

Response to Comments on Red Hill Shaft Flow Optimization Work Plan

Navy Submission: 27 October 2022

Regulator Comments: 15 December 2022

- 1) **EPA/DOH: Sample Collection Upon Red Hill Shaft (RHS) Pump Start Up:** A water sample from the pump discharge within the first five to ten minutes after restarting the pumping after each non-pumping interval should be collected. This is intended to evaluate what impact periods of non-pumping/"stagnation" will have on the dissolved contaminant levels for water in the infiltration gallery (and surrounding saturated rock). The ultimate purpose of the data will be to indicate how much impact residual fuel in the formation will likely have on "normal"/intermittent pumping of RHS when it comes back online.

The sample should be collected from the discharge pipeline between the well pump and the granular activated carbon (GAC) treatment system and analyzed for the same list of analytes required by the November 2021 Notice of Interest (NOI) groundwater sampling. This sample is in addition to any sampling required under the Red Hill Bulk Fuel Storage Facility's (the Facility's) National Pollutant Discharge Elimination System permit.

Navy Response: This comment is incorporated into the revised Flow Optimization Work Plan, Section 4.7. Sampling will be conducted from between the discharge pipeline and the GAC system after each scheduled outage of the GAC system during the flow optimization trial periods. The sample will be analyzed for the same list of analytes performed during NOI sampling at the time of the sample's collection.

- 2) **Pump Control and Management:** Study trials #2 and #3 reduce the average pumping rate by starting and stopping the well pump one or more times per week. Trial #2 limits pumping to Monday through Friday. Trial #3 limits pumping to Monday, Tuesday, and Friday. Does the Navy plan to continue to start and stop the well pump if, at the conclusion of the study, the EPA and DOH, collectively the "Regulatory Agencies," agree to a reduction in the average pumping rate? If so, please explain how the pump and motors will be impacted by the frequent starts and stops, if there is contingency planning to pull the equipment and replace as necessary, and if the initial pump startup pressure will be problematic for the GAC materials within the train with the proposed intermittent start and stops over a period of time.

Navy Response: Yes, the Navy will continue the start and stop of the RHS well pump at the end of the survey if the Regulatory Agencies agree to a reduction in the average pump rate. The Navy intends to utilize the data collected during this flow optimization trial to inform future sustained operation in reduced pumping conditions. The frequent starts and stops would return the pumps back to their intended function of being on and off for periods of time, as the pumps had operated at Red Hill Shaft (and our other water supply locations) prior to the November 2021 release. These start/stop periods also allow for opportunity to balance the workload among all capable pumps in the Red Hill Pump Station, vice having the work burden solely placed on one of the pumps.

The GAC vessels are designed for 125 pounds per square inch (psi). Through the hourly pressure readings during operation (and specific periods after pump restart), pressures of 25-30 psi have been observed. These real-world observed conditions, combined with the

initial pressure test of 80 psi sustained for two hours in January 2022, do not lead to an assessment that frequent start/stop scenarios will adversely affect the GAC system. Shutdowns and changing treatment trains are managed by slowly opening valves to minimize hydraulic hammer effects and associated pressure spikes.

- 3) **Data Management:** To support near real-time interpretation and optimization of collaboratively collected data, the Navy shall immediately upload the draft field data as downloaded from data loggers into the Environmental Data Management System (EDMS). Immediate or near real-time distribution of the data to the Regulatory Agencies shall be done in electronic format consistent with the NOI submittals. Electronic data shall be uploaded along with the field notes documenting transducer disturbance and water level corrections with respective times and dates.

Navy Response: The Navy has incorporated immediate or near real-time distribution of data to the Regulatory Agencies into the work plan, section 5.0. The Navy will provide data as soon as practical after its collection, and upload into EDMS for viewing by the Regulatory Agencies.

- 4) **Vertical/Down-dip Flows to RHS:** Although contamination may reside primarily at the top of the aquifer (water table), the extent of hydraulic containment and capture is a 3D volume, and we are lacking complete understanding of the vertical component at this time. Hydraulic, geologic, and water quality lines of evidence indicate there may be a significant contribution to RHS from vertical/down-dip flows. This would need to be factored into the conceptual site model and may be important for holistic capture zone analyses.

Navy Response: The Navy will continue to utilize the capabilities of its existing monitoring well network, as well as the future monitoring wells that the Navy is continuing to install. Specifically, RHP04B and RHP04C were located and designed to allow for data collection beyond the water table's surface that could be utilized in the future to understand holistic analyses.

- 5) **Synoptic Survey Report of Findings Analysis:** In the planned "Synoptic Survey Report of Findings" (Section 5.0 Deliverables), the Regulatory Agencies request an analysis of the benefits and feasibility of a dye tracer study, including a discussion of possible groundwater injection and monitoring locations.

Navy Response: Separate from the Red Hill Shaft Flow Optimization Work Plan, the Navy continues to investigate and considerate the benefits and feasibility of a dye tracer study. The Navy has currently requested a future special purpose meeting on 01 February 2023 to discuss in-well testing methods to better inform models and flow. Since this is along similar ideas of utilizing our network to understand the groundwater flow, a future special purpose meeting specific to the dye tracer study will be considered.

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- 6) **RHS Hydraulic Containment and Capture (Target Capture Zone):** The Work Plan proposed a Target Capture Zone (Figure 6) that appears to be defined by several of the newly installed or planned Red Hill plume delineation or perimeter wells also known as “P wells” and well OWDFMW04A. The region of contamination to be “captured” typically encompasses the entire volume of dissolved groundwater impacted exceeding a cleanup level. However, pumping and GAC treatment at RHS is part of an emergency response primarily meant to address the groundwater impacts to RHS from the November 20, 2021 Adit 3 JP-5 fuel product release. The Regulatory Agencies emphasize that the “target capture zone” (Figure 6) focuses on the remaining product and dissolved constituents from the release area below Adit 3 and does not show capture from the tank farm or the entire region of contamination that may need remediation or capture in the future.

Navy Response: The Navy acknowledges the Regulatory Agencies’ comments regarding the focus of “target capture zone” in this work plan. The GAC is, as designed, providing a means to create the capture zone in response to the November 2021 fuel release at Adit 3 and does not serve nor operate, without future analysis of its capabilities and design, to address future remediation or capture requirements.

- 7) **No comment provided by the Regulatory Agencies.**

- 8) **No comment provided by the Regulatory Agencies.**

- 9) **Red Hill Shaft Recovery and Monitoring Plan (RHSRMP) GAC Performance**

Metric: The RHSRMP GAC performance metric states, “[t]he measure of success for the capture zone will be [1] efficacy in recovery of fuel in the Red Hill Shaft, and [2] prevention of migration of fuel and related contaminants away from the well.” A “target capture zone” is typically defined within the aquifer itself, rather than within the well or tunnel that is being pumped and does not necessarily need to be defined to remove fuel product impacts/prevent migration from the RHS tunnel by pumping.

Navy Response: The Navy intends to utilize the GAC, and this flow optimization trial, to reduce water usage while continuing to maintain the “target capture zone” in the vicinity of the November 2021 fuel release near Adit 3. Any future operating conditions for the GAC based on the results of this trial will remain in compliance with the Red Hill Shaft Recovery and Monitoring Plan and the DOH Emergency Order dated May 06, 2022.

- 10) **Heat Map Methodology:** The Work Plan includes figures (Figure 4 and Appendix A “Heat Maps”) depicting the measured concentrations and interpreted extent of TPH-d, TPH-o, 1-methylnaphthalent, 2-methylnaphthalene, naphthalene, and xylenes in groundwater. The methods used to interpolate concentrations between well locations and depict the extent of groundwater contamination may significantly underestimate the extent of contamination. Additionally, the Regulatory Agencies suggest using the 266 micrograms per liter Environmental Action Level (EAL) for the TPH results with footers

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indicating the date of regulatory change and a distinct color change so that values above/below the site-specific EAL are shown clearly.

Navy Response: The Navy continues to install new monitoring wells through the area surrounding the Red Hill Bulk Fuel Storage Facility to gain greater understanding of the local groundwater conditions. The Navy has observed, based on its weekly groundwater sampling, a clear reduction and contraction of any contaminant plume back towards historical norms.

The Navy will continue to use the applicable groundwater EALs for TPH-d and TPH-o in the heat maps, along with continuing to show the applicable dashed line to represent the area that is above the EAL. Since drinking water and groundwater are different, utilization of the suggested drinking water EALs for groundwater would potentially create confusion and not a standard representation for these groundwater conditions observed.

The Navy continues to utilize the 266 micrograms per liter Environmental Action Level for all drinking water testing being performed at individual residences, medical facilities and schools, as a part of the two-year drinking water long-term monitoring plan.

- 11) **Groundwater Conditions, Appendix A:** The Regulatory Agencies generally do not agree with the interpretation of the areal extent of EAL exceedances in groundwater depicted in Appendix A “Heat Maps.” For example, the presentation of TPH-o results leaves out important groundwater data for RHS without explanation. In the work plan, the earliest map showing TPH-o results in groundwater is from Quarter 3, 2021 Long-term Monitoring data, and the heatmap (PDF page 80) states that “[p]rior to the November 2021 release, TPH-o was typically not detected at elevated concentrations.” However, following the May 2021 release from the Facility near tanks 18 and 20, there were TPH-o EAL exceedances at RHS (pre-chlorination samples) starting in August 2021 (the Regulatory Agencies were not notified of this data until October 2021). From July to September 2021, there were twelve consecutive TPH-o detections at RHS (pre-chlorination sampling location). However, none of the May 6th Release and Nov 20th Release Notice of Interests’ Groundwater Sampling Plan’s pre chlorination weekly sampling results were integrated, analyzed, and depicted in the Appendix A “Heat Maps.” The TPH-o detections at RHS (RHMW2254-01), along with detections of TPH-o in the groundwater well network following the May 2021 release indicate that a contiguous groundwater plume encompassing/extending from the Facility tanks to RHS (RHMW2254-01) may be present.

Navy Response: The Navy utilizes the Red Hill Shaft (RHMW2254-01) for its assessment of the groundwater conditions in the respective area. Pre-chlorination and post-chlorination sampling are performed for drinking water, which is why it is eliminated from the groundwater heat maps.

The Navy understands that TPH-o was observed in consecutive pre-chlorination sampling events from July to September 2021. Due to the increased NOI sampling at the time, which increased the number of samples taken and the backlog of mainland United States certified laboratories, the Navy did not receive validated results for the pre-chlorination

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samples back until October 2021, at which time they were provided to the Regulatory Agencies.

The Navy continues to install monitoring wells in the area to gain a greater understanding of the groundwater conditions in the vicinity of the Red Hill Bulk Fuel Storage Facility.

- 12) **Return to RHSRMP Pumping Rate:** Unless the Regulatory Agencies indicate otherwise in writing, after completion of the Work Plan study, pumping and GAC treatment at RHS should resume at approximately the current average rate of 4.2 million gallons per day.

Navy Response: The Navy agrees to return the pumping and GAC treatment at RHS to the “always on” condition in place since the GAC system was installed. This has been incorporated into the work plan, Section 4.1 and Table 4. The data collected by the Navy during this flow optimization trial period will be utilized to support any proposed permanent reductions in water usage from Red Hill Shaft. This work plan’s data, which will be provided to the Regulatory Agencies, should be given reasonable time to be reviewed before performing GAC treatment at a level less than the current average rate of 4.2 million gallons per day, which represents “always on” operation.

- 13) **In Letter comment to Water Resources Impact Offsets:** We also note that there is no discussion of proposed water reuse plans, therefore, please provide a status of the deliverables required under Section 6, Water Resources Impact Offsets, of the RHSRMP.

Navy Response: The Navy awarded a contract to CAPE Environmental Management, Inc in January 2022 to conduct an evaluation of potential water use courses of action (COAs) for effluent from the Red Hill Shaft GAC system.

The courses of action reviewed focused on various iterations of potential reuse receivers and mechanisms of water conveyance. These COAs considered public/private entity and off-base DoD Use of Effluent Water; use by DoD users; Aquifer Recharge options; Partnership with Honolulu Board of Water Supply (BWS) to use existing non-potable pipelines; and combinations of these approaches with aquifer recharge, existing non-potable infrastructure and/or construction of new piping.

Based on the assessments provided, none of these interim COAs provided a viable solution to the water re-use problem in timelines quicker than a Military Construction project effort for a permanent Water Treatment Facility at Red Hill Shaft could provide. The Navy continues to work towards this permanent solution in an expeditious manner and continues to look at ways to reduce water usage, similar to the flow optimization work plan’s intent of performing the capture zone treatment with reduced water usage.

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