

# Tank 5 Quarterly Release Response Report Red Hill Bulk Fuel Storage Facility JBPHH, Oahu, Hawaii

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Prepared by:



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## **Table of Contents**

<i>Table of Contents</i> .....	i
<i>Executive Summary</i> .....	iii
<i>1.0 Introduction</i> .....	1
1.1 Statement of Purpose.....	1
1.2 Previous Reports .....	1
<i>2.0 Background</i> .....	3
2.1 Site Description .....	3
2.2 Facility Information.....	3
<i>3.0 Groundwater and Soil Vapor Monitoring</i> .....	4
3.1 Oil/Water Interface Measurements .....	4
3.2 Soil Vapor Monitoring .....	4
3.3 Groundwater Sampling and Analysis.....	5
3.4 Drinking Water Sampling .....	5
<i>4.0 Continued Groundwater and Soil Vapor Monitoring</i> .....	5
<i>5.0 Continued Drinking Water Sampling</i> .....	6
<i>6.0 Planned Future Release Response Actions</i> .....	6
<i>7.0 Public Notifications</i> .....	7
<i>8.0 Conclusions and Recommendations</i> .....	7
<i>9.0 References</i> .....	7

Appendix A – Oil/Water Interface Measurements, January 2014 through October 2020

Appendix B – Soil Vapor Sampling Results through October 2020

Appendix C – Public Notifications

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## ***Executive Summary***

Navy Region Hawaii (NRH) prepared this Quarterly Release Response Report in accordance with the State of Hawaii Department of Health (DOH) Underground Storage Tank (UST) Technical Guidance Manual (DOH, 2000) and in response to the DOH release response letters dated February 12, 2014 and February 26, 2014 for the Red Hill Bulk Fuel Storage Facility (Facility). The objective of this report is to describe the actions taken by the Navy between October and December 2020 in response to the fuel reportedly released from Tank 5 in January 2014.

Soil vapor, drinking water and groundwater samples continue to be collected from locations inside the Red Hill tunnel system. Groundwater samples are also collected from locations outside the Red Hill tunnel system. Results of groundwater and drinking water sampling and analysis indicate the release of JP-8 from Tank 5 has not impacted the Red Hill Shaft.

The Navy continues to perform work to ensure drinking water remains safe. Future release response actions include determining the feasibility of alternatives for investigating and remediating releases from the Facility and continuing efforts to monitor and characterize the flow of groundwater around the Facility.

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## ***1.0 Introduction***

As required by Hawaii Administrative Rules 11-280.1-65.2, Release Response Reporting, this Quarterly Release Response Report presents the following information:

- 1) All release response actions taken pursuant to subchapter 6 after the last reported date;
- 2) A plan for future release response actions to be taken; and
- 3) Information required pursuant to section 11-280.1-65.1.

This report presents a summary of the release response activities performed October 1 through December 18, 2020 at the Red Hill Bulk Fuel Storage Facility (hereinafter referred to as “the Facility”) located at Joint Base Pearl Harbor-Hickam (JBPHH), Oahu, Hawaii.

## ***1.1 Statement of Purpose***

Release response actions were performed to address a fuel release observed in Tank 5.

## ***1.2 Previous Reports***

The following documents were previously submitted to DOH:

- Release confirmation information for Tank 5 as Navy Region Hawaii (NRH) letter 5090 Ser N45/044 dated January 23, 2014
- Initial Release Response Report, enclosed with NRH letter 5090 Ser N45/320 dated April 24, 2014
- Quarterly Release Response Report enclosed with NRH letter 5090 Ser N45/563 dated July 22, 2014
- Quarterly Release Response Report enclosed with NRH letter 5090 Ser N45/929 dated November 10, 2014
- Quarterly Release Response Report enclosed with NRH letter 5090 Ser N45/121 dated January 21, 2015
- Quarterly Release Response Report enclosed with NRH letter 5090 Ser N45/322 dated April 20, 2015
- Quarterly Release Response Report enclosed with NRH letter 5090 Ser N45/573 dated July 17, 2015
- Quarterly Release Response Report enclosed with NRH letter 5090 Ser N45/812 dated October 16, 2015
- Quarterly Release Response Report enclosed with NRH letter 5090 Ser N45/0411 dated January 13, 2016
- Quarterly Release Response Report enclosed with NRH letter 5090 Ser N45/0508 dated April 13, 2016

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- Quarterly Release Response Report enclosed with NRH letter 5090 Ser N45/0583 dated July 28, 2016
  - Quarterly Release Response Report enclosed with NRH letter 5090 Ser N45/0658 dated October 24, 2016
  - Quarterly Release Response Report enclosed with NRH letter 5090 Ser N45/0422 dated January 27, 2017
  - Quarterly Release Response Report enclosed with NRH letter 5090 Ser N45/0489 dated April 24, 2017
  - Quarterly Release Response Report enclosed with NRH letter 5090 Ser N45/0552 dated July 24, 2017
  - Quarterly Release Response Report enclosed with NRH letter 5090 Ser N45/0627 dated October 23, 2017
  - Quarterly Release Response Report enclosed with NRH letter 5090 Ser N45/0410 dated January 19, 2018
  - Quarterly Release Response Report enclosed with NRH letter 5090 Ser N45/0492 dated April 19, 2018
  - Quarterly Release Response Report enclosed with NRH letter 5090 Ser N45/0553 dated July 18, 2018
  - Quarterly Release Response Report enclosed with NRH letter 5090 Ser N45/0630 dated October 16, 2018
  - Quarterly Release Response Report enclosed with NRH letter 5090 Ser N45/0403 dated January 11, 2019
  - Quarterly Release Response Report enclosed with NRH letter 5090 Ser N45/0403 dated April 15, 2019
  - Quarterly Release Response Report enclosed with NRH letter 5090 Ser N45/0590 dated July 12, 2019
  - Quarterly Release Response Report enclosed with NRH letter dated October 9, 2019
  - Quarterly Release Response Report enclosed with NRH letter dated January 9, 2020
  - Quarterly Release Response Report enclosed with NRH letter dated April 8, 2020
  - Quarterly Release Response Report enclosed with NRH letter dated July 7, 2020
  - Quarterly Release Response Report enclosed with NRH letter dated September 30, 2020

## **2.0 Background**

The following sections provide a description of the site and information on the Facility.

### **2.1 Site Description**

The Facility is located on federal government land (zoned a mix of F1- Military and Federal and P-1 Restricted Preservation districts) in south-central Oahu, approximately 2.5 miles northeast of Pearl Harbor. It is located on a low ridge on the western edge of the Koolau Mountain Range that divides Halawa Valley from Moanalua Valley. The Facility occupies 144 acres of land and the majority of the ground surface of the site lies at an elevation of approximately 200 to 500 feet above mean sea level (msl) (AECOM Technical Services, Inc., 2018).

The Facility is bordered on the southwest by residential neighborhoods and the United States (U.S.) Coast Guard reservation, on the southeast by residential neighborhoods in Moanalua Valley, and on the northeast by preservation land. The Facility is bordered on the north by Halawa Correctional Facility and Halawa Industrial Park, which includes private businesses and a former bus facility. A quarry is located less than a quarter mile away to the northwest.

### **2.2 Facility Information**

The Facility contains fourteen (14) active and six (6) inactive bulk fuel field-constructed underground storage tanks (USTs), which are operated by Naval Supply Systems Command (NAVSUP) Fleet Logistics Center (FLC) Pearl Harbor (formerly Fleet and Industrial Supply Center). The Facility was constructed by the U.S. Government in the early 1940s. Twenty (20) USTs and a series of tunnels were constructed to supply fuel to the Navy. Each UST has a capacity of approximately 12.5 million gallons. The Facility is located approximately 100 feet above the basal aquifer. The USTs currently contain Jet Fuel Propellant No. 5 (JP-5), North Atlantic Treaty Organization (NATO)-grade F-24 jet fuel, or Marine Diesel Fuel (F-76). Tank 5 was used to store Jet Fuel Propellant No. 8 (JP-8) and now stores F-24.

Four (4) groundwater monitoring wells (wells RHMW01, RHMW02, RHMW03, and RHMW05) are located within the lower access tunnel, and one (1) sampling point (RHMW2254-01) is located at Red Hill Shaft. Sampling point RHMW2254-01 is located inside the infiltration gallery of the Department of the Navy (Navy) Supply Well 2254-01.

Fifteen (15) groundwater monitoring wells (RHMW04, RHMW06, RHMW07, RHMW08, RHMW09, RHMW10, RHMW11, RHMW12, RHMW13, RHMW14, RHMW15, RHMW16A, RHMW19, OWDFMW01, and HDMW2253-03) are located outside of the Facility tunnel system. Well OWDFMW01 is located at the former Oily Waste Disposal Facility, near Adit 3, and wells RHMW11, RHMW12, RHMW14, and HDMW2253-03 are located at the Halawa Correctional Facility (outside the Red Hill Facility).

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### **3.0 Groundwater and Soil Vapor Monitoring**

The following sections describe activities that were performed to monitor the groundwater and soil vapor beneath Tank 5 from October 1 through December 18, 2020.

#### **3.1 Oil/Water Interface Measurements**

The water level was gauged and measured for the presence of light non-aqueous phase liquids (LNAPLs) using an interface meter. The interface meter was lowered into the groundwater monitoring wells located within the lower access tunnel to determine the depth of water to the nearest 0.01 foot, and the existence of any immiscible layers (LNAPL).

Oil/water interface measurements were taken at groundwater monitoring wells RHMW01, RHMW02, RHMW03, and RHMW05 in October 2020. No LNAPL was observed. Following the oil/water interface measurements, transducers were installed in the monitoring wells for a water level survey. No oil/water interface measurements were taken in November and December due to the presence of the transducers.

A summary of interface measurements through October 2020 is presented in Appendix A.

#### **3.2 Soil Vapor Monitoring**

Soil vapor samples were collected and analyzed in the field for volatile organic compound (VOC) concentrations using a photo-ionization detector (PID). Soil vapor monitoring points (SVMPs) were given a SV prefix, followed by the associated tank number, and then the location under the tank: "S" for shallow or front of the UST, "M" for mid depth or middle of the UST, and "D" for deep or outer edge of the UST.

A conservative approach to assess the integrity of the associated tank system is to measure if VOC concentrations exceed 280,000 parts per billion by volume (ppbv) in soil vapor monitoring probes beneath tanks containing jet fuels (JP-5 or F-24), or 14,000 ppbv in soil vapor monitoring probes beneath tanks containing marine diesel fuel (F-76) (TEC, 2010). These values are 50 percent of the calculated vapor concentration from fuel-saturated water.

Soil vapor monitoring was performed at all active and accessible tanks in October, November, and December 2020. Soil vapor VOC concentrations at Tank 5 were below the action level of 280,000 ppbv during all three monitoring events. During the same monitoring events, soil vapor VOC concentrations at all other active and accessible tanks were below the action levels, with no consistent positive trend.

Soil vapor sampling results from January 2014 through October 2020 are presented in Appendix B. The results for November and December 2020 are being reviewed and will be submitted under separate cover.

### **3.3 Groundwater Sampling and Analysis**

Groundwater samples were collected from 18 monitoring locations within the Red Hill groundwater monitoring network in October 2020. Groundwater samples were collected from sampling point RHMW2254-01 located at Red Hill Shaft, 12 single-screen monitoring wells within the Facility boundary (wells RHMW01 through RHMW10, RHMW19, and OWDFMW01), the Halawa Deep Monitor Well (HDMW2253-03) at the Halawa Correctional Facility, 2 multilevel monitoring wells (RHMW11 and RHMW14) located at the Halawa Correctional Facility, and 2 multilevel monitoring wells (RHMW13 and RHMW15) located within the Facility boundary.

A groundwater monitoring report, which summarizes sampling activities and laboratory analytical results, will be submitted under separate cover.

### **3.4 Drinking Water Sampling**

Drinking water sampling was performed monthly as required by DOH letter of June 16, 2020, which supersedes the 2014 Transition Plan requirements.

Drinking water samples were collected from the Red Hill Shaft post-treatment regulatory compliance sampling point (360-011, Tap Outside Chlorine Building), and before chlorine was added to the water supply at the Red Hill Shaft Pump-head, RHMW2254-01 (360-001, pre-chlorination sample) on October 13, 2020, November 12, 2020, and December 16, 2020.

According to DOH's request, samples were analyzed using the following analytical methods:

- VOCs – EPA 524.2
- SVOCs – EPA 525.2 \*
- Gas Chromatography for JP-8/F-24 – EPA 8015
- Lead – EPA 200.8
- Dissolved Organic Carbon – SM Method 5310C

Drinking water sampling results will be submitted under separate cover. \*October samples were not analyzed for SVOC.

### **4.0 Continued Groundwater and Soil Vapor Monitoring**

Continued monitoring of the groundwater and soil vapor will be conducted as follows:

- Oil/water interface measurements – quarterly
- Soil vapor sampling – monthly
- Groundwater sampling and analysis – quarterly

Monitoring results will be submitted to DOH for each sampling event.

## **5.0 Continued Drinking Water Sampling**

Drinking water sampling will continue to be performed on the following schedule requested by DOH letter of June 16, 2020, which supersedes the 2014 Transition Plan requirements:

- Weekly for one (1) month – completed August 5, 2020
- Monthly for 6 to 12 additional months – commenced August 12, 2020
- Quarterly thereafter, unless otherwise directed by DOH

According to DOH's request, samples will continue to be taken at the post-chlorination sample point, entry point to the distribution system (360-011 Tap Outside Chlorine Building) and pre-chlorination sample point (360-001 Red Hill Shaft Pump-head), and analyzed using the following analytical methods:

- VOCs – EPA 524.2
- SVOCs – EPA 525.2
- Gas Chromatography for JP-8/F-24 – EPA 8015
- Lead – EPA 200.8
- Dissolved Organic Carbon – SM Method 5310C

## **6.0 Planned Future Release Response Actions**

The Navy and DLA negotiated with the EPA and DOH (the “Regulatory Agencies”) release response actions that will be pursued. Future release response actions include determining the feasibility of alternatives for investigating and remediating releases from the Facility and continuing efforts to monitor and characterize the flow of groundwater around the Facility. A revised Work Plan/Scope of Work that describes the future release response actions was submitted pursuant to the Red Hill Administrative Order on Consent to the Regulatory Agencies in November 2016. Conditional approval was received from the Regulatory Agencies in December 2016.

The following documents were submitted for regulatory review:

- Monitoring Well Installation Work Plan Addendum No. 2 in August 2017
- Groundwater Flow Model Progress Report 02 in August 2017
- Groundwater Flow Model Progress Report 03 in December 2017
- Sentinel Well Network Development Plan in December 2017
- Risk Based Decision Criteria Development Plan in December 2017
- Tank Upgrade Alternatives in December 2017
- Technical Memorandum, Testing and Verification of Packer Integrity at RHMW11 in February 2018
- Seismic Profiling to Map Hydrostratigraphy in the Red Hill Area in March 2018
- Groundwater Flow Model Progress Report 04 in April 2018
- Conceptual Site Model Report and Groundwater Protection and Evaluation Considerations Report in July 2018
- Groundwater Flow Model Progress Report 05 in August 2018

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- Groundwater Flow Model Progress Report 06 in December 2018
  - Groundwater Flow Model Progress Report 07 in April 2019
  - Conceptual Site Model Report Revision 01 in June 2019
  - Groundwater Flow Model Progress Report 08 in August 2019
  - Tank Upgrade Alternatives and Release Detection Decision Document in September 2019
  - Groundwater Flow Model Progress Report 09 in December 2019
  - Groundwater Flow Model Progress Report 10 in March 2020
  - Groundwater Flow Model Report in March 2020
  - Investigation and Remediation of Releases Report in March 2020
  - Errata for Conceptual Site Model Report, Revision 01, of June 2019 in April 2020
  - Technical Memorandum, Evaluation of Chromatograms for Understanding TPH Detections in Monitoring Wells in September 2020

Approval by the Regulatory Agencies of the documents will guide future release response actions.

## **7.0 Public Notifications**

The Navy provided the Red Hill Update to the public at the Fuel Tank Advisory Committee (FTAC) held via ZOOM on October 30, 2020. The script was submitted electronically to DOH and EPA and is online at [https://health.hawaii.gov/shwb/files/2020/11/Navy-Presentation-on-All-FCTs-and-Red-Hill\\_10\\_30\\_2020.pdf](https://health.hawaii.gov/shwb/files/2020/11/Navy-Presentation-on-All-FCTs-and-Red-Hill_10_30_2020.pdf) and <https://www.youtube.com/watch?v=iXnuRpvcVxY>.

A copy of this information is included in Appendix C.

## **8.0 Conclusions and Recommendations**

Results of groundwater sampling and analysis and drinking water sampling and analysis indicate the release of JP-8 from Tank 5 has not impacted the Red Hill Shaft.

Additional release response actions have been negotiated with the EPA and DOH to protect the drinking water sources near the Facility.

The next quarterly release response report will be submitted in April 2021 and will cover the release response actions completed between January and March 2021.

## **9.0 References**

AECOM Technical Services, Inc., 2018, *Final First Quarter 2018 – Quarterly Groundwater Monitoring Report, Red Hill Bulk Fuel Storage Facility*, Prepared for Department of the Navy, Naval Facilities Engineering Command, Hawaii, JBPHH, Hawaii, July 2018.

DOH, 2000, *Technical Guidance Manual for Underground Storage Tank Closure and Release Response*, Environmental Management Division, Solid and Hazardous Waste Branch, Underground Storage Tank Section, March 2000.

DOH, 2013, *Technical Guidance Manual for the Implementation of the Hawaii State Contingency Plan*, Office of Hazard Evaluation and Emergency Response, Interim Final, March 2013.

DOH, 2017, *Evaluation of Environmental Hazards at Sites with Contaminated Soil and Groundwater*, Environmental Management Division, Fall 2017.

DOH, 2020, *Red Hill Shaft Drinking Water Sample Results and Analysis, Joint Base Pearl Harbor-Hickam (JBPHH) Public Water System (PWS 360)*. Letter from: Keith E. Kawaoka, Deputy Director for Environmental Health, to: Captain Marc R, Delao, Regional Engineer, Navy Region Hawaii, attention: CDR Darrel E. Frame. June 16.

*Hawaii Administrative Rules, Title 11, Chapter 280.1, Underground Storage Tanks*, July 2018.

TEC, 2007, *Final Technical Report, Red Hill Bulk Fuel Storage Facility*, Prepared for Department of the Navy, Commander Naval Facilities Engineering Command, Pacific, Pearl Harbor, Hawaii, August 2007.

TEC, 2008, *Final Groundwater Protection Plan, Red Hill Fuel Storage Facility*, prepared for Navy Region Hawaii, Pearl Harbor, Hawaii, January 2008, revised December 2009 and August 2014.

TEC, 2010, *Final Soil Vapor Sampling Monitoring Analysis Letter Report*, February 1, 2010.

***Appendix A***  
***Oil/Water Interface Measurements***  
***January 2014 through October 2020***

Red Hill Oil/Water Interface Measurements January 2014 to Present

Date	RHMW01			RHMW02			RHMW03			RHMW05		
	Elevation = 101.9955 ft <sup>1</sup>			Elevation = 104.5970 ft <sup>1</sup>			Elevation = 120.8980 ft <sup>1</sup>			Elevation = 101.3102 ft <sup>1</sup>		
	DTW (TOC)	SWL	LNAPL									
15-Jan-14	83.94	18.06	0	86.62	17.98	0	NT	NT	NT	NT	NT	NT
16-Jan-14	NT	NT	NT	NT	NT	NT	NT	NT	NT	83.09	18.22	0
22-Jan-14	83.53	18.47	0	86.20	18.40	0	NT	NT	NT	82.87	18.44	0
23-Jan-14	83.58	18.42	0	86.24	18.36	0	NT	NT	NT	82.94	18.37	0
24-Jan-14	83.57	18.43	0	86.23	18.37	0	NT	NT	NT	82.93	18.38	0
27-Jan-14	83.55	18.45	0	86.23	18.37	0	NT	NT	NT	82.93	18.38	0
28-Jan-14	83.56	18.44	0	86.25	18.35	0	102.52	18.38	0	82.94	18.37	0
29-Jan-14	83.56	18.44	0	86.22	18.38	0	NT	NT	NT	82.94	18.37	0
30-Jan-14	83.53	18.47	0	86.21	18.39	0	NT	NT	NT	82.93	18.38	0
31-Jan-14	83.53	18.47	0	86.19	18.41	0	NT	NT	NT	82.88	18.43	0
3-Feb-14	83.54	18.46	0	86.20	18.40	0	NT	NT	NT	82.91	18.40	0
4-Feb-14	83.54	18.46	0	86.20	18.40	0	NT	NT	NT	82.89	18.42	0
10-Feb-14	84.49	17.51	0	86.16	18.44	0	102.47	18.43	0	82.83	18.48	0
24-Feb-14	83.54	18.46	0	86.24	18.36	0	102.47	18.43	0	82.97	18.34	0
4-Mar-14*	NT	NT	NT									
13-Mar-14*	NT	NT	NT									
28-Mar-14	83.76	18.24	0	86.42	18.18	0	102.65	18.25	0	83.18	18.13	0
7-Apr-14*	83.42	18.58	0	86.43	18.17	0	NT	NT	NT	83.21	18.10	0
21-Apr-14	83.93	18.07	0	86.58	18.02	0	102.80	18.10	0	83.27	18.04	0
29-Oct-19	83.15	18.85	0	85.84	18.76	0	102.19	18.71	0	82.09	19.22	0
31-Jan-20	Obstructed	NA	0	85.88	18.72	0	102.17	18.73	0	82.52	18.79	0
23-Apr-20	82.93	19.07	0	85.68	18.92	0	101.82	19.08	0	82.27	19.04	0
24-Jul-20	83.28	18.72	0	85.94	18.66	0	102.13	18.77	0	82.63	18.68	0
15-Oct-20	83.69	18.31	0	86.39	18.21	0	102.56	18.34	0	83.12	18.19	0

Notes:

- 1 - Elevations were updated based on the Well Elevation Survey Report, Red Hill Bulk Fuel Storage Facility (DON 2018).
- 2 - Dedicated groundwater pump was obstructing the path of the interface meter probe. Depth measured was based on the elevation of water when pump was removed from the monitoring well (RHMW05).
- Measurements recorded by Environmental Science International from January 2014 to August 2015, unless otherwise noted.
- Measurements recorded by Element Environmental, LLC from September 2015.
- \* - Measurements recorded by NAVFAC HI.

All units in feet (ft).

DTW (TOC) - depth to water from top of well casing

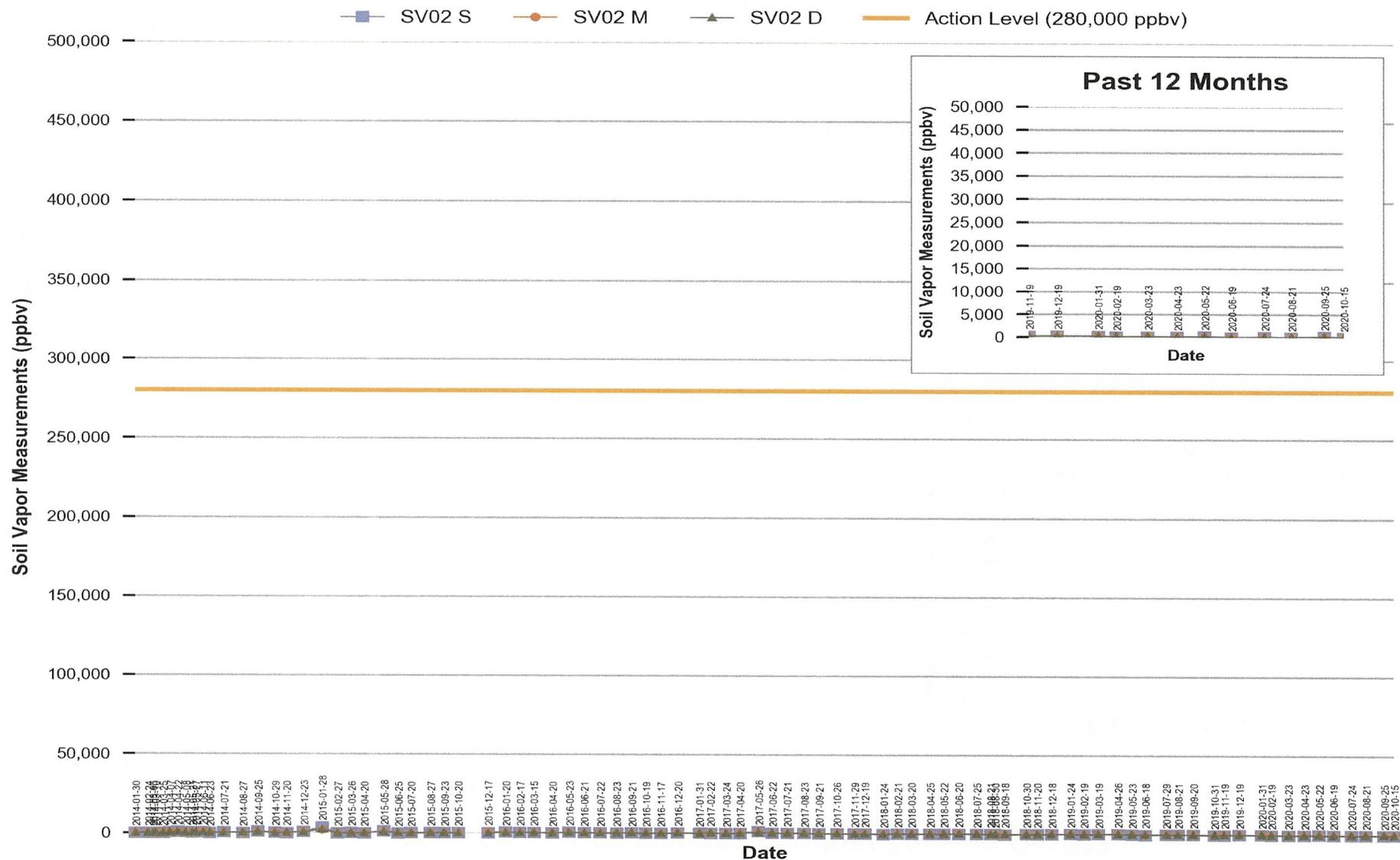
LNAPL - light non-aqueous phase liquid

NT - measurement not taken

SWL - static water level

***Appendix B***  
***Soil Vapor Sampling Results through October 2020***

**Figure 1**  
**Red Hill - Tank 02 (F-24)**  
**Soil Vapor Measurements (Jan 2014 Through Oct 2020)**



Notes (where applicable):

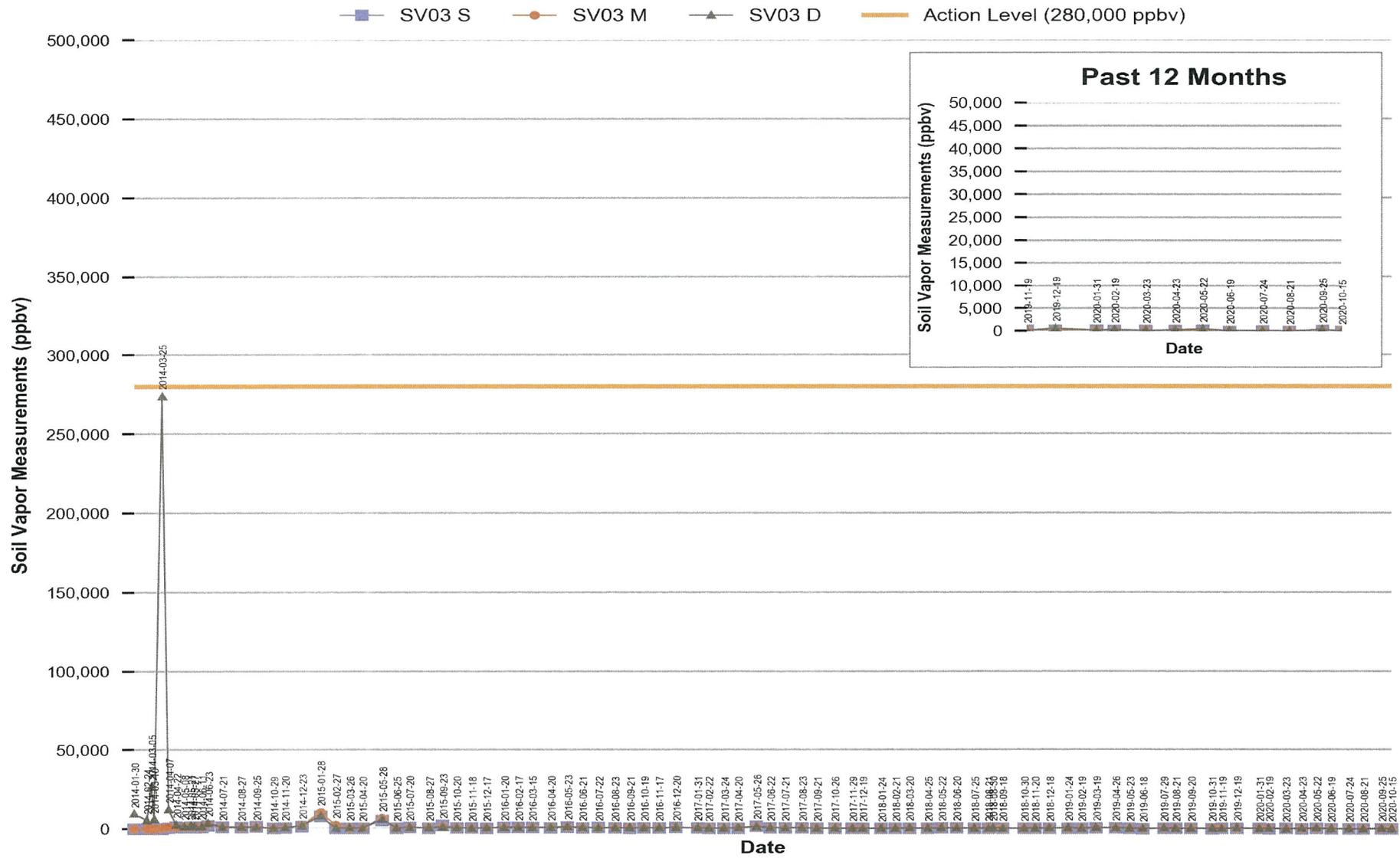
ppbv: Parts Per Billion by Volume

F-24: Jet Fuel, Fuel Number 24

JP-5: Jet Fuel, Propellant Number 5

F-76: Marine Diesel, Fuel Number 76

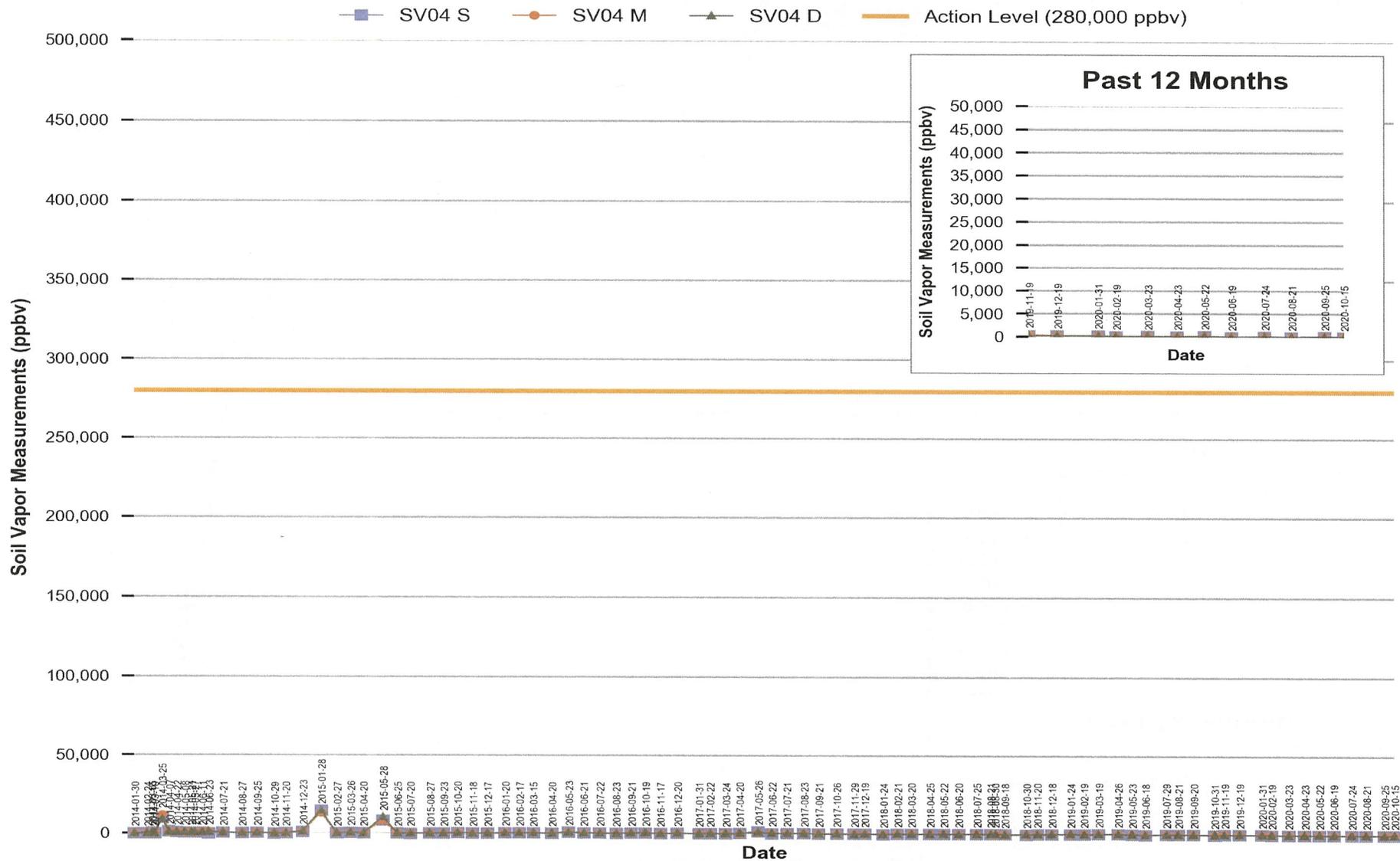
**Figure 2**  
**Red Hill - Tank 03 (F-24)**  
**Soil Vapor Measurements (Jan 2014 Through Oct 2020)**



Notes (where applicable):  
 ppbv: Parts Per Billion by Volume  
 F-24: Jet Fuel, Fuel Number 24

JP-5: Jet Fuel, Propellant Number 5  
 F-76: Marine Diesel, Fuel Number 76

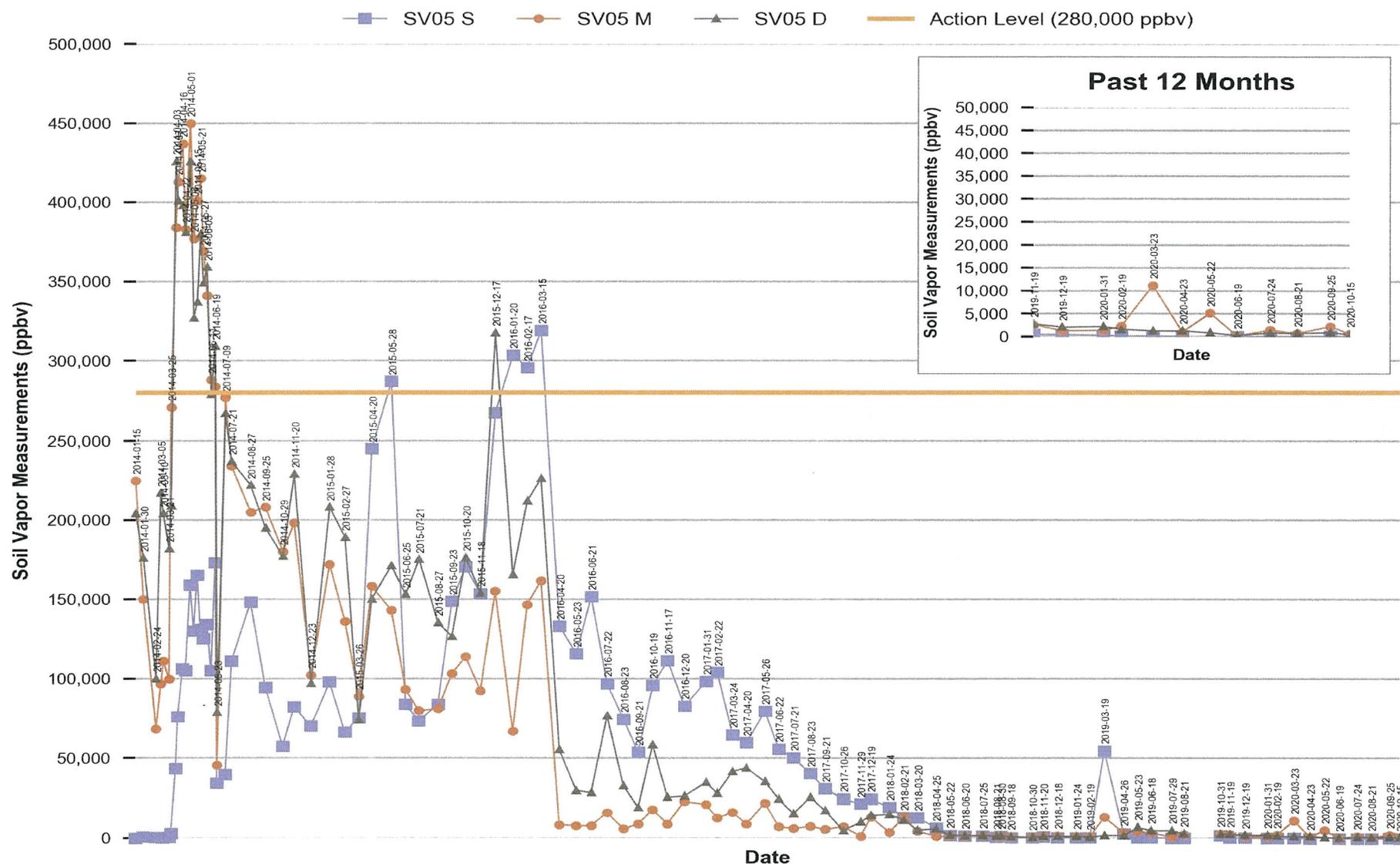
**Figure 3**  
**Red Hill - Tank 04 (F-24)**  
**Soil Vapor Measurements (Jan 2014 Through Oct 2020)**



Notes (where applicable):  
 ppbv: Parts Per Billion by Volume  
 F-24: Jet Fuel, Fuel Number 24

JP-5: Jet Fuel, Propellant Number 5  
 F-76: Marine Diesel, Fuel Number 76

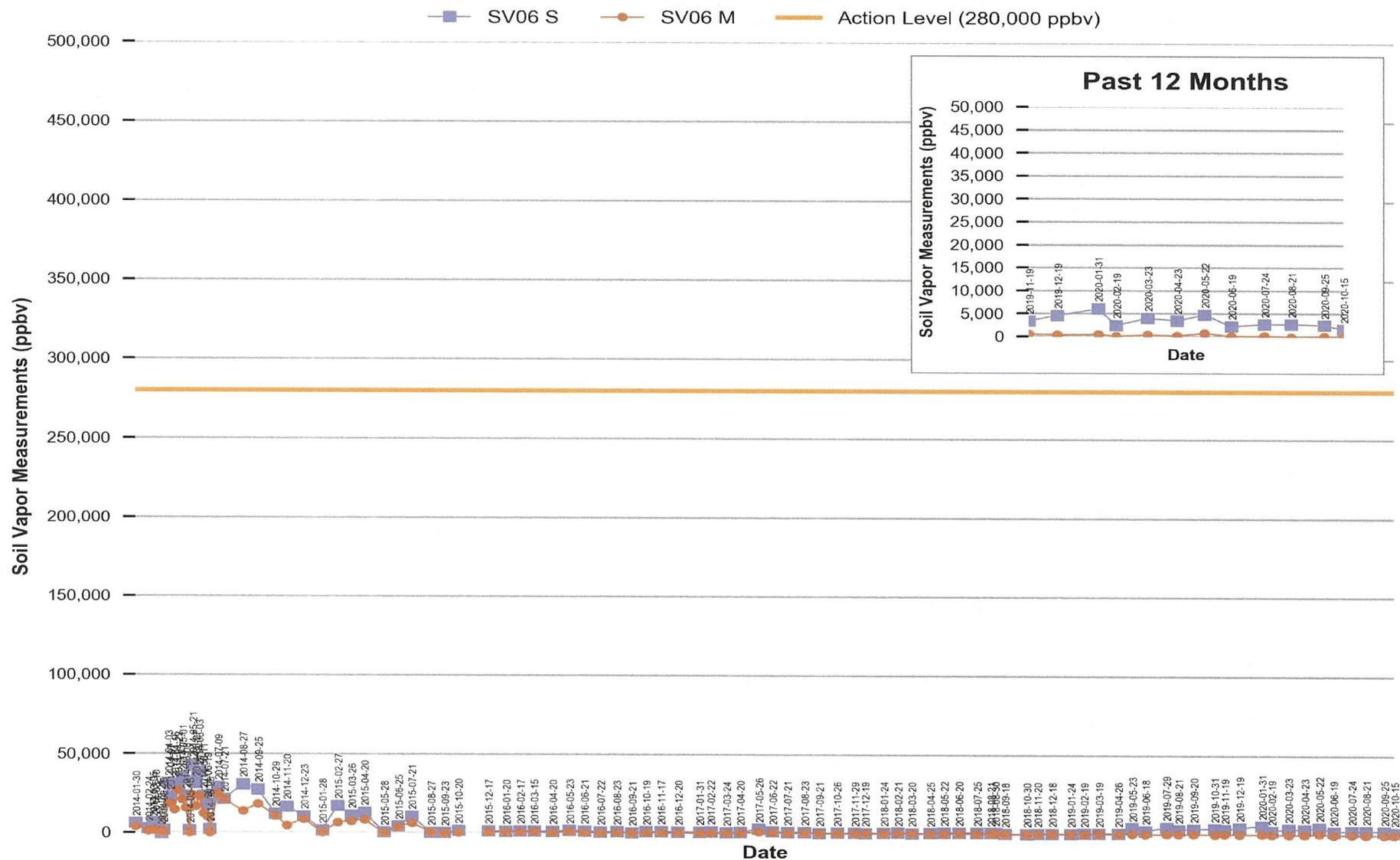
**Figure 4**  
**Red Hill - Tank 05 (F-24)**  
**Soil Vapor Measurements (Jan 2014 Through Oct 2020)**



Notes (where applicable):  
 ppbv: Parts Per Billion by Volume  
 F-24: Jet Fuel, Fuel Number 24

JP-5: Jet Fuel, Propellant Number 5  
 F-76: Marine Diesel, Fuel Number 76

**Figure 5**  
**Red Hill - Tank 06 (F-24)**  
**Soil Vapor Measurements (Jan 2014 Through Oct 2020)**



Notes (where applicable):

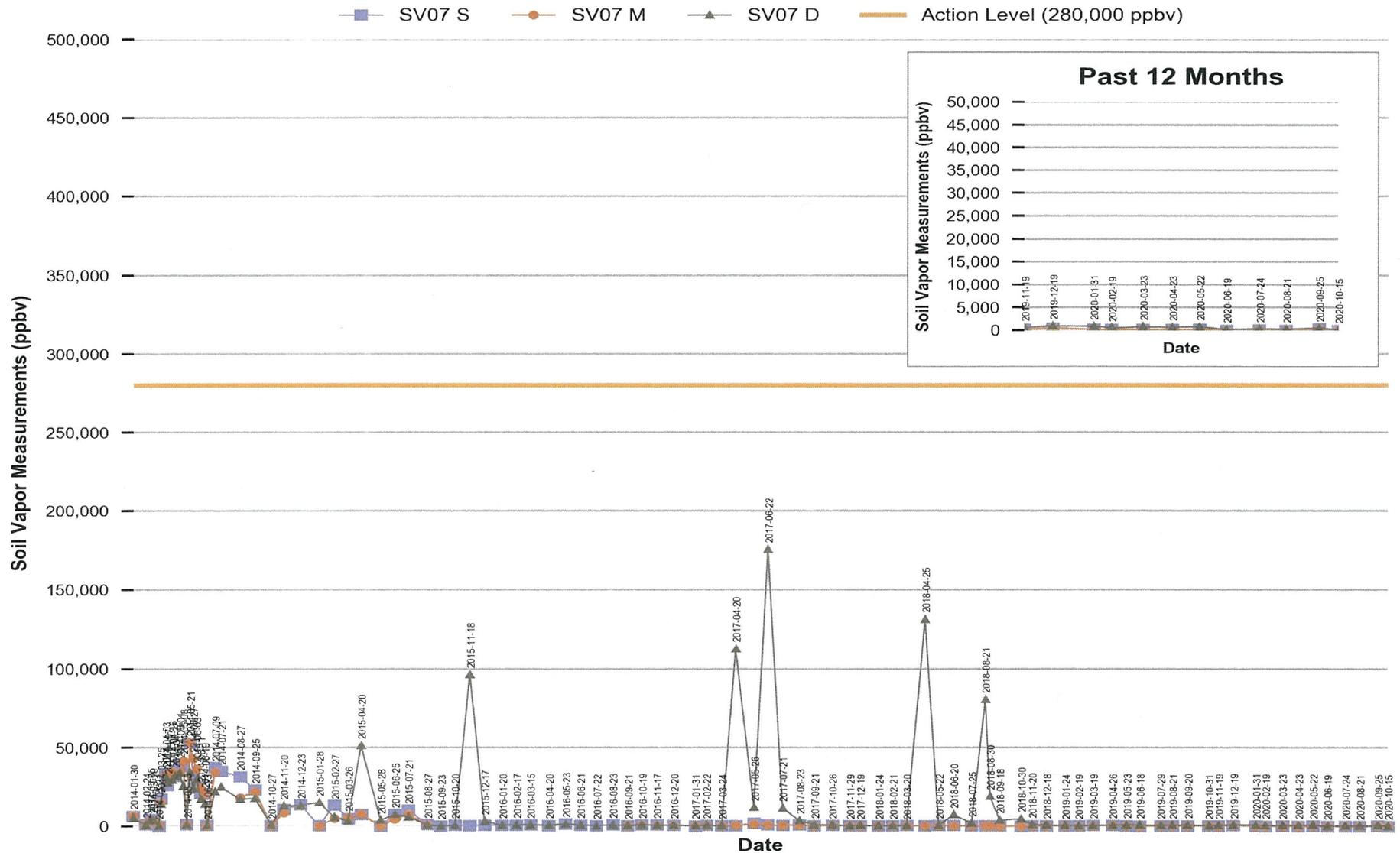
ppbv: Parts Per Billion by Volume

F-24: Jet Fuel, Fuel Number 24

JP-5: Jet Fuel, Propellant Number 5

F-76: Marine Diesel, Fuel Number 76

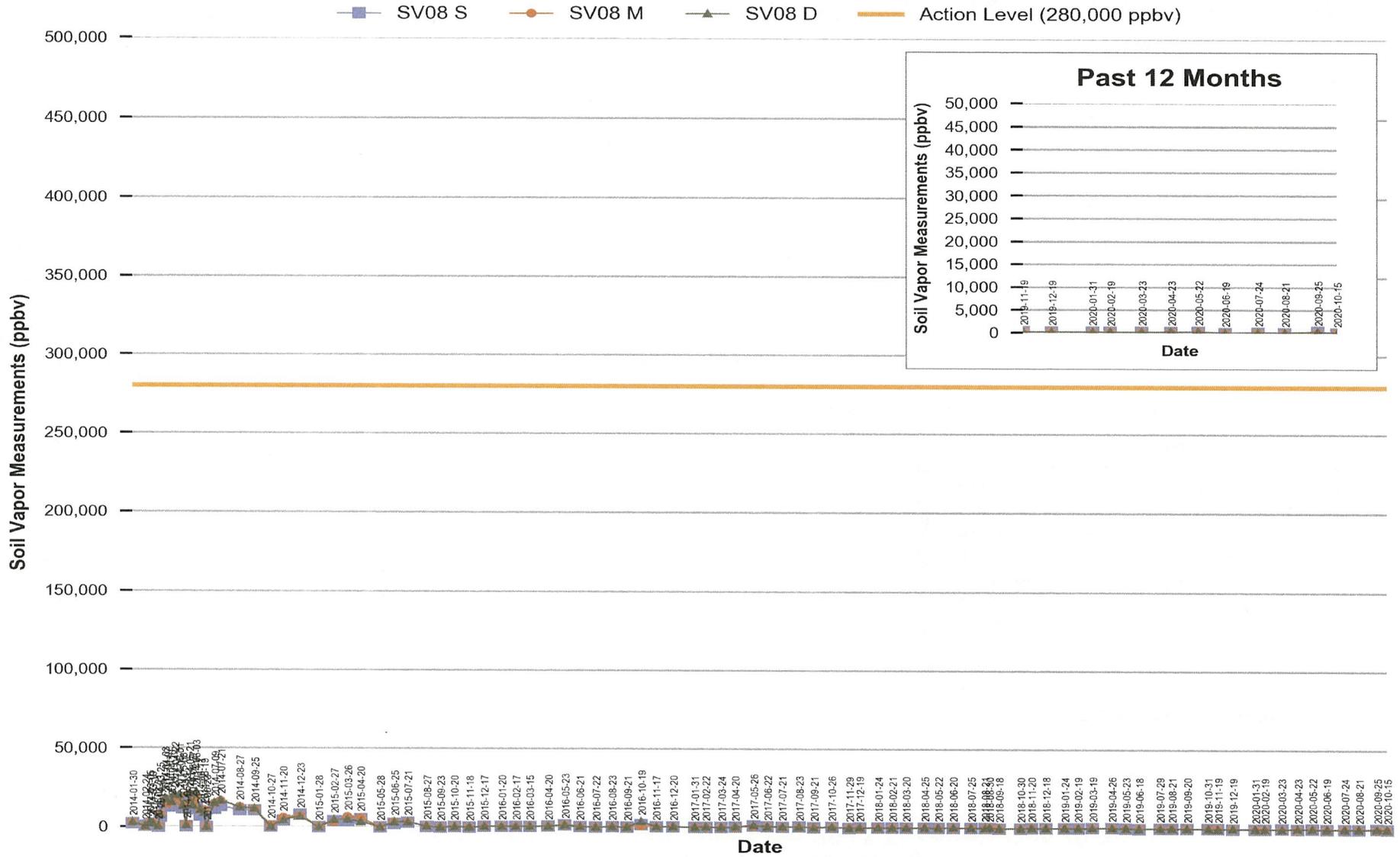
**Figure 6**  
**Red Hill - Tank 07 (JP-5)**  
**Soil Vapor Measurements (Jan 2014 Through Oct 2020)**



Notes (where applicable):  
 ppbv: Parts Per Billion by Volume  
 F-24: Jet Fuel, Fuel Number 24

JP-5: Jet Fuel, Propellant Number 5  
 F-76: Marine Diesel, Fuel Number 76

**Figure 7**  
**Red Hill - Tank 08 (JP-5)**  
**Soil Vapor Measurements (Jan 2014 Through Oct 2020)**



Notes (where applicable):

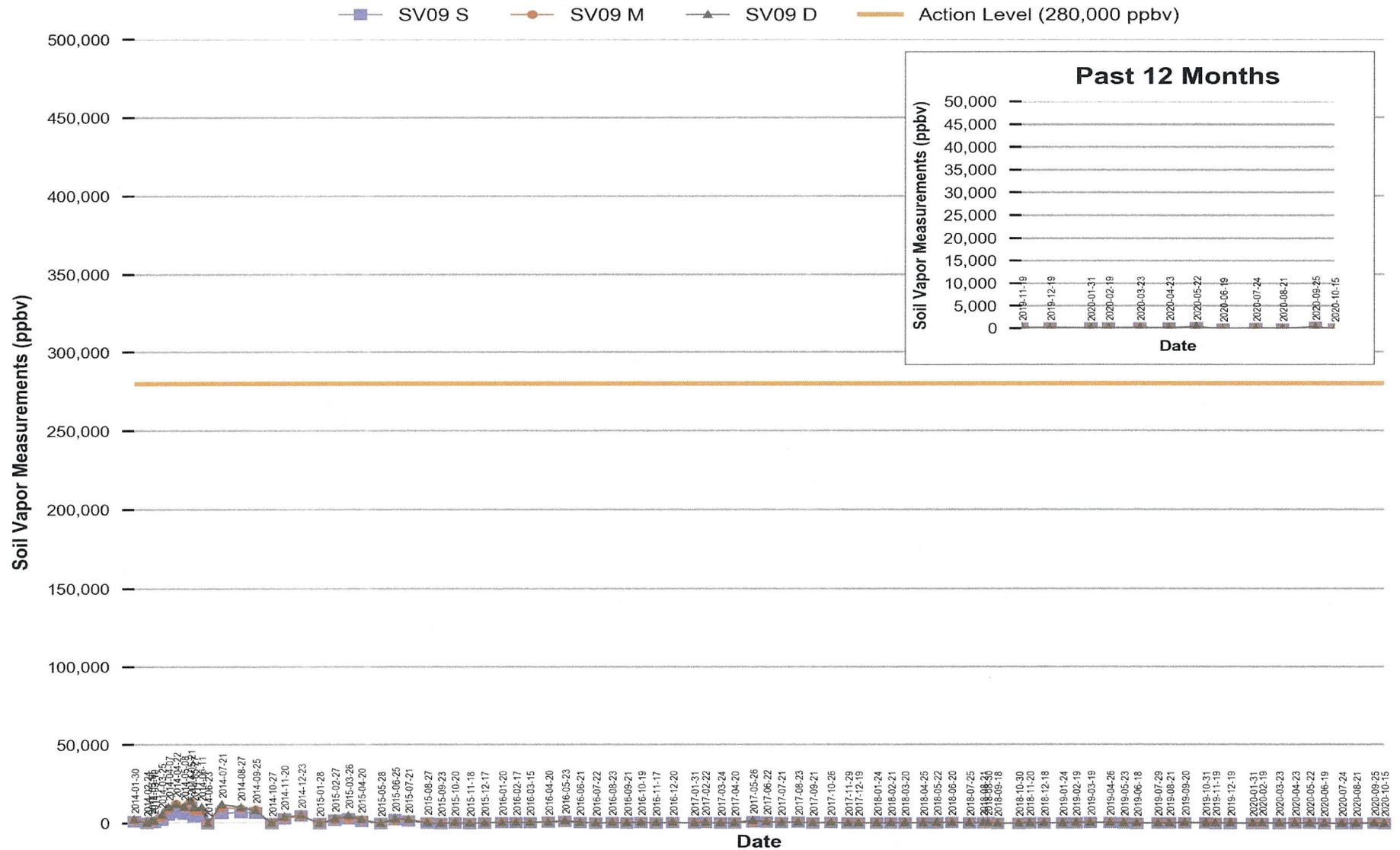
ppbv: Parts Per Billion by Volume

F-24: Jet Fuel, Fuel Number 24

JP-5: Jet Fuel, Propellant Number 5

F-76: Marine Diesel, Fuel Number 76

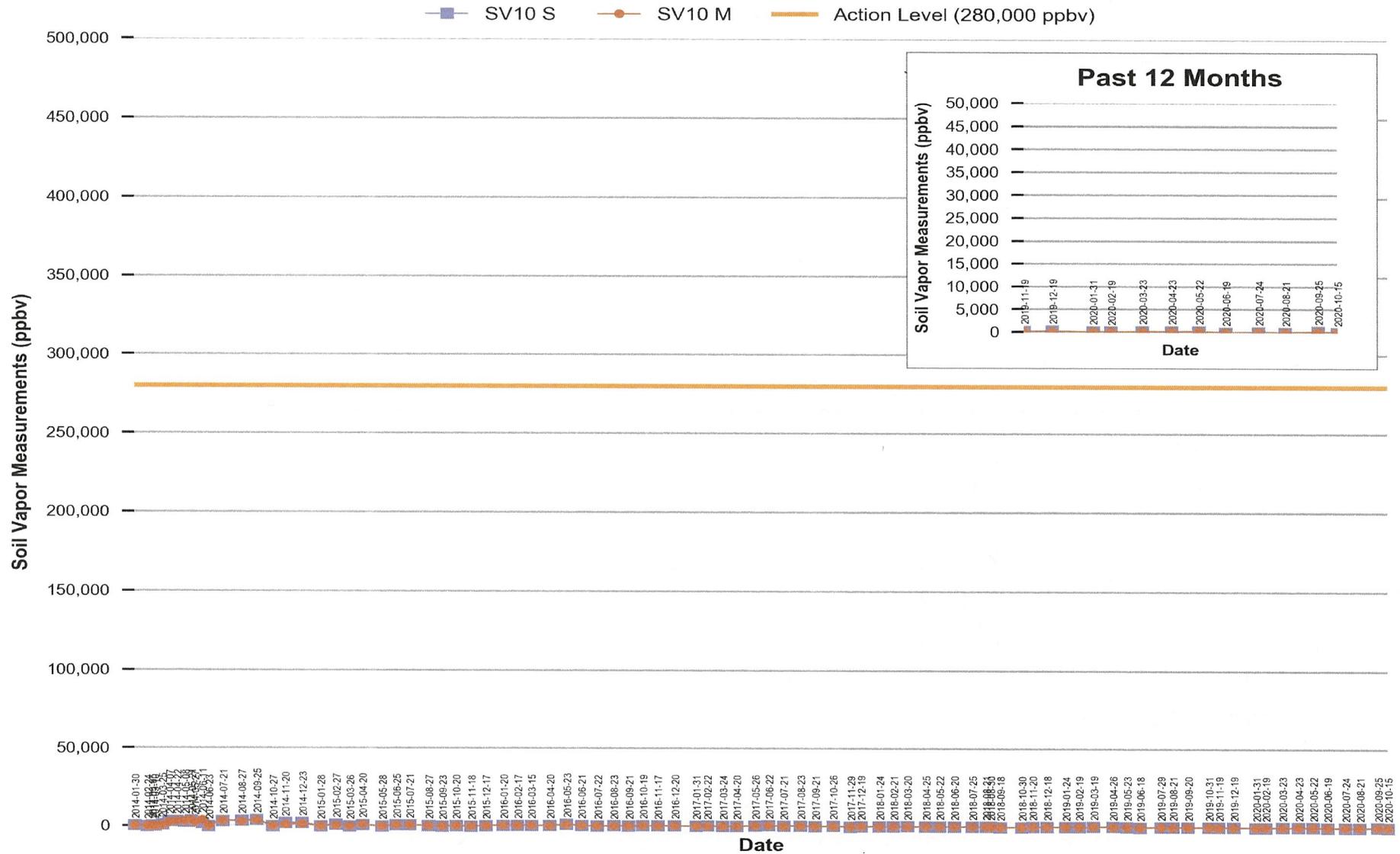
**Figure 8  
Red Hill - Tank 09 (JP-5)  
Soil Vapor Measurements (Jan 2014 Through Oct 2020)**



Notes (where applicable):  
ppbv: Parts Per Billion by Volume  
F-24: Jet Fuel, Fuel Number 24

JP-5: Jet Fuel, Propellant Number 5  
F-76: Marine Diesel, Fuel Number 76

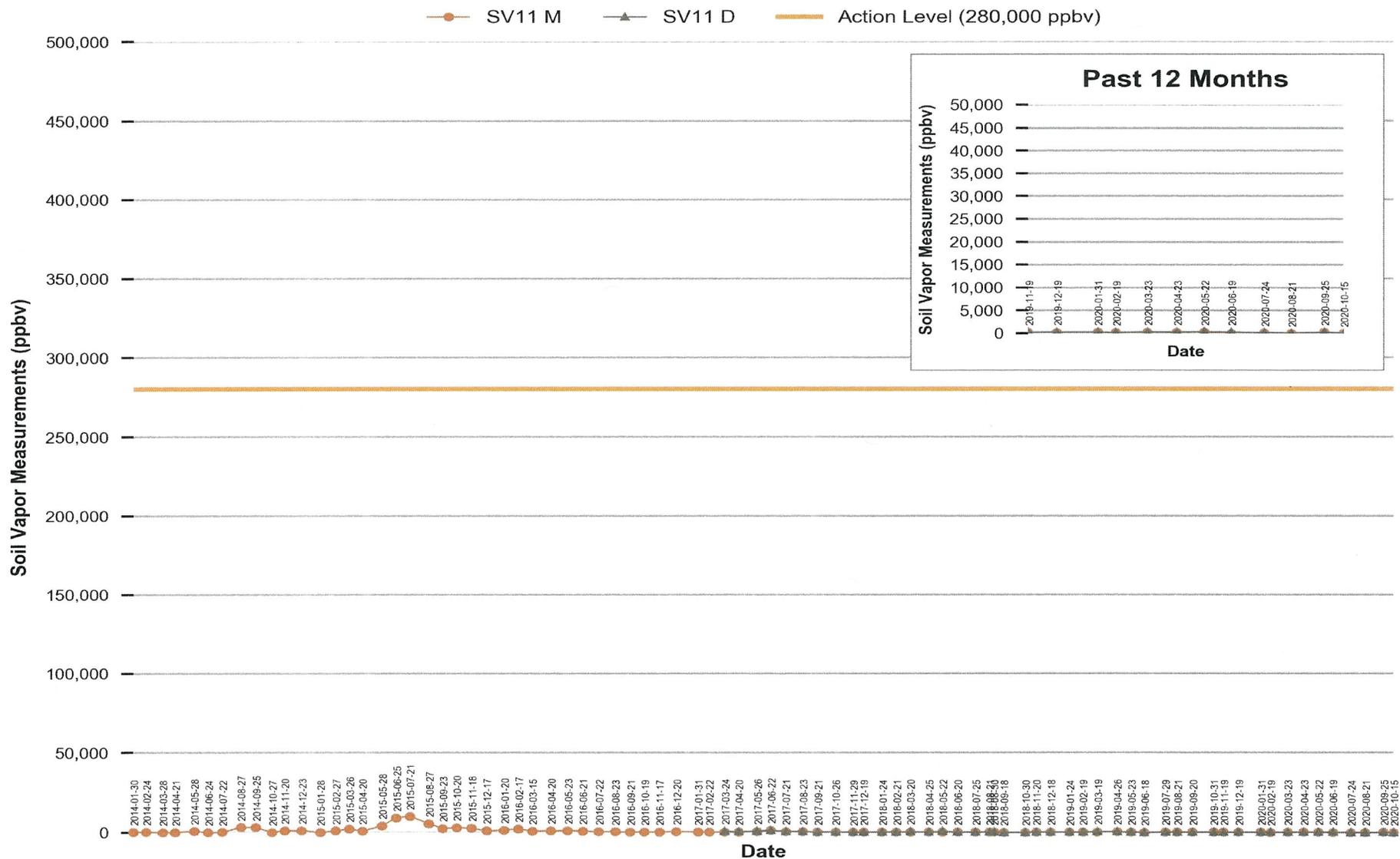
**Figure 9**  
**Red Hill - Tank 10 (JP-5)**  
**Soil Vapor Measurements (Jan 2014 Through Oct 2020)**



Notes (where applicable):  
 ppbv: Parts Per Billion by Volume  
 F-24: Jet Fuel, Fuel Number 24

JP-5: Jet Fuel, Propellant Number 5  
 F-76: Marine Diesel, Fuel Number 76

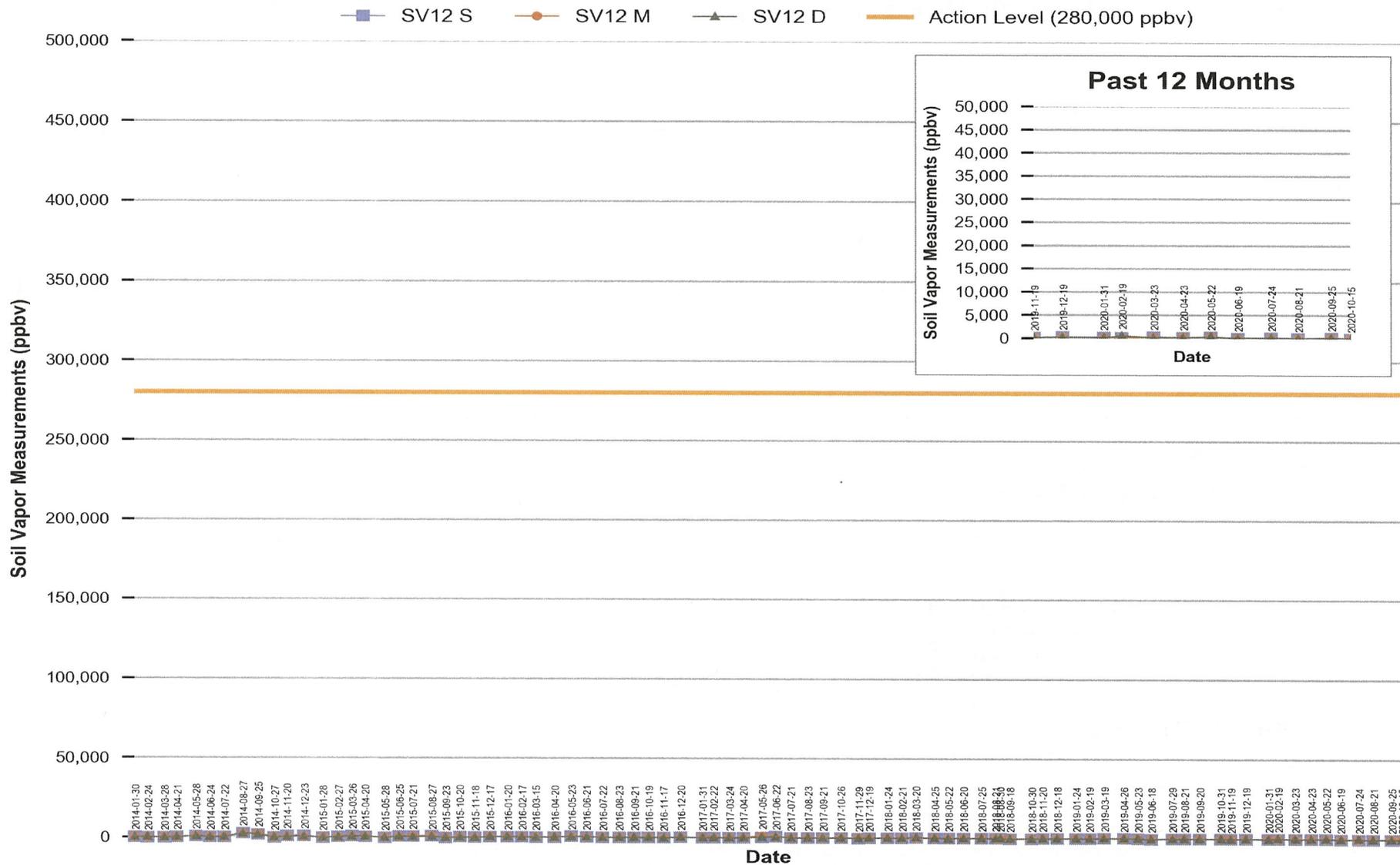
**Figure 10**  
**Red Hill - Tank 11 (JP-5)**  
**Soil Vapor Measurements (Jan 2014 Through Oct 2020)**



Notes (where applicable):  
 ppbv: Parts Per Billion by Volume  
 F-24: Jet Fuel, Fuel Number 24

JP-5: Jet Fuel, Propellant Number 5  
 F-76: Marine Diesel, Fuel Number 76

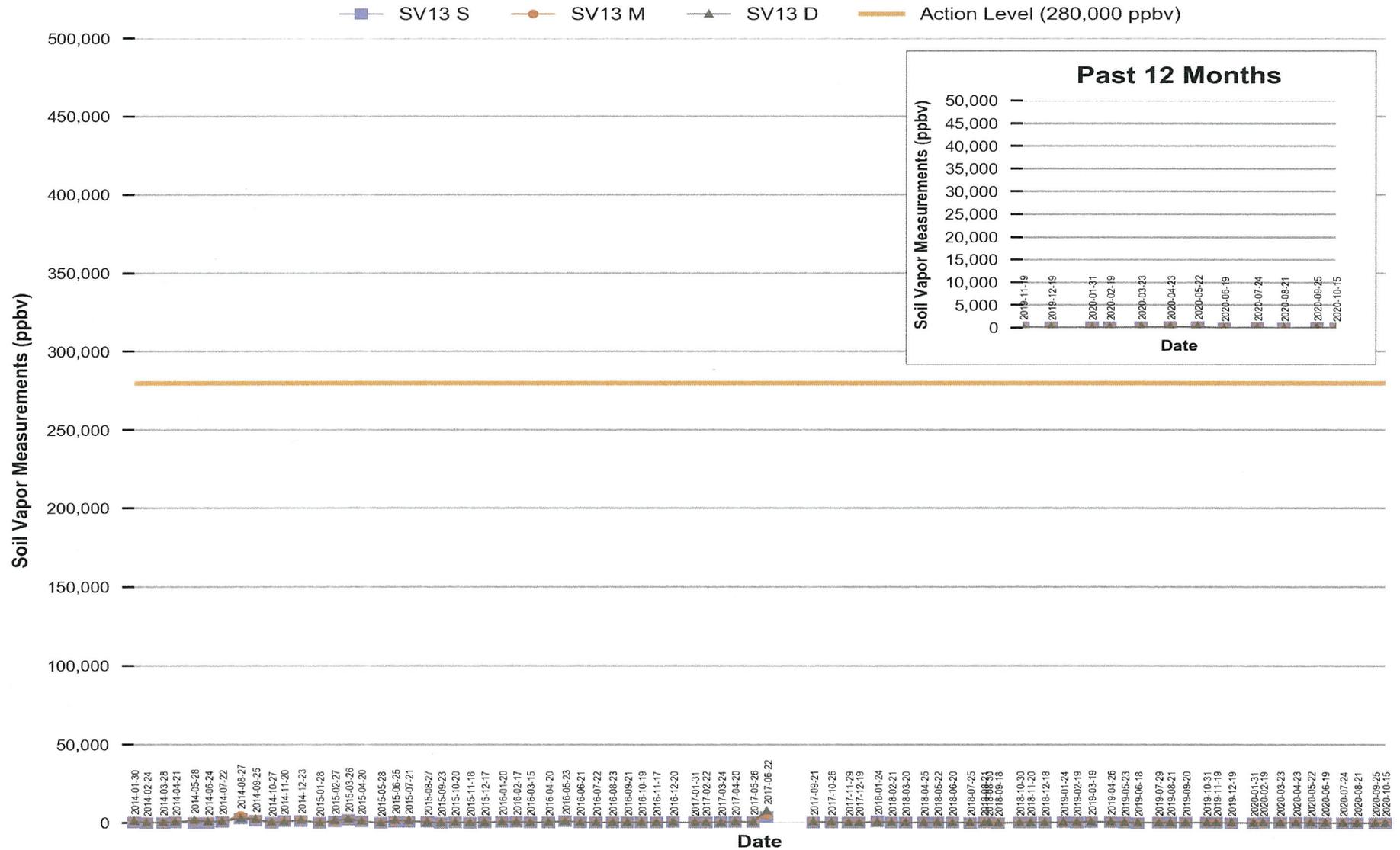
**Figure 11**  
**Red Hill - Tank 12 (JP-5)**  
**Soil Vapor Measurements (Jan 2014 Through Oct 2020)**



Notes (where applicable):  
 ppbv: Parts Per Billion by Volume  
 F-24: Jet Fuel, Fuel Number 24

JP-5: Jet Fuel, Propellant Number 5  
 F-76: Marine Diesel, Fuel Number 76

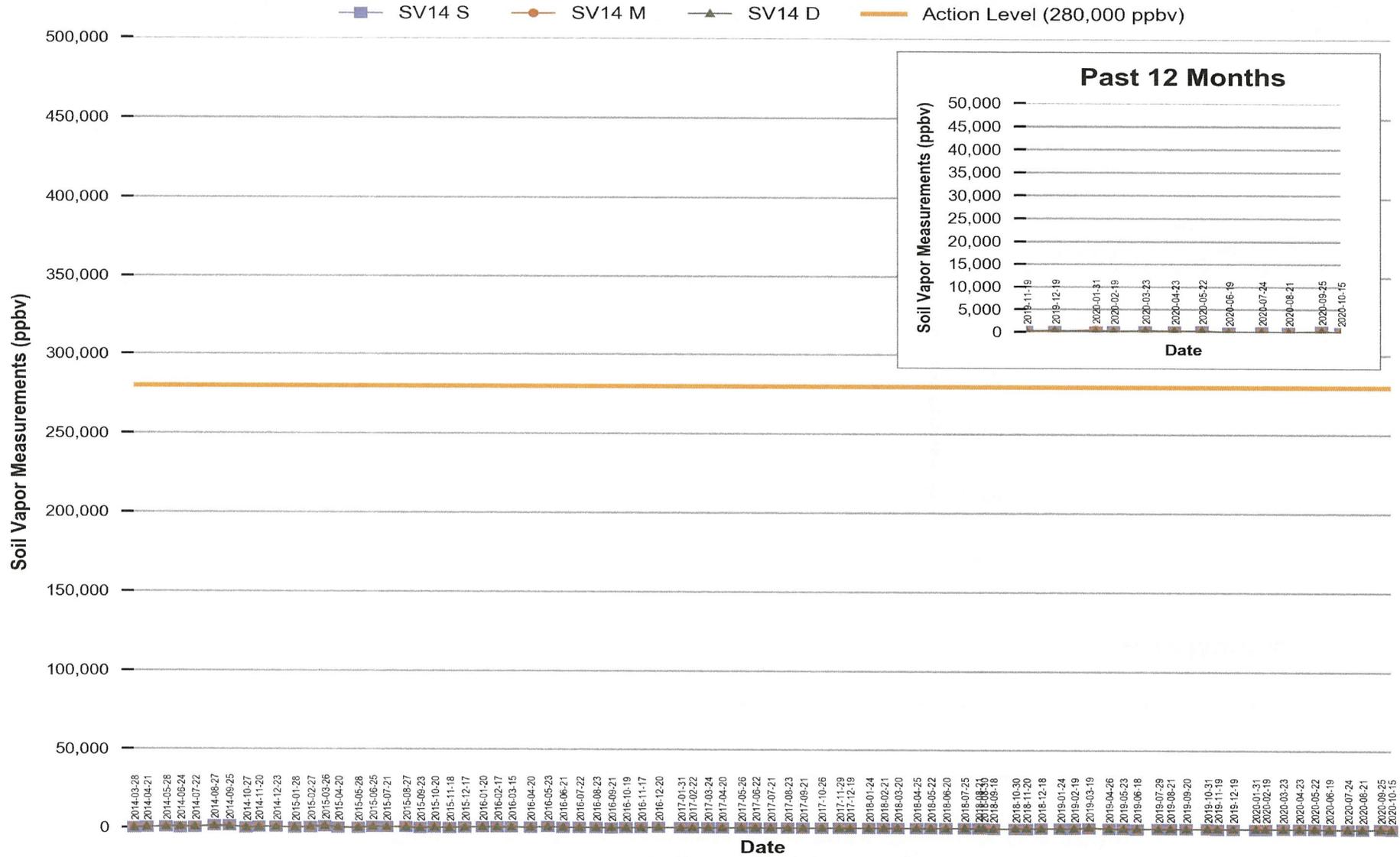
**Figure 12**  
**Red Hill - Tank 13 (JP-5)**  
**Soil Vapor Measurements (Jan 2014 Through Oct 2020)**



Notes (where applicable):  
 ppbv: Parts Per Billion by Volume  
 F-24: Jet Fuel, Fuel Number 24

JP-5: Jet Fuel, Propellant Number 5  
 F-76: Marine Diesel, Fuel Number 76

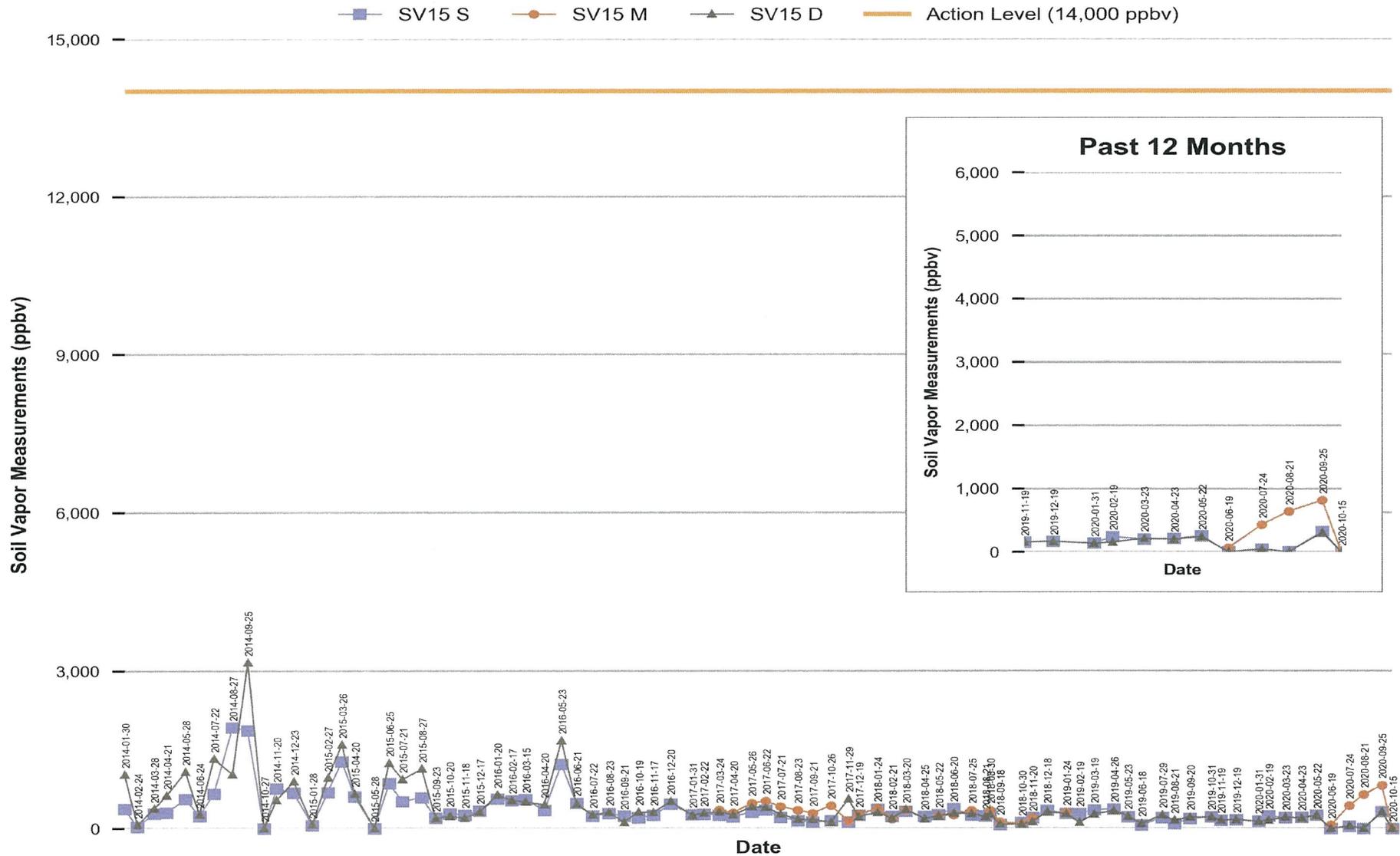
**Figure 13**  
**Red Hill - Tank 14 (JP-5)**  
**Soil Vapor Measurements (Mar 2014 Through Oct 2020)**



Notes (where applicable):  
 ppbv: Parts Per Billion by Volume  
 F-24: Jet Fuel, Fuel Number 24

JP-5: Jet Fuel, Propellant Number 5  
 F-76: Marine Diesel, Fuel Number 76

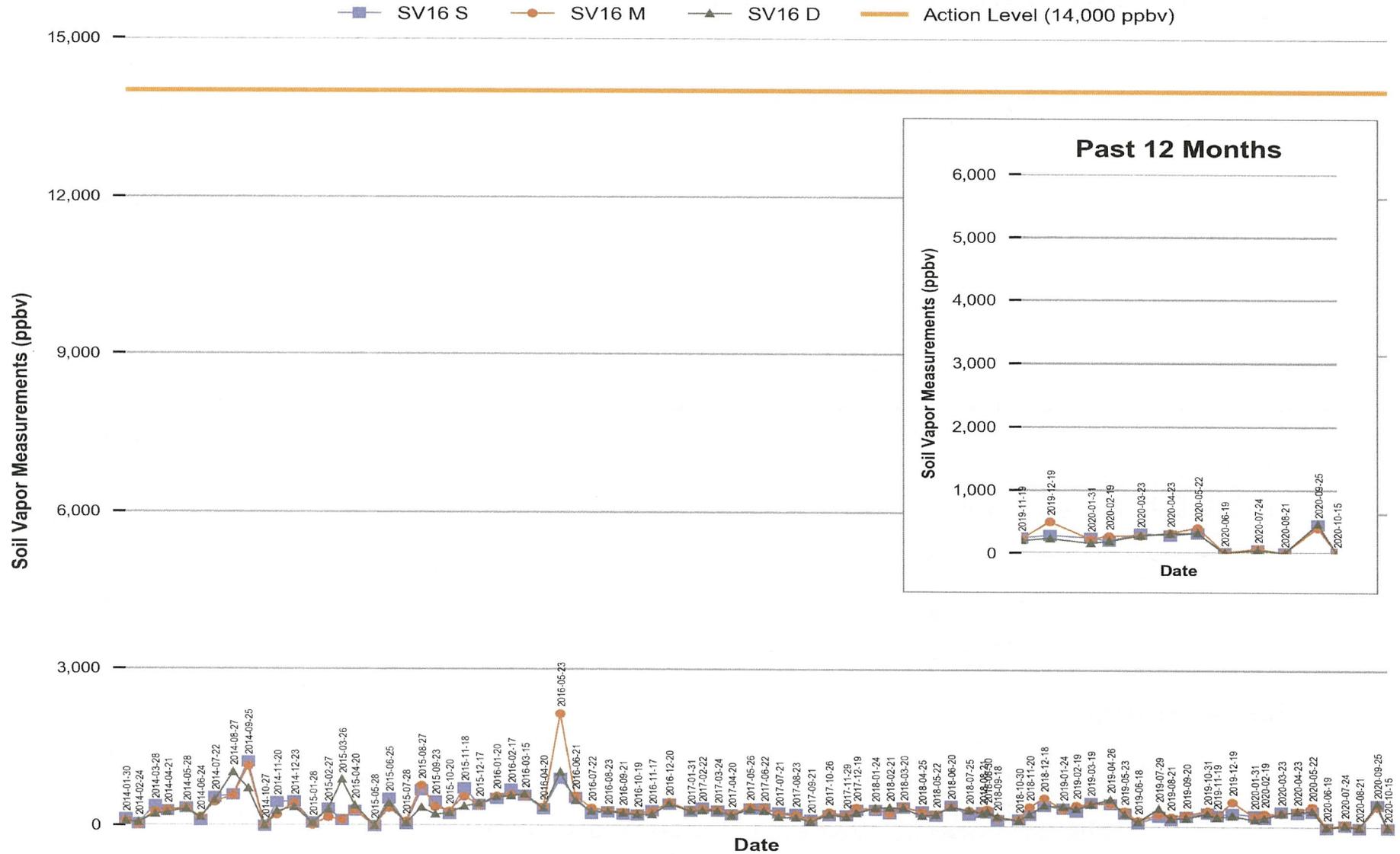
**Figure 14**  
**Red Hill - Tank 15 (F-76)**  
**Soil Vapor Measurements (Jan 2014 Through Oct 2020)**



Notes (where applicable):  
 ppbv: Parts Per Billion by Volume  
 F-24: Jet Fuel, Fuel Number 24

JP-5: Jet Fuel, Propellant Number 5  
 F-76: Marine Diesel, Fuel Number 76

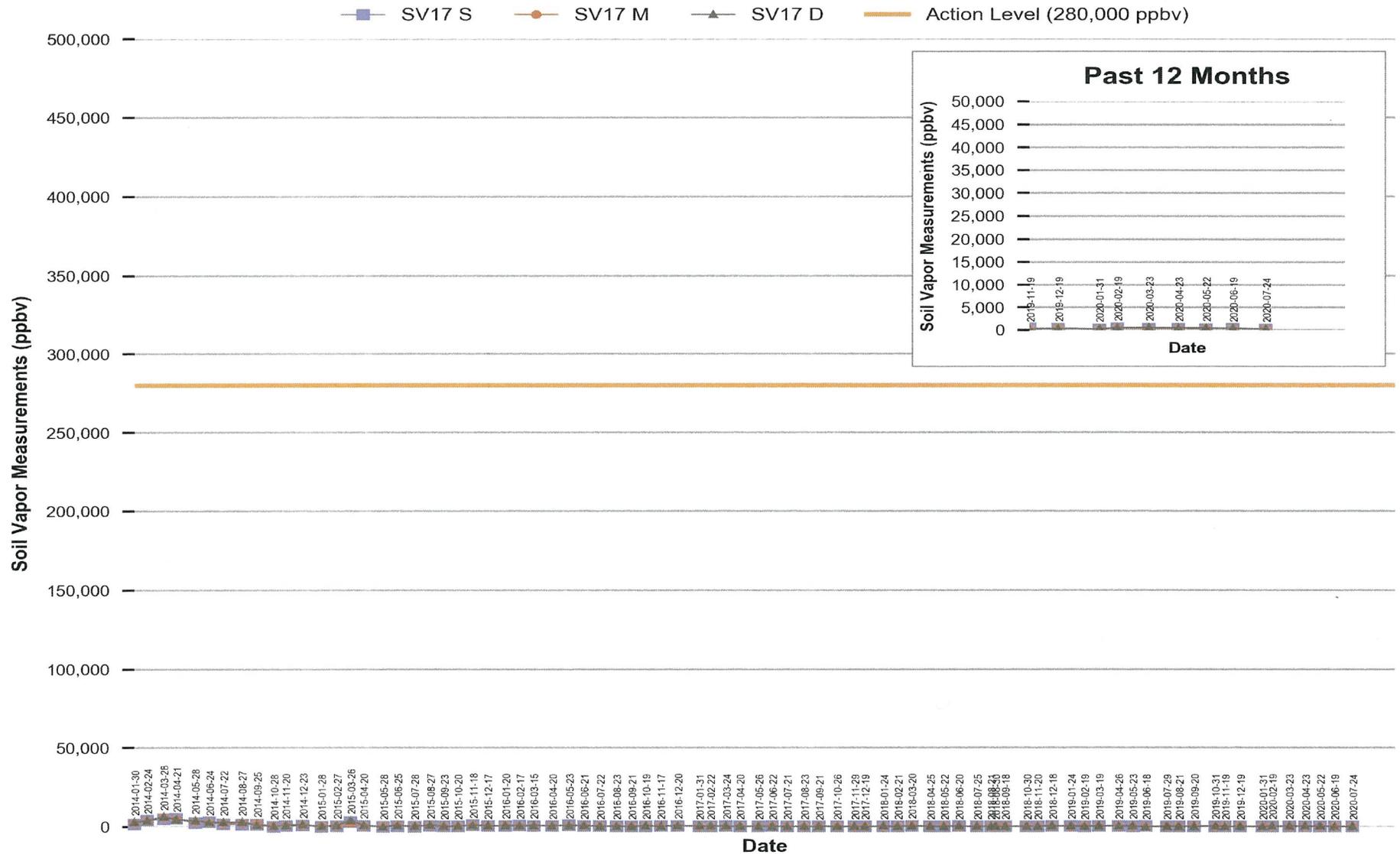
**Figure 15**  
**Red Hill - Tank 16 (F-76)**  
**Soil Vapor Measurements (Jan 2014 Through Oct 2020)**



Notes (where applicable):  
 ppbv: Parts Per Billion by Volume  
 F-24: Jet Fuel, Fuel Number 24

JP-5: Jet Fuel, Propellant Number 5  
 F-76: Marine Diesel, Fuel Number 76

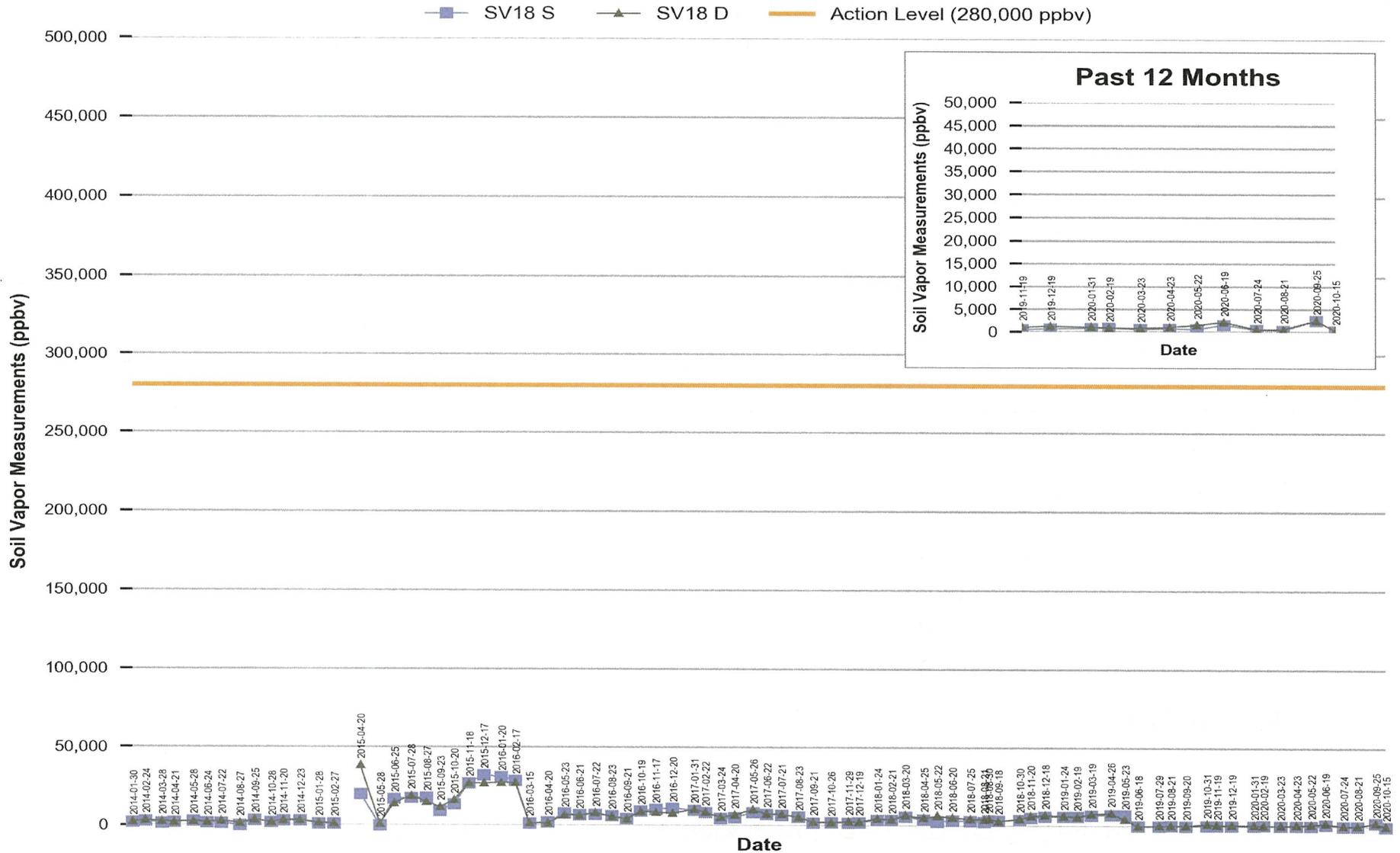
**Figure 16**  
**Red Hill - Tank 17 (JP-5)**  
**Soil Vapor Measurements (Jan 2014 Through Oct 2020)**



Notes (where applicable):  
 ppbv: Parts Per Billion by Volume  
 F-24: Jet Fuel, Fuel Number 24

JP-5: Jet Fuel, Propellant Number 5  
 F-76: Marine Diesel, Fuel Number 76

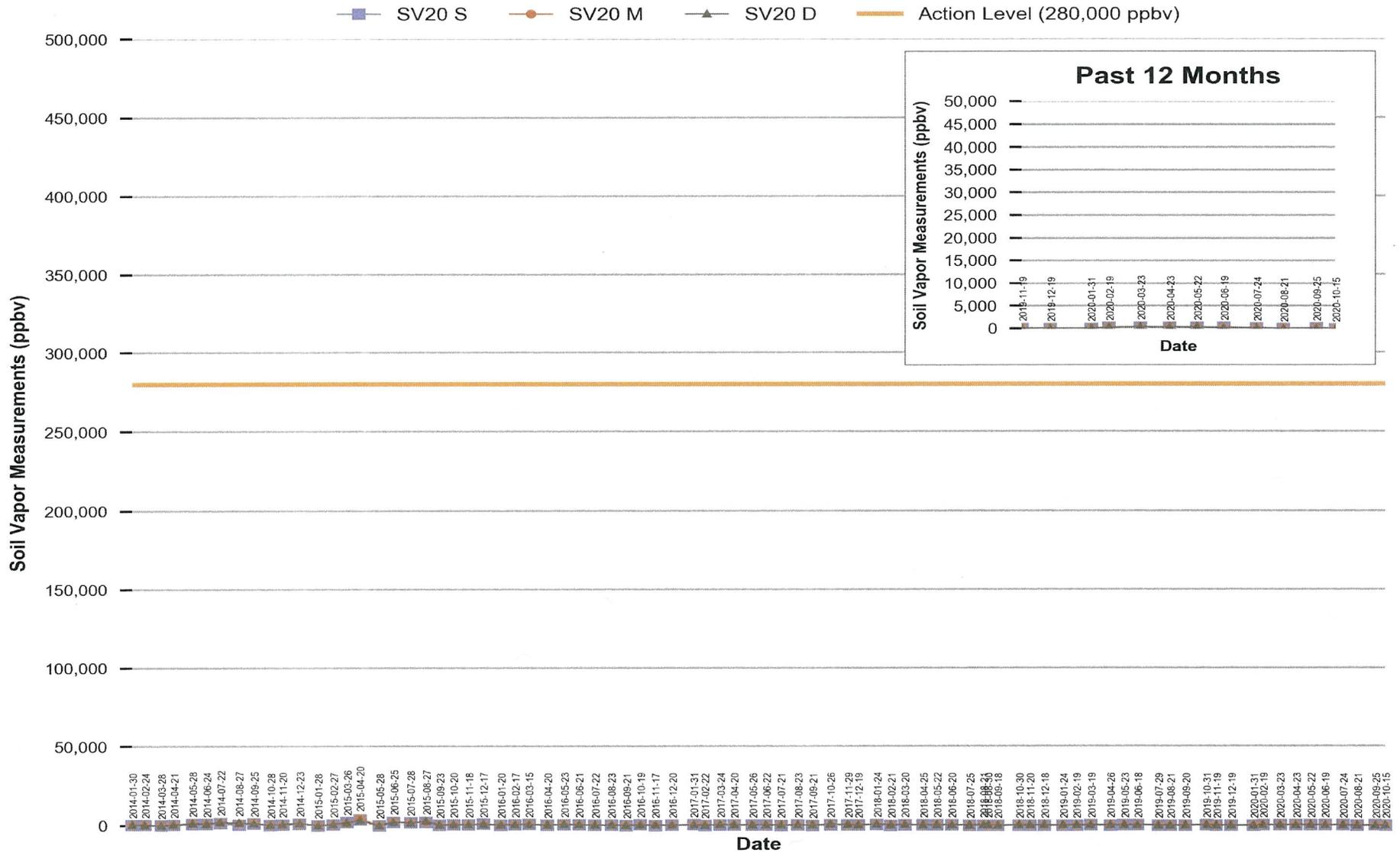
**Figure 17**  
**Red Hill - Tank 18 (JP-5)**  
**Soil Vapor Measurements (Jan 2014 Through Oct 2020)**



Notes (where applicable):  
 ppbv: Parts Per Billion by Volume  
 F-24: Jet Fuel, Fuel Number 24

JP-5: Jet Fuel, Propellant Number 5  
 F-76: Marine Diesel, Fuel Number 76

**Figure 18**  
**Red Hill - Tank 20 (JP-5)**  
**Soil Vapor Measurements (Jan 2014 Through Oct 2020)**



Notes (where applicable):  
 ppbv: Parts Per Billion by Volume  
 F-24: Jet Fuel, Fuel Number 24

JP-5: Jet Fuel, Propellant Number 5  
 F-76: Marine Diesel, Fuel Number 76

***Appendix C***  
***Public Notifications***

# Aloha

2020 Update

Fuel Tank Advisory Committee (FTAC)

*October 30, 2020*





# Review of Sites

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## **Permanently out of use:**

- Hickam POL Annex (Kipapa)
- Hickam POL Annex (Waikakalaua)

## **Temporarily out of use (pending decommissioning):**

- Kuahua Peninsula (a.k.a. Diesel Purification Plant)

## **Currently in use:**

- Pacific Missile Range Facility
  - Red Hill Underground Storage
-



# Hickam Fuel Annexes



## Kipapa:

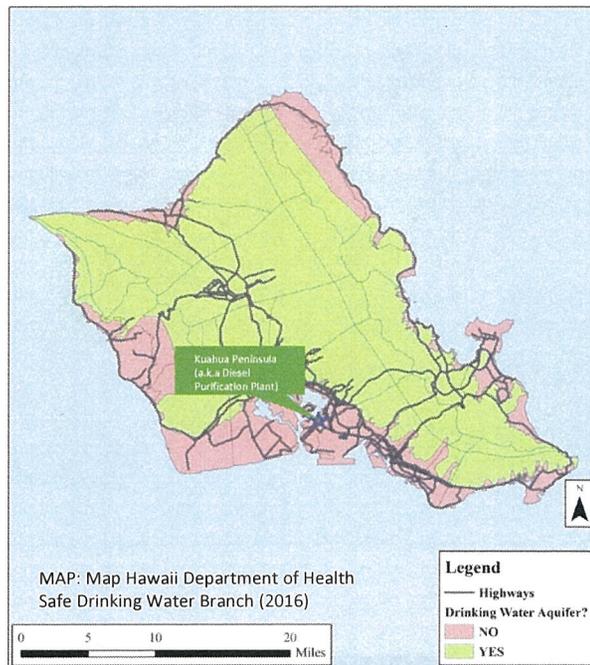
- Monitored natural attenuation enhanced with bioventing (currently shutdown)
- Annual groundwater monitoring annually

## Waikakalaua:

- A Record of Decision approved and signed by DOH on 19 Oct 2009 with a no further action decision



# Kuahua Peninsula (a.k.a Diesel Purification Plant)

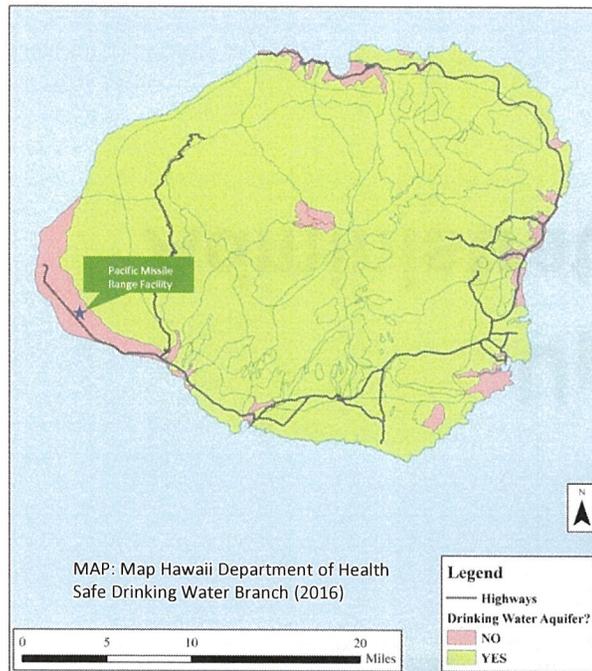


## Kuahua:

- Contract in progress to empty, clean, cap, and secure eight USTs and associated piping
- Area development plan includes removing the USTs and tank system, no timeline yet for the demolition



# Pacific Missile Range Facility



## PMRF:

- All tanks at PMRF currently in use continue to successfully pass monthly release detection evaluation
- Currently removing 4 tanks from service due to reduced requirement for operational storage at this time





# Red Hill Bulk Fuel Storage Facility

## **Navy Update on the Administrative Order on Consent (AOC)**

- Completed items since the last FTAC
- On-going Actions
- Targeted items for completion before the next FTAC



# Red Hill Bulk Fuel Storage Facility Update on AOC Actions

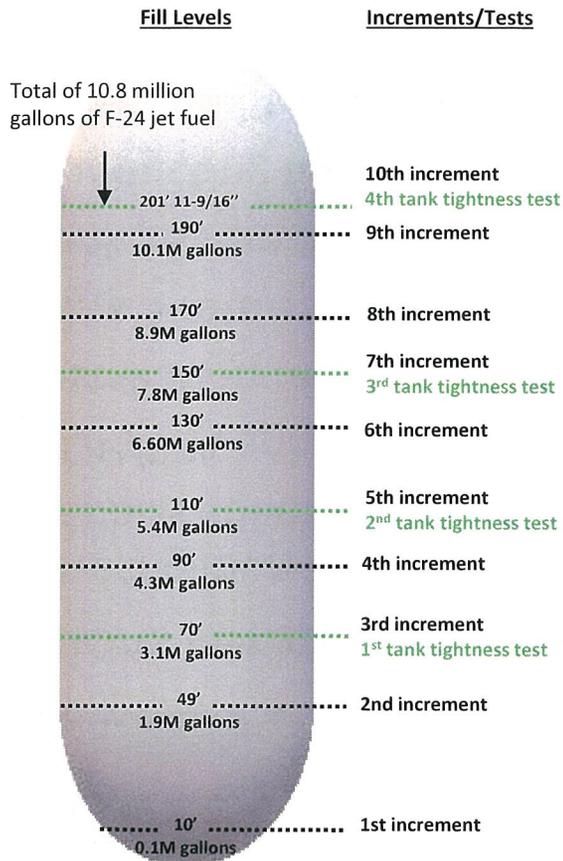
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## **Actions completed since last meeting:**

- Investigation & Remediation of Releases and Groundwater Flow Model Reports submitted to DOH/EPA (March 2020)
- DOH/EPA approved Destructive Testing Results Report (July 2020)
- Installation of three additional Red Hill Monitoring Wells
- **Tank 5 returned to service (May 2020)**
- Tank 18 removed from service for CIR program
- **Conducting feasibility study for secondary containment at Red Hill**
- **Partnership established with the University of Hawaii**



# Improved Fill Plan



- Tank 5 completed a rigorous Clean, Inspect, Repair (CIR) process.
- Since the tank was last filled, the Navy has improved quality control, the response plan, fill procedures, and has added layers of protection.
- The tank was gradually filled in 10 increments, grouped into four phases. Tank tightness tests were conducted in each of those four phases, as indicated in **green**.
- The tests independently confirmed the integrity of the tank using approved EPA methodology.
- As the tank was slowly filled, the amount of fuel was automatically measured to an accuracy of 1/16th inch (thickness of a nickel) to better track fuel levels.
- To verify the automatic measurements, manual measurements were taken at least every eight hours using equipment certified by the National Institute of Standards and Technology.
- HI Dept. of Health inspected the filling of Tank 5. No issues identified.



# Tank 5 Tank Tightness Test Results

Fuel System	Designation	Height <sup>1</sup> (Feet)	Capacity <sup>2</sup> (Gallons)	Test Product Height (Feet)	Certified MDLR (gph)	Test Date	Result
Red Hill Fuel Storage Complex	BFCUST 5	250	12,700,000	70.20	0.5	4 March - 9 March 2020	Pass
				110.08	0.5	19 March - 24 March 2020	Pass
				150.15	0.5	1 April - 6 April 2020	Pass
				201.88	0.5	15 April - 20 April 2020	Pass
Table Notes: 1. Tank height is rounded to the nearest foot. 2. Tank volume is rounded to the nearest hundred thousand gallons.							



# Secondary Containment Feasibility Study

## STAGE 1: Initial Specification and Feasibility Assessment

- Deliverables: Concept validation and development, membrane feasibility report, small scale model
- Award: Validation and development funded and awarded

## STAGE 2: Concept Design Development

- Deliverables: Special Area Design, constructability assessment, HAZID analysis, small scale model of developed dual membrane concept
- Award: SOW developed based on Stage 1 results
- Can expand Stage 2 SOW if funding is adequate

## STAGE 3: Design/Construction, Prototype Red Hill Secondary Containment

- Deliverables: One tank upgraded with secondary containment and in-service
- Federal Acquisition Regulation-based contract with company licensed for GTTNA technology





# UH-USN Partnership Initiatives



## Eleven Initiatives funded by ONR (\$1.9M)

### Applied Research Laboratory Effort

1. **Flexible Environmental Sensing System**
2. **Cybersecurity for Red Hill Data-Collection**
3. Advanced Data Analysis for Operational Awareness
4. **Graphical User Interface Dashboard**
5. Red Hill Movie and Mobile Application

### College of Engineering Effort

1. Ultrasonic, Infrared and Electromagnetic Tank Inspection
2. Inspect and Repair Protocols for Red Hill Bulk Fuel Storage Tanks (RHBFSST)
3. Mapping of RHBFSST Corrosion by Advanced Microscopic Methods
4. Concrete Degradation, Inspection and Retrofit
5. **Permanent-Magnet, Wall-Crawling Mobile Robot for Remote Inspection of Backside Corrosion of RHBFSST While Fuel-submerged**
6. **Microbial Degradation of Fuel Hydrocarbons in Subsurface for Early Detection of RHBFSST Releases**

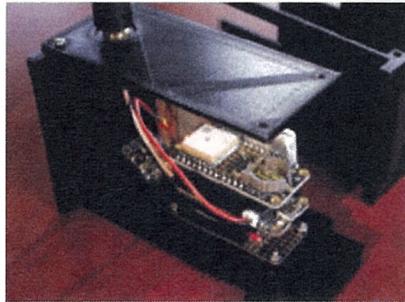
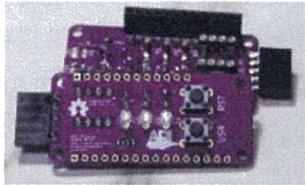
**Scheduled for completion by AUG 2021**



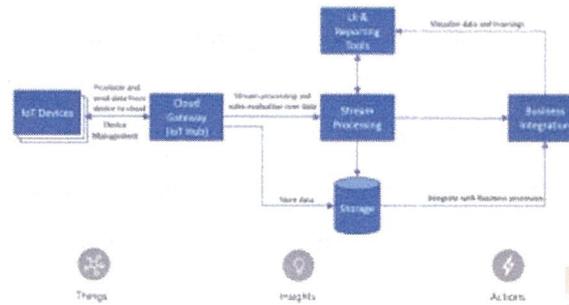
# UH-USN Partnership Initiatives



Flexible Environmental Sensing System

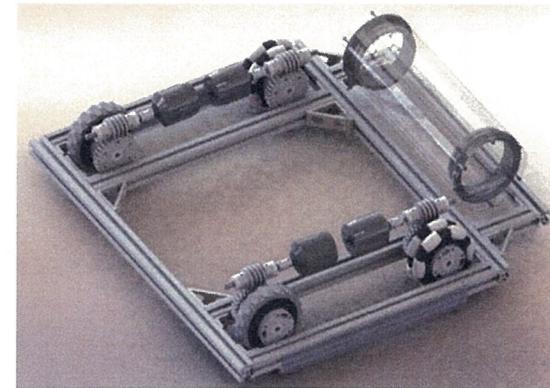
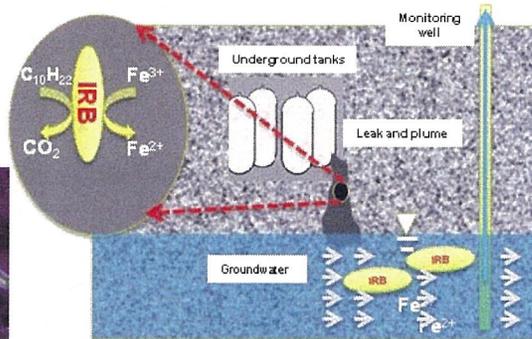


Cybersecurity CUI Enclave



Graphical User Interface Dashboard

Microbial Degradation of Fuel Hydrocarbons in Subsurface Soil



Wall-Crawling Robot for Remote Corrosion Inspection While Submerged



# Red Hill Bulk Fuel Storage Facility Update on AOC Actions

## Ongoing work:

- **Semi-annual Tank Tightness Testing**
- **Continuous Release Detection Equipment**
- Real Time Soil Vapor Monitoring Pilot Project
- Development of Need & Scope of Modified Corrosion & Metal Fatigue Practices
- **Installation of Red Hill Monitoring Well Nos. 01R, 16A and 17**
- Ongoing Groundwater Modeling Working Group Collaboration with BWS, UH, USGS, DOH, and EPA
- Quarterly Groundwater Monitoring
- Monthly Soil Vapor Monitoring
- Monthly Water Interface Testing
- **Annual Water Quality Reporting**
- Annual Split Sampling



# Drinking Water Remains Safe & Clean - Year after Year

"[W]e conducted tests for over 70 contaminants that have potential for being found in your drinking water.....In all cases, the levels measured met both EPA and State Requirements for **safe drinking water.**"  
 -Joint Base Pearl Harbor-Hickam Water June 2020 Water Quality Report

2020 Annual

## Water Quality Report Joint Base Pearl Harbor-Hickam Water System (Waiawa, Halawa & Red Hill Sources)



This report meets federal and state requirements for Consumer Confidence Reports. This report is updated annually and reflects monitoring data collected up to Dec. 31, 2019.

The Navy is pleased to provide you with this year's annual Water Quality Report for the Joint Base Pearl Harbor-Hickam Water System.

This pamphlet provides information about the water that has been delivered to you over the past year. It describes where your water comes from, what it contains, and how it compares to standards for safe drinking water.

Our goal is, and always has been, to provide you safe and dependable drinking water.

### Water Provider

The Naval Facilities Engineering Command (NAVFAC) Hawaii operates the water systems servicing your area. As the Navy water provider in the state, we primarily supply water to military installations and housing.

### Drinking Water Standards

The Environmental Protection Agency (EPA) and State of Hawaii regulations require us to test your water for contaminants on a regular basis, making sure it is safe to drink, and to report our results accordingly.

To ensure that tap water is safe to drink, EPA prescribes regulations which limit the amount of certain contaminants in water provided by public water systems. The Food and Drug Administration does the same for bottled water.

In the latest compliance monitoring period, we conducted tests for over 70 contaminants that have potential for being found in your drinking water. Tables 1, 2, 3, 4, 5, 6, 7, 8, 9, and 10 show the levels of concentrations of regulated contaminants found in your water. In all cases, the levels measured met both EPA and state requirements for safe drinking water. We are continually working to protect your drinking water from contaminants. The State of Hawaii's Department of Health completed the Source Water Assessment in 2004. This document identifies the susceptibility of your water supply to contamination. The source water assessment is available for review by contacting NAVFAC Hawaii Public Affairs, at 808-474-7300.

### Source of Water

Your drinking water comes from three ground water sources: Waiawa, Halawa, and Red Hill. Ground water is naturally filtered as it travels from the surface to the aquifer below ground. The water is pumped up from

the aquifer, disinfected, fluoridated, and piped into the distribution system.

For a limited time during 2019:

- The Redford Terrace Eastern Housing area was supplemented with water from the Honolulu Board of Water Supply's (BWS) Kalaheo Wells and Puanani Wells.
- The Waianua housing area was supplemented with water from the Honolulu Board of Water Supply's (BWS) Pearl City Shaft and Well 1.

### Possible Source of Contaminants

The sources of drinking water (both tap water and bottled water) include rivers, lakes, streams, ponds, reservoirs, springs and wells. As water travels over the surface of the land or through the ground, it dissolves naturally-occurring minerals. It can also pick up other substances resulting from the presence of animals or human activity. Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that the water poses a health risk.

More information about contaminants and potential health effects can be obtained by calling the EPA's Safe Drinking Water Hotline at 1-800-426-7276.

### Potential Contaminants

Contaminants that may be present in your source water include:

- Microbial contaminants** – such as viruses and bacteria, which may come from sewage treatment plants, septic systems, agricultural livestock operations, and wildlife.
- Inorganic contaminants** – such as salt and metals, which can be naturally-occurring or result from urban storm water runoff, industrial or domestic wastewater discharges, oil and gas production, mining, or farming.
- Pesticides and herbicides** – which may come from a variety of sources such as agriculture, urban storm water runoff, and residential use.
- Organic chemical contaminants** – including synthetic and volatile organic chemicals, which are by-products of industrial processes and petroleum production, and can also come from gas stations, urban storm water runoff, and septic systems.
- Radionuclide contaminants** – which can be naturally-occurring or be the result of oil and gas production and mining activities.
- Lead** – if present, elevated levels of lead can cause serious health problems, especially for pregnant women and young children. Lead

2020 ANNUAL

## WATER QUALITY REPORT

Federal and state law requires testing your drinking water for many different types of contaminants. This report contains test results showing your water is safe to drink and meets all federal and state requirements if a contaminant is not listed then it was not detected.



Federal and state law requires testing your drinking water for many different types of contaminants. Below is a complete list.

### Regulated Primary Contaminants

Achardide	2,4-D	Fecal coliform	Selenium
Alkaloid	Diuron	Fluoride	Sinigrin
Alpha emitters	Di (2-ethylhexyl)sebacate	Glycolate	Strychnine
Ammonia	Dibromochloropropane (DBCP)	Hexachloro Acid (HAA5)	Tetrachloroethylene (PCE)
Arsenic	n-Dichlorobenzene	Methylolac	Thallium
Atrazine (1-D isomer)	p-Dichlorobenzene	Hexachloro epoxide	Toluene
Barium	1,2-Dichloroethane	Hexachlorobenzene	Total coliform
Benzene	1,1-Dichloroethylene	Hexachlorocyclopentadiene	Total Trihalomethanes (THM5)
Benzophenone	1,2-Dichlorobutadiene	Lead	Total phosphorus
Beta-hydroxy emitters	Dichloromethane	Mercury (total)	2,4,6-Trichlorobenzene
Bromate	1,2-Dichloropropane (DCP)	Methoxychlor	1,1,1-Trichloroethane
Cadmium	Dieldrin	Nitrate (as N)	1,1,2-Trichloroethane
Carbaryl	Diazinon	Nitrite (as N)	Tetrachloroethylene (TCE)
Carbonyl sulfide	Di (2-ethylhexyl)phthalate	Organic phosphorus	1,2,3-Trichloropropane (TCP)
Chloroform	Diquat	PCBs	Turbidity
Chloride	Endosulfan	Pentachlorophenol	Uranium
Chlorobenzene	Endrin	Picloram	Vinyl chloride
Chromium (total)	Ethionon	Polycyclic aromatic hydrocarbons	Xylenes (total)
Copper	Ethylene dibromide (EDB)	Benzimidazole	
Cyanide		Radium 226 + 228	

### Unregulated Contaminants

Atrazine	Chlorine	rsdndv	Sodium
Bromoform	Chloroacetic acid	HAAS	Selenium
1,1-Dichloroethane	Chromium, hexavalent	Madagascar	Vanadium
Chloride	Dieldrin	Methyl tert-butyl ether (MTBE)	

**Measurements** In this report, one part per million (ppm) is the same as one milligram of the substance in one liter of water (mg/L). To put this into perspective, one part per million is approximately one second in 11.3 days. One part per billion (ppb) is even smaller - about 1 second in 11.7 years.

"The water serving Halawa Shaft and Moanalua Wells has been tested and meets all Federal and State standards."

\* Board of Water Supply 2020 Water Quality Report



# Red Hill Bulk Fuel Storage Facility Update on AOC Actions

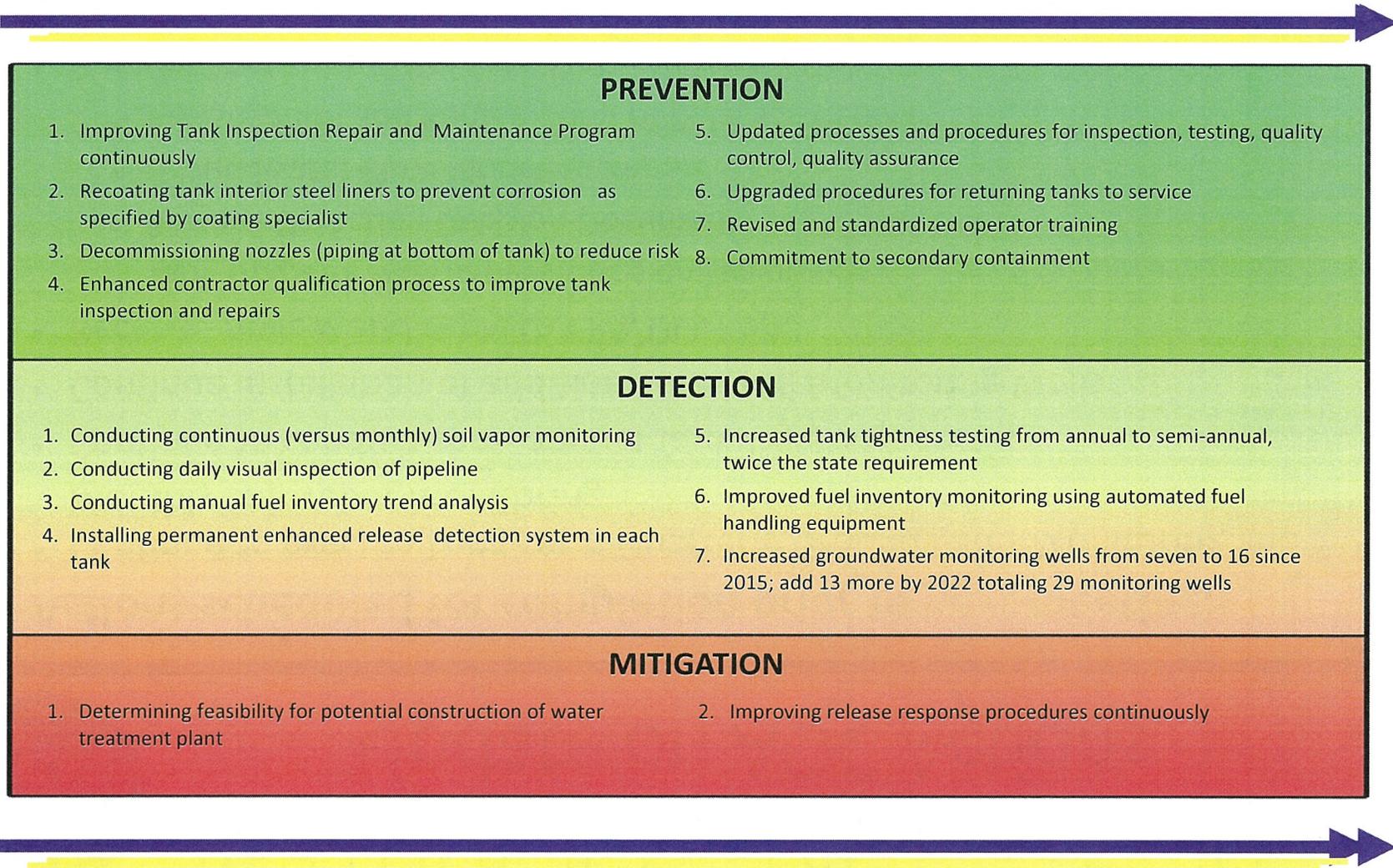
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## **Actions scheduled for completion prior to next meeting:**

- Continue to execute Long-term Quarterly Groundwater Monitoring and Monthly Soil Vapor Monitoring
- Continue to conduct semi-annual Tank Tightness Testing
- Continue installation of additional Red Hill Monitoring Wells
- Receive, review and reply to EPA/DOH on:
  - Tank Upgrade Alternatives Decision Document
  - Release Detection Decision Document
  - Groundwater Flow Modeling Report
  - Investigation and Remediation of Releases Report
- Pursue Continuous Release Detection and Continuous Soil Vapor Monitoring
- Submit and obtain approval from EPA/DOH of:
  - SOW for Modified Corrosion and Metal Fatigue Practices
  - SOW for Phase 2 Risk and Vulnerability Assessment

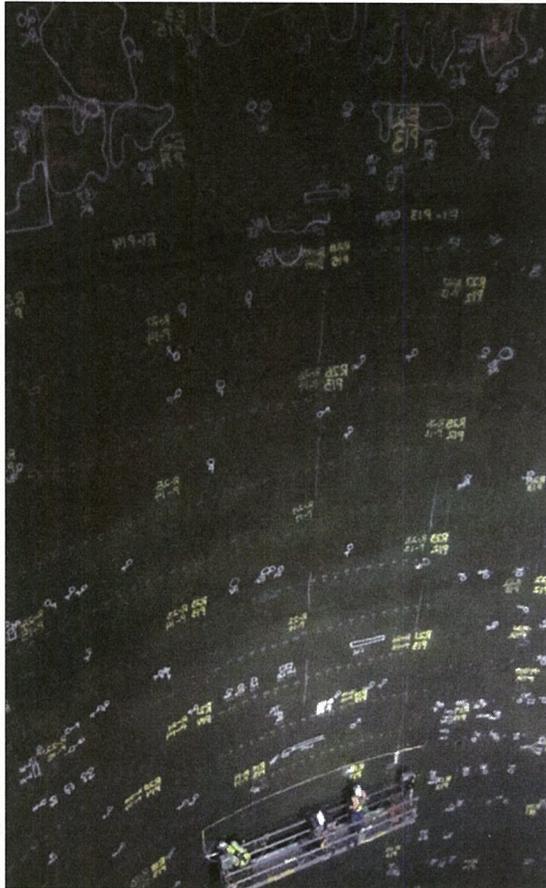


# Layers of Protection





# Red Hill Bulk Fuel Storage Facility Clean, Inspect and Repair Status



## The Regulatory Agencies approved the Tank Inspection Repair and Maintenance (TIRM) Process for Red Hill

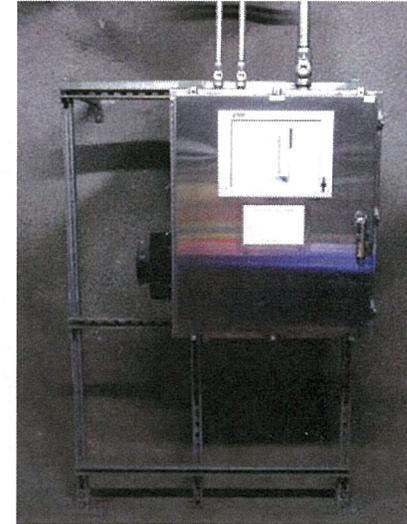
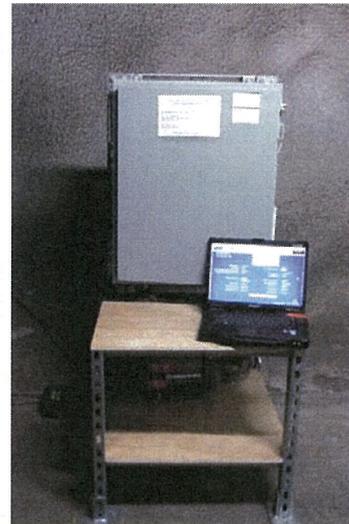
- Detailed marking of a tank allows for a more precise/thorough inspection. This results in higher quality control and quality assurance.
- This state-of-the-art technology identifies the difference between:
  - Aesthetics – dents, etc. (non-actionable)
  - Defects – welds, pits, etc. (actionable)
  - Corrosion – depending on plate thickness (actionable/non-actionable)
  - Redundancy – redundant measures in place
- The filling sequence has been refined to better detect problems (i.e. 4 TTT rather than just one at the end)

LAYER OF PROTECTION - PREVENTION



# Release Detection

- Leak Detection Systems (LDS) are certified by the National Working Group for Leak Detection
- Currently tank tightness testing is achieved at Red Hill via a service contract.
- Since 2009 when tank tightness testing began, every tank in service has been tested and successfully passed tank tightness testing.
- In 2018, tank tightness testing increased frequency to semi-annual.
- Red Hill tank tightness testing is independent of the automated fuel handling equipment currently monitoring levels in each tank in service
- The Navy plans to permanently install LDS equipment which will allow tank tightness testing to occur on demand, should there be any indirect indications of a potential release



LAYER OF PROTECTION - DETECTION



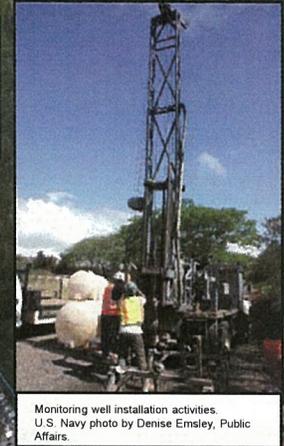
# Red Hill Groundwater Monitoring Network

## RED HILL GROUNDWATER MONITORING NETWORK:

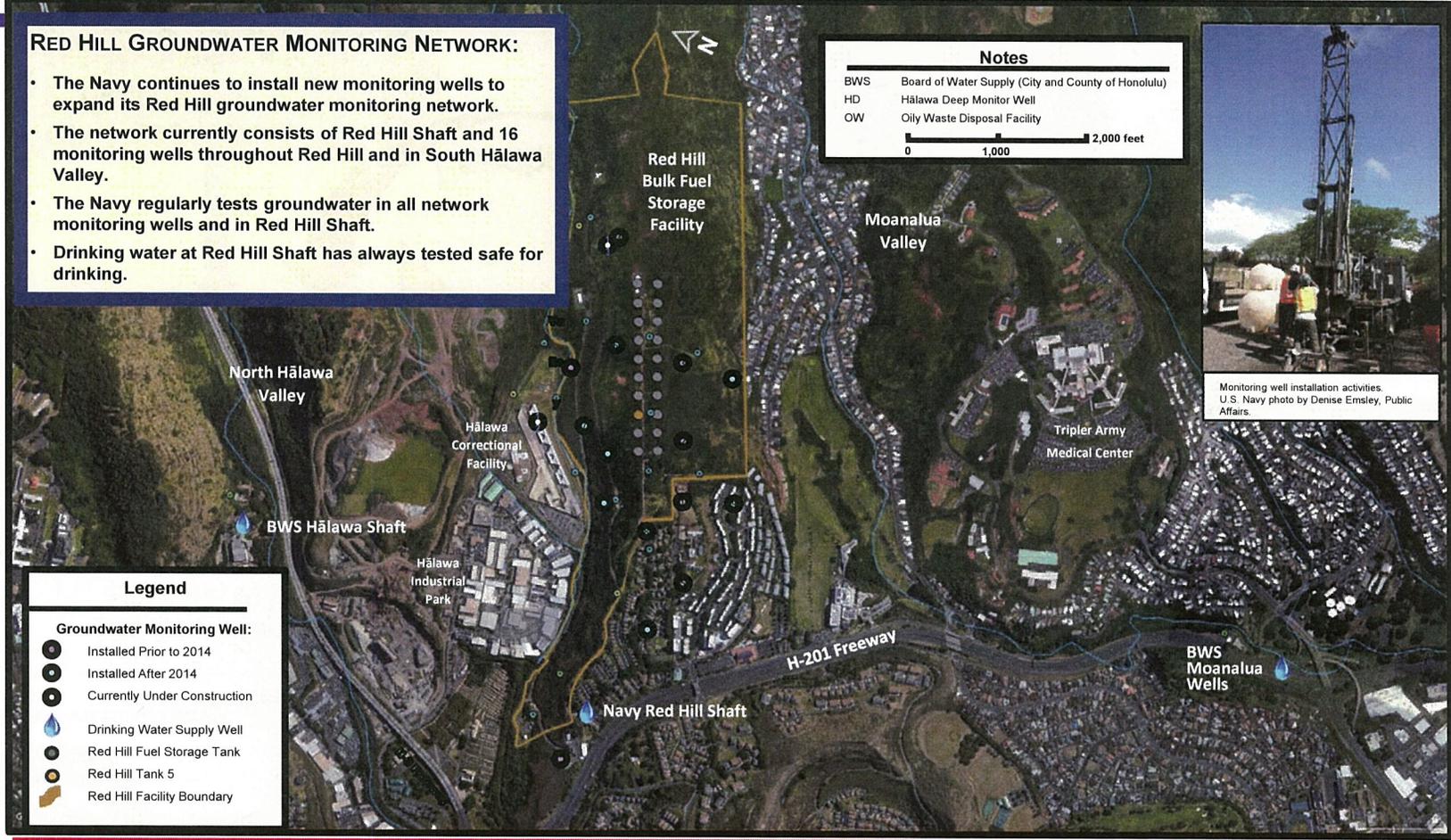
- The Navy continues to install new monitoring wells to expand its Red Hill groundwater monitoring network.
- The network currently consists of Red Hill Shaft and 16 monitoring wells throughout Red Hill and in South Hālawā Valley.
- The Navy regularly tests groundwater in all network monitoring wells and in Red Hill Shaft.
- Drinking water at Red Hill Shaft has always tested safe for drinking.

Notes	
BWS	Board of Water Supply (City and County of Honolulu)
HD	Hālawā Deep Monitor Well
OW	Oil Waste Disposal Facility

0 1,000 2,000 feet



Monitoring well installation activities.  
U.S. Navy photo by Denise Emsley, Public Affairs.

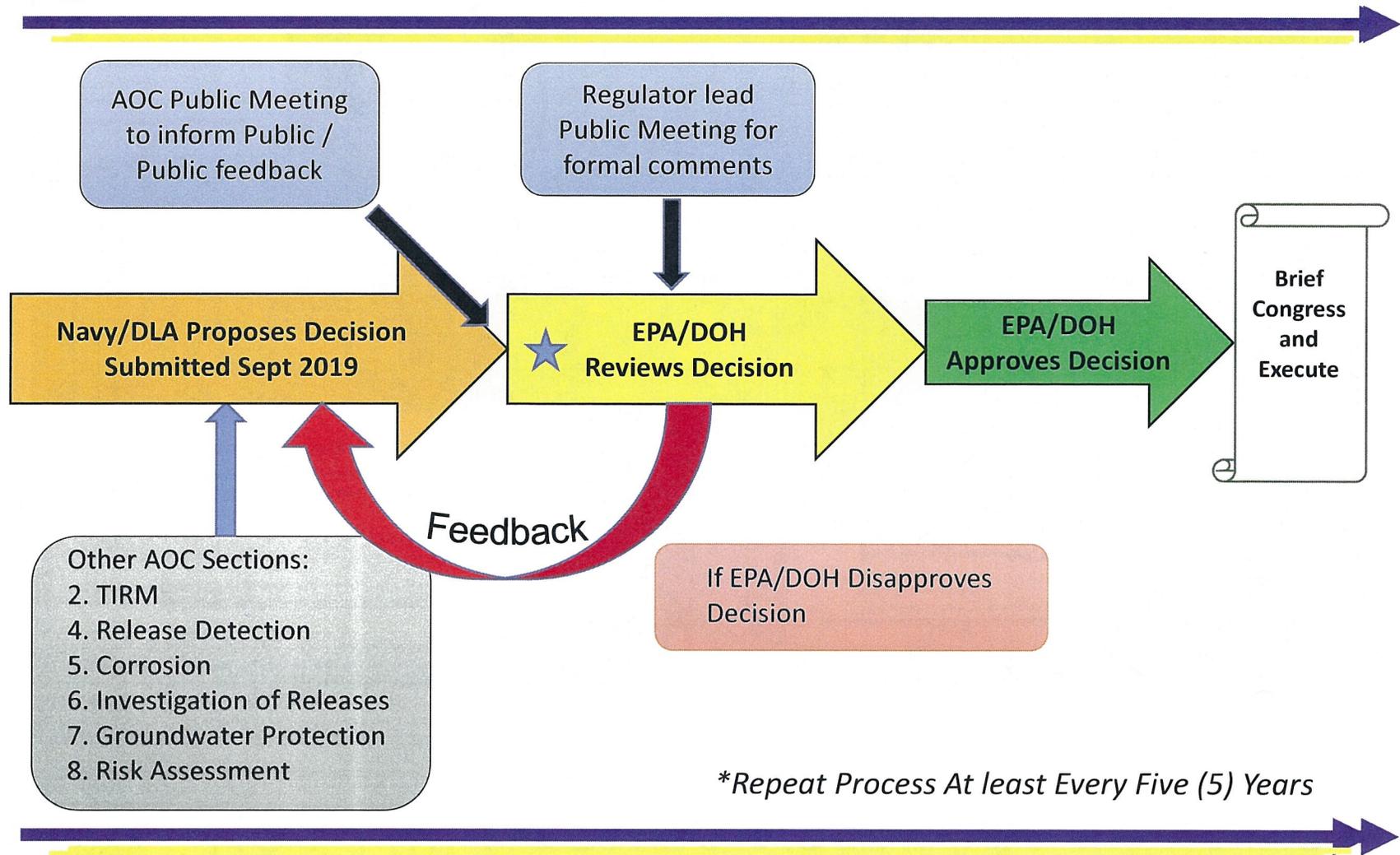


Legend	
<b>Groundwater Monitoring Well:</b>	
	Installed Prior to 2014
	Installed After 2014
	Currently Under Construction
	Drinking Water Supply Well
	Red Hill Fuel Storage Tank
	Red Hill Tank 5
	Red Hill Facility Boundary

LAYER OF PROTECTION – DETECTION-MITIGATION



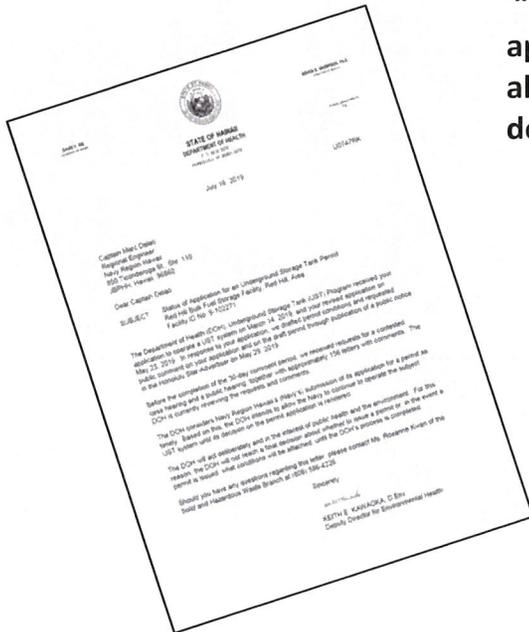
# Decision Process



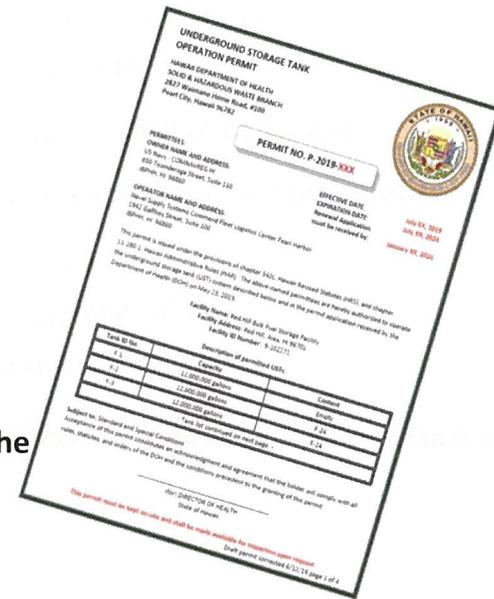


# Permit Status

**“The DOH considers Navy Region Hawaii’s (Navy’s) submission of its application for a permit as timely. Based on this, the DOH intends to allow the Navy to continue to operate the subject UST system until its decision on the permit application is rendered.”**

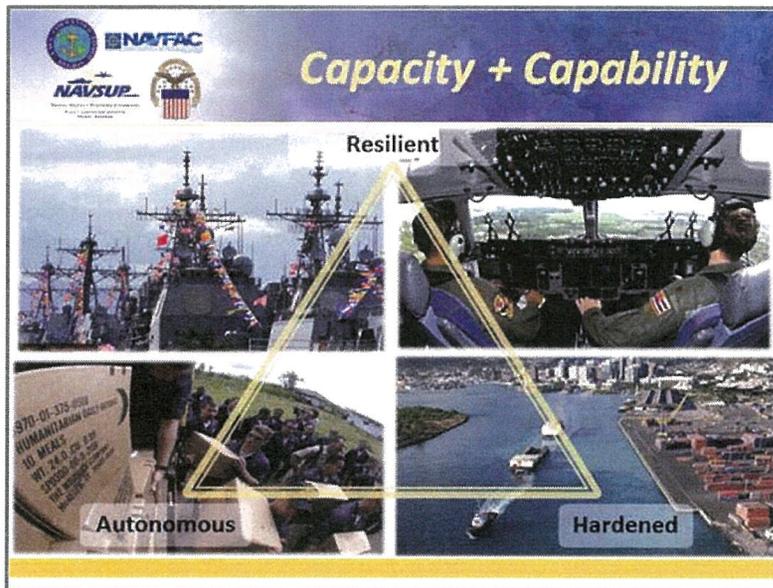


**“Perform semi-annual tank tightness testing ...in accordance with the description provided under the heading “Tanks – Release Detection” ... of the permit application received by DOH on May 23, 2019 for any and all tanks storing product.”**





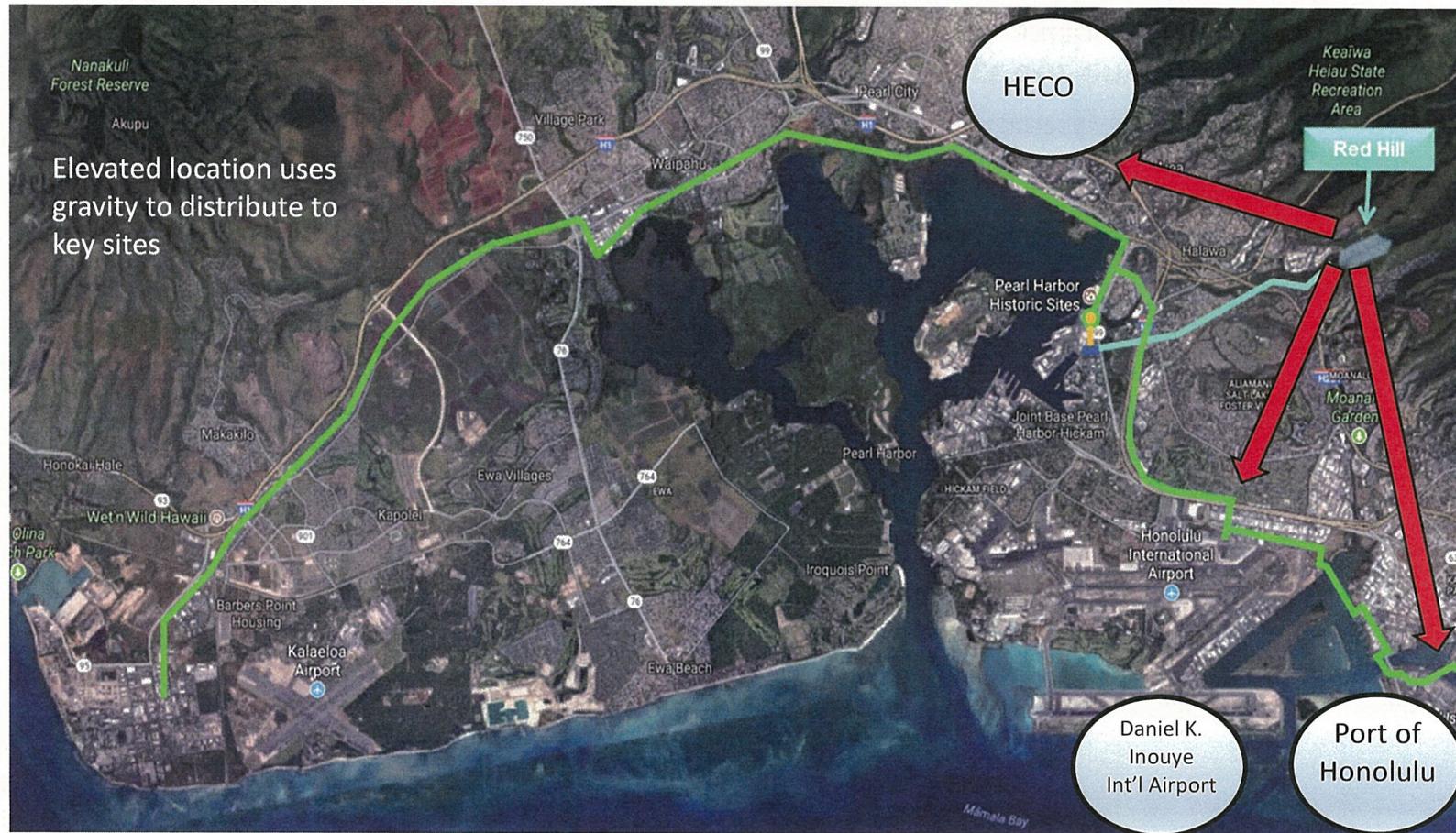
# Summary



- Investments to protect drinking water
  - \$203M since AOC was signed
  - \$470M through FY25
- Navy moving forward with Secondary Containment
- Navy's partnership with University of Hawaii
- Water continues to be safe to drink
  - Routine water sampling/testing
- Tanks continue to pass semi-annual tank tightness tests
- AOC is working
  - Navy/DLA is accountable to EPA and the State of Hawaii
  - Navy/DLA meeting all AOC deadlines
- TUA and Release Detection Decision Document submitted September 2019
- Red Hill fuel is critical to National Security and the people of Hawaii

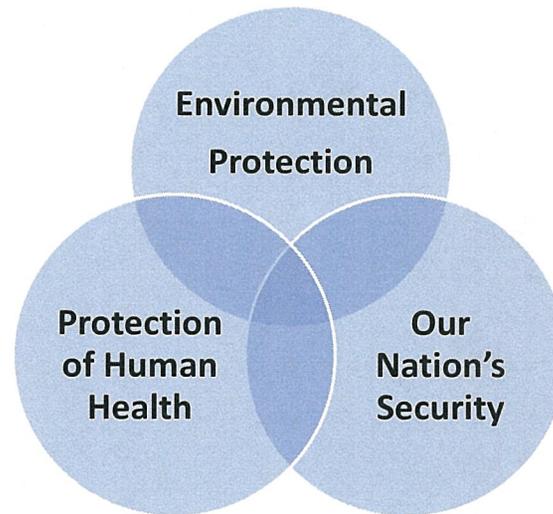


# Fuel Source During Blackout





# And Finally.....



The Navy is taking significant actions to protect our environment, our nation's security, and human health

***The final Tank Upgrade Alternative Decision accomplishes all three of these important goals***



**Mahalo**

**Questions?**

