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**Re: Regulatory Agencies' comments on Derivative Deliverables "Existing Data Summary and Evaluation Report for Groundwater Flow and Contaminant Fate and Transport Modeling, Red Hill Bulk Fuel Storage Facility" dated March 5, 2017 and "Data Gap Analysis Report, Investigation and Remediation of Releases and Groundwater Protection and Evaluation, Red Hill Bulk Fuel Storage Facility" dated April 25, 2017.**

Dear Mr. Manfredi:

The U.S. Environmental Protection Agency ("EPA") and Hawaii Department of Health ("DOH"), collectively the "Regulatory Agencies", have reviewed the *Existing Data Summary and Evaluation Report for Groundwater Flow and Contaminant Fate and Transport Modeling, Red Hill Bulk Fuel Storage Facility"* (Existing Data Summary Report) dated March 5, 2017 *and "Data Gap Analysis Report, Investigation and Remediation of Releases and Groundwater Protection and Evaluation, Red Hill Bulk Fuel Storage Facility"* (Data Gap Analysis Report) dated April 25, 2017. These two documents are not deliverables explicitly required under the Red Hill Administrative Order on Consent (AOC) Statement of Work (SOW) and are not subject to approval. However, they are necessary to ensure that the AOC SOW deliverables can obtain Regulatory Agency approval. The Regulatory Agencies have thoroughly reviewed these documents and have determined that the Navy continues to demonstrate insufficient understanding of the expertise and level of effort necessary to develop technically defensible environmental assessment and modeling deliverables required by the AOC.

We have repeatedly informed the Navy that work performed under Sections 6 & 7 of the AOC is critical for evaluating the overall risk the Red Hill Facility poses to Oahu's groundwater resources. We continue to encourage the Navy to perform an investigation that can withstand critical scientific scrutiny. The regulatory agencies anticipate significant scrutiny on the Navy's proposal for tank upgrades, and we believe that defensible work under 6 & 7 along with other AOC sections will need to be used to demonstrate the basis for the Navy's proposal.

Based upon the Regulatory Agencies' experience working on other similar large scale environmental projects with significant stakeholder and public interest, the Navy does not appear to have the appropriate personnel directing this work. The Navy has spent almost two years on the environmental investigation and modeling aspects of the Red Hill AOC, yet little additional information about environmental conditions in the area has been collected. Per the recently submitted Existing Data Summary and Data Gap Analysis Reports, much of the analysis the Navy proposes to implement is postponed until the Navy gathers additional data. The Navy continues to fail to implement an effective iterative approach to data collection and analysis that is typical of large groundwater investigation and modeling projects. This is resulting in significant delays generating preliminary analyses needed to efficiently guide the development of a comprehensive Conceptual Site Model (CSM) and perform timely and efficient data collection activities.

For example, there are abundant data currently available and easily obtainable that the Navy should have already collected and analyzed. This data includes, but is not limited to, two detailed pumping tests, long-term monitoring of water levels on-site and in non-Navy wells within the study area, and measurements of water quality parameters within the study area. Although uncertainty is often an inherent characteristic of groundwater investigations, skilled and experienced groundwater scientists can develop appropriate and technically defensible ways to deal with the uncertainty. The Navy should perform an iterative investigation that concurrently investigates and analyses existing and new field data to yield a better understanding of environmental conditions around the facility.

In our September 15, 2016 letter disapproving the Navy's initial Work Plan/Scope of Work for Sections 6 & 7 of the AOC SOW, we provided numerous comments supporting our disapproval, as well as extensive guidance on the development of a defensible conceptual site model (CSM), groundwater flow model and contaminant fate and transport model. In response, the Navy developed an approvable Scope of Work for the Section 6 & 7 tasks; however, the Navy has not satisfactorily executed those tasks.

In that September 2016 letter, we stated that "[t]he Work Plan needs to include a deliverable that adequately describes the existing data available to be used for the modeling effort and assesses the adequacy of the data to achieve the objectives of the AOC. **The Navy and DLA should compile <u>all</u> existing data**, including but not limited to groundwater chemistry data, water table elevation data, precipitation data, groundwater production data, aquifer test data, boring logs, tank barrel logs, and other relevant data into a standalone deliverable for the Regulatory Agencies' review and approval. This document should not only present the existing data, but assess the quality and limitations of the data for the purposes of satisfying the objectives of the AOC."

The March 5, 2017 Existing Data Summary Report did not include all existing data nor did it fully assess the quality and limitations of the data. While it is apparent that a significant amount of effort went into compiling and reviewing the data in the report, there were significant omissions. For example, there are multiple statements regarding the inability to obtain U.S. Geological Survey (USGS) data. Much of the cited USGS data can be downloaded from USGS

publications or data websites. The enclosure to this letter contains additional comments on the Existing Data Summary Report.

The April 25, 2017 Data Gap Analysis Report also did not meet our expectations. The Navy and the Regulatory Agencies have had numerous discussions regarding data collection to improve our understanding of groundwater flow direction and contaminant transport in the area surrounding the Red Hill Facility. However, there appears to be a basic misunderstanding about the purpose of this report. The Regulatory Agencies believe a data gap refers to relevant environmental data which does not currently exist and must obtained through an investigative process. Yet the majority of the data gaps identified by the Navy do not represent actual data gaps in accordance with this common usage. In many cases the data gaps identified in this report are existing data that have not yet been compiled by the Navy. In these cases, the Navy's data gap merely represents a deficiency in the Existing Data Summary Report. In other cases, data gaps represent scopes of work that are expected to be performed as part of the modeling effort, or the output of the model itself. In some cases, data gaps are written so broadly that the Regulatory Agencies believe a definable course of action to rectify the data gap will be difficult to develop.

Our primary concern is that the Data Gap Analysis Report presents little if any insight into the Navy's interpretation of the existing data and the perceived deficiencies which must be rectified to produce a defensible Conceptual Site Model (CSM). Without a clear understanding of these critical deficiencies, it is unlikely that the Navy will develop a definitive strategy for addressing these actual data gaps. The enclosure to this letter contains additional comments on the Data Gap Analysis Report.

The work to be performed under sections 6 & 7 of the AOC will inform many of our decisions for other aspects of the AOC. If the Navy is unable to provide a defensible demonstration that contaminant migration due to groundwater flow will not impact drinking water wells, the appropriate response to the January 2014 fuel release and any potential future release will likely lead to the conclusion that the more stringent and protective tank upgrade alternatives are appropriate.

The Regulatory Agencies are including some specific comments in an attachment to this letter. These comments are meant to provide further examples of issues with the two reports that are the subject of this letter, but these comments on their own are relatively minor compared to the overarching concerns we are expressing in this letter.

We look forward to discussing these issues further during the in-person meetings the week of June 19, 2017. Please have your staff contact us if you have any questions or would like to discuss our concerns.

Sincerely,

Steven Linder for

Bob Pallarino
EPA Red Hill Project Coordinator

Steven Chang, P.E.
DOH Red Hill Project Coordinator

Enclosure

cc: Captain Richard D. Hayes III (via email)
John Montgomery, Navy (via email)

## Comments on Existing Data Summary Report

**Comment #1, General Comment on Regional Groundwater Flow**

Synoptic water level measurements made by USGS from 2002-2012 do not appear to be fully represented within the Existing Data Summary Report. These data can be accessed at:

https://hi.water.usgs.gov/studies/synoptic/pearl/

This data is critical because the synoptic regional groundwater maps do not support the hypothesis that groundwater does not flow from Red Hill toward Halawa Shaft.

Additionally, the Navy data summary should consider the findings presented in:

> The description on page 19 Mink, J., 1980. State of the relationship between the Groundwater Resources of Southern Oahu. Published Board of Water Supply Manuscript Report, Honolulu and Pearl Harbor Aquifers and , Hawaii.

Figure 3 on Page 38 of this document depicts groundwater flow direction from Red Hill toward Halawa Shaft.

**Comment #2: General Comment on Data Presentations**

The Excel data tables included in the submittal do not adequately and completely depict the data in a manner that will allow for effective evaluation and presentation of the dataset. For example, the data presented does not include locational data in the tables. The regulatory agencies suggest that the Navy manage all data in a relational database, and provide this database to the regulatory agencies for our independent review and evaluation.

**Comment #3: Page 1-2, Section 1.1 Physical Boundaries of the Study, Lines 17 – 39**

Data collection and summary needs to include the entire modeling domain. Therefore, the Regulatory Agencies suggest that the study area boundary be defined as the extend of the model domain boundaries.

The description of the modeling domain boundary in this section references Figure 2 includes two modeling boundaries; the regional modeling boundaries and the local modeling boundaries. The Regulatory Agencies believe that the study area boundaries should match the local modeling domain boundaries as depicted in Figure 2. As stated in the study area boundary description, this is the area "where the collection of physical (e.g., geologic data, water 21 level data) and chemical data will be focused". One of the critical questions that the AOC process is meant to answer is "What risk do the operations at the Red Hill Bulk Fuel Storage Facility pose to area drinking water sources?" Answering this question will require properly characterizing the nature of the connectivity between the Honolulu and Pearl Harbor Aquifer Sectors.

**Comment # 3: Page 2-1, Table 2-1, 2.1.1 Geologic Data**

The Navy provides an extensive set of boring logs as an attachment to this document, however the information is not presented in a usable fashion nor does it seem to be complete, for example the boring logs from RHMW02 were not included but are available.

To effectively utilize the boring log information, the regulatory agencies suggest that the Navy utilize specialized software designed to allow for spatial visualization of boring logs to allow for effective geologic interpretation in three dimensions.

However, many of boring logs included are for wells or borings that are 20 feet or less in depth. The Navy should consider omitting these from their database and spatial interpretation due to their limited utility.

**Comment #4: Page 2-2, Table 2-1, 2.1.3, Groundwater Characteristics**

The report fails to present data that is readily available such as pump rates over time, and therefore also fails to describe the limitations of this data. The Navy correctly states that a high degree of accuracy and precision is needed to define the hydraulic gradients in the area but does not present existing data such as groundwater elevation measurements over the entire model domain, and does not assess its utility and limitations relative to the modeling goals. For example, top of casing survey accuracy is an important factor relative to the utility of water table elevation data, but the report fails to characterize this data and its accuracy for the wells within the model domain area.

**Comment #5, General Comment on data availability**

Throughout this document the Navy indicates that certain data is unavailable, either because they are unaware of its existence or due to difficulties in accessing the data. The Navy should work more closely with organizations such as the USGS and the Hawaii Department of Land and Natural Resources to research what data is available and to access such data. The Regulatory Agencies are aware of much more existing data that is available from these organizations. Additionally, some data that the Navy states is unavailable is included in previous Red Hill Investigation Reports written by the Navy.

**Comment #6, General Comment on Figures included in Report**

The Navy should review the figures included in this report for accuracy, especially those that include groundwater monitoring and drinking water supply wells (Figures 16, 17, 19 and 20). Many of the wells are mislabeled and some wells are not included.

**Comment #7: Page 2-4, Table 2-1, 2.3.3 Chemical Data and Page 3-8, Section 3.2, Chemical Data, Lines 1-44**

A limitation of the data that should be noted is that the use of improper sampling techniques also affected the validity of chemistry results from OWDFMW1 and HDMW2253-03 from October 2010 through January 2016.

**Comment #8: Page 2-17, Section 2.1.2.2 Site Hydrogeology, Lines 31-36**

The Regulatory Agencies contend that the statement, "The infiltration gallery intercepts most of the water that would be affected by releases for the facility." is not supported by the existing dataset and analysis. The data summary report should present factual data, and should not include opinions.

**Comment #9: Page 2-18, Section 2.1.2.4 Hydraulic Properties of Hydrogeologic Units, lines 29-32**

This section describes three primary hydrogeologic units: Caprock, Valley Fill, and Basalt. Depending upon the publication and author, the term Valley Fill has been loosely used to refer to alluvium and saprolite, which are separate hydrogeologic units. It goes on to state "The valley fill deposits are underlain by weathered basalt (saprolite) of low permeability that impedes groundwater flow." The Regulatory Agencies suggest that the Navy define "valley fill" more precisely by breaking it up into "Alluvium" and "Saprolite". Ultimately, the hydrogeologic properties of alluvium will probably not be used in the model (since it lies above the groundwater table), however the saprolite will. For modeling purposes, it is important to ensure that the hydrogeologic properties of saprolite are not commingled with the properties of alluvium. Further work is necessary to better refine and define model layers. We suggest this effort include consultation with USGS, DLNR and BWS.

**Comment #10: Page 3-4, Section 3.1.3, Hydrogeologic Features in the Groundwater Flow Modeling Area, Lines 8 – 16**

While in theory the storm water and process water runoff could influence groundwater flow, there is nothing currently included to describe available data to test this hypothesis.

**Comment #11: Page 4-9, Section 4, References**

Takasaki and Mink (1985); "Evaluation of Major Dike Impounded Ground-Water Reservoirs, Oahu, Hawaii" USGS Water Paper 2217; should be included in the list of referenced reports.

## Comments on Data Gap Analysis Report

Overall, the report does not effectively present some of the critical data gaps the Regulatory Agencies believe currently exists. Some examples where these critical gaps may easily be identified by describing the data needed by conducting the following assessment:

- Data needed to adequately understand lateral flow direction between potential sources and receptors.
- Data needed to adequately evaluate rate of flow between sources and receptors.
- Data needed to adequately understand existing contaminant distribution between sources and receptors.
- Data needed to adequately understand of preferential flow pathways.
- Data needed to adequately evaluate attenuation rates.
- Data needed to adequately understand vadose zone NAPL transport pathways.
- Data needed to adequately understand NAPL distribution in vadose zone.
- Data needed to adequately assess vertical gradients.
- Data needed to adequately assess influence of pumping centers.
- Data needed to adequately assess the fill in the valleys influence on groundwater flow and contaminant transport.

**Comment #1: Both the Existing Data Summary Report and the Data Gap Analysis Report fail to include easily acquired data.**

There is much data that are readily available and that should have been included in the Existing Data Summary Report but are instead listed as data gaps. Some examples include:

1. Current and historical water level data available from the Hawaii Department of Land and Natural Resources Commission on Water Resources Management (CWRM);
2. Well construction and boring information also available from CWRM;
3. Regional synoptic water level data can be derived from the 2006 and 2015 aquifer tests;
4. Boring logs from South Hālawa Valley and other non-Facility wells (e.g. well borings at Tripler Army Medical Center) and data from existing USGS studies;

5. Chemical composition of JP-8 fuel stored at the Facility;
6. The primary petroleum compounds in TPH-d detected in RHMW02. This data has been collected routinely for many years;
7. Permitted flow rates for the Pearl Harbor and Honolulu Aquifers that are readily available from CWRM;
8. Solubility limits of the principal compounds in TPH-d, naphthalene, and other COPCs; these data are readily available from many published sources.

**Comment #2: The Navy incorrectly describes data from future work to be performed as data gaps.**

As discussed in the cover letter to these comments, a data gap refers to relevant environmental data which does not currently exist and must obtained through an investigative process. Some examples of future work that are not considered data gaps are:

1. Future groundwater level data
2. Preparing potentiometric maps
3. Identification of [sub]surface geophysical methods

**Comment #3: The Data Gap Analysis implies that investigative work is necessary to obtain data but does not discuss any plans to collect such data.**

For example, inferences are made to characterizing stream bed leakage and focused infiltration at the rock quarry. If these processes are to be considered, then approaches need to be developed to test how these processes will affect the water table elevation and more importantly the direction of groundwater flow.

**Comment #4: Page 14 of 44, Section 2.2 Data Needs for the Numerical Groundwater Model, Lines 28-30**

It is not necessary for the Conceptual Site Model (CSM) and numerical modeling process to be done sequentially. There are sufficient quality data available to start the modeling. In fact, if done in parallel, the numerical model can inform the CSM and help guide field activities.

**Comment #5, Page 32 of 44, Table 4-1 Summary of Data Gaps and Data Acquisition Plan**

This table states that data derived from boring logs from South Halawa Valley and other non-facility wells can be used to help estimate the valley fill thickness for the detailed CSM. This may be overstating the value of the geotech borings. Most of these borings do not extend to the water table. If it is the Navy's intention to use these the data to estimate

the thickness of the valley fill rather than elevation of the valley fill saprolite sequence, then the geotech boring data would have some value even if the borings do not extend to the water table.

**Comment #7, Page 40 of 44, Table 5-1 Summary of Analysis and Results**

Regarding the portion of the table which addresses data gaps for modeling COPCs in groundwater, there are a significant number of variables used in developing petroleum hydrocarbon concentration data trends. Some of the variables are rate coefficients associated with natural attenuation. Others are physical factors such as variation in recharge. Using data trends to derive first order decay coefficients is not likely sufficient to establish degradation rates.