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KA 'OIHANA WAI
CITY AND COUNTY OF HONOLULU

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September 23, 2024

Martha Guzman
Regional Administrator
U.S. Environmental Protection Agency, Region 9
75 Hawthorne Street
San Francisco, California 94105

and

Kenneth S. Fink, MD, MGA, MPH
Director of Health
Hawai'i State Department of Health
1250 Punchbowl Street
Honolulu, Hawai'i 96813

Dear Ms. Guzman and Dr. Fink:

Subject: Honolulu Board of Water Supply (BWS) Response to U.S. Environmental Protection Agency (EPA) and Hawai'i State Department of Health (DOH) Request for Information (RFI) dated August 9, 2024, Regarding Polycyclic Aromatic Hydrocarbons (PAHs) at BWS 'Aiea Wells

BWS submits the enclosed materials and responses to the subject letter. For clarity, the RFI is reprinted in bold font, followed by our reply.

DOH RFI No. 1 – Specific locations in BWS 'Aiea Wells where samples were taken?

BWS Response No. 1 – The 'Aiea Wells samples were collected from 'Aiea Wells Pump No. 2. Please see Attachment 1 entitled "'Aiea Wells Pump #2."

DOH RFI No. 2 – Sample Collection Methodologies Used?

BWS Response No. 2 – BWS followed sample collection methodologies outlined in the EPA Methods used (EPA Methods 525.2 and 625.1). Please see Attachment 2 entitled "Collection Methodologies for EPA Methods 525.2 and 625.1."

DOH RFI No. 3 – Sample type (pre/post-treatment)?

BWS Response No. 3 – The 'Aiea Wells samples collected were pre-treatment. The samples are collected at 'Aiea Wells Pump No. 2 (HI0000331-0040WL103) wellhead.

DOH RFI No. 4 – Results of any general chemistry sample results that may indicate natural attenuation of fuel hydrocarbons is occurring, as this would be expected in a contaminant plume persistent enough to have originated from the Red Hill facility.

BWS Response No. 4 – The following table outlines General Chemistry data collected from 'Aiea Wells Pump No. 2 in April and July 2024:

General Chemistry
'Aiea Wells pump 2, April and July 2024

Parameter	Apr-24	Jul-24	Reporting Level	Units	Method
Bromide	360	360	5.0	µg/L	300.0
Chloride	99	100	2.5	mg/L	300.0
Nitrate as N	0.85	0.87	0.050	mg/L	300.0
Sulfate	16	17	0.25	mg/L	300.0
Calcium	18	20	1.0	mg/L	200.7 Rev 4.4
Magnesium	17	18	0.10	mg/L	200.7 Rev 4.4
Potassium	2.4	2.5	1.0	mg/L	200.7 Rev 4.4
Sodium	37	38	1.0	mg/L	200.7 Rev 4.4
Chromium	2.2	2.3	1.0	µg/L	200.8
Zinc	20	<20	20	µg/L	200.8
Alkalinity	57	57	2.0	mg/L	SM 2320B
Bicarbonate Alkalinity as CaCO3	57	57	2.0	mg/L	SM 2320B
Specific Conductance	480	490	2.0	µmhos/cm	SM 2510B
Total Dissolved Solids	300	300	20	mg/L	SM 2540C
Fluoride	0.056	0.053	0.050	mg/L	SM 4500 F C
pH	7.9	7.9		SU	SM 4500 H+ B

Note that natural attenuation of hydrocarbons in groundwater typically involves a series of redox conditions evolving from anaerobic conditions near the source to aerobic conditions near the edge of the plume and beyond, such that moderate concentrations of terminal electron acceptors in offsite wells are inconclusive on their own. Also note that PAHs are more persistent in the environment than the paraffins and isoparaffins comprising much of the mass of petroleum products.

DOH RFI No. 5 – Analytical laboratory reports for samples collected from the 'Aiea Wells during and after June 2024.

BWS Response No. 5 – The requested analytical laboratory reports were included in the July 8, 2024 letter from BWS to EPA and DOH, except for one laboratory report that was unavailable and pending at the time of the letter, EEA analytical laboratory report #380-99954. This report is now available and included as Attachment 3.

DOH RFI No. 6 – BWS 'Aiea Wells have been shut off since 2021: As mentioned in your July 8, 2024 letter, BWS Hālawa Shaft, Hālawa Wells, and 'Aiea Wells have been shut off since the November 2021 fuel release from the Red Hill Facility. This means, the aquifer has been relatively static for years, and contaminants that are not highly mobile (such as the PAHs detected) originating from further distances are likely not being drawn up into these wells. Therefore, it is more likely the PAHs detected originated from a source closer to the BWS 'Aiea Wells.

BWS Response No. 6 – BWS does not agree. The total release volume for the Red Hill releases in 2021 is not well documented and likely more extensive than reported by the Navy and others. This is also the case with the Red Hill release history, where there have been at least 76 documented releases (likely others) and very few of these document release volumes. Our understanding is the total release volume documented for the Red Hill facility is approximately 2 million gallons over its operational life, but "The amount of fuel in the ground is greater than previously reported; most historical releases at the Red Hill Bulk Fuel Storage Facility (RHBFSF) did not report release volumes" (WAI Report, 2023). Further, the Navy used surfactants to clean the tunnel in 2021, and it is well documented that this, in conjunction with the 2021 Red Hill releases, mobilized heavier-end petroleum hydrocarbons (TPH-o). The volume of surfactants released in 2021 is unknown. Just as the 2021 hydrocarbons release was only one in an extensive series of historical releases, based on the Red Hill facility's history, it would be unreasonable to assume the 2021 release of surfactants was an isolated occurrence. In addition to likely more undocumented releases of cleaning surfactants prior to 2021, the Red Hill facility has released PFAS products that have surfactant properties, for example the 1,300 gallons of AFFF concentrate released in 2022, as well as apparent older, undocumented PFAS releases: "the PFOS detections in the non-routine wells are not suspected to be related to the AFFF concentrate released in November 2022 at the Site [i.e., the PFAS detected are likely to be from different sources]" (AECOM, 2024). Thus, there are too many data gaps regarding the nature, quantities, and interactions of the many substances released from Red Hill at many times before and after 2021 to make simple assumptions about contaminant mobility. Given these reasons and the lack of natural organic material in the vadose zone and

host-rock aquifer, PAHs, which agreed are not typically highly mobile, could be, and likely are, migrating further than is typical from the Red Hill facility.

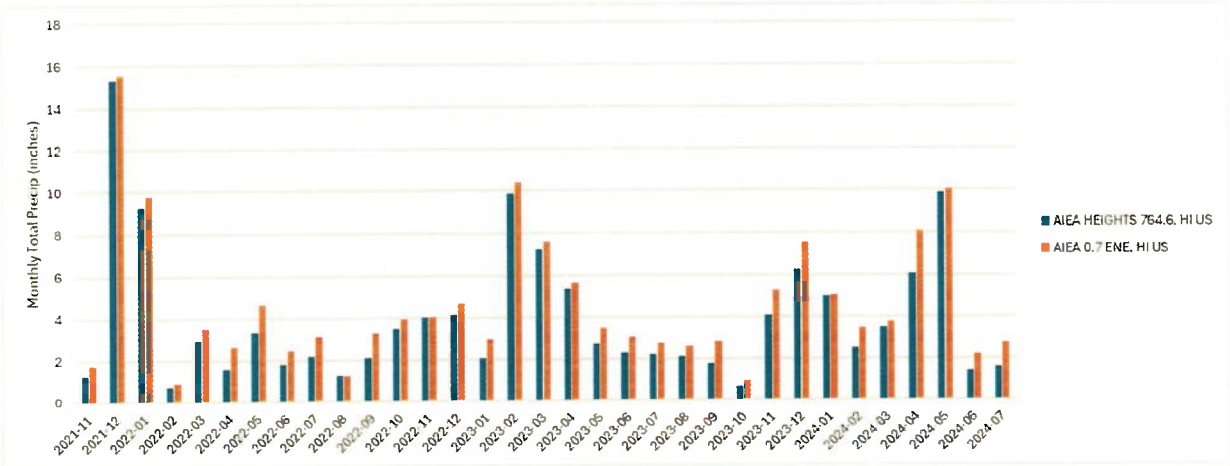
DOH RFI No. 7 – Nearby sources of PAHs: We are aware of the following potential nearby sources, although there are likely more. Has the BWS considered and ruled out the following?

a. ***The former Honolulu Plantation (aka 'Aiea Sugar Mill) a quarter mile northeast of the BWS 'Aiea Wells. The plantation operated a series of siphons, dams, and reservoirs that moved water from 'Aiea and other nearby streams to irrigate sugar mills in the fields from 1901 to 1947. A concrete reservoir was in the 'Aiea Wells area in 1930.***
b. ***Surface runoff from roads and parking areas.***
c. ***BWS construction projects in the 'Aiea area around the time BWS detected PAHs in the 'Aiea Wells.***

BWS Response No. 7 – BWS did not have any construction projects in the area of 'Aiea Wells before, during, or after the sampling event. Also, if the PAHs were from a nearby surface source, we would expect to see other contaminants (bacteria, metals, etc.) which were analyzed for and not detected. BWS did not do an environmental database radius search to look for other release sites in the area, but we are aware of the nearby Navy Laundry Facility, where a diesel-plume was documented in the early 2000s. BWS expects DOH to be aware of this information and inform BWS if there are other threats in the area other than the RHBFSF.

DOH RFI No. 8 – Sustained rainfall before the detections: There was sustained rainfall in April and May 2024 before the samples were taken on May 13 and June 4, 2024. Sustained rainfall can lead to locally elevated concentrations of PAHs, as well as pesticides, which were detected in BWS Hālawa Wells and Moanalua Wells on June 4 and 12, 2024. These results could indicate that contaminants from localized sources were mobilized by the sustained rains.

BWS Response No. 8 – Below is a hydrograph of precipitation measurements from the 'Aiea area dating back to 2021. Rainfall events similar to May 2024 were observed in 2022 and 2023, and similar PAH detections, as observed in 'Aiea Wells in May and June 2024, were not identified following these precipitation events.



DOH RFI No. 9 – Lack of detections between 'Aiea Wells and Red Hill: The BWS Hālawa Wells are between the 'Aiea Wells and the Red Hill Facility. Thus, if a contaminant plume from the Red Hill Facility passed under the 'Aiea Wells, we would expect to see equivalent or greater PAH detections in BWS Hālawa Wells first. Did BWS see a similar or greater spike in PAH detections in BWS Hālawa Wells before the detections in BWS 'Aiea Wells? We reviewed a subset of BWS' data and data from the Navy's Red Hill groundwater monitoring well network and did not find conclusive evidence of plume migration in the groundwater between 'Aiea Wells and the Red Hill Facility.

BWS Response No. 9 – BWS did not see a similar or greater spike in contemporaneous PAH detections in BWS Hālawa Wells before the detections in BWS 'Aiea Wells. BWS understands that the hydrogeology of the underlying aquifer allows this sort of issue to occur (compartmentalized flow), so nearby wells may not see a contaminant that other wells in the area will. Further, there is a component of deep aquifer flow that has not been evaluated in the area of the RHBFSF. The WAI Alliance Report discusses the need for more monitoring wells and deeper monitoring wells to the northwest of Red Hill and specifically in the area between Red Hill and the BWS 'Aiea Wells (WAI Report, 2023).

DOH RFI No. 10 – Groundwater flow direction: According to BWS' Draft Source Water Protection Plan, dated May 2024, the groundwater under BWS 'Aiea Wells flows to the Southeast. For contaminants to travel from the Red Hill Facility, groundwater would need to flow in the opposite direction. How did BWS reconcile these different flow directions?

BWS Response No. 10 – These are capture zones developed by DOH in 2004 and were not developed by BWS that show the flow direction DOH is citing (BWS Draft SWPP, 2023). BWS has consistently stated that we believe there is a component of groundwater flow direction from Red Hill that is oriented to the northwest in the direction of 'Aiea Wells.

DOH RFI No. 11 – Source of PAH compounds: The PAH compounds detected in BWS 'Aiea Wells are different than those expected from degraded fuel from the Red Hill Facility. The low concentrations of longer-chain PAHs detected in the absence of more mobile compounds associated with petroleum fuels suggests that the contamination is likely from a different source. A review of the chromatogram of the sample or future samples would help to determine the likely source. How did BWS conclude that the PAHs detected were from the Red Hill Facility and not a potential nearby source mentioned above?

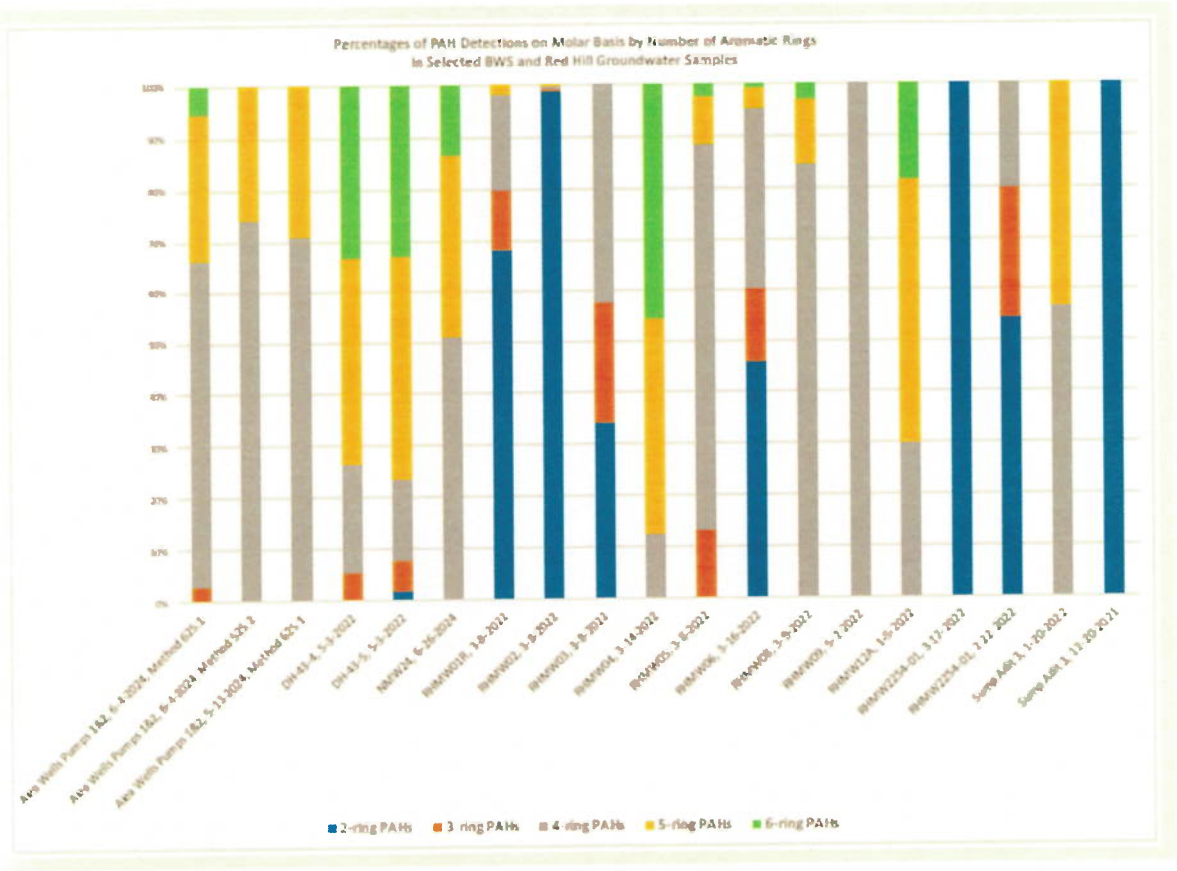
BWS Response No. 11 – The chromatogram detecting PAHs in the June 4, 2024 sample at 'Aiea Wells is attached. Please see "Chromatogram of 'Aiea Wells Pump 2 with PAH Detections" included at Attachment 4.

Detection of PAHs in drinking water supplies at levels of concern is rather uncommon, therefore there logically exists a low probability of those features most common to cities being sources of PAHs in municipal wells. All cities have extensive development with roads, parking areas, and construction projects using concrete and asphalt materials as are implied to be sources in DOH RFI No. 7 above (asphalt is known to contain PAHs, whereas the basis for believing concrete reservoirs, dams, or siphons would contain and leach PAHs was stated). The probability of large releases of hydrocarbons such as those as Red Hill impacting groundwater with PAHs seemed at least as high or higher than of that of any other potential source and thus warrants consideration.

The idea that certain PAHs are not expected in fuels is incorrect. Petroleum fuels are derived from crude oil containing a broad distribution of PAHs, and these PAHs could be expected in any petroleum product in amounts varying depending on the degree of refining of the product. For instance, PAHs might be reduced, but not eliminated, in lighter fuels like gasoline products by distillation and cracking (partially offset by blending and reforming), whereas they might be concentrated by distillation in heavier fuels like bunker fuel. Red Hill stored a full range of fuel products from gasoline to bunker fuel and as previously noted, has an extensive history of releasing those products to the environment. The absense of more mobile petroleum constituents and the lower of abundance of lighter PAHs versus heavier PAHs makes attribution to a petroleum source more difficult but does not rule it out, since heavier PAHs are more resistant to weathering than more mobile petroleum constituents and lighter PAHs. As noted in previous responses, a complex history of releases of fuels and surfactants into a complex hydrogeologic system does not allow simple assumptions to describe contaminant mobility. Thus, rather than debate forensic principles gleaned from research elsewhere, the data from around Red Hill is the best indication of what contaminants are expected from releases from Red Hill.

The bar chart below is plotted using the percentages of PAH compounds with each number of aromatic rings. It shows that some locations at or around Red Hill detected the same PAH compounds that the question incorrectly asserts are not expected from degraded fuel, that a given location has a different distribution of detected PAHs over time, and the BWS wells are similar to some results from Red Hill and dissimilar to others (including samples from the same location on different dates), e.g. results from

Sump Adit 3 illustrate all three of these points. This PAH distribution information shows there are PAH ratios at Red Hill monitoring wells, both on and off-site, that are similar to the PAH ratios observed at 'Aiea Wells in May and June 2024.



DOH RFI No. 12 – Potential matrix interference (aka false positives):

a. ***The chains of custody (COCs) for the samples are uncertain. For example, some analyses conducted do not have container numbers or the type of analysis listed – yet the analyses were still conducted. Others have different preservation methods (or no preservation method) listed for the same analysis on different COCs. Therefore, the impact of potential matrix interference is difficult to assess.***

b. ***No matrix spike/matrix spike duplicate (MS/MSD) samples were collected that could shed light on potential matrix interference at these low PAH levels.***

BWS Response No. 12 –

a. The contract laboratory sends sampling bottles in coolers, as a sampling kit for requested sampling sites. These coolers contain a "kit order," which lists the bottles comprising the kit as well any preservation requirements. The contract laboratory adds required preservatives to the sampling containers before shipping. Sampling kits also include a generalized COC template, which lists all

customary analyses, where any analyses that are being sampled would be noted by the number of containers. For example, the COC from BWS for analytical report #380-98637 clearly lists the desired analyses with the number of sample containers being returned to the contract lab for analyses. Preservation codes are listed on the COC in the grey row, between "Analyses Requested" and the numbers of containers listed for each analysis, while the legend for preservation codes is presented in the last column on the right-hand side of the COC, between "Special Instructions" and "job #." In the COC for analytical report #380-98637, no containers for 533 or 537.1 were sent for this particular job and these analyses were not performed, so no container numbers are listed for these analyses on the COC. The subcontracting COCs in the final report are for sample containers shipped from the contract lab to their subcontracting lab. These COCs are auto generated by the contract lab's laboratory information management system (LIMS) and populated based upon the sample containers sent by BWS to the contract lab. In the cases of a subcontract lab within the contract lab's network, the original COC's data is available within their respective LIMS, which are linked as part of the subcontracting process.

b. At the time of this sample collection, the contract laboratory was not using matrix spike samples for this site. The contract laboratory has now been requested to add additional containers for matrix spikes to 'Aiea Wells. As any sample hits for PAHs are all verified as per the method, matrix interference should have no impact on peak identification as peak identification requires both a spectra match and a retention time match. A matrix spike/matrix spike duplicate can serve to note the presence of matrix interference, but would have no impact on analyte identification, as that is not hindered by the matrix of the site in question.

DOH RFI No. 13 – Potential cross contamination: For the June 4, 2024 sample that had PAH detections, the lab report noted one bottle broke and 4 containers became empty in transit. We do not know if cross contamination occurred in transit because there was no accompanying trip blank.

BWS Response No. 13 – We do not view cross contamination as a concern for these samples. Coolers are received from the contract lab clean with the necessary bottles for the sampling event, transported to the sampling site for collection, then shipped back to the contract lab for analyses. The levels of contamination necessary for small volumes of a spilled sample to be sufficiently contaminating enough to be dected in sealed containers of other samples in the coller is something we do not consider plausible, especially since the four empty samples in this cooler came from 'Aiea Gulch, which was not detected for PAH, and the broken sample was from 'Aiea Wells itself. Nevertheless, a field blank and trip blank will be added for PAH samples (see BWS Response No. 14).

DOH RFI No. 14 – Recommendations: To increase the certainty of sample results moving forward, we recommend the following for BWS' sampling protocol:

1. ***Add a field blank and trip blank for PAH samples.***

2. ***Add a low concentration spike close to the MRL (method reporting limit) for Method 625.***
3. ***Resample when containers are broken.***
4. ***Collect a MS/MSD sample for PAHs at locations suspected to have PAH detections.***
5. ***Double-check the accuracy of the chain of custody.***

BWS Response No. 14 –

1. Field Blank and Trip Blank will be added for samples.
2. Low concentration close to MRL (1x-2x) in reagent will be added.
3. With a weekly sampling frequency, resamples are taken by design the next week.
4. The laboratory will add MS/MSDs for PAH detections.
5. A COC template is used for weekly sampling in the Red Hill area. This template includes all customary analyses and those that are being samples at the time are noted with container numbers. As noted above, the contract lab's subcontracting chain of custody is auto generated from their LIMS.

BWS strongly urges DOH to investigate fully the source of these PAH detections in 'Aiea Wells and BWS will notify DOH immediately if PAHs are detected in any BWS wells in the future. If there are any questions, please contact Erwin Kawata, Deputy Manager, at (808) 748-5066.

Very truly yours,

Ernest Y.W. Lau, P.E.
Manager and Chief Engineer

Enclosures
1. 'Aiea Wells Pump #2
2. Collection Methodologies for EPA Methods 525.2 and 625.1
3. EEA (Eurofins) Analytical Laboratory Report #380-99954
4. Chromatogram of 'Aiea Wells Pump 2 with PAH Detections

References

Lau, Ernest Y.W. (Lau). 2024. Polynuclear Aromatic Hydrocarbons (PAHs) Detected at Board of Water Supply 'Aiea Wells. Letter from Ernest Y.W. Lau, BWS Manager and Chief Engineer to Ms. Martha Guzman, United States Environmental Protection Agency Region IX Administrator, and Dr. Kenneth S. Fink, Director, State of Hawai'i Department of Health. July 8.

Hawai'i State Department of Health (DOH). 2024. Request for Information Regarding Polycyclic Aromatic Hydrocarbons Detected at Board of Water Supply 'Aiea Wells. Letter from DOH and the United States Environmental Protection Agency (EPA) to Mr. Ernest Y.W. Lau, P.E. August 9.

AECOM Technical Services Inc. (AECOM) 2024. Draft Remedial Investigation Work Plan Per- And Polyfluoroalkyl Substances Release, Red Hill Bulk Fuel Storage Facility, JOINT BASE PEAR HARBOR-HICKAM OAHU HI PEARL HARBOR HI FISC SITE 30. Prepared for Naval Facilities Engineering Systems Command Hawai'i JBPHH HI. June.

Red Hill Water Alliance Initiative (WAI) Report. 2023. November.

Honolulu Board of Water Supply (BWS). 2024. DRAFT Source Water Protection Plan (SWPP). Prepared by CDM Smith. May.

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Nā'ālehu Anthony
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