From: [redacted]
To: Yoda, Kathy S
Cc: DLNR.CW.DLNRCWRM
Subject: [EXTERNAL] Agenda Item C-1 Informational Briefing: DOH Update on Red Hill Red Hil l Response and Remediation
Date: Monday, January 23, 2023 9:32:53 PM

Aloha Members of the Water Commission,

My name is Sherry Pollack and I am a concerned citizen and water-drinker.

I am writing to express my deep concerns at the continued mishandling of precious water resources that are under the Navy's purview.

It is clear that the Navy lacks the capability to responsibly manage and maintain their water system, let alone oversee the mitigation of the jet fuel and PFAS contamination they caused. Month after month this Commission reviews the status of this existential crisis to our island, and each month the situation only worsens. It is time to take immediate action to remove the Navy from the role of overseeing their water system and the clean-up, and **appoint a qualified and unbiased third party to oversee the aquifer's full and expeditious remediation.** To this end, I strongly urge the Commission work closely with the Board of Water Supply in future planning and remediation efforts, as they have both the expertise and the trust of the community to do so. This needs to be done without delay as families under the Navy's water system **are still reporting problems with their water**, not to mention the Navy's lack of transparency and criminal disregard for the numerous scathing violations to the drinking water system that were noted by the EPA, in addition to the nearly one thousand Clean Water Act violations noted by the Department of Health.

The Navy has lied over and over to us, and has caused, and continues to cause serious harms —not only to their own people, but to the civilian community as well. The Navy's negligent actions have been criminal. All this must be stopped.

Your Commission has the power to help make things pono. Ensure the expeditious draining of the jet fuel tanks that sit 100 feet over our sole-source aquifer by a qualified entity now.

Ola I Ka Wai. Water is Life.

Respectfully,
Sherry Pollack

From: ann Wright
To: DLNR.CW.DLNRCWRM; Yoda, Kathy S
Subject: [EXTERNAL] Testimony from Col (Ret) Ann Wright for January 24, 2023 Commission on Water Resource Management Hearing
Date: Tuesday, January 24, 2023 10:22:59 AM

Testimony for January 24, 2023 Commission on Water Resource Management Hearing

I am providing testimony on the Red Hill update portion of the Commission on Water Resource Management hearing.

I am a 20-year resident of Honolulu. I served 29 years in the U.S. Army/Army Reserves and retired as a Colonel.

I was a U.S. diplomat for 16 years in Nicaragua, Grenada, Somalia, Uzbekistan, Kyrgyzstan, Sierra Leone, Micronesia, Afghanistan and Mongolia.

PFAS and AFFF contamination of Hawaii's Waters

As a retired U.S. Army colonel with 29 years of military service, I am very disappointed at the military's continued lack of transparency on the 2021 jet fuel spills at Red Hill — and now, the lack of sensitivity on the November 29, 2022 spill of 1,300 gallons of a toxic firefighting foam….and its harmful effects on the waters of Oahu and the Pacific Ocean.

PFAS investigator Pat Elder gave a very informative presentation on January 31 on PFAS poisoning in Hawaii. Mr. Elder is the Director of MilitaryPoisons.Org. Hawaii Climate and Environment Coalition sponsored the webinar. Here is the link to the webinar in which Mr. Elder speaks of pollution of Hawaii waters with PFAS.

https://drive.google.com/file/d/1YtqKYVeS-ckUGkCrdJRoB79lcsThFIlk/view.

The AFFF (aqueous film forming foam) apparently billowed up inside an entrance tunnel of the underground jet fuel storage complex, and the foam tide flowed over 100 meters along and into the ground outside of the tunnel and down the hill.
Just as with the Navy initially stating there was no video of the 19,000 gallons of jet fuel spewing for 34 hours in November 2021 and then having to admit there was a video when it was released by a whistleblower, causing public outrage, the holding back from the public of the video of the 1,300 gallons of AFFF is going to cause even more outrage. And it's a reminder that the Navy has still not officially released any video of the 2021 spewing jet-fuel spill.
There are many photos of the release of AFFF/PFAS (per- and polyfluoroalkyl substances, also known as "forever chemicals"), and billowing snowlike mounds of the foam, in other facilities where it has occurred.

The AFFF foam that was released in a U.S. Air Force hanger on Okinawa several years ago filled the hanger and the attached parking area to a depth of several feet.

Here, the 1,300 gallons of AFFF foamed inside the entrance hall of the Red Hill tunnel and then flowed downhill on the ground outside the tunnel at least 200 feet. Drone video showed that the Navy put blue tarps over the foam. The tarps apparently were useful for two reasons. First the tarps hid the billowing foam that was probably at least 1 to 2 feet deep. Second, the tarps attempted to contain the foam from flowing further downhill with Oahu's rains.

Community outrage concerning the recent AFFF/PFAS spill of dangerous firefighting foam near the Red Hill jet fuel tanks erupted at two meetings on Dec. 12. At the monthly meeting of the Honolulu Board of Water Supply, in a remarkable show of disrespect for the community, representatives from the state Department of Health and the U.S. Environmental Protection Agency abruptly left the meeting after their presentations and just before scheduled community testimony.

A few hours later, community outrage flowed at the town hall meeting held at Moanalua Middle School, hosted by state legislators. Navy officials left the stage as questions were yelled from the audience.
Those with questions for the panel included family members who have severe medical complications from jet-fuel poisoning. Coming in for specific ire was the military for taking more than a year to set up a clinic for military families for support for those suffering from toxic exposure — and it is still not ready for patients.

It's time for the Navy to come clean on the AFFF spill at Red Hill.

NAVY STILL FLUSHING 4.2 MILLION GALLONS A DAY WITHOUT FINDING A WAY TO RE-USE THE WATER

At the Honolulu Board of Water Supply meeting on January 23, 2023, Hawaii Department of Health reported that the Navy still does NOT have a plan for re-using the 4.2 million gallons of water that is pumped out of the jet fuel contaminated Red Hill drinking water well and run through the Granulator Activated Carbon filters and then released into

Halawa stream that goes into Pearl Harbor and out into the ocean.

The US military has 15 golf courses on Oahu and certainly this water could be used to water the golf courses.

According to a member of the Board of Water Supply, ver 1 billion gallons of water has been flushed down Halawa stream in the year since the Navy began flushing 4-5 million gallons out of the Red Hill drinking water well shaft!

The Navy can not be allowed to continue this wasteful procedure!

Ann Wright
[redacted]
Honolulu, HI 96826
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Ann Wright
Dissent: Voices of Conscience
www.voicesofconscience.com

From: Katherine McClanahan
To: Yoda, Kathy S
Subject: [EXTERNAL] Commission meeting Zoom testimony
Date: Tuesday, January 24, 2023 12:20:02 PM
Attachments: red_hill_navy_fuel_additives_list.pdf

Hello,
My name is Katherine McClanahan and I am writing to request in person ZOOM testimony during the 1/24/23 water commission meeting. Here is my script below:

My name is Katherine Mcclanahan and my family and I like many were affected by the contamination at Red Hill. I have several questions I would like to ask the commission members, the HDOH or any expert in the room:
1) Referring to the groundwater sampling data posted on the HDOH website (741 page document), why was the information not placed on the HDOH website until late August/early September 2022 but included data as far back as May 2021??

2) On the HDOH website for the same groundwater data beginning on 5/12/21, why are pages 4-14, 16-25, among many more pages between page 4- and page 50 blank for groundwater sampling results??? Why is there so much data missing from those pages and dates including the very contaminants listed on the EPA's contaminants of concern document from 2016? I will attach EPA contaminant of concern document below:

https://www.epa.gov/sites/default/files/2016-07/documents/red_hill_navy_fuel_additives_list.pdf

3) Between pages 28-49 With large gaps in the data missing and then suddenly high levels of multiple contaminants recorded including methane, lead, 1,2, methylethalanes not to mention scores of other contaminants that are missing data between those pages, what is the commissions, Navy's, or HDOH best explanation as to why that data is missing??

4) Does the commission or any expert in the room surmise that the data is missing from the previous question because the levels were extremely high or elevating throughout the time period of May to December of 2021??

Thank you for your time,
Katherine McClanahan
Sent from my iPad

Chemicals of Potential Concern (COPCs) Recommendations Fuel Additives

Red Hill Bulk Fuel Storage Fuel Facility

A meeting was held on May 10, 2016 to discuss the recommended approach to addressing the objectives of the Administrative Order on Consent (AOC) In the Matter of Red Hill Bulk Fuel Storage Facility (herein referred to as "the Facility") Statement of Work (SOW) Section 6 and Section 7 with the Regulatory Agencies (State of Hawaii Department of Health [DOH] and United States Environmental Protection Agency Region IX [EPA]) and various subject matter experts (SMEs). The following attended the meeting: Parties of the AOC (Regulatory Agencies, Department of Navy [Navy], and Defense Logistics Agency [DLA]) and SMEs to the Regulatory Agencies (University of Hawaii [UH]; State of Hawaii Department of Land and Natural Resources [DLNR] Commission on Water Resources Management [COWRM]; United States Geological Survey [USGS] Pacific Islands Water Science Center; City and County of Honolulu Board of Water Supply [BWS]). Also in attendance were the Navy's contractor, AECOM, and BWS' contractor, Intera Geoscience & Engineering Solutions (Intera). One of the action items from the meeting was for the Navy and DLA to evaluate fuel additives and determine if additional analytes need to be included on the chemicals of potential concern (COPCs) list for the Facility, as previously agreed upon by the Parties of the AOC on February 4, 2016. The following discussion and table present the results of the fuel additives evaluation:

Table 1 summarizes 18 chemical constituents of additives associated with fuel stored at the Facility. Six groups of fuel additives were identified and evaluated: (1) metal deactivators; (2) corrosion inhibitors and lubricity improvers; (3) icing inhibitors; (4) static dissipaters; (5) lubricity improvers; and (6) antioxidants. To better assess and determine which chemical constituents could potentially pose a concern to the groundwater resource, the following attributes were evaluated for each additive group and associated chemical constituents: estimated/projected quantities of chemicals present per 10,000 barrels of fuel; physical, chemical, and toxicity properties; and associated EPA and DOH screening criteria (if available).

Based on the information gathered and data evaluated, Table 1 details the following results:

- Four of the 18 chemicals, while common, are proprietary (trade-secret) and permitted chemicals for which no information could be obtained at this time. These 4 chemicals are:
    1. lubricity improver additive Infenium R655;
    2. trade secret polymer containing sulphur (chemical component, 10-30% by weight, of the static dissipater additive STADIS 450) in F-24 and JP-8;
    3. trade secret polymer containing nitrogen (chemical component, 5-10% by weight, of the static dissipater additive STADIS 450) in F-24 and JP-8; and
    4. NJ Trade Secret Registry #00850201001-5000 P (chemical component, 70-80% by weight, of the corrosion inhibitor and lubricity improver DCI-4A) in JP-5.

- Five of the 18 chemicals are already included on the COPCs list for the Facility:
    1. benzene;

2. ethylbenzene;
3. toluene;
4. xylene; and
5. naphthalene

- Seven of the 18 chemicals have no associated regulatory screening criteria, and are present at extremely dilute concentrations in fuel and/or have very low water-solubility. Therefore, these seven chemicals are not anticipated to pose concerns for the groundwater resource. These 7 chemicals are:
  1. solvent naphtha (petroleum; chemical component, 10-30% by weight, of the static dissipater additive STADIS 450);
  2. dinonylnaphthylsulphonic acid (chemical component, 10-30% by weight, of the static dissipater additive STADIS 450);
  3. propan-2-ol (chemical component, 1-5% by weight, of the static dissipater additive STADIS 450);
  4. N,N-disalicylidene-1,2-propanediamine (the metal deactivator additive);
  5. tertiary butylated phenol;
  6. o-terbutylphenol; and
  7. 2,4,6-tri-terbutylphenol (chemical components of the antioxidant additive AO-37).

- The Navy and DLA recommend the remaining two of the 18 chemicals to be added to the COPCs list for the Facility and analyzed during the first two monitoring events. Given the short half-lives and very low concentrations of these two chemicals in fuel (e.g., additive to bulk fuel ratios), the Navy and DLA further recommend these two chemicals be removed from the COPCs list if groundwater sampling results show chemical concentrations are not detected above screening criteria, similar to the approach agreed upon for the lead scavengers. These two chemicals are:
  1. 2-[2-methoxyethoxy]-ethanol (screening criterion of 800 µg/L) and
  2. phenol (screening criterion of 5 µg/L)

  The half-lives of 2-[2-methoxyethoxy]-ethanol in water is 15 days and phenol in soil is less than 5 days. It is estimated that, at most, 26.4 gallons of 2-(2-methoxyethoxy)-ethanol may have been released as part of the 27,000-gallon Tank 5 fuel release in January 2014. Phenol is not a chemical constituent in additives used for the fuel type released in January 2014. Furthermore, these two chemicals have the following properties:
  - readily biodegradable and water-soluble;
  - only present in fuel at small concentrations (i.e., at most, 2-[2-methoxyethoxy]-ethanol amounts to 410 to 615 gallons per 10,000 barrels of fuel and phenol amounts to 1.5% of 9.408 gallons of AO-37 additive per 10,000 barrels of fuel); and
  - each chemical has associated EPA Tap Water Regional Screening Levels (RSLs)

  EPA Method 8270D will need to be added to the sampling and analysis program proposed in the May 4, 2016 Work Plan/Scope of Work for AOC SOW Section 6 and Section 7 in order to analyze for these two chemicals.

Table 1. Summary of Chemical Information and Estimated/Projected Quantities of Fuel Additives, Red Hill Bulk Fuel Storage Facility, Joint Base Pearl Harbor-Hickam, Oahu, Hawaii

Additive	Additization Site	Specification	Description	Fuel	Approx. Max Additive Volume Added to Fuel	Chemical (Additive percent composition by weight)	CAS No.	Approx. Max Chemical Volume per Gallon of Fuel	EPA RSL (µg/L)	DOH EAL (µg/L)	Potential Receptors	Recommendation	Notes
Static Dissipater Additive (SDA) STADIS 450 Injected onsite	On-site Pearl Harbor	50 to 600 pS/m	If electrical conductivity additive is used, the conductivity shall not exceed 600 pS/m at the point of use of the fuel. When electrical conductivity additive is specified by the purchaser, the conductivity shall be 50 to 600 pS/m under the conditions at point of delivery.	F-24 and JP-8	1.331 gal per 10,000 barrels	Toluene (30-60%)	108-88-3	0.0000019 gal	1100	40	Human and ecological	Analyte is currently included on the COPCs list.	Investigation screening criteria is 40 µg/L.
						Solvent naphtha (petroleum), heavy aromatic (10-30%)	64742-94-5	0.00000095 gal	NA	NA	Ecological	Due to lack of regulatory screening criteria, negligible solubility in water, and very minimal volumes added to fuels (maximum 30% of 1.331 gallons added per 10,000 barrels), not recommended to add this analyte to the COPCs list.	Negligible solubility in water; moderate toxicity to aquatic organisms, and chronic aquatic toxicity is not expected due to low solubility in water and tendency to move from water to air. Biodegrades at a rapid rate and does not persist in the environment.
						Dinonylnaphthylsulphonic acid (10-30%)	25322-17-2	0.00000095 gal	NA	NA	Human and ecological	Due to lack of regulatory screening criteria, insolubility in water, and very minimal volumes added to fuels (maximum 30% of 1.331 gallons added per 10,000 barrels), not recommended to add this analyte to the COPCs list.	Insoluble in water. Very toxic to aquatic organisms.
						Trade secret polymer containing sulphur (10-30%)	NIF	0.00000095 gal	NIF	NIF	NIF	No information was found due to proprietary nature of analyte. Due to lack of information found and the very minimal volumes added to fuels (maximum 30% of 1.331 gallons added per 10,000 barrels), not recommended to add this analyte to the COPCs list.	NIF
						Trade secret polymer containing nitrogen (5-10%)	NIF	0.00000032 gal	NIF	NIF	NIF	No information was found due to proprietary nature of analyte. Due to lack of information found and the very minimal volumes added to fuels (maximum 10% of 1.331 gallons added per 10,000 barrels), not recommended to add this analyte to the COPCs list.	NIF
						Propan-2-ol (1-5%) (also known as isopropyl alcohol, isopropanol)	67-63-0	0.00000016 gal	410	NA	Human and ecological	This chemical has a short half-life in water and is present in extremely low concentrations in the fuels (maximum 5% of 1.331 gallons per 10,000 barrels), Not recommended to add this analyte to the COPCs list at this time. However, if light non-aqueous phase liquid (LNAPL) is observed during groundwater sampling, it may be appropriate to re-evaluate this analyte.	Miscible in water, ethanol, ether, and chloroform. Estimated volatilization half-lives for a model river and model lake are 86 hours and 29 days, respectively. Biodegradation is expected to be an important fate process based on the results of microbial screening tests.
						Naphthalene (1-5%)	91-20-3	0.00000016 gal	0.17	17	Human and ecological	Analyte is currently included on the COPCs list.	Screening criteria is 17 µg/L.
Metal Deactivator (MDA) N,N-disalicy-lidene-1,2-propane diamine	Refinery	NA	MDA may be added to fuel to counteract the effects of metals known to be deleterious to thermal stability, such as copper, cadmium, iron, cobalt and zinc, provided that the nature of the contamination is reported. Where metallic contamination is unproven, an MDA may be used to recover thermal stability provided that the Thermal Stability Test (in accordance with Table 2) is determined before and after MDA addition and reported on the test certificate. Initial addition of more than 2.0 mg/L MDA is permitted when fuel will be transported in supply chains where copper contamination may occur; the maximum cumulative addition in Table 2 still applies. Note that fuel containing MDA has been shown to promote the dissolution of copper and may exacerbate thermal stability problems.	JP-5, F-24 and JP-8	0.9425 gal per 10,000 barrels	N,N-disalicylidene-1,2-propanediamine	94-91-7	0.0000022 gal	NA	NA	Human	Due to lack of screening criteria, low solubility, and very minimal volumes added to fuel (maximum 0.9425 gallons per 10,000 barrels), recommend not recommended to add this analyte to the COPCs list.	Mildly toxic by ingestion. When heated to decomposition it emits toxic fumes. In its pure form, the analyte is a solid at room temperature. Acute toxicity data (1960) indicates an LD50 of 4560 mg/kg via oral ingestion. Observed effects were depressed activity and weight loss or decreased weight gain.

Additive	Additi-zation Site	Spe-cifica-tion	Description	Fuel	Approx. Max Additive Volume Added to Fuel	Chemical (Additive percent composition by weight)	CAS No.	Approx. Max Chemical Volume per Gallon of Fuel	EPA RSL (µg/L)	DOH EAL (µg/L)	Potential Receptors	Recommendation	Notes
Infenium R655 (Lubricity Improver)	Refinery	520 micron max	Routinely used to improve the lubricity of military fuels and may be used in civil fuels. These additives vary in efficacy and may be depleted by adsorption on tank and pipe surfaces, so treat rates should be set with care. Because of their polar nature, these additives can have adverse effects on fuel filtration systems and on fuel water separation characteristics. For this reason, it is preferable to avoid adding more of these additives than needed.	F-76	145 ppm (equal to 60.9 gal per 10,000 barrels)	NIF	NIF	0.00015 gal	NIF	NIF	NIF	NIF	NIF
AO-37 (Antioxidant)-Only for Synthesized Paraffinic Diesel (AltAir)	Refinery	Contract and Refinery Based	Used to prevent the formation of oxidation deposits in engine fuel systems, to counteract the catalytic effects of active metals in fuel systems, and to improve the oxidation stability of fuels in storage.	F-76	22.4 ppm (equal to 9.408 gal per 10,000 barrels) currently (contract dependent)	Tertiary butylated phenol (>75%)	68610-06-0	0.000017 gal	NA	NA	NIF	Due to very minimal volumes added to fuels (9.408 gallons per 10,000 barrels) and lack of screening criteria, not recommended to add this analyte to the COPCs list.	Not found in Toxnet – toxicology data network. Physical properties of this chemical indicate a chemical density similar to water. Chemical structure is similar to o-terbutylphenol with the exception of more reactive –ene group instead of terbutyl.
						o-terbutylphenol (<10%)	88-18-6	0.0000022 gal	NA	NA	NIF	Due to very minimal volumes added to fuel (9.408 gallons per 10,000 barrels) and lack of screening criteria, not recommended to add this analyte to the COPCs list.	This substance is a colorless to yellow liquid which is soluble in alcohol, ether, isopentane, toluene and ethanol, and insoluble in water. Estimated chemical and physical properties for o-terbutylphenol indicate that this substance would adsorb to suspended solids and sediment in water, would slowly volatilize from water surfaces, and bioconcentrate in aquatic organisms. Limited empirical data, mainly derived by analogy to 4-t-butylphenol, indicate that 2-t-butylphenol may be resistant to biodegradation.
						2,4,6-tri-terbutylphenol (<15%)	732-26-3	0.0000034 gal	NA	NA	NIF	Due to very minimal volumes added to fuel (9.408 gallons per 10,000 barrels) and lack of screening criteria, not recommended to add this analyte to the COPCs list.	This substance is a liquid which is soluble in most organic solvents ethanol, acetone and carbon tetrachloride and is insoluble in water. Estimated chemical and physical properties for 2,4,6-tri-ter-butylphenol indicate that this substance would adsorb to suspended solids and sediment in water. Volatilization from water surfaces is expected but hindered by its preference to adsorb to suspended solids. Measured bioconcentration factors for this analyte in carp suggests bioconcentration is very high.
						Phenol (0.5-1.5%)	108-95-2	0.00000034 gal	5800	5	Human	Phenol has not been analyzed at thus far for the Facility, therefore, there is no data/information on the presence, absence, or concentration of phenol in the groundwater (if any). Since phenol is present in low concentrations in F-76 and LNAPL has not been observed thus far in at the groundwater table interface at the Facility, it is anticipated that phenol is not likely to be present in groundwater at levels suggesting a potential concern. However, the Navy and DLA recommend analyzing for phenol during the first two groundwater monitoring events and based on those results, re-evaluating whether it should be retained on the COPCs list.	Phenol was not one of the many analytes in the historical data set for the Facility. The DOH Tier 1 EAL is based on gross contamination concerns (5 µg/L), which is lower than drinking water toxicity (11,000 µg/L, non-carcinogenic effects) and acute aquatic habitat impacts (3,400 µg/L). Phenol is a product of combustion of coal wood, municipal solid waste, and petroleum, and a product of auto exhaust. Although low levels of phenol have been detected in certain foods and tap water, these levels do not constitute major sources of exposure for most people. Phenol has been reported at concentrations of 7 and 28.6 ppm in smoked summer sausage and smoked pork belly, respectively. Phenol is readily biodegraded under both aerobic and anaerobic conditions in soil; half-life in soil is generally <5 days. Phenols generally do not adhere strongly to

Additive	Additi-zation Site	Spe-cifica-tion	Description	Fuel	Approx. Max Additive Volume Added to Fuel	Chemical (Additive percent composition by weight)	CAS No.	Approx. Max Chemical Volume per Gallon of Fuel	EPA RSL (µg/L)	DOH EAL (µg/L)	Potential Receptors	Recommendation	Notes
													soils and tend to be relatively mobile in water. Phenols are present in crude petroleum at low concentrations. Usually phenol concentrations are lower in refined petroleum, such as diesel fuel.
Fuel System Icing Inhibitor (FSII) (0.08%) Diethylene Glycol Monomethyl Ether	Refinery	0.08-0.11%	Utilized to reduce icing effects of aviation turbine fuels. The quantity must be declared by the fuel supplier and agreed to by the purchaser.	JP-5	615 gal per 10,000 barrels	Ethanol, 2-(2-methoxyethoxy)-	111-77-3	0.0015 gal	800	NA	Human	This analyte has a short half-life and is present in low concentrations in the fuel. There is an EPA tap water screening criterion and a known risk to human health. The Navy and DLA recommend analyzing 2-(2-methoxy-ethoxy)-ethanol during the first two monitoring events and based on those results, re-evaluating whether it should be retained on the COPCs list.	High mobility in soils, not expected to volatize from soil surfaces. Readily biodegradable (100%). Not expected to adsorb to suspended solids and sediments in water and volatilization from water is not expected. Half-life for water is 15 days. Biomedical effects: can be absorbed by skin and causes possible harm to unborn children.
				F-24 and JP-8	410 gal per 10,000 barrels			0.00098 gal					
Corrosion Inhibitor (CI) & Lubricity Improver (LI) DCI-4A	Refinery	NA	Routinely used to improve the lubricity of military fuels and may be used in civil fuels. These additives vary in efficacy and may be depleted by adsorption on tank and pipe surfaces, so treat rates should be set with care. Because of their polar nature, these additives can have adverse effects on fuel filtration systems and on fuel water separation characteristics. For this reason, it is preferable to avoid adding more of these additives than needed.	JP-5	1.331 gal per 10,000 barrels	NJ Trade Secret Registry # 00850201001-5000 P (70-80%)	NIF	0.0000025 gal	NIF	NIF	NIF	Due to proprietary nature of analyte, no information was found. Due to very minimal volumes added to fuels (maximum 80% of 1.331 gallons per 10,000 barrels), recommend to perform no further research on this analyte and not to include analyte on COPCs list.	NIF
				F-24 and JP-8	10.06 gal per 10,000 barrels	Xylene (20-30%)	1330-20-7	0.00000095 gal	190	20	Human and ecological	Analyte is currently included on the COPCs list.	Investigation screening criteria is 20 µg/L.
								0.0000072 gal					
						Ethylbenzene (0-5%)	100-41-4	0.0000012 gal	1.5	30	Human and ecological	Analyte is currently included on the COPCs list.	Investigation screening criteria is 30 µg/L.
						Benzene (0.02%)	71-43-2	0.0000000048 gal	0.46	5	Human and ecological	Analyte is currently included on the COPCs list.	Investigation screening criteria is 5 µg/L.

%	percent	LI	lubricity improver
µg/L	microgram per liter	m	meter
AO	antioxidant only	max	maximum
CAS	Chemical Abstracts Service	mg/kg	milligram per kilogram
CI	corrosion inhibitor	mg/L	milligram per liter
COPC	chemical of potential concern	MDA	metal deactivator
DOH	State of Hawaii Department of Health	NA	not applicable
EAL	environmental action level	NAPL	non-aqueous phase liquid
EPA	United States Environmental Protection Agency	NIF	no information found
F-24	NATO Fuel 24, jet fuel	NJ	New Jersey
F-76	NATO Fuel 76, marine diesel fuel	ppm	part per million
FSII	fuel system icing inhibitor	pS/m	picoSiemens per meter
gal	gallon	RHSF	Red Hill Bulk Fuel Storage Facility
JP-5	jet fuel propellant 5	RSL	regional screening level
JP-8	jet fuel propellant 8	SDA	static dissipater additive

Notes:

DOH EALs were based on Tier 1 Groundwater Action Levels for sites where groundwater is a current or potential drinking water resource, and the nearest surface water body is greater than 150 meters from site (DOH 2012).
EPA RSLs were based on May 2016 Tapwater RSLs (EPA 2016).
Shaded row indicates analytes recommended to be added on to COPCs list.

References:

Department of Health, Hawaii (DOH). 2012. Evaluation of Environmental Hazards at Sites with Contaminated Soil and Groundwater, Hawaii Edition. Office of Hazard Evaluation and Emergency Response. Fall 2011 (revised January 2012).
Environmental Protection Agency, United States (EPA). 2016. Regional Screening Levels for Chemical Contaminants at Superfund Sites. EPA Office of Superfund. May.

Commission on Water Resource Management Meeting

January 24, 2023

TESTIMONY: Susan A. Pcola-Davis

NOTE: HIDOH GUIDANCE FLUSHING February 8, 2022 for active irrigation and line purging requested the plan for flushing. There was zero guidance on how the flushing plan for flushing would be carried out nor any monitoring of the plan by the HIDOH. So was the plan followed. My testimony suggests that the planning and execution was and is seriously flawed. The Consent Order contains the "Long Term Monitoring Plan" which references the December 2021 Drinking Water Distribution System Recovery Plan (Attachment 6, pg. 17) A link from that page is another attachment that describes the flushing planning and execution.

Basically all of these are interrelated.

Attachment Summary:

1. December 8, 2021 HIDOH Flushing Requirements Case # 20211128-1848
2. January 8, 2022 Original email from Dr. Whelton. He was the consultant for distribution recovery. There are significant differences between his recommendations and what actually was done.
3. January 15, 2022 Memo for the Record. Incorrectly states Spill occurred on November 28, 2021 Shaft was secured on November 28, 2021. Aiea/Halawa shaft was used between November 28-December 3, 2021. It is still uncertain whether the closure of that shaft was due to fuel contamination since all focus has gone to the Red Hill shaft.
   3.3 (Pg. 2) Hydraulic Model developed in 2014. Clearly indicated that that model had some limitations.
   3.4 (Pg. 2) Clearly indicates that Dr. Whelton is considered the SME.
   MOST IMPORTANTLY: 4.1 CONSTRAINTS!!
   4.6 (Pg. 3) Last sentence: "TRUE UNIDIRECTIONAL" not feasible due to the following reasons.
   4.6.1 through 5 READ VERY CAREFULLY
   WHAT KIND OF FLUSHING WAS DONE????

4. February 7, 2022 Memo for Interagency DWST. Please read carefully. This is the ARMY flushing report. Different from Navy reports.
   4.4 (pg.2) is one example.
5. February 8, 2023 Zone I1 Removal Action Report Paragraph 2: Clearly states the spill occurred on NOVEMBER 20, 2021
6. February 15, 2022 Validity and application of Volumetric Exchange Method Paragraphs 1-2 mention Dr. Whelton however it appears that the recommendations from him were pick and chose or drastically modified.
7. 6. EPA Consent Order: Long Term Monitoring Plan "Unidirectional Flushing"
8.

DAVID Y. IGE
GOVERNOR OF HAWAII

ELIZABETH A. CHAR, M.D.
DIRECTOR OF HEALTH

STATE OF HAWAII
DEPARTMENT OF HEALTH
P. O. BOX 3378
HONOLULU, HI 96801-3378

In reply, please refer to:
File:

December 8, 2021

Directive One (Effective Immediately) – Flushing Requirements
Navy Water System Incident, Case No.: 20211128-1848

The Hawaii Department of Health (DOH) provided flushing guidelines to the U.S. Department of the Navy (Navy) by email on Friday, December 3, 2021. Because the Navy did not adhere to those requirements during its flushing activities, on Saturday, December 4, 2021, DOH instructed the Navy by email to cease unauthorized flushing activity. On Tuesday, December 7, 2021, the Navy informed DOH that it *continues* to flush, despite never having requested or obtaining authorization to resume the flushing activity.

The Navy is required by DOH to comply with the following orders with respect to flushing activities. These orders are issued pursuant to Hawaii Revised Statutes Section 342D-10. All discharges that do not EXPLICITLY comply with these orders will be considered violations of Hawaii State law:

- Submit a written Plan to DOH by Close of Business December 9, 2021, prior to initiating actions.
- Discharges to State waters are NOT authorized.
- Treatment, such as using diffusers & granulated activated carbon, shall be conducted prior to discharge.
- Discharges into any storm drain system is not authorized without the written consent of the owner of the storm drain, whether it is the Hawaii Department of Transportation, City and County of Honolulu, or Navy. The Navy is required to identify where the storm drain leads to State waters.
- Discharges may only be made onto soil – not to asphalt, concrete, or roadways (i.e., impervious surfaces that will result in immediate runoff). No discharges may leave the soil and enter any storm drains.
- Prior to the flushing activity, initial discharges must be arranged with a Wastewater Treatment Plant that will accept as much of the flushed water as the Navy expects to discharge.
- The Navy must maintain personnel at each flushing location to ensure the discharge does not contact persons, pets, wildlife, etc.
- The Navy personnel at each flushing location must also ensure that no discharge enters the storm drain or State waters (e.g., stream, ocean, etc.).
- The Navy must immediately stop the flushing activity at the flushing location if the discharge results in adverse effects at the discharge point (impacts include, but

are not limited to, fuel smells, flooding, injury to wildlife, presence of endangered species in area, erosion, etc.).

- The Navy must provide a written notification plan to DOH which includes delivering handouts door-to-door to affected populations, press releases, etc. that explain to the public why the flushing is being conducted, when it will occur, duration of flushing activities, and under what limiting or protective conditions.
- The Navy must provide a written schedule and a verbal notification to the DOH 24 hours in advance when EACH hydrant or tank is opened is needed. The notification shall be sent as follows, and must include:
    - DOH Incident Command and DOH Clean Water Branch by email (cleanwaterbranch@doh.hawaii.gov);
    - Specific address and location of hydrant and identification of water line being flushed;
    - Duration of the flushing with planned or anticipated total quantity of discharge;
    - Specific Point-of-Contact in case of incident; and,
    - Identification of the nearest storm drains to ensure that no discharge enters the storm drain.
- The Navy must collect for analysis water samples of the discharge, and report (or make provision for reporting directly from the laboratory) the analytical results to DOH promptly upon receipt from the lab.
- The Navy must collect multi-incremental soil samples before discharging onto ground to provide for baseline data. The Navy must also collect soil samples after discharge is completed. The Navy must report (or make provision for reporting directly from the laboratory) analytical results to DOH promptly upon receipt from the lab.
- The Navy must post signs and surround the affected area with yellow tape or other comparable warning device/method.
- The Navy must not flush during inclement weather or in the event of rain (to avoid erosion and potential runoff).

Kathleen Ho

Kathleen S. Ho
Deputy Director for Environmental Health

Dec 8, 2021
Date

Jan 8, 2022

From: Whelton, Andrew J <awhelton@purdue.edu>
Sent: Saturday, January 8, 2022 4:58 AM
To: Lee, Andre K (NAVFAC HI BD) CIV USN NAVFAC HAWAII PEARL (USA) <andre.k.lee4.civ@us.navy.mil>
Cc: Isaacson, Kristofer P <isaacsok@purdue.edu>; Proctor, Caitlin Rose <proctoc@purdue.edu>
Subject: [URL Verdict: Neutral][Non-DoD Source] RE: Cross Connection Control Plan and Flushing Plan documentation requirements for DoH

LCDR Daly,

I am free to talk later this afternoon today if you want. I'm Mountain Standard Time.
Below is some information.

Andy
540-230-6069

FEEDBACK

1. You applied unidirectional flushing and if you opened hydrants fully you likely maximized velocity in the pipes you were flushing. The issue they seem to be getting at is scouring velocity which you identify. This is used for removing sediment (typical cleaning of water pipes) as you know. There is no SOP for water contamination response and recovery, so you applied standard water distribution system maintenance practice of unidirectional flushing. This is good. The state I think invoked water main disinfection standard which, to my knowledge isn't applicable here unless you conducted shock disinfection.
    a. For perspective, per a Water Research Foundation study: Microbial Control Strategies for Main Breaks and Depressurization, Project 4307. Published 2014. Denver, Colorado.
        1. Scouring velocity helps removed sediment from water mains/pipes. To achieve 2.5 to 3 log removal of sand particles for 4-to-16-inch diameter PVC pipes, 3 ft/s is needed.
        2. In that report, to achieve this removal for a 6-inch diameter PVC pipe, Q was 308 GPM
        3. In that report, to achieve this removal for 4-inch diameter PVC pipe, Q was 137 GPM
    b. We recommended starting flushing from the clean water source and moving systematically through the entire system in a unidirectional way. If you all did this, be sure to explain that. That helps minimize the change residual "old" water gets untouched, or is left in the system.
    c. You could calculate scouring velocities in each of the areas. If any are lower than desired you can go back and just keep repeat flushing giving an added level of safely.
    d. The state's interest in scouring velocity may be of concern that (JP-5?) free product adsorbed to sediment/scales and they want to be certain it got scoured out. If it didn't,

f. Question: How long was each hydrant open typically?
g. I think we mentioned flushing 3 times the pipe volume. Rules of three is what I often recommend. Flushing velocity is certainly important. I vaguely remember NAVFAC had contracted a consultant to create the flushing plan. Who was the contractor?

Provide the contract to include any mods thru the process

2. JP-5 isn't a single contaminant which we've talked about before. It's a mixture of 100s-1000s of individual chemicals. Even if JP-5 itself is hydrophobic and primarily found in emulsions or floating on the surface, some of these constituents will still diffuse into the water itself. The question they are likely after is how do you know you removed all parts of JP-5 that may have gotten entrained in the water system? This goes back to what chemicals are you testing for in the water distribution system. JP-5 constituents have different water solubility and octanol-water partitioning coefficients (Log Kow = How much they like to be in biofilm and plastics, not water). Additionally, the different materials (Metal vs PVC vs HDPE vs. gaskets) may be more prone to soaking up some JP-5 contaminants and not others depending on their characteristics. For example, PVC has been shown to be less susceptible to soaking up some crude oil-based contaminants than HDPE pipes (Huang et al. study with Whelton). Ultimately, the fate of the chemicals in the drinking water system will not be the same for all JP-5 constituents. Remember the drawing I drew on the whiteboard when meeting with CDR Chase, NAVFAC, COE, and Army? It showed different constituents may be in different parts of the water system. That's what DOH is likely after. Question to you: What wide screen testing have you done in the water distribution system since December 22? This can help you hunt down that the contaminants are present or gone.

draw

3. Escalation should be based on how much flushing you are okay with trying. If you want to remove and replace infrastructure (that has sometimes happened after other contamination events on the mainland and overseas), it's a viable but laborious option. As an extreme example, following the Camp Fire it was estimated it would take over a year of continuous flushing to return some contaminanted pipes to safe use, so for some conditions they removed and replaced pipes. However, this flushing timeline will vary significantly depending on the water distribution systems and water testing results – AND chemicals or individual JP-5 constituents present. If I knew what the chemicals were still being found and what was done to try to get rid of them, I could give a more informed opinion. Food grade surfactants were used in Israel after a drinking water contamination incident...BUT using surfactants is not trivial and can cause all sorts of damage to water system components and leave residual. This probably isn't an email, but more discussion. Happy to talk. If you decide you want to go this way we should be more engaged technically in what this means. It's not likely an email response/effort, but more involved.

review the underlying evidence of each incident, often the utility and state didn't document much. Even incidents overseas had little documentation. It seems groups simply tried something, it did or didn't work, and they moved on. They also didn't sample much and rarely it an entire water distribution system that was affected.

Again, I can get on a zoom call or phone this afternoon MST to connect. I was called into the Colorado wildfires to help the communities identify and design water sampling and recovery plans. We're getting data every day and meeting with state and federal agencies. This is the Marshall Fire and Middle Fork Fire. I apologize for the delayed response.

Andy

Cell/text: 540-230-6069

Zone A1
PC Peninsula

*******15 Jan 2022
MEMORANDUM FOR THE RECORD ARMY
From: LCDR Carl Chase, JBPHH Drinking Water Distribution System Recovery Team
To: Interagency Drinking Water System Team
Subj: DISTRIBUTION SYSTEM RECOVERY PLAN ADDENDUM – ZONE A1 ANALYSIS
Ref:

(a) Memorandum for the Record from LCDR John Daly regarding the Distribution System Zone Flushing, December 28, 2021
(b) State of Hawaii Department of Health, Directive One– Flushing Requirements Navy Water System Incident, Case No.: 20211128-1848 (HI Directive One, dated 08 December, 2021)
(c) Drinking Water Distribution System Recovery Plan, 17 December 2021
(d) Incident Specific Criteria to Meet Lines of Evidence Objectives 1c and 2a, dated 05 January 2022

1. OBJECTIVE: The Drinking Water Distribution System Recovery Plan (DWDSRP) was signed by the Interagency Working Group on 17 December 2021. This addendum provides additional technical information to document the system flushing methodology and engineering approach used to restore Flushing Zone A1 to service as requested by the State of Hawaii Department of Health (HI DoH) in reference (d).

2. BACKGROUND:

2.1. Portions of the Navy water distribution system serving JBPHH and surrounding areas were exposed to low levels of fuel contamination with initial indications in the form of smell reports occurring on or about 28 November 2021.

2.2. Prior to the aquifer contamination incident (incident), water users connected to the Navy's system were supplied by three Navy owned water sources, Red Hill Shaft, Aiea/Halawa Shaft and Waiawa Shaft. In the time period prior to the incident, Waiawa Shaft was the main water source supplying approximately 16 million gallons per day (MGD) to the JBPHH system with at least one pump operating full time (100%). A single Red Hill Shaft pump was operated intermittently as a secondary source to supply approximately 5.5 MGD to the system. The Aiea/Halawa shaft was not being operated due to concerns over high chloride concentrations caused by saltwater intrusion into the aquifer.

2.3. On the evening of 28 November 2021, the Red Hill Shaft was secured and all pumping operations ceased. The Aiea/Halawa shaft briefly served as the secondary source starting on 28 November 2021 but was shut down on 03 December 2021 to prevent westward contaminant migration in the aquifer.

2.4. Since 03 December 2021. Waiawa Shaft has been the sole water source providing potable

3.1. ArcGIS was the primary tool used for mapping, volumetric calculations, and spatial analysis of the JBPHH utility systems.

3.2. System flows were measured by meters at key points within the distribution system. Data was recorded and stored by the Navy's SCADA system historian. SCADA is also monitored 24/7 by water system operators.

3.3. A hydraulic model was developed in 2014 and calibrated to conditions at the time. It is a skeletonized model depicting major transmission lines to many areas of the base. It does not include all mainline pipes, the Hickam area, or laterals feeding residence and non-residence facilities. The model was considered to be of limited use in determining the effectiveness of system flushing. It was primarily used to determine areas that were most likely impacted by the contamination event. The results directly correlated with initial reporting from impacted residents.

3.4 Dr. Andrew Whelton, a Purdue University associate professor of civil, environmental, and ecological engineering and recognized for his expertise in disaster response and recovery, provided recommendations to the US Navy based on his research and experience. His work is often cited in EPA literature and he is a leading expert in the field of recovering contaminated drinking water plumbing. His recommendations were incorporated into the DWDSRP.

4. CONSTRAINTS: In addition to Section 1.3 of the DWDSRP, the following constraints were considered during development of the plan:

4.1. Waiawa Shaft pumps are capable of pumping 19 MGD with 2 pumps running at full speed. There are 4 pumps at Waiawa Shaft, 2 are operational, one is standby, and one is down for maintenance. Average daily demand at JBPHH since the incident has ranged from 11 to 14 MGD. Maximum potable water system flushing flows were limited to 5 MGD to avoid excessive drawdown of the S1/S2 tanks and stay within the capacity of Waiawa Shaft pumps.

4.2. The two 6 million gallon (each) tanks, S1 and S2 could not be drawn down below the 28-foot level. This constraint was imposed by the water system operators who wanted to avoid low water system pressures that would be caused by S1/S2 drawdown below 28-feet.

4.3. Discharge to the Navy's sanitary sewer system and the Fort Kamehameha Wastewater Treatment Plant (Ft. Kam WWTP) was limited to 1 MGD by wastewater operations staff. Much of the infrastructure Ft. Kam WWTP was considered to be in poor condition and some process elements do not have a backup unit. The direct discharge of too much potable water to the plant was also thought to pose the risk of "wash out" of the microbes that provide secondary treatment.

4.5. Water service was required be maintained to residents and JBPHH tenants. Many families have remained in their homes and mission essential Government activities require continuous water service.

4.6. JBPHH did not have an established unidirectional flushing plan developed prior to the incident. Unidirectional flushing typically involves inducing one-way flow through each pipe segment in a water distribution system by closing mainline isolation valves and opening hydrants for a short period of time. The number of hydrants required would be determined by the pipe size and the minimum water velocity required to flush sediments and other contaminants from the pipe segment. True unidirectional flushing of the system was determined not to be a feasible method for flushing the JBPHH potable water system for the following reasons:

4.6.1. Per section 1.2 of the DWDSRP, the distribution system was to be recovered with critical urgency. Additionally, SMEs advised that the longer contaminants remained in the system, the more likely it was that they would migrate into plastics, gaskets, sediments, etc. A unidirectional flushing program would take several months to develop and implement and the timeline was not considered feasible for a return to service.

lie?

4.6.2. Water system operators indicated that many mainline isolation valves would not properly close and could not be relied upon to isolate pipe segments.

4.6.3. A single short duration flush of higher velocity flow through each pipe segment may be effective at removal of sediments from a single pipe segment. However, the method was considered to be less effective at system-wide removal of aqueous phase fuel contaminants than other options.

4.7. Dr. Whelton recommended three volumetric turnovers for impacted pipe networks. Flushing zones with higher risk of contamination were identified and prioritized using water user complaint history, testing results, the hydraulic model, and the hydraulic proximity to Red Hill Shaft. A factor of safety was applied to the highest priority zones by specifying a minimum of five volumetric turnovers. Zones where the hydraulic modelling indicated that contamination may have travelled, were in close hydraulic proximity to Red Hill Shaft, and had few complaints were flushed with the recommended three volumetric turnovers. Low priority was given to zones where SCADA data indicated that water was fed solely from Waiawa Shaft before and after the incident. To reduce water waste, flush zones with lower risk of contamination were volumetrically turned over a minimum of once or twice.

5. Following Dr. Whelton's recommendation, the DWDSRP was designed with a directional flush of the distribution system starting from the clean water source and moving systematically through the entire system. The limited water source capacity at Waiawa Shaft and disposal constraints required that the system be broken down into smaller flush zones. 19 total zones were established that could be

portions of the system include the Naval Magazine area (NAVMAG), A2 and A3 located to the south. Flow meter data shows that water flows from north to south in this zone and does not reverse.
Section 2a.1 Memorandum for Record

6.2. WATER USE/TENANTS: Water users in this zone are mostly residential housing tenants. Operational tenant facilities include Marine Corps warehouses to the north, a SPAWAR facility on the east shore and the Navy Seal Compound on the southern tip of the peninsula.

6.3. PIPE VOLUME: Per section 2.5.1.1. of the DWDSRP, Flush Zone A1 has a mainline pipe volume of 390 thousand gallons (KGal) and a minimum turnover volume of 1,950 KGal. With the exception of the main transmission pipelines, mainline pipes in the zone are 6 to 8-inches in diameter. Transmission main pipes upstream of this zone were not included in the pipe volume since they are fed directly from Waiawa Shaft and were considered "clean".

6.4. PRIORITY: Zone A1 was a high "priority 1" zone and was included in Phase #1 because it was used as a proof of concept for the mobile GAC operations. The likelihood of contamination entering this zone is very low because it is fed solely from Waiawa Shaft. All zones within Phase #1 were required to be flushed with five volumetric turnovers minimum.

6.5. HYDRANT SELECTION: Five geographically and hydraulically dispersed flushing hydrants were selected to flush Zone A1. Hydrants were also selected so that they were as far as possible from the 24- and 30-inch transmission mains and water would be pulled through the mains serving residences and facilities.

6.6. DEAD-END LINES: It is possible that flushing was not induced in some small neighborhood loops or longer dead-end lines serving facilities or piers. To address this concern, additional distribution water line samples were taken in locations selected in a joint effort by the Navy, DoH, and EPA. These samples are representative of other dead-end lines within the zone.

6.7.1. The total volume flushed through the system was 1,969 KGal for 5 volumetric turnovers. Actual volumetric turnovers exceeded the minimum requirement.

6.8. SCADA Data: Daily average flow data collected between 18 November 2021 and 09 January 2022 is shown in Figure 3 below. Instantaneous (1 minute) flow data at meters 4700, 4710 and 4704 was also reviewed to ensure that the direction of flow did not reverse.:

6.8.1. Meter 4787 (Figure 1) at Waiawa Shaft shows an average flow of 15.53 MGD.

6.8.2. An average of 6.60 MGD continued through Meter 4700 towards McGrew Point. 6.8.3. The majority of the remaining volume, approximately 8.9 MGD flowed through Zone A1 each day. Between

DEPARTMENT OF THE ARMY
HEADQUARTERS, UNITED STATES ARMY GARRISON, HAWAII
DIRECTORATE OF PUBLIC WORKS
947 WRIGHT AVENUE, WHEELER ARMY AIRFIELD
SCHOFIELD BARRACKS, HAWAII 96857-5013

AMIM-HWP

7 February 2022

MEMORANDUM FOR Interagency Drinking Water System Team (IDSWT) Building C27, Nanumea Road, Naval Station Pearl Harbor, Joint Base Pearl Harbor-Hickam, Hawaii 96818

SUBJECT: Army Flushing Report for Zone I1

1. OBJECTIVE. This addendum provides additional technical information to document the system flushing methodology and engineering approach used to restore Zone I1 (Red Hill Housing) to service as requested by the State of Hawaii Department of Health (HI DoH). This memorandum and associated technical document (see Army Flushing Report for Zone I1) fully support the Drinking Water Distribution System Recovery Plan (DWDSRP) which was signed by the Interagency Working Group (IDWST) on 17 December 2021.

2. BACKGROUND.

2.1. Portions of the water distribution system serving Joint Base Pearl Harbor Hickam (JBPHH) and surrounding areas were exposed to low levels of fuel contamination with initial indications in the form of smell reports occurring on or about 28 November 2021.

2.2. Prior to the aquifer contamination incident, water users connected to the JBPHH system were supplied by three Navy owned water sources, Red Hill Shaft, Aiea/Halawa Shaft and Waiawa Shaft. In the time period prior to the incident, Waiawa Shaft was the main water source supplying approximately 16 million gallons per day (MGD) to the JBPHH system with at least one pump operating full time (100%). A single Red Hill Shaft pump was operated intermittently as a secondary source to supply approximately 5.5 MGD to the system. The Aiea/Halawa shaft was not being operated due to concerns over high chloride concentrations caused by saltwater intrusion into the aquifer.

2.3. On the evening of 28 November 2021, the Red Hill Shaft was secured and all pumping operations ceased. The Aiea/Halawa shaft briefly served as the secondary source starting on 28 November 2021 but was shut down on 03 December 2021 to prevent westward contaminant migration in the aquifer. This drinking water incident is attributed to the Red Hill shaft.

2.4. Since 03 December 2021, Waiawa Shaft has been the sole water source providing potable water to the distribution network. It is located 5.5 miles west of the Red Hill Fuel Facility and testing has not found any water quality issues at this source.

2.6. This memorandum is specific to Red Hill Housing also called Flushing Zone I1. Water is supplied to Red Hill Housing by the JBPHH water system via a 30" water main which is pumped to two (2) 250K storage tank and gravity fed to consumers. Red Hill Housing (I1) is hydraulically distinct after water is conveyed to the storage tank. A water distribution system diagram is provided in Enclosure 1.

3. Engineering Analysis and Tools. US Army Garrison-Hawaii (USAG-HI) utilized engineering judgement informed by existing tools and data sources such as ArcGIS, Supervisory Control and Data Acquisition (SCADA) system historic and current data, water system hydraulic model, and input from water system infrastructure contamination subject matter experts (SMEs) to include US Army Environmental Command (USAEC), US Army Corps of Engineers (USACE), and Naval Facilities Engineering Systems Command (NAVFAC) to develop water system flushing methodologies. The following text provides additional information on this analysis and tools.

3.1. ArcGIS was the primary tool used for mapping, volumetric calculations, and spatial analysis of the utility systems.

3.2. System flows were measured by meters at key points within the distribution system. Data was recorded and stored by the Navy's SCADA system historian. SCADA is also monitored 24/7 by water system operators.

3.3. A hydraulic model of Army assets was developed and iteratively refined over the last 3 years. However, model calibration is not possible as data requirements are not available, e.g., water meters on residences and, c-factors. Therefore, the model is skeletonized depicting major transmission lines to many areas of the zone. The model is considered to be of limited use in determining the overall effectiveness of system flushing.

3.4 Pressure data loggers were used at strategic locations in the distribution system to monitor flushing operations.

4. CONSTRANTS. The following constraints were considered during development of the plan:

4.1. Waiawa Shaft pumps are capable of pumping 19 million gallons day (MGD) with 2 pumps. There are 4 pumps at Waiawa Shaft, 2 are operational, one is standby, and one is down for maintenance. Average daily demand at JBPHH since the incident, and after water conservation measures were implemented, has ranged from 12 to 17 MGD. Maximum potable water system flushing flows were limited to 5 MGD to avoid excessive drawdown of the S1/S2 tanks and stay within the capacity of Waiawa Shaft pumps.

4.2. The two 6 million gallon (each) tanks, S1 and S2 could not be drawn down below the 28-foot level. This constraint was imposed by the water system operators who wanted to avoid low water system pressures that would be caused by S1/S2 drawdown below 28-feet

other contaminants from the pipe segment. True unidirectional flushing of the system was determined not to be a feasible method for flushing the potable water system for the following reasons:

4.4.1. The distribution system was to be recovered with critical urgency. Additionally, SMEs advised that the longer contaminants remained in the system, the more likely it was that they would migrate into plastics, gaskets, sediments, etc. A unidirectional flushing program would take several months to develop and implement and the timeline was not considered feasible for a return to service.

4.4.2. Water system operators indicated that many mainline isolation valves would not properly close and could not be relied upon to isolate pipe segments.

4.4.3. A single short duration flush of higher velocity flow through each pipe segment may be effective at removal of sediments from a single pipe segment. However, the method was considered to be less effective at system-wide removal of aqueous phase fuel contaminants than other options.

4.6. Flushing zones with higher risk of contamination were identified and prioritized using water user complaint history, testing results, the hydraulic model, and the hydraulic proximity to Red Hill Shaft. A factor of safety was applied to the highest priority zones by specifying a minimum of five volumetric turnovers. Army Zones were flushed with this safety factor.

5. Flushing Operations. Flushing plans are designed with a directional flush of the distribution system starting from the clean water source and moving systematically through the entire system. The limited water source capacity at Waiawa Shaft and disposal constraints required that the system be broken down into smaller flush zones. Four (4) total zones were established that could be independently flushed without adverse hydraulic or water quality impacts to previously flushed zones.

6. Flushing Zones. Detailed information, i.e., maps, calculations, data, are included in the Army Flushing Report-Zone I1 intended to accompany this memorandum.

6.1. Flushing Zone Commonalities.

6.1.1. Army tank volumes were cycled prior to flushing.
6.1.2. Flushing started at a hydrant and discharged into a sanitary sewer manhole.
6.1.3. Five (5) volume exchanges of the distribution pipes.
6.1.4. Systematic directional flow without operating valves.
6.1.5. Higher velocities required more hydrants and shorter runs of pipe to be flushed.
6.1.6. Every effort was made to account for elevation when flushing hydrants.

6.2. Specific Limitations. The Red Hill Housing (Zone I1) neighborhood is limited to 200 gallons per minute (gpm) due to wet well size and pump capacity. Two hydrants were flushed

6.4. Volume. In consultations with professionals a recommendation of three volumetric turnovers for impacted pipe networks was established. A factor of safety was applied to the highest priority zones by specifying a minimum of five volumetric turnovers.

Zone I1= 17,000 (kgals) , 5 volumes = 85,200 (kgals)

7.0. Residential Flushing. Zone I1 flushing of 137 homes in the Red Hill residential community was accomplished over a four (4) day period. The original intent was to complete residential flushing within 2 calendar days, i.e., 10 and 11 January. However, it was determined on 11 January via quality control checks by USAG Hawaii Department of Public Works (DPW) and Island Palm Communities (IPC) that documented residential flushing times were inconsistent with the agreed Standard Operating Procedure (SOP). Specifically, a stand-alone or duplex home has an absolute minimum flush time; 72 residences did not meet the minimum flush time requirement. Conversations with Task Force Ohana (Flushing Team) indicate flushing was done properly. However, steps articulated in the SOP were accomplished out of sequence (water heaters not flushed in the right sequence) and not adequately documented. Therefore, 72 homes were re-flushed in accordance with the prescribed SOP. A limited number of concerns were identified during the residential flushing: (1) low pressure; (2) COVID quarantined residents; (3) unsecured pets; and (4) resident plumbing and other technical issues. Concerns are documented in Enclosure 5 Residential Flushing Worksheet. Residential flushing for Zone I1 is complete.

8.0. Non-Residential Flushing. Non-residential flushing is complete. Flushing was done in accordance with the SOP and records are provided in the Enclosure 7 Army Flushing Report for Zone I1.

9.0. Water Quality Data. The Army must comply with parameters identified by the IDWST and are provided in the accompanying Enclosure 6 Water Quality Data & Sampling Plan. All samples are within the Department of Health Groundwater Action Levels, Department of Health Safe Drinking Water Act Regulatory Constituents and the US Environmental Protection Agency Maximum Contaminate Levels (MCLs) for drinking water. Samples collected in residential housing after the residential flushing did exceed the incident specific parameter of 2.9 parts per billion (ppb) for Copper. The likely source of copper is corrosion of household plumbing systems and/or erosion of natural deposits from the flushing event. The copper samples are well below the regulatory MCL drinking water standard of 1300 ppb. The Army will continue to sample and report copper samples in the annual consumer confidence report. Mercury was detected in one of the samples. The sample that detected mercury is below the regulatory drinking water MCL of 2 ppb and is a laboratory estimated value.

10.0. Re-flushing. During residential flushing of Zone I1 it was identified that 72 residences did not meet the minimum flush time requirement. Therefore, these homes were re-flushed flowing the prescribed SOP and flush times documented.

SUBJECT: Army Flushing Report for Zone I1

2/7/2022

X Nisit A. Gainey

Signed by: GAINEY.NISIT.ANTHONY.1067651371

NISIT A. GAINEY
Director, Public Works

7 Encls
1. Water System Diagram
2. Flushing Map All Zones
3. Worksheet for Flushing Volumes
4. Residental Flushing Maps
5. Residential Flushing Worksheet
6. Water Quality Data & Sampling Plan
7. Army Flushing Report for Zone I1

NAVY

February 8, 2022

From: Naval Facilities Engineering Systems Command Representative, IDWS Team
To: Interagency Drinking Water System Team

Red Hill

SUBJ: ZONE I1 REMOVAL ACTION REPORT

Ref: (a) Drinking Water Sampling Plan, December 2021
(b) Drinking Water Distribution System Recovery Plan, December 2021
(c) Single Family Home Flushing Plan Checklist and Standard Operating Procedures, December 23, 2021
(d) Non-Residential Facility Flushing Plan Checklist and Standard Operating Procedures, January 4, 2022
(e) DOH's Guidance on the Approach to Amending the Drinking Water Health Advisory, December 30, 2021; HEER Incident Case No.: 20211128-1848
(f) DOH Checklist to Amend the Drinking Water Health Advisory in Zone XX

Encl: (1) Zone I1 Removal Action Report

1. The enclosed report documents completion of the requirements outlined in references (a) through (f). This is in response to HEER Incident Case No.: 20211128-1848 involving the Joint Base Pearl ~~Harbor-Hickam~~ (JBPHH) Public Water System No. 360.

2. On the 20th of November, a spill of jet fuel, specifically JP-5 jet fuel, occurred at the Red Hill Bulk Fuel Storage Facility in an access tunnel that provides fire suppression and service lines for the facility. The fuel spill was cleaned up and, on the 23rd of November, Admiral Paparo, directed an independent investigation of the spill event, and ordered the investigating officer to also determine any connection between the 20 November event and the spill that occurred earlier this year, on the 6th of May. The results of the investigation are pending public release.

On the 27th of November, the Commander, Navy Region Hawaii, RDML Tim Kott, met with the Fleet Logistics Center Commander, who operates The Red Hill Fuel Storage Facility for the Navy, and they jointly made the decision to stop Red Hill Tank fuel transfer operations based on the ongoing investigation into the recent spills.

On Sunday, the 28th of November, the JBPHH HQs and Hawaii Department of Health (HDOH) began receiving phone calls from military residents reporting a chemical or petroleum taste and smell to the water on the Navy's drinking water system. As more calls were received, it became clear that the reports were a clustered around neighborhoods fed by the Red Hill Shaft Well, so the Navy, on the evening of the 28th of November, shut down that well and stood up the

On December 8, 2021, HDOH issued Directive One which provided requirements for flushing of the Navy Water System. The Navy began working with HDOH and the U.S. Environmental Protection Agency (EPA) to meet the requirements of this directive and resume flushing of the potable water system.

On December 17, 2021, HDOH, the U.S. Navy, the U.S. Army and EPA established an Interagency Drinking Water System (IDWS) Team to restore safe drinking water to affected JBPHH housing communities. The working group was established to ensure that the agencies were coordinated in actions to restore safe drinking water to Navy water system users and that they had a clear, coordinated source of information as work continued to restore safe drinking water. On the same day, the U.S. Navy, U.S. Army, HDOH, and the EPA jointly signed the Water Distribution System Recovery Plan agreement. The signing of this plan was the second work product of the IDWS Team, which is focused on efficiently and effectively restoring safe drinking water to JBPHH military housing communities. Earlier in that week, the team jointly signed the Drinking Water Sampling Plan.

The flushing of the water distribution lines resumed on December 20, 2021. Residence and non-residence facilities were flushed and sampled after the completion of flushing and testing of the distribution system of a specific Zone. This report specifically documents the requirements outlined in references (a) through (f) for Zone I1.

3. The removal action report (RAR) for Zone I1 documents two specific lines of evidence necessary to amend the drinking water health advisory for Zone I1 as provided by HDOH. The two lines of evidence under evaluation included:

i. Ensure no contamination is entering the water system.
ii. Ensure no contamination remains in the system and water chemistry concerns are addressed.

Each line of evidence has several objectives with specific lines of evidence and incident specific criteria required to be met. Achievement of the criteria will be described and supported with documentation in the subsequent sections of the RAR.

4. I certify under penalty of law that I have personally examined and I am familiar with the information submitted and I the submitted information is true, accurate, and complete.

MENO.MICHAEL.W AYNE.JR.1088310035 Digitally signed by MENO.MICHAEL.W.AYNE.JR.1088310035

Also Refers to Dr. Whelton email

February 15, 2022

From: Naval Facilities Engineering Systems Command Representative, IDWS Team
To: Interagency Drinking Water System Team

SUBJ: VALIDITY AND APPLICATION OF VOLUMETRIC EXCHANGE METHOD

Ref: (a) Drinking Water Distribution System Recovery Plan, December 2021

Encl: (1) Dr. Whelton email documenting volumetric exchange method dtd 08 JAN 22

1. This letter documents the basis of the volumetric exchange method used in the development of reference (a). The basis of the flushing method was based on two key recommendations from Dr. Whelton, who served as the Navy's consultant in the early stages of the incident. Enclosure (1) documents key recommendations from Dr. Whelton which included flushing from a clean source, systematically moving through the entire system, and flushing at least three times the pipe volume. Rules of three is what Dr. Whelton generally recommends.

2. Reference (a) incorporated the recommendations from Dr. Whelton by creating a flushing sequence that began with clean water from the Waiawa shaft and flushing systematically through the entire system. The volumetric exchanges for each zone and zone flushing sequence plan was developed by Navy engineers. This is outlined in table 2.4, Distribution System Recovery Plan Diagram, and section 2.5, Flushing Plan Phasing, of reference (a). A safety factor was applied to the rule of three to obtain five volumetric turnovers for the phase 1 zone areas. Phase 2 zone areas had three volumetric turnovers. Phase 3 zone area had two volumetric turnovers and phase 4 zone areas had one volumetric turnover. The phase 3 and phase 4 zone volumetric turnover determinations were made after considering the up-gradient zone flushing volumes and the non-potable use of water in the zones.

3. I certify under penalty of law that I have personally examined and I am familiar with the information submitted and the submitted information is true, accurate, and complete.

MENO.MICHAEL.WAYNE.JR.1088310035
Digitally signed by MENO.MICHAEL.WAYNE.JR.1088310035
Date: 2022.02.15 07:17:55 -10'00'

M. W. Meno
Captain, U.S. Navy Civil Engineer Corps

Within one-hundred-and-eighty (180) days after EPA's approval of the Hydraulic Model, Navy shall submit, for EPA approval, a Unidirectional Flushing ("UDF") Plan. The UDF Plan shall include:

- A contaminant slug study from each active source or potential location of the contaminant within the distribution system, identifying early valve closure response to contain the spread of contamination;
- A UDF Computer Model Study incorporating the completed Hydraulic Model and a velocity or sheer-stress based flushing target to remove sediments and solids from the line;
- The results of a series of UDF event runs, under the model, for each area or hydraulic flushing zone (established in the *December 2021 Drinking Water Distribution System Recovery Plan*, https://health.hawaii.gov/about/files/2021/12/Drinking-Water-Distribution-System-Recovery-Plan.pdf); and
- A computer-model-generated flushing report for each hydraulic zone showing all parameters needed to sequence and perform UDF flushing in sections for each zone.

Any updates, additions or changes to the JBPHH System should be reflected in a revision to the Hydraulic Model in subsection 6.5.3, and flushing report for each area (zone) contingent to any construction.

6.5.5 MAINTENANCE FLUSHING PROGRAM

6.5.5.1 INTERIM FLUSHING

Within thirty (30) days after the Effective Date, and until approval of the Maintenance Flushing Program required under this subsection, Navy shall continue to perform any ongoing interim flushing of Navy-owned and/or -operated distribution lines to ensure safe drinking water is served to its consumers.

6.5.5.2 DEVELOPMENT OF MAINTENANCE FLUSHING PROGRAM

Within two-hundred-and-seventy (270) days after EPA's approval of the Hydraulic Model, Navy shall submit to EPA for approval a Maintenance Flushing Program, designed to improve water quality served to customers. The Maintenance Flushing Program shall be developed in accordance with American Water Works Association ("AWWA") Standard G200-15 Distribution Systems Operation and Management, subsection 4.1.8 System Flushing, effective May 1, 2015 (available at AWWA's website at: https://www.awwa.org/Portals/0/Awwa/Publishing/Standards/G200-15LookInside.pdf?ver=2020-03-09-114002-377). UDF shall be incorporated wherever possible, particularly, among other circumstances, where the Hydraulic Model required under 6.5.3 indicates it is necessary. The entire system, including dead-ends and blow-off locations, shall be flushed at least annually, with the possible need for more frequent flushing based on the reoccurrence of the following: air and sediment in the lines; issues with maintaining free chlorine residual; and issues (customer complaints) with taste, odor or color. Records of all Maintenance Flushing Program flushing events shall include the following: date, time, locations, persons responsible

The Commission on Water Resource Management has a mission to protect the water for not only current Hawai'i residents but also for the future generations. In today's meeting, the Department of Health is here to give an update on the Red Hill response. I would like the DOH to address why they are continuing to say that the current EAL's of fuel in water are protective of human health. As someone who has been poisoned by toxins chronically, I am here to try to save you all from having to experience the same. You must take action now. At the December 12th Board of Water Supply meeting, we heard Roger Brewer talk about the randomly picked weight limits that these EAL's are based on, which are weight limits that NO young children will ever reach. We cannot accept these EAL's as written, no matter how much the DOH wishes them to seem safe! These weight limits essentially mean that children do not matter in the DOH's own calculations of what is protective of human health. They have no science to back up their claims. My vestibular dysfunction at the hands of toxic exposure is the SCIENCE. My children's damaged thyroids are the SCIENCE. We must insist that the DOH take into account the weight limits of infants! Breastfeeding mothers drink, clean, cook, and bathe themselves in and with tap water. These exposures are cumulative. We cannot only consider one method of exposure! We know that women continue to birth our future generations and it is a fact that women continue to bear the burden of housework such as cleaning the house with water, laundering clothes in water, cooking with water, and bathing their own children in the water. Pregnant women who drink water and go on to breastfeed their infants will be passing PFAS and other versions of these "forever chemicals" into the mouths of the most vulnerable and tiniest babies. CWRM: YOU MUST INSIST THAT DOH WRITE THEIR EAL'S TO PROTECT THE MOST

VULNERABLE! Only then, can the CWRM ensure that their water policies are truly protective for FUTURE GENERATIONS.

Please do not wait to get involved in the lowering of EAL's. It must be done now to protect the future. Please do not wait until you and your family have been poisoned by the ground water. You do not want the experience I have had, learning what these toxins can do to a child's thyroid and blood counts, and waiting for the diseases to come. PROTECT THE FUTURE TODAY, STARTING NOW!

Lacey Quintero

Mother, veteran, military spouse, and advocate for future generations

CWRM 1/24/2023

ORAL TESTIMONY: Susan A. Pcola-Davis

From yesterday's Board of Water Supply Meeting with the HIDOH and EPA as guests,

I learned

1. Environmental Action Levels

Using a Plume Degradation Scenario:

Non Degraded JP-5 Action Level is 266 ug/l, When posed with the question of how a sample indicating 265 would be described as non detect then. I am not sure why I could not get an answer of either yes or no.

Mr. Brewer explained how this number is determined. Mind you, at the December 15, 2022 BWS meeting he said his spreadsheet had an error and he had to recalculate. He also explained how he is a risk accessor not a toxicologist. Ms. Ho introduced him as a scientist.

He said he solicits information from many sources and states to come to a decision.

I know there is a most recent publication by HIDOH that updated the Environmental Action Levels with a strict calculation model for EAL's. Did you use that model to develop the spreadsheet?

What are your credentials, Mr. Brewer? Do you have a curriculum vitae? If yes, the public wants to see it. This is not a case of privacy as you may ascertain.

Exactly how are EAL levels decided? By whom? Provide name(s)

Question: Does that make you feel confident that his spreadsheet doesn't have any more errors?

2. SAMPLING
   During the actual sampling in the zones, HIDOH used several lower incident specific levels (i.e.300, 200, 211). HIDOH still hasn't clearly explained why that was.

Question WHY?

3. SAMPLING REPORTS
   Upon review of the online sampling reports, it appears that any sample of TPH-g,o,d that fell below the incident specific level was determined as "non detect," Leading customers to believe their drinking water was clear of ANY fuel.

   THIS IS NOT TRUE.

   If a sample is collected, using the incident specific level of 200 and the sample is 199. !99 will be notated as "non detect" and NOT 199.

Question: HOW DO YOU FEEL ABOUT THAT?

4. HIDOH and EPA
   THE 2023 EPA Consent Order

As stated by Ms. Ho yesterday, HIDOE is not part of the Consent Order and will use HIDOEs 2015 Order.
Question: Why would HIDOH not want to partner with the EPA in the development of this Consent Order?

NOTE: HIDOH GUIDANCE FLUSHING February 8, 2022 for active irrigation and line purging requested the plan for flushing. There was zero guidance on how the flushing plan for flushing would be carried out nor any monitoring of the plan by the HIDOH. So was the plan followed. My testimony suggests that the planning and execution was and is seriously flawed. The Consent Order contains the "Long Term Monitoring Plan" which references the December 2021 Drinking Water Distribution System Recovery Plan (Attachment 6, pg. 17) A link from that page is another attachment that describes the flushing planning and execution.

From: Gina Hara
To: DLNR.CW.DLNRCWRM; Hyatt, Rae Ann P
Subject: [EXTERNAL] CWRM 1/24/23 Testify Commission
Date: Tuesday, January 24, 2023 3:33:02 PM

May I request permission to testify via zoom for the RED HILL section?

If not, may I add the following for my testimony?

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Thank you CWRM board members for including Red Hill on the agenda.
AQUIFER REMAINS AT RISK:

I would like to inform you as a community member that went to the Board of Water Board Meeting 1/23/23 from 2pm to 8pm last night - it has been recorded by the BWS - that Red Hill could leak again as far as we are concerned because there has never been an analysis of what happened and hwo people have learned from these mistakes.

The EPA last week on Wed and Thursday as well as yesterday has been trying to gain insight into formulating a Consent Decree, another AOC, which is opposed by the Board of Water Supply, giving the Navy the upper hand with more delays. The EPA did not seem to understand that the 2015 AOC was damaging to the aquifer and part of the reason why 2021 happened. The EPA stance is that for them, an AOC is more effective than unilateral action, much to the dismay of the community, Sierra Club etc.

Last night the Department of Health also presented to the Board of Water and community. The cavalier relaxed attitude towards the AFFF / PFAS / PFOS forever chemicial was upsetting. Kathy Ho said she researched PFAS and found it to be everywhere, even in food covers, etc. and passed out fliers.

I asked at this meeting for people to please watch DARK WATERS about the 70,000 people that got poisoned by DuPont for 40 years by PFAS, and what the children looked like genetically and asked that there be an accounting of all AFFF that has entered Hawaii, what is missing and when it will be removed.

PFAS is already in the water in Halawa, Kunia (6000x the EAL) and these did not happen overnight. People have the right to know.

CWRM, please write to the Department of Health, Navy and EPA to encourage them to take this more seriously.

Thank you,
Gina Hara, Halawa Valley

Tel: [redacted]
Email: [redacted]