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DEPARTMENT OF HEALTH

STATE OF HAWAII

In the Matter of the Application of UNITED STATES NAVY For an Underground Storage Tank Permit for the Red Hill Bulk Fuel Storage Facility	DOCKET NO. 19-UST-EA-01 WRITTEN TESTIMONY OF CHRISTOPHER D. CAPUTI; CERTIFICATE OF SERVICE

DEPARTMENT OF HEALTH
Contested Case Hearing Re Red Hill Permit Application
19-UST-EA-01
Testimony of Christopher D. Caputi

I provide this written testimony on behalf of the United States Navy in the above-captioned contested case before the Hawaii Department of Health (DOH).

1. I have 28 years of experience providing engineering and management support to petroleum storage tank environmental regulatory compliance programs, including petroleum storage tank system leak detection testing, petroleum storage tank system design, storage tank management plans, spill prevention, control, and countermeasure plans, and oil spill preparedness and planning support. My resume is attached.

2. I have supported the DLA Leak Detection CMP since its inception in 2006, executing thousands of regulatory required leak detection, or release detection, test events at over 200 Department of Defense installations worldwide, including leak detection testing at the Red Hill Bulk Fuel Storage Facility, Joint Base Pearl Harbor-Hickam, Hawaii.

3. I have a Bachelor of Science Degree in Civil and Environmental Engineering.

4. I am a Licensed Professional Engineer in the State of Virginia.

5. I was asked to provide technical support regarding the Release Detection aspects of the Underground Storage Tank Permit for the Red Hill Bulk Fuel Storage Facility, specifically:

   a. What is the current method of Release Detection for tanks F-1 to F-20 and F-ST1 to F-ST4?
   b. Why was the current method of Release Detection for tanks F-1 to F-20 and F-ST1 to F-ST4 chosen?
   c. Explain the current method of Release Detection for tanks F-1 to F-20 and F-ST1 to F-ST4.
   d. Explain what scaling and averaging of the leak detection method is and how it applies to the current method of Release Detection for tanks F-1 to F-20 and F-ST1 to F-ST4.
   e. Why does the current method of Release Detection remain the proposed approach to Release Detection for tanks F-1 to F-20 and F-ST1 to F-ST4?

f. What is the current method of Release Detection for the underground piping associated to tanks F-1 to F-20 and F-ST1 to F-ST4?

g. Explain the Pressure Testing of the underground piping associated to tanks F-1 to F-20 and F-ST1 to F-ST4.

6. My technical support, are set forth in the letter attached to this testimony, which was prepared under my supervision. The conclusions in this letter include:

a. The Release Detection applied to tanks F-1 to F-20 and F-ST1 to F-ST4 meets State of Hawaii UST regulations, HAR 11-280.1-43(10).

b. The Release Detection of the underground piping associated to tanks F-1 to F-20 and F-ST1 to F-ST4 was appropriately applied to those sections under the jurisdiction of the Hawaii UST program, and meets State of Hawaii UST regulations, HAR 11-280.1-44(A)(i).

c. The Pressure Testing of the underground piping associated to tanks F-1 to F-20 and F-ST1 to F-ST4, was appropriately applied to those sections under the jurisdiction of the U.S. Coast Guard and meets U.S. Coast Guard regulations, 33 CFR 156.170.

Executed this 15th day of January 2021, Virginia Beach, Virginia.

CHRISTOPHER D. CAPUTI

Michael Baker
INTERNATIONAL

We Make a Difference

January 15, 2021

Mr. Jonathan McKay
Senior Associate Counsel
Navy Region Southwest
750 Pacific Highway
San Diego, CA 32132

Re: Hawaii Department of Health hearing for Docket No. 19-UST-EA-01; contested draft permit for the Navy Red Hill Underground Fuel Storage Facility.

Dear Mr. McKay,

Michael Baker International (Michael Baker) was contracted by the U.S. Department of the Navy to provide technical support regarding the above referenced case and specifically the Release Detection aspects of the Red Hill permit application, related to the bulk field constructed underground storage tanks (BFCUSTs) and associated underground pipelines. Additionally, clarification of the pressure integrity testing of underground pipelines at Joint Base Pearl Harbor-Hickam to comply with U.S. Coast Guard regulations is provided.

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Red Hill Permit Application – Release Detection

Navy Exhibit 038 lists two items related specifically to Release Detection (also known as tightness testing and leak detection testing).

Operation Requirements:

Owners or operators must:

14. Provide a method, or combination of methods, of release detection that is installed, calibrated, operated, and maintained in accordance with §11-280.1-40, HAR.

SPECIAL CONDITIONS

5. Perform semi-annual tank tightness testing on tanks F-1 to F-20 and F-ST1 to F-ST4 in accordance with the description provided under the heading "Tanks – Release Detection" on page 3 of the letter portion of the permit application received by DOH on 23 May 2019 for any and all tanks storing product. The Permittee may additionally implement release detection methods consistent with a New Release Detection Alternatives Decision Document approved by DOH under AOC SOW section 4.8 and subchapter 4 of chapter 11-280.1, HAR.

Section 1: Release Detection – BFCUSTs

Current Method of Leak Detection

The current form of Release Detection employed on tanks F-1 to F-20 and F-ST1 to F-ST4 is semi-annual leak detection testing performed by utilizing the Mass Technology Corporation (MTC) Precision Mass Measurement System (PMMS) LDS, with Static In-Tank Measurement (SIM) 1000 (24-hour) leak detection method. The leak detection method is a third-party evaluated method listed with the National Work Group for Leak Detection Evaluators (NWGLDE). In the most general terms, this leak detection method functions as a very sensitive level gauging system that measures the mass (weight) of the liquid

column in the tank by directly measuring pressure and temperature and looks for changes to that mass over a 24-hour period of time.

Why was this Leak Detection method chosen?

In 2007 Michael Baker was tasked by Defense Logistics Agency (DLA) to perform an evaluation of leak detection approaches and requirements for all DLA capitalized fuel systems at Joint Base Pearl Harbor-Hickam, Hawaii. At that time, it was a common tasking by DLA to evaluate sites for inclusion into their newly established Centrally Managed Program for Leak Detection (aka the DLA LD CMP). Michael Baker staff mobilized to Pearl Harbor and collected site data to support the evaluation of the current (or technically suitable) leak detection approaches for the Joint Base Pearl Harbor-Hickam fuel systems including the Red Hill facility.

The results of that evaluation identified the Red Hill BFCUSTs (tanks F-1 to F-20 and F-ST1 to F-ST4) as reasonable candidates to apply point-in-time leak detection testing as a Best Management Practice (BMP) since, at that time, there were no state or federal requirements for leak detection for the Red Hill BFCUSTs. The MTC CBU-1000 leak detection method (similar in concept to the MTC PMMS LDS, with SIM-1000 leak detection method) was the most technically acceptable test by the DLA LD CMP for BFCUSTs at the time.

The selection of leak detection test methods utilized by the DLA LD CMP and the Navy, both at that time and currently, follows accepted industry standard approach. This approach focusses on identifying the leak detection criteria required for the site (either by regulation or self-imposed) and selecting a method that is capable of meeting those criteria. UST owners do not need to be experts to determine how the leak detection method meets all applicable technical requirements because the industry has streamlined that process. The industry relies on two interconnected processes to help choose methods that are technically acceptable; independent third-party evaluations and listed on the National Work Group for Leak Detection Evaluations (NWGLDE).

The use of independent, third-party evaluated methods is key in the process of leak detection method selection. This process provides for the inventor, or vendor, of a leak detection method to present

scientifically substantiated claims on the performance of their leak detection method and submit their test method for third-party review. This approach eliminates the need for end users of the leak detection method to rely on vendor marketing claims or to perform their own engineering performance evaluation, and allows the end user to rely on the results of a scientific evaluation of the leak detection method by an independent third-party to identify the leak detection method's actual performance capabilities. The independent third-party evaluation does not explore or analyze the actual method's process (data collection, equipment type, analysis) only the actual results of a test compared to the "known" result of the evaluation data. Simply stated, a third-party evaluation of a release detection method is performed by utilizing the test method and comparing the measured leak rate results of that test compared to an induced and known leak rate established by the evaluator. This is repeated for multiple induced leak rates (including zero gph) and a statistical analysis of those results is completed. From that evaluation of results the third-party evaluator arrives at the Minimum Detectable Leak Rate (MDLR) of the test system.

The NWGLDE is an independent work group that focuses on the process of the third-party evaluations of leak detection methods. The work group is comprised of 11 members: ten state regulators and one member from the U.S. EPA. All members of the NWGLDE are state or federal employees whose full-time job is to regulate storage tank systems. As presented in their web site (http://www.nwglde.org/), the mission of the NWGLDE is to review third-party evaluations of leak detection methods to determine if each third-party evaluation was performed in accordance with acceptable evaluation protocols as identified by the U.S. EPA and/or other regulatory performance standards, if applicable. If the third-party evaluation is deemed to have been performed in accordance with these protocols, the NWGLDE lists the leak detection method and any exceptions they may note.

Due to the rigor of the independent third-party evaluation and the NWGLDE listing of vetted leak detection methods, DLA, the Navy, and Michael Baker did not need to perform their own technical analysis of the inner workings (data collection or analysis) of any of the leak detection methods that were selected for use under the DLA LD CMP to be sure the method met the regulatory requirements. The technology, engineering and specific processes that a test vendor develops for their specific leak detection methods are usually proprietary in nature. This industry standard approach of applying independent third-party evaluations and NWGLDE listing allows for the determination of the performance standards of a leak detection method without the need to analyze, and thus divulge or expose any proprietary systems and

processes used by that method. Rather, the industry only focuses on evaluation of the final results of the leak detection method to determine how well the system works.

In 2008, and prior to execution of the first point-in-time leak detection testing at Red Hill, the Navy and DLA engaged Michael Baker to further evaluate leak detection testing options for the Red Hill BFCUSTs, with the goal of identifying options for a permanently installed solution. A formal Market Survey was conducted that considered various technologies with any potential to perform leak detection on these BFCUSTs. The results of that Market Survey concluded that due to the small market presence of these types of tanks (BFCUSTs), there were not many realistic options for permanent leak detection that were readily available in the industry, and none that could be considered "Plug-and-Play" on the BFCUSTs at Red Hill. It was noted that from a permanent installation perspective, considerable engineering would need to be performed to implement a solution. The directive from DLA to the Navy was that in the absence of any fully installed permanent solution, Michael Baker should begin to implement point-in-time leak detection testing utilizing a third-party evaluated, NWGLDE listed, leak detection method that could be implemented without considerable construction or major impacts to facility operations. The method recommended by Michael Baker to the Navy and DLA that met those criteria was the MTC CBU-1000 leak detection method. The Navy and DLA accepted that recommendation and Michael Baker executed the first biennial leak detection testing event on the Red Hill BFCUSTs in 2009.

It should be noted that in 2009 MTC released an improved/simplified version of the CBU-1000 leak detection method. The updated version is the MTC PMMS LDS, with SIM-1000. The concept of this leak detection method remained the same, however improvements to the technology, including the elimination of the need for nitrogen gas cylinders, greatly improved the ability to easily deploy the test equipment. Since this leak detection method also was listed on the NWGLDE as a viable method, DLA and the Navy accepted the recommendation to employ this updated version of the technology in the biennial leak detection testing.

A brief explanation of the MTC Leak Detection test method

The MTC PMMS LDS, with SIM-1000 is a mass-based leak detection and monitoring system that is deployed for each test and is not permanently fixed to the infrastructure of the Red Hill BFCUSTs. The PMMS LDS, with SIM-1000 is deployed from the tank Gauging Gallery (directly above the tank) by lowering a pressure transducer to the bottom of the tank, and an array of temperature sensors to the lower hemisphere of the tank. The pressure transducer and the array of temperature sensors are each connected by cable to the MTC PMMS LDS, with SIM-1000 computer located in the Upper Tunnel area (approximately the upper third of the tank), where leak detection data points are continuously logged and processed using proprietary software developed by MTC. In preparation for leak detection testing, confirmation that the tank has been fully isolated (i.e. closing isolation valves) from the remaining fuel system is required.

In laymen's terms the MTC leak detection method is a very sensitive tank gauge (a device used to measure the fuel level in a tank) that takes multiple measured mass readings and compares them to identify extremely small changes over time. At the end of a test event the measured mass changes are expressed in gallons per hour (gph) and are compared to the MDLR of the system as determined by its third-party evaluation. Any measured leak rate above the MDLR is a failing test. Any measured leak rate below the MDLR is a passing test.

Scaling and Averaging

The concepts of scaling and averaging are critical to the understanding of how the MTC leak detection method provides results specific to the Red Hill BFCUSTs. The first concept to consider is scaling. Scaling refers to how the MDLR established for a leak detection method under its third-party evaluation could be applied to other tanks of differing sizes. The MDLR of the MTC leak detection method resulted from their third-party evaluation on an evaluation tank of a specific size (volume = 120,000-gallons and Product Surface Area = 1,257-square feet). The evaluation of the MTC leak detection method resulted in a MDLR for the evaluation tank to be 0.1 - gallons per hour (gph). In order for the MTC leak detection method to be utilized on other tanks not of the exact size as the evaluation tank, a mathematical formula was developed by the third-party evaluator to allow MDLRs of other size tanks to be calculated. This is the concept of

scaling, whereby the MDLR of the evaluation tank is "scaled" in relation to the size of the tank to be tested. Specifically, for the MTC PMMS LDS, with SIM-1000, the formula developed under the third-party evaluation and listed by the NWGLDE is as follows:

From the NWLDGE listing (http://www.nwglde.org/evals/mass_technology_a.html) for the MTC SIM-1000 and CBU-1000 (24-hour test):

> Mass Technology Corp.
> Precision Mass Measurement Systems SIM-1000 and CBU-1000 (24-hour test)
> BULK UNDERGROUND STORAGE TANK LEAK DETECTION METHOD (50,000 gallons or greater)
> Leak rate is proportional to product surface area (PSA).
> For tanks with PSA of 1,257 ft² or less, leak rate is 0.1 gph with PD = 97.9% and PFA = 2.1%.
> Calculated minimum detectable leak rate is 0.078 gph with PD = 95% and PFA = 5%.
> For tanks with larger PSA, leak rate equals [(PSA in ft² ÷ 1,257 ft²) x 0.1-gph].
> Example:
> For a tank with PSA = 2,000 ft²; leak rate = [(2,000 ft² ÷ 1,257 ft²) x 0.1-gph] = 0.16-gph.

Specifically, for the large BFCUSTs at Red Hill the scaling is calculated as follows:

For a 100-foot diameter tank, the PSA = 7,850 ft²

So using the NWGLDE listed formula:
The MDLR for one 24-hour test = [(7,850 ft² ÷ 1,257 ft²) x 0.1 gph] = 0.62 - gph.

This result brings up the obvious question, how does one get better MDLR results if one can only scale the results based on the PSA? The industry standard approach to address that issue is to employ "averaging". In the context of leak detection testing the term averaging refers to the ability to perform several non-overlapping tests and reduce the overall MLDR of those tests. Specifically, for the MTC leak detection method, the listing in the NWGLDE identifies that the use of averaging of this method is acceptable.

From the NWLDGE listing (http://www.nwglde.org/evals/mass_technology_a.html) for the MTC SIM-1000 and CBU-1000 (24-hour test):

Comments Tests only portion of tank containing product.
As product level is lowered, leak rate in a leaking tank decreases (due to lower head

pressure).
Consistent testing at low levels could allow a leak to remain undetected.
Evaluated in a nominal 120,000 gallon, vertical underground tank with product surface area (PSA) of 1,257 ft².
Averaging of multiple tests may be used to improve the performance of the system.

The formula for averaging the MDLR based on multiple tests is as follows:

The MDLR of multiple tests = the MDLR of one test ÷ square root of the number of tests

Since 2015, each leak detection test event at Red Hill was conducted for five days. The first two days allow for test equipment stabilization, followed by three (3), 24-hour, non-overlapping tests. The resulting MDLR is calculated as follows:

MDLR(three tests) = MDLR of one test ÷ Square Root of 3.
MDLR (three tests) = 0.62 ÷ Square Root of 3
MDLR (three tests) = 0.62 ÷ 1.73
MDLR (three tests) = 0.36-gph

This averaging allows the MTC test method to get to an MDLR below 0.5-gph. However, since the regulatory required MDLR was specified as 0.5-gph, the test was only reported to that level of sensitivity.

Prior to any regulatory requirements, the BMP leak detection testing performed from 2009 through 2013 at Red Hill utilized measured results compared to values above those obtainable by the formulas identified on the NWGLDE listing as a conservative approach to testing these unique tanks. A conservative value of 0.7-gph was set for the MDLR for this BMP testing. Then beginning in 2015, and continuing through the most recent 2020 testing events, the MDLR used has been 0.5-gph, which is the current regulatory requirement.

Why does this method remain the choice for the current approach to Leak Detection?

The DLA LD CMP has reevaluated options for leak detection of the Red Hill BFCUSTs on several occasions to ensure that the most appropriate method was being implemented. The first was in 2015 when

the federal UST regulations were revised and these BFCUSTs were then required to have Release Detection performed on an annual basis. Utilizing the standard industry approach to selecting appropriate leak detection methods, a review of the NWGLDE listing that could meet the requirements for this testing was undertaken. Once again, the most logical and technically acceptable option to meet the federal regulatory requirements for leak detection on the Red Hill BFCUSTs was to perform annual point-in-time leak detection testing utilizing the MTC PMMS LDS, with SIM-1000 to a MDLR of 0.5-gph.

In 2016 the Navy instructed Michael Baker to further evaluate an alternative leak detection method to the MTC leak detection method that could perform point-in-time leak detection testing on these BFCUSTs to meet federal regulatory requirements. This evaluation focused on utilizing the Vista Precision Solutions, Inc (VPSI) Low-Range Differential-Pressure (LRDP) Leak Detection System that had been third-party evaluated in 2001 in two of the BFCUSTs at Red Hill. The VPSI leak detection method requires several components to be constructed inside the tank, which requires considerable construction activities including emptying and cleaning the tank. Tanks F-9 and F-16 still had that leak detection equipment existing in place and in 2016 these systems were evaluated by VPSI and leak detection tests were attempted utilizing that equipment. The results of that 2016 evaluation were that only one of the two leak detection units was still usable and able to give leak detection testing results. It was concluded that although VPSI was a potential option for leak detection testing at Red Hill, the numerous logistical and construction challenges associated with installing and maintain that equipment was not as favorable as continuing to utilize the MTC leak detection method.

In 2017 the most comprehensive evaluation for potential Release Detection methods for the Red Hill BFCUSTs was initiated to comply with the requirements of the Red Hill Administrative Order on Consent (AOC). This evaluation, performed by Michael Baker, attempted to identify the best options, either currently available or new/innovative technologies, for Release Detection on the BFCUSTs. Initially, as part of this evaluation Michael Baker identified potential candidates including both those previously known, as well as any new or innovative technologies that had not been previously considered.

Six forms of leak detection were ultimately selected and agreed to by the AOC stakeholders (including the U.S. EPA, the Hawaii Department of Health [DOH], and the U.S. Navy and DLA) for further evaluation. Essentially, blind testing of the six leak detection methods was undertaken on one of the tanks at Red Hill.

Controlled "leaks" were induced while the six leak detection methods performed leak detection testing. The results of that leak detection testing indicated that the MTC leak detection method was capable of achieving leak detection results comparable with those considered initially in 2008 when the leak detection method was first selected for use at Red Hill. While the duration of time of the standard test for the 2017 AOC evaluation is different than the standard point-in-time leak detection testing (one 48-hr. test vice three 24-hr. tests) the conclusion of that evaluation is that the MTC leak detection method is capable of achieving test results at the MDLRs required by the current federal regulatory requirements, and similarly, current State of Hawaii regulatory requirements. This evaluation underwent review by the U.S. EPA and Hawaii DOH and ultimately, they stated that they agreed with that conclusion.

In a letter (Attached as Enclosure 1) from the U.S. EPA and Hawaii DOH to the Navy regarding these results dated August 30, 2018 the U.S. EPA/DOH acknowledges that "the site specific technology study described in this report indicates that two of the vendor's technologies [MTC and VPSI] tested meet or exceed the current regulatory standard 0.5 gallons per hour for annual tank tightness testing described in Hawaii Administrative Result 11-280.1-43(10)(A)."

The letter also goes on to say that "In addition to our [the U.S. EPA and Hawaii DOH] internal review, we had our expert tank contractor review the report and provide their comments which are attached to this letter"

The comments from the expert tank contractor, dated 24 August 2018 and attached to the U.S. EPA / Hawaii DOH letter, by PEMY Consulting, state "PEMY agrees that the process of vendor selection, use of industry standards and protocols for conducting the test, and the types of technologies that are available to fulfil the leak detection goals at Red Hill[s] are all reasonable and appropriate".

PEMY goes on to offer the recommendation that "a detailed spreadsheet that does the calculations and which is reviewable and auditable and downloadable to the public should be and approved to ensure that the statistical calculations are correct now and into future testing as well as to ensure the process is repeatable and auditable." Michael Baker disagrees that this recommendation is necessary due to the fact that the system results have already been established in the independent third-party evaluation as well as with the additional scrutiny afforded by the NWGLDE listing process. Calling for the review of the analysis

in which a leak detection system performs these calculations would be challenging as it would divulge the proprietary algorithms used to calculate the test results. As stated previously, third-party evaluations of leak detection systems focus on comparing actual results and not criticism or suggestions of how those results are achieved. Since these third-party evaluations check the accuracy and precision of their measured leak rate compared to a known leak rate induced by the evaluator, the NWGLDE approval renders an independent evaluation of the underlying data unnecessary.

Conclusions

Michael Baker, the DLA LD CMP and the Navy have undertaken multiple evaluations to review leak detection methods at Red Hill. Utilizing the industry standard approach to leak detection method selection, the NWGLDE listings, the MTC leak detection method was identified as a valid testing approach. Specifically scaling and averaging are utilized to get the specific MDLRs for the tanks at Red Hill, all of which are industry accepted approaches discussed in the NWGLDE listing for the leak detection method. Finally, considerable scrutiny by the U.S. EPA and Hawaii DOH during an evaluation of the MTC leak detection method employed on the Red Hill BFCUSTs resulted in their acknowledgement that use of the MTC leak detection method is appropriate.

Section 2: Release Detection – BFCUST Piping

The letter portion of the permit application received by DOH on 23 May 2019 (Navy Exhibit 095) includes excerpts of the 2019 Annual Leak Detection Testing Report of Petroleum Pipelines. This report was prepared for DLA, under Naval Facilities Engineering Command (NAVFAC) Atlantic contract, certified by Christopher D. Caputi of Michael Baker, and submitted by Michael Baker. That report documents leak detection testing at Joint Base Pearl Harbor-Hickam, Hawaii and includes underground pipelines within Naval Station Pearl Harbor and Hickam Airfield Facility of which are associated with Red Hill BFCUST system.

The report documents that the underground piping for Red Hill was leak detection tested utilizing leak detection methods that are third party evaluated and listed with the NWGLDE to meet the MDLR for each test section in accordance with HAR 11-280.1-44(4)(A)(i). The pipeline testing executed under this project was performed utilizing Hansa Consult of North America (HCNA) methods version 2.0 and 2.1. These leak detection methods are standard approaches to leak detection testing of bulk piping systems throughout

the Department of Defense and commercial industry and were selected based on having appropriate third-party evaluations and listings on the NWGLDE website. It should be noted that no averaging is applied to these test results.

The HCNA leak detection testing method essentially perform multiple pressure tests at varying pressures and their proprietary analysis can determine a measured leak to compare to the MDLR established by their independent third-party evaluation. If the measured leak rate is calculated to be below the established MDLR of the piping being tested, then the test is considered a pass. If the measured leak rate is above the MDLR the result is considered a fail. Different versions of the HCNA method are used based on the volume of the section being tested.

Although the piping being tested is ultimately associated to the BFCUSTs at Red Hill, this in no way influences how the HCNA systems addresses testing the piping. The HCNA method employed to test these pipes utilizes the same approach as they would to test any bulk piping system. This testing is unaffected by the size of the tanks to which the piping is connected and is only affected by the volume of the piping section being tested.

Section 3: Bulk Piping Static Liquid Pressure Testing

The letter portion of the permit application received by DOH on 23 May 2019 (Navy Exhibit 130) includes excerpts of the 2019 Annual Static Liquid Pressure Testing Report of Petroleum Pier Pipelines. This report was prepared for DLA, under NAVFAC Atlantic contract, certified by Christopher D. Caputi of Michael Baker, and submitted by Michael Baker. This report documents pressure testing at Joint Base Pearl Harbor-Hickam, Hawaii and includes underground pipelines within Naval Station Pearl Harbor which are associated with Red Hill but are regulated under Title 33, Code of Federal Regulation, Part 156, Section 170 (33 CFR 156.170) and are under the jurisdiction of the U.S. Coast Guard.

The 2019 testing report documents that the underground piping was static liquid pressure tested in conformance with industry standard practices acceptable to the U.S. Coast Guard. The testing is required to ensure that no leaks occur under a static liquid pressure of at least 1.5 times the maximum allowable working pressure as required in 33 CFR 156.170. In very simplistic terms, this type of testing is performed by pressurizing a pipeline section and ensuring that there are no unaccounted-for losses of pressure.

Additionally, the testing utilizes visual inspection of all portions of the piping located above grade for signs of any leaks or weeps. This method of pipe leak detection or integrity evaluation is the longest serving and most basic approach of testing employed in the industry. Like the HCNA leak detection method mentioned previously, no special accommodations are required to be performed to employ this method related to the fact that the piping is associated to the BFCUSTs at Red Hill.

Michael Baker subcontracted Pipeline Petroleum Services, Inc. (PPSI) to perform the static liquid pressure testing. Testing was performed per the requirements of 33 CFR 156.170. The test equipment, inspections, procedures, and passing criteria used by PPSI were performed in conformance with the following:

- American Petroleum Institute Recommended Practice – 1110: Pressure Testing of Liquid Petroleum Pipelines.
- Title 49 CFR Part 195, Subpart E: Pressure Testing.
- California State Fire Marshal's Pressure Testing Requirements for Hazardous Liquid Pipelines.
- American Society of Mechanical Engineers (ASME) B31.3: Process Piping.
- ASME B31.4: Pipeline Transportation Systems for Liquid Hydrocarbons and Other Liquids.

The equipment used to monitor the test and record test data was third-party calibrated by Standard Calibrations, Inc. and MadgeTech. The supervisor from PPSI that was on site during testing has over 20 years of static liquid pressure testing experience with a working knowledge of the applicable regulations and test standards.

This simple, yet effective testing method allows Naval Station Pearl Harbor to maintain compliance with Title 33, Code of Federal Regulation, Part 156, Section 170.

Christopher D. Caputi, P.E.

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Mark Manfredi
Red Hill Regional Program Director
850 Ticonderoga Street, Suite 110
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August 30, 2018

**Re: Approval of Red Hill Administrative Order on Consent ("AOC")
New Release Detection Alternatives Report – Section 4 – Release Detection / Tank Tightness Testing**

Dear Mr. Manfredi:

The U.S. Environmental Protection Agency ("EPA") and the Hawaii Department of Health ("DOH"), collectively the "Regulatory Agencies", have reviewed the *New Release Detection Alternatives Report* ("Report") submitted by the U.S. Department of the Navy ("Navy") and Defense Logistics Agency ("DLA") on July 26, 2018. The Regulatory Agencies have determined the Report satisfies the requirements of Section 4.6 of the Red Hill AOC SOW. The Report, prepared by Navy and DLA expert engineering contractors, identifies and evaluates leak detection alternatives that can be applied to the tanks at the Red Hill Bulk Fuel Storage Facility ("Facility"). Pursuant to 7(b) of the Red Hill AOC, the Regulatory Agencies approve the Report.

In addition to approval of the Report, as discussed at our recent Tank Upgrade Alternatives ("TUA") Decision Meetings the week of August 13th, selection of the leak detection is closely tied with the tank upgrade approach. Therefore, we suggest that the decision process for the TUA Decision be combined with the decision for leak detection improvements. Given that we have already had preliminary discussions regarding expectations for leak detection, we intend to conclude decision discussions on both TUA and Release Detection by the end of October thus requiring the Navy to submit a proposed TUA and Release Detection Decision by the end of the calendar year. Please respond to this letter regarding our proposal for combination of TUA and -Release Detection into one proposal document.

As we discussed in the meetings the week of August 13th, the Navy needs to consider a range of potential failure modes in order to design a comprehensive approach to leak detection and response. Generally, the Regulatory Agencies believe the appropriate leak detection for Red Hill tanks will likely involve multiple detection systems combined with alarms and procedures to build a high degree of confidence that a release can be identified rapidly and stopped to mitigate or prevent damage to nearby resources or potentially harmful exposure.

The site specific technology study described in this report indicates that two of the vendor's technologies tested meet or exceed the current regulatory standard 0.5 gallons per hour for annual tank tightness testing described in Hawaii Administrative Rule §11-280.1-43(10)(A). However, the Navy and DLA should keep in mind that the AOC requires the use of Best Available Practicable Technology ("BAPT"). Therefore, if exceeding the regulatory standard is practicable, then it is required by the AOC for Red Hill.

In addition to our internal review, we had our expert tank contractor review the report and provide their comments which are attached to this letter. Our expert's comments are primarily forward looking, and should be addressed during our decision meeting and the Navy/DLA's leak detection - and TUA decision documents.

If you have any questions, please contact us.

Sincerely,

Steven Linder
for

Omer Shalev
Red Hill Project Coordinator
EPA Region 9

Roxanne Kwan
Red Hill Project Coordinator
State of Hawaii, Department of Health

Enclosures: PEMY Review of New Release Detection Alternatives Report, 24 August 2018.

cc: Captain Marc Delao, Navy (via email)

PEMY Consulting

PEMY Review of NEW RELEASE DETECTION ALTERNATIVES REPORT ADMINISTRATIVE ORDER ON CONSENT - SECTION 4.6 RED HILL BULK FUEL STORAGE FACILITY JOINT BASE PEARL HARBORHICKAM, HAWAII

Prepared for: Defense Logistics Agency Energy Fort Belvoir, Virginia Prepared under: Naval Facilities Engineering Command Atlantic Contract N62470-16-D-9007 Delivery Order N6247018F4014 Submitted by: Michael Baker International Virginia Beach, Virginia Date: 25 July 2018

Overview

The report adequately covers the subject of the required leak detection requirements for future leak testing at Red Hills. AOC Section 4.6 requires the issue of "The New Release Detection Alternatives Report" which shall include:

a. A description of existing practices;

b. Static and dynamic release detection system alternatives;

c. Tank tightness alternatives;

d. Comparison of the effectiveness of existing and alternative technologies; and

e. A decision matrix.

PEMY has reviewed the document and concludes it fulfills the objectives required by the AOC.

Discussion

PEMY agrees that the process of vendor selection, use of industry standards and protocols for conducting the test, and the types of technologies that are available to fulfill the leak detection goals at Red Hills are all reasonable and appropriate.

Although not required in this report, there is little discussion related to the effectiveness of leak detection in concert with other methods as a combined integrity system. For example, vapor monitoring is mentioned but not in the context of how it could be used to enhance the efforts of the leak detection process. It is important that stakeholders have input on the use of leak detection and how it supplements the general tank integrity plan effectively.

The report should (but does not) state the fundamental difference between the MTC versus the Vista and the GSI systems. MTC cannot or does not adjust for temperature distortions caused by the lower hemispherical portion of the tank. VPSI takes this into account by use of the curved tubes. GSI takes it into account by multiple measurements throughout the liquid. MTC does not take this into account. PEMY will shortly be providing a white paper on this issue.

Approval Recommendations

PEMY recommends the report should be approved with certain conditions:

- The frequency of formal leak testing be negotiable to establish a final plan for leak detection working in concert with other monitoring systems. A credible decision process should be used to decide on when to test the tanks. This includes working out the protocol for alarm settings and what must happen when the soil vapor sampling process shows high hydrocarbon vapor levels.
- The leak detection protocol for the ongoing testing should be redrafted and finalized with any changes that were applied to the procedures for the 2018 leak tests for approval by stakeholders.
- A detailed spreadsheet that does the calculations and which is reviewable and auditable and downloadable to the public should be and approved to ensure that the statistical calculations are correct now and into future testing as well as to ensure that the process is repeatable and auditable.
- Development of new methods as to how the GSI system can be applied to improve the protocols for the AFHE system should be undertaken since it is able to use mass measurement during normal operations. The development should consider integrating not only the current AFHE system and the GSI system but any other potential improvements to the operational side of leak monitoring.
- Consideration should be given to a formal review of how to make the leak testing program more automated to the extent possible within the framework of the protocol by use of automation to the extent possible.

Michael Baker INTERNATIONAL

We Make a Difference

Christopher D. Caputi, P.E.

Technical Manager & Subject Matter Expert

Years with Michael Baker: 18
Years with Other Firms: 10

Degrees

B.S., 1991, Civil and Environmental Engineering, Clarkson University

A.S., 1987, Engineering Science, Tompkins Cortland Community College

Licenses/Certifications

Professional Engineer, Virginia, 2000, 0402032382

Specialized Experience

28 years of petroleum storage tank compliance and design experience

Has supported DLA-Energy Leak Detection Centrally Managed Program since 2006 in executing thousands of test events at over 200 DOD installations worldwide

Since 2015, SME on seven NAVFAC Atlantic compliance task orders ($27.9M) supporting DLA-Energy Leak

General Qualifications

Mr. Caputi has experience as an engineer with an emphasis in civil engineering and environmental compliance. His expertise lies in petroleum storage tank (PST) and POL system design, storage tank management plans, spill prevention, control and countermeasure plans (SPCCs), spill response planning, and underground storage tank and piping systems integrity testing.

Mr. Caputi is an industry-recognized SME in PST compliance and has given numerous presentations at DOD workshops on environmental compliance of fueling systems, oil spill planning and response and training, and PST management. Since 2006, his primary role has been SME and program management support to DLA-Energy's Leak Detection Centrally Managed Program (CMP) for petroleum assets in the execution of approximately $15M annually for PST asset leak detection, regulatory-driven compliance testing, and BMP testing at over 200 Navy, USMC, and DLA-E facilities, **including leak detection testing at the Red Hill Bulk Fuel Storage Facility**. His support to the DLA-E has focused on optimizing testing technologies and strategies, with the goal of consistently meeting regulatory compliance requirements. Additional support to DLA-E included participating in updates to the OEBGD, various FGSs, UFC 3-460-01 & 03 and negotiations with USEPA on the 2015 updates to 40 CFR 280.

Experience

Since 2009, Mr. Caputi has serviced as a technical consultant and Subject Matter Expert to NAVFAC Atlantic, DLA Energy and FLC Pearl Harbor for the execution of annual leak detection testing of the 18 in-service bulk fuel storage tanks at the Red Hill, HI Bulk Fuel Storage Facility.

N62470-16-D-9007; Task Order N6247018F014: Defense Fuel Supply Point Red Hill Administrative Order on Consent Evaluation for Red Hill Bulk Fuel Storage Facility, Joint Base Pearl Harbor-Hickam, Hawaii. *NAVFAC Atlantic.* Subject Matter Expert in UST Leak Detection. Planned and executed a technical evaluation of best available leak detection systems for the unique field-constructed USTs at the Red Hill, HI Bulk Fuel Storage Facility. Supported the Navy and DLA-E in responding to a Consent Order with USEPA Region 9 and the State of Hawaii that required an evaluation of best available leak detection systems for the field-constructed USTs. Facilitated extensive coordination with stakeholders and three leak detection vendors during a 60-day on-site technology evaluation. Participated in data review meetings with the Navy, USEPA Region 9, and Hawaii Department of Health. Co-authored the leak detection evaluation summary report and presented findings to USEPA Region 9 and the

State of Hawaii.

Firm Cost: $1,365,828.00
Total Project Cost: $1,365,828.00
Completion Date: 2/28/2019

N42470-16-D-9007; Task Order 0004: Military Fuel System Tightness Testing and Pressure Testing at U.S. Navy, Marine Corps, and DLA-Energy Facilities, Worldwide. *NAVFAC Atlantic.* Technical Manager and Subject Matter Expert. Oversaw a structured team of Project Managers, Engineers and other Technical Professionals to execute a multi-million-dollar program focused on Leak Detection Testing and Environmental Compliance to Support DLA Energy. Michael Baker provided PST environmental compliance and pollution prevention engineering support to NAVFAC Atlantic and DLA-E at Navy, Marine Corps, and other DLA-Energy facilities worldwide. This delivery order included compliance support at 43 installations in 14 states (CA, CT, FL, GA, HI, MD, ME, MS, NC, NV, SC, TX, VA, WA), as well as eight OCONUS installations in Cuba, Greece, Italy, Japan, and Spain. Michael Baker staff completed a wide range of PST compliance activities on this delivery order, including PST and pipeline leak detection testing of bulk fuel storage facilities. This task order also included **CY 2019 semi-annual and annual leak detection testing of the in-service bulk storage tanks at the Red Hill Bulk Fuel Storage Facility** to meet the requirements of the Administrative Order on Consent (AOC), signed September 2015, between the Commander Navy Region Hawaii, DLA Energy, the State of Hawaii Department of Health, and the United States Environmental Protection Agency Region 9 and meets the regulatory requirements stated in the Hawaii Administrative Rules.

Firm Cost: $8,736,603
Total Project Cost: $8,736,603
Completion Date: 5/28/2020

N62470-16-D-9007; Task Order N6247018F4143: 2018 Red Hill Bulk Fuel Storage Facility Annual Leak Detection Testing. *NAVFAC Atlantic.* Technical Manager and Subject Matter Expert. Responsible for executing CY 2018 annual leak detection testing of 18 bulk field-constructed storage tanks at Red Hill. Oversaw QA/QC activities and provided client coordination. Annual leak detection testing was performed to meet the requirements of the Administrative Order on Consent (AOC), signed September 2015, between the Commander Navy Region Hawaii, DLA Energy, the State of Hawaii Department of Health, and the United States Environmental Protection Agency Region 9 and meets the regulatory requirements stated in the Hawaii Administrative Rules.

Firm Cost: $325,097
Total Project Cost: $325,097
Completion Date: 9/27/2019

N62470-16-D-9007; Task Order N6247018F4006: Military Fuel System Tightness Testing and Pressure Testing at U.S. Navy, Marine Corps, and DLA-Energy Facilities, Worldwide. *NAVFAC Atlantic.* Technical Manager and Subject Matter Expert. Oversaw a structured team of Project Managers, Engineers and other Technical Professionals to execute a multi-million-dollar program focused on Leak Detection Testing and Environmental Compliance to Support DLA Energy. Michael Baker provided regulatory-required and best management practice leak detection tests or compliance actions at Navy, USMC, and DLA-E fuel facilities worldwide, supporting DLA-Energy's leak detection Centrally Managed Program

(CMP). Over a 14-month base period of performance, Michael Baker managed the execution of 134 discrete leak detection and compliance action tasks supporting the DLA-Energy Leak Detection CMP at 46 CONUS and five OCONUS Navy, USMC, and DLA-Energy installations, including off-loading facilities, storage tanks, hydrant fueling systems, and pipelines.

Firm Cost: $5,651,909
Total Project Cost: $5,651,909
Completion Date: 7/31/2020

Naval Shipyard Infrastructure Optimization Program, Pearl Harbor Naval Shipyard, Hawaii, Portsmouth, Naval Shipyard, Maine, Puget Sound Naval Shipyard, Washington, Norfolk Naval Ship, Virginia. *NAVFAC Pacific.* Senior Engineer. Responsible for developing a scope of work and associated rough order of magnitude (ROM) costs to provide a comprehensive adaptive re-use proposal plan for the shipyard's historical facilities. The study examined each historical facility and proposed adaptive re-use ideas, perceived barriers and explored alternative solutions to those barriers. Upon completion, the study will serve as a tool to advise the Area Development Team and associated stakeholders of viable options for consideration over the 20-year SIOP development period. Deliverables included a real estate study and a fuels study at Pearl Harbor and an adaptive re-use plan for historical facilities at Puget Sound, Portsmouth and Norfolk.

Firm Cost: $272,895
Total Project Cost: $272,895
Estimated Completion Date: 12/31/2020