

BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HI 96843
www.boardofwatersupply.com



December 13, 2021

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Manager and Chief Engineer

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Deputy Manager and Chief Engineer

Chair and Members
Board of Water Supply
City and County of Honolulu
Honolulu, Hawaii 96843

Chair and Members:

Subject: Considering Adoption of Resolution No. 931, 2021 Regarding the Navy's Red Hill Bulk Fuel Storage Facility and Associated Water Contamination Issues

We submit for your consideration of Resolution No. 931, 2021 regarding the Navy's Red Hill Bulk Fuel Storage Facility and recent water contamination issues at Joint Base Pearl Harbor Hickam (JBPHH).

On December 2, 2021 the Navy determined their Red Hill Shaft water source is contaminated with petroleum and the source of fuel odors present in JBPHH housing tap water. That night, the Board of Water Supply (BWS) shut down Halawa Shaft pumping station that delivers 20% of the water to metropolitan Honolulu to prevent any fuel contamination of the BWS Honolulu water system.

The proposed Resolution before you today reaffirm the need to protect our drinking water aquifer and urges the Navy to take swift action to install secondary containment or relocate the fuel away from the aquifer and we ask the Board for your approval of this Resolution.

Respectfully submitted

ERNEST Y. W. LAU, P.E.
Manager and Chief Engineer

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU

RESOLUTION NO. 931, 2021

NAVY RED HILL FUEL STORAGE FACILITY
AND WATER CONTAMINATION ISSUES AT
JOINT BASE PEARL HARBOR HICKAM

WHEREAS, since 2014, the Board of Water Supply has raised concerns of aquifer contamination from the Red Hill fuel facility by storing more than 180 million gallons of fuel in vintage World War II tanks, and pipelines and infrastructure that are located 100-feet above a major source of drinking water for Oahu residents and visitors and;

WHEREAS, on November 28, 2021, the Navy began receiving complaints of fuel odor in the tap water from JBPHH housing residents and subsequently shutting down its Red Hill Shaft water source and;

WHEREAS, on December 2, 2021, the Navy determined their Red Hill Shaft water source is contaminated with petroleum and the source of the odors and in response, the Board of Water Supply shut down its Halawa Shaft pumping station that serves 20% of the water delivered to 450,000 residents and visitors in metropolitan Honolulu; and

WHEREAS, this Board appreciates Hawaii's congressional delegation, the Secretary of Navy, and the Governor for supporting the suspension of operations at the Red Hill fuel facility in response to the JBPHH water contamination crisis and;

WHEREAS, this Board reminds the Navy and the Department of Defense of the need for a long-term solution of relocating the fuel away from the aquifer if the installation of secondary containment is not feasible given our the Navy's past proposals are not adequate for preventing contamination of the aquifer and;

WHEREAS, the continued oversight by the United States Environmental Protection and the Hawaii Department of Health of the Navy's timely compliance of all requirements specified under the Red Hill Administrative Order on Consent remains and;

WHEREAS, this Board reiterates our support of our armed forces in safeguarding our Nation and urge their continued investing in the protection of our drinking water aquifer now, therefore,

BE IT RESOLVED by the Members of the Board of Water Supply, City and County of Honolulu, that this Board reaffirms the need to protect and preserve our water resources; and

BE IT FURTHER RESOLVED that the Board supports immediate removal of the fuel while investigating alternatives not over the drinking water aquifer; and

BE IT FINALLY RESOLVED that the Navy take steps to identify where in the aquifer past and recent leaks are located and the direction its moving in the aquifer.

ADOPTED:

Bryan Andaya
Chair

Honolulu, Hawaii
December 13, 2021



RED HILL BULK FUEL STORAGE FACILITY INFORMATIONAL BRIEFING

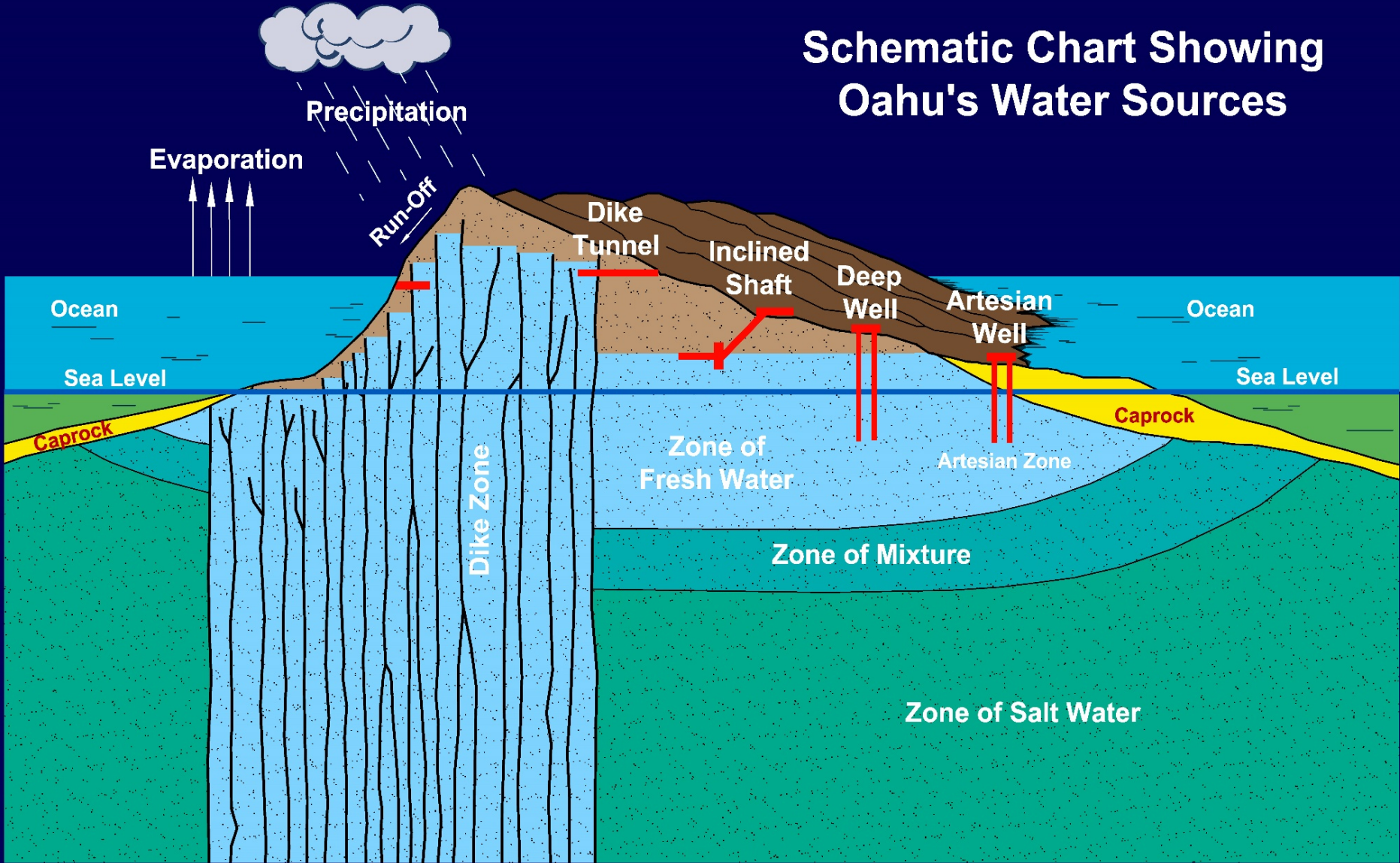
December 13, 2021
boardofwatersupply.com

TODAY'S DISCUSSION

- Oahu's groundwater aquifer
- Red Hill Bulk Fuel Storage Facility
 - Overview of Navy studies and findings to date
- Water contamination at JBPHH housing areas
- Summarize



Schematic Chart Showing Oahu's Water Sources



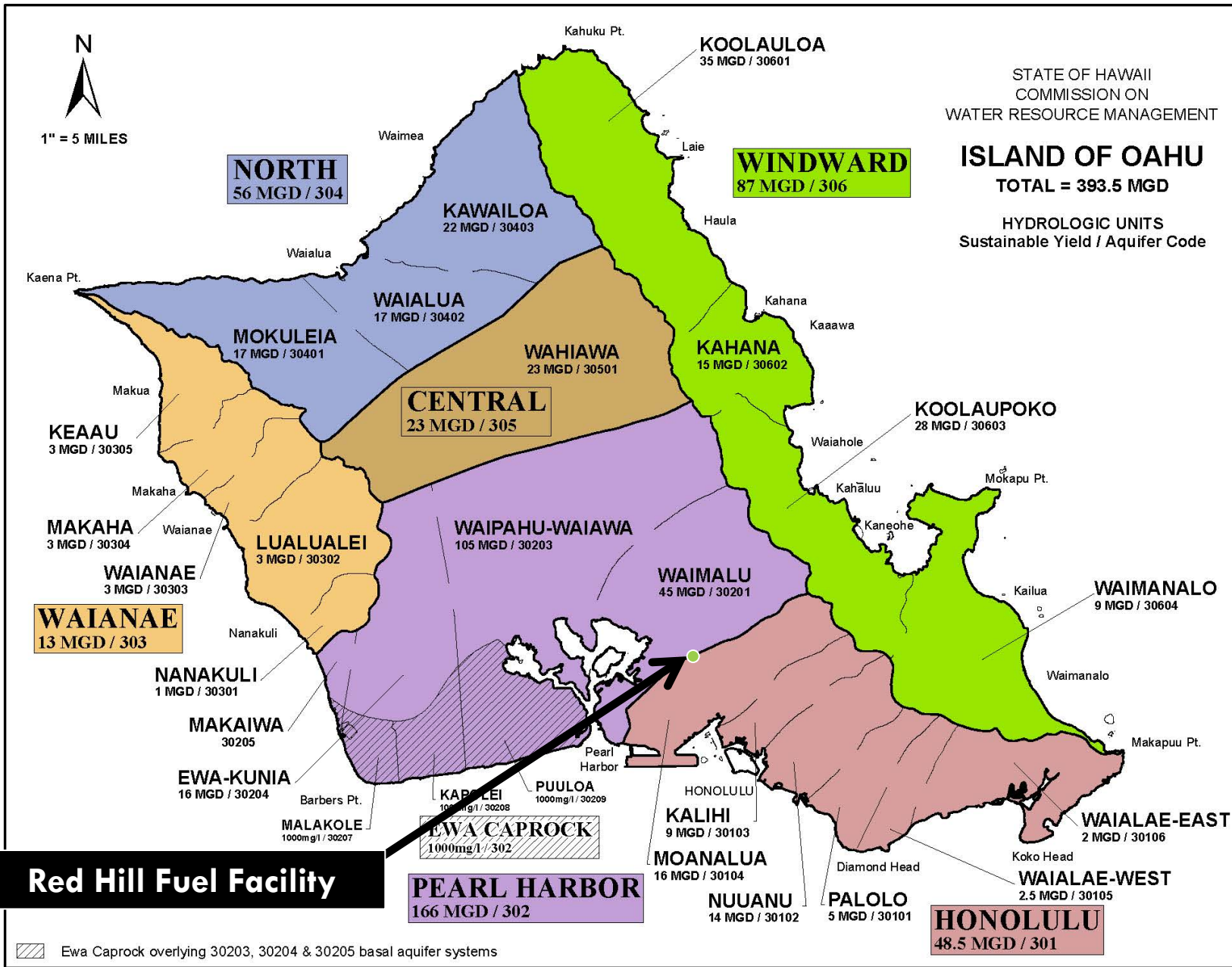
OAHU'S GROUNDWATER BODIES AND CAPROCK

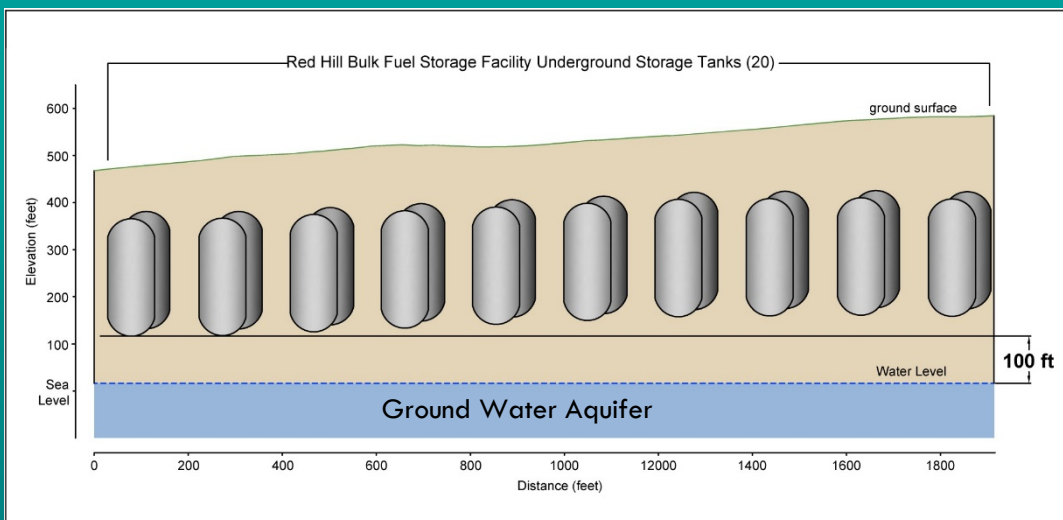
- Oahu is 598 square miles
- About 461 square miles of Oahu (77% of the island) are inland of the caprock
- About 137 square miles (23% of the island) are covered by caprock



Ref. Izuka, Engott, Rotzoll, Bassiouni, Johnson, Miller and Mair, Volcanic aquifers of Hawai'i—Hydrogeology, water budgets, and conceptual models, Scientific Investigations Report 2015-5164, United States Geological Survey, 2015

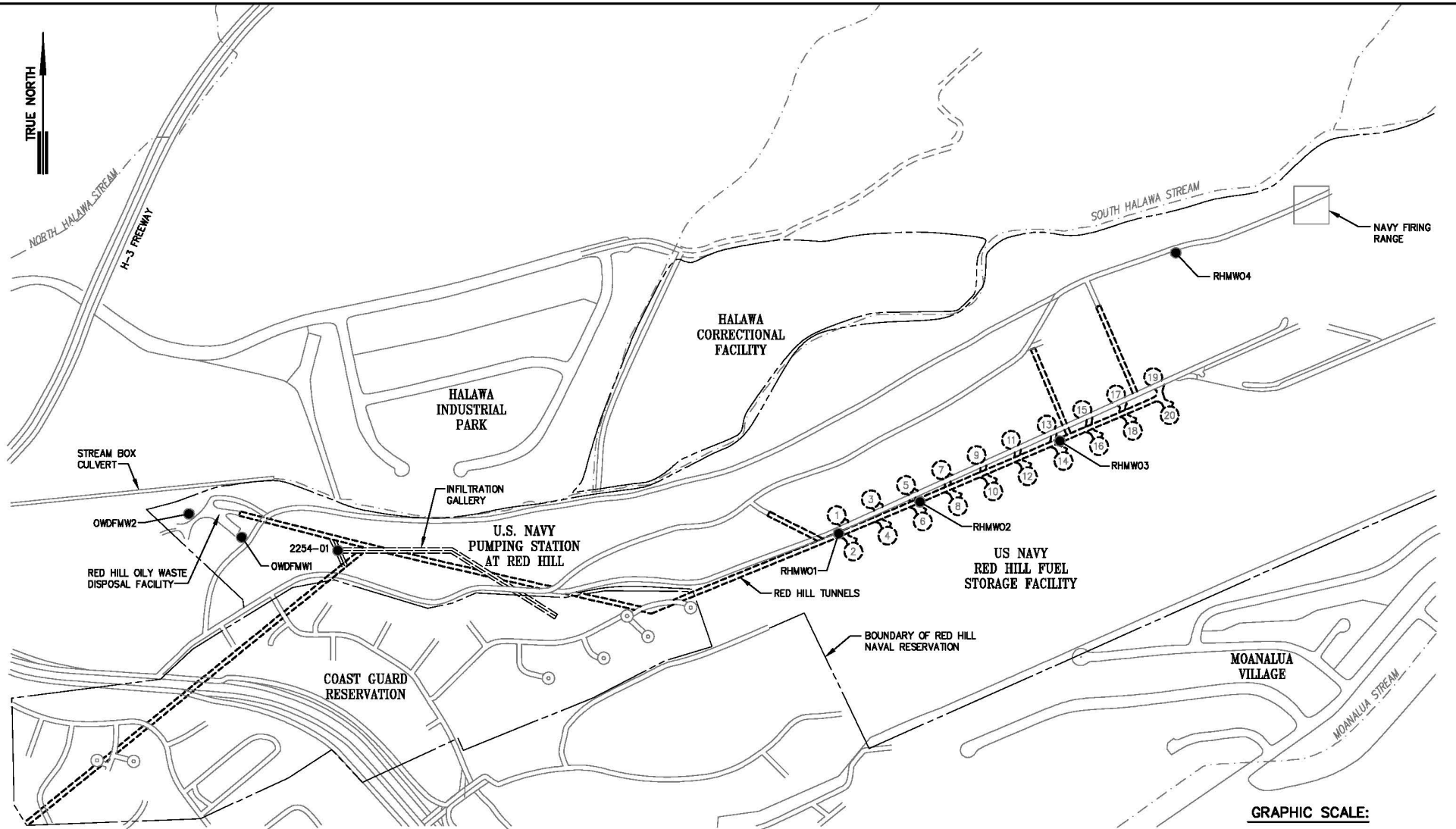




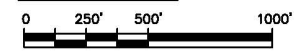


- Twenty tanks sitting on end connected by an upper and lower access tunnel.
- Constructed from 1940 to 1943.
- Each tank is 250 feet high and 100 feet in diameter.
- 12.5 million gallon capacity per tank.
- Concrete with $\frac{1}{4}$ inch steel liner. (Lower dome base is $\frac{1}{2}$ inch)
- Facility declassified in 1995.
- Navy's Red Hill Shaft approx. 2,500 feet down gradient from the facility.
- **Tanks located 100 feet above the groundwater table.**





GRAPHIC SCALE:



SCALE: 1" = 500'

DATE: 08/19/10
 SCALE: 1" = 1/4"
 FILE: 2008014-FIG-14

ETH
 PK:
 CPER: FA
 REVISION:

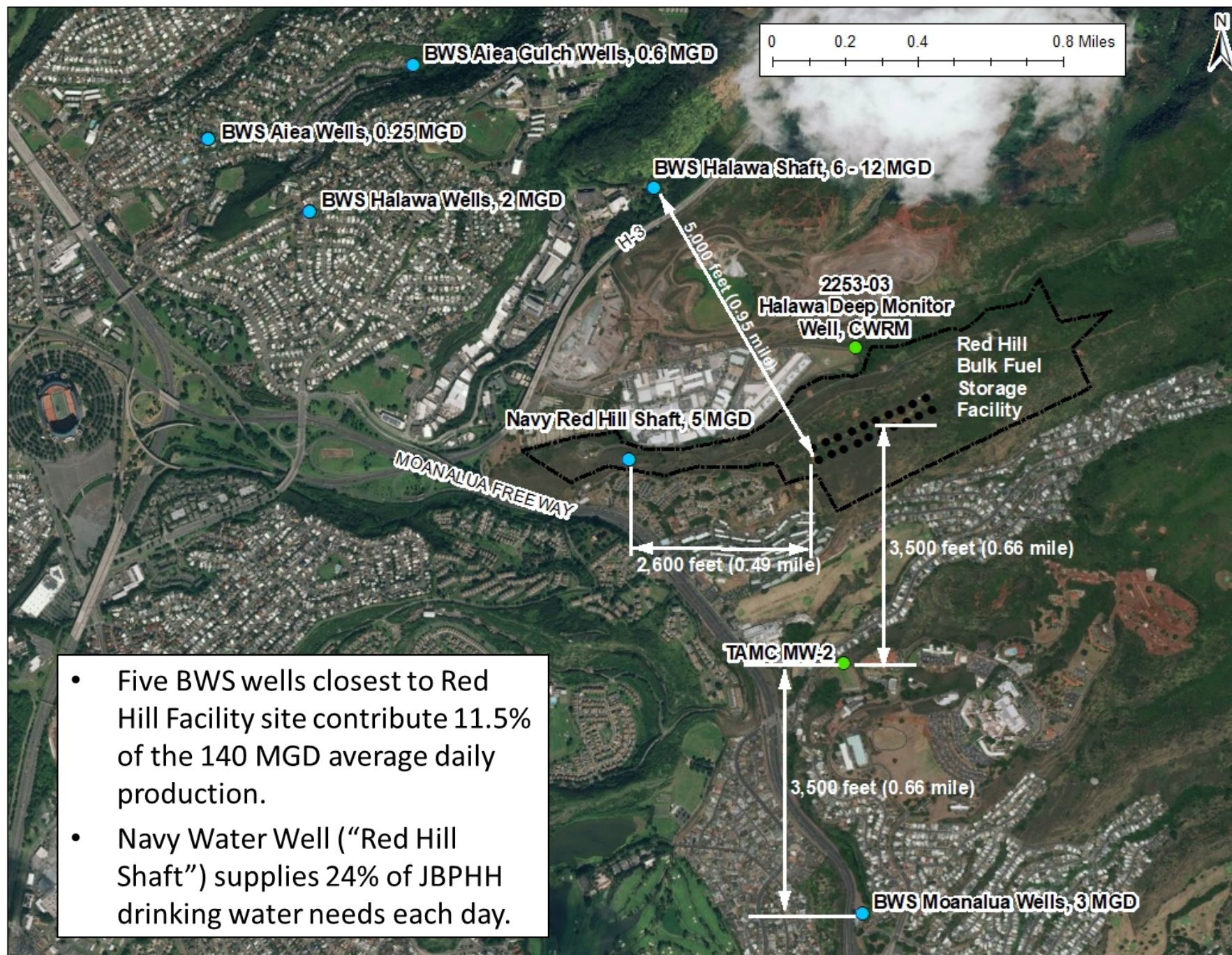


EVALUATE TREATMENT FOR RED HILL WELL,
 PEARL HARBOR, HAWAII
 PEARL HARBOR OAHU, HAWAII

GENERAL LOCATION MAP

FIGURE
 1-2





- Five BWS wells closest to Red Hill Facility site contribute 11.5% of the 140 MGD average daily production.
- Navy Water Well (“Red Hill Shaft”) supplies 24% of JBPHH drinking water needs each day.



HALAWA SHAFT

HALAWA

KAILUA

MAUNAWILI

KEOLU HILLS

SALT LAKE

KALIHI

KALIHI PUMP STATION

Honolulu International Airport

MANOA

WAIMANALO

MAKIKI

BERETANIA PUMP STATION

MAUNALUA

WILDER WELLS

SAND ISLAND

KAIMUKI PUMP STATION

AINA HAINA

HONOLULU

HAWAII KAI

WAIKIKI

DIAMOND HEAD

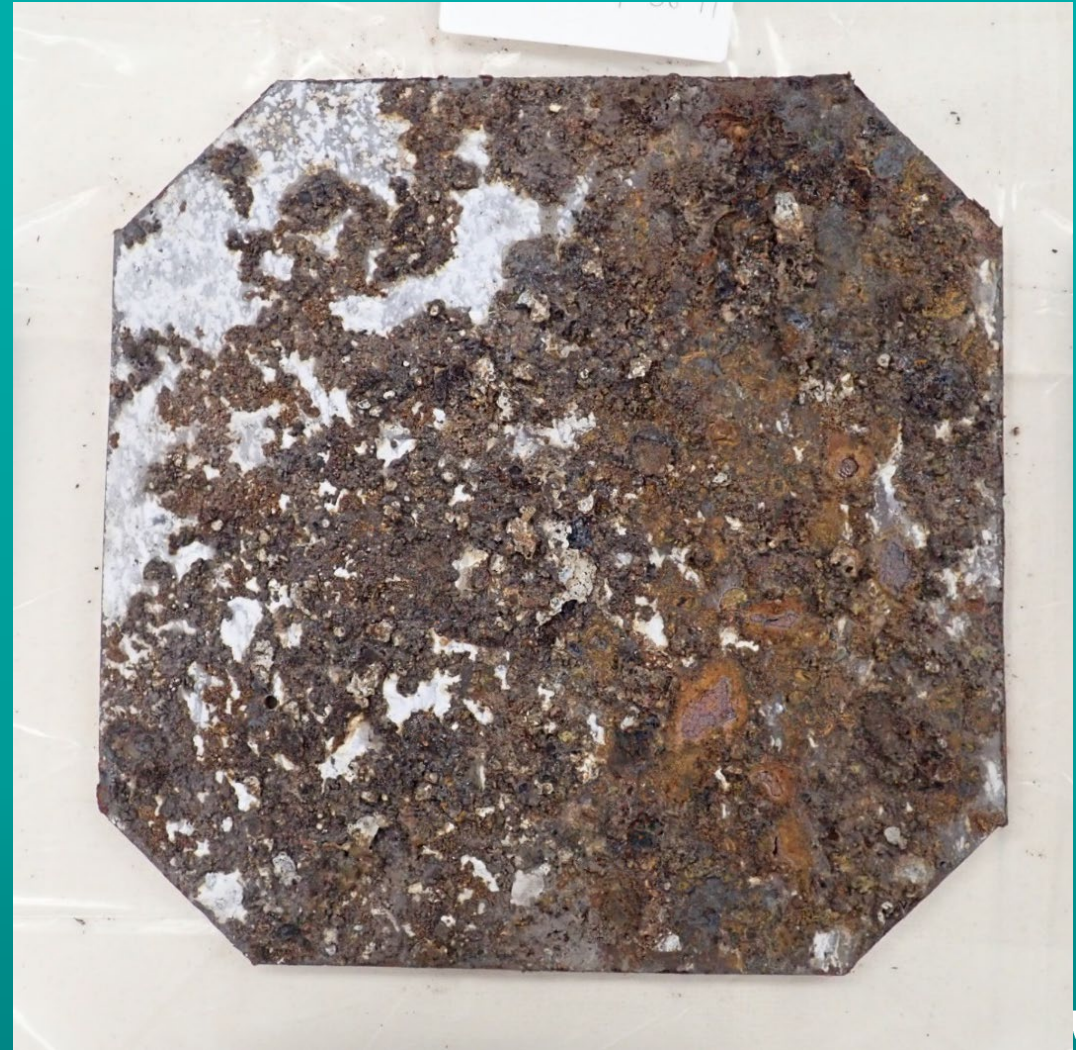
KOKO HEAD



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NAVY STUDIES AND FINDINGS


- Petroleum hydrocarbons detected in groundwater and rock beneath facility.
- Rusting occurring on the side of the tanks that the Navy cannot inspect nor fix.
- Laboratory tests show the Navy's ability to locate areas of the tank that need repairs is inaccurate 50% of the time.




NAVY STUDIES – CONT.

- 2010 Audit Report
- 2010 Treatment study
- 2015 request to BWS for alternate water service


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Naval Audit Service



Audit Report




Department of the Navy Red Hill and Upper Tank Farm Fuel Storage Facilities

This report contains information exempt from release under the Freedom of Information Act. Exemptions (b)(2) high and (b)(6) apply.

~~Do not release outside of the Department of the Navy, or post on non-Naval Audit Websites or in Navy Taskers, without approval from the Auditor General of the Navy.~~

N2010-0049
16 August 2010

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DEPARTMENT OF THE NAVY
COMMANDER
NAVY REGION HAWAII
850 TICONDEROGA ST STE 110
JBPHH, HAWAII 96860-5101

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mgn
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Wb

5750
Ser N45/38815
May 18, 2015

MAY 26 A 8:35

CERTIFIED NO: 7014 1200 0000 9859 0008

Mr. Ernest Lau
Manager and Chief Engineer
Honolulu Board of Water Supply
P.O. Box 135037
Honolulu, HI 96801-5037

Dear Mr. Lau:

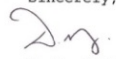
SUBJECT: NAVY RED HILL DRINKING WATER SHAFT - POTENTIAL ALTERNATE POTABLE WATER SOURCES

As part of Navy Region Hawaii's routine contingency planning, a contract has been awarded to Engineering Concepts, Inc. (ECI) to complete an engineering study that will identify and evaluate potential alternative and/or recommended potable water sources in lieu of the Navy's Red Hill Drinking Water Shaft in the event that the Red Hill Shaft is unavailable for use. Alternatives and recommendations that will be reviewed include (1) leveraging use of the Navy's other existing water sources, (2) potential development of new sources, and (3) the consideration of purchase of Honolulu Board of Water Supply water.

This project supplements a prior study that was completed in 2010 which evaluated treatment technologies for the Red Hill Shaft, but did not look at other non-treatment alternatives. Development of other alternatives will support the programming and budgeting for a project should it become necessary.

We ask for your support in assisting ECI with evaluating whether becoming a direct customer is possible.

If you have any questions regarding this matter, please contact Ms. Arleen Mizuno at 471-1171, extension 203.

Sincerely,

D. A. TUFTS
Captain, CEC, U.S. Navy
Regional Engineer
By direction of the
Commander

Copy to: Anna Sasaki, Engineering Concepts, Inc.

Final Report

Evaluate Treatment Technologies for the Red Hill Drinking Water Well

Prepared For:
NAVFAC Hawaii
Pearl Harbor, Hawaii

Prepared by:
HDR|Hawaii Pacific Engineers

Contract No. N62742-06-D-1881
13 August 2010
HPE 2008014

PAST FUEL RELEASES

(c) Tests on Tank 16

After an earth disturbance on June 28, 1948, and previous to our inspection, gaging during the period June 28 to July 21, indicated a loss of 14 inches, or approximately 850 barrels. The suction and discharge valves were blanked off with the oil level standing at 241' - 3-1/4" and a six day test conducted over the period July 21 to July 27. Careful hand gaging during this test indicated a loss of 37.4 barrels per day. The level was then lowered to 198' - 2-5/8" and a two day test was conducted. This indicated a loss of 14.5 barrels per day at this level. The tank was then emptied. The total leakage indicated during the entire period was in the order of 1100 barrels. Results of this and subsequent tests are indicated in accompanying Red Hill Sketch 3.



RECENT RED HILL RELEASES

- 72 releases reported in Red Hill AOC studies
- January 2014 – 27,000 gallons from Tank 5
- March 2020 – Fuel release from Kilo Pier pipelines at Red Hill.
- May 2021 – Pressure surge releasing approximately 1,600 gallons of jet fuel from supply piping in the lower access tunnel
- September 2021 – Navy shut down Red Hill facility for 9 days without informing the DOH.
- November 2021 – 14,000-gallon fuel water mixture release in lower access tunnel quarter mile downgradient from Red Hill Shaft.



NAVY RISK ASSESSMENT STUDY

- Greater than 27% probability of a sudden release of between 1,000 and 30,000 gallons of fuel each year
- Greater than 34% chance of a sudden release of more than 120,000 gallons of fuel in the next 100 years
- Greater than 5% probability of a sudden release of more than 1 million gallons of fuel in the next 100 years
- For chronic, undetected releases, the expected fuel release is 5,803 gallons per year (facility-wide)

[For example: 25 years x 5,803 gallons/year = 145,075 gallons released]



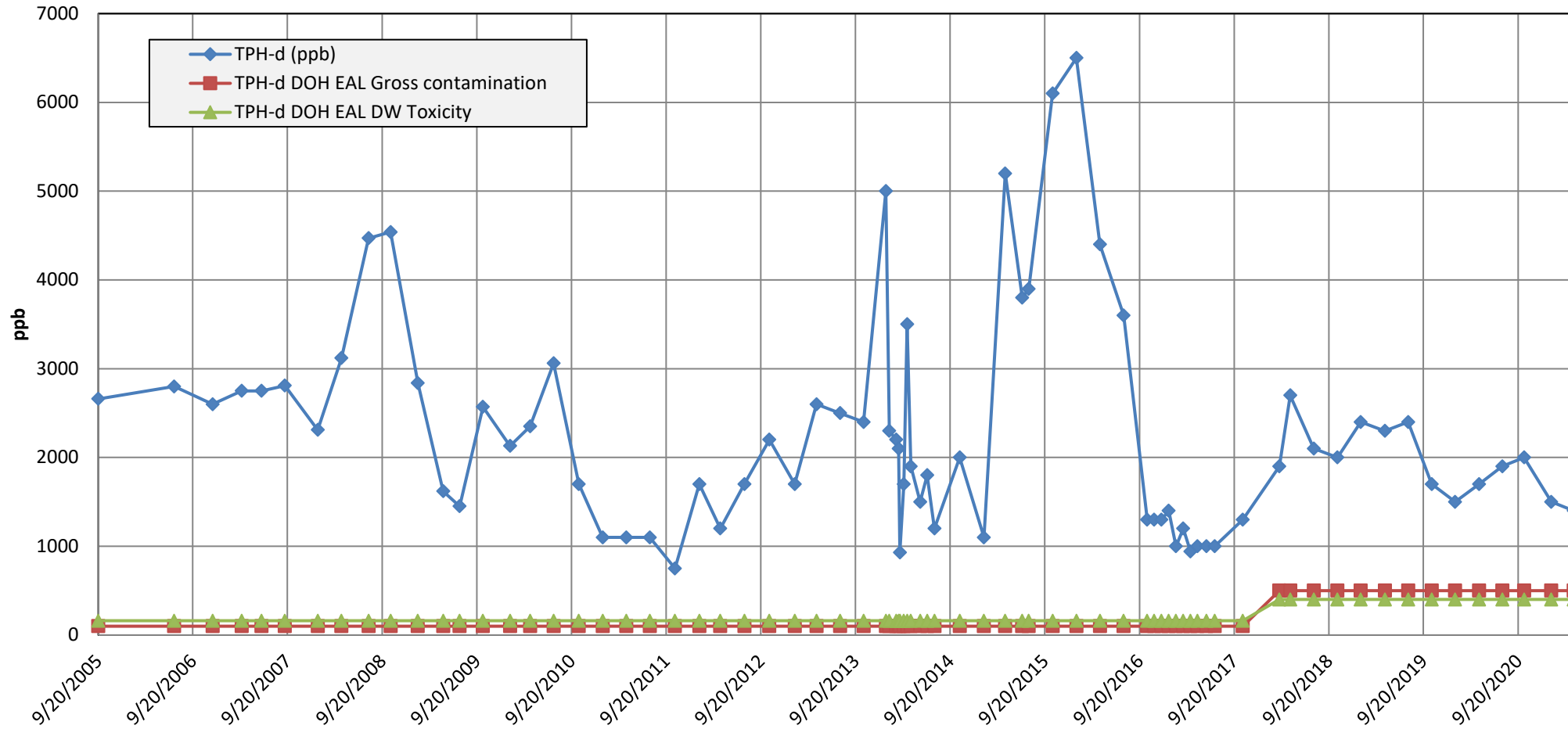
RED HILL SHAFT WATER QUALITY

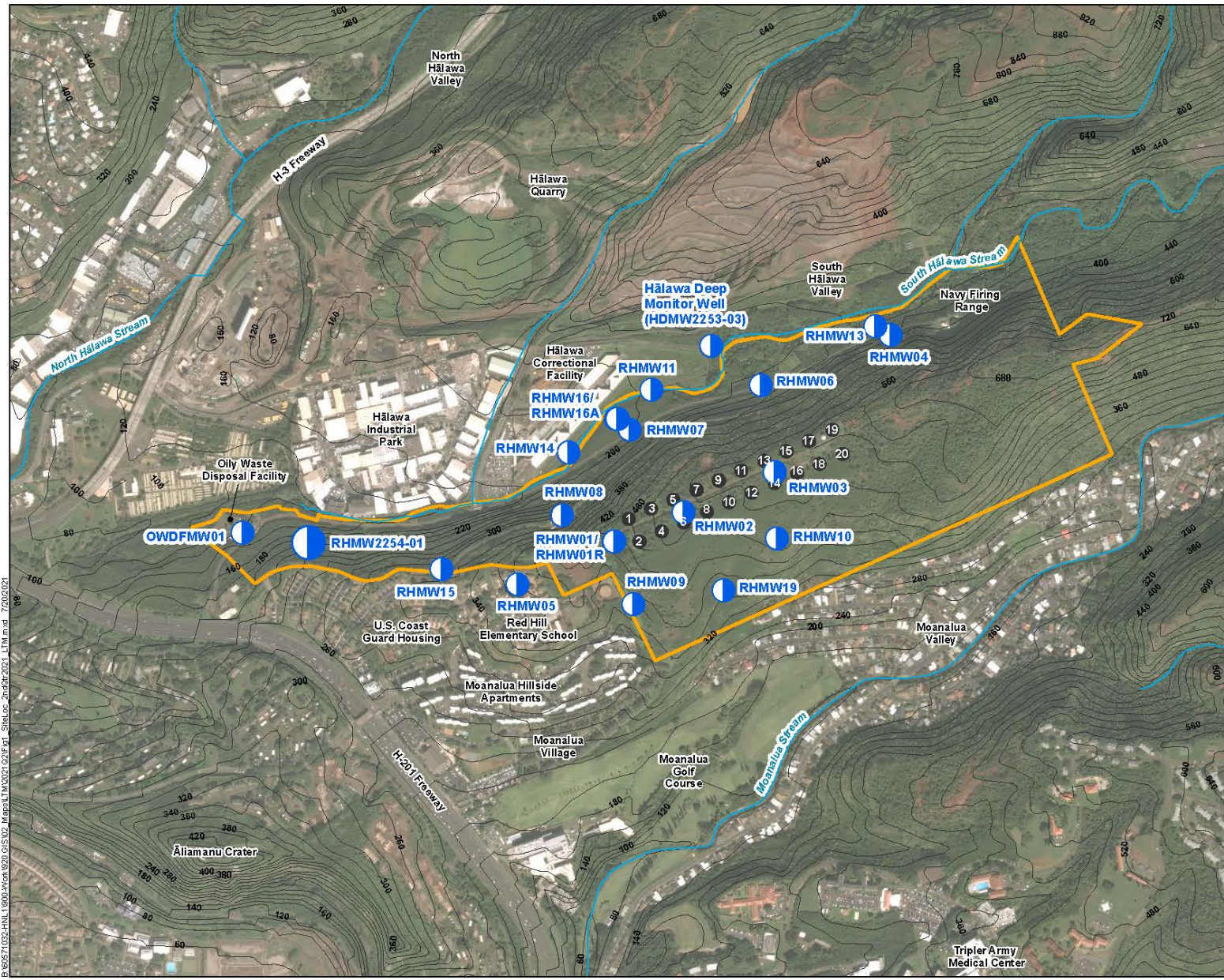
- Navy Annual Water Quality Report (CCR)
 - 2018 – 65 ppb TPH-d
 - 2019
 - Ethylbenzene – 1.2 ppb J
 - Toluene – 0.24 ppb J
 - Xylene – 0.81 ppb J
 - 2021 – 490 ppb TPH-d



GROUNDWATER MONITORING

RHMW02 as of April 2021





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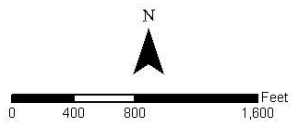
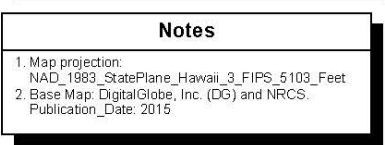
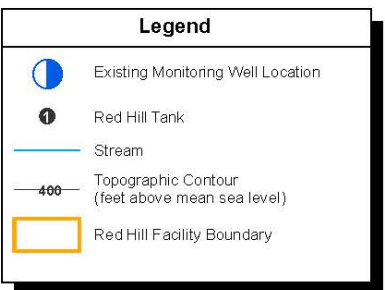
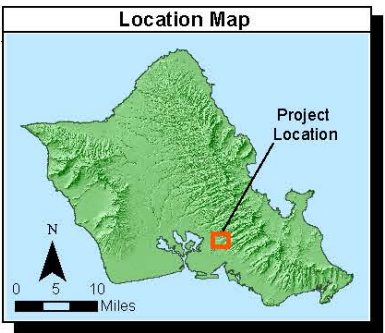


Figure 1
Site Location Map
 2nd Qtr 2021 Groundwater LTM Report
 Red Hill Bulk Fuel Storage Facility
 JBPHH, O'ahu, Hawai'i



RED HILL SHAFT AND GW MONITORING

| Location | Date | TPH-d (ppb) | TPH-g (ppb) | TPH-o (ppb) | Xylene, Total (ppb) | Naphthalene (ppb) |
|----------------|------------|-------------|-------------|-------------|---------------------|-------------------|
| RHMW02 | 7/20/2020 | 1900 | 46 | 180 | <0.3 | 64 |
| RHMW02 | 10/12/2020 | 2000 | 66 | 270 | <0.3 | 98 |
| RHMW02 | 1/25/2021 | 1500 | <18 | 180 | <0.3 | 44 |
| RHMW02 | 4/22/2021 | 1400 | 41 | 160 | <0.3 | 69 |
| Red Hill Shaft | 1/26/2021 | <300 | <18 | <300 | <0.3 | <0.1 |
| Red Hill Shaft | 4/21/2021 | <300 | <18 | <300 | <0.3 | <0.1 |
| Red Hill Shaft | 7/8/2021 | <300 | <18 | 370 | <0.3 | <0.1 |
| Red Hill Shaft | 7/15/2021 | <300 | <18 | 480 | <0.3 | <0.1 |
| Red Hill Shaft | 7/29/2021 | <300 | <18 | 230 | <0.3 | <0.1 |
| Red Hill Shaft | 8/5/2021 | <300 | <18 | 540 | <0.3 | <0.1 |
| Red Hill Shaft | 8/12/2021 | <300 | <18 | 320 | <0.3 | <0.1 |
| Red Hill Shaft | 8/26/2021 | <300 | <18 | 530 | <0.3 | <0.1 |
| Red Hill Shaft | 9/1/2021 | <300 | <18 | 480 | <0.3 | <0.1 |
| Red Hill Shaft | 9/15/2021 | <300 | <18 | 270 | <0.3 | <0.1 |
| Red Hill Shaft | 9/22/2021 | <300 | <18 | 490 | <0.3 | <0.1 |
| Red Hill Shaft | 9/29/2021 | <300 | <18 | 170 | <0.3 | <0.1 |
| Red Hill Shaft | 10/13/2021 | <300 | <18 | <300 | <0.3 | <0.1 |
| Red Hill Shaft | 11/29/2021 | <290 | 31 | <290 | 1.4 | 3.8 |

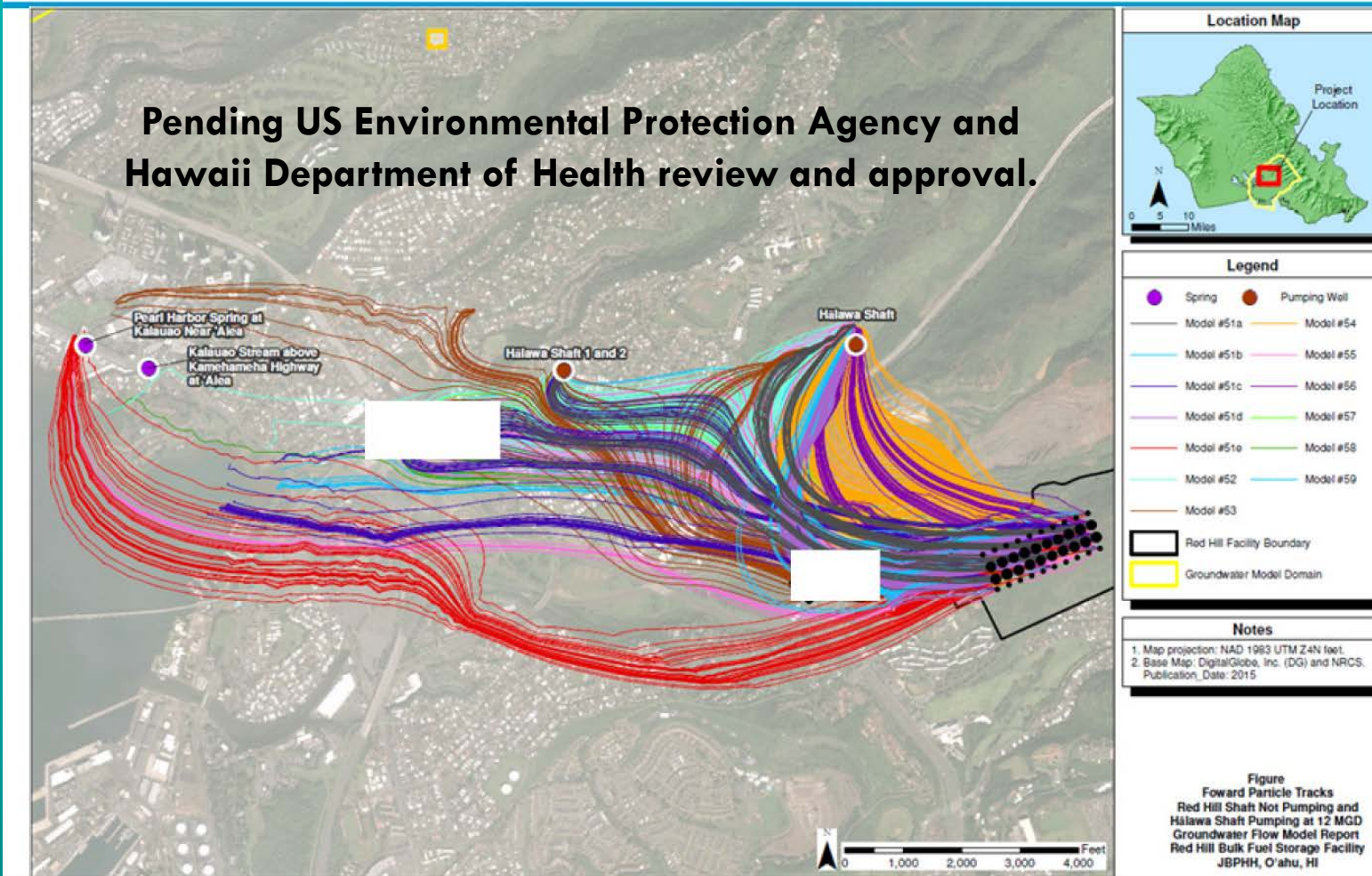
Ref. <https://health.hawaii.gov/ust/files/2021/12/Red-Hill-Notice-of-Interest-Sampling-Results-10-May-21-22-Nov-21.pdf>



Forward Particle Tracking from All Models with Red Hill Shaft Off and Halawa Shaft Pumping at 12 mgd



- Navy groundwater model of cross valley flow



WATER CONTAMINATION AT JBPHH HOUSING

- Nov. 28 – Navy shuts down Red Hill Shaft in response to complaints of fuel odor in tap water from JBPHH housing residents
- Nov. 30 – BWS reduces Halawa Shaft pumpage to 5 mgd in response to Red Hill Shaft shut down
- Dec. 2 – Navy determines petroleum contamination in Red Hill Shaft as the cause of fuel odor in tap water.
- Dec. 2 – BWS shuts down Halawa Shaft in response to Navy announcement
- Dec. 8 – Navy announces detecting 920 ppb TPH-d at Navy's Aiea Halawa Shaft.
- Dec. 8 – BWS shuts down BWS Halawa Wells and Aiea Wells



DOH EMERGENCY ORDER TO NAVY ON 12/6/21

- Immediately suspend operations including fuel transfers at Red Hill
- Install a drinking water treatment system at Red Hill Shaft
- Within 30 days submit a workplan and implementation schedule to assess the Facility operations and system integrity to safely defuel the tanks. Upon receiving DOH approval of the workplan, make the necessary repairs and changes in operations to address any deficiencies identified in the assessment
- Within 30 days of completing the required corrective actions, defuel the tanks. Any refueling subject to DOH approval.

STATE OF HAWAII
DEPARTMENT OF HEALTH
SOLID AND HAZARDOUS WASTE BRANCH
UNDERGROUND STORAGE TANK SECTION

EMERGENCY ORDER

| | |
|--|--|
| TO: THE UNITED STATES DEPARTMENT OF THE NAVY, c/o REAR ADMIRAL TIMOTHY KOTT, COMMANDER NAVY REGION HAWAII, 850 Ticonderoga St., Suite 110 JBPBH, Hawaii 96860-5101, Respondent. | Docket No. 21-UST-EA-02 Re: Emergency Change-In-Service and Defueling of 20 Underground Storage Tanks, Red Hill Bulk Fuel Storage Facility |
|--|--|

This Emergency Order ("EO") is an administrative action initiated pursuant to chapters 91 and 342L of the Hawaii Revised Statutes (HRS) and chapters 11-1 and 11-280.1 of the Hawaii Administrative Rules (HAR) by the DEPARTMENT OF HEALTH (the "Department") against THE UNITED STATES DEPARTMENT OF THE NAVY, c/o ADMIRAL TIMOTHY KOTT, COMMANDER NAVY REGION HAWAII (the "Respondent") and is based upon recent impacts on the Respondent's drinking water system incident to the operation of the Red Hill Bulk Fuel Storage Facility (the "Facility"). Respondent is the owner and operator of the Facility. This EO concerns only the issues identified herein and does not function to preclude or limit actions by any public agency or private party. The Department reserves the right to bring other actions as may be necessary to protect public health and the environment.

I. AUTHORITY AND BACKGROUND

| | |
|----------------|--|
| Statutes/Rules | Section 342L-9, HRS , states that: "§342L-9 Emergency powers; procedures. (a) Notwithstanding any other law to the contrary, if the governor or the director determines that an imminent peril to human health and safety or the environment is or will be caused by: (1) A release; (2) Any action taken in response to a release from an underground storage tank or tank system; or (3) The installation or operation of an underground storage tank or tank system; that requires immediate action, the governor or the director, without a public hearing, may order any person causing or contributing to the peril to immediately reduce or stop the release or activity, and may take any and all other actions as may be necessary. The order shall fix a place and time, not later than twenty-four hours thereafter, for a hearing to be held before the director. (b) Nothing in this section shall be construed to limit any power which the governor or any other officer may have to declare an emergency and act on the basis of such declaration, if such power is conferred by statute or constitutional provision, or inheres in the office." |
|----------------|--|



SUMMARY

- BWS shut down BWS Halawa Shaft, Aiea Wells and Halawa Wells in response to Navy announcement of petroleum contamination at Navy Red Hill Shaft and distribution system sample point near Aiea Halawa Shaft.
- Continued storage of Red Hill fuel above the aquifer endangers the resource from further contamination.
- Immediately relocate the fuel away from the aquifer.



QUESTIONS / DISCUSSION





Mahalo!

BOARD OF WATER SUPPLY

Red Hill Bulk Fuel Storage Facility
Informational Briefing
boardofwatersupply.com for more
information
December 13, 2021

Providing safe, dependable, and affordable
drinking water, now and into the future.