" C-01



SECTION B
1/4"=1'-0" C-01



SECTION C
1/4"=1'-0" C-02

NOTES:

1. ALL ELEVATIONS REFERENCED TO COLUMBIA RIVER DATUM (CRD).
2. MOORING STRUCTURE INFO SHOWN ON THIS DRAWING BASED ON SITE VISIT/ORIGINAL DRAWING AND IS FOR CALCULATION PURPOSES ONLY. (NO ORIGINAL DRAWINGS AVAILABLE FOR M.D. #2 AND BARGE FENDER 1/2/3).

1' 0' 2' 4' 6' 8'
SCALE: 1/4"=1'-0" (22x34)
SCALE: 1/8"=1'-0" (11x17)

ALPHA TECHNICAL GROUP INC.
2929 NW 29th AVE, PORTLAND, OR. 97210
Tel:(503)227-3317/Fax:(503)227-3244

ATGI PROJECT NUMBER: 19-11

DRAWING NO.	REFERENCE DRAWINGS	REV.	DATE	REVISED	DRAWN	CKD.	CIV/STRL	MECH/PIPING	ELEC/INST	SAFETY	P.E.
		A	01/09/18	REPORT ISSUE	HVT	JPD					

PACIFIC TERMINAL SERVICES, INC.
7900 St. Helens Rd., Portland, Oregon 97210

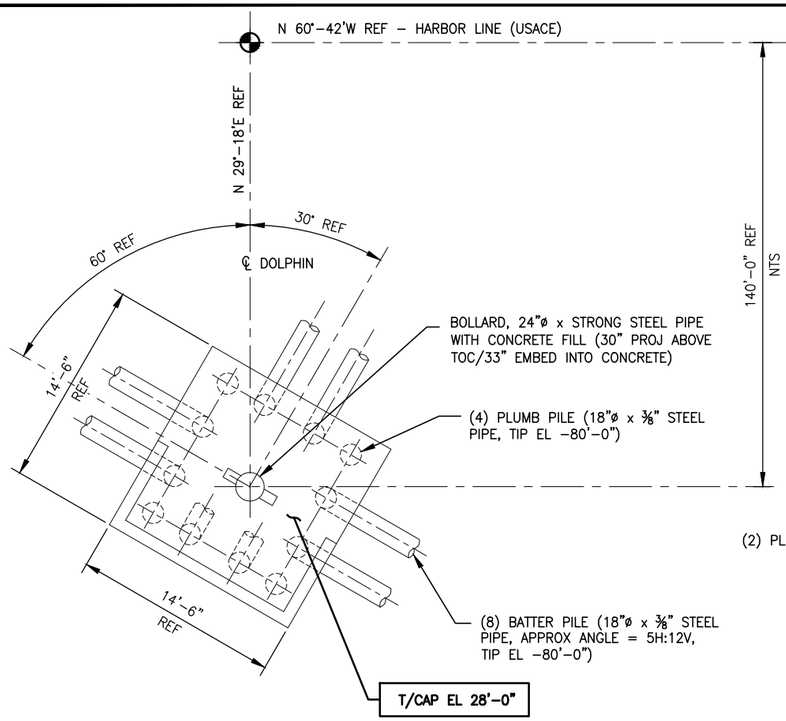
CLIENT APPROVALS		
REV	BY	DATE

SCALE:AS NOTED		DATE
DRAWN BY	HVT	12/15/17
DESIGNED BY	JPD	
CHECKED BY	JPD	
WORK ORDER		22x34
DATE		
11/22/17		

PORTLAND TERMINAL
PORTLAND, OREGON

DOLPHIN STRUCTURE SECTIONS

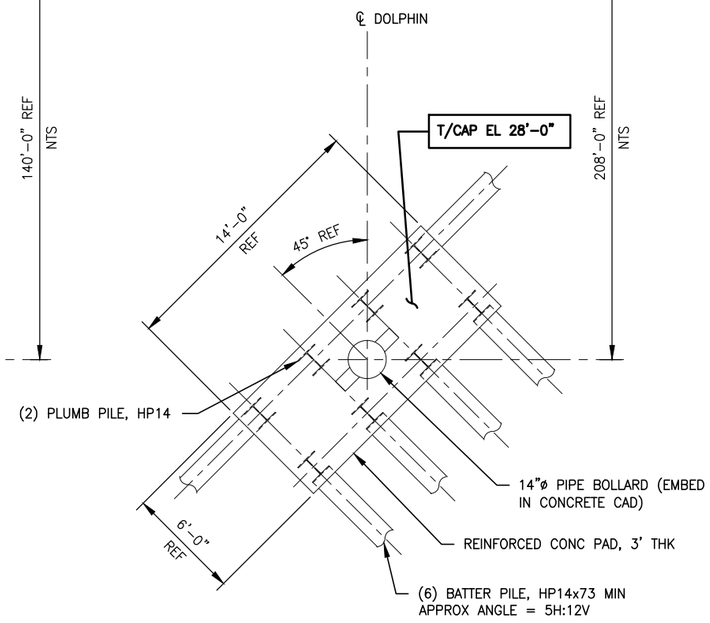
DRAWING NO.	SHEET	REV.
1911-C-03	1 OF 1	A



EXIST MOORING DOLPHIN #1

DETAIL

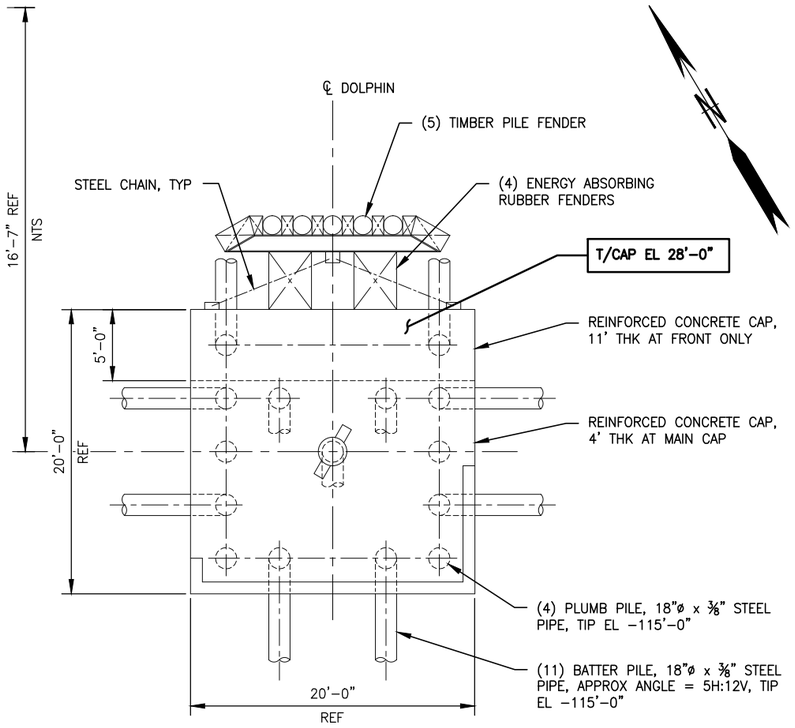
3/16"=1'-0"



EXIST MOORING DOLPHIN #2 (UPSTREAM)

DETAIL

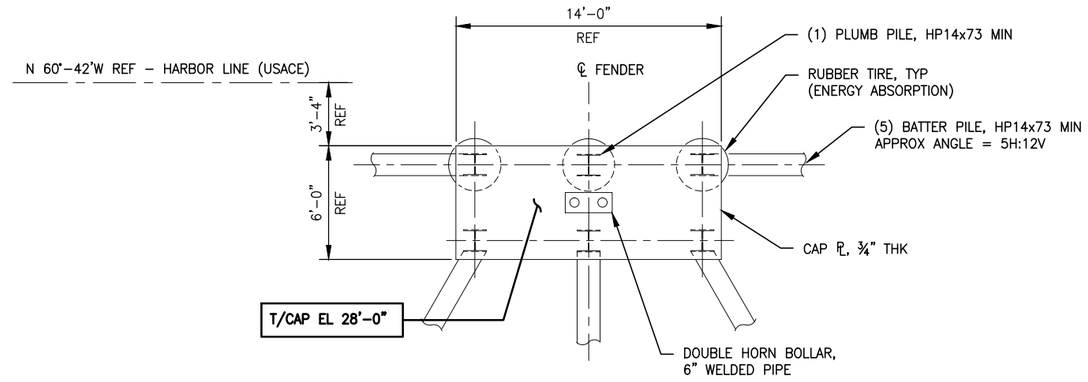
1/4"=1'-0"



EXIST SHIP BREAST DOLPHIN #1 & #2

DETAIL

3/16"=1'-0"



EXIST BARGE FENDER #1, 2, 3

DETAIL

3/16"=1'-0"

NOTES:

1. MOORING STRUCTURE INFO SHOWN ON THIS DRAWING BASED ON SITE VISIT/ORIGINAL DRAWING AND IS FOR CALCULATION PURPOSES ONLY. (NO ORIGINAL DRAWINGS AVAILABLE FOR M.D. #2 AND BARGE FENDER 1/2/3).

2' 0' 6' 12'
SCALE: 3/16"=1'-0" (22x34)
SCALE: 3/32"=1'-0" (11x17)

1' 0' 2' 4' 6' 8'
SCALE: 1/4"=1'-0" (22x34)
SCALE: 1/8"=1'-0" (11x17)

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		A	01/09/18	REPORT ISSUE	HVT	JPD					

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CHECKED BY	JPD	
WORK ORDER		22x34
DATE		11/22/17

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DOLPHIN STRUCTURE DETAILS

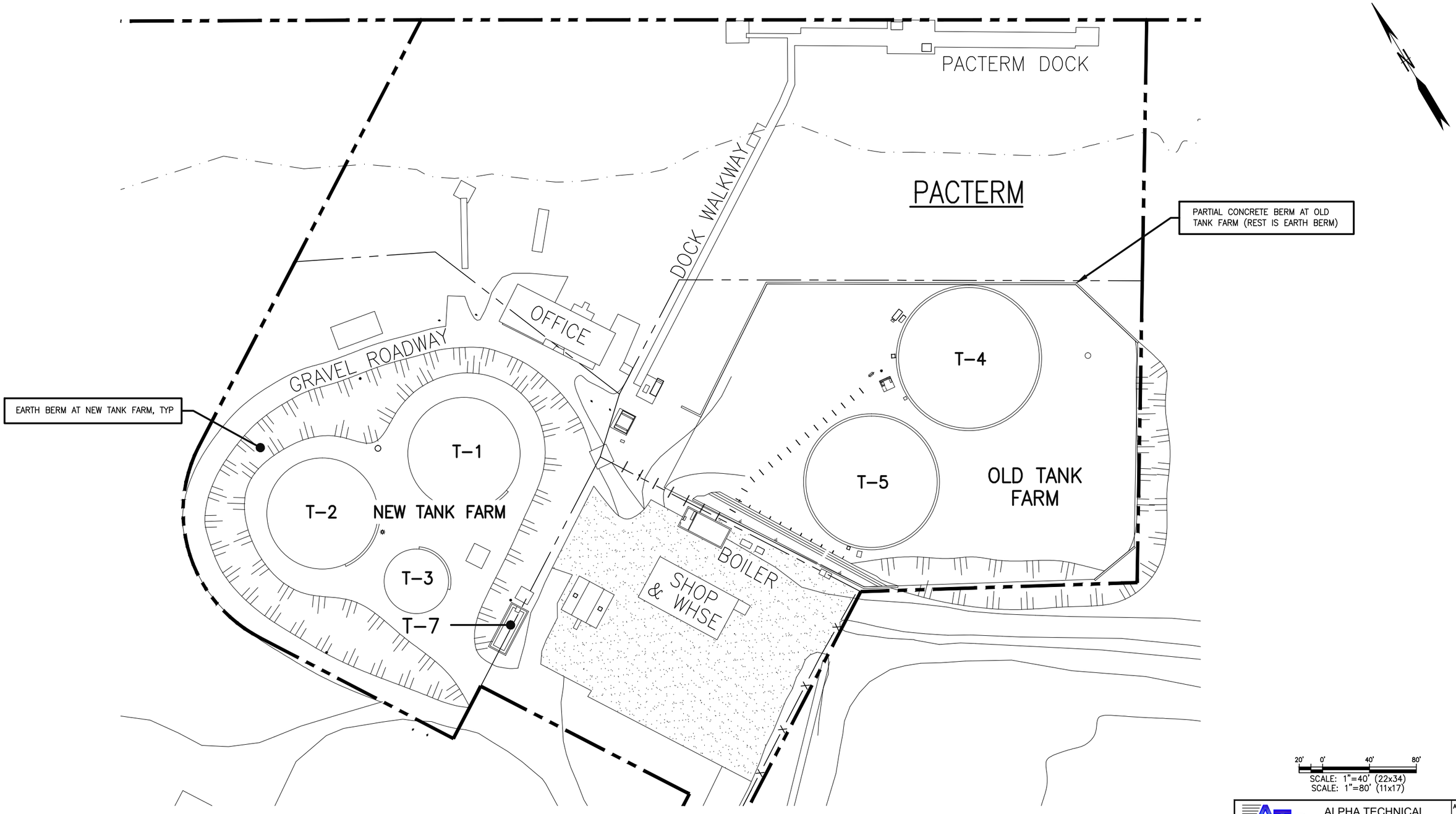
DRAWING NO.	SHEET	REV.
1911-C-04	1 OF 1	A

Appendix 5

- Not used-no LNG facilities at Pacterm

Appendix 6

- Dikes & Berms Site Plan



DIKE & BERM SITE PLAN

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DIKE & BERM SITE PLAN

DRAWING NO.	SHEET	REV.
19-13-BERM-01	1 OF 1	A

PHOTO #1 – OLD TANK FARM

PHOTO #2 – OLD TANK FARM

PHOTO #3 – OLD TANK FARM

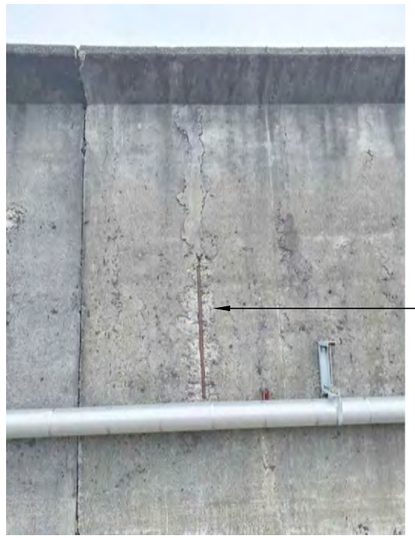

PHOTO #4 – OLD TANK FARM

PHOTO #5 – OLD TANK FARM

PHOTO #6 – NEW TANK FARM

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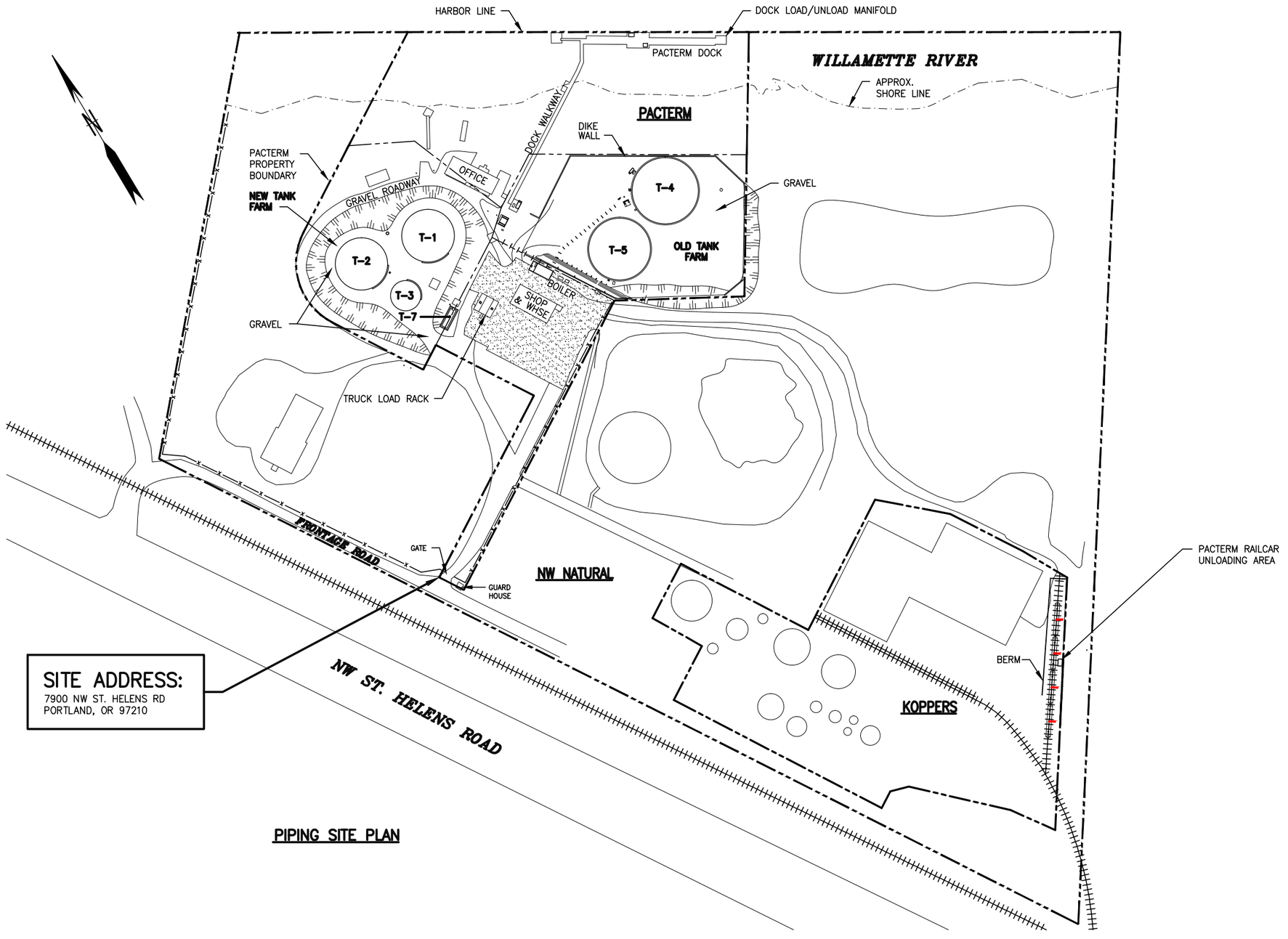
BERM DETAILS

DRAWING NO.	SHEET	REV.
19-13-BERM-02	1 OF 1	A

Appendix 7

- Buildings Site Plan



PIPING SITE PLAN

50' 0' 100' 200'

SCALE: 1"=100' (22x34)
SCALE: 1"=200' (11x17)

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05/24/24		

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BUILDING SITE PLAN

DRAWING NO.	SHEET	REV.
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PHOTO #1 – OFFICE BLDG

PHOTO #2 – CTRL RM/BOILER BDLG

PHOTO #3 – SHOP/WAREHOUSE

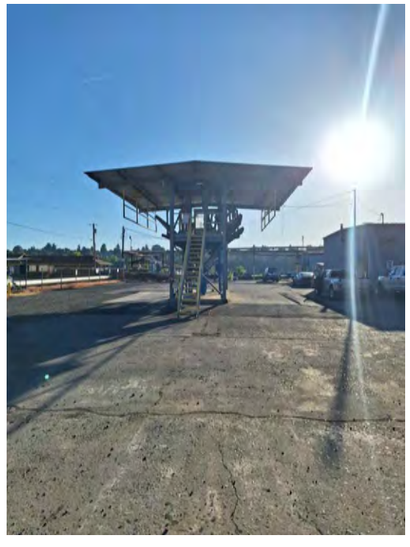

PHOTO #4 – TRUCK LOAD RACK

DRAWING NO.	REFERENCE DRAWINGS	REV.	DATE	REVISED	DRAWN	CKD.	CIV/STRL	MECH/PIPING	ELEC/INST	SAFETY	P.E.
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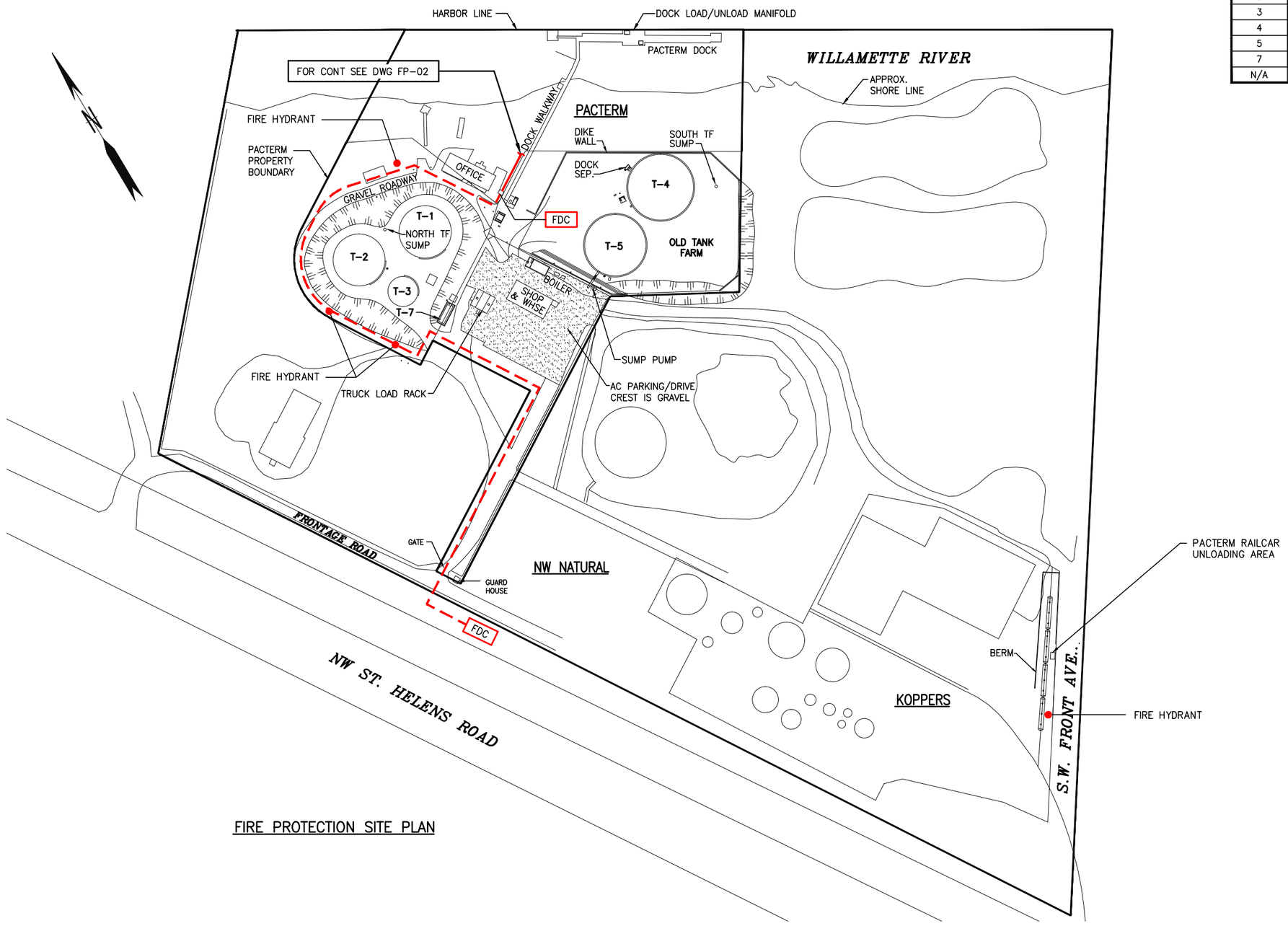
BUILDING
PHOTO DETAILS

DRAWING NO.	SHEET	REV.
19-13-BLDG-02	1 OF 1	A

Appendix 8

- Fire Site Plan



FIRE PROTECTION SITE PLAN

TANK DATA

TANK NO.	DIAMETER	HEIGHT	TYPE	BARRELS	SERVICE
1	95'-0"	48'-0"	CONE ROOF	60,567	F.O. #6
2	95'-0"	48'-0"	CONE ROOF	60,567	DO #2
3	55'-0"	48'-0"	CONE ROOF	20,301	F.O. #6
4	117'-2"	42'-0"	CONE ROOF	80,613	F.O. #6
5	114'-6"	30'-0"	CONE ROOF	54,990	CUTTER OIL
7	10'-0"	35'-1"	HORIZONTAL	501	DO #2
N/A	500 GALLON BOILER FUEL TANK (DIESEL, ABOVE GROUND – NEAR TO BOILER BUILDING)				

LEGEND

- FIRE WATER PIPING (UNDERGROUND)
- FIRE HYDRANT
- FDC — FIRE DEPARMENT CONNECTION

NOTE

1. ALL PIPING ARE APPROXIMATE.

50' 0' 100' 200'
SCALE: 1"=100' (22x34)
SCALE: 1"=200' (11x17)

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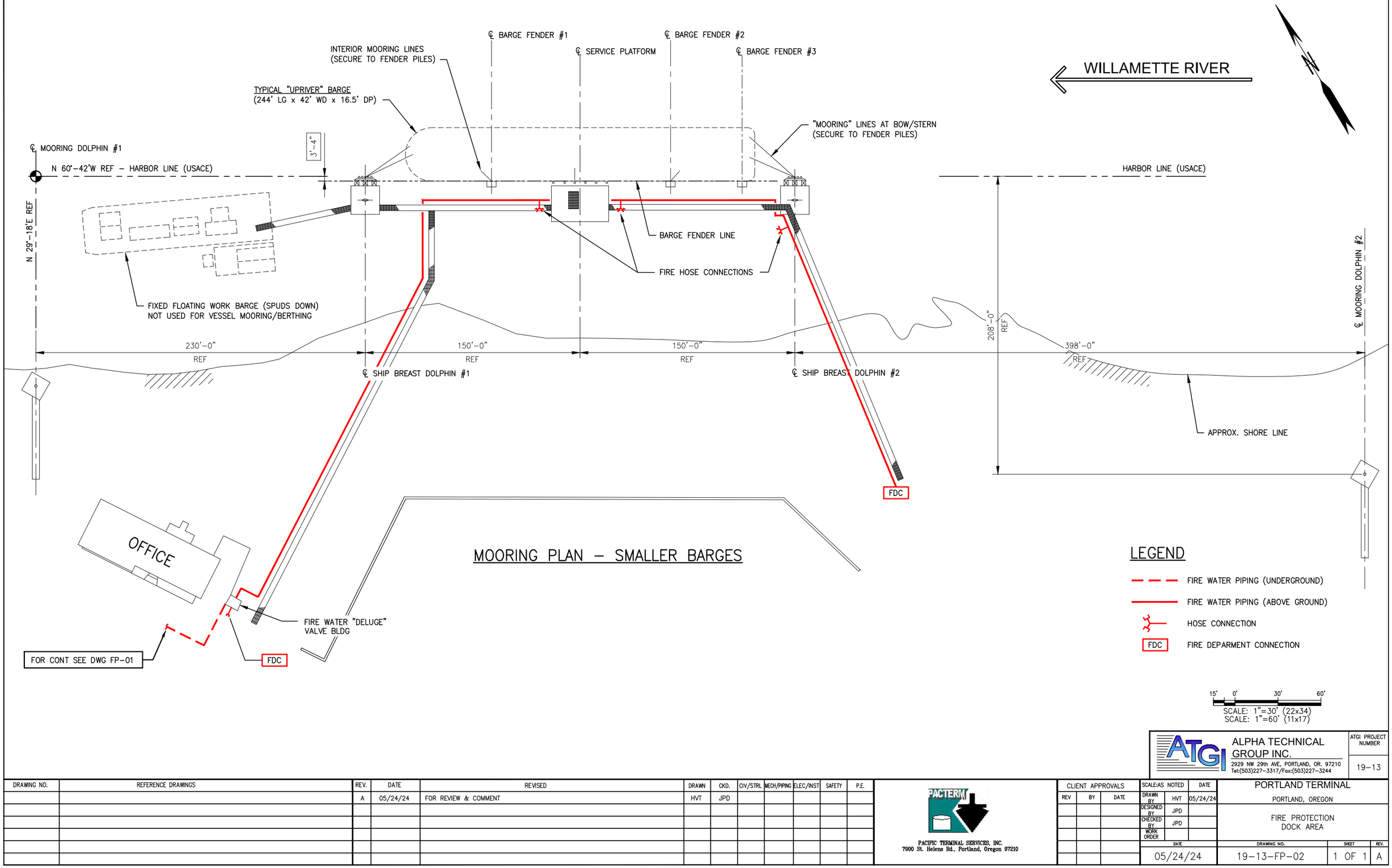
FIRE PROTECTION SITE PLAN

DRAWING NO.	SHEET	REV.
19-13-FP-01	1 OF 1	A



MOORING PLAN - SMALLER BARGES

LEGEND

- FIRE WATER PIPING (UNDERGROUND)
- FIRE WATER PIPING (ABOVE GROUND)
- HOSE CONNECTION
- FDC — FIRE DEPARMENT CONNECTION

15' 0' 30' 60'

SCALE: 1"=30' (22x34)
SCALE: 1"=60' (11x17)

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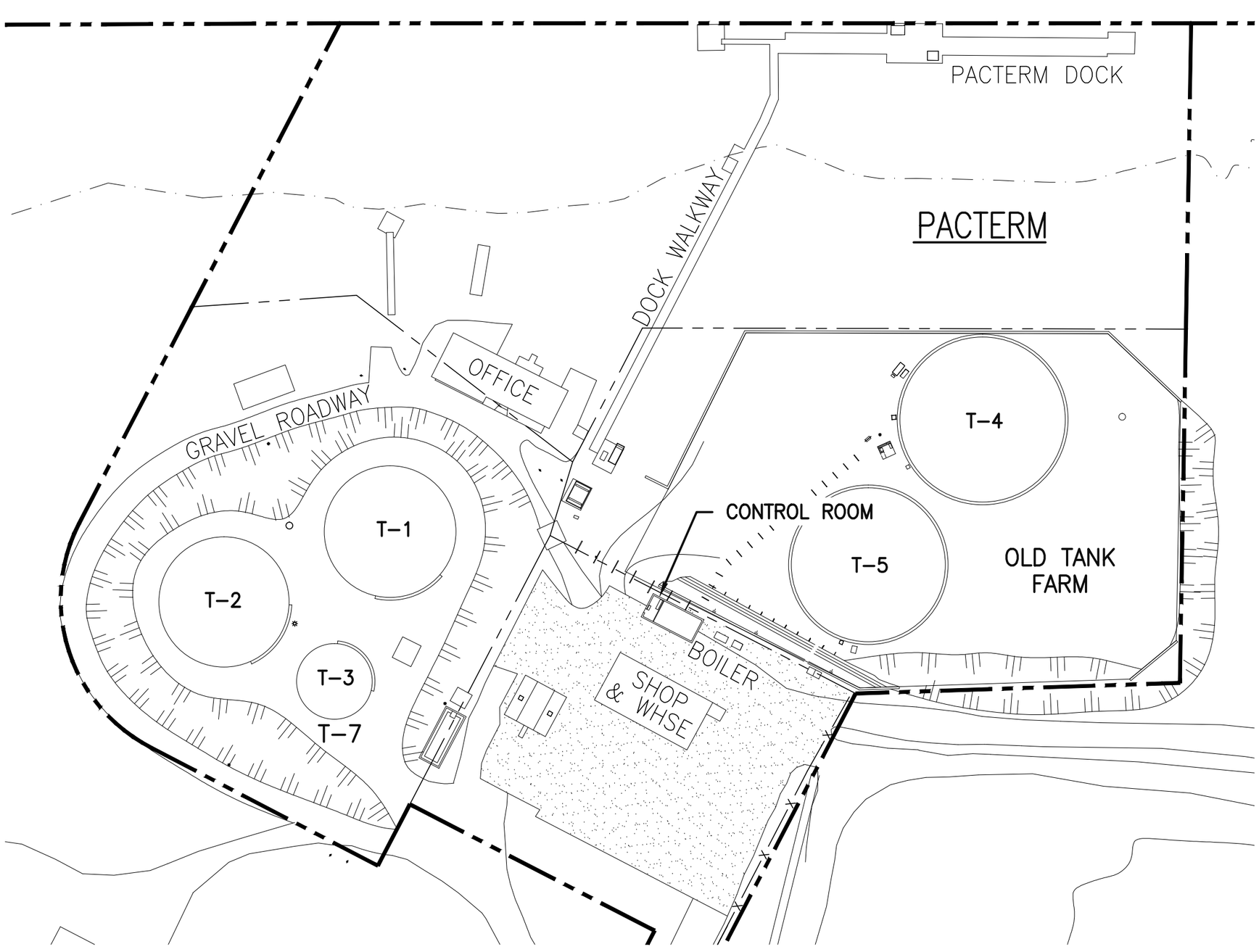
FIRE PROTECTION
DOCK AREA

DRAWING NO.	SHEET	REV.
19-13-FP-02	1 OF 1	A

Appendix 9

- Controls Site Plan



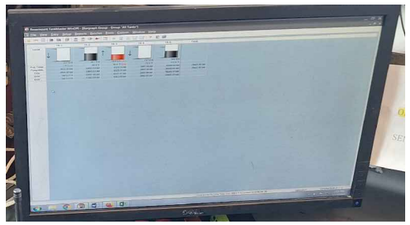


PHOTO #1 – TANK LEVEL DISPLAY

PHOTO #2 – CONTROL PANEL

20' 0' 40' 80'

SCALE: 1"=40' (22x34)
SCALE: 1"=80' (11x17)

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CONTROL ROOM PLAN

DRAWING NO.	SHEET	REV.
19-13-CTL-01	1 OF 1	A