**Subgroup Combined Report -- 11-26-2014**

**REPORT TO THE TWENTY-EIGHTH LEGISLATURE**

**STATE OF HAWAII**

**2015**

**PURSUANT TO SENATE CONCURRENT RESOLUTION 73**

**REQUESTING THE DEPARTMENT OF HEALTH**

**TO CONVENE A TASK FORCE**

**TO STUDY THE EFFECTS OF THE JANUARY 2014 FUEL TANK LEAK AT**

**THE RED HILL FUEL STORAGE FACILITY**

**PREPARED BY:**

**STATE OF HAWAII**

**RED HILL FUEL STORAGE FACILITY TASK FORCE**

**DECEMBER 2014**

**Introduction**

On April 24, 2014, the Hawaii State Legislature adopted Senate Concurrent Resolution (SCR) 73 which requested the Director of Health to convene a Task Force to study the effects of the January 2014 fuel tank leak at the Red Hill Fuel Storage Facility and submit a report of the Task Force’s findings and recommendations, including any proposed legislation, to the Legislature no later than 20 days prior to the convening of the Regular Session of 2015.

1. Short-term and long-term effects of the leak at the Red Hill Fuel Storage Facility, including effects relating to the health of residents, safe drinking water, and the environment,
2. Response strategies to mitigate the effects of future leaks at the Red Hill Fuel Storage Facility,
3. Ways to improve communication between the United States Navy, the State, and the public in the event of future leaks at the Red Hill Fuel Storage Facility; and
4. Implications of closing the Red Hill Fuel Storage Facility.

State of Hawaii Department of Health (DOH), the United States Environmental Protection Agency (EPA), the United States Navy (Navy), one member from the State House of Representatives, one member from the State Senate, the Department of Land and Natural Resources, the BWS, and two members from the community. Appendix A contains a list of all the Task Force participants and alternates.

The Red Hill Fuel Storage Facility (Facility) is the state’s largest field constructed underground storage tank (UST) complex, located in the south-central portion of the Island of Oahu, Hawaii. It is owned and operated by the United States Navy.

The facility contains twenty (20) cylindrical tanks, 250 feet high and 100 feet in diameter. Eighteen (18) are active and operational, and two (2) are presently out of use. Each tank is able to store up to 12.5 million gallons of fuel. The Facility is located 100 feet above a major groundwater aquifier, which is also used as a source of drinking water. Of the 18 operational tanks, three (3) are empty awaiting various stages of a repair cycle. The remaining fifteen (15) tanks are in use, storing over 180 million gallons of fuel.

After 2005, seven (7) groundwater monitoring wells (RHMW01-RHMW05, RH2254-01 and OWDFMW1) were installed to detect contamination into the groundwater. Upon determination that RH2254-01 (Red Hill Shaft) was also the Navy’s Drinking Water Well, drinking water parameters were added to the groundwater list of constituents to be sampled. Refer to **Diagram 1** for the locations of all wells. Outside the confines of the Facility are five (5) drinking water wells that are maintained by the Honolulu Board of Water Supply. Only Halawa Shaft is shown in Diagram 1. In this report, there is a distinction made between drinking water samples from the Navy’s drinking water well, RH2254-01 and the BWS wells, which are separate from groundwater samples taken at RHMW01-RHMW05 and OWDFMW1.

**January 13, 2014 release from Tank No. 5**

A suspected fuel release was discovered and verbally reported to DOH on January 13, 2014. Immediately after the release was detected, the Navy began draining the contents of Tank 5 and collected soil vapor samples from existing vapor monitoring points and groundwater samples from the existing monitoring wells. taken in and around Tank 5, a spike inThe elevated groundwater samples came from groundwater monitor well 2 (RHMW02) which is the closest monitor well to Tank 5.

In consultation with the EPA and DOH, the Navy is investigating the cause of the reported release from Tank 5 and whether any free product is present outside the tank liner, the concrete surrounding the tank, or in the adjacent basalt rock. In the event that free product is detected, the Navy will remove it to the maximum extent practicable.

Following the reported release, drinking water samples were collected at an increased frequency from the Navy’s Drinking Water Well (2254-01 Red Hill Shaft) and the Honolulu Board of Water Supply (BWS) Halawa Shaft, Halawa Wells, Aiea Wells, Aiea Gulch Wells and Moanalua Wells. Test results for of the BWS wells were non-detect for petroleum constituents, while the Navy drinking water wells showed detections but all under DOH Environmental Action Levels (EALs). Laboratory analytical results showed that the water was within applicable safe drinking water standards.

In 2008, the Navy developed and implemented a Groundwater Protection Plan, which the DOH approved. The plan was updated in 2009 and 2014. In the 2009 update of this plan, there was a finding of a potential northwesterly flow toward the Board of Water Supply’s Halawa Shaft Pumping Station which supplies water to urban Honolulu. The existing Groundwater Flow Model and Contaminant Transport Analysis will also be updated and incorporated into the Groundwater Protection Plan.

Separate from the Task Force activities, DOH, EPA, and Navy continue to work together on a negotiated agreement to assess the reported release of petroleum and minimize the threat of future releases.

**Senate Concurrent Resolution 73 & Red Hill Task Force**

Meetings were held on September 3, October 7, November 6 and December 11, 2014 to discuss the effects of the January 2014 release, results of on-going Navy investigations on the tank leak, Navy response actions since the leak was discovered and recommendations for improving operations to ensure protection of Hawaii’s drinking water. These included regulatory requirements, facility improvements and improved communication to the public. Two additional subgroup meetings were held on November 17 and November 26, 2014. Materials from the four Task Force meetings, and the two subgroup meetings, including attendance lists, minutes and other supportive materials are posted online at: <http://health.hawaii.gov/shwb/underground-storage-tanks/>.

This report contains the Task Force’s findings and recommendations for each of the review topics in accord with SCR 73*. (NOTE:**Because the EPA and the Navy are federal agencies, they are unable to provide recommendations for state legislation. All recommendations for legislation are from DOH, BWS, the two members of the Legislature and the public.)*

**Findings and Recommendations**

1. **Short-Term and Long-Term Effects of the leak at the Red Hill Fuel Storage Facility including effects relating to the health of residents, safe drinking water, and the environment**

**Finding of Facts**

Short-term effects

After the January release, increased groundwater and soil vapor monitoring indicated contamination in the environment outside of Tank 5. Groundwater monitoring in RHMW02, located near tank 5, showed an increase in total petroleum hydrocarbons diesel (TPH(d)) of up to 5000 ppb, 500 ppb higher than the site specific risk based EAL approved by DOH, and upwards of 50 times DOH EAL (5,000 ppb compared to EAL of 100 ppb). During the same period, soil vapor results increased from 794 ppbv to 204,000 ppbv (parts per billion by volume) under Tank 5. There were also increases in soil vapor in the tanks closest to Tank 5. Refer to **Appendix B** for DOH’s summary of the groundwater results at the Facility and soil vapor monitoring analysis from Tank 5 in the past and following the release. Refer to **Appendix C** for the Navy’s current monitoring plan and an explanation of EALs and Site Specific Risk Based Levels (SSRBLs).

The Navy’s sampling and analysis indicated that the increases of soil vapor volatile organic compound (VOC) concentrations beneath Tank 5 and nearby tanks may be attributed to the release of JP-8 from Tank 5 in January 2014. According to the Navy, results of groundwater sampling and analysis indicate the release of JP-8 from Tank 5 has had limited impact on the underlying groundwater and has not impacted any drinking water source. However, there has been detection of low levels of various petroleum chemicals in the RH2254-01 (Red Hill Shaft).

Drinking water samples were collected from the 5 BWS drinking water sources and the regulatory drinking water distribution point for Navy Drinking Water Well RH2254-01. Results from the 5 BWS water sources were non-detect for petroleum contamination. The Navy well, RH2254-0, showed detections but all results were under EALs. Analytical results from the drinking water samples data were within applicable safe drinking water standards or below any MCLs. Refer to **Table 1 of Appendix B** for a comparison table. Note, there is no drinking water standard for Total Petroleum Hydrocarbons as diesel (TPH(d)) and naphthalene.

The Task Force finds that the BWS and the Navy have undertaken significant efforts to assess the effects of the reported fuel leak on the environment and to protect drinking water resources. The Task Force acknowledges that the BWS has accelerated sampling at nearby drinking water sources. In addition, the Navy has performed extensive sampling and analysis of the groundwater, drinking water, and soil vapor at or near the Red Hill Fuel Storage Facility. The Navy has reported that their drinking water source remains safe. The BWS has reported that 5 BWS drinking water wells in close proximity to Red Hill to date show no detections of petroleum chemical contaminants.

Long-term effects

According to the most recent groundwater monitoring results dated, July, 21, 2014, levels of TPH(d) still persist in the groundwater beneath Tank 5, above DOH Environmental Action Levels (EALs), but are below the site specific risk based level approved by DOH. The monthly soil vapor results also remain elevated in the range of 100,000 – 200,000 ppbv in the latest report dated September 25, 2014. However, soil vapor results remain below the site specific risk based level of 280,000 ppbv approved by DOH. Refer to **Appendix B** for a more detailed narrative by DOH and **Appendix C** for the current monitoring plan and an explanation of EALs and SSRBLs by the Navy. Additional cumulative groundwater sampling results are posted online at: <http://health.hawaii.gov/shwb/underground-storage-tanks/>.

BWS will continue periodic monitoring of its drinking water sources for petroleum contamination. The Navy will also continue periodic monitoring of the groundwater, drinking water, and soil vapor at the Red Hill Fuel Storage Facility, in accordance with the Groundwater Protection Plan. The Task Force expects the BWS and the Navy to continue providing reports on those efforts to the DOH and the EPA. The reports are available to the public from the DOH.

**DOH and BWS Recommendations**

* Navy must comply with state requirements for investigation of release points within Tank 5 and characterization and delineation of contamination released, including free product removal to “the maximum extent practicable”. The Navy has taken steps to determine where free product, if any, may be located. To date no free product has been found. The Navy is continuing efforts to investigate and recover retrievable free product.
* Request Navy to continue to provide to DOH all water quality data collected at the Facility by monitoring well location and contaminant.
* Continue groundwater modeling studies by the Navy and the BWS. The studies are critical to understanding the rate and direction of groundwater movement in the area to assess potential impacts to neighboring potable water wells. The studies will also complement groundwater monitoring well contaminant data collection to assess the overall condition of the aquifer.
* Navy to drill and install additional groundwater monitoring wells north and south of the facility to enable the collection of groundwater data and provide information for the updated area-wide groundwater modeling. This will increase and improve the scientific understanding of the present and long-term quality and condition of the aquifer beneath the Red Hill tanks and beyond its boundaries. Select sites for additional monitoring wells after sampling results are obtained from the two monitoring wells installed in September and October 2014. Obtain relative groundwater elevation data in the Halawa/Red Hill/Moanalua area for proper characterization.
* Devise a financial mechanism in which the Department of Health, the Honolulu Board of Water Supply, and the U.S. EPA may be reimbursed for site investigation activities needed to initiate (e.g. installation of additional monitoring wells, any increased groundwater and drinking water sampling, and any water treatment to remove contamination) within the area, to ensure that contamination is not migrating from the Red Hill facility into neighboring drinking water pump stations.
* Strengthen Hawaii’s groundwater protection program by increasing surveillance and identification of potentially contaminating activities from other field constructed tanks to protect and mitigate impacts to groundwater aquifers.
* Navy and Department of Health, Safe Drinking Water Branch should monitor the drinking water by collecting and testing duplicate samples for the parameters identified in the existing groundwater and drinking water sampling schedules and others identified by the Honolulu Board of Water Supply. The results should be shared with all interested parties to assure that all Quality Assurance/Quality Control procedures were followed.
* Navy should mitigate existing contamination beneath the tanks starting with the area adjacent to Red Hill groundwater monitoring well RHMW02 to contain and prevent contamination from extending beyond the current location (e.g. active remedial activities like pump and treat).
* Navy should consider developing a system to continuously monitor the soil vapor probes as a form of leak detection, with alarm set points to alert operator(s) of organic vapors rising above pre-determined concentrations.

**Further recommendations by BWS**

1. Graph the Navy monitor well data and *analyze for water quality data trends, correlation with past fuel releases, interrelationships between wells and groundwater flow*.

Reason:

Graphing data provides a pictorial view of trends over time. Comparing the data with other information is standard scientific practice in conducting a thorough analysis of the information collected. The comparisons can show any correlations between data points when compared with past fuel releases and contaminant presence at other monitor wells. All of this data analysis enables a better understanding of the “**short and long term effects of the leak**”.

1. *Fund and conduct a health effects study* to assess the health significance of low level concentrations of petroleum chemicals in ground water and sources of drinking water.

Reason:

A health effects study will provide scientific data to understand the **“effects relating to the health of residents, safe drinking water, and the environment”** and is responsive to the Task Force’s charge under SCR 73.

1. *Conduct a scientific peer review and evaluation of the sampling and test methods and detection limits* used by the Navy to *develop a uniform monitoring protocol*.

Reason:

Understanding the short and long term effects of Red Hill leaks needs reliable peer-reviewed and vetted scientific data in order to accurately understand the issues and make sound decisions on those issues. Professional scientific peer-review and auditing is standard practice in all good testing and research studies undertaken to insure data validity, quality and transparency.

**Navy Recommendations and Opinions:**

The need for additional ground water monitoring wells should be evaluated based on results of scientific analysis, contaminant fate and transport modeling, ground water modeling, and geological studies. Siting of any additional wells should be based on science.

The Navy will continue to ensure the safety of the water supply through implementation of the Groundwater Protection Plan approved by DOH. That plan will be updated as additional information becomes available. Because the Navy currently satisfies all statutory and regulatory monitoring requirements through EPA certified laboratories, redundant sampling and analysis by DOH, EPA and BWS is not needed, so no additional funding mechanism is necessary.

The Navy is actively investigating for the presence of free product and will remove free product to the maximum extent practicable. The Navy will continue soil vapor and ground water monitoring in accordance with the approved Ground Water Protection Plan.

1. **Response strategies to mitigate the effects of future leaks at the Red Hill Underground Fuel Storage Facility**

**Finding of Facts**

REGULAR MAINTENANCE

The Red Hill facility consists of field constructed USTs that are currently deferred from federal and state UST regulations that require other regulated non-field constructed USTs to have secondary containment for all new tanks and piping. It also requires corrosion protection and leak detection for all existing tanks and piping.

The Navy performs periodic inspection of all petroleum, oil, and lubricant tanks and pipelines to ensure that the Red Hill Bulk Fuel Storage Tank system is properly maintained. Other protective measures include a Mass Technology Measurement System used by the Navy to assess tank tightness for all active Red Hill tanks. The tank tightness testing is performed every two years. In addition, the Navy employs an Automated Fuel Handling System to detect unscheduled fuel movements which alerts the operators of any potential fuel loss. Inventory levels are also assessed on a regular basis for trends that might reveal any potential fuel losses. Soil vapor monitoring equipment is also installed at the Facility to monitor hydrocarbon levels in the subsurface.

Recent maintenance cycles performed on tanks within Red Hill utilize a modified American Petroleum Institute (API) 653 procedure for determining integrity of steel plates and welds. According to the Navy, the goal of tank maintenance is to have at least 0.1 inches of steel plate remaining at the end of a 20 year operational cycle. The Navy reported up to 600+ sites where tank thickness did not meet the appropriate standards. The required thickness was restored through additional weld patch plating within Tank 5 during its maintenance cycle that ended December 2013.

SECONDARY CONTAINMENT EVALUATION

All current methods of release detection that the Navy implements at the Facility are reactionary. There is no ‘alarm’ until contamination has entered the environment. Secondary containment would capture fuel released from the inner wall into an interstitial space and alert Navy operators of releases.

At the October 7, 2014 Task Force meeting, the Navy stated the importance of the Facility and its need to continually maintain the capacity at Red Hill to support its fuel needs. The Task Force finds that the Navy plans to study secondary containment options and advanced leak detection technologies in collaboration with the DOH and EPA.

SITE ASSESSMENT & CONTINGENCY PLANS

In continuing efforts to monitor the groundwater for contamination and to better assess the fate-transport model, the six (6) groundwater monitoring wells that were previously installed in and around the Facility will continued to be monitored on a regular basis, as well as the Navy’s one drinking water well and the multiple drinking water wells maintained by the BWS. Subsequent to the January 2014 release, the Navy, in coordination with the DOH and EPA, installed two additional groundwater monitoring wells in October 2014 (RHMW06 and RHMW07). Sampling results will be submitted to the BWS and to DOH, which in turn, will make the data available to the public.

The Task Force is in agreement that two additional wells is a start, but that more wells are necessary to adequately determine groundwater hydrology and support fate and transport models. **Diagram 1** maps the location of the existing wells and the two new wells recently installed.

The Task Force recognizes that the Navy has developed contingency plans to address potential future release. These plans are detailed in the Navy’s Integrated Contingency Plan and Red Hill Storage Facility Groundwater Protection Plan (2008). In coordination with DOH and EPA, the Navy will periodically review and update these plans and will take responsible actions consistent with the plans, if necessary.

**DOH and BWS Recommendations**

* BWS and the public to support proposed EPA regulatory changes to cancel the deferral of field constructed USTs from 40 CFR Parts 280 and 281.
* The Legislature to issue resolution to encourage Navy to consider enhanced containment and improved leak detection at Red Hill.
* DOH to amend the State’s UST regulations to require secondary containment and leak detection for field constructed USTs.

**Navy Recommendations and Opinions**

The Navy will continue a service life extension program for the 12 remaining tanks.

Navy will explore additional containment protection solutions and implement when feasible and affordable.

**Department of Land and Natural Resources Recommendations**

* Provide an update on the wells which have been surveyed by US Geological Survey.
* Provide the date of distribution of the final USGS survey data.
* To effectively monitor the groundwater beneath a facility as large as Red Hill, with the complexities inherent in the fractured and porous basalts that underlie the facility, monitoring wells must be placed based upon a careful and thorough evaluation of the groundwater flow regime under and around the facility.  Groundwater modeling will provide some insight and flow direction predictions, however, modeling and any other groundwater flow evaluation is dependent upon accurate water level data collected from monitoring wells with screened casings across the water table, and in locations that allow flow directions to be calculated.  The linear locations of wells RH MW01, 02, 03, and 05, along the ridge, are too linear and too closely spaced to evaluate groundwater gradients.
* At this time, the CWRM recommends that two additional monitoring wells be installed and sampled: one monitoring well on the south side of the Facility (e.g. near the west end of Ala Iolani Street), and one monitoring well on Icarus Way, west/northwest of RHMW01, near the entrance of the upper tunnel. These new wells, and all others associated with the Facility, should be surveyed to a common benchmark. A water level survey of all wells should then be conducted. Based on upon water levels, and sampling results, groundwater gradient/flow direction can be evaluated, and then if needed, additional monitoring well(s) can be installed and sampled.

**Further recommendations by BWS**

1. Revise the DOH UST leak response requirements to specify the Resource Conservation and Recovery Act (RCRA) methodology for characterizing the nature and extent of contamination.

Reason:

The RCRA site characterization approach is a comprehensive data collection method for producing a clear understanding of the current contamination problem and its extent in the environment. From there targeted measures can be developed to mitigate the situation that can lead to developing strategies to mitigate the effects of future leaks at Red Hill.

The major elements of the RCRA methodology are:

* Identify and determine the velocity of contaminant movement in the groundwater (saturated zone), amounts present, factors influencing plume movement and extrapolation of future movement (modeling)
* Examine the contamination in vadose zone (unsaturated zone), amounts present, factors influencing plume movement and extrapolation of future movement (modeling)
* Employ contaminant characterization presentation tools to create three-dimensional data plots to show lateral and vertical extent of contaminant plumes
* Examine impacts to potential receptors such as potentially affected human populations, environmental systems, ecology, biota and endangered/threatened species.

1. Release and use EPA Drinking Water State Revolving Fund (DWSRF) set-aside grants to fund the drilling and installation of additional monitor wells in the Red Hill area.

Reason:

The use of DWSRF set asides describes a specific funding source and strategy to mitigate the effects of future leaks at Red Hill. The installation of additional sentinel wells provides long range surveillance and advance planning information to mitigate the effects of past and future leaks. The number of additional monitor wells to drill should be based on sound science data generated through the RCRA site characterization process.

The Board of Water Supply believe the Hawaii State Legislature will expect the Taskforce’s report to contain specific targeted action steps, strategies and recommendations that are based on sound science and the most state-of-the-art technical approaches for characterizing and mitigating the short and long term effects of leaking Red Hill underground fuel tanks.

1. **Improve communications between the United States Navy, the State, and the public in the event of future leaks at the Red Hill Underground Fuel Storage Facility**

**Finding of Facts**

The technical information on Red Hill is primarily communicated between the Navy and the DOH and EPA. Regulatory monitoring data is available to the public and other agencies through DOH.

The Task Force also finds that all parties have demonstrated and continue to be fully committed to communicating with the public for any matters of public interest regarding the Red Hill Fuel Storage Facility. The Task Force acknowledges that the DOH, EPA, BWS and the Navy have made significant efforts to keep the public informed on the reported fuel leak. This began with a joint press conference by the DOH, BWS and Navy immediately following the January 2014 release, and continued with participation in community outreach events, publication of numerous media releases, and active coordination between and among appropriate State and Federal agencies to remediate any potential contamination and prevent future leaks at the Facility. The Task Force expects that all parties will continue to keep the public informed of any events at the Red Hill Storage Facility that would impact the public or the environment.

**DOH and BWS Recommendations**

* DOH continue to maintain a public website containing all information from the Task Force, Navy, DOH, BWS, and other agencies (e.g., meeting notices, notes of meetings, reports, data, trend graphs, laboratory analysis, etc.) to provide easy access to information and improve transparency.
* Continue the work of the Red Hill Task Force to ensure the long-term management, information access and decision making on issues related to leaks at Red Hill and the protection of Oahu’s ground water aquifer, environment and public health.
* Continue to utilize notification systems to communicate future leaks and incidences at Red Hill or other underground storage tanks located above or in the vicinity of drinking water aquifers. The alert system should be targeted to specific persons for first response action.

**Department of Land and Natural Resources Recommendations**

Timeline for the distribution of any sampling results to the Task Force and/or involved parties (e.g. distribute results within 2 weeks of receipts of results).

1. **Implications of Closing the Red Hill Underground Fuel Storage Facility**

**Finding of Facts**

The Task Force finds that the Navy operates and maintains the Red Hill Fuel Storage Facility as a strategic petroleum facility that provides critical fuel to operating forces in the Pacific region. The Task Force acknowledges that the Navy has no plans to close the Facility. The Task Force expects that the Navy will inform the public should those plans change.

The Navy indicated at the October 7, 2014 meeting that assessments are underway to explore alternative fuel storage solutions in lieu of either continued full or partial use of the Red Hill Facility.

The Department of Health does not have information regarding implications of shutting down this facility. DOH’s priority is the protection of the environment and it views the storage of up to 187 million gallons of fuel, 100 feet above a drinking water resource, is inherently dangerous. It is the Navy’s view that preceding sentence is an opinion not a fact and the Navy does not agree with this statement.

**DOH and BWS Recommendations**

* The operation of this facility should only exist on the condition that the facility be upgraded with secondary containment and state-of-the-art leak detection to ensure safe operations and adverse impact to the environment.
* The Navy should have facility-wide implementation of secondary containment by December 31, 2024.
* In the interim, while the Navy studies available technologies increased protection and monitoring must be applied until secondary containment can be implemented.

**Navy Recommendations and Opinions**

The Navy strongly disagrees with the above recommendations.

The Navy will continue a service life extension program for the 12 remaining tanks.

The Navy will explore additional containment protection solutions and implement when feasible and affordable.

**Legislative Recommendations from the BWS and DOH**

* Passage of a resolution that would request owners and operators of the 46 FCTs in Hawaii to update the Legislature and the Department of Health on the status and condition of each of their 70+ year old tanks (e.g. leak detection and liner upgrades, visual inspections, maintenance procedures, etc… This is currently not required of FCTs in the current UST rules.
* Pass an increase in the Environmental Response Revolving Fund (ERRF) that receives funding primarily from a tax of 5 cents, on every barrel of oil imported into the State under the Environmental Response, Energy, and Food Security Tax (“Barrel Tax”), to 15 cents. This will provide the Solid & Hazardous Waste Branch and the Safe Drinking Water Branch additional personnel and resources to support oversight to the Red Hill case over the next ten years.
* Support adoption of revisions to existing DOH UST rules requiring increased protection from Hawaii’s 46 field constructed tanks, of which Red Hill tanks make up 20. All of these tanks are 70 years or older.

**Navy Comments**

* The Task Force recommends that the Legislature encourage the DOH, EPA, BWS, and Navy to continue efforts to protect Hawaii’s groundwater and drinking water sources.
* The Task Force recommends that the Legislature encourage the DOH, EPA, BWS, and Navy keep the public informed on matters of public interest regarding the Red Hill Fuel Storage Facility.
* The Task Force further recommends that the Legislature encourage the DOH, EPA, and

Navy to finalize a negotiated agreement for the Red Hill Fuel Storage Facility that protects drinking water resources, appropriately responds to the reported release of petroleum, and minimizes the threat of potential future releases.

**EPA Comments**

**APPENDIX A**

Red Hill Task Force Members

1. Gary Gill, Deputy Director, Department of Health
2. Aaron Poentis, NAVFAC Hawaii
   1. Capt. Mike Williamson
3. Senator Mike Gabbard, Chair, Energy/Environment Committee
4. Representative Chris Lee, Energy/Environmental Committee
5. Steven Linder, EPA Region IX
   1. Dean Higuchi, Hawaii EPA representative
6. Ernest Y.W. Lau, P.E., Honolulu Board of Water Supply (HBWS)
   1. Erwin Kawata, - HBWS
7. Patrick N. Casey, P.G., CHG, Geologist, Commission on Water Resource Management
   1. Robert Chenet, alternate
8. Steven Y. Onoue, President, Moanalua Valley Community Association
9. David Yomes, Chair Aliamanu/Salt Lake Neighborhood Board

**APPENDIX B**

**DOH & BWS History of Red Hill**

Navy studies and test reports show the Red Hill tanks have a history of fuel releases dating back to 1949 and the presence of fuel contaminants in groundwater and fractured rock beneath the tanks. Soil vapor and groundwater monitoring well data consistently show petroleum detections from 2005 to the present.

Samples from Red Hill groundwater monitoring well 2 (RHMW02), located in the tunnel near Tank 5 and Tank 6, contain the highest levels of total petroleum hydrocarbons as diesel (TPH-d) at 12 to 50 times above the DOH environmental action levels (EALs) of 100 µg/L (parts per billion) from 2005 to the present. The latest groundwater sampling event occurred on July 21, 2014 with 1,300 ppb of TPH-d (1.3 ppm). Based on Navy monitoring well test results submitted to DOH, the range of petroleum chemical contaminants detected and EPA health advisories, DOH Hazard Evaluation & Emergency Response Office Environmental Action Levels (DOH HEER EALs) and EPA safe drinking water Maximum Contaminant Levels (MCLs) are summarized in **Table 1.**

Soil Vapor sampling points were installed by the Navy beneath each of the 18 operational tanks at Red Hill. Tank 1 & Tank 19 were removed from service in the 1980s and lack soil vapor sampling points. The Navy has collected and reported monthly soil vapor for volatile organic compounds (VOCs) by photo ionization detector (PID) beneath each tank from 2008 to present.

Soil vapor VOCs spiked to 225,000 ppbv (parts per billion by volume) beneath Tank 5 in the sampling event of January 15, 2014. The prior event on December 23, 2013 showed 794 ppbv. The Navy increased SV monitoring to a weekly basis from Feb 2014 to July 2014. Maximum SV VOCs beneath Tank 5 increased to 450,000 ppbv on May 1, 2014 and have since declined to 208,000 ppbv on September 25, 2014.

Soil vapor sampling beneath the adjacent Tank 6 showed maximum VOCs of 43,600 ppbv on May 21, 2014 and 18,700 ppbv on September 25, 2014. Similar results were seen in the direction of Tanks 6-10 and sporadic high readings beneath Tanks 2, 3, 4 indicating air pathways thru the fractured basalt surrounding the tanks within the complex.

Monthly data from the Navy’s soil vapor sampling report for Tank 5 is shown in **Table 2**. **Figure 1** illustrates this information in graphical form (Navy report, Oct 2014).

**Table 1 of Appendix B Petroleum Contaminants Detected**

**Navy Red Hill Groundwater Monitoring Wells 2005 to 2014**

(values that exceed DOH/EPA levels in Bold)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| # | Contaminant | DOH EAL drinking water (ppb) | EPA drinking water MCL\*\* (ppb) | EPA health advisory (ppb) | Minimum value reported (ppb) | Maximum value reported (ppb) |
| 1 | TPH-d (diesel) | 100 | None | None | <20 | **5,000** |
| 2 | TPH-g (gasoline) | 100 | None | None | 13.2 | **650** |
| 3 | Xylene | 20 | 10,000 | None | 0.37 | 1.1 |
| 4 | Benzene | 5 | 5 | None | 0.14 | 0.92 |
| 5 | Toluene | 40 | 1,000 | None | 0.5 | 2.5 |
| 6 | Acenaphthene | 20 | None | None | 0.02 | 0.86 |
| 7 | Fluorene | 240 | None | None | 0.03 | 0.3 |
| 8 | 1-methylnaphthalene | 4.7 | None | None | 0.02 | **109** |
| 9 | 2-methylnaphthalene | 10 | None | None | 0.007 | **88.5** |
| 10 | Naphthalene | 17 | None | 100 | 0.03 | **180** |
| 11 | Ethyl benzene | 300 | 700 | None | 0.15 | 0.58 |
| 12 | Lead | 15 | 15 | None | 0.14 | 11.9 |
| 13 | Pyrene | 68 | None | None | 0.03 | 0.11 |
| 14 | Chrysene | 1 | None | None | 0.0159 | 0.062 |
| 15 | Phenanthrene | 240 | None | None | 0.02 | 0.14 |
| 16 | Fluoranthene | 130 | None | None | 0.026 | 0.24 |
| 17 | Benzo[k]fluroanthene | 0.4 | None | None | 0.0068 | 0.017 |
| 18 | Benzo[a] anthracene | 0.092 | None | None | 0.077 | 0.047 |
| 19 | Indeno[1,2,3-c,d]pyrene | 0.092 | None | None | 0.0075 | 0.037 |
| 20 | Benzo[a]pyrene | 0.2 | 0.2 | None | 0.0086 | 0.045 |
| 21 | Benzo[g,h,i]perylene | 0.13 | None | None | 0.0057 | 0.034 |
| 22 | 1,2-dibromoethane (EDB) | 0.04 | None | 0.05 | ND\*\*\* | ND\*\*\* |
| 23 | 1,2-dichloroethane (1,2 DCA) | 0.15 | None | 5 | ND\*\*\* | ND\*\*\* |

\*ppb = parts per billion same as micrograms per liter

\*\* MCL = maximum contaminant level (EPA safe drinking water standard)

\*\*\*Non-Detectable however, minimum detection limits were higher than DOH HEER EALs

NOTE: Additional constituents have been analyzed but have not shown significant detections

**Table 2 of Appendix B  
Soil Vapor Results from SV05**

**Soil Vapor Monitoring Letter Report  
Red Hill Bulk Fuel Storage Facility**



**Figure 1 of Appendix B  
Soil Vapor Measurements**

**SV05**



**APPENDIX C**

**Navy Data**

Current Red Hill Monitoring Plan

This data is provided in addition to the information provided by the BWS in Appendix B. The Navy monitors at many wells and tanks. The current regulatory approved monitoring plan includes:

* 50 soil vapor monitoring points (2 to 3 monitors beneath the 18 tanks) –measures volatile organic compounds (VOC) vapors in the soil/rock beneath the tanks. The data is collected monthly.
* 7 groundwater monitoring wells and 2 new wells – groundwater samples are analyzed for chemical contaminants at least quarterly and the groundwater is also monitored for free product monthly.
* Drinking water monitoring at Red Hill Water Shaft – samples are routinely analyzed according to Safe Drinking Water standards. Additional analyses are performed to check for petroleum products.

All monitoring plans and sampling results are provided to the Department of Health.

Environmental Action Levels (EALs) and Site Specific Risk Based Levels (SSRBLs)

The results from the monitoring are compared against the EALs and Site Specific Risk Based Levels (SSRBLs). The Department of Health’s guidance, “Evaluation of Environmental Hazards at Sites with Contaminated Soil and Groundwater” describes how to use and interpret EALs:

* ***“Exceeding the Tier 1 EAL for a specific chemical does not necessarily indicate that the contamination poses significant environmental concerns, only that additional evaluation is warranted.”***
* ***“The Tier 1 EALs presented in the lookup tables are NOT regulatory “cleanup standards”.”***

When additional evaluation is warranted as specified above, the risks at the specific site are studied and Site Specific Risk Based Levels (SSRBLs) developed and submitted to the regulators. Data from a particular site should also be compared against the SSRBLs approved for the site. For Red Hill, the following SSRBLs were approved:

* SSRBL for TPH-d = 4500 ug/l in groundwater
* SSRBL for benzene = 750 ug/l in groundwater
* SSRBL for JP8/5 = 280,000 ppb per volume in soil vapors

Groundwater Data Beyond Tank 5

Wells down-gradient to Tank 5 and between the Red Hill Shaft are below the SSRBLs for TPH-d and below the EALs for other chemicals. Similarly, the data from the well between Tank 5 and the Halawa Shaft is below the EALs. The data for the contaminants marked as a concern in the BWS table in Appendix B is summarized for the other relevant wells below. (60+ other low level chemical results not listed in table.) Values are displayed in in parts per billion (ppb).

**Table 1 of Appendix C – Data on Other Wells**

**For Petroleum Contaminants of Concern in Listed Appendix B**

**Navy Red Hill Groundwater Monitoring Wells 2005 to 2014**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| # | Contaminant | DOH EAL (ppb) | EPA drinking water MCL (ppb) | EPA health advisory (ppb) | Min. value reported (ppb) | Max value reported (ppb) | SSRBL  (ppb) |
| **RHMW02** (nearest to Tank 5) | | | | | | | |
| 1 | TPH-d (diesel) | 100 | None | None | <20 | 5,000 | 4,500 |
| 2 | TPH-g (gasoline) | 100 | None | None | 13.2 | 650 |  |
| 8 | 1-methylnaphthalene | 4.7 | None | None | 0.02 | 109 |  |
| 9 | 2-methylnaphthalene | 10 | None | None | 0.007 | 88.5 |  |
| 10 | Naphthalene | 17 | None | 100 | 0.03 | 180 |  |
| **RHMW01** (downstream of Tank 5) | | | | | | | |
| 1 | TPH-d (diesel) | 100 | None | None | <80.8 | 1400 | 4500 |
| 2 | TPH-g (gasoline) | 100 | None | None | <13 | 16.6 |  |
| 8 | 1-methylnaphthalene | 4.7 | None | None | <.05 | 9.44 |  |
| 9 | 2-methylnaphthalene | 10 | None | None | <0.015 | 3.07 |  |
| 10 | Naphthalene | 17 | None | 100 | <.050 | 5.61 |  |
| **RHMW05** (downstream of Tank 5, before Red Hill Shaft) | | | | | | | |
| 1 | TPH-d (diesel) | 100 | None | None | <10 | 2060 | 4500 |
| 2 | TPH-g (gasoline) | 100 | None | None | <30 | 13.2 |  |
| 8 | 1-methylnaphthalene | 4.7 | None | None | \* | \* |  |
| 9 | 2-methylnaphthalene | 10 | None | None | \* | \* |  |
| 10 | Naphthalene | 17 | None | 100 | \* | \* |  |
| **\*\*RHMW04** (between Tank 5 and Halawa Shaft) | | | | | | | |
| 1 | TPH-d (diesel) | 100 | None | None | new | 17 |  |
| 2 | TPH-g (gasoline) | 100 | None | None | new | <60 |  |
| 8 | 1-methylnaphthalene | 4.7 | None | None | \* | \* |  |
| 9 | 2-methylnaphthalene | 10 | None | None | \* | \* |  |
| 10 | Naphthalene | 17 | None | 100 | \* | \* |  |
|  |  |  |  |  |  |  |  |

\* concentration below EAL

\*\* Data for RHMW04 represents the re-start of testing in July 2014. HDMW2253-03 tested and levels also below EAL or SSRBL, but well suitability for groundwater testing is questionable. Data from new monitoring wells not yet available.

Soil Vapor Results

Soil vapor results at Tank 5 are represented in the graph in Appendix B. The comparison to the SSRBL of 280,000 ppbv prompted more frequent monitoring. Increases at neighboring tanks were also detected.

Free Product Floating on the Surface of the Groundwater

Monthly monitoring using and oil/water interface probe has not detected any measurable product at the well nearest to Tank 5 or any of the other groundwater monitoring wells.

**Diagram 1**

**Locations of the seven monitoring wells routinely tested by the Navy in green, and the two new sentinel wells north installed in Sep/Oct 2014 in blue.**

