

Final Third Quarter 2015 - Quarterly Groundwater Monitoring Report Outside Tunnel Wells

**Red Hill Bulk Fuel Storage Facility
Joint Base Pearl Harbor-Hickam, Oahu, Hawaii**

DOH Facility ID No.: 9-102271

DOH Release ID No.: 990051, 010011, 020028, and 140010

November 2015

Prepared for:



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Prepared under:

Contract Number N62742-12-D-1853, CTO 0002

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**FINAL
THIRD QUARTER 2015 - QUARTERLY GROUNDWATER MONITORING REPORT
OUTSIDE TUNNEL WELLS
RED HILL BULK FUEL STORAGE FACILITY**

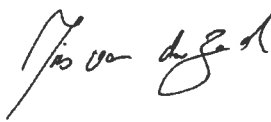
Long-Term Groundwater and Soil Vapor Monitoring
Red Hill Bulk Fuel Storage Facility
Joint Base Pearl Harbor-Hickam, Oahu, Hawaii

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Contract Number: N62742-12-D-1853
Contract Task Order: 0002

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ACRONYMS AND ABBREVIATIONS

ACRONYMS/ ABBREVIATIONS	DEFINITION/MEANING
COPC	Contaminant of Potential Concern
CCV	Continuing Calibration Verification
DLNR	State of Hawaii Department of Land and Natural Resources
DoD	Department of Defense
DOH	State of Hawaii Department of Health
DON	Department of the Navy
DQO	Decision Quality Objective
EAL	Environmental Action Level
EPA	Environmental Protection Agency
ESI	Environmental Science International, Inc.
F-76	Marine Diesel Fuel
ICAL	Initial Calibration
ID	Identification
JBPHH	Joint Base Pearl Harbor-Hickam
JP-5	Jet Fuel Propellant-5
JP-8	Jet Fuel Propellant-8
LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
LOD	Limit of Detection
LOQ	Limit of Quantitation
µg/L	micrograms per liter
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
NAVFAC	Naval Facilities Engineering Command
NAVSUP FLC	Naval Supply Systems Command Fleet Logistics Center
N.D.	Not Detected
PAH	Polycyclic Aromatic Hydrocarbons
PARCCS	Precision, Accuracy, Representativeness, Completeness, Comparability, and Sensitivity
pH	hydrogen activity
QC	Quality Control
QSM	Quality Systems Manual
RHSF	Red Hill Bulk Fuel Storage Facility
RPD	Relative Percent Difference
SAP	Sampling and Analysis Plan
TCE	Trichloroethylene
TEC	The Environmental Company, Inc.
TPH	Total Petroleum Hydrocarbons
TPH-d	Total Petroleum Hydrocarbons as diesel
TPH-g	Total Petroleum Hydrocarbons as gasoline
TPH-o	Total Petroleum Hydrocarbons as oil
U.S.	United States of America
UST	Underground Storage Tank
VOC	Volatile Organic Compounds
WP	Work Plan

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EXECUTIVE SUMMARY

This quarterly groundwater monitoring report presents the results of the third quarter 2015 groundwater sampling event, conducted on July 22, 27, and 28, and August 20, 2015, at the outside tunnel wells of the Red Hill Bulk Fuel Storage Facility [RHSF], Joint Base Pearl Harbor-Hickam [JBPHH], Hawaii. The RHSF is located in Halawa Heights on the Island of Oahu. There are 18 active and 2 inactive underground storage tanks [USTs] located at the RHSF. The State of Hawaii Department of Health [DOH] Facility Identification [ID] number is 9-102271. The DOH Release ID numbers are 990051, 010011, 020028, and 140010.

The groundwater sampling was conducted as part of the long-term groundwater and soil vapor monitoring program at the RHSF and concurrent with release response activities initiated at Tank 5 in January 2014, for Naval Supply Systems Command Fleet Logistics Center [NAVSUP FLC] Pearl Harbor (formerly Fleet and Industrial Supply Center), under Naval Facilities Engineering Command [NAVFAC] Contract Number N62742-12-D-1853. The sampling was conducted in accordance with the approved Work Plan [WP]/Sampling and Analysis Plan [SAP] prepared by Environmental Science International, Inc. [ESI].

On July 22, 27, and 28, and August 20, 2015, ESI personnel collected groundwater samples from five outside tunnel monitoring wells (wells OWDFMW01, HDMW2253-03, RHMW04, RHMW06, and RHMW07). One primary and one duplicate groundwater sample were collected from well OWDFMW01. All groundwater samples were analyzed for petroleum constituents. Analytical results were compared to DOH Tier 1 Environmental Action Levels [EALs]. A summary of the analytical results is provided below.

- **HDMW2253-03** – The only analytes detected in groundwater were Total Petroleum Hydrocarbons [TPH] as diesel [TPH-d] (18 micrograms per liter [$\mu\text{g/L}$]), TPH as oil [TPH-o] (77 $\mu\text{g/L}$), and lead (0.025 $\mu\text{g/L}$). The concentrations did not exceed the DOH Tier 1 EALs. With the exception of one possibly erroneous result obtained during the event in April 2014, TPH-d concentrations have not exceeded the DOH Tier 1 EAL in well HDMW2253-03 since January 2013.
- **OWDFMW01** – Concentrations of TPH-d (3,100 and 3,000 $\mu\text{g/L}$) and TPH-o (390 and 330 $\mu\text{g/L}$) were detected above their respective DOH Tier 1 EALs. Lead (0.022 and 0.034 $\mu\text{g/L}$) and several volatile organic compounds [VOCs] and polycyclic aromatic hydrocarbons [PAHs] were also detected; however, none of these detected concentrations exceeded their respective DOH Tier 1 EALs. The TPH-d concentrations exceeded the previous historical high concentrations from November 2012. The TPH-o concentrations detected during this event were approximately three times the concentrations detected during the April 2015 event, which was the first time since 2012 that samples from the well were analyzed for TPH-o. Due to the consistent high hydrogen activity (pH) and presence of acetone in well OWDFMW01, it is possible there are issues with the well construction or some other isolated condition resulting in sample data that may not accurately represent the groundwater conditions at the site.

- **RHMW04** – The only analytes detected in groundwater were TPH-d (24 µg/L), TPH-o (40 µg/L), lead (0.026 µg/L), naphthalene (0.0075 µg/L) and 2-methylnaphthalene (0.0059 µg/L). The concentrations did not exceed their respective DOH Tier 1 EALs.
- **RHMW06** – The only analyte detected in groundwater was lead (0.006 µg/L). The concentration did not exceed the DOH Tier 1 EAL.
- **RHMW07** – The analytes detected in groundwater were TPH-d (22 µg/L), TPH-o (48 µg/L), fluorene (0.0042 µg/L), 1-methylnaphthalene (0.0051 µg/L), 2-methylnaphthalene (0.0095 µg/L), naphthalene (0.0060 µg/L), phenanthrene (0.0084 µg/L), and lead (0.006 µg/L). The concentrations did not exceed their respective DOH Tier 1 EALs.

During the July 2015 sampling event, TPH-d and TPH-o were detected at concentrations above their respective DOH Tier 1 EALs in OWDFMW01. Both concentrations exceeded their previous historical high concentrations. The majority of the TPH-d concentration reported for the samples from OWDFMW01 was caused by one single peak. The compound or compound mixture represented by the single peak does not resemble a petroleum fuel. For both TPH-d and TPH-o in OWDFMW01, the total concentrations reported are likely inaccurate, because they were determined by comparison to a diesel and an oil standard, respectively. Additional scrutiny of the TPH-d concentrations in well OWDFMW01 is warranted. Based on an unnaturally high pH and the presence of acetone in well OWDFMW01, the associated sample data may not accurately represent the conditions of the groundwater at the site.

The groundwater contaminant concentrations in the other wells remained at low concentrations and did not change significantly since the previous sampling event (April 2015), or were not detected. No Contaminants of Potential Concern [COPCs] in wells HDMW2253-03, RHMW04, RHMW06 or RHMW07 were detected at concentrations above their respective DOH Tier 1 EALs.

Based on a suspected 2014 release at the RHSF and the results of the recent groundwater sampling and analysis, continued groundwater monitoring at the RHSF is recommended. If the TPH-d concentrations significantly increase, the monitoring frequency should be increased to monthly, even though wells RHMW04, RHMW06, RHMW07, HDMW2253-03, and OWDFMW01 are not included in the RHSF Groundwater Protection Plan.

An alternative means of collecting groundwater samples from the vicinity of well OWDFMW01 should be evaluated if TPH impacts continue to trend upwards and high pH conditions persist.

SECTION 1 – INTRODUCTION

This quarterly groundwater monitoring report presents the results of the third quarter 2015 groundwater sampling event conducted on July 22, 27, and 28, and August 20, 2015, at the outside tunnel wells of the RHSF, JBPHH, Hawaii. The RHSF is located in Halawa Heights on the Island of Oahu. The purpose of the sampling is to (1) assess the condition of groundwater beneath and in the vicinity of the RHSF with respect to chemical constituents associated with jet fuel propellant and marine diesel fuel, and (2) to ensure the Navy remains in compliance with DOH UST release response requirements as described in Hawaii Administrative Rules 11-281 Subchapter 7, Release Response Action (DOH, 2013). The DOH Facility ID number for the RHSF is 9-102271. The DOH Release ID numbers are 990051, 010011, 020028, and 140010.

The groundwater sampling was conducted as part of the long-term groundwater and soil vapor monitoring program at the RHSF for NAVSUP FLC Pearl Harbor, under NAVFAC Contract Number N62742-12-D-1853. The sampling was conducted in accordance with the approved WP/SAP and WP/SAP Technical Addendum prepared by ESI (ESI, 2012; 2015c).

1.1 SITE DESCRIPTION

The RHSF is located on federal government land (zoned F1 - Military and Federal), located in Halawa Heights, approximately 2.5 miles northeast of Pearl Harbor (Figure 1). It is located on a low ridge on the western edge of the Koolau Mountain Range that divides Halawa Valley from Moanalua Valley. The RHSF is bordered on the north by Halawa Correctional Facility and private businesses, on the southwest by the United States of America [U.S.] Coast Guard reservation, on the south by residential neighborhoods, and on the east by Moanalua Valley. A quarry is located less than a quarter mile away to the northwest. The RHSF occupies 144 acres of land and the majority of the site is at an elevation of approximately 200 to 500 feet above mean sea level.

The RHSF contains 18 active and 2 inactive USTs, which are operated by NAVSUP FLC Pearl Harbor. Each UST has a capacity of approximately 12.5 million gallons. The RHSF is located approximately 100 feet above the basal aquifer. The USTs contain Jet Fuel Propellant-5 [JP-5], Jet Fuel Propellant-8 [JP-8], and Marine Diesel Fuel [F-76]. The current status of each of the USTs is summarized in Table 1.1.

Five groundwater monitoring wells (wells RHMW04, RHMW06, RHMW07, HDMW2253-03, and OWDFMW01) are located outside of the RHSF tunnel system (Figure 2). Well HDMW2253-03 is located at the Halawa Correctional Facility (outside the RHSF); well OWDFMW01 is located at the former Oily Waste Disposal Facility near Adit 3; and wells RHMW04, RHMW06, and RHMW07 are located on the north side of the RHSF along the road to the Navy Firing Range. Four groundwater monitoring wells (wells RHMW01, RHMW02, RHMW03, and RHMW05) are located within the RHSF lower access tunnel, and one sampling point (RHMW2254-01) is

located at Red Hill Shaft. Monitoring data for the four wells located inside the tunnel and one sampling point at Red Hill Shaft are included in a separate report.

As noted, monitoring wells RHMW01, RHMW02, RHMW03, and RHMW05 are located inside the underground tunnels. Sampling point RHMW2254-01 is located inside the infiltration gallery of the Department of the Navy [DON] drinking water supply Well 2254-01. DON Well 2254-01 is located approximately 2,400 feet downgradient of the USTs and provides potable water to the JBPHH Water System, which serves approximately 65,200 military customers. NAVFAC Public Works Department operates the infiltration gallery and DON Well 2254-01.

TABLE 1.1
Current Status of the USTs
Red Hill Bulk Fuel Storage Facility
July 2015 Quarterly Monitoring Report

Tank Identification	Fuel Type	Status	Capacity
F-1	None	Inactive	12.5 million gallons
F-2	JP-8	Active	12.5 million gallons
F-3	JP-8	Active	12.5 million gallons
F-4	JP-8	Active	12.5 million gallons
F-5	JP-8	Active	12.5 million gallons
F-6	JP-8	Active	12.5 million gallons
F-7	JP-5	Active	12.5 million gallons
F-8	JP-5	Active	12.5 million gallons
F-9	JP-5	Active	12.5 million gallons
F-10	JP-5	Active	12.5 million gallons
F-11	JP-5	Active	12.5 million gallons
F-12	JP-5	Active	12.5 million gallons
F-13	F-76	Active	12.5 million gallons
F-14	F-76	Active	12.5 million gallons
F-15	F-76	Active	12.5 million gallons
F-16	F-76	Active	12.5 million gallons
F-17	JP-5	Active	12.5 million gallons
F-18	JP-5	Active	12.5 million gallons
F-19	None	Inactive	12.5 million gallons
F-20	JP-5	Active	12.5 million gallons

F-76 Marine Diesel Fuel
JP-5 Jet Fuel Propellant-5
JP-8 Jet Fuel Propellant-8

1.2 PHYSICAL SETTINGS

Climatological conditions in the area of the RHSF consist of warm to moderate temperatures and low to moderate rainfall. The RHSF is leeward of the prevailing northeasterly trade winds. The average annual precipitation is approximately 40 inches, which occurs mainly between November and April (State of Hawaii Department of Land and Natural Resources [DLNR], 1986). Annual pan evaporation is approximately 75 inches (DLNR, 1985). Average temperatures range from the low 60's to high 80's (degrees Fahrenheit) (Atlas of Hawaii, 1983).

Oahu consists of the eroded remnants of two shield volcanoes, Waianae and Koolau. The RHSF is located on the southwest flank of the Koolau volcanic shield. Lavas erupted during the shield-building phase of the volcano belong to the *Koolau Volcanic Series* (Stearns and Vaksvik, 1935). Following formation of the Koolau shield, a long period of volcanic quiescence occurred, during which the shield was deeply eroded. Following this erosional period, eruptive activity resumed. Lavas and pyroclastic material erupted during this period belong to the *Honolulu Volcanic Series* (Stearns and Vaksvik, 1935).

In the immediate area of the RHSF, Koolau Volcanic Series lavas dominate, although there are consolidated and unconsolidated non-calcareous deposits in the vicinity that consist of alluvium generated during erosion of the Koolau volcanic shield. South-southwest of the RHSF, and in isolated exposures to the west, are pyroclastic deposits formed during eruptions from three Honolulu Volcanic Series vents, Salt Lake, Aliamanu, and Makalapa (Stearns and Vaksvik, 1935). Based on established geology and records of wells drilled at the RHSF (Stearns and Vaksvik, 1938), the RHSF is underlain by Koolau Volcanic Series basalts. The area of the RHSF is classified as *Rock Land*, where 25 to 90% of the land surface is covered by exposed rock and there are only shallow soils (Foote, et al., 1972).

Groundwater in Hawaii exists in two principal aquifer types. The first and most important type, in terms of drinking water resources, is the basal aquifer. The basal aquifer exists as a lens of fresh water floating on and displacing seawater within the pore spaces, fractures, and voids of the basalt that forms the underlying mass of each Hawaiian island. In parts of Oahu, groundwater in the basal aquifer is confined by the overlying caprock and is under pressure. Waters that flow freely to the surface from wells that tap the basal aquifer are referred to as *artesian*.

The second type of aquifer is the caprock aquifer, which consists of various kinds of unconfined and semi-confined groundwater. Commonly, the caprock consists of a thick sequence of nearly impermeable clays, coral, and basalt that separates the caprock aquifer from the basal aquifer. The impermeable nature of these materials and the artesian nature of the basal aquifer severely restrict the downward migration of groundwater from the upper caprock aquifer. However, in the area of the RHSF, there is no discernible caprock.

Groundwater in the area of the RHSF is part of the *Waimalu Aquifer System* of the *Pearl Harbor Aquifer Sector*. The aquifer is classified as a basal, unconfined, flank-type; and is currently used as a drinking water source. The aquifer is considered fresh, with less than 250 milligrams per liter of chloride, and is considered an irreplaceable resource with a high vulnerability to contamination (Mink and Lau, 1990).

The nearest drinking water supply well is the Red Hill Shaft Well 2254-01, located in the infiltration gallery within the RHSF. The Well 2254-01 is located approximately 2,400 feet downgradient of the USTs (Figure 2).

The nearest body of surface water is Halawa Stream, an ephemeral stream that is present along the north side of the RHSF. Except for the portion to the east of the Halawa Correctional Facility, the stream is contained by a concrete culvert. The stream is usually dry, but flows after periods of significant rainfall.

Wells HDMW2253-03, OWDFMW01, RHMW04, RHMW06, and RHMW07 are all located within 150 meters of a portion of Halawa stream. The distance of each well to Halawa Stream is presented in Table 1.2

TABLE 1.2
Distance of Wells to Halawa Stream
Red Hill Bulk Fuel Storage Facility
July 2015 Quarterly Monitoring Report

Well	Distance to Halawa Stream (meters)
HDMW2253-03	64.25
OWDFMW01	142.68
RHMW04	80.85
RHMW06	104.09
RHMW07	81.20

1.3 BACKGROUND

The RHSF was constructed by the U.S. Government in the early 1940s. Twenty USTs and a series of tunnels were constructed to supply fuel to the Navy. The USTs were constructed of steel and they currently contain JP-5, JP-8, and F-76. Several tanks in the past have stored DON special fuel oil, DON distillate, aviation gasoline, and motor gasoline (Environet, 2010). The fueling system is a self-contained underground unit that was installed into native rock comprised primarily of basalt with some interbedded tuffs and breccias (Environet, 2010). Each UST measures approximately 250 feet in height and 100 feet in diameter. The upper domes of the tanks lie at depths varying between 100 feet and 200 feet below ground surface.

In response to increasing concentrations of COPCs in the groundwater monitoring wells within the facility (specifically RHMW02) during the 2008 sampling events, quarterly groundwater monitoring was initiated in 2009 at the outside tunnel wells.

In 2009, groundwater samples were collected from wells RHMW04, OWDFMW01, and HDMW2253-03. Samples were collected in August and October 2009. None of the COPCs were detected at concentrations exceeding the current gross contamination or drinking water toxicity DOH EALs.

In 2010, groundwater samples were collected from wells RHMW04, OWDFMW01, and HDMW2253-03. Samples were collected from well RHMW04 in January and April 2010. Samples were collected from well OWDFMW01 in January, April, and October 2010. Samples were collected from well HDMW2253-03 in January, April, July and October 2010. The COPCs with concentrations that exceeded current DOH EALs are summarized below.

- **HDMW2253-03** – TPH-d was detected at a concentration above the DOH EALs for gross contamination and drinking water toxicity in January 2010 (The Environmental Company, Inc. [TEC], 2010a).
- **OWDFMW01** – TPH-d was detected at a concentration above the DOH EALs for gross contamination and drinking water toxicity in January and April 2010 (TEC, 2010a; TEC, 2010b).

In 2011, groundwater samples were collected from wells OWDFMW01 and HDMW2253-03. Samples were collected in January, April, July, and October 2011. None of the COPCs were detected at concentrations exceeding the current DOH EALs for gross contamination or drinking water toxicity. In Fall 2011, the DOH EALs were revised. The drinking water toxicity EAL for TPH-d decreased from 210 to 190 µg/L.

In 2012, groundwater samples were collected from wells OWDFMW01 and HDMW2253-03. Samples were collected in January, April, July, and November 2012. TPH-d was detected at a concentration above the DOH EALs in samples collected from wells HDMW2253-03 and OWDFMW01 (Environet, 2012; ESI, 2013a). The COPCs with concentrations that exceeded current DOH EALs are summarized below.

- **HDMW2253-03** – TPH-d was detected at concentrations above the DOH EALs for gross contamination and drinking water toxicity in April and November 2012.
- **OWDFMW01** – TPH-d was detected at a concentration above the DOH EALs for gross contamination and drinking water toxicity in April 2012.

In 2013, groundwater samples were collected from wells OWDFMW01 and HDMW2253-03. Samples were collected in January, April, July, and October 2013. TPH-d was detected at a concentration above the DOH EALs in samples collected from wells HDMW2253-03 and OWDFMW01 (ESI, 2013b, 2013c, 2013d, and 2014a). The COPCs with concentrations that exceeded current DOH EALs are summarized below.

- **HDMW2253-03** – TPH-d was detected at a concentration above the DOH EALs for gross contamination and drinking water toxicity in January 2013.
- **OWDFMW01** – TPH-d was detected at concentrations above the DOH EALs for gross contamination and drinking water toxicity in all four quarters during 2013.

In 2014, groundwater samples were collected from wells OWDFMW01 and HDMW2253-03. Samples were collected in January, April, July, and October 2014. Well RHMW04 was also sampled in July and October 2014. TPH-d was detected at concentrations above the DOH EALs in samples collected from well OWDFMW01 in January and April 2014. TPH-d was also detected at a concentration above the DOH EALs in a sample collected from well HDMW2253-03 in April 2014; however, this was likely an erroneous result due to a switched

sample (ESI, 2014c, 2014d, 2014e, and 2015a). The COPCs with concentrations that exceeded current DOH EALs are summarized below.

- **HDMW2253-03** – TPH-d was detected at a concentration above the DOH EALs for both gross contamination and drinking water toxicity in April 2014. However, as discussed above, this was likely an erroneous result.
- **OWDFMW01** – TPH-d was detected at concentrations above the DOH EALs for gross contamination and drinking water toxicity in April 2014 and above only the EAL for gross contamination in January 2014.

In January 2014, an additional groundwater sampling was conducted at HDMW2253-03 in response to a suspected release from Tank 5. None of the COPC concentrations exceeded the current DOH EALs (ESI, 2014b).

Between August and October 2014, wells RHMW06 and RHMW07 were installed at the RHSF in order to develop a more robust groundwater monitoring network at the site (Battelle, 2015a). Both wells were sampled in October 2014. The PAH 2-methylnaphthalene was detected in the sample collected from well RHMW06. TPH-d, 2-methylnaphthalene, and acetone were detected in the sample collected from well RHMW07. None of the COPC concentrations exceeded the current DOH EALs for gross contamination or drinking water toxicity. In the well installation report, it was speculated that these detections may have been related to the drilling foam used during the installation of the wells.

In January 2015, groundwater samples were collected from wells OWDFMW01, HDMW2253-03, and RHMW04 (ESI, 2015b), and from wells RHMW06, and RHMW07 (Battelle, 2015b). None of the COPC concentrations exceeded the current DOH EALs for drinking water toxicity or gross contamination.

In April 2015, groundwater samples were collected from wells OWDFMW01, HDMW2253-03, RHMW04, RHMW06, and RHMW07. The COPCs with concentrations that exceeded current DOH EALs are summarized below.

- **OWDFMW01** – TPH-d and TPH-o were detected at concentrations above their respective DOH EALs.

1.3.1 Previous Reports

The following groundwater monitoring reports for wells located outside the RHSF tunnel system were previously submitted to DOH:

1. Groundwater Monitoring Report, August 2009 (submitted September 2009).
2. Groundwater Monitoring Report, October 2009 (submitted December 2009).

3. Groundwater Monitoring Report, January, 2010 (submitted April 2010).
4. Groundwater Monitoring Report, April 2010 (submitted May 2010).
5. Groundwater Monitoring Report, July 2010 (submitted August 2010).
6. Groundwater Monitoring Report, October 2010 (submitted December 2010).
7. Groundwater Monitoring Report, January 2011 (submitted March 2011).
8. Groundwater Monitoring Report, April 2011 (submitted June 2011).
9. Groundwater Monitoring Report, July 2011 (submitted September 2011).
10. Groundwater Monitoring Report, October 2011 (submitted December 2011).
11. Groundwater Monitoring Report, January 2012 (submitted March 2012).
12. Groundwater Monitoring Report, April 2012 (submitted July 2012).
13. Groundwater Monitoring Report, July 2012 (submitted August 2012).
14. Groundwater Monitoring Report, November 2012 (submitted January 2013).
15. Groundwater Monitoring Report, January 2013 (submitted April 2013).
16. Groundwater Monitoring Report, April 2013 (submitted July 2013).
17. Groundwater Monitoring Report, July 2013 (submitted September 2013).
18. Groundwater Monitoring Report, October 2013 (submitted January 2014).
19. Groundwater Monitoring Report for Additional Sampling of HDMW2253-03, January 2014 (submitted February 2014).
20. Groundwater Monitoring Report, January 2014 (submitted April 2014).
21. Groundwater Monitoring Report, April 2014 (submitted June 2014).
22. Groundwater Monitoring Report, July 2014 (submitted September 2014).
23. Groundwater Monitoring Report, October 2014 (submitted January 2015).
24. Groundwater Monitoring Report, January 2015 (submitted March 2015).
25. Draft Monitoring Well Installation Report for RHMW06 and RHMW07, March 2015 (submitted March 2015).
26. Draft Technical Memorandum, Groundwater Sampling Event for RHMW06 and RHMW07, April 2015 (submitted April 2015).
27. Groundwater Monitoring Report, April 2015 (submitted August 2015).

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SECTION 2 – GROUNDWATER SAMPLING

On July 22, 27, and 28, and August 20, 2015, ESI personnel collected groundwater samples from five monitoring wells (wells OWDFMW01, HDMW2253-03, RHMW04, RHMW06, and RHMW07). A primary and duplicate groundwater sample were collected from well OWDFMW01. Samples from four wells were collected in July; however, due to a pump malfunction the sample from RHMW04 was not collected until August 20, 2015.

The samples were collected in accordance with the 2012 WP/SAP and the 2015 Technical Addendum (ESI, 2012; 2015c). The WP/SAP is consistent with DOH UST release response requirements (DOH, 2000); DON Procedure I-C-3, *Monitoring Well Sampling* (DON, 2007); and the Final RHSF Groundwater Protection Plan (TEC, 2008). Prior to purging and sampling, the depth to groundwater and the depth to the bottom of the wells were measured by ESI using a Geotech oil/water interface probe. The measurements are included in the groundwater sampling logs. No measurable product, sheen, or petroleum hydrocarbon odor was observed in any of the wells.

2.1 GROUNDWATER SAMPLING

Prior to collecting groundwater samples, the monitoring wells were purged of standing water in the well casings. Wells OWDFMW01 and HDMW2253-03 were purged using disposable bailers. Wells RHMW04, RHMW06, and RHMW07 contain dedicated bladder pumps which were used to purge the wells and to collect samples. The monitoring wells were purged at rates of 0.21 to 0.94 liters per minute.

Water quality parameters were monitored on a periodic basis during well purging. The water quality parameters that were measured included pH, temperature, conductivity, dissolved oxygen, and oxidation-reduction potential. The water quality parameters were evaluated to demonstrate that the natural characteristics of the aquifer formation water were present within the monitoring well before collecting the sample. At least four readings were collected during the purging process. Purging was considered complete when at least three consecutive water quality measurements stabilized within approximately 10%. The readings were recorded on groundwater monitoring logs which are included in Appendix A. The field notes are included in Appendix B.

When the water quality parameters stabilized, groundwater samples were collected from the wells. The disposable bailers or dedicated bladder pump were used to collect the groundwater samples from the monitoring wells. For each monitoring well, the groundwater samples were collected no more than two hours after purging was completed to prevent groundwater interaction with the monitoring well casing and atmosphere. Samples collected for dissolved lead were filtered in the field using new 0.45-micron filters.

All samples were labeled and logged on the Sample Inventory Log, placed in Ziploc™ bags and sealed, custody sealed, sealed with tape, placed in a cooler with wet ice, and logged onto the

Chain-of-Custody form. The samples were labeled and logged in accordance with DON Procedure III-E, *Record Keeping, Sample Labeling, and Chain-of-Custody Procedures* (DON, 2007). All samples were shipped under Chain-of-Custody to the analytical laboratory and analyzed for the COPCs as described in Section 2.2.

2.2 ANALYTICAL RESULTS

The samples were analyzed for TPH as gasoline [TPH-g], TPH-d, and TPH-o using U.S. Environmental Protection Agency [EPA] Method 8015M; VOCs using EPA Methods 8260C, 8260C-SIM, and 8011; PAHs using EPA Method 8270C SIM; and dissolved lead using EPA Method 6020. Analytical results were compared to DOH Tier 1 EALs where groundwater is a current source of drinking water and surface water is less than 150 meters from the site. The analytical results are described below and summarized in Table 2.1. A copy of the laboratory report is included as Appendix C.

For ease of reading, only analytical results for chemicals that have been detected since 2010 are presented in Table 2.1. A description of laboratory data qualifiers, definitions of the terms Method Detection Limit [MDL], Limit of Detection [LOD], and Limit of Quantitation [LOQ], and basic concepts of those terms are presented as Appendix D.

- **HDMW2253-03** – The only analytes detected in groundwater were TPH-d (18 µg/L), TPH-o (77 µg/L), and lead (0.025 µg/L). The concentrations did not exceed the DOH Tier 1 EALs.
- **OWDFMW01** – Concentrations of TPH-d (3,100 and 3,000 µg/L) and TPH-o (390 and 330 µg/L) were detected above their respective DOH Tier 1 EALs. Lead (0.022 and 0.034 µg/L) and several VOCs and PAHs were also detected; however, none of these detected concentrations exceeded their respective DOH Tier 1 EALs.
- **RHMW04** – The only analytes detected in groundwater were TPH-d (24 µg/L), TPH-o (40 µg/L), lead (0.026 µg/L), naphthalene (0.0075 µg/L) and 2-methylnaphthalene (0.0059 µg/L). The concentrations did not exceed their respective DOH Tier 1 EALs.
- **RHMW06** – The only analyte detected in groundwater was lead (0.006 µg/L). The concentration did not exceed the DOH Tier 1 EAL.
- **RHMW07** – The only analytes detected in groundwater were TPH-d (22 µg/L), TPH-o (48 µg/L), fluorene (0.0042 µg/L), 1-methylnaphthalene (0.0051 µg/L), 2-methylnaphthalene (0.0095 µg/L), naphthalene (0.0060 µg/L), phenanthrene (0.0084 µg/L), and lead (0.006 µg/L). The concentrations did not exceed their respective DOH Tier 1 EALs.

2.2.1 Groundwater Contaminant Trends

The historical groundwater contaminant concentration trends for COPCs that exceeded the DOH Tier 1 EALs are illustrated in Appendix E. A table of cumulative historical groundwater results is included as Appendix F. A summary of groundwater contaminant trends is provided below.

- **HDMW2253-03** – TPH-d was detected in this well at a concentration below the DOH Tier 1 EAL. With the exception of one possibly erroneous result obtained during the event in April 2014, TPH-d concentrations have not exceeded the DOH Tier 1 EAL in well HDMW2253-03 since January 2013.
- **OWDFMW01** – TPH-d and TPH-o were detected in both samples from this well at concentrations exceeding their respective DOH Tier 1 EALs. The TPH-d concentrations (3,000 and 3,100 µg/L) exceeded the previous historical high concentrations from November 2012 (2,500 µg/L in both primary and duplicate samples). The TPH-o concentrations detected during this event (330 and 390 µg/L) were approximately three times the concentrations detected during the April 2015 event (110 and 140 µg/L), which was the first time since 2012 that samples from the well were analyzed for TPH-o. Concentrations of all other COPCs detected during this round of quarterly sampling were consistent with historical data.
- **RHMW04** – Concentrations of TPH-d and TPH-o were detected in this well above the previous reported concentrations but remain below the respective DOH Tier 1 EALs. Concentrations of all other COPCs detected during this round of quarterly sampling were below the detection limits of the historical analytical results.
- **RHMW06** – This well was installed in September 2014 and first sampled in October 2014. To date, no COPCs have been detected at concentrations exceeding the DOH Tier 1 EALs.
- **RHMW07** – This well was installed and first sampled in October 2014. To date, no COPCs have been detected at concentrations exceeding the DOH Tier 1 EALs.

2.3 WASTE DISPOSAL

The purged groundwater and decontamination water generated during sampling of the wells were placed in two 55-gallon drums along with the purged water and decontamination water from the inside tunnel wells. The drums were profiled and manifested as non-hazardous and transported off the site on 23 October 2015. A copy of the non-hazardous waste manifest is included in Appendix G.

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**TABLE 2.1
Analytical Results for Groundwater Sampling (July 22, 27, and 28, and August 20, 2015)
Red Hill Bulk Fuel Storage Facility
July 2015 Quarterly Monitoring Report**

Method	Chemical	DOH EAL	OWDFMW01 (ES152)					HDMW2253-03 (ES151)					RHMW04 (ES156)					RHMW06 (ES155)					RHMW07 (ES154)				
			Results	Q	LOQ	LOD	DL	Results	Q	LOQ	LOD	DL	Results	Q	LOQ	LOD	DL	Results	Q	LOQ	LOD	DL	Results	Q	LOQ	LOD	DL
EPA 8015C	TPH-g	100	N.D.	U	50	25	13	N.D.	U	50	25	13	N.D.	U	50	25	13	N.D.	U	50	25	13	N.D.	U	50	25	13
	TPH-d	100	3,100	Z	50	20	11	18	J	50	20	11	24	JB	50	20	11	N.D.	U	49	20	11	22	J	52	21	12
	TPH-o	100	390	Z	99	50	19	77	J	100	50	19	40	JB	110	50	19	N.D.	U	97	50	19	48	J	110	52	20
	Acenaphthylene	30	N.D.	U	0.02	0.0050	0.0034	N.D.	U	0.019	0.0050	0.0034	N.D.	U	0.020	0.0050	0.0034	N.D.	U	0.020	0.0050	0.0034	N.D.	U	0.020	0.0050	0.0034
EPA 8270D SIM	Anthracene	0.73	N.D.	U	0.02	0.0050	0.0036	N.D.	U	0.019	0.0050	0.0036	N.D.	U	0.020	0.0050	0.0036	N.D.	U	0.020	0.0050	0.0036	N.D.	U	0.020	0.0050	0.0036
	Benzofluoranthracene	0.027	0.0030	J	0.02	0.0050	0.0026	N.D.	U	0.019	0.0050	0.0026	N.D.	U	0.020	0.0050	0.0026	N.D.	U	0.020	0.0050	0.0026	N.D.	U	0.020	0.0050	0.0026
	Fluorene	3.9	N.D.	U	0.02	0.0050	0.0038	N.D.	U	0.019	0.0050	0.0038	N.D.	U	0.020	0.0050	0.0038	N.D.	U	0.020	0.0050	0.0038	0.0042	J	0.020	0.0050	0.0038
	1-Methylnaphthalene	2.1	0.0088	J	0.02	0.0050	0.0035	N.D.	U	0.019	0.0050	0.0035	N.D.	U	0.020	0.0050	0.0035	N.D.	U	0.020	0.0050	0.0035	0.0051	J	0.020	0.0050	0.0035
	2-Methylnaphthalene	2.1	0.0086	J	0.02	0.0050	0.0023	N.D.	U	0.019	0.0050	0.0023	0.0059	J	0.020	0.0050	0.0023	N.D.	U	0.020	0.0050	0.0023	0.0095	J	0.020	0.0050	0.0023
	Naphthalene	17	0.014	J	0.02	0.0050	0.0038	N.D.	U	0.019	0.0050	0.0038	0.0075	J	0.020	0.0050	0.0038	N.D.	U	0.020	0.0050	0.0038	0.0060	J	0.020	0.0050	0.0038
	Phenanthrene	4.6	0.014	J	0.02	0.0050	0.0050	N.D.	U	0.019	0.0050	0.0050	N.D.	U	0.020	0.0050	0.0050	N.D.	U	0.020	0.0050	0.0050	0.0084	J	0.020	0.0050	0.0050
	1,2-Dichloroethane	0.15	0.012	J	0.02	0.0150	0.0058	N.D.	U	0.02	0.015	0.0058	N.D.	U	0.020	0.015	0.0058	N.D.	U	0.020	0.015	0.0058	N.D.	U	0.020	0.015	0.0058
	Acetone	1,500	150		20	10	3.3	N.D.	U	20	10	3.3	43		20	10	3.3	N.D.	U	20	10	3.3	N.D.	U	20	10	3.3
	Benzene	5	N.D.	U	0.5	0.10	0.062	N.D.	U	0.5	0.10	0.062	N.D.	U	0.50	0.10	0.062	N.D.	U	0.5	0.10	0.062	N.D.	U	0.5	0.10	0.062
	Bromodichloromethane	0.12	N.D.	U	0.02	0.010	0.0034	N.D.	U	0.02	0.010	0.0034	N.D.	U	0.020	0.010	0.0034	N.D.	U	0.020	0.010	0.0034	N.D.	U	0.020	0.010	0.0034
	Chloromethane	1.8	0.080	J	0.5	0.2	0.088	N.D.	U	0.5	0.20	0.088	N.D.	U	0.50	0.20	0.088	N.D.	U	0.5	0.20	0.088	N.D.	U	0.5	0.20	0.088
Methyl ethyl ketone (2-Butanone)	7,100	N.D.	U	20	4.0	1.9	N.D.	U	20	4.0	1.9	N.D.	U	20	4.0	1.9	N.D.	U	20	4.0	1.9	N.D.	U	20	4.0	1.9	
Methylene chloride	4.8	0.20	J	2.0	0.20	0.10	N.D.	U	2.0	0.20	0.10	N.D.	U	2.0	0.20	0.10	N.D.	U	2.0	0.20	0.10	N.D.	U	2.0	0.20	0.10	
Toluene	40	N.D.	U	0.5	0.10	0.054	N.D.	U	0.5	0.10	0.054	N.D.	U	0.50	0.10	0.054	N.D.	U	0.5	0.10	0.054	N.D.	U	0.5	0.10	0.054	
Xylenes	20	N.D.	U	1	0.20	0.18	N.D.	U	1	0.20	0.18	N.D.	U	1.0	0.20	0.18	N.D.	U	1	0.20	0.18	N.D.	U	1	0.20	0.18	
EPA 8020	Dissolved Lead	5.6	0.022	B	0.02	0.01	0.005	0.025	B	0.02	0.01	0.005	0.026		0.020	0.010	0.004	0.006	J	0.02	0.01	0.004	0.006	J	0.02	0.01	0.004

The data are in micrograms per liter (µg/L). Shaded values exceeded the DOH EALs.
 DL: Detection Limit or Method Detection Limit (MDL)
 DOH EAL: DOH Tier 1 Environmental Action Levels for groundwater where groundwater is a current drinking water source and is located within 150 meters of surface water (DOH, Fall 2011).
 EPA: Environmental Protection Agency
 J: Analyte was detected at a concentration below the LOQ and above the DL. Reported value is estimated.
 LOD: Limit of Detection
 LOQ: Limit of Quantitation
 N.D.: Not Detected
 Q: Total Petroleum Hydrocarbons as gasoline, diesel fuel, and oil
 TPH-g / TPH-d / TPH-o: Undetected at DL and is reported as less than the LOD.
 U: The chromatographic pattern was inconsistent with the profile of the reference fuel standard.
 Z: Analyte was present in the associated method blank.

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SECTION 3 – DATA QUALITY ASSESSMENT

A data quality assessment, which consists of a review of the overall groundwater sample collection and analysis process, was performed in order to determine whether the analytical data generated met the decision quality objectives (DQOs) for the project and if the data is usable for the intended purpose. The data quality assessment was performed in accordance with the approved WP/SAP (ESI, 2012). The field Quality Control program consisted of standardized sample collection and management procedures, and the collection of field duplicate samples, matrix spike [MS] samples, and trip blank samples. The laboratory quality assurance program consisted of the use of standard analytical methods and the preparation and analyses of MS/Matrix Spike Duplicate [MSD] samples, surrogate spikes, blanks, and Laboratory Control Samples [LCSs]/Laboratory Control Sample Duplicates [LCSDs].

3.1 DATA VALIDATION AND ASSESSMENT

The objective of data validation is to provide data of known quality for project decisions. Data quality is judged in terms of Precision, Accuracy, Representativeness, Completeness, Comparability, and Sensitivity [PARCCS]. A number of factors may affect the quality of data, including: sample collection methods, sample analysis methods, and adherence to established procedures for sample collection, preservation, management, shipment, and analysis.

Precision

Precision is defined as the reproducibility of replicate measurements. Precision is evaluated by Relative Percentage Difference [RPD] of field duplicate, LCS/LCSD, and MS/MSD results. Field duplicate and MS/MSD samples were collected at a rate of approximately 25% of project samples. Field duplicates were sent to the laboratory along with the primary samples.

The RPDs of detected analytes for the primary and field duplicate samples (ES152 and ES153) are provided in Table 3.1. An RPD of less than 50% for duplicate pairs is required by the DON *Project Procedures Manual* to be considered acceptable (DON, 2007). Pyrene and toluene were only detected in the duplicate sample at concentrations below the LODs and were assigned RPDs of 200%. These analytes were only detected at levels that are very close to the LOD and significantly lower than the DOH EALs. Therefore, the usability of the data is not impacted. The RPDs for duplicate sample pairs for all other analytes met acceptance criteria.

Accuracy

Accuracy is defined as the degree of conformity of a measurement to a standard or true value. Accuracy is evaluated through measurement of the percent recovery of an analyte in a reference standard or spiked sample. Accuracy limits for surrogates, laboratory control spike, MS, and MSD samples are either prescribed by the Department of Defense [DoD] or established by the individual laboratory. The acceptance criteria for accuracy are dependent on the analytical method and are based on historical laboratory or DoD data.

The fairly large error inherent to the analysis of diesel- and oil-range hydrocarbons by EPA Method 8015 should be considered when results are compared to each other, to action levels, and to results from previous sampling events. Any comparative analysis of the results should take into consideration the fairly wide method acceptance limits as per DoD Quality Systems Manual [QSM] 5.0 (36-132%).

The results for TPH-d in samples ES152 and ES153 (well OWDFMW01 primary and duplicate samples) were flagged "Z" by the laboratory to indicate that the majority of the final concentration reported was caused by one single peak. The compound or compound mixture represented by the single peak could not be identified unambiguously and the total concentration of the compound/compound mixture was likely inaccurate, because it was determined by comparison to a diesel standard. Concentrations of TPH-d in these samples were detected at levels significantly exceeding the DOH EALs; however, due to the decreased accuracy and the problems with well-integrity described in the representativeness section of this report the data should be used with caution. Similarly, TPH-o results were flagged "Z" by the laboratory to indicate the mismatch to the oil standard and these results also should be used with caution.

During the TPH-d and TPH-o analyses, the surrogate spike recovery for n-triacontane was above the control limit in samples ES152 and ES153 because one of the minor peaks belonging to the sample co-eluted with the surrogate peak. Thus, surrogate recovery data for these two samples was inconclusive. The MS/MSD spiked into ES152 was used instead to assess matrix interference in these two (duplicate) samples. Data usability was not significantly affected.

The TPH-g recovery for the MSD associated with sample ES156 was slightly above the acceptable range indicating a high bias in the reported result. However the analyte was not detected and project decisions are not affected.

The MS and/or MSD recoveries for trichloroethene, 4-methyl-2-pentanone, dibromochloromethane, and bromodichloromethane for sample ES152 were above control criteria, indicating a potential high bias for these analytes. None of these analytes were detected in any field samples; consequently, the high biases for these compounds did not affect data usability.

The MS and MSD recoveries for sample ES152 (well OWDFMW01 primary sample) were below the control limits for 1,1,2,2-tetrachloroethane, indicating a potential low bias for this analyte. A review of data from past events indicated that the analyte consistently recovered extremely low from MS/MSDs performed on samples collected from this well. Acceptable recovery of the analyte from the LCS confirmed that the issue was restricted to the matrix. Since pH values of the groundwater in well OWDFMW01 were high, it was hypothesized that the low spike recovery was due to chemical degradation of 1,1,2,2-tetrachloroethane by base-catalyzed dehydrochlorination to trichloroethylene [TCE]. The rate of chemical degradation (via base catalyzed hydrolysis or dehydrochlorination) of other chlorinated analytes on the project target list spiked into the MS/MSD would be expected to be much lower and therefore not observed.

The high recovery of the chemical degradation product of this reaction, TCE, from the MS/MSD supported the suggested explanation. Therefore, the failure to recover 1,1,2,2-tetrachloroethane from the MS/MSDs did not affect the usability of the dataset significantly. The analyte is not a fuel related contaminant and the effect described above should be restricted to samples with high pH (well OWDFMW01 only, in this case). When pH levels drop, the effect is expected to disappear.

The MS and MSD recoveries for the batch quality control [QC] sample associated with samples ES154 and ES155 were below the control limits for several VOCs due to suspected matrix interference, suggesting a possible low bias. The MS/MSD RPD for 2-butanone was also outside the control limit. None of the affected analytes were detected in the field samples. A slight low bias may affect the usability of data where the LOD or LOQ of an analyte is near the EAL; however, none of the analytes where this is potentially the case have ever been detected in these two wells, and it is unlikely that this affects data usability.

The LCS and LCSD recoveries for bromodichloromethane and dibromochloromethane were above the control limits, indicating a potential high bias. However, the analytes were not detected in any field samples, and the high biases for these compounds did not significantly affect data usability.

During the VOC analyses, the surrogate spike recovery for 1,2-dichloroethane-d4 was above the control limit in sample ES155, the trip blank, and the batch QC sample. The associated analytes were not detected in any of the field samples, and the quality of the sample data was not significantly affected.

The laboratory indicated initial calibration [ICAL] and continuing calibration verification [CCV] exceedances for VOCs (8260 and 8260-SIM) that may have an impact on data quality. The affected analytes were 1,1,2,2-tetrachloroethane, 1,2-dibromo-3-chloropropane, chloromethane, bromomethane, dibromochloromethane, acetone, 2-butanone, TCE, 4-methyl-2-pentanone, and bromoform. The ICAL issues indicated increased error and potentially decreased sensitivity for the affected analytes. The CCV failures indicated low bias for the data. The EPA method 8260 LOD (0.80 µg/L) for 1,2-dibromo-3-chloropropane was above the EAL (0.040 µg/L). However, the 1,2-dibromo-3-chloropropane analysis from the preferred EPA Method 8011 provided results with an LOD below the DOH EAL and without the above described ICAL and CCV issues.

All other calibration QC-data, MS/MSD, LCS/LCSD, and surrogate spike recoveries were within acceptable recovery limits. The data accuracy for this monitoring event is considered acceptable.

Representativeness

Representativeness is the degree to which data accurately and precisely represents a characteristic of a population, parameter variations at a sampling point, or an environmental condition. Representativeness was achieved by conducting sampling in accordance with the

sample collection procedures described in the project WP/SAP, including standardized sample collection methods (ESI, 2012).

Representativeness is also evaluated through the compliance with the standardized sample holding time and sample preservation methods, and through the analysis of blank samples, including method blank and trip blank samples.

For this sampling event, a total of three trip blanks were included in the coolers containing samples for VOC and TPH-g analysis to assess the potential for contamination during sample transport. Methylene chloride, chloroethane, chloroform, bromodichloromethane, and toluene were detected in at least one trip blank at low concentrations. Additionally, methylene chloride and bromodichloromethane were detected at similar concentrations in at least one method blank, indicating that the contamination was caused by the laboratory. However, because methylene chloride, chloroethane, chloroform, bromodichloromethane, and toluene were not detected in any of the associated field samples, their presence in the trip blank was irrelevant.

Additionally, lead, TPH-d, TPH-o, and hexachlorobutadiene were detected in at least one method blank at concentrations below their respective LOQs. The lead results for samples ES151, ES152, ES153 were flagged "B" to indicate that they may be artifacts of laboratory contamination. Hexachlorobutadiene was not detected in any field samples and all other detected concentrations of lead, TPH-d, and TPH-o were significantly greater than five times the concentration in the method blank, indicating that laboratory contamination was not a significant source of error.

The method blank associated with sample ES156 had similar reported TPH-d and TPH-o concentrations as sample ES156. Therefore the sample was flagged "B" to indicate a significant high bias in the associated samples due to the presence of analyte in the method blank.

The consistently high pH (10 to 13) observed over several sampling events in well OWDFMW01 is atypical for the groundwater in the area and suggests, along with the presence of acetone, that there may be a deficiency in the concrete or bentonite sealing materials used in the construction of the well, or some other localized condition in the vicinity of the well. Consequently, the associated sample data (ES152 and ES153) may not accurately represent the conditions of the groundwater at the site.

With the exceptions noted above, the groundwater sample data are considered representative of the groundwater quality at the site. A summary of the trip blank results is provided in Table 3.1.

Completeness

Completeness is defined as the overall percentage of valid analytical results (including estimated results) compared to the total number of analytical results reported by the laboratory. No data were rejected for this project, and therefore the completeness goal for this project (90%) was successfully met.

Comparability

Comparability expresses the confidence with which one data set can be compared to another data set. Comparability can be related to accuracy and precision because these quantities are measures of data reliability. Data with acceptable precision and accuracy are considered comparable if collection techniques, analytical procedures, methods and reporting are equivalent. For this monitoring event, the samples were collected using approaches consistent with those in the previous events, and the same analytical methods/procedures were used to measure the concentration of COPCs. The field and laboratory personnel followed standard operating procedures. With the exceptions noted below, the results are considered comparable within this data set and with the data collected from previous sampling events.

All samples collected from wells OWDFMW01, HDMW2253-03, and RHMW04 from October 2010 to and including February 2015 were analyzed by Calscience Environmental Laboratories in Garden Grove, CA (now Eurofins Calscience). Samples collected from wells RHMW06 and RHMW07 in October 2014 and January 2015 were analyzed by APPL Laboratories, Inc. of Clovis, CA and EMAX Laboratories of Torrance, CA. Samples collected from all five wells in April and July 2015 were analyzed by ALS Environmental in Kelso, WA. Analytical MDLs, LODs, and LOQs were lower for most analytes than they had been prior to April 2015, and several VOCs and PAHs have been detected since April 2015 at concentrations that would have been below previous LODs and therefore not detected. The method used to analyze 1,2-dichloroethane, bromodichloromethane, dibromochloromethane, and 1,1,2,2-tetrachloroethane was changed from EPA Method 8260 to EPA Method 8260-SIM to improve sensitivity. Correspondingly, analysis of 1,2-dibromo-3-chloropropane and 1,2-dibromoethane was changed from EPA Method 8260 to EPA Method 8011 for the same reason. The significantly improved reporting limits should be considered when results are compared to data from previous events.

Additionally, during the April 2015 event, TPH-o was added to the analyte list. There are very few previous TPH-o results to compare this data to.

Between August 2009 and July 2010, naphthalene was analyzed for by both EPA Methods 8260B and 8270C-SIM, and beginning in October 2010, only results using EPA Method 8270C-SIM were reported. Naphthalene was not detected in groundwater from either well HDMW2253-03 or OWDFMW01 until November 2012 and has never been detected in RHMW04; however, when both methods were used for samples collected from inside well RHMW02, concentrations of naphthalene detected by EPA Method 8260B were generally two to three times higher than those detected by EPA Method 8270C-SIM. We assume this is due to the better preservation of VOCs associated with the use of EPA Method 8260B. This suggests that the naphthalene results provided by EPA Method 8270C-SIM may be biased low. Naphthalene concentrations in samples collected beginning in October 2010 were analyzed using EPA Method 8270C-SIM and results may be biased low. However, naphthalene concentrations in project samples have been orders of magnitude below DOH EALs, and this potential low bias should not affect project decisions.

The TPH-g analysis of project samples through July 2010 was performed using EPA Method 8015. Between October 2010 and January 2015, EPA Method 8260B was used. Beginning with the April 2015 event, EPA Method 8015 was used again. There was no event where both methods were used; consequently, there is no way to directly compare the results obtained by the two methods and to assess potential bias. However, there is no reason to believe that using either method should bias the data, and the TPH-g data for all events should be comparable.

Other than the lower detection limits, the addition of TPH-o to the analyte list, and the naphthalene bias discussed above, no other issues with comparability were identified. The results are considered comparable within this data set and with the data collected from recent sampling events.

Sensitivity

The LOQs are established by the laboratory based on the LODs or instrument detection limits, historical data, and EPA limits established for the various methods. The LOQs and LODs for samples may require adjustment by the laboratory due to matrix interference or if high levels of target analytes necessitate dilution before analysis. Matrix interference and sample dilutions have the effect of decreasing sensitivity and increasing the LOQs/LODs.

All LODs were sufficiently low to satisfy project DQOs. The limits for several analytes were significantly lower than in historical sampling events. The impact on comparability of the data to historical data is described in the comparability section of this report. The laboratory, in several cases, indicated issues with relative response factors determined for initial calibrations or calibration verifications of certain VOCs. In every case, the laboratory verified that the sensitivity was sufficient to detect the affected compounds at their respective LOQs. All LOQs for the affected analytes were below the EALs, indicating that any potential impact on sensitivity was minor and irrelevant in terms of project decisions.

3.2 DATA ASSESSMENT AND USABILITY CONCLUSIONS

The PARCCS criteria were evaluated, and with some exceptions, all criteria were met. Results associated with QC data that failed acceptance criteria are discussed in detail in Section 3.1 of this report. Data quality issues that need to be taken into account for project decisions are summarized below.

The MS/MSD recoveries of 1,1,2,2-tetrachloroethane were very low and are likely affected by the high pH in well OWDFMW01. This suggests that the high pH causes the chemical degradation of 1,1,2,2-tetrachloroethane in this well. Given that the degradation product, TCE, was not detected in the well at or above its LOD (0.10 µg/L), it is unlikely that 1,1,2,2-tetrachloroethane is a contaminant of concern for well OWDFMW01, and this is unlikely to affect data usability.

The TPH-d and TPH-o results in samples ES152 and ES153 were impacted by decreased accuracy due to the mismatch between the chromatographic profiles of the samples and the

standard used for quantitation. The fairly large error inherent to the analysis of diesel- and oil-range hydrocarbons by EPA method 8015 augment the impact of the inaccuracy created by the chromatographic profiles. Because TPH-d and TPH-o in these samples were detected at levels exceeding the DOH EALs, project decisions may be impacted regarding whether the analyte represents a fuel-related contaminant and whether concentrations in the well at the time of sampling exceeded the DOH EAL.

The TPH-d and TPH-o results in sample ES156 were impacted by similar concentrations of TPH-d and TPH-o in the associated method blank. Therefore the sample was flagged "B" to indicate a significant high bias in the associated samples due to the presence of analyte in the method blank. The high bias in the reported TPH-d and TPH-o results for sample ES156 should be considered when making project decisions.

The data assessment concludes that all data generated during this event are usable for the intended purpose, with the limitations described above.

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TABLE 3.1
Quality Control Results for Groundwater Sampling (July 22, 27, and 28, and August 20, 2015)
Red Hill Bulk Fuel Storage Facility
July 2015 Quarterly Monitoring Report

Method	Chemical	DOH EAL	OWDFMW01 (ES152)			OWDFMW01 (ES153) (Dup)			RPD Duplicate (%)	ES Trip (7/22/15)			ES Trip (7/27/15)			ES Trip (8/20/15)							
			Results	Q	LOQ	LOD	DL	Results		Q	LOQ	LOD	DL	Results	Q	LOQ	LOD	DL	Results	Q	LOQ	LOD	DL
EPA 8015C	TPH-g	100	N.D.	U	50	25	13	N.D.	U	50	25	13	N.D.	U	50	25	13	N.D.	U	50	25	13	
	TPH-d	100	3.100	Z	50	20	11	3.28	NA	U	50	20	11	N.D.	U	50	20	11	N.D.	U	50	20	11
	TPH-o	100	350	Z	99	50	19	16.67	NA	Z	99	50	19	N.D.	U	50	25	13	N.D.	U	50	25	13
	Acenaphthene	20	N.D.	U	0.02	0.005	0.0044	N.D.	U	0.022	0.0055	0.0048	N.A.	U	0.022	0.0055	0.0048	N.A.	U	0.022	0.0055	0.0048	N.A.
	Acenaphthylene	30	N.D.	U	0.02	0.005	0.0034	N.D.	U	0.022	0.0055	0.0037	N.A.	U	0.022	0.0055	0.0037	N.A.	U	0.022	0.0055	0.0037	N.A.
	Anthracene	0.27	N.D.	U	0.02	0.005	0.0036	N.D.	U	0.022	0.0055	0.004	N.A.	U	0.022	0.0055	0.004	N.A.	U	0.022	0.0055	0.004	N.A.
	Benzo[a]anthracene	0.027	0.0030	J	0.02	0.005	0.0028	0.0046	J	0.022	0.0055	0.0029	42.11	U	0.022	0.0055	0.0029	42.11	U	0.022	0.0055	0.0029	42.11
	Benzo[b]fluoranthene	0.1	N.D.	U	0.02	0.005	0.0043	N.D.	U	0.022	0.0055	0.0032	NA	U	0.022	0.0055	0.0032	NA	U	0.022	0.0055	0.0032	NA
	Benzo[k]fluoranthene	0.014	N.D.	U	0.02	0.005	0.0041	N.D.	U	0.022	0.0055	0.0047	NA	U	0.022	0.0055	0.0047	NA	U	0.022	0.0055	0.0047	NA
	Benzo[e]pyrene	0.092	N.D.	U	0.02	0.005	0.0034	N.D.	U	0.022	0.0055	0.0045	NA	U	0.022	0.0055	0.0045	NA	U	0.022	0.0055	0.0045	NA
	Chrysene	0.4	N.D.	U	0.02	0.005	0.003	N.D.	U	0.022	0.0055	0.0033	NA	U	0.022	0.0055	0.0033	NA	U	0.022	0.0055	0.0033	NA
	Dibenz[a,h]anthracene	0.0092	N.D.	U	0.02	0.005	0.0025	N.D.	U	0.022	0.0055	0.0037	NA	U	0.022	0.0055	0.0037	NA	U	0.022	0.0055	0.0037	NA
	Fluoranthene	8	N.D.	U	0.02	0.005	0.0025	N.D.	U	0.022	0.0055	0.0028	NA	U	0.022	0.0055	0.0028	NA	U	0.022	0.0055	0.0028	NA
	Fluorene	3.9	N.D.	U	0.02	0.005	0.0038	N.D.	U	0.022	0.0055	0.0028	NA	U	0.022	0.0055	0.0028	NA	U	0.022	0.0055	0.0028	NA
	Indeno[1,2,3-cd]pyrene	0.92	N.D.	U	0.02	0.005	0.0038	N.D.	U	0.022	0.0055	0.0042	NA	U	0.022	0.0055	0.0042	NA	U	0.022	0.0055	0.0042	NA
1-Methylnaphthalene	2.1	0.0088	J	0.02	0.005	0.0026	N.D.	U	0.022	0.0055	0.0026	NA	U	0.022	0.0055	0.0026	NA	U	0.022	0.0055	0.0026	NA	
2-Methylnaphthalene	2.1	0.0088	J	0.02	0.005	0.0035	0.0086	J	0.022	0.0055	0.0039	8.7	U	0.022	0.0055	0.0039	8.7	U	0.022	0.0055	0.0039	8.7	
Naphthalene	17	0.014	J	0.02	0.005	0.0038	0.016	J	0.022	0.0055	0.0026	12.02	U	0.022	0.0055	0.0026	12.02	U	0.022	0.0055	0.0026	12.02	
Phenanthrene	4.6	0.014	J	0.02	0.005	0.005	0.014	J	0.022	0.0055	0.0042	13.33	U	0.022	0.0055	0.0042	13.33	U	0.022	0.0055	0.0042	13.33	
Pyrene	2	N.D.	U	0.02	0.005	0.0053	0.0063	J	0.022	0.0055	0.0055	0	U	0.022	0.0055	0.0055	0	U	0.022	0.0055	0.0055	0	
1,1,1,2-Tetrachloroethane	0.52	N.D.	U	0.5	0.2	0.11	N.D.	U	0.5	0.2	0.11	200	U	0.5	0.2	0.11	200	U	0.5	0.2	0.11	200	
1,1,1,2,2-Tetrachloroethane	0.67	N.D.	U	0.5	0.2	0.11	N.D.	U	0.5	0.2	0.11	NA	U	0.5	0.2	0.11	NA	U	0.5	0.2	0.11	NA	
1,1,1-Trichloroethane	62	N.D.	U	0.5	0.2	0.11	N.D.	U	0.5	0.2	0.11	NA	U	0.5	0.2	0.11	NA	U	0.5	0.2	0.11	NA	
1,1,2-Trichloroethane	5	N.D.	U	0.5	0.2	0.14	N.D.	U	0.5	0.2	0.14	NA	U	0.5	0.2	0.14	NA	U	0.5	0.2	0.14	NA	
1,1-Dichloroethane	2.4	N.D.	U	0.5	0.2	0.077	N.D.	U	0.5	0.2	0.077	NA	U	0.5	0.2	0.077	NA	U	0.5	0.2	0.077	NA	
1,1-Dichloroethylene	7	N.D.	U	0.5	0.2	0.08	N.D.	U	0.5	0.2	0.08	NA	U	0.5	0.2	0.08	NA	U	0.5	0.2	0.08	NA	
1,2,3-Trichloropropane	0.6	N.D.	U	0.5	0.2	0.2	N.D.	U	0.5	0.2	0.2	NA	U	0.5	0.2	0.2	NA	U	0.5	0.2	0.2	NA	
1,2,4-Trichlorobenzene	25	N.D.	U	2	0.5	0.2	N.D.	U	2	0.5	0.2	NA	U	2	0.5	0.2	NA	U	2	0.5	0.2	NA	
1,2-Dibromo-3-chloropropane	0.04	N.D.	U	0.0098	0.004	0.0036	N.D.	U	0.0097	0.004	0.0036	NA	U	0.0097	0.004	0.0036	NA	U	0.0097	0.004	0.0036	NA	
1,2-Dibromoethane	10	N.D.	U	0.5	0.2	0.12	N.D.	U	0.5	0.2	0.12	NA	U	0.5	0.2	0.12	NA	U	0.5	0.2	0.12	NA	
1,2-Dichlorobenzene	0.4	N.D.	U	0.5	0.2	0.033	N.D.	U	0.5	0.2	0.033	NA	U	0.5	0.2	0.033	NA	U	0.5	0.2	0.033	NA	
1,2-Dichloroethane	0.15	N.D.	U	0.5	0.2	0.058	0.012	J	0.02	0.015	0.0058	0	U	0.02	0.015	0.0058	0	U	0.02	0.015	0.0058	0	
1,3-Dichloropropane	5	N.D.	U	0.5	0.2	0.095	N.D.	U	0.5	0.2	0.095	NA	U	0.5	0.2	0.095	NA	U	0.5	0.2	0.095	NA	
1,3-Dichlorobenzene	0.43	N.D.	U	0.5	0.2	0.18	N.D.	U	0.5	0.2	0.18	NA	U	0.5	0.2	0.18	NA	U	0.5	0.2	0.18	NA	
1,4-Dichlorobenzene (total of cis/trans)	5	N.D.	U	0.5	0.2	0.12	N.D.	U	0.5	0.2	0.12	NA	U	0.5	0.2	0.12	NA	U	0.5	0.2	0.12	NA	
Acetone	1,500	N.D.	U	20	10	3.3	150	U	20	10	3.3	0	U	20	10	3.3	0	U	20	10	3.3	0	
Benzene	5	N.D.	U	0.5	0.1	0.082	N.D.	U	0.5	0.1	0.082	NA	U	0.5	0.1	0.082	NA	U	0.5	0.1	0.082	NA	
Bromodichloromethane	0.12	N.D.	U	0.02	0.01	0.0034	N.D.	U	0.02	0.01	0.0034	NA	U	0.02	0.01	0.0034	NA	U	0.02	0.01	0.0034	NA	
Bromofluoromethane	80	N.D.	U	0.5	0.5	0.18	N.D.	U	0.5	0.5	0.18	NA	U	0.5	0.5	0.18	NA	U	0.5	0.5	0.18	NA	
Bromomethane	8.7	N.D.	U	0.5	0.3	0.1	N.D.	U	0.5	0.3	0.1	NA	U	0.5	0.3	0.1	NA	U	0.5	0.3	0.1	NA	
Carbon Tetrachloride	5	N.D.	U	0.5	0.2	0.066	N.D.	U	0.5	0.2	0.066	NA	U	0.5	0.2	0.066	NA	U	0.5	0.2	0.066	NA	
Chlorobenzene	25	N.D.	U	0.5	0.2	0.11	N.D.	U	0.5	0.2	0.11	NA	U	0.5	0.2	0.11	NA	U	0.5	0.2	0.11	NA	
Chloroethane	18	N.D.	U	0.5	0.2	0.16	N.D.	U	0.5	0.2	0.16	NA	U	0.5	0.2	0.16	NA	U	0.5	0.2	0.16	NA	
Chloroform	70	N.D.	U	0.5	0.2	0.072	N.D.	U	0.5	0.2	0.072	NA	U	0.5	0.2	0.072	NA	U	0.5	0.2	0.072	NA	
Chloromethane	1.8	0.080	J	0.5	0.2	0.068	0.080	J	0.5	0.2	0.068	11.76	U	0.5	0.2	0.068	11.76	U	0.5	0.2	0.068	11.76	
cis-1,2-Dichloroethylene	0.16	N.D.	U	0.5	0.2	0.067	N.D.	U	0.5	0.2	0.067	NA	U	0.5	0.2	0.067	NA	U	0.5	0.2	0.067	NA	
Dibromochloromethane	30	N.D.	U	0.5	0.1	0.088	N.D.	U	0.5	0.1	0.088	NA	U	0.5	0.1	0.088	NA	U	0.5	0.1	0.088	NA	
Ethylbenzene	0.66	N.D.	U	2	0.3	0.11	N.D.	U	2	0.3	0.11	NA	U	2	0.3	0.11	NA	U	2	0.3	0.11	NA	
Hexachlorobutadiene	7,100	N.D.	U	20	4	1.9	N.D.	U	20	4	1.9	NA	U	20	4	1.9	NA	U	20	4	1.9	NA	
Methyl ethyl ketone (2-Butanone)	170	N.D.	U	20	10	2.6	N.D.	U	20	10	2.6	NA	U	20	10	2.6	NA	U	20	10	2.6	NA	
Methyl isobutyl ketone (4-Methyl-2-Pentanone)	5	N.D.	U	0.5	0.3	0.11	N.D.	U	0.5	0.3	0.11	NA	U	0.5	0.3	0.11	NA	U	0.5	0.3	0.11	NA	
Methyl tert-butyl Ether	4.8	N.D.	U	0.5	0.2	0.11	N.D.	U	0.5	0.2	0.11	NA	U	0.5	0.2	0.11	NA	U	0.5	0.2	0.11	NA	
Methylene chloride	5	N.D.	U	0.5	0.2	0.11	N.D.	U	0.5	0.2	0.11	NA	U	0.5	0.2	0.11	NA	U	0.5	0.2	0.11	NA	
Styrene	10	N.D.	U	0.5	0.2	0.089	N.D.	U	0.5	0.2	0.089	NA	U	0.5	0.2	0.089	NA	U	0.5	0.2	0.089	NA	
Tetrachloroethylene	5	N.D.	U	0.5	0.2	0.089	N.D.	U	0.5	0.2	0.089	NA	U	0.5	0.2	0.089	NA	U	0.5	0.2	0.089	NA	
Toluene	40	N.D.	U	0.5	0.2																		

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SECTION 4 – SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

This quarterly monitoring report presents the results of groundwater sampling conducted on July 22, 27, and 28, and August 20, 2015, at the RHSF, JBPHH, Hawaii. The RHSF is located in Halawa Heights on the Island of Oahu. The DOH Facility ID number for the RHSF is 9-102271. The DOH Release ID numbers are 990051, 010011, 020028, and 140010.

The groundwater sampling was conducted as part of the long-term groundwater and soil vapor monitoring program at the RHSF for NAVSUP FLC Pearl Harbor, under NAVFAC Contract Number N62742-12-D-1853. The sampling was conducted in accordance with the approved WP/SAP and Technical Addendum prepared by ESI.

ESI personnel collected groundwater samples from five monitoring wells (wells HDMW2253-03, OWDFMW01, RHMW04, RHMW06, and RHMW07). One primary sample and one duplicate sample were collected from well OWDFMW01. A summary of the analytical results is provided below.

- **HDMW2253-03** – The only analytes detected in groundwater were TPH-d (18 µg/L), TPH-o (77 µg/L), and lead (0.025 µg/L). The concentrations did not exceed the DOH Tier 1 EALs.
- **OWDFMW01** – Concentrations of TPH-d (3,100 and 3,000 µg/L) and TPH-o (390 and 330 µg/L) were detected above their respective DOH Tier 1 EALs. The laboratory indicated the majority of the TPH-d concentration reported for the samples from OWDFMW01 was caused by one single peak. The compound or compound mixture represented by the single peak does not resemble a petroleum fuel and the total concentration of the compound/compound mixture was likely inaccurate, because it was determined by comparison to a diesel standard. Lead (0.022 and 0.034 µg/L) and several VOCs and PAHs were also detected; however, none of the concentrations exceeded their respective DOH Tier 1 EALs.
- **RHMW04** – The only analytes detected in groundwater were TPH-d (24 µg/L), TPH-o (40 µg/L), lead (0.026 µg/L), naphthalene, (0.0075 µg/L), and 2-methylnaphthalene (0.0059 µg/L). The concentrations did not exceed their respective DOH Tier 1 EALs.
- **RHMW06** – The only analyte detected in groundwater was lead (0.006 µg/L). The concentration did not exceed the DOH Tier 1 EAL.
- **RHMW07** – The only analytes detected in groundwater were TPH-d (22 µg/L), TPH-o (48 µg/L), fluorene (0.0042 µg/L), 1-methylnaphthalene (0.0051 µg/L), 2-methylnaphthalene (0.0095 µg/L), naphthalene (0.0060 µg/L), phenanthrene (0.0084 µg/L), and lead (0.006 µg/L). The concentrations did not exceed their respective DOH Tier 1 EALs.

Groundwater Contaminant Trends

Historical groundwater contaminant concentration trends of COPCs that exceeded the DOH EALs are presented in Appendix E. A summary of groundwater contaminant trends for the five monitoring wells is provided below.

- **HDMW2253-03** – TPH-d was detected in this well at a concentration below the DOH Tier 1 EAL. With the exception of one possibly erroneous result obtained during the event in April 2014, TPH-d concentrations have not exceeded the DOH Tier 1 EAL in well HDMW2253-03 since January 2013.
- **OWDFMW01** – TPH-d and TPH-o were detected in both samples from this well at concentrations exceeding their respective DOH Tier 1 EALs. The TPH-d concentrations (3,000 and 3,100 µg/L) exceeded the previous historical high concentrations from November 2012 (2,500 µg/L in both primary and duplicate samples) and represent a significant increase in concentration since the two previous events. The TPH-o concentrations detected during this event (330 and 390 µg/L) were approximately three times the concentrations detected during the April 2015 event (110 and 140 µg/L), which was the first time since 2012 that samples from the well were analyzed for TPH-o. Concentrations of all other COPCs detected during this round of quarterly sampling were consistent with historical data.
- **RHMW04** – Concentrations of TPH-d and TPH-o were detected in this well above the previously reported concentrations but remain below the respective DOH Tier 1 EALs. Concentrations of all other COPCs detected during this round of quarterly sampling were below the detection limits of the historical analytical results.
- **RHMW06** – This well was installed in September 2014 and first sampled in October 2014. To date, no COPCs have been detected at concentrations exceeding the DOH Tier 1 EALs.
- **RHMW07** – This well was installed and first sampled in October 2014. To date, no COPCs have been detected at concentrations exceeding the DOH Tier 1 EALs.

Conclusions and Recommendations

During the July 2015 sampling event, TPH-d and TPH-o were detected at concentrations above their respective DOH Tier 1 EALs in OWDFMW01. Both concentrations exceeded their previous historical high concentrations. The majority of the TPH-d concentration reported for the samples from OWDFMW01 was caused by one single peak. The compound or compound mixture represented by the single peak does not resemble a petroleum fuel. For both TPH-d and TPH-o in OWDFMW01, the total concentrations reported are likely inaccurate, because they were determined by comparison to a diesel and an oil standard, respectively. Additional scrutiny of the TPH-d concentrations in well OWDFMW01 is warranted.

The groundwater contaminant concentrations in the other wells remained at low concentrations and did not change significantly since the previous sampling event (April 2015), or were not detected. No COPCs in wells HDMW2253-03, RHMW04, RHMW06 or RHMW07 were detected at concentrations above their respective DOH Tier 1 EALs.

Acetone has been detected in well OWDFMW01 at low concentrations occasionally since October 2010 and then in every groundwater sampling event since April 2013. The well also has an unnaturally high pH in the range of 10 to 13. As discussed in Section 3, these conditions are likely unrelated to a release from the USTs at RHSF and may be a result of a deficiency in the well sealing material or another condition isolated to the immediate area of the well. This suggests that the associated sample data may not accurately represent the conditions of the groundwater at the site.

Based on a suspected 2014 release at the RHSF and the results of the recent groundwater sampling and analysis, continued groundwater monitoring at the RHSF is recommended. If the TPH-d concentrations significantly increase, the monitoring frequency should be increased to monthly, even though wells RHMW04, RHMW06, RHMW07, HDMW2253-03, and OWDFMW01 are not included in the RHSF Groundwater Protection Plan.

An alternative means of collecting groundwater samples from the vicinity of well OWDFMW01 should be evaluated if TPH impacts continue to trend upwards and high pH conditions persist.

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SECTION 5 – FUTURE WORK

Future work includes the fourth quarter 2015 groundwater monitoring, which is tentatively scheduled for October 2015. A quarterly groundwater monitoring report will be prepared to document the sampling.

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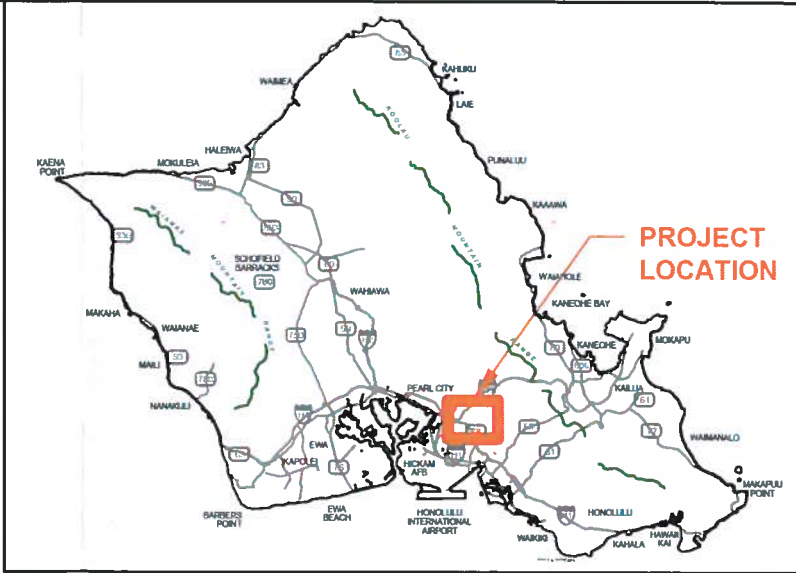
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TEC, 2010b, Quarterly Groundwater Monitoring Report – Outside (Non-Tunnel) Wells, Prepared for Navy Region Hawaii, Pearl Harbor, Hawaii, May 2010.

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FIGURES

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NOTES

The accuracy of this document is limited to the quality and scale of the source information. This document is not a legal representation of an engineered survey.

SOURCES

Pearl Harbor Base Map
Navy GIS files

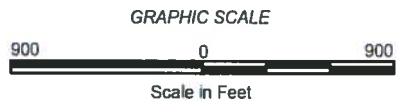
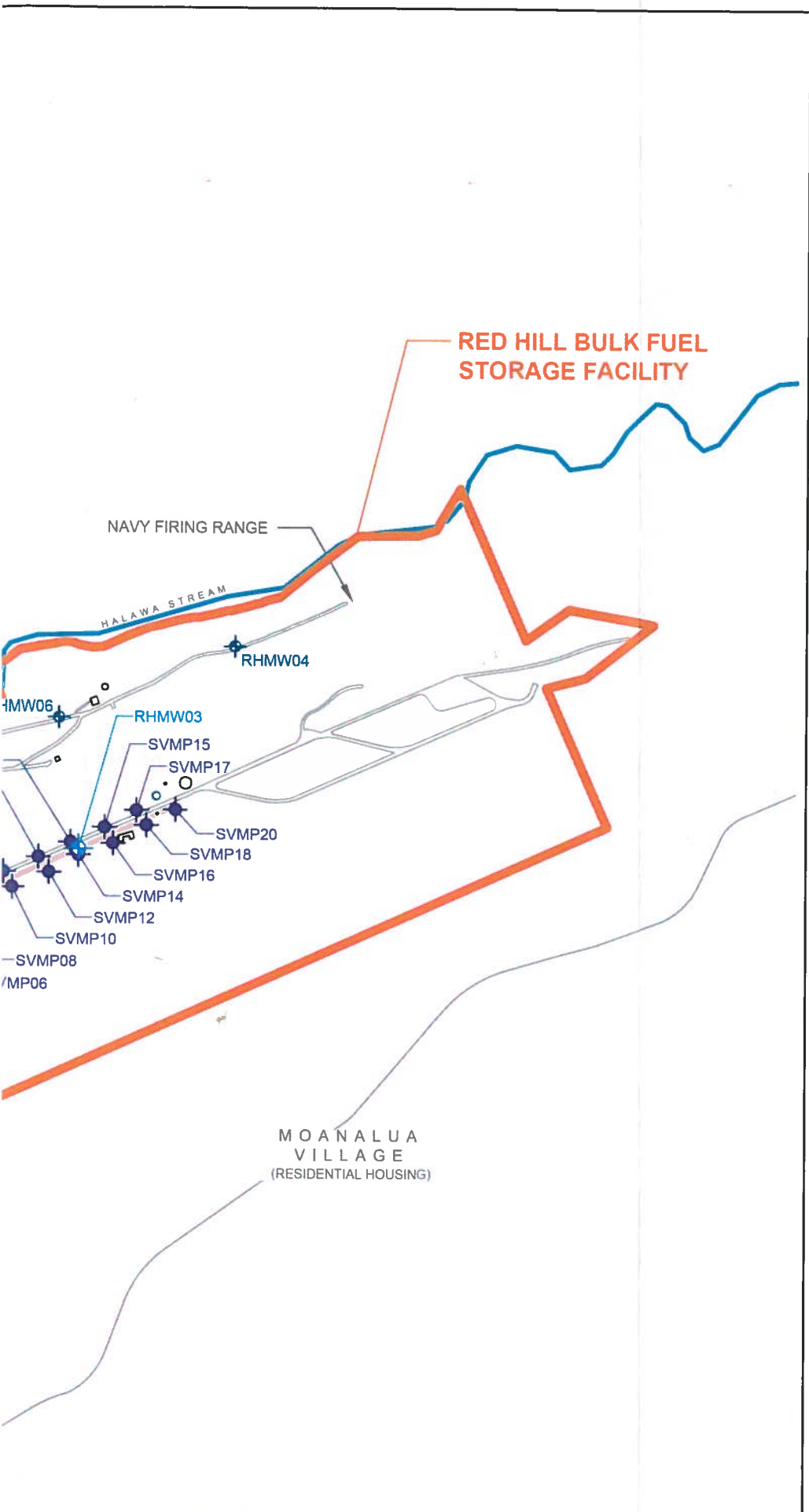


FIGURE 1
SITE LOCATION
GROUNDWATER MONITORING
RED HILL BULK FUEL STORAGE FACILITY
NAVAL SUPPLY SYSTEM COMMAND (NAVSUP)
FLEET LOGISTICS CENTER
JBPHH, OAHU, HAWAII



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LEGEND	
	RED HILL BULK FUEL STORAGE FACILITY
	HALAWA CORRECTIONAL FACILITY
	HALAWA STREAM
	BUILDING
	ROAD
	ABOVEGROUND STORAGE TANK
	WATER TANK
	SOIL VAPOR MONITORING POINT
	GROUNDWATER MONITORING WELL LOCATED INSIDE TUNNEL
	GROUNDWATER MONITORING WELL LOCATED OUTSIDE TUNNEL
	BOARD OF WATER SUPPLY PUMP STATION
	TUNNEL

NOTES

The accuracy of this document is limited to the quality and scale of the source information. This document is not a legal representation of an engineered survey.

SOURCES

Pearl Harbor Base Map
 Navy GIS files
 Well Installation Report, Battelle, March 2015

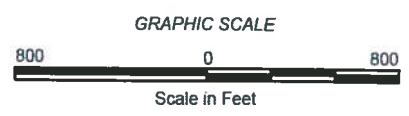


FIGURE 2
SITE LAYOUT
 GROUNDWATER MONITORING
 RED HILL BULK FUEL STORAGE FACILITY
 NAVAL SUPPLY SYSTEM COMMAND (NAVSUP)
 FLEET LOGISTICS CENTER
 JBPBH, OAHU, HAWAII

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APPENDIX A

Groundwater Sampling Logs

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Groundwater Sampling Log

Well ID: RHMW04 Location: Red Hill Bulk Fuel Storage Facility Project No.: 114017

Initial Water Level: 295.10 ft Date: 8/20/2015 Time: 840

Total Depth of Well: 305 ft Personnel Involved: Kirk Markle, Jeff Hattemer

Length of Saturated Zone: 9.9 Weather Conditions: Overcast, light variable winds

Volume of Water to be Removed: 9.0 L Method of Removal: Dedicated Bladder Pump

Water Level After Purging: 293.88 ft Pumping Rate: 0.21 L/min

Well Purge Data:

Time	Volume Removed	pH	Conductivity (mS/cm)	DO (mg/l)	Temperature	Salinity	Redox (ORP) (mV)
925	0.0 L	7.08	0.445	9.38	24.12	-	82.8
933	1.0 L	7.15	0.446	9.37	24.06	-	86.8
942	2.0 L	7.17	0.448	8.54	24.13	-	84.5
949	3.0 L	7.19	0.447	8.34	23.91	-	85.4
954	4.0 L	7.20	0.448	8.29	29.93	-	85.9
957	5.0 L	7.20	0.448	8.24	24.01	-	86.3
1000	6.0 L	7.21	0.447	8.16	23.97	-	87.0
1002	7.0 L	7.22	0.448	8.29	24.07	-	87.2
1005	8.0 L	7.34	0.445	8.59	23.97	-	86.8
1007	9.0 L	7.33	0.444	8.29	23.89	-	85.2

Sample Withdrawal Method: Dedicated Bladder Pump

Appearance of Sample:

Color: Clear
 Turbidity: None
 Sediment: None
 Other: None

Laboratory Analysis Parameters and Preservatives: TPH-g, -d, -o - 8015; VOCs - 8260, 8260 SIM, 8011; PAHs - 8270 SIM; lead - 6020

Number and Types of Sample Containers: 8 - 40ml VOAs, 3 - 1L amber jar, 1 - 250ml HDPE

Sample Identification Numbers: ES156 [1030]

Decontamination Procedures: Triple Rinsed

Notes: YSI did not have salinity parameter.

Sampled by: Kirk Markle, Jeff Hattemer

Sampled Delivered to: ALS Transporters: FedEx

Date: 8/20/2015 Time: 1050

Capacity of Casing (Gallons/Linear Feet)
2"-0.16 • 4"-0.65 • 8"-2.61 • 10"-4.08 • 12"-5.87



Groundwater Sampling Log

Well ID: RHMW06 Location: Red Hill Bulk Fuel Storage Facility Project No.: 114017

Initial Water Level: 241.98 ft Date: 7/28/2015 Time: 820

Total Depth of Well: 264.4 ft Personnel Involved: Kirk Markle, Jeff Hattemer

Length of Saturated Zone: 22.4 ft Weather Conditions: Sunny, Very Little Wind

Volume of Water to be Removed: 114 L Method of Removal: Dedicated Bladder Pump

Water Level After Purging: 241.99 ft Pumping Rate: 0.88 L/min

Well Purge Data:

Time	Volume Removed	pH	Conductivity (mS/cm)	DO (mg/l)	Temperature	Salinity	Redox (ORP) (mV)
825	0 L	7.22	1.72	6.72	24.2	0.87	249.7
839	11 L	6.94	1.71	5.63	22.3	0.87	224.9
853	23 L	6.96	1.71	5.43	22.3	0.87	211.2
904	34 L	7.02	1.72	5.54	22.2	0.87	195.9
919	45 L	7.04	1.72	5.24	22.2	0.87	151.2
933	57 L	7.03	1.70	5.47	22.4	0.86	134.8
947	68 L	7.05	1.67	5.53	22.2	0.84	126.0
1000	80 L	7.05	1.66	5.41	22.2	0.84	125.6
1010	91 L	7.06	1.65	5.30	22.2	0.83	125.4
1021	102 L	7.07	1.64	5.67	22.2	0.83	125.1
1035	114 L	7.09	1.61	5.42	22.2	0.81	127.6

Sample Withdrawal Method: Dedicated Bladder Pump

Appearance of Sample:

Color: Clear
 Turbidity: Low
 Sediment: None
 Other: None

Laboratory Analysis Parameters and Preservatives: TPH-g, -d, -o - 8015; VOCs - 8260, 8260 SIM, 8011; PAHs - 8270 SIM; lead - 6020

Number and Types of Sample Containers: 8 - 40ml VOAs, 3 - 1L amber jar, 1 - 250ml HDPE

Sample Identification Numbers: ES155 [1100]

Decontamination Procedures: Triple Rinsed

Notes: YSI did not have salinity parameter

Sampled by: Kirk Markle, Jeff Hattemer

Sampled Delivered to: ALS Transporters: FedEx

Date: 7/29/2015 Time: 1300

Capacity of Casing (Gallons/Linear Feet)
2"-0.16 • 4"-0.65 • 8"-2.61 • 10"-4.08 • 12"-5.87

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APPENDIX B

Field Notes

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Location RYSE
Project / Client NAWAC

1151	S	SV11						
DM		10.0	10.1	10.3	10.3	10.2		
D		Blocked. No sample.						
1158	S	SV12						
S		859	932	984	984	989		
M		850	822	914	914	875		
D		478	484	478	518	490		
1214	S	SV13						
S		551	685	746	746	682		
M		889	1063	1173	1173	1075		
D		1191	1408	1563	1563	1431		
1239	S	SV14						
S		386	448	521	521	469		
M		402	463	448	503	454		
D		417	499	542	542	500		
1246	S	SV15						
S		435	487	569	569	519		
M		Blocked. No sample.						
D		761	932	993	993	927		
1300								
		Depart tunnel and give samples to Tracie Sober.						
1345		Done cleaning up and drop off into Dept.						
1415		Go to Agassiz to pick up Nitro						
1500		Done						

Location RYSE
Project / Client NAWAC

Purpose	GW Sampling
Weather	Overcast in rain
Personnel	SFH / KM
0810	Met @ OCC - Safety meeting
0820	Met DNR & sign in @ OCC.
0829	Gauge KDMW2253 - 203, DTW = 208.69' b/c
0850	Begin hand bail KDMW2253's
0930	Collected ES151, 13 L ^{press}
0955	Gauge OWDFMW01, DTW = 120.99' b/c
1005	Begin hand bail OWDFMW01.
1100	Collected samples ES152, ES152MS/MSD, and ES153 (drape @ 1130).
1230	Lunch.
1300	Back to Ad Hill
1320	Gauge RHMW04, DTW = 294.85'
1445	Reinstalled pump in well RHMW04. Will sample tomorrow.
1500	Depart site.
	SFH 7/22/15

Purpose: CW sampling

Weather: Overcast

Personnel: JIA, KM

0900 @ Red Hill, Head to RHW04

0930 Replaced pump into well but

not pin. Unable to get

pump to sample. Sounds like

air is leaking from fitting

near surface, will try with new

fitting or

@ RHW06. Re-install well

1000 Flow rate is really slow.

1100 Unsure what problem is.

1145 set up @ RHW06

1155 fell off tailgate and

screen cracked. Head back to

office to get replacement

1330 Back onsite. @ RHW07

1450 Pulled pump and clamp

on bladder pump is loose.

Kirk says there is no easy

way to repair

1500 @ RHW04.

1600 Fitting on air line from

previous configuration has hairline crack and air is leaking out. Will need new fittings. Head back to office

Sit 7/23/19

Purpose: Maintenance of bladder pumps @ RHMW07

Weather: Partly cloudy

Personnel: JH, KM

0800 @ Fed Hill. of

0815 Open RHMW07 and re-install pump.

0900 Test pump. Working okay.

Replaced bladder with spare from M office.

0945 Open RHMW07. Try to attach fittings and try to operate pump.

1130 Lunch @ RHMW07

1200 Unable to get pump to work

1500 Will pump for one cycle then stop head back to office to try to work on pump.

1715 Unable to find out what is wrong with pump. Swap out some parts and try again Monday.

(Sat 1/24/15)

Purpose: GW sampling

Weather: Hot, sunny

Personnel: JH, KM

0800 @ Red Hill, head to RHMW07

01245 Unable to get pump to work. Mostly air coming up water. Jic.

1255 Gauge RHMW07. DTW = 198.6

1300 Begin purging RHMW07

1445 Collected sample ES154. 26 gal purged. Pump set at 160 psi, 30 sec, 30 sec.

1515 Dumped water in drum. Head back to office to put sample in refrigerator and look at pump.

JH

JH

JH

JH

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APPENDIX C

**Laboratory Reports
(included on attached CD)**

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APPENDIX D

Fact Sheet, Quantitation and Detection

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Fact Sheet: Detection and Quantitation — What Project Managers and Data Users Need to Know

1

As a Project Manager or decision-maker, you may use environmental data to accomplish one or more of the following tasks:

- Determine whether a chemical substance is present in an environmental sample at or above some threshold value or action level;
- Verify that a pollutant concentration remains below a permit limit;
- Evaluate potential risks to human health or the environment;
- Monitor changes in concentrations of contaminants; or
- Determine the effectiveness of remediation activities.

Making correct decisions in these cases often depends on the ability of an analytical method to detect and measure extremely low concentrations of a substance.

This fact sheet has been prepared to: 1) provide Project Managers and data users with basic information about detection and quantitation concepts; and 2) acquaint the reader with detection and quantitation terminology and requirements contained in the *DoD Quality Systems Manual for Environmental Laboratories (DoD QSM)*, Version 4.1. This information should help clarify the uncertainty associated with reporting low-concentration data. It should also help project teams understand the importance of selecting analytical methods that are sensitive enough for their intended uses, i.e., capable of generating reliable data (data of known precision and bias) at the project-specific decision levels.

Measures of Sensitivity — Basic Concepts

The following terms are used to describe the routine sensitivity of analytical procedures:

- DL – Detection Limit
- LOD – Limit of Detection
- LOQ – Limit of Quantitation

All measures of sensitivity are specific to the analyte, sample matrix, test method, instrumentation, and analyst/laboratory performance. Therefore, analytical performance must be demonstrated for each variable (e.g., it is possible that two “identical” instruments from the same manufacturer may exhibit different sensitivities).

The Detection Limit (DL) is the smallest analyte concentration that can be demonstrated to be different from zero or a blank concentration at the 99% level of confidence. In other words, if a substance is detected at or above the DL, it can be reliably stated (with 99% confidence) that the analyte is present (there is a 1% chance that the analyte is not present (a false positive)). Note that for reporting purposes, any result at or above the DL must also meet qualitative identification criteria required by the test method. Although a result at or above the DL indicates that the analyte is present, the absence of a result at or above the DL is inconclusive (i.e., one cannot confidently state whether the analyte is present or absent), because the false negative rate at the DL is 50%.

The Limit of Detection (LOD) is the smallest amount or concentration of a substance that must be present in a sample in order to be detected at a 99% confidence level. In other words, if a sample has a true concentration at the LOD, there is a minimum probability of 99% of reporting a “detection” (a measured value \geq DL) and a 1% chance of reporting a non-detect (a false negative).

The failure to obtain a “detection” should be reported as “<LOD,” because the false negative rate at the LOD is 1%. Reporting the sample result as “<DL” is inappropriate because, as stated above, the false negative rate at the DL is 50%.

The Limit of Quantitation (LOQ) is the lowest concentration of a substance that produces a quantitative result within specified limits of precision and bias. The LOQ is typically larger than the LOD (but may be equal to the LOD, depending upon the acceptance limits for precision and bias); therefore, the following is true:

$$DL < LOD \leq LOQ$$

Quantitative results can only be achieved at or above the LOQ. Measurements between the DL and the LOQ assure the *presence* of the analyte with confidence, but their numeric values are estimates.

Types of Procedures for Estimating Sensitivity

Numerical estimates of the DL, LOD, or LOQ for a specific analyte, matrix, and method can be calculated using various statistical procedures, which involve spiking reagent water or other specific matrix with low concentrations of the analyte of interest. At this time, unfortunately, universally accepted statistical procedures do not exist.

The estimator that has been most commonly used by environmental laboratories is the EPA Method Detection Limit (MDL), which is an approximation of the DL. EPA has defined the MDL as the “minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero, and is determined from analysis of a sample in a given matrix containing the analyte.”¹ Calculating the MDL at 99% confidence means there is a 1% probability that a sample having a result at or above the MDL is a false positive. The EPA MDL was designed to protect against false positives.

Uses and Limitations of the MDL

When performed correctly and consistently, MDLs determined using the EPA procedure can be useful for comparing different laboratories' performance using the same methods, or the performance of different methods within the same laboratory. Laboratories typically determine the MDL in reagent water, resulting in a “best-case” MDL, which provides limited information about method performance on real-world samples.

The EPA MDL procedure has been criticized as a poor estimator of the DL for the following reasons:

1. It is a single laboratory, short-term estimator that fails to account for analytical bias, changing instrument conditions, or analyst skill.
2. It assumes uniform variance across all possible spike concentrations, failing to account for the fact that variance increases at higher concentrations.
3. It assumes that measured values at the spike concentration are normally distributed. By using this procedure and spiking at very low concentrations, laboratories have been able to calculate MDLs that cannot be achieved in practice.

DoD QSM Requirements

For the reasons discussed in the previous paragraph, the DoD QSM requires that laboratories verify measures of method sensitivity, in terms of the LOD and LOQ, at least quarterly. Requirements for the LOD and the LOQ are contained in DoD QSM Boxes D-13 and D-14, respectively, which follow:

¹ 40 Code of Federal Regulations (CFR) Part 136, Appendix B, rev. 1.11.

Box D-13

Limit of Detection (LOD): Determination and Verification (Requirement)

A laboratory shall establish a detection limit (DL) using a scientifically valid and documented procedure for each suite of analyte-matrix-method, including surrogates. The detection limit shall be used to determine the LOD for each analyte and matrix as well as for all preparatory and cleanup methods routinely used on samples, as follows:

After each detection limit determination, the laboratory must immediately establish the LOD by spiking a quality system matrix at approximately two to three times the detection limit (for a single-analyte standard) or one to four times the detection limit (for a multi-analyte standard). This spike concentration establishes the LOD. It is specific to each combination of analyte, matrix, method (including sample preparation), and instrument configuration. The LOD must be verified quarterly. The following requirements apply to the initial detection limit/LOD determinations and to the quarterly LOD verifications.

- The apparent signal to noise ratio at the LOD must be at least three and the results must meet all method requirements for analyte identification (e.g., ion abundance, second-column confirmation, or pattern recognition.) For data systems that do not provide a measure of noise, the signal produced by the verification sample must produce a result that is at least three standard deviations greater than the mean method blank concentrations.
- If a laboratory uses multiple instruments for a given method the LOD must be verified on each.
- If the LOD verification fails, then the laboratory must repeat the detection limit determination and LOD verification at a higher concentration or perform and pass two consecutive LOD verifications at a higher concentration and set the LOD at the higher concentration.
- The laboratory shall maintain documentation for all detection limit determinations and LOD verifications.

Box D-14

Limit of Quantitation (LOQ): Establishment and Verification of LOQ (Requirement)

For DoD projects, the LOQ must be set within the calibration range prior to sample analysis. At a minimum, the LOQ must be verified quarterly.

The laboratory procedure for establishing the LOQ must empirically demonstrate precision and bias at the LOQ. The LOQ and associated precision and bias must meet client requirements and must be reported. If the method is modified, precision and bias at the new LOQ must be demonstrated and reported.

Establishing Project-Specific Requirements for Method Sensitivity

Project teams should establish their project-specific requirements for method sensitivity in terms of a Reporting Limit (RL) for each analyte and matrix. As defined in the DoD QSM, the RL is the lowest concentration value specified by the client that meets project requirements for reporting quantitative data with known precision and bias for a specific analyte in a specific matrix. The LOQ cannot be greater than the RL, if precision and bias of the RL and LOQ are the same. If the LOQ for a particular analytical method or laboratory cannot meet the RL, then a project team has three options:

1. Improve analyst performance or modify the method to achieve a lower LOQ.
2. Select a different method with an LOQ less than or equal to the RL.
3. Raise the RL.

Please note that precision and bias must be taken into consideration when assessing the LOQ versus the RL. Also note that data below the RL can be reported; however they are estimated values if less than the LOQ.

Reporting and Flagging Analytical Data

Although data reporting and flagging requirements are project-specific, all reported LOD and LOQ shall be adjusted for the size of sample aliquots, concentration/dilution factors, and percent solids. In addition, the following example (based on Box 47 of DoD QSM Version 4.1) illustrates the proper use of the “U” and “J” data qualifier flags for non-detect and estimated analytical results, respectively.

U – Analyte was not detected and is reported as less than the LOD or as defined by the client. The LOD has been adjusted for any dilution or concentration of the sample (* see Example, below).

J – The reported result is an estimated value (e.g., matrix interference was observed or the analyte was detected at a concentration outside the quantitation range, see Box 33).

Example: DL = 2, LOD = 4, LOQ = 20, and RL = 30 with the precision and bias of the LOQ meeting those of the RL and all samples are undiluted.

Sample #1: Analytical result: Non-detect	Reported result: <4 U
Sample #2: Analytical result: 3	Reported result: 3 J
Sample #3: Analytical result: 10	Reported result: 10 J
Sample #4: Analytical result: 20	Reported result: 20
Sample #5: Analytical result: 30	Reported result: 30

Understanding and Documenting Uncertainty for Low-Concentration Data

As mentioned above, detection and quantitation limits are laboratory specific. Following are some steps Project Managers can take to document measurement uncertainty for low concentration data.

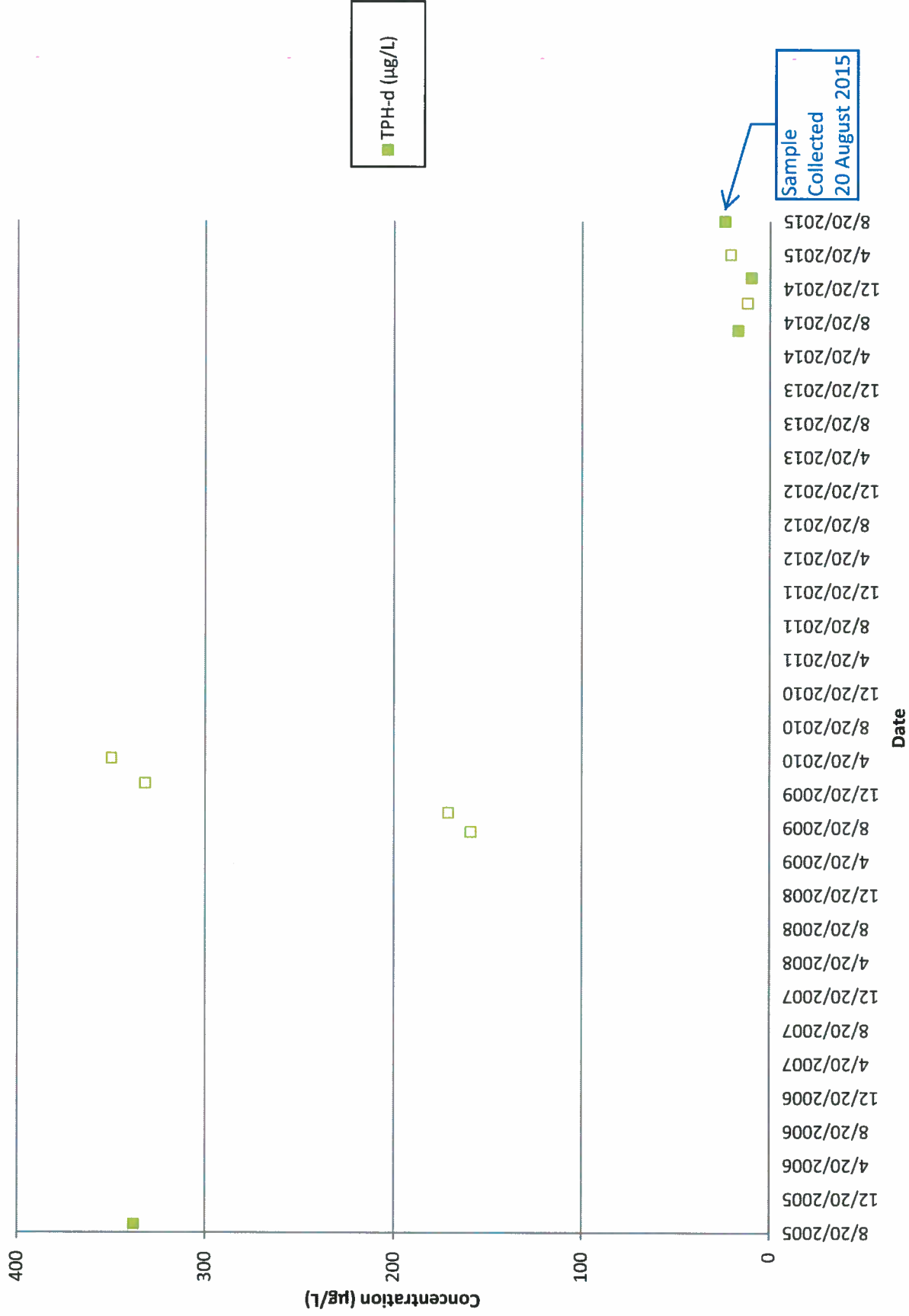
- As part of the laboratory selection process, provide the laboratory with project-specific RLs, including precision and bias, for each analyte and matrix. Ask the laboratory to provide its DL, LOD, and LOQ with associated precision and bias for each target analyte, in each matrix of concern (e.g., reagent water, clean sand, etc.), and verify that these values meet project-specific RLs. Request laboratory SOPs for establishing the DL and for establishing and verifying the LOD and LOQ.
- Ask the laboratory to verify the LOD by processing an LOD verification check sample with each batch of samples. This is a quality control sample that is spiked at a concentration at or slightly above the LOD to evaluate whether the analyte of interest is in fact “detectable” in the matrix of interest. To confidently report non-detects, set the reporting for non-detects to less than the LOD.
- If the project involves the collection of unusual or difficult matrices, or if the project-specific RL is near the LOQ, ask the laboratory to verify the LOQ in the project-specific matrix by analyzing a minimum of four replicate samples with known concentrations at the LOQ.
- Review the raw data (e.g., chromatograms) for low-concentration data. If a result is reported above the DL, make sure that the signal-to-noise ratio is at least 3.
- Compare sample results with blank results. If sample results (including chromatograms) cannot be distinguished from blank results, then they are not meaningful.

APPENDIX E

Historical Groundwater Exceedance Trends

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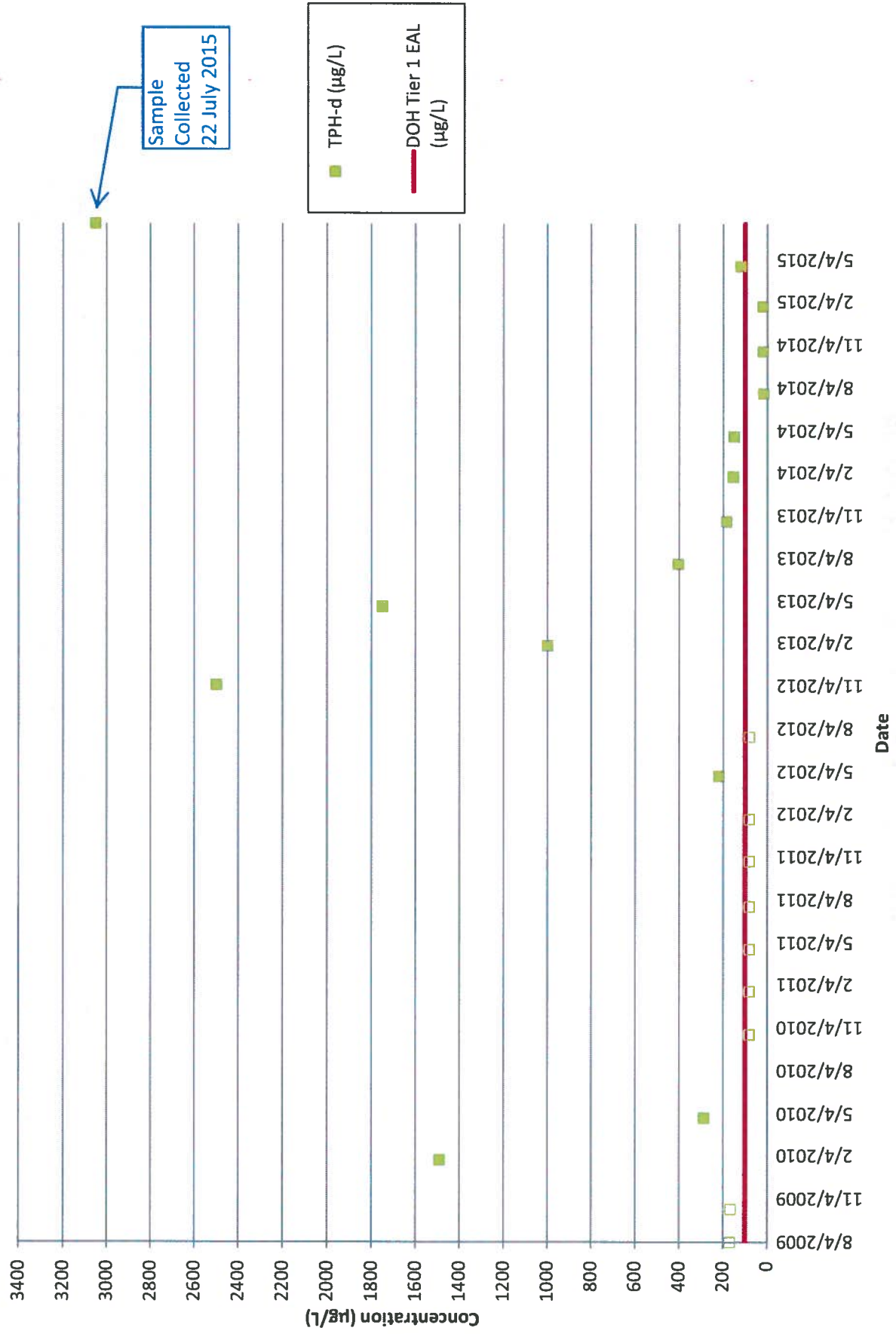
TPH-d Concentrations for RHMW04



Sample Collected 20 August 2015

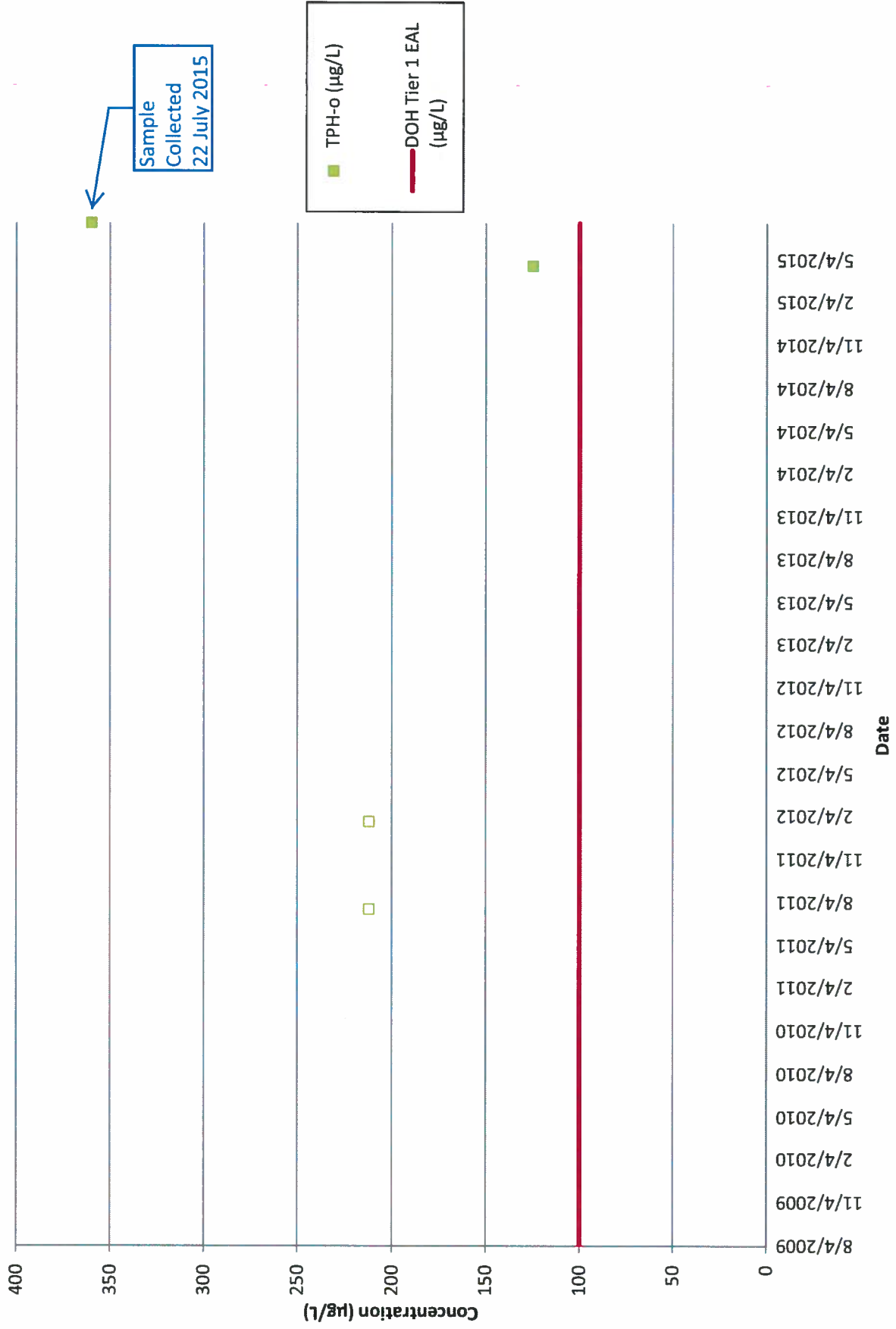
Data points for 8/4/2008 through 4/26/2010 are the average of the primary and duplicate samples. Unfilled boxes indicate non-detections.

TPH-d Concentrations for OWDFMW01



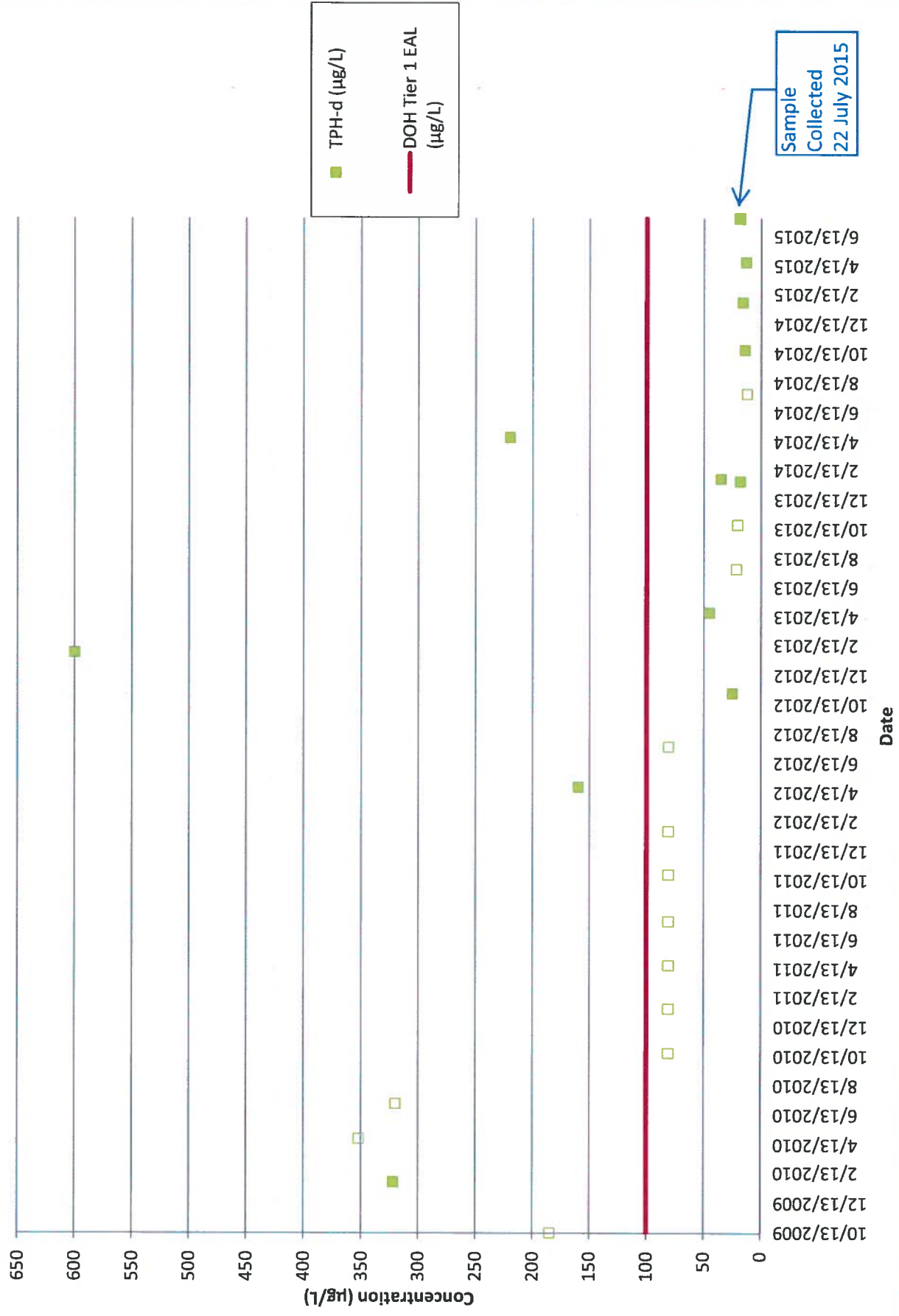
Data points for 10/21/2010 through 1/24/2012 and 11/07/2012 through 7/24/2014 are the average of the primary and duplicate samples. Unfilled boxes indicate non-detections. Method detection limits (MDLs) are shown for 2009, and limits of detection (LODs) are shown from January 2010 on.

TPH-o Concentrations for OWDFMW01



Data points for 4/22/2015 and 7/22/2015 are the average of the primary and duplicate samples. Unfilled boxes indicate non-detections. Limits of detection (LODs) are shown.

TPH-d Concentrations for HDMW2253-03



Unfilled boxes indicate non-detections. MDLs are shown for 2009, and LODs are shown from January 2010 on. 4/23/2014 - A review of the chromatograms and historical data concluded the TPH-d subsample for HDMW2253-03 and the duplicate sample for OWDFMW-01 were likely switched during this event. The TPH-d concentration for the OWDFMW-01 duplicate sample was 32 µg/L.

APPENDIX F

**Cumulative Groundwater Results
(included on attached CD)**

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APPENDIX G

Non-Hazardous Waste Manifest

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NON-HAZARDOUS WASTE MANIFEST

1. Generator ID Number: NOT APPLICABLE 2. Page 1 of 1 3. Emergency Response Phone: 808-266-0000 4. Waste Tracking Number: 00020059

5. Generator's Name and Mailing Address: COBAYNE'S HAWAII, C/O HAVFAC HAWAII, CODE PRJ42
400 MARSHALL ROAD, APOE ALAN SUGIHARA
JRPHH, HI 96860-3129
 Generator's Site Address (if different than mailing address): RED HILL BULK FUEL STORAGE FACILITY
AEWA, HI 96701
 HIC300415-04-4

6. Transporter 1 Company Name: PACIFIC COMMERCIAL SERVICES, LLC. U.S. EPA ID Number: HID 982 040 578
 Phone: 808-545-4599

7. Transporter 2 Company Name: UNITED SOLVENT SERVICES, INC. OAHU U.S. EPA ID Number: H 1 D 9 8 2 4 4 3 7 1 5
 Phone: 808-692-8284

8. Designated Facility Name and Site Address: UNITED SOLVENT SERVICES, INC. U.S. EPA ID Number: H 1 D 9 8 2 4 4 3 7 1 5
91-111 KAOHI LOOP
KAPOLEI, HI 96707
 Facility's Phone: 808-692-8284

9. Waste Shipping Name and Description	10. Containers		11. Total Quantity	12. Unit Wt/Vol.	NON-RCRA
	No.	Type			
1. MATERIAL NOT REGULATED BY EPCRA (WELL PURGE AND DECONTAMINATION WATER)	002	DM	00070	G	
2.					
3.					
4.					

13. Special Handling Instructions and Additional Information: 2012 961 TOTAL HALOGEN:
 GENERATOR'S CERTIFICATION: I HEREBY DECLARE THAT THE CONTENTS OF THIS CONSIGNMENT ARE FULLY AND ACCURATELY DESCRIBED ABOVE BY PROPER SHIPPING NAME (WHERE APPLICABLE) AND ARE CLASSIFIED, PACKED, MARKED, AND LABELED AND ARE IN ALL RESPECTS IN PROPER CONDITION FOR TRANSPORT BY HIGHWAY ACCORDING TO APPLICABLE GOVERNMENT REGULATIONS. I FURTHER CERTIFY THAT IF THIS IS DANGEROUS IT IS SUBJECT TO REGULATIONS UNDER 49 CFR PART 173; THAT IT DOES NOT EXCEED SUCH LIMITS WITH OR WITHOUT SOLIDIFICATION, AND THAT IT HAS NOT BEEN CONTAMINATED WITH CARCINOGENS, TERATOGENS, OR OTHER HAZARDOUS MATERIALS AND/OR HAZARDOUS WASTE.

14. GENERATOR'S/OFFEROR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labeled/placarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations.

Generator's/Offorer's Printed/Typed Name: _____ Signature: _____ Month: _____ Day: _____ Year: _____

15. International Shipments: Import to U.S. Export from U.S. Port of entry/exit: _____ Date leaving U.S.: _____

16. Transporter Acknowledgment of Receipt of Materials: Transporter Signature (for exports only): _____ Date leaving U.S.: _____

Transporter 1 Printed/Typed Name: ALAN O. WILLIAMS Signature: _____ Month: _____ Day: _____ Year: _____
 Transporter 2 Printed/Typed Name: _____ Signature: _____ Month: _____ Day: _____ Year: _____

17. Discrepancy: 17a. Discrepancy Indication Space: Quantity Type Residue Partial Rejection Full Rejection

17b. Alternate Facility (or Generator): _____ Manifest Reference Number: _____ U.S. EPA ID Number: _____
 Facility's Phone: _____

17c. Signature of Alternate Facility (or Generator): _____ Month: _____ Day: _____ Year: _____

18. Designated Facility Owner or Operator: Certification of receipt of materials covered by the manifest except as noted in Item 17a: Printed/Typed Name: _____ Signature: _____ Month: _____ Day: _____ Year: _____

GENERATOR INT'L TRANSPORTER DESIGNATED FACILITY

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