



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105

August 7, 2024

Ms. Jocelyn Tamashiro, L.G.
Environmental Restoration Manager
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400 Marshall Road, Building X-11
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**Subject: DRAFT REMEDIAL INVESTIGATION WORK PLAN PER- AND
POLYFLUORALKYL SUBSTANCES RELEASE, RED HILL BULK FUEL STORAGE
FACILITY, JOINT BASE PEARL HARBOR-HICKMAN, OAHU HI, PEARL HARBOR
HI FISC SITE 30, JUNE 2024**

Dear Ms. Tamashiro:

Enclosed are the U.S. Environmental Protection Agency's (EPA's) comments regarding the subject document (Draft RI WP). Please prioritize your response to the comments in Enclosure 1 so the Navy can expedite the sampling of the wells agreed upon during the EPA/US Department of the Navy/Hawaii Department of Health teleconference on Friday July 12th. Please see enclosed table summarizing the wells the Navy agreed to sample beginning in September (Enclosure 2).

We understand the Navy would like to finalize the PFAS RI WP without submitting a draft final document. Our acceptance of this process is contingent upon the Navy's responsiveness to our remaining comments. To finalize the PFAS RI WP please also provide formal responses by Friday August 30th.

We are currently scheduled to meet to discuss the PFAS RI WP on August 14th. EPA recommends that we focus on Enclosure 1 during that meeting. Please review the comments and provide questions in advance of that meeting if possible.

If you have any questions regarding this letter, please feel free to call me at (415) 972-3149 or contact me by email at lichens.christopher@epa.gov.

Sincerely,

Chris Lichens
Remedial Project Manager
Superfund and Emergency Management Division
Federal Facilities and Site Cleanup Branch
US EPA, Region IX

Enclosures (3)

cc: Allison Hutto, HDOH

Enclosure 1:
**EPA Review of DRAFT REMEDIAL INVESTIGATION WORK PLAN PER- AND
POLYFLUORALKYL SUBSTANCES RELEASE, RED HILL BULK FUEL STORAGE
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Priority Comments for Expedited Well Installation

PRIORITY COMMENTS FOR EXPEDITED WELL INSTALLATION

To proceed with sampling of the additional wells the Navy agreed to during the United States Environmental Protection Agency (EPA)/US Department of the Navy (Navy)/Hawaii Department of Health (DOH) teleconference on Friday July 12th, please expedite the Navy's responses to the comments in this enclosure. We understand that the Navy may begin sampling these wells as soon as September.

GENERAL PRIORITY COMMENTS

1. In addition to the subset of wells the Draft RI WP proposes sampling in Areas A and B, Enclosure 2 is a table of the additional wells the Navy agreed to sample quarterly for one year and then re-evaluate. The table lists well names, the status of construction of the wells, and the objectives for sampling. Some of the agreed-upon additional Phase 1 locations are also listed here:
 - a. Adit 3 Area: RHP04A, RHP04B, RHP04C, RHP05, RHP08B, RHP08C, OWDFMW01, OWDFMW03A and B, OWDFMW08A and B. These wells need to be sampled for delineation and to evaluate seasonal variability and trends in PFAS concentrations in the vicinity of Red Hill Shaft. In addition, only one round of samples has been collected and some of the wells have concentrations that exceeded the Maximum Contaminant Levels (MCLs).
 - b. Adit 6 Area: RHMW-01R, RHMW-02, RHMW-03, RHMW-04, RHMW-05, RHMW-07, RHMW-08, RHMW-20, and RHMW-21. These wells need to be sampled for delineation, to evaluate seasonal trends and to understand downgradient transport, due to proximity to Adit 6 and/or uncertainty in the groundwater flow direction.

Please revise the Draft RI WP to propose these additional Phase 1 locations and include them in Worksheets #17 (Sampling Design and Rationale) and #18 (Locations-Specific Sampling Methods/SOP [Standard Operation Procedures] Requirements Table), so that the objective to delineate the nature and extent of PFAS contamination can be met.

Additional step-outs may be needed during a Phase 2. As we discussed during the meetings, the other wells that EPA recommended for sampling, but which the Navy did not agree to, are documented in Enclosure 3 of this letter.

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2. A laboratory has not been specified to perform sample analyses, so several worksheets are incomplete and cannot be fully evaluated. For example, in Worksheet #15, Reference Limits and Evaluation Tables, laboratory detection limits are listed as “TBD [to be determined]” and therefore can’t be compared to project screening levels. Worksheets #24, Analytical Instrument Calibration Table, and #28, Laboratory QC Samples Table, contain requirements of EPA Method 1633, but may not match a laboratory’s specific standard operating procedures (SOPs). This is not an exhaustive list of affected worksheets. Please revise the Draft RI WP to include information about the laboratory and include relevant analytical SOPs as an appendix.
3. It is unclear why matrix spike/matrix spike duplicate (MS/MSD) samples are not proposed for collection. Please revise the Draft RI WP to include the collection of MS/MSD samples for soil, sediment, and groundwater.

SPECIFIC PRIORITY COMMENTS

1. **Worksheet #12, Field Quality Control Samples, Page 59** - The measurement performance criteria (MPC) for field duplicates in waters (relative percent difference [RPD] ≤ 50) and soils (RPD $\leq 100\%$), are taken from *Department of Defense (DoD) Module 6: Data Validation Guidelines*. However, these limits in the guidelines are used in the context as an example of what *may be considered* a major exceedance. EPA recommends that the RPD criteria be reviewed for adequacy and that rationale for the MPC be provided in the RI Work Plan.
2. **Appendix B, SOP I-C-3, Monitoring Well Sampling, PDF Page 273:** While some of this Standard Operating Procedure (SOP) is applicable to this project, it seems more targeted to sampling wells with fuel-related and/or volatile constituents. Please update this SOP to include site-specific requirements for sampling PFAS contaminants. Similar comments apply to the decontamination SOP I-F and Field QC SOP III-B.

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**Table of Wells: Navy/DOH/EPA Agreed to Sample Wells on this Table on
 July 12,2024**

Status	Wells Recommended for PFAS RI Sampling			
	Well ID	Location	Purpose of Monitoring	Justification
All Parties Agree	RHMW-2254	RHS	Evaluate impacts to drinking water source	Historical Detections
All Parties Agree	RHP01	< 500 ft from RHS	Delineation; evaluate seasonal variability and trends in PFAS concentrations in the vicinity of Red Hill Shaft	Some wells near RHS exceeded MCLs. PFAS may have been comingled with JP-5 released in November 2021. Only one round of samples collected.
All Parties Agree	RHP02	< 500 ft from RHS		
All Parties Agree	RHP03	< 500 ft from RHS		
All Parties Agree	RHP-06	< 500 ft from RHS		
All Parties Agree	RHP-07	< 500 ft from RHS		
All Parties Agree	RHP-08	< 500 ft from RHS		
All Parties Agree	RHMW-06	Close proximity to Adit 6	Delineation	Uncertainty in groundwater flow direction, rate, vadose zone breakthrough
All Parties Agree	RHMW-17, 17S, 17D	Near Adit 6 entrance	Evaluate variability and trends in PFAS concentration Near Adit 6 Release	Release history, residual soil contamination, unknown groundwater arrival times
All Parties Agree	RHP-04A,04B,04C	< 500 ft from RHS		
All Parties Agree	RHP-05	< 500 ft from RHS		
All Parties Agree	OWDFMW01	< 500 ft from RHS		

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**Table of Wells: Navy/DOH/EPA Agreed to Sample Wells on this Table on
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Status	Wells Recommended for PFAS RI Sampling			
	Well ID	Location	Purpose of Monitoring	Justification
All Parties Agree	RHMW-18	East of Adit 6	Delineation.	Proximity to Adit 6 release, uncertainty in flow direction
All Parties Agree	RHMW-20	500 ft Downridge of Adit 6	Evaluate trends	Potential migration pathway , Navy fate and transport
All Parties Agree	RHMW-07	Downridge of Adit 6	Delineation; evaluate downridge Transport from Adit 6	Historical detections, uncertainty in GW direction, fate and transport modelling
All Parties Agree	RHMW-08	Downridge of Adit 6	Delineation; evaluate downridge Transport from Adit 6	Historical detections, uncertainty in GW direction, fate and transport modelling
All Parties Agree	RHMW-21	East of Adit 6	Delineation	Proximity to Adit 6 release, uncertainty in flow direction
All Parties Agree	RHMW-04	800 ft NE of Adit 6	Evaluate seasonal variability and trends in PFAS concentrations Near Adit 6 Release	Release history, residual soil contamination, unknown groundwater arrival times
All Parties Agree	RHP-08B,-08C	< 500 ft from RHS		

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**Table of Wells: Navy/DOH/EPA Agreed to Sample Wells on this Table on
 July 12,2024**

Status	Wells Recommended for PFAS RI Sampling			
	Well ID	Location	Purpose of Monitoring	Justification
All Parties Agree	RHMW 01R			
All Parties Agree	RHMW-02	1600 ft SW of Adit 6	Delineation; evaluate trends	Historical Detections, Uncertainty in GW flow direction
All Parties Agree	RHMW-03	700 ft S of Adit 6	Delineation; evaluate trends	Historical Detections, Uncertainty in GW flow direction
All Parties Agree	RHMW-05	2600 ft SW of Adit 6	Delineation	Uncertainty in groundwater flow direction and rate
All Parties Agree	OWDFMW03A and 03B			
All Parties Agree	OWDFMW 08A and 08B			

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Comments for Finalization of Work Plan

To finalize the Remedial Investigation Work Plan Per- and Polyfluoroalkyl Substances Release (Draft RI WP), please respond to the comments in this enclosure.

GENERAL COMMENTS

1. The "Site" should be the entire Red Hill Bulk Fuel Storage Facility (Red Hill) and not just Areas A and B. Given the lack of documented information about where Per- and Polyfluoroalkyl Substances (PFAS) was used previously and lack of a full Red Hill PA/SI, there is insufficient information to narrow it to these areas. The Remedial Investigation and sampling should also determine whether any other areas may be potential PFAS sources and nature and extent at Red Hill.
2. All Red Hill operations and activities are not discussed or mapped in the Draft RI WP. Specifically, non-AFFF sources of PFAS at Red Hill don't seem to be fully investigated. For instance, petroleum facilities may use PFAS-containing materials for vapor suppression, so the tank gallery may be a large source of PFAS contamination. Over the years, the Navy constructed and maintained metal in the main tanks, pipelines, surge tanks, rail cars, rail lines, etc. It is unclear where smelting, metal-plating and other activities occurred. Sites like the Oily Waste Disposal Facility (OWDF) may have received and burned PFAS-containing chemicals. Figure 2-7 of the 1992 Red Hill Oily Waste Disposal Pit Remedial Investigation/Feasibility Study Work Plan showed a plumber's shop, switch room, septic tank, crusher pit, and other potential PFAS sources. PFAS-containing surfactants may have been used and stored throughout the facility. Please update the RI WP to identify and investigate all potential sources of PFAS contamination.
3. Please provide full schematics that will identify aqueous film-forming foam (AFFF) storage and transport locations through Red Hill. The Navy should provide descriptions and schematics for legacy AFFF systems, as well as the more recent system.

For instance, the following excerpt describes a more extensive and complex fire suppression system than presented in the report figures. Section 10.2.1.4 of the report states, *"Upon activation, AFFF suppressant, generated by mixing AFFF concentrate (Ansulite AFC-3MS 3% AFFF Concentrate, product code 442683) with water, would be released through sprinklers. The water would be pumped from Bldg. 313 by fire pumps, serving both the five lower tunnel AFFF zone mixing/release stations and the wet-pipe sprinkler system for the upper tunnel."*

Figures should be revised to show the entire AFFF fire suppression system including but not limited to sprinkler systems, mixing and release stations, distribution piping, aboveground storage tanks (ASTs), release retention piping, waste piping and tanks, as well as the components and sections of the system through which AFFF concentrate, mixed product and

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/or PFAS-containing wastes were held or conveyed during testing or operations. The AFFF system at the surge tanks, fuel oil recovery (FOR) facility, underground pumphouse, Building (Bldg) 1721, Bldg 1613, and the connecting pipelines should also be clearly represented.

4. During a meeting on July 17, the Navy discussed looking at the conceptual site model (CSM) and fate and transport three-dimensionally. This three-dimensional approach seems missing from the Draft RI WP. Please update the Draft RI WP to include discussions of subsurface preferential pathways like conduits, pipelines, and the Harbor Tunnel.
5. Delineation of PFAS contamination should be based on detections. In appendix A, please map all locations where PFAS contaminants were detected in soil and groundwater. Use the locations with detections to identify in Worksheets #11 and #17 where data gaps will be investigated.
6. The proposed groundwater sampling should be more comprehensive.
 - a. It is unclear why installation of additional monitoring wells (i.e., a cluster) and/or sampling existing Oily Waste Disposal Facility wells are not proposed west-southwest of RHP06 downgradient of the investigation area. The Perfluorooctanesulfonic acid (PFOS) MCL exceedance in RHP06 should be delineated. The proposed well would be outside of the investigation area and Red Hill Facility Boundary; however, monitoring well locations RHP06 and RHP08, among others, are located outside of the depicted Red Hill Facility Boundary. Please revise the Draft RI WP to propose additional monitoring well locations west-southwest of RH06.
 - b. During the EPA/DOH/Navy teleconference in July, EPA proposed multiple additional wells for sampling. While the Navy did not agree to expedite sampling of the following wells, EPA continues to emphasize their importance:
 - i. NMW-32 Area: Due to the location of NMW-32 near a Red Hill tunnel, we cannot dismiss the PFAS detected in NMW-32 in September 2023 as being from a non-PFAS source. There is also uncertainty in the groundwater flow direction, so real-world data are needed to understand these PFAS detections. Wells NMW-25, NMW-32, NMW-33, NMW-37, and NMW-39 need to be sampled for delineation and to evaluate trends.

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- ii. Adit 3 Area:
 - 1. OWDFMW04: This well needs to be sampled for delineation and to evaluate seasonal variability and trends in PFAS concentrations in the vicinity of Red Hill Shaft.
 - 2. NMW-23, NMW27/27A, NWM-29/29A, NMW-30, NMW-35, NMW-36, NMW-38/38A, NMW-41, NMW-43, and SS: These wells need to be sampled due to uncertainty in the groundwater flow direction as some of them are potentially downgradient of Adit 3 based on the Groundwater Flow Model. Also, there are groundwater sources/users to the west and northwest of Adit 3 area.
- iii. Adit 6 Area: RHMW-01, RHMW-09, RHMW-12, RHMW-12A, RHMW-18, RHMW-19, Halawa Deep, NMW-22, NMW-28/28A, NMW-31, NMW-40/40A, NMW-42/42A, XE, OO, and KK. These wells need to be sampled for delineation, to evaluate seasonal trends and downgradient transport. Several are near Adit 6 and others are needed because of the uncertainty in the groundwater flow direction.

Please revise the Draft RI WP to propose these additional locations and include them in Worksheets #17 (Sampling Design and Rationale) and #18 (Locations-Specific Sampling Methods/SOP [Standard Operation Procedures] Requirements Table), so that the objective to delineate the nature and extent of PFAS contamination can be met.

- 7. The proposed borings should be numbered on Figures 10 (Proposed Sampling Locations – Area A) and 11 (Proposed Sampling Locations – Area B) and in Worksheet #18. For example, Figure 10 appears to only show 7 of the 12 proposed surface/subsurface soil boring locations surrounding Bldg 313; however, numbering boring locations would allow for easier analysis and ensure that nothing is overlooked in the field. Please revise Worksheet #18 and Figures 10 and 11 of the Draft RI WP to number the proposed borings.
- 8. EPA Regional Screening Levels (RSLs) released in November 2023 are cited throughout the Draft RI WP, but newer RSLs were released in May 2024. The 24 August 2023 Office of the Assistant Secretary of Defense (OSD) memorandum states that the Department of Defense (DoD) will no longer issue revisions to incorporate future RSL updates and will instead include these updates on its website (<https://www.acq.osd.mil/eie/eer/ecc/pfas/pfas101/rsl.html>). There are new, lower RSLs for PFOS and perfluorooctanoic acid (PFOA), based on the May 2024 RSLs, which are included by link on the OSD web page. Please revise the Draft RI WP to incorporate the most recent RSLs.

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9. EPA drinking water maximum contaminant levels (MCLs) for certain PFAS were finalized in June 2024, so screening of existing and newly generated data should include applicable MCLs. Please revise the Draft RI WP to incorporate the PFAS MCLs in data screening, including the rescreening of existing data using the MCLs.
10. In some cases, throughout the Draft RI WP, the RSL that was used for screening purposes was not specified. For example, Worksheet #10, Conceptual Site Model, PDF Page 41, first bullet, states that soil sample results from Area A, Excavation Areas/Formal DUs (Decision Units), were “below EPA regional screening levels (RSLs)”, but it does not specify which RSLs are meant. Please revise the Draft RI WP to note the specific RSL (i.e., release date, residential or industrial, Target Hazard Quotient (THQ) = 0.1 or 1,.) whenever mentioned in text.
11. There is no human health risk assessment work plan presented in the Draft RI WP; it appears that an ecological risk assessment may or may not be applicable for this site. If risk assessment work plan(s) are anticipated to be produced under separate cover, please revise the Draft RI WP to indicate this in the appropriate worksheet(s) (e.g., Worksheet #10, etc.).

SPECIFIC COMMENTS

1. **Worksheet #3, Distribution List, Page 19, and Worksheet #5, Project Organization Chart, Page 23:** The Distribution List displays Alison Fong's title as Regulatory Project Manager. Please correct her title to reflect that she is, "Assistant Director, RCRA Branch Land, Chemicals & Redevelopment Division".
2. **Worksheet #4, Project Personnel Sign-Off Sheet, Page 21:** Having all personnel working in the field read and sign off on the Draft RI WP will benefit the quality of the work. Shouldn't additional field personnel be required to read and sign?
3. **Worksheet #5, Project Organization Chart, Page 23:** The Project Organization Chart seems to indicate that the lines of authority go from EPA to Hawaii Department of Health (DOH), to several Navy contractors. This is incorrect. Please delete the black line from EPA to DOH. Ensure the Navy project managers communicate with both DOH and EPA. Move the contractors to under the Navy's authority.
4. **Worksheet #6, Communication Pathways, Pages 25 and 26:** Work Plan/Sampling and Analysis Plan (WP/SAP) changes prior to field/laboratory work and WP/SAP changes in the field, e.g., field change requests, should be reviewed and approved by EPA, and EPA should be included in communications about WP/SAP changes. Please revise the Draft RI WP to include EPA approval of WP/SAP changes and include EPA in all communications about WP/SAP changes.

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5. Worksheet #10, Conceptual Site Model, Pages 33 through 52:

a. General:

- i. Section 10.2 describes site history and environmental information. Section 10.2.8 discussed previous investigations and removal actions. However, there is no discussion of the December 20 and 27 exceedances of PFOS in Red Hill Shaft or the September 2023 detections of multiple PFAS contaminants in waste characterization samples from the AFFF retention line. Additional Adit 6 soil investigation-derived waste (IDW) results were received in July 2024 that weren't documented in the remedial action completion report or this Draft RI WP. Please document these four sets of data somewhere in Section 10.2.
- ii. Given available information on the amount of AFFF spilled, recovered, excavated, and disposed of the Draft RI WP should include an estimate of the net mass of PFAS released to the environment during the November 2022 release at Adit 6.

b. Section 10.2.1, Site Description(s) and History, Page 33: Include all potential PFAS source locations in the investigation. Potential locations include, but aren't limited to:

- i. AFFF storage locations throughout the facility
- ii. Locations of routine or heavy surfactant use
- iii. Location of wastewater storage, seepage, or large releases
- iv. Disposal locations, including where waste was infiltrated, buried, or burned.

c. Section 10.2.1.2, Adit 6 and Former Slop Tank, Pages 33 and 34:

- i. This section describes a historical AFFF system that was plumbed to a 210,000-gallon slop tank outside of Adit 6, however, several details are missing, including the installation date of the AFFF system decommissioned in 2008. Please revise this section of the Draft RI WP to more completely describe the purpose of the AFFF system at Adit 6, period of use, frequency of use, and AFFF formulation it contained. Include discussion of all types of waste that entered the slop tank. Describe the function of the lines connecting the AFFF AST to the slop tank.
- ii. The text describes cutting and plugging piping associated with a slop tank and AFFF AST. Is there documentation that the residual fuel was removed from the piping and the piping was cleaned before plugging?
- iii. Figure 2 indicates wastewater and fluids from the former slop tank (S-355) were discharged to Halawa stream. Please include a discussion in this section of the potential for PFAS to have been discharged directly to Halawa Stream and the resulting contaminant exposure pathways.

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- d. Section 10.2.1.3, Red Hill Fire Suppression System Located at Building 313 and Adit 6, Page 34:** Based on the text, it appears no AFFF system was operated at Red Hill between 2008 and 2018. Please confirm.
- e. Section 10.2.1.4, Site Features, Pages 35 and 36:**
- i.** The text indicates post-excavation soil sample results were below EPA RSLs. The text should be revised to indicate the RSLs relate to direct contact with contaminated soil. There should be additional discussion about how the Navy will consider the leaching to groundwater pathway.
 - ii.** A potential source of PFAS in Area B groundwater is the fuel release in Adit 3 in November 2021. Several lines of evidence support this conclusion including the timing, magnitude, and composition of PFAS detected in Red Hill Shaft (RHS) after the November 2021 release. Please revise the text to acknowledge this potential source of PFAS in Area B. Include sampling and analyses of soil and perched groundwater for PFAS within the area impacted by the November 2021 JP-5 release. (Comment also applies to Section 10.4.2, Fate and Transport Considerations).
 - iii.** The first sentence of the paragraph after the bullet states, "No known AFFF release occurred in Area B, but sampling showed perfluorooctanesulfonic acid (PFOS) present in Area B groundwater monitoring wells." However, multiple PFAS contaminants were detected in those wells, including but not limited to PFBS, PFBA, PFHpA, PFHxS, PFHxA, PFNA, PFOS, PFOA, PFPeA, PFHpS. PFOS, PFOA, and PFHxS exceeded screening criteria. Please update the text to state, "~~No known AFFF release occurred in Area B, but sampling showed~~ detected **multiple PFAS contaminants perfluorooctanesulfonic acid (PFOS) present in Area B groundwater monitoring wells. Three PFAS, perfluorooctanesulfonic acid (PFOS), Perfluorooctanoic acid (PFOA) and Perfluorohexanesulfonic acid (PFHxS) exceeded screening criteria.**"
 - iv.** When discussing infrastructure, potential release locations, and wells near Area B, please also include discussion of NMW32 and the tunnel and pipelines running from the "wye" to Adit 1, the pipelines and tunnel through Adit 3, and the associated tanks and infrastructure outside Adit 3.
- f. Section 10.2.2, Surrounding Area and Land Use, Page 36, and Appendix A Figures:** The property boundary does not match the Tax Map Key (TMK) boundary. Please update the Red Hill facility boundary in all figures to use the TMK boundary or add text to Section 10.2.2 documenting how the Navy chose to define the smaller Red Hill footprint. In Section 10.2.2 please also discuss the locations of adits and tunnels that are part of the Red Hill Bulk Fuel Storage Facility.

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- g. Section 10.2.4.2, Topography and Surface Water, Page 37 Section 10.4.3 Potential Receptors and Exposure Pathways, Page 51, and Appendix A, Figures 6, 7, and 8:** Several sections in Worksheet 10 describe Red Hill Shaft as "formerly" used for drinking water and as being offline "since the November 2021 fuel release". However, we understand the Navy is completing MILCON projects at Navy's Aiea-Halawa Shaft (NAH) and Red Hill Shaft (RHS) to install drinking water treatment systems. Therefore, the drinking water pathway should be considered potentially complete for future receptors.

Navy has informed EPA that the treatment systems will treat the water to remove PFAS contaminants and TPH. Since the RI and risk assessment are not complete, and since PFAS contaminants were detected in both RHS and NAH, the Navy should monitor the treatment system frequently to understand when breakthrough will occur and should coordinate closely with regulators to ensure the treatment system is effective before serving water from NAH or RHS. In particular, the Navy should very closely monitor for and prevent breakthrough of smaller PFAS molecules.

- h. Section 10.2.5, Geology and Soils, Page 37, and Appendix A, Figures 6 and 7:** It would be helpful to update the text in this section and the associated cross sections/geologic renderings in the CSM figures with real-world data collected from the multiple coring and boring logs that the Navy has generated over the past few years.
- i. Section 10.2.8.2, AFFF Release and Response Actions at Adit 6 (November 2022), Pages 41 through 43 (last sentence) and Appendix A, Figure 4 –** The text indicates that 6:2 FTS is shown in Figure 4, but concentrations of that chemical in soil are not shown in Figure 4. Since 6:2 FTS was detected at a higher soil concentration than other PFAS compounds (maximum 150 µg/kg), it would be useful to add it to Figure 4.
- j. Section 10.2.8.3, Sampling and Analysis at Adit 6, Pages 43 through 45 –**
- i.** The text indicates that EPA Method 1633 does not include analytes such as 6:2 FTS and 8:2 FTS. However, these are in fact Method 1633 analytes. Please delete the statement indicating these analytes are not detected via EPA Method 1633.
 - ii.** Please revise the second paragraph of the Baseline PFAS Sampling Event subsection on page 45 to clearly state that concentrations of PFOS in RHP01, RHP02, RHP03, RHP06, RHP07, and NMW32 exceeded the EAL and RSL. Add that concentrations of PFOA exceeded the MCL in RHP02 and NMW32 and that the concentration of PFHxS exceeded the MCL in NMW32.

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- k. Table 10-1, Results for Soil, Total PFAS Samples Collected in December 2022, Page 44** – November 2023 residential soil RSLs are listed in Table 10-1, but if May 2024 RSLs were listed, the maximum PFOS and PFOA concentrations would substantially exceed them (by 8-fold to 63-fold). EPA recommends that the most current RSLs be incorporated into the work plan.
- l. Table 10-2, Statistical Metrics for Comprehensive Set of Groundwater PFAS Samples Validated through December 2023, Page 46:**
 - i.** November 2023 tapwater RSLs are listed in Table 10-2, but if May 2024 RSLs were listed, the maximum PFOS and PFOA groundwater concentrations would substantially exceed them. EPA recommends that the most current RSLs be incorporated into the work plan.
 - ii.** The groundwater results presented in Table 10-2 are not comprehensive. These statistics are only from the weekly and monthly sampling conducted after the Adit 6 release. They do not include the RHS PFOS exceedances on Dec. 20 and 27, 2021, or the Sept 2023 one-time Baseline Sampling Event results. Please revise the title to, "Statistical Metrics of Validated Groundwater PFAS Samples Collected from December 2022 through December 2023 to investigate the Adit 6 release." Add a footnote stating that, PFAS samples collected during December 20 and 27, 2021 and September 2023 are not included in the statistical representation.
- m. Section 10.2.8.4, Previous Investigations at OWDF, Page 47:** The last sentence discusses the lack of records of AFFF use but does not discuss how the waste fluids that were disposed and/or burned in the oily waste pits may be sources of PFAS. It also doesn't discuss the plumbing shop, septic tank, and other historical operations in this area that may have released PFAS into the environment. Please add text specifying that waste disposed or burned at the OWDF, and military operations conducted in this area may have been sources of PFAS contamination.
- n. Section 10.4.1, PFAS Release Mechanism, Page 49:** Please add a clarifying statement at the beginning of this section. Most of the Navy's focus has been to investigate the release of AFFF at Adit 6. However, the Navy will expand its investigation as it uncovers other Red Hill PFAS sources.
- o. Section 10.4.1.1, PFAS and Environmental Media, Page 50:**
 - i.** The text states that only 11 PFAS currently have toxicity values for deriving regulatory screening criteria, but that number is 14 as of May 2024.
 - ii.** Although reference dose and other toxicity data currently may only be available for 14 PFAS, the availability of toxicity data should be periodically re-evaluated as new RSLs are published. In addition, it is expected that for

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PFAS that do not have sufficient toxicity data to quantify risks, they will be qualitatively assessed. Please update the Draft RI WP to state that the availability of toxicity data will be re-evaluated as new RSLs are published, and PFAS that do not have sufficient toxicity data to quantify risk will be qualitatively assessed.

- p. Section 10.4.2.1, Aqueous Film-Forming Foam and Per-and Polyfluoroalkyl Substances, Pages 50 and 51:**
- i.** The fluorocarbon tail is described as oleophobic, when in fact it is oleophilic. This should be corrected.
 - ii.** Based on the following excerpt from the report the locations of all former wastewater outfalls along Halawa Stream should be identified and the associated discharge areas characterized and potentially sampled:
"Historically, water was allowed to settle out of the former slop tank and was emptied into Halawa Stream; remaining waste was loaded into a truck for offsite disposal (Earl and Wright 1962). However, there has not been a known release of AFFF from the fire suppression system at Area A, prior to the November 2022 AFFF Adit 6 release."
 - iii.** The last paragraph of Section 10.4.2.1 indicates, and EPA concurs, leaching-to-groundwater is one of the principal PFAS transport pathways of concern. Screening soil data for this pathway is important for identifying sources of groundwater contamination and should be incorporated into the DQOs of the investigation. Navy should delineate to detection limits and then consider using EPA soil SSLs and/or HDOH soil EALs to understand risk and fate and transport.
- q. Section 10.4.3, Potential Receptors and Exposure Pathways, Pages 51 and Page 52, and Appendix A, Figure 8 - Human Health Exposure Pathway Evaluation, and Appendix A, Figure 9 Ecological Conceptual Site Model/Exposure Pathway Evaluation:**
- i.** Although Hunters are identified as potential receptors at the site (Figure 8), and game animals (such as pigs) are potential receptors for PFAS incidental ingestion and food web transfer (Figure 9), Hunter biouptake of PFAS is considered "Insignificant." This claim needs further justification, e.g., what is the reasonable maximum exposure (RME) of Hunters to PFAS based on their game consumption rates?
 - ii.** The second paragraph on PDF Page 58 (document Page 52) states that dermal exposure to groundwater is considered an insignificant pathway. However, the basal groundwater beneath the site is a drinking water source that could be used in the future. Please revise this section and the conceptual site model figure (Appendix A, Figure 8, Human Health Exposure Pathway Evaluation,

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PDF Page 167) to include dermal exposure to groundwater, as well as ingestion, for hypothetical future residents.

- iii. The third paragraph of document page 52 discussed perched water. While perched water isn't used for drinking water and direct exposure to in situ perched water isn't likely, isn't there potential for perched water to discharge to the stream and cause direct exposure, ingestion, and/or ecological risk? Please update the Draft RI WP CSMs with this potential exposure pathway.
- iv. The text of the last paragraph on Page 52 indicates: *"Receptors potentially exposed to PFAS through water sources from the Site are considered insignificant or incomplete for ecological receptors potentially found offsite at Halawa Stream."* However, based on historical operations, there is potential PFAS were a component of the wastes discharged to Halawa Stream. Please update the text and Figure 9 to identify this exposure pathway as complete.

6. Worksheet #11, Project Quality Objectives/Systematic Planning Process Statements, Pages 53 through 58:

- a. **Section 11.1, Step 1 - State the Problem:** Between the second and third sentence, please add, *"...former 200-gallon AFFF AST. Throughout the history of Red Hill, there may have been additional sources of PFAS contamination associated with the construction, operation, maintenance, and/or disposal practices at the facility. Soil and groundwater samples..."*
- b. **Section 11.2, Step 2 – Identify Study Goals:**
 - i. PSQ#1, 2 and 3 also apply to Area B.
 - ii. Please add a principal study question, "Have there been impacts to Halawa Stream surface water and sediments from Red Hill PFAS releases?" Update the remaining sections of WS #11 to address this new PSQ.
 - iii. PSQ#2 should also consider whether soil contamination represents a leaching risk and whether groundwater impacts as a result of previous releases have peaked.
 - iv. Please add a caveat at the end of this section that, as the Navy identifies additional Red Hill sources of PFAS, the principal study questions and other project quality objectives will be updated in QAPP addenda.
- c. **Section 11.3, Step 3 – Identify the Information Inputs to the Decision, :** The 2023 RSLs are cited; however, the most recent RSLs (May 2024) should be cited. Please revise the Draft RI WP to cite the most recent RSLs.

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- d. Section 11.5, Step 5 – Develop the Analytical Approach:** Please update this step to indicate that, in addition to no exceedances of PSLs, groundwater concentrations must show a stable or declining trend.
- e. Section 11.7, Step 7 – Optimize the Design:** During a series of meetings in July 2024, the Navy met with regulators to discuss additional requirements for groundwater sampling. Please incorporate the additional well locations and the objectives for those locations into the sampling design (**see enclosed table**).

Please also include sampling of all available OWDF well clusters and the RHS pre-chlorination point. After updating the DQOs and PSQs, please consider revising the locations of the Navy's proposed new wells to locations that will better meet project objectives.

7. Worksheet #13, Secondary Data Criteria and Limitations Table, Pages 61 and 62:

Include the remedial action completion report, "Red Hill Bulk Fuel Storage Facility, Adit 6 AFFF Release Report," dated November 2023.

8. Worksheet #14, Summary of Project Tasks, Pages 70 through 79:

- a. Section 14.5.6.2, Well Construction, Page 71:** If the sand pack is completed above the water table, the bentonite pellets may not sufficiently hydrate. Recommend adding PFAS-free potable water to hydrate the seal, preferably after each foot of bentonite pellets have been placed, until the entire seal has been placed and hydrated.
- b. Section 14.5.8, Well Development, Page 72:** This section acknowledges that groundwater is impacted by well development (i.e., groundwater is oxygenated, affecting dissolved oxygen [DO] and oxidation-reduction potential [ORP]), but does not specify how long an interval should be allowed between well development and groundwater sampling to allow the groundwater in the borehole, sand pack, and vicinity of the borehole to equilibrate with aquifer conditions. If sampling occurs prematurely, the samples may not be representative. At least 7 to 14 days, depending on the lithology, should elapse between well development and sampling in order to allow time for equilibration with the aquifer. Please revise the text to specify the interval between well development and sampling.
- c. Section 14.11, Investigation-Derived Waste Management and Disposal, Pages 78 and 79:** Section 14.11 states that if liquid IDW contains PFAS concentrations exceeding the EPA lifetime health advisory level, treatment will be required, but this criterion has been rescinded. EPA MCLs for six PFAS were finalized in June 2024, and these values should be used for screening IDW. Please revise Section 14.11 to specify comparison of IDW analyses results to the MCLs.

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9. Worksheet #17, Sampling Design and Rationale, Pages 93 through 100:

- a. Section 17.1 Sampling Design Overview** – The text describes four discrete sampling depths for subsurface soils: 2-3' bgs, 5-6' bgs, 11-12' bgs, and 17-18' bgs. These four subsurface soil sampling depths are repeated many times throughout Worksheet 17 (e.g., Sections 17.2.1 and 17.2.2). The rationale for these specific depths should be given in the Work Plan. It is not clear how these subsurface soil depths correspond to how human exposure to PFAS in subsurface soil will be evaluated (e.g., for construction workers). These depths also appear to be inconsistent with Section 11.3 (Identify the Information Inputs to the Decision), which states: “[*Primary decision inputs will include the following:*] PFAS concentrations in surface soil (0–0.5-foot bgs) and subsurface soil (0.5–18 feet bgs) samples collected from locations at Area A and Area B during the RI.” How will soil PFAS concentrations from 0.5–18' bgs be evaluated for primary decision making when there will not be any samples corresponding to that full depth interval?
- b. Section 17.2 Surface and Subsurface Soil Sampling, Page 93:** Given potential PFAS associations with petroleum contamination and the tendency to collect at fluid interfaces, soil intervals exhibiting petroleum contamination should also be targeted for PFAS analyses. In the field, if field observations identify these intervals, the field team should target them for sampling.
- c. Section 17.2.1, Area A, Page 94:** Sidewall multi-incremental confirmation samples were required in the SAP but were not collected from DU3 before the apron was capped. This remains a data gap and should be addressed in the Work Plan. Please also include additional samples to step out from existing release areas in Adit 6, and more adequately cover the sample areas.

10. Worksheet #18, Locations-Specific Sampling Methods/SOP Requirements Table, Pages 101 and 102:

- a. Page 101:** The number of samples specified for 2-2.5 feet (ft) below ground surface (bgs) at Apron Area Outside Adit 6 and Corner Apron is listed as two; however, three sampling locations are listed and the number of primary samples will be three. Please revise Worksheet #18 to list the correct number of samples for each location.
- b. Page 101:** The number of samples at Down-Sloping Areas North of Adit 6 are inconsistent with Worksheet #17. For example, Worksheet #18 lists 2 sampling locations; however, Section 17.2.1.5 (Surface and Subsurface Soil Sampling at the Down-Sloping Areas North of Adit 6) states 7 borings will be completed and “A surface soil sample (0–0.5 foot bgs) and discrete 3- to 6-inch subsurface soil samples are planned from within the 1-foot target depth intervals of 2–3, 5–6, 11–12, and 17–

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18 feet bgs.” Please revise Worksheet #18 to list the correct number of samples at the Down-Sloping Areas North of Adit 6.

- c. Page 101:** The number of samples at Surge Rock Drainage Area are inconsistent with Worksheet #17. For example, Section 17.2.1.6 (Surface Soil Sampling at the Surge Rock Drainage Area) states, “soil samples will be collected from within the 1-foot soil target depth intervals of 2–3, 5–6, 11–12, and 17–18 feet bgs;” however, there are only two intervals (2-2.5 and 4-5 ft bgs) listed and just 2 samples from the 2-2.5 ft bgs interval listed in Worksheet #18. Please revise Worksheet #18 to list the correct number of samples at the Surge Rock Drainage Area.
 - d. Page 102:** The number of samples at Downslope of Road are inconsistent with Worksheet #17. For example, Section 17.2.1.10 (Sediment and Surface Soil Sampling at the Downslope of Road) states, “Up to two sediment grab samples will be collected from the unpaved area downslope of the road, southwest of Bldg. 313. Additionally, up to two surface soil samples (0–0.5 foot bgs) will be collected from this area.” However, only one location is listed on the Worksheet. Please revise Worksheet #18 to resolve the discrepancy.
- 11. Worksheet #19, Field Sampling Requirements Table, Page 105:** EPA Method 1633 Sections 8.2.3 and 8.3.2 require that samples be protected from light, but this is not specified in the preservation requirements in Worksheet #19. Please revise Worksheet #19 to specify that samples must be protected from light.
- 12. Worksheet #21, Project Sampling SOP References Table, Pages 109 and 110:** The SOPs listed in Worksheet #21 that are not included in Appendix B should be included for reference. Specifically, all SOPs with reference number “N/A” and SOPs I-A-5, I-C-1, I-C-2, and I-E, are not included in the appendix. Additionally, two SOPs are included in Appendix B (I-B-2 and I-H) that are not included on Worksheet #21, although I-H is mentioned in Worksheet #14. Please revise the Draft RI WP to include all relevant field SOPs in Appendix B and Worksheet #21 and delete any that are not applicable.
- 13. Worksheet #22, Field Equipment Calibration, Maintenance, Testing, and Inspection, Pages 111 and 112:** Some equipment specified for use in the Draft WP/SAP are not included in Worksheet #22. For example, a gyroscopic alignment instrument or accelerometer is discussed in Section 14.5.3 and a pressure transducer is discussed in 14.5.4.3. Additionally, an extensive list of potentially necessary video logging equipment is listed in Section 14.5.2. Please revise Worksheet #22 to include all necessary field equipment.
- 14. Worksheet #27, Sample Custody Requirements, Section 27.3, Handling, Shipping, and Custody, Page 125:** Section 27.3 states that sample storage and disposal will be managed per Section 5.8 of *Department of Defense (DoD) and Department of Energy (DOE)*

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Consolidated Quality Systems Manual (QSM) for Environmental Laboratories, Version 5.4 (DoD and DOE 2021), but QSM Version 6.0 (2023) is cited elsewhere in the document. Please revise Section 27.3 to cite QSM Version 6.0.

- 15. Worksheet #37, Usability Assessment, Page 143:** In Worksheet #37, completeness is defined as the percentage of acceptable sample results compared to the total number of sample results; however, completeness should be calculated relative to the total number of planned results, to account for results that were not able to be obtained (e.g., sample breakage, inability to collect a sample, etc.). Please revise the RI WP to indicate completeness will be calculated based on the number of planned results.
- 16. Appendix A, Figures:** Previous comments included suggested revisions to several figures. Additional comments are provided below:
- a. Figure 6, Pictorial Conceptual Site Model – Area A, PDF Page 163:** The figure shows the perched groundwater as a layer on the model; however, the symbol used for the layer is omitted from the figure legend. The legend should define the layer used to illustrate the perched groundwater. Please revise Figure 6 legend to include and define the symbol (layer) used to illustrate the perched groundwater at Area A.
 - b. Figure 7, Pictorial Conceptual Site Model – Area B, PDF Page 165:**
 - i.** The figure shows the conceptual site model for Area B; however, perched groundwater is omitted. For example, Section 10.2.6 (Groundwater Hydrogeology) states perched groundwater is present west of Area B. Additionally, Figure 6 (Pictorial Conceptual Site Model – Area A) illustrates the perched groundwater at Area A. Figure 7 should depict the perched groundwater present near Area B. If possible, the location-specific depiction should be generated based on core hole and boring data collected at this site. Please revise Figure 7 to depict the perched groundwater near Area B.
 - ii.** Please include the locations of the temporary RHS drinking water treatment system and the more permanent RHS drinking water treatment system that should be installed in approximately 5 years.
 - iii.** Please include a label for Halawa Stream and describe its significance in exposure pathways and contaminant transport.
 - c. Figure 8, Human Health Exposure Pathway Evaluation, PDF Page 167, and Figure 9, Ecological Conceptual Site Model/Exposure Pathway Evaluation, PDF Page 169:** Evaluation of the CSMs is limited because Figures 8 and 9 identify the only release mechanism as AFFF from the Red Hill Fire Suppression System, likely only at Adit 6, and only the recent release. As the Navy identifies additional Red Hill AFFF sources, the CSM should be updated in QAPP addenda.

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d. Figure 10, Proposed Sampling Locations – Area A, PDF Page 171:

- i. The figure shows four surface soil/subsurface soil sample locations around the former aqueous film-forming foam (AFFF) aboveground storage tank (AST) and three locations down-slope; however, Section 17.2.1.5 states, “Seven borings will be drilled near the location of the former AFFF AST. Five borings will be placed around the concrete pad that held the AST. Two borings will be located down-slope and downgradient of the former AST.” Please revise the figure to resolve the discrepancy.
- ii. The figure shows seven subsurface soil sample locations around Bldg 313; however, Section 17.2.1.7 (Surface and Subsurface Soil Sampling at Bldg. 313 Pump House, Piping Area, and Former Slop Tank) states, “Twelve borings are proposed to be positioned around and outside of the concrete footprint of Bldg. 313.” Please revise the figure to resolve the discrepancy.

e. Figure 10, Proposed Sampling Locations – Area A, PDF Page 171: The figure shows one surface soil and one sediment sample location, respectively, southwest of Bldg. 313; however, Section 17.2.1.10 states, “Up to two sediment grab samples will be collected from the unpaved area downslope of the road, southwest of Bldg. 313. Additionally, up to two surface soil samples (0–0.5 foot bgs) will be collected from this area.” Please revise the figure to resolve the discrepancy.

f. Figure 11, Proposed Sampling Locations – Area B, PDF Page 173:

- i. Adit 3 and the area of known and suspected petroleum impacts associated with the November 2021 JP-5 release should be presented in Figure 11.
- ii. The Navy’s proposed monitoring well clusters don’t seem targeted to delineate the contamination identified during the September 2023 Baseline Sampling Event, or to further investigate risk of PFAS contamination at RHS. Please consider adding additional OWDF monitoring wells, including OWDF04/04A and OWDF01/01A, to the sampling design. Consider placing new wells west of RHP 06 and south of OWDF 04 and OWDF 01. Include NMW32.

17. Appendix B, SOP I-A-6, Section 3.1.2, CERCLA Hazardous Substances, PDF Page 182:

- a. Please consider changing the word "waste" in the last sentence of the first paragraph to "substances" or list the name of the table, "Table 302.4—List of Hazardous Substances and Reportable Quantities".
- b. This section discusses CERCLA hazardous substances but doesn't address PFAS. PFOS and PFOA were designated as CERCLA Hazardous substances on July 8, 2024

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(<https://www.federalregister.gov/d/2024-08547>). Please update this section with information about PFOS and PFOA and reference EPA's Interim Guidance on the Destruction and Disposal of Perfluoroalkyl and Polyfluoroalkyl Substances and Materials Containing Perfluoroalkyl and Polyfluoroalkyl Substances—Version 2 (2024).

18. Appendix D, Analytical Data Package Requirements, PDF Pages 399 through 402 -

Appendix D details the requirements of a “full” deliverable. For data packages requiring full validation, EPA recommends that standard traceability, standard preparation logs, and certificates of analysis be included.

19. Appendix G, References, PDF Page 419: Please add the following references:

- a. Glüge J, Scheringer M, Cousins IT, DeWitt JC, Goldenman G, Herzke D, Lohmann R, Ng CA, Trier X, Wang Z. 2020. An overview of the uses of per- and polyfluoroalkyl substances (PFAS). The Royal Society of Chemistry (RSC), Environmental Science Processes and Impacts. 22: 2345-2373.
- b. Barfoot K, McGrath A, Richards S, Shanoff T, Stonebridge J. 2022. PFAS and the Mining Industry: Understanding the Challenges. Proceedings of Mine Water Solutions. <http://www.mineconferences.com/bluepixeldesign/wp-content/uploads/2022/07/47.-Krista-Barfoot-PFAS-and-the-Mining-Industry-Understanding-the-Challenges-Final.pdf>
- c. Gaines LGT. Historical and current usage of per- and polyfluoroalkyl substances (PFAS): a literature review. Am J Ind Med. 2022;1-26. doi:10.1002/ajim.23362
- d. State Water Resources Control Board. 2021. Water Code Sections 13267 and 13383 Order for the Determination of the Presence of Per- and Polyfluoroalkyl Substances at Bulk Fuel Storage Terminals and Refineries. Order WQ 2021-0006-DWQ. March 12. https://www.waterboards.ca.gov/pfas/docs/order_wq2021-0006-dwq_pfas.pdf
- e. EPA. 2024. Designation of Perfluorooctanoic Acid (PFOA) and Perfluorooctanesulfonic Acid (PFOS) as CERCLA Hazardous Substances. Document Number: 2024-08547. Federal Register, Vol. 89, No. 90. RIN 2050-AH09. May 8. <https://www.federalregister.gov/documents/2024/05/08/2024-08547>.
- f. EPA. 2024. Interim Guidance on the Destruction and Disposal of Perfluoroalkyl and Polyfluoroalkyl Substances and Materials Containing Perfluoroalkyl and Polyfluoroalkyl Substances—Version 2. April 8. <https://www.epa.gov/system/files/documents/2024-04/2024-interim-guidance-on-pfas-destruction-and-disposal.pdf>.

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- g.** Navy. 2023. Red Hill Bulk Fuel Storage Facility, Adit 6 AFFF Release Report. November. (RACR)
- h.** Navy. 2023. Per- and Polyfluoroalkyl Substances Delineation Baseline Groundwater Wells Investigation Report, Red Hill Bulk Fuel Storage Facility, Joint Base Pearl Harbor-Hickam, O‘ahu, HI. November 27.