



JET FUEL IN THE DRINKING WATER IN HAWAI'I

Diana Felton MD

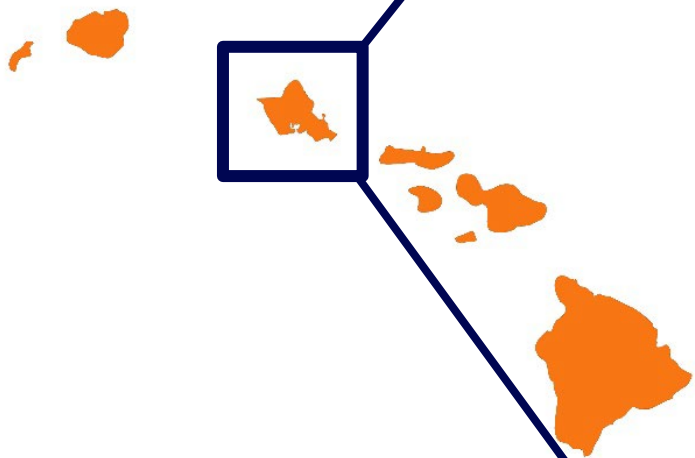
Hawai'i Department of Health

NASEM Meeting - February 20, 2025

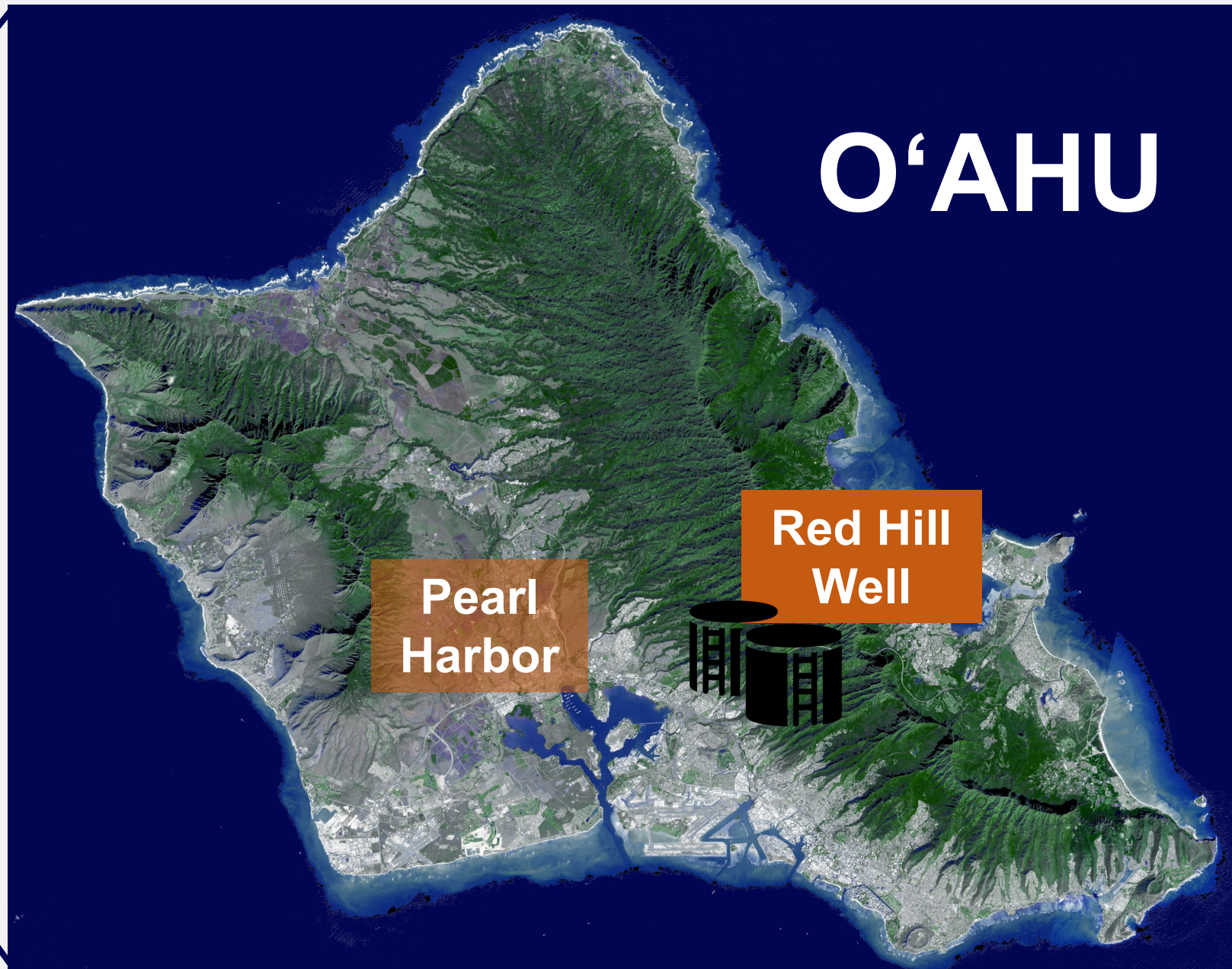
FINANCIAL DISCLOSURES - NONE



HAWAII



Shoutout: Dr. Daniel Nguyen,
DOH

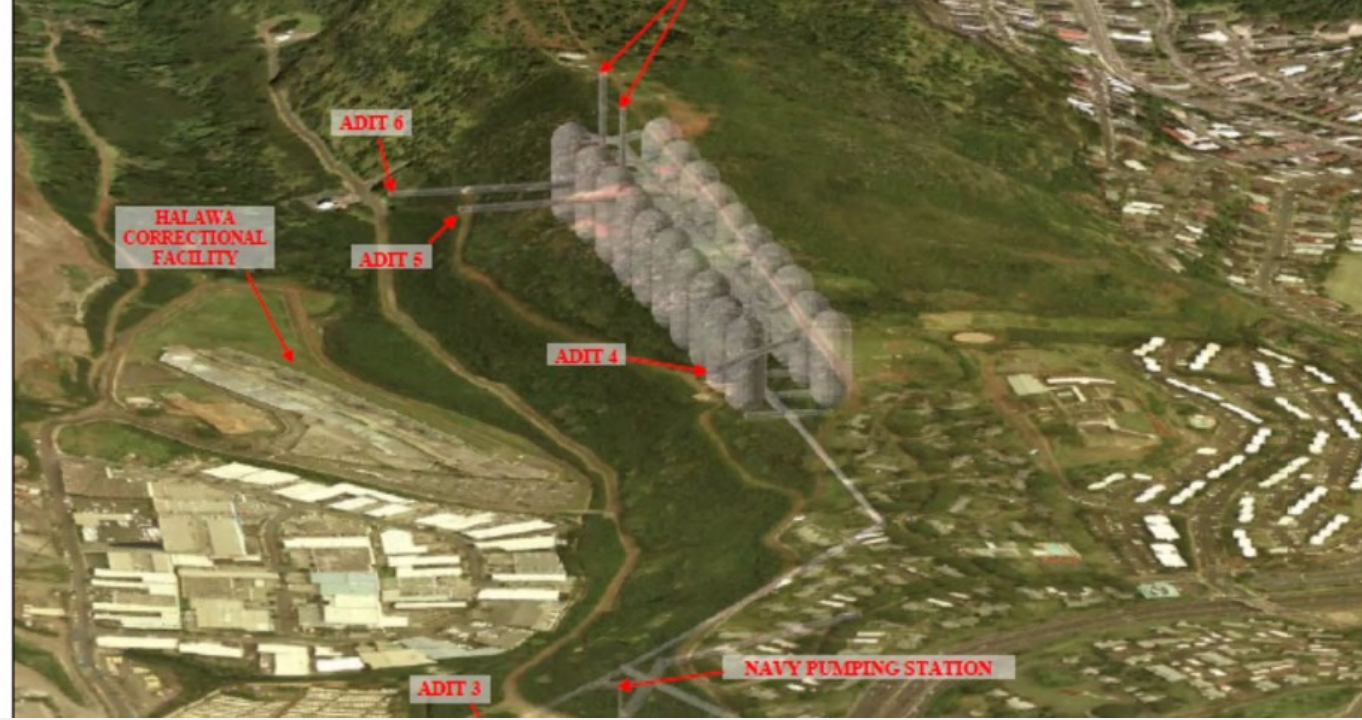




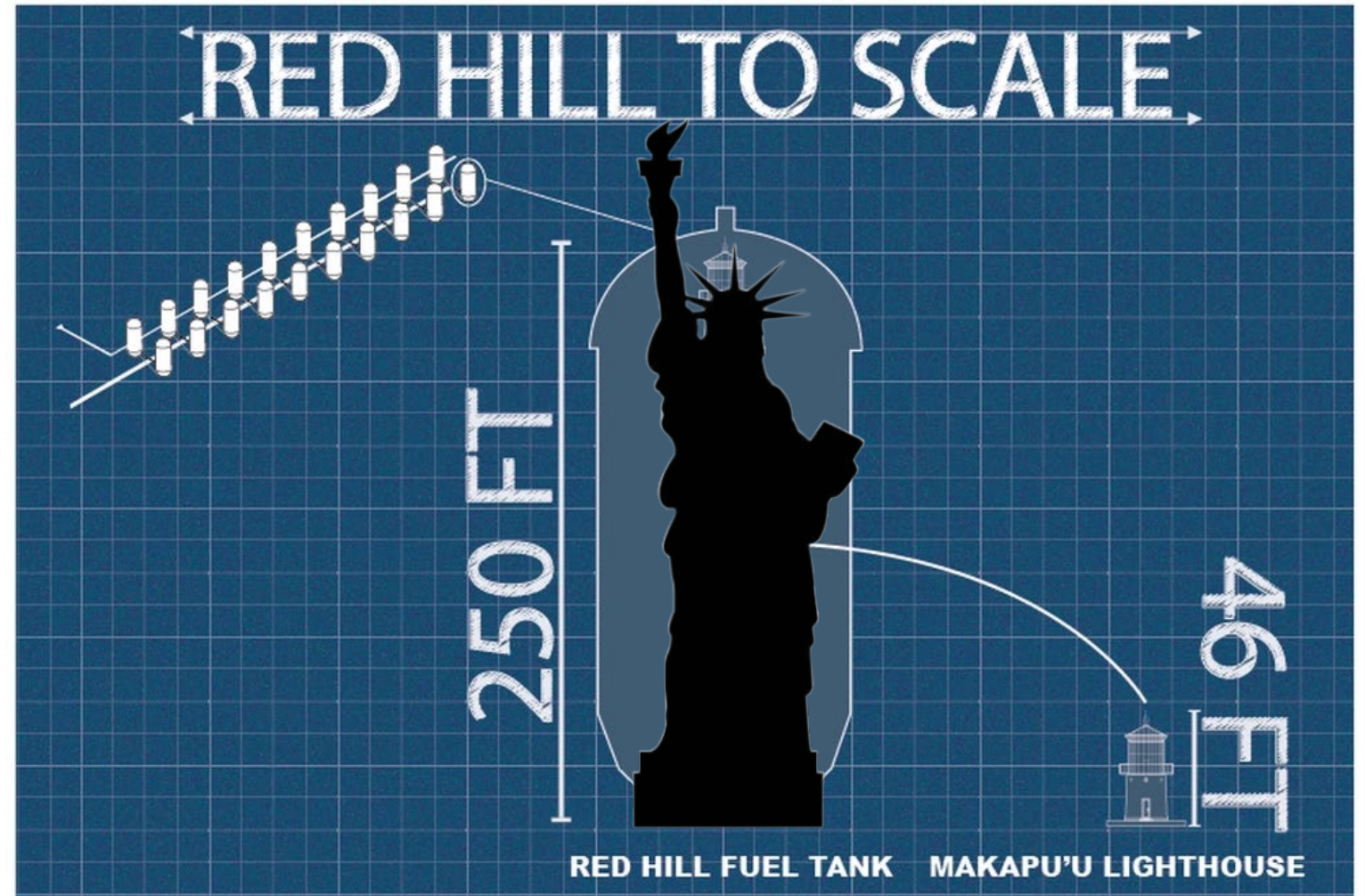
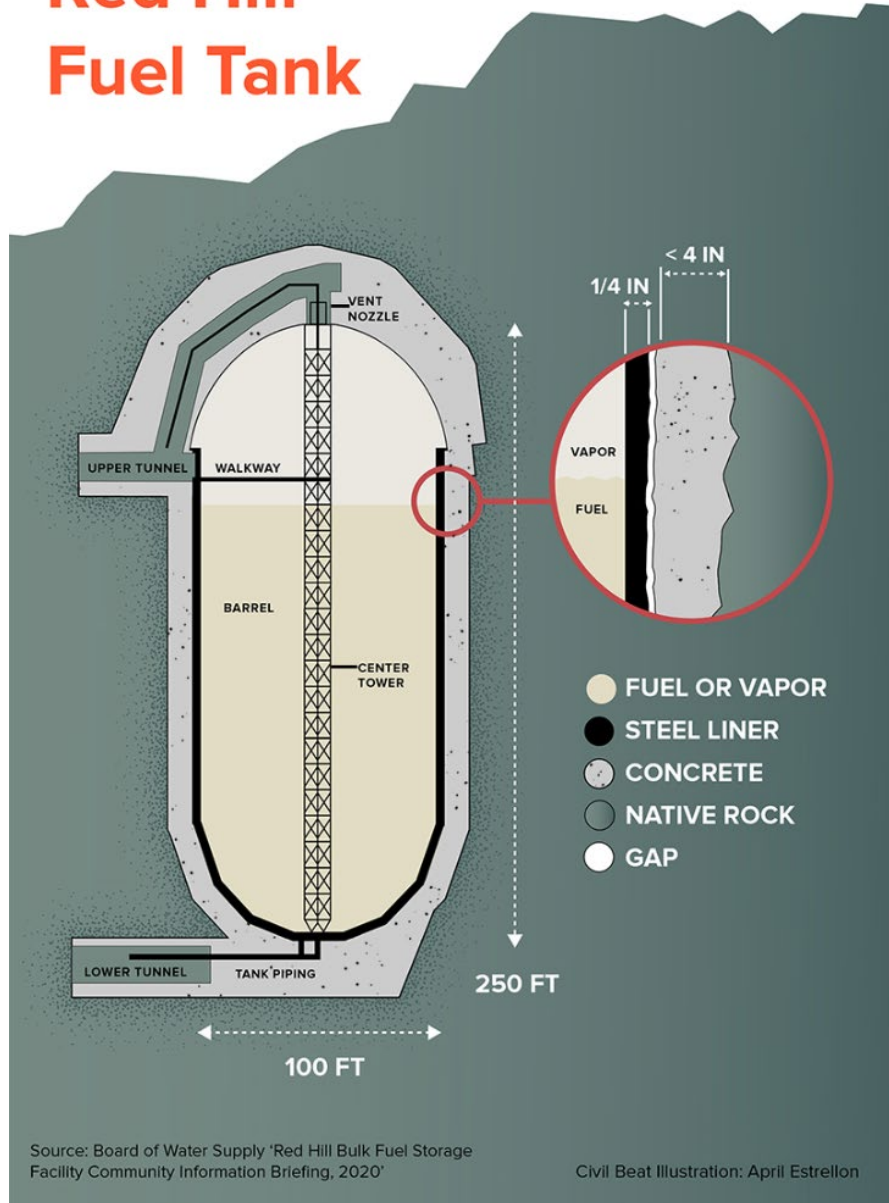
Slide Credit: Red Hill Registry

RED HILL BULK FUEL STORAGE FACILITY

- 20 tanks with 100 million gallons of fuel just 100 feet above Oahu's primary drinking water supply
- Built in the 1940s
- 2.5 miles mauka (uphill) of Pearl Harbor with connecting tunnel and pipes
- History of spills, three reported releases in 2021



Red Hill Fuel Tank



The tanks are large enough to fit five of the Makapu'u Point lighthouses stacked on top of each other. Each of the 20 tanks can hold up to 12.5 million gallons of fuel.

Source: **Graphics by Sgt. Luke Cohen**

<https://www.dvidshub.net/graphic/23052/red-hill-scale>

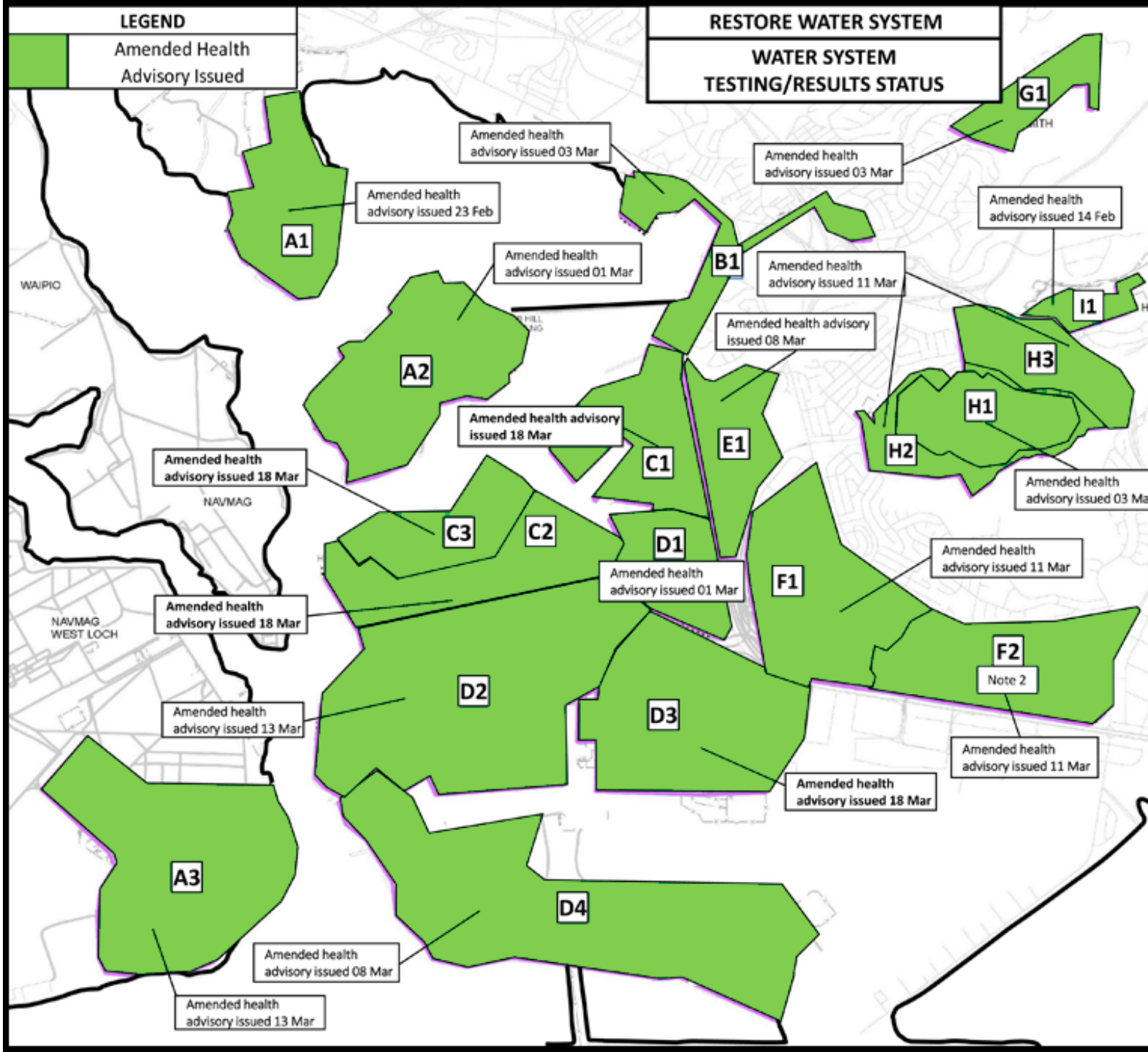
Source: <https://www.civilbeat.org/2021/12/how-the-red-hill-fuel-system-has-threatened-oahus-drinking-water-for-decades/>

OFFICIAL USN PHOTO
NAVAL PHOTOGRAPHY CENTER
NOT FOR PUBLICATION



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TO-1



Approximately
9600 Households

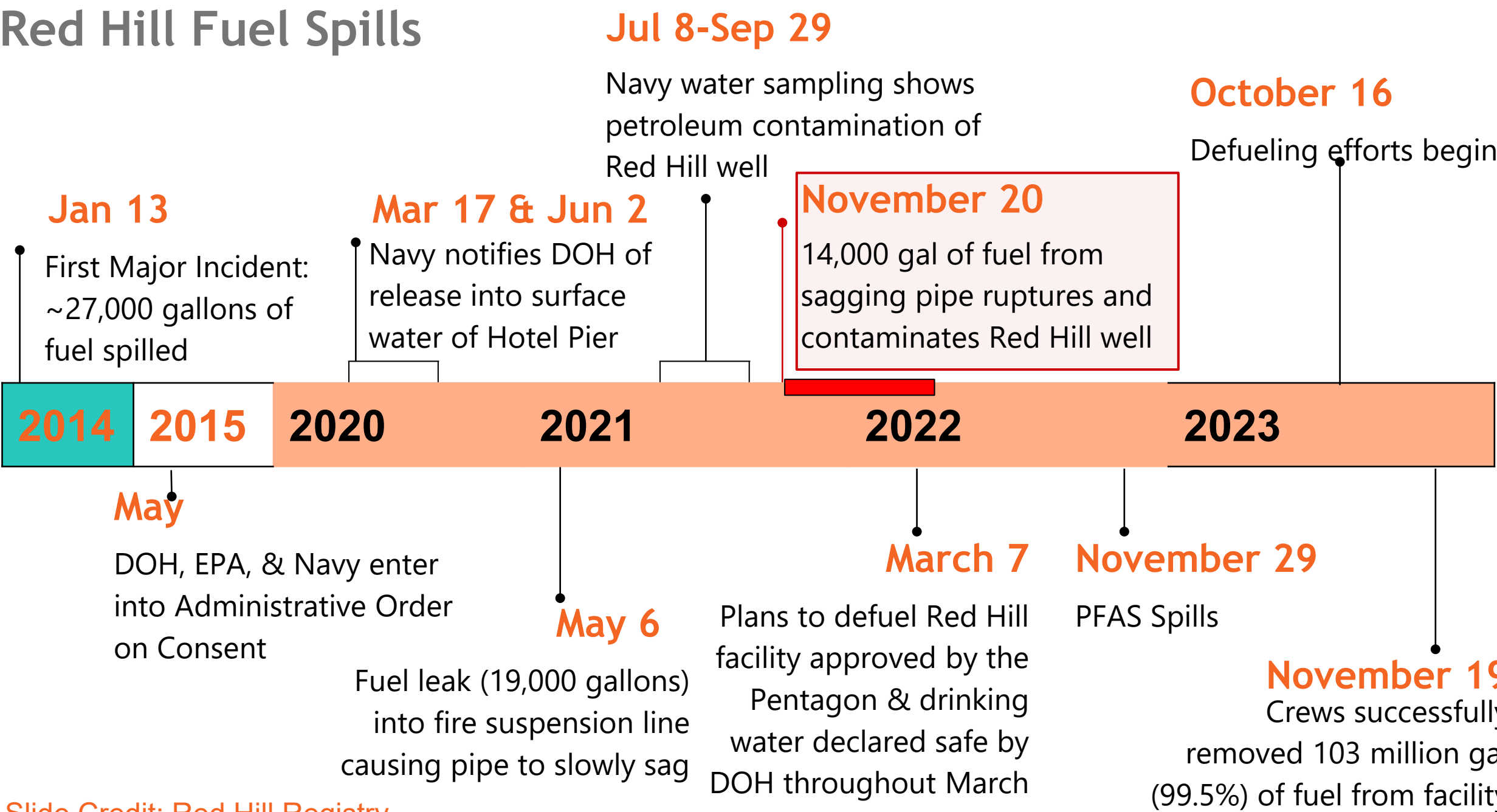
93,000 people



Source: Joint Base Pearl Harbor-Hickam, Safe Waters website, Zone Map

Slide Credit: Red Hill Registry

Red Hill Fuel Spills







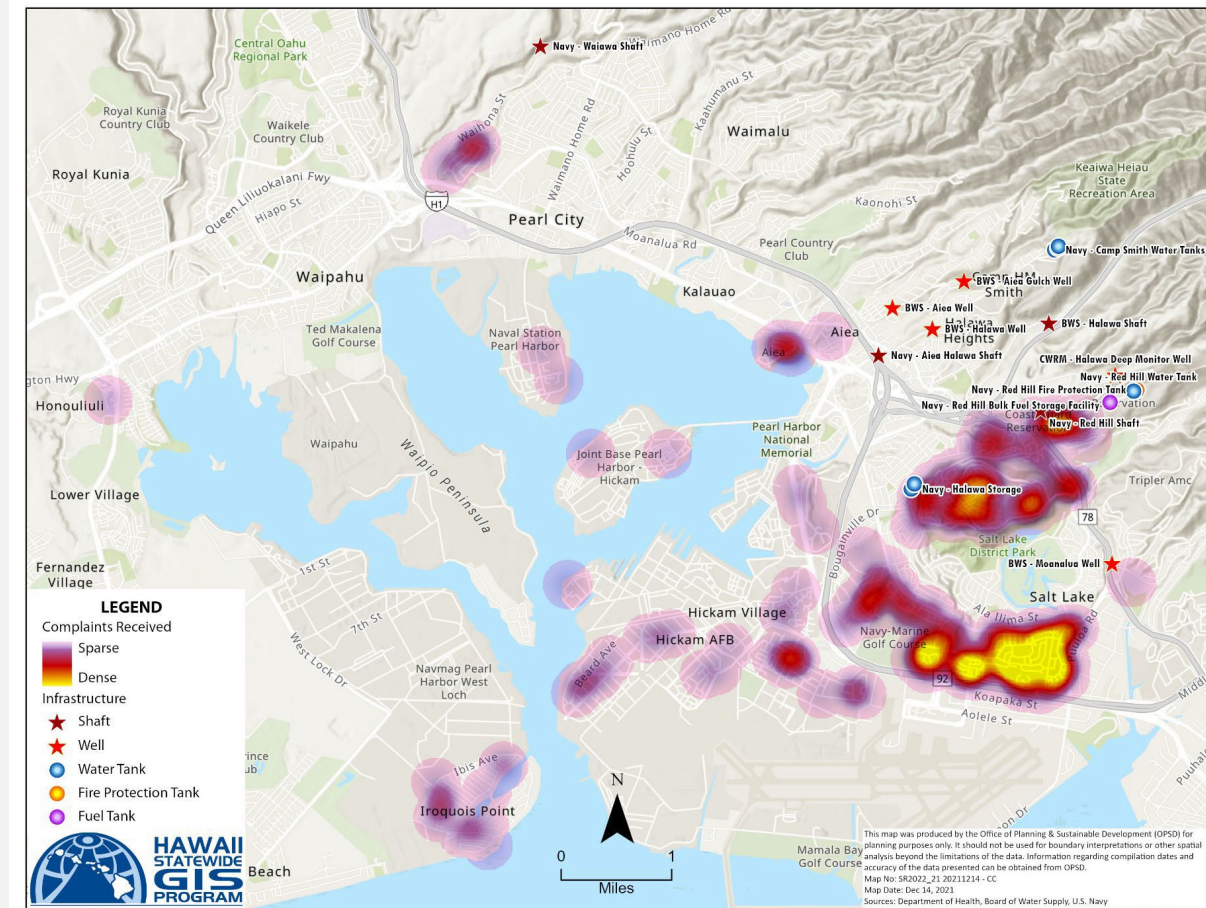
**Nov. 20, 2021:
Jet Fuel Water
Contamination**



>14,000 gallons

NOVEMBER 28-29, 2021 IDENTIFICATION OF A PROBLEM

- Hundreds of calls to HDOH Safe Drinking Water Branch reporting fuel-like odor in drinking water and health symptoms
- Hawaii Poison Center received 30 calls and identifies a “sentinel event”
- November 29, 2021 – HDOH issues “Do Not Drink” health advisory for the Navy’s JBPHH water system



JP-5

- Kerosene-like military jet fuel
- 1000+ different constituents
- Additives

Contaminant	Estimated Concentration
Benzene	0.2%
Toluene	0.1%
Xylenes	3.5%
Methylnaphthalenes	4.6%
Naphthalene	3.0%
C5-C8 Aliphatics	12%
>C8-C18 Aliphatics	68%
>C18-C32 Aliphatics	0.0%
>C8 Aromatics	9%

SYMPTOMS FROM EXPOSURE TO PETROLEUM HYDROCARBONS IN DRINKING WATER

- Stomach upset, nausea, vomiting and diarrhea
- Lightheadedness, headache and difficulty concentrating
- Skin irritation, redness or peeling skin
- Difficulty breathing, coughing and a pneumonia like syndrome



ENVIRONMENTAL & PUBLIC HEALTH RESPONSE

Communication

Partnerships

Federal Support

Outreach to Providers



Petroleum Hydrocarbons in Water: Health Effects



What happens if I swallow water with petroleum?

Drinking water containing petroleum hydrocarbons can cause an upset stomach, stomach cramping, nausea, vomiting, and diarrhea. Your throat and mouth may also get irritated.



What happens if water with petroleum gets on my skin?

Petroleum hydrocarbons can irritate the skin (dermal exposure). Continuous exposure can cause itchy rash with red and peeling skin. After skin contact, always wash with soap and clean water.



What happens if I breathe air that smells like petroleum?

Breathing petroleum vapors (also called inhalational exposure) can cause



How can this affect my future health?

Evaluation of the possibility of long-term health effects is ongoing. Based on current information, people exposed



What Are Petroleum Hydrocarbons?

Petroleum Hydrocarbons are a large class of chemicals made up of carbon and hydrogen that are the primary compounds found in common fuels such as kerosene, gasoline, diesel, motor oil, and different jet fuels, including JP-5. Each type of fuel consists of a slightly different mixture of hundreds of types of petroleum hydrocarbons.

Petroleum Hydrocarbons are organized in categories based on their size and chemical properties. They are measured in different ranges such as TPH-g, TPH-d, and TPH-o. All petroleum products and fuels consist of hydrocarbons in these ranges but with different amounts in each range.



RISK COMMUNICATION

- Complications of different messages from different groups
- HDOH tried to provide consistent, clear messaging
- Targeted public via news releases, TV appearances, fact sheets, website and social media
- Guidance for health care providers

GUIDANCE FOR HEALTH CARE PROVIDERS



HAWAII STATE
DEPARTMENT
OF HEALTH

December 9, 2021 Drinking Water Petroleum Exposure; Health Care Provider Evaluation and Treatment Guidance

<https://health.hawaii.gov/about/files/2021/12/Medical-Advisory-Drinking-Water-Petroleum-Exposure.pdf>

January 25, 2022: Notification of DOH-ATSDR Health Impact Survey

https://health.hawaii.gov/docd/files/2022/03/Medical-Advisory_Navy-Water-System-Contamination-DOH-ATSDR-Health-Survey.pdf

March 11, 2022: Biological Monitoring related to Petroleum Exposures in Drinking Water

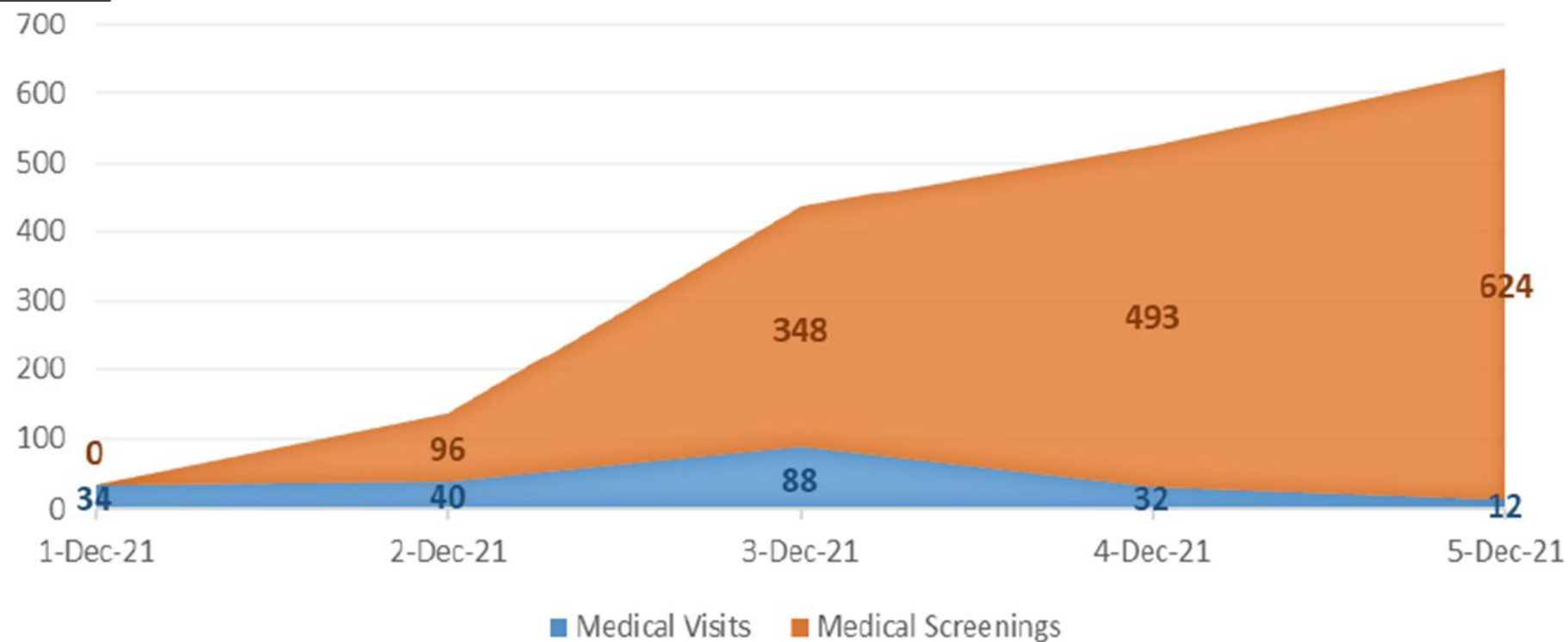
<https://health.hawaii.gov/docd/files/2022/03/Medical-Advisory-Chemical-Screening-aka-Biological-Monitoring-for-Exposures-to-Petroleum-Hydrocarbons-in-Drinking-Water.pdf>

PARTNERSHIPS

FEDERAL	STATE/LOCAL
EPA R9 On-scene Coordinators, Office of Water, Communications, plus	HDOH Safe Drinking Water Branch (SDWB)
US Navy	HDOH Hazard Evaluation & Emergency Response (HEER)
US Army	HDOH Solid and Hazardous Waste Branch (SHWB)
DOD's Defense Health Agency (DHA)	HDOH Clean Water Branch (CWB)
US Air Force, Coast Guard, NOAA	HDOH State Laboratory Division (SLD)
CDC/ATSDR/NCEH	Hawaii Department of Land and Natural Resources (DLNR)
USGS	University of Hawaii Water Resources Research Center (UH-WRRC)
Hawaii Congressional Delegation	Hawaii Commission on Water Resource Management (CWRM)
	Honolulu Board of Water Supply (HBWS)

MHS – INITIAL MEDICAL RESPONSE

OVERALL MEDICAL DEMAND AND SUPPORT



DATE	Service Members						DOD Dependents	DOD Civilians	DOD Contractor	Other (Non-Tricare)	Totals
	Army	Navy	Air Force	Marines	Coast Guard	Space					
28-Nov-21 to 1-Mar-22	921	565	608	33	75	5	3797	111	5	1	6121

ADDITIONAL DOD PUBLIC HEALTH RESPONSE ACTIONS

- Joint Health Services Working Group
- DOEHRS
- Water Delivery (~20,000 gal per day)
- Temporary Housing for over 4000 families
- Communication Materials
- Red Hill Clinic

https://www.cpf.navy.mil/Portals/52/Downloads/JBPHH-Water-Updates/Resident%20Resources%20Guide_Final%20Version.pdf?ver=SHSRVFQR3cftjHNKmEOFA%3d%3d×tamp=1641881712721

Resident Resources Packet

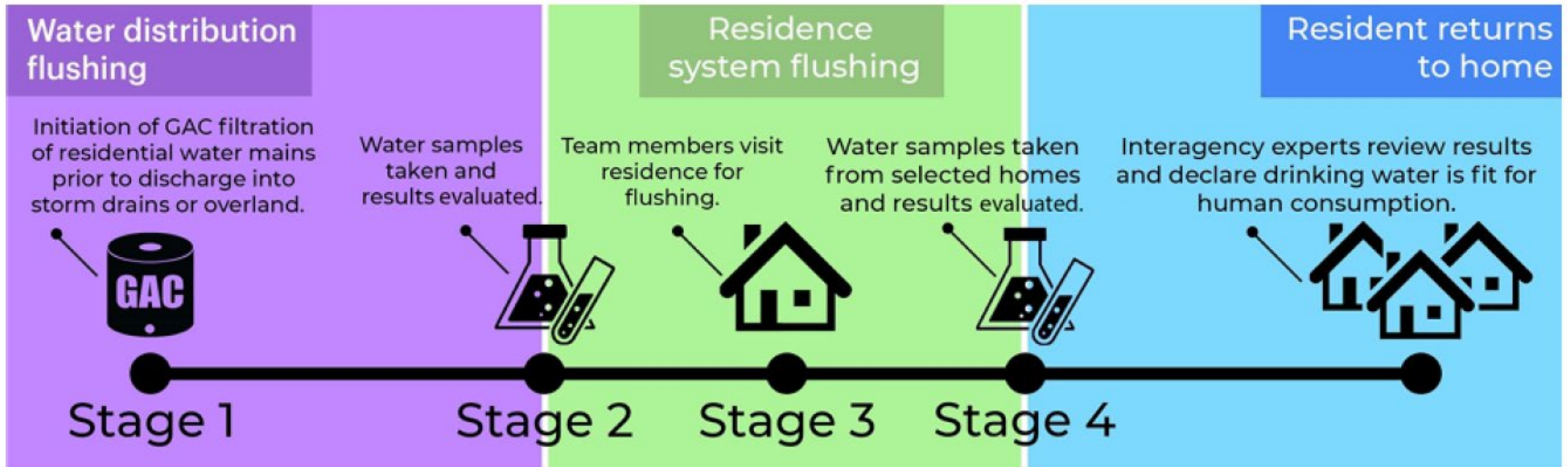
- Do's/Don'ts
- Sampling Fact Sheet
- Appliance Cleaning
- Flushing Plan
- Health Effects
- Incident Registry
- Definitions
- Resources/POCs

Interagency Drinking Water System Team (IDWST)

- Established on 12/17/2021
- Working group comprised of DOH, U.S. Navy, U.S. Army and U.S. EPA
- IDWST goals:
 - 1) Protect public health, safety, and the environment
 - 2) Ensure access to safe drinking water
 - 3) Sample and test drinking water consistent with a jointly agreed upon Sampling and Analysis Plan
 - 4) Monitor and address community concerns at impacted residences
 - 5) Implement flushing activities consistent with a jointly agreed upon Flushing Plan



Drinking Water Distribution System Recovery Plan: Stages 1-4



A Remedial Action Report was prepared for each zone, at the conclusion of Stage 4, documenting the flushing and analytical testing conducted in the distribution system and at buildings and homes. This document included lines of investigation required by the DOH to determine if the advisory for a zone should be amended.



HEALTH IMPACT SURVEYS

- #1: January 2022
- #2: September 2022



Water Use



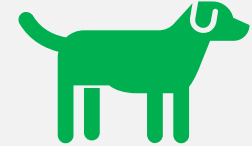
Health Symptoms



Medical Care



Children



Pets

CDC/ATSDR
Assessment of Chemical Exposure (ACE) Investigations

CDC/ATSDR ACE INITIAL RESULTS JAN/FEB 2022

MMWR published 05/27/2022

https://www.cdc.gov/mmwr/volumes/71/wr/mm7121a4.htm?s_cid=mm7121a4_w

87% of participants reported symptoms with 80% of those reporting improvement in their symptoms after switching water source

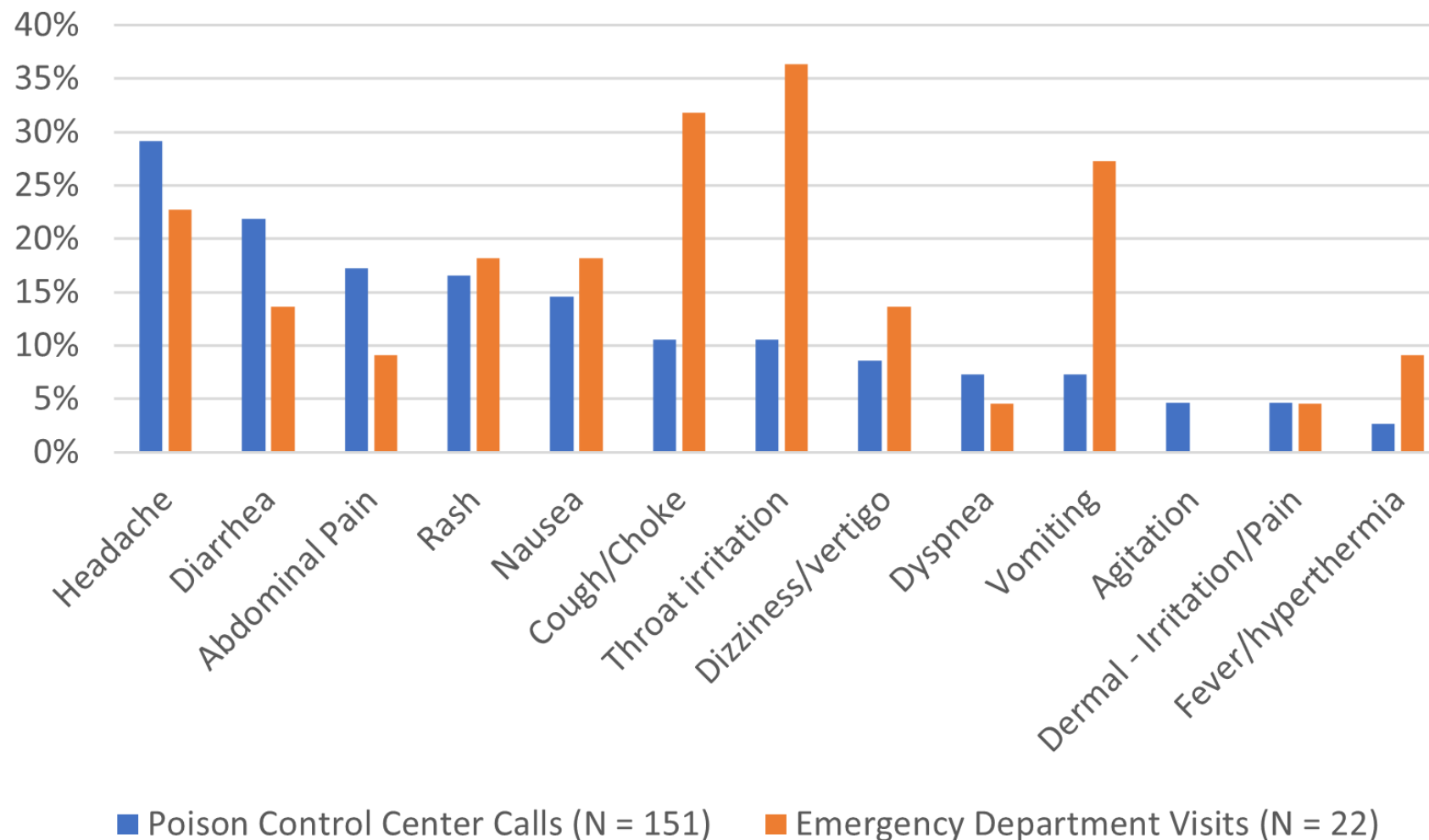
37% (853) sought medical care

Hundreds of people reported new mental health symptoms

Hundreds reported symptoms in pets

Majority received information from online sources

SYMPTOMS REPORTED IN POISON CONTROL CALLS AND EMERGENCY DEPARTMENT VISITS



8 MONTH FOLLOW UP CDC/ATSDR ACE SURVEY RESULTS

September 2022

health.hawaii.gov/about/files/2022/11/ATSDR-Follow-Up-Survey-One-Pager.pdf

80% of participants reported symptoms in the last 30 days with 65% convinced related to the water

Headaches, Anxiety, dry/itchy skin, fatigue

85% still using an alternative water source

50% reported worse mental health

Massive concern and frustration with communication, transparency and trust

OVERALL HEALTH AT FOLLOW-UP

55%

reported worse
physical health
after the incident
when compared
to before

50%

reported worse
mental health
after the incident
when compared
to before

21%

kept from usual
activities for 14+
of the past 30
days due to poor
health

MENTAL HEALTH

Event was an
extreme source of
stress

Likely to be
persistent

Significant reports of mental health
impacts in health impact survey, DOH
complaints and observed in callers, on
social media

LIMITATIONS

Study design

Convenience sampling

Self-reported/parent reported symptoms

Lack of exposure data

Outreach Barriers

Strengths

Widespread partner engagement

Large number of responses

Timely data for action

Reported Health Effects



Study	Dates	Sample size	Data collection
ACE 1	Jan 7–Feb 10, 2022	2,289	survey/interview
ACE 2	Sep 2022	986 (from ACE 1)	survey
ACE 3	Feb 2023	653	Medical records
UHERO	Jan 2024	174 (from ACE 1 & 2)	survey
DCPH-P-EDC	Nov/2020 - Dec/2023	44,373 (Red Hill), 59,499 (Comparison)	Medical Records

Abbreviations: Assessment of Chemical Exposures (ACE), The Economic Research Organization at the University of Hawai'i (UHERO), Defense Centers for Public Health-Provisional-Epidemiology Data Center (DCPH-P-EDC)



**NATIONAL
ACADEMIES** *Sciences
Engineering
Medicine*

ATSDR Agency for Toxic Substances and Disease Registry

Division of Community Health Investigations (DCHI)

WHAT'S NEXT – HEALTH

- NASEM
- Red Hill Registry
- ATSDR Public Health Assessment Activities

WHAT'S NEXT ENVIRONMENTAL

Ongoing Monitoring of the
Drinking Water System

Facility Closure

Aquifer recovery

Environmental Remediation

Last tanker of Red Hill fuel departs

By [Kevin Knodell](#) · Dec. 21, 2023

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CINDY ELLEN RUSSELL / CRUSSELL@STARADVERTISER.COM





An aerial photograph of a tropical coastline. In the foreground, a dark, sandy beach curves along the edge of a calm, turquoise ocean. The land is covered in dense, lush green vegetation. Behind the beach, a series of steep, rugged mountains rise sharply, their slopes covered in greenery. The mountains have sharp ridges and deep valleys. In the background, more mountain ranges are visible, some shrouded in a light mist or haze, creating a sense of depth. The overall scene is a beautiful, natural landscape.

QUESTIONS?

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