

BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
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September 28, 2018

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Mr. Omer Shalev
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And

Ms. Roxanne Kwan
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Department of Health
Solid and Hazardous Waste Branch
2827 Waimano Home Road
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Dear Mr. Shalev and Ms. Kwan:

Subject: Board of Water Supply (BWS) Comments on the Red Hill Administrative Order on Consent (AOC) Statement of Work (SOW) Sections 6 and 7 Groundwater Modeling Working Group Meeting No. 13 held August 16, 2018

The Honolulu Board of Water Supply (BWS) attended the 13th groundwater modeling working group (GMMWG) meeting on August 16, 2018 in the roles of stakeholder and subject matter expert (SME). Based on the presentation materials and discussion by participants we offer the comments below.

General Comments

During the August 16, 2018 GMMWG meeting, the Environmental Protection Agency (EPA) and the Hawaii Department of Health (DOH) contractors identified significant concerns and short-comings concerning the Navy's interim groundwater flow model. EPA and DOH contractors stated that the interim groundwater flow model and its results are not "believable" because of the large mismatches between the measured and the simulated hydraulic gradients in the area of the Navy's groundwater pumping well Red Hill Shaft. Dr. Delwyn Oki of the United States Geological Survey (USGS) agreed with these particular concerns from the Regulatory Agencies' contractors. In addition to the concerns with the mismatches between the observed and simulated hydraulic gradients,

EPA and DOH shared nine other concerns with the USGS, the Navy, and the BWS. Many of EPA's and DOH's concerns have been previously identified by BWS in correspondence with the Navy (Lau, 2017a, 2017b, 2017c, 2017d, 2017e, 2018a, 2018b, 2018c, 2018d). The discussions of concerns by DOH's and EPA's consultants support the BWS position that the interim groundwater flow model and its results are not adequate for assessing the risk from the Red Hill Bulk Fuel Storage Facility (RHBFSF) to our drinking water supply.

BWS understood the Navy contractors to say that the final groundwater flow modeling will be completed in October 2018, in order to prepare the written report in time for the December 2018 AOC deadline. Given the interim model's numerous inadequacies identified by SMEs, the EPA, and DOH, it is unreasonable to expect that the amount of time available is sufficient to rectify the inadequacies before the December 2018 deadline. Consequently, BWS is very concerned that the resulting final groundwater flow model, like the interim groundwater flow model, will not be adequate to evaluate the risks to our water supply wells from contaminant releases from the RHBFSF. The BWS asks Regulatory Agencies to give the Navy more time to properly address all key interim groundwater flow model concerns in writing before submitting the final groundwater flow model.

Specific Comments to Navy and EPA/DOH Slide Presentations

1. EPA and DOH contractors presented 10 major concerns to the Navy and their contractors during the meeting. Navy committed to consider which of the 10 major concerns they could address and still meet their December 2018 deadline. The Navy did not commit to incorporating or changing the interim groundwater flow model to address any of these 10 major concerns or any of the BWS's previously expressed concerns. Given this, the most likely outcome is that the final groundwater flow model will still not be adequate and contain significant deficiencies upon submittal in December 2018. AOC Parties should consider changing the deadline to ensure that the final model produces results that the SMEs consider as representative of the existing groundwater flow system.
2. EPA and DOH SMEs analyzed the synoptic water level data from 2017 and 2018 to determine the estimate of the groundwater gradient between each pair of monitoring wells for every 10-minute period with measurements (DOH-EPA comment number 4). They also calculated the frequency of occurrence of those gradients for times when Red Hill Shaft was pumping and times when it was not. They then compared what the observed water level gradients to those predicted by the interim model and identified that very large differences between observed and modeled gradients were present. These findings corroborate recent BWS communicated concerns about the significant discrepancies between observed groundwater levels and those predicted by the interim model (Lau, 2018c,

2018d). Regarding concerns about the large differences between measured and simulated hydraulic gradients. Because the model-predicted groundwater levels are incorrect, then the model-predicted capture zones for Red Hill Shaft are also incorrect thus eliminating all or most of the Navy's argument that Red Hill Shaft pumping will intercept all fuel contaminants that leak from the RHBFSF. Consequently, the interim groundwater flow model should not be used for the Tank Upgrade Alternative (TUA) decision process.

3. During the EPA and DOH presentation of concerns with the Navy interim groundwater flow model, several SMEs suggested that the Navy remove several of their "multiple models" scenarios from their review because they were "unreasonable". BWS is concerned that the Navy's approach to selecting modeling scenarios has been and will continue to be unable to appropriately represent the uncertainty about the hydrogeologic processes and features. Thus, the resulting probability or frequency maps made from particle tracks do not represent the key issues. We observe that had the Navy adopted the constrained uncertainty analysis approach we recommended more than a year ago, we would likely have modeling results that quantitatively evaluate the likelihood of contaminant migration from the RHBFSF instead of the Navy's arbitrarily selected and incomplete qualitative sensitivity analyses that do not match observed groundwater levels.
4. DOH, USGS, and BWS SMEs commented on the Navy's application of the word "conservative" in the conceptual site model (CSM) report. The SME's suggested that whether or not a modeling assumption or modeling approach is "conservative" should be made with respect to how the assumption or approach affects the fate and transport of LNAPL components. And, because a transport model has not been developed, the evaluation of whether or not an assumption of approach is "conservative" is difficult to make and maybe should not be made. Dr. Oki of the USGS gave an example in the CSM report where the Navy's statement of a "conservative" scenario is not actually "conservative" with respect to transport. For instance, the Navy states that a model run with a high hydraulic gradient between Red Hill and Halawa Shaft (large difference in water levels) means it is conservative, but if the high gradient is created by putting in a no-flow barrier between the valleys, then the model really is not conservative, so people need to only use "conservative" characterization when it is truly conservative for transport.
5. Several comments from the EPA and DOH SMEs identify approaches to the interim and final flow models that could lead to non-conservative predictions of contaminant transport. The BWS agrees with these concerns should be addressed.

- a. EPA and DOH SMEs presented data that shows the interim groundwater flow model's alignment for strike and dip differs substantially from field measurements of lava flow strikes and dips and this misalignment likely introduced significant error in the Navy's particle tracks. The BWS has stated previously that the Navy has not provided sufficient evidence for their selection of strike and dip angles.
- b. EPA and DOH SMEs stated the bore log for Halawa Deep Monitor Well indicates saprolite does not extend as deep as the Navy contends and the depth of the saprolite below the water table is exaggerated in the Navy interim groundwater flow model for much of South Halawa Valley. The BWS recommends that the data indicating the saprolite depth extent interpreted from the geophysical survey needs additional ground truthing.
- c. EPA and DOH SMEs suggested that the Navy's current hydrogeologic framework overestimates the hydraulic conductivity of the caprock unit, causing mismatches between observed and predicted groundwater levels and potentially non-conservative flow patterns.
- d. EPA and DOH SMEs said that preferential pathways in the form of lava tubes are present in 13 of the 20 barrel logs for the RHBFSF tanks and the interim groundwater flow model does not adequately address the potential effects from them. The omission of the effects of lava tubes would lead to potentially non-conservative predictions of contaminant migration.
- e. EPA and DOH SMEs stated the interim groundwater flow model distributes pumping along Red Hill Shaft in a manner is inconsistent with their assumption that the basalt has uniform properties. Diagrams on EPA and DOH Slide 23 appear to show that pumping is only applied to a fraction of the infiltration gallery length for Red Hill Shaft, specifically, no pumping is applied to the first 525 feet of the infiltration gallery and uniform rates (which do not match historical observations of inflows) are applied to the last roughly 600 feet of the gallery. The effects on capture zone extent from the Navy's choice of how it represents pumping at Red Hill Shaft and whether the Navy's only presenting the basalt has a homogeneous aquifer should be investigated. Capture zone extent is critical, and the Navy should demonstrate how the extent does or does not change based on different choices of configuring the boundary condition representing pumping at Red Hill Shaft.
- f. DOH SMEs presented data about the location of submarine discharges of groundwater into Pearl Harbor do not occur where the Navy's groundwater

model is predicting them to occur. The differences are large enough to cause very different migration paths for fuel contamination from RHBFSF, with the potential for it to migrate closer to Halawa Shaft.

6. EPA and DOH SMEs identify non-conservative assumptions and analyses about migration of light non-aqueous phase liquid (LNAPL) fuel from the Red Hill tanks through the subsurface. Two of the issues are discussed below. The BWS agrees with both of these concerns.
 - a. Fuel from the Tank 5 2014 release caused a much more rapid and larger increase in soil vapor concentrations at the distal soil vapor detector (farthest from the access tunnel and closest to Halawa Valley) compared to the proximal detector (nearest to the access tunnel). This rapid migration below the outer perimeter of Tank 5 contradicts the Navy's contention that fuel from the Tank 5 release is "hung up" in the top most 20 to 30 feet below the access tunnel near monitoring well RHMW02. If the fuel was indeed hung up at the depth interval, the high soil vapor concentrations initially observed at the distal and center detectors would have continued to persist and should have been observed at the proximal detector as well.
 - b. Using data from another site, DOH SMEs presented evidence that contradicts the Navy's assumption that temperature differences with depth can accurately predict the location of LNAPL in the subsurface. The evidence presented by DOH demonstrates that LNAPL can be found much lower than the depth intervals with high temperatures. Moreover, the EPA SME stated that the inferred temperature differences at RHMW02 were dependent on the choice of background well. A possible implication of this data is that the Navy's argument of LNAPL retention in the vadose zone near Tank 5 is not correct.

Thank you for the opportunity to comment. If you have any questions, please feel free to call Erwin Kawata, Program Administrator of the Water Quality Division, at 808-748-5080.

Very truly yours,


ERNEST Y. W. LAU, P.E.
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cc: Mr. Steve Linder, United States Environmental Protection Agency, Region IX
Mr. Stephen Anthony, United States Geological Survey Pacific Islands Water
Science Center Inouye Regional Center
Mr. Mark Manfredi, NAVFAC Hawaii

Enclosures: Attachment A, Navy Slide Presentation Dated Aug. 16, 2018
Attachment B, EPA/DOH Slide Presentation Dated Aug. 16, 2018

References

- Lau, E. 2017a. Board of Water Supply (BWS) Comments on the Groundwater Modeling Working Group Meeting held June 26, 2017 for Red Hill Administrative Order on Consent (AOC) Sections 6 and 7. July 3.
- Lau, E. 2017b. Board of Water Supply (BWS) Comments on the Groundwater Modeling Working Group Meeting Held August 17, 2017 for Red Hill Administrative Order on Consent (AOC) Sections 6 and 7. August 28.
- Lau, E. 2017c. Honolulu Board of Water Supply (BWS) Comments on the Groundwater Modeling Working Group (GMMWG) Meeting Held September 22, 2017 for Red Hill Administrative Order on Consent (AOC) Statement of Work (SOW) Sections 6 and 7. October 18.
- Lau, E. 2017d. Board of Water Supply Comments on the Groundwater Model Evaluation Plan (GMEP), Investigation and Remediation of Releases and Groundwater Protection and Evaluation, Red Hill Bulk Fuel Storage Facility Administrative Order on Consent (AOC) in the Matter of Red Hill Bulk Fuel Storage Facility, EPA Docket Number RCRA 7003-R9-2015-01 and OOH Docket Number 15-UST-EA- 01, Attachment A, Statement of Work (SOW) Section 6.2, Section 7_1-2, Section 7.2.2, and Section 7.3.2 dated September 8, 2017. November 13.
- Lau, E. 2017e. Board of Water Supply (BWS) Comments on the Red Hill Administrative Order on Consent (AOC) Statement of Work (SOW) Sections 6 and 7 Meeting Held November 16, 2017 and the Groundwater Modeling Working Group Meeting No. 5 Held on November 17, 2017. December 19.
- Lau, E. 2018a. Board of Water Supply (BWS) Comments on the Red Hill Administrative Order on Consent (AOC) Statement of Work (SOW) Sections 6 and 7 Groundwater Modeling Working Group Meeting No. 6 held December 20, 2017. January 25.

Lau, E. 2018b. Board of Water Supply (BWS) Comments on the Red Hill Administrative Order on Consent (AOC) Statement of Work (SOW) Sections 6 and 7 Groundwater Modeling Working Group Meeting No. 7 held January 11, 2018. February 13.

Lau, E. 2018c. Honolulu Board of Water Supply (BWS) Comments on the Red Hill Administrative Order on Consent (AOC) Statement of Work (SOW) Sections 6 and 7 Groundwater Modeling Working Group Meeting (GMMWG) No. 10 held April 13, 2018. April 30.

Lau, E. 2018d. Honolulu Board of Water Supply (BWS) Comments on the Groundwater Flow Model Progress Report 04, Red Hill Bulk Fuel Storage Facility (RHBFSF), dated April 5, 2018. May 24.