# FINAL 2013 BIENNIAL LEAK DETECTION TESTING REPORT OF BULK FIELD-CONSTRUCTED UNDERGROUND STORAGE TANK 12, RED HILL UNDERGROUND FUEL STORAGE FACILITY

## JOINT BASE PEARL HARBOR-HICKAM, HAWAII

***Prepared for:***
**Defense Logistics Agency Energy**
**Ft. Belvoir, Virginia**

*Prepared under:*
**NAVFAC Atlantic**
**Contract N62470-10-D-3000-0026**

*Submitted by:*
**Michael Baker Jr., Inc.**
**Virginia Beach, VA**

*Date:*
**23 APRIL 2013**

***Project: 127964***
***Task: 4.1.033***

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## LIST OF ABBREVIATIONS AND ACRONYMS

| | |
|---|---|
| AFB | Air Force Base |
| Baker | Michael Baker Jr., Inc. |
| BFCUST | Bulk field-constructed underground storage tank |
| BMP | Best Management Practice |
| CMP | Centrally Managed Program |
| DLA | Defense Logistics Agency |
| gph | Gallons per hour |
| JB | Joint Base |
| MDLR | Minimum detectable leak rate |
| MTC | Mass Technology Corporation |
| NWGLDE | National Work Group on Leak Detection Evaluations |
| PD | Probability of detection |
| PFA | Probability of a false alarm |
| PSA | Product surface area |

**PROFESSIONAL ENGINEER CERTIFICATION:**

**Final 2013 Biennial Leak Detection Testing Report**
**Of Bulk Field-Constructed Underground Storage Tank 12,**
**Red Hill Underground Fuel Storage Facility**

**Joint Base Pearl Harbor-Hickam, Hawaii**

This report has been reviewed by a professional engineer and has been prepared in accordance with good engineering practices. Laboratory results, field notes, and supporting data have been reviewed and referenced correctly.

I hereby certify that I have examined this report and attest that it has been prepared in accordance with good engineering practices.

Engineer: Christopher D. Caputi, P.E.

Registration Number: 032382

State: Virginia

Date: 23 April 2013

## EXECUTIVE SUMMARY

The scope of this project is to perform biennial leak detection testing of Bulk Field-Constructed Underground Storage Tank 12 at Red Hill Underground Fuel Storage Facility, Joint Base Pearl Harbor-Hickam, Hawaii. There are currently no regulations that require testing of bulk field-constructed underground storage tanks at Red Hill. The testing is being conducted under Defense Logistics Agency Energy's Leak Detection Centrally Managed Program as a pollution prevention Best Management Practice.

Bulk Field-Constructed Underground Storage Tank 12 was Mass Technology Corporation leak detection tested from 22 February through 1 March 2013 with no detectable leak above the test method's minimum detectable leak rate of 0.7 gallons per hour resulting in a passed test.

Biennial leak detection testing of Bulk Field-Constructed Underground Storage Tank 12 should be completed on or before the anniversary date of 1 March 2015 under Defense Logistics Agency Energy's Leak Detection Centrally Managed Program as a pollution prevention Best Management Practice.

# 1.0 INTRODUCTION

## 1.1 Purpose of Project

The Defense Logistics Agency (DLA) Energy contracted Michael Baker Jr., Inc. (Baker) through Naval Facilities Engineering Command (NAVFAC) Atlantic Contract N62470-10-D-3000-0026 to perform biennial leak detection testing of Bulk Field-Constructed Underground Storage Tank (BFCUST) 12 at Red Hill Underground Fuel Storage Facility, Joint Base (JB) Pearl Harbor-Hickam, Hawaii. There are currently no regulations requiring the testing of BFCUSTs at Red Hill. The testing is being conducted under DLA Energy's Leak Detection Centrally Managed Program (CMP) as a pollution prevention Best Management Practice (BMP).

## 1.2 Site Background and History

Pearl Harbor was established as a United States naval base in 1908. In 1934, the Army Air Corps began construction of the base that, on May 31, 1935, was dedicated as Hickam Air Force Base (AFB). In 2010, Naval Station Pearl Harbor and Hickam AFB were merged into JB Pearl Harbor-Hickam combining the two historic bases into a single joint installation to support both Air Force and Navy missions, along with the tenant commands, and all the service members and their families. The base plays a central role in the Pacific theater and constitutes a vital part of the United States defense establishment today.

The Red Hill underground fuel storage facility was constructed between 1940 and 1943 to replace vulnerable aboveground fuel storage tanks that were located around Pearl Harbor. The Red Hill underground fuel storage facility consists of 20 BFCUSTs located hundreds of feet below ground. There are 2 rows of 10 (each) 12,600,000 gallon BFCUSTs. The BFCUSTs at Red Hill are connected and accessible through two tunnel systems. A top tunnel runs approximately 60 feet below the top of the tanks and a bottom tunnel runs along the bottom level of the tanks. The issue/receipt and water drain pipelines connecting each BFCUST and Pearl Harbor are located in the lower tunnel. All lines are equipped with Double Block and Bleed Valves for isolation. BFCUST 12 stores JP-5 and is 100 feet in diameter and 250 feet in height (capacity equals 12,600,000 gallons).

## 1.3 Historical Leak Detection Results

The last biennial test event of BFCUST 12, a Mass Technology Corporation (MTC) leak detection test conducted from 28 January to 6 February 2011, showed passing results with no detectable leak above the test method's minimum detectable leak rate (MDLR) of 0.7 gallons per hour (gph) (Baker, 2011).

## 1.4 Project Scope

A MTC leak detection test on BFCUST 12 was performed from 22 February through 1 March 2013. Table 1-1 provides a description of the systems tested. Figure 1-1 provides a base overview map. Figure 1-2 provides a layout of the Red Hill system.

**Table 1-1: Items Tested**

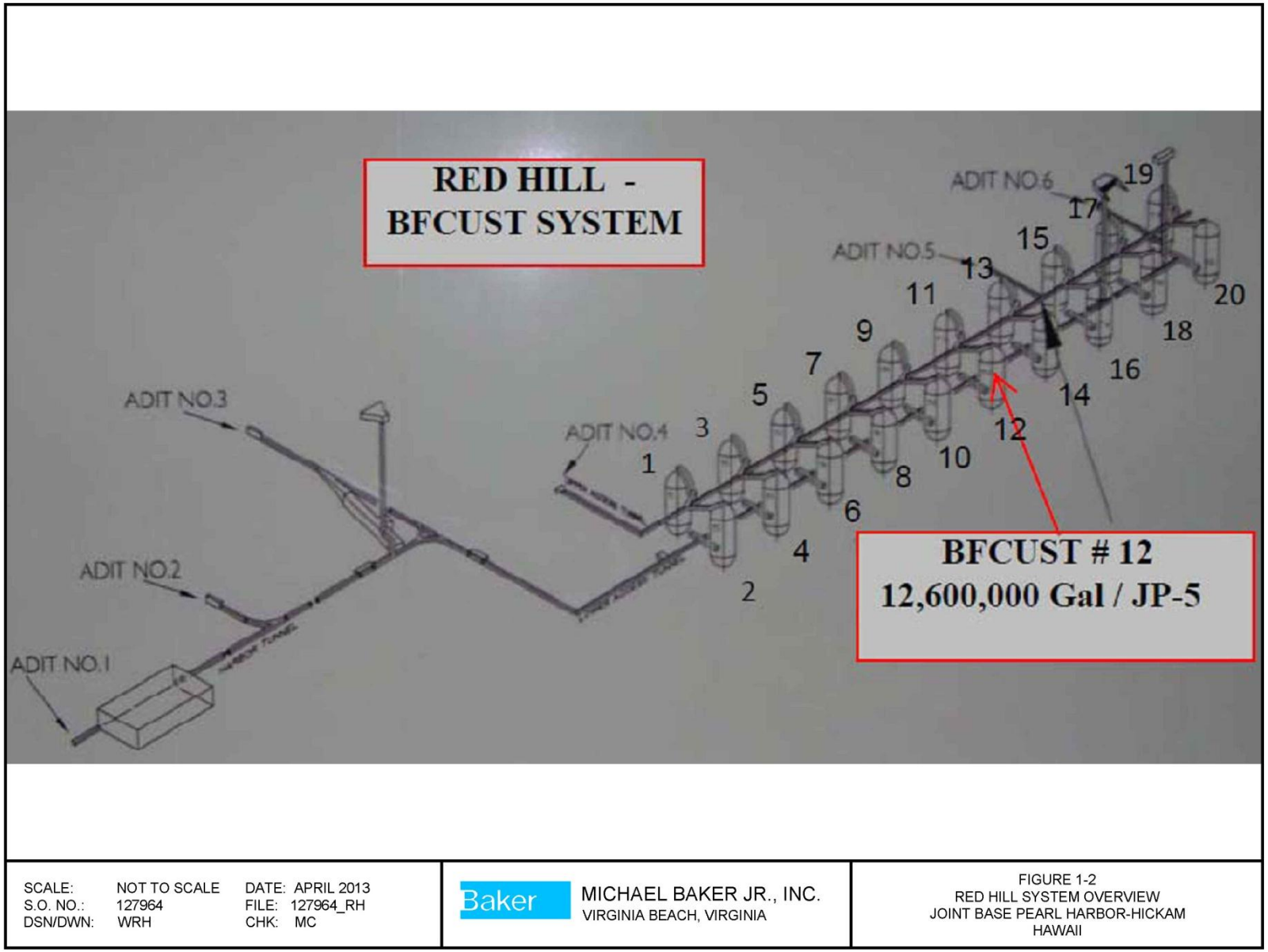
| Designation | Diameter (Feet) | Height (Feet) | Volume (Gallons) | Product | Comments |
|---|---|---|---|---|---|
| BFCUST 12 | 100 | 250 | 12,600,000 | JP-5 | Product Level at Test: 142 feet |

**Figure 1-1: Base Overview Map**

**(Source: Google Maps, 2013)**

**Figure 1-2: Red Hill System Layout**

**(Source: Baker, 2009)**



## 1.5 Project Team

Baker subcontracted MTC to perform the leak detection testing. Field-testing oversight, coordination with facility fuels representatives, quality assurance/quality controls, and final report preparation and submission was provided by Baker personnel.

## 1.6 Qualifications of Testing Procedures Used

The testing procedures used were those defined as the MTC - Precision Mass Measurement Systems SIM-1000 / CBU-1000 (72 hour test) leak detection method. Determination of leakage is based on the criteria established in the Ken Wilcox Associates third party evaluation (National Work Group on Leak Detection Evaluations [NWGLDE, 2013]). The MTC Precision Mass Measurement System (72 hour test) is certified with a capability to detect leaks on a tank proportional to the product surface area (PSA) with a probability of detection (PD) of 95 percent and probability of a false alarm (PFA) of 5 percent. Due to the extreme height of the tank, a total of 168 hours of testing was performed.

By performing a number of non-overlapping tests in sequence and averaging the resultant leak rates, a modified threshold can be established for declaring a leak. Through standard statistical analysis, the larger the number of tests used in the averaging will result in a lower threshold and, therefore, a smaller size leak can be detected with a 95 percent PD.

**72 hour test 50,000 gallons or greater:**
Leak rate is proportional to PSA.
For tanks with PSA of 14,200 $ft^2$, leak rate is 0.638 gph with PD = 95% and PFA = 5%.
For other tank sizes, leak rate equals [(PSA in $ft^2$ ÷ 14,200 $ft^2$) x 0.638 gph].
Example:
For a tank with PSA = 20,000 $ft^2$; leak rate = [(20,000 $ft^2$ ÷ 14,200 $ft^2$) x 0.638 gph] = 0.898 gph.
Leak rate may not be scaled below 0.2 gph

## 2.0 LEAK DETECTION TESTING AND RESULTS

MTC's test report is provided in Appendix A. BFCUST 12 was leak detection tested with no detectable leak above the test method's minimum detectable leak rate (MDLR) of 0.7 gph. Test results are listed in Table 2-1.

**Table 2-1: Test Results**

| Designation | Volume (Gallons) | Height (Feet) | Product | Certified MDLR (gph) | Test Date | Result |
|---|---|---|---|---|---|---|
| BFCUST 12 | 12,600,000 | 250 | JP-5 | 0.7 | 22 February 2013 – 1 March 2013 | Passed |

## 3.0 CONCLUSIONS AND RECOMMENDATIONS

### 3.1 Conclusions

BFCUST 12 passed the 2013 biennial leak detection testing.

### 3.2 Recommendations

In accordance with DLA Energy's Leak Detection CMP as a pollution prevention BMP, biennial leak detection testing of BFCUST 12 should be completed on or before the anniversary date of 1 March 2015.

## 4.0 REFERENCES


Baker, 2011 — Final 2011 Biennial Integrity Testing Report Of Bulk Field Constructed Underground Storage Tank 12 – Naval Station Pearl Harbor / Red Hill, Hawaii. Prepared for DLA Energy, Ft. Belvoir, Virginia, under NAVFAC Atlantic Contract N62470-10-D-3000-0004. Dated 11 March 2011.

NWGLDE, 2013 — Listing by the NWGLDE (20th Edition): Mass Technology Corporation – Precision Mass Measurement Systems SIM-1000 and CBU-1000 (72 hour test) – BULK UNDERGROUND STORAGE TANK LEAK DETECTION METHOD (50,000 gallons or greater).
Issue Date: 23 August 1999
Revision Date: 28 May 2008
http://nwglde.org/evals/mass_technology_c.html.

***APPENDIX A –***

# *MASS TECHNOLOGY CORPORATION TEST REPORT*

**Precision Leak Measurement Report**
**P.O. Box 1578**
**Kilgore, Texas 75662**

FISC Red Hill
Pearl Harbor, HI

Project Manager – Mr. Mark Caldon

Site Supervisor – Travis Ricketson

Scope of Work: Furnish all required management, labor, services, materials and equipment to perform the required annual tightness testing of Tank # 12 an underground fuel storage tank located at FISC Red Hill, Pearl Harbor, HI.

Report compiled by: _____ Date: 04-10-2013
Ricky Slaughter

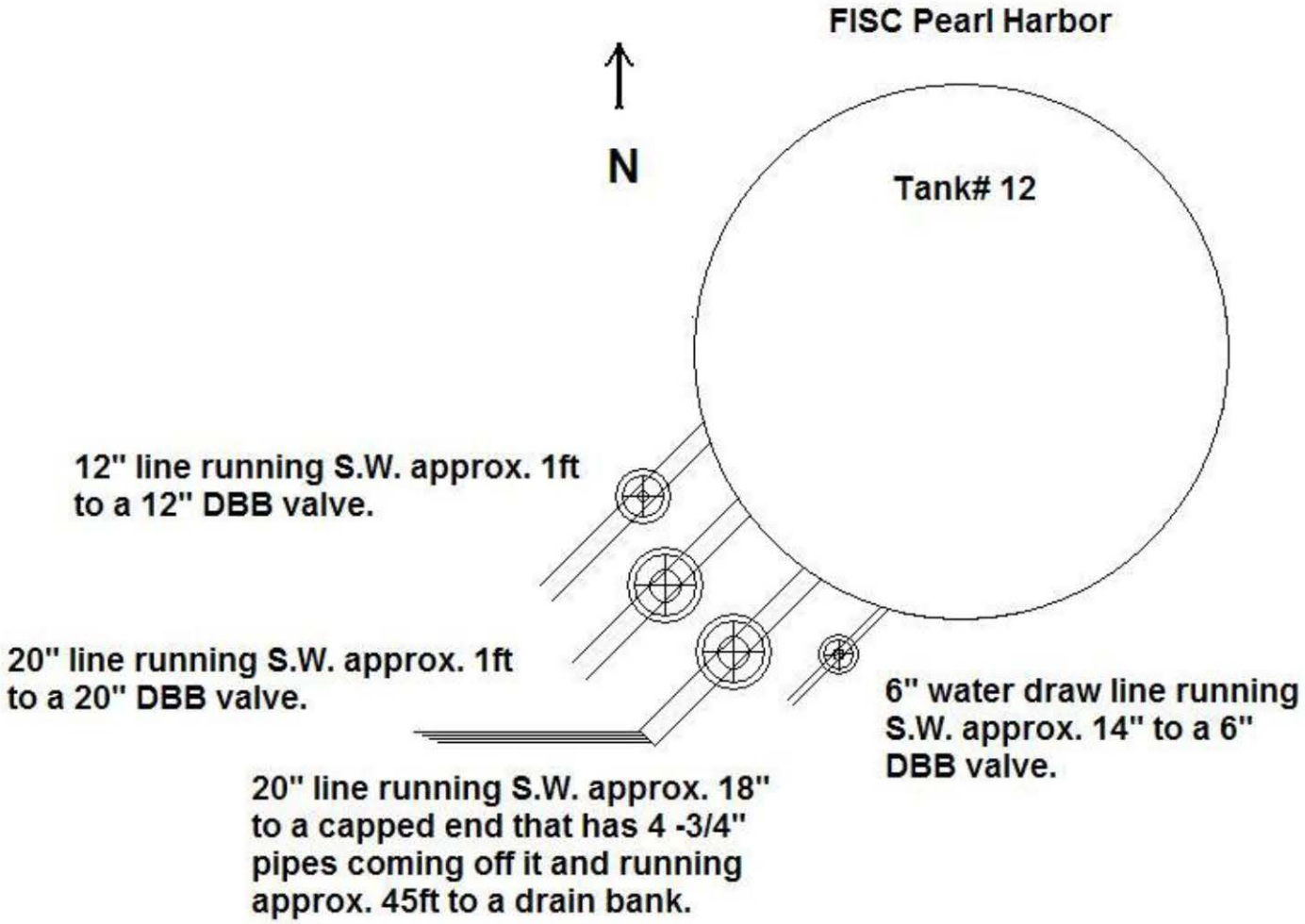

Summary

Testing of Tank # 12 a 12,600,000 gal underground storage tank located at FISC Red Hill, Pearl Harbor, Hawaii commenced February 22, 2013 and was completed March 1, 2013. The result of that testing is that the tank system is determined to be tight to isolation. All tank valves were adequately secured such that no unusual readings were noted. Testing was performed using the Mass Technology Corporation protocols set out in the third party evaluations. All tank valves were adequately secured such that any fluid loss was isolated to leakage. Therefore, the containment integrity of the tank was not compromised and the test is considered conclusive.


Tank # 12: After 168 hours of testing the tank is certified to be tight.

**Tank Data Tank # 12**

| | | | |
|---|---|---|---|
| Diameter: | 100 ft. | Height: | 250 ft. |
| Tank Type: | Vertical UST | Contents: | JP-5 |
| Specific Gravity: | 0.82 | Product Level: | 142 ft. |
| Start Date: | 02/22/2013 | Completion Date: | 03/01/2013 |
| Unit Operator: | Travis Ricketson | Test Results: | Certified Tight |




All dimensions, line locations, sizes and valve descriptions have been furnished by the facility operator.

Results

The fluid mass data was recorded over a 168-hour period. A linear regression of the recorded fluid mass data resulted in a leak rate detected below the minimum detection level of 0.7 gallons per hour. All tank valves were adequately secured such that any fluid loss was isolated to leakage. Therefore, the containment integrity of the tank was not compromised and the test is considered conclusive.

Tank # 12 is certified to be tight.