BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
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July 20, 2015

Board of Water Supply
Comments on the
Proposed Administrative Order on Consent (AOC) and
Attachment A, Statement of Work (SOW) on the
Red Hill Bulk Fuel Storage Facility

1.0 INTRODUCTION

The Board of Water Supply (BWS) is pleased to submit the following comments on the proposed Administrative Order on Consent (AOC) and Attachment A: Statement of Work (SOW). BWS is the largest municipal drinking water utility in the City and County of Honolulu and the State of Hawaii, serving an average of 140 million gallons of water per day to almost one million residents and visitors on the island of Oahu. Ka Wai Ola, Water For Life, is the BWS guiding principle and declaration to the importance of water for life and our commitment as stewards of this most precious resource to ensure a safe, dependable, and affordable water supply for present and future generations.

On June 1, 2015, the U.S. Environmental Protection Agency (US EPA) and the Hawaii State Department of Health (Hawaii DOH) released for public review and comment a proposed agreement (the AOC and SOW) with the US Department of Navy (Navy) and the Defense Logistics Agency (DLA) that requires the military to take measures to minimize the threat of future leaks at the Navy's Red Hill Bulk Fuel Storage Facility (Red Hill or Facility).

As the provider of clean drinking water to nearly one million people living in the City and County of Honolulu across the island of Oahu, the BWS and its contractors have thoroughly evaluated the regulatory and technical aspects of the AOC (US EPA and Hawaii DOH, 2015a) and its SOW (US EPA and Hawaii DOH, 2015b) and developed the list of comments and recommendations included below. (Note all references are listed in Section 4.) Our contractors are subject matter experts in hydrogeology, sub-surface contaminant transport, and tank corrosion and vulnerability. On behalf of the BWS Board of Directors, BWS employees, and our ratepayers, we ask that the Parties (US EPA, Hawaii DOH, Navy, and DLA) provide written responses to our comments and to our requests for clarification and revisions to the two documents.

The AOC directs the Navy and the DLA to implement a release assessment, response(s) to release(s), and actions to minimize the threat of future releases in connection with the field-constructed bulk fuel underground storage tanks (USTs), surge tanks, pumps, and associated piping at the Facility (AOC Section 1(b)). Its primary objectives are to ensure that the groundwater resource in the vicinity of the Facility is protected and that the Facility is operated and maintained in a manner that will protect the environment from further releases. The AOC appears to describe the set of processes by which the SOW tasks are defined and implemented, how the implementations are to be evaluated, and how the Parties are to communicate and resolve disputes. The SOW describes tasks and requirements that the Navy and DLA must complete to comply with the AOC, specifically, to deploy the best available practicable technology (BAPT) to prevent fuel releases, to develop a better understanding of the hydrogeology of the area surrounding the Facility, and to conduct an assessment of the risk to the groundwater resources that is posed by the Facility (US EPA and Hawaii DOH, 2015b).

The BWS cannot support the AOC or SOW as currently written. Our evaluation has identified critical issues in the proposed documents that render the AOC and SOW "inappropriate, improper, or inadequate," per AOC Section 23 (a). We strongly recommend that the documents be revised to:

1. Ensure appropriate characterization and remediation of past sub-surface contaminants in the vadose zone and saturated zone in concert with installation of a well-designed monitoring well network.
2. Rehabilitate the Facility tanks to arrest the decades of corrosion to the tanks' thin steel plates and so eliminate the threat to our drinking water from new fuel releases.
3. Shorten the time frames to complete tank and pipeline rehabilitation, remediate past fuel releases, and comply with regulations.
4. Include proper consultation and participation by the major stakeholders and the public.
5. The AOC and SOW need to require full (without censoring) disclosure and access to all records, data, and studies about fuel leaks at the Facility over its history.
6. Appropriately follow the most stringent applicable regulatory standards and guidelines.
7. Commit the necessary funding to carry out this work and quickly put in place the necessary protections for our drinking water supply.

The proposed AOC and SOW do not recognize that the Waimalu and Moanalua aquifers are part of the US EPA-designated Sole Source Aquifer called the Southern Oahu Basal Aquifer. This Sole Source Aquifer, which was designated in 1987, is the primary groundwater resource for the majority of the nearly one million residents and visitors on the island of Oahu. It is vital that the Parties base all of their decisions and actions for the Facility on the fact that the Southern Oahu Basal Aquifer is the only one of its kind on the island and there are no cost-effective water supply alternatives. Currently, the BWS wells nearest to the Facility appear to show no contamination from the Facility.

The BWS strongly recommends that the proposed AOC and SOW be revised as described in our comments below to properly safeguard our drinking water supply from past and future releases from the Facility's aging and corroding fuel tanks. BWS is ready to work with the Parties to expedite resolution of the important problems described below and thereby expedite mitigation of the risk posed by the Facility to our groundwater supply.

Our comments on the AOC are presented in Section 2, and our comments on the SOW are given in Section 3. Each of these sections begins with a summary of the most important comments, followed by individual detailed comments. Section 4 lists the references cited.

2.0 AOC COMMENTS

2.1 AOC Comment Summary

1. The AOC should be revised to emphasize the fact that the Facility in its current state poses a serious risk to the Waimalu and Moanalua aquifers that underlie the Facility and to the Halawa Shaft and Moanalua Wells, which are the public water supply wells nearest to the Facility. The Halawa Shaft and Moanalua Wells provide 25% of the drinking water to our metropolitan Honolulu water system, which serves approximately 400,000 residents from Moanalua to Hawaii Kai. The AOC should be revised to state that the Facility poses a serious risk to the aquifers and metropolitan Honolulu water system and state the population size that is dependent on the Halawa Shaft and Moanalua Wells. It should also be revised to emphasize the risk the Facility poses to the Navy's Red Hill Shaft which provides 20% of the drinking water for Joint Base Pearl Harbor-Hickam.
2. The AOC ignores the fact that the Facility is located within the boundaries of the Southern Oahu Basal Aquifer, which was designated by US EPA Region 9 in 1987 as a Sole Source Aquifer under the authority of Section 1424(e) of the Safe Drinking Water Act (Federal Register Citation 52 FR 45496 11/30/1987). The Southern Oahu Basal Aquifer encompasses the Waimalu and Moanalua aquifers as well as the Facility. The Sole Source Aquifer designation requires appropriate assessment of potential impacts from all federally funded projects on the Southern Oahu Basal Aquifer, thus the AOC should be revised to incorporate the Sole Source Aquifer regulatory and procedural requirements.
3. The AOC and its SOW should be revised to clearly state that the Parties will determine the current location and appropriately characterize the fate of the approximately 27,000 gallons of fuel released in January 2014 in a timely manner, and that the Parties will then proceed with remediation of the light non-aqueous phase liquid (LNAPL), sorbed, and dissolved-phase contamination caused by that fuel release as quickly as possible.
4. The AOC unacceptably limits participation by major stakeholders, most notably the BWS, in scoping, review, and decision-making activities, as well as in the development of the initial and revised AOC and SOW documents. This should be resolved by including representatives from the major stakeholders in all scoping, review, and decision-making activities. Major stakeholders include, but are not limited to, the BWS, the City and County of Honolulu, and the Commission on Water Resource Management (Hawaii Department of Land and Natural Resources).
5. The AOC lacks public transparency by limiting communication with and participation by the public at regular intervals, which are routinely included as part of remediation planning at other major contaminated Department of Defense (DOD) sites. The AOC should be revised to require regular public meetings in which the Parties, together with

major stakeholders, will present recent findings, discuss next steps, and hold open question-and-answer periods for public participation.

6. The AOC should be revised to require that all work performed by the Navy and DLA under the AOC meets the most stringent and protective regulations, including the newly updated UST regulations from US EPA (US EPA, 2015). The AOC should be revised to require that the work performed by the Navy and DLA under the AOC always achieves the highest degree of protection of the vadose zone underlying the Facility tanks, the underlying Waimalu and Moanalua aquifers (part of the greater Southern Oahu Basal Sole Source Aquifer), all water supplies, and the surrounding environment. Under no circumstances should future agreements negotiated by the Parties reduce these protections under the AOC. We strongly recommend that the Hawaii DOH adopt the newly updated US EPA UST regulations as part of the Hawaii UST program without delay

7. According to the AOC Administrative Record, the Navy and DLA have not implemented technologies that have been available since the 1980s to slow the rate of tank corrosion and reduce leakage at the Facility. Damage to the field-constructed USTs at Red Hill from corrosion and fatigue is progressive and accumulates over time. The Red Hill tanks have been in service for more than 70 years and have experienced both internal and external corrosion (Anonymous, Undated; Weston, 2007a; Weston, 2007b). These tanks have never been cathodically protected; consequently, the corrosion continues unabated, which means that the frequency and magnitude of fuel releases from the tanks will continue to increase. Given that the Navy and DLA must soon act to bring the Facility tanks and associated piping in compliance with the newly updated EPA UST regulations (US EPA, 2015), the AOC should be revised to clearly state the steps and timeline for achieving compliance.

   The AOC revisions should clearly state that the Facility tanks and pipelines will receive leak detection and secondary containment (with cathodic protection) upgrades required under the newly updated US EPA UST regulations within the next several years or shortest time possible and state the process and timeline for achieving these upgrades. Installing a tank-within-a-tank or composite tank lining will greatly reduce the frequency and magnitude of fuel releases from the Facility tanks. Prior comprehensive, government-funded engineering evaluations commissioned by the Navy or DLA have already yielded various options for repairing the Red Hill tanks, e.g., Enterprise Engineering Inc. (2008a), including options that may provide long-term, i.e., 40-year, life extension. This report estimated that the recommended repair options would require less than 3.5 years to implement for all tanks (Enterprise Engineering Inc., 2008a).

8. The Navy and DLA unacceptably restrict access to information about fuel releases and other environmental impacts from the Facility. Out of eight Freedom of Information Act (FOIA) requests filed with the Navy by BWS between 10 June 2014 and 19 May 2015, only two have been fulfilled (see comment # 26 in Section 2.2 below). The AOC should be revised to require full disclosure of all Facility records, studies, reports, fuel inventory records (and tank gauger log books), and documents and data about the nature, characterization, and remediation of all fuel releases since the Facility tanks and pipelines went into service, and to provide all studies and data on alternative tank

options, current corrosion and corrosion rates, pipeline leaks, leak detection, and corrosion protection. The AOC should be revised to state that major stakeholders will also be given immediate access to data from work activities, especially with regard to groundwater and other sub-surface environmental characterization and monitoring.

9. The timelines for SOW task planning and completion, approval of deliverables, funding of work, and dispute resolution are too long and are poorly constrained. The dispute resolution process has no apparent limit on duration, potentially continuing for many months or more, thereby delaying implementation of the needed protections for our drinking water supply (see comment #30 in Section 2.2 and Figure 1A and 1B). The dispute resolution section (AOC Section 14) should be removed from the AOC and replaced with dispute resolution processes found in the applicable regulations. The maximum amount of time for approval of deliverables and funding of work should be specified explicitly. The Navy and DLA should promptly comply with all appropriate regulations, as would be required of any other regulated person or party.

10. The current AOC does not fully protect Honolulu's water supply or the environment because its work activities and schedule are limited by poorly defined funding constraints. The AOC activities should be given highest priority by immediately dedicating the necessary funding to address this issue. Section 12 (Funding of Work) of the AOC should be revised to state that the US EPA and Hawaii DOH require the Navy and DLA to arrange necessary funding within no more than six months from the signing of the AOC for five important sets of activities: (1) upgrading the Facility tanks to meet US EPA updated UST regulations, (2) tank testing and rehabilitation/closure, (3) characterization of the full nature and extent of the 2014 fuel release within the sub-surface, (4) participation by major stakeholders in planning and decision making, and (5) regular public meetings to educate residents by sharing findings and decisions.

    If the funding required to carry out the necessary repair and upgrade activities is not available now, we respectfully request that the Navy and DLA actively start the budget process to procure such funding. Funding specifics for the various options to extend the operational life of the Facility tanks have generally been redacted from the documents that were made available. The AOC should be revised to state how much funding is currently available for the AOC and SOW tasks and how much more is estimated to be required. The funding commitment should be sufficient to complete the activities within five years (or a similarly short time period) after signing of the AOC and to enable preservation and continuity of institutional knowledge, responsibility, and accountability to all successors of the Navy and DLA in perpetuity or until all fuel releases are remediated. Section 12.c (Funding of Work) of the AOC should also be revised to restrict re-scoping or schedule delays of work activities due to lack of sufficient funding to no more than three months, and if unmet, the Hawaii DOH and US EPA will take appropriate actions against the Navy and DLA.

11. The potential for catastrophic environmental and economic damages caused by fuel releases from one or more of the 20 field-constructed tanks at Red Hill is quite high, given a) the large (fuel) volume and age of the tanks, b) acknowledged instances of through-wall, corrosion-induced holes (Enterprise Engineering Inc., 2008a; Whitacre, 2005; Weston, 2007a; Whitacre, 2005; WillBros, 2012), and c) general uncertainty about

the structural integrity of the tanks and piping. The cost of immediate action to rehabilitate the Facility tanks and characterize and remediate the subsurface contamination will be far less than the cost required to remediate another large fuel release as well as rehabilitate the tanks. US EPA argued that upgrading large field-constructed tanks (including those at Red Hill) can lead to "*substantial reductions in remediation costs and public exposure*" caused by large-scale fuel releases from these previously deferred large field-constructed tanks (Industrial Economics, 2015).

2.2 AOC Detailed Comments

1. Page 2, Introduction Paragraph 1(b): The words "to take steps" should be removed from the sentence "*The primary objectives of this AOC are to take steps to ensure that the groundwater resource in the vicinity of the Facility is protected and to ensure that the Facility is operated and maintained in an environmentally protective manner*." The original sentence improperly allows the actions to fall short of ensuring the aquifer is protected, because "steps" could be construed as taking actions that could only begin to prevent contamination rather than fully prevent contamination.
2. Page 2, Introduction Paragraph 1(c): "*Navy and DLA's participation in this AOC shall not constitute or be construed as an admission of liability*." Please remove. Under US EPA and Hawaii regulations, the Navy and DLA are "operators" of the Facility and therefore liable for responding to reported releases of regulated substances from USTs or UST systems (Hawaii Revised Statutes [HRS] §342L-1; Hawaii Administrative Rules [HAR] Subchapter 7 §11-281-71; Code of Federal Regulations (CFR) Title 40, Chapter I, Subchapter I, Part 280.12).
3. Page 2, Introduction Paragraph 1(d): The statement that the AOC is "*fair, reasonable, protective of human health and the environment, and is in the public interest*" should be deleted. This statement cannot be justified because it only reflects the opinions of the Parties and not the opinions of the major stakeholders, including the BWS. All major stakeholders should be the primary arbiters of whether the AOC is fair, reasonable, and in the public interest because the major stakeholders will have to deal with the consequences of the AOC and SOW.
4. Page 2, Jurisdiction Paragraph 2(a) and 2(b): Revise to acknowledge that the AOC should conform to the requirements set forth under the Hawaii DOH UST program, the US EPA Resource Conservation and Recovery Act (RCRA), and the authority of Section 1424(e) of the Safe Drinking Water Act (Federal Register Citation 52 FR 45496 11/30/1987). The Southern Oahu Basal Aquifer, which includes the Waimalu and Moanalua aquifers as well as the area surrounding the Facility, was designated as a Sole Source Aquifer by US EPA in 1987. Federally funded activities within a sole source aquifer can be brought under review by US EPA if those activities could contaminate the groundwater (Public Law 93-523, 42 U.S.C. 300 et seq Section 1424e).
5. Page 2, AOC Section 2(c): According to the AOC, the Navy and DLA agree to undertake and complete all actions required by the terms and conditions of the AOC, and the AOC is binding upon the parties and their successors. The Navy and DLA are also jointly and

severally liable under this AOC. However, the AOC also states that the participation of the Navy and DLA in this AOC shall not constitute or be construed as an admission of liability. The AOC further states that the Navy and DLA neither admit nor deny the factual allegations and legal conclusions set forth in the AOC under the AOC's Findings of Fact and Conclusions of Law. This section appears to suggest that the Navy and DLA are not responsible or accountable for the past fuel releases from Red Hill as described in Navy reports and measurements that show the presence of fuel contaminants in the rocks and groundwater underneath the Facility or for future fuel releases.

This section of the AOC should be revised to clearly state that the Navy and DLA are responsible for past fuel releases, will be responsible for future fuel releases, and are obligated to clean up this contamination and to improve the tanks now to protect the subsurface, including the vadose zone and the Southern Oahu Basal Aquifer, and the environment.

The Navy and DLA, as the owner and/or operator of the Facility, are subject to requirements regarding response and remediation in HRS Chapter 342L and HAR Chapter 11-281 (40 CFR § 280 Subpart E) and are subject to orders which may be necessary to protect the health of persons who are or may be users of a public water system as provided in HRS Chapter 340E and the rules promulgated pursuant thereto including, but not limited to, HAR §11-19 and 11-20, and are subject to administrative orders and civil actions which are necessary to address discharges to state waters as provided for in HRS Chapter 342D.

Additionally the ownership and operation of the Facility, which is federally owned and operated, is subject to "*all administrative orders and all civil and administrative penalties or fines, regardless of whether such penalties or fines are punitive or coercive in nature or are imposed for isolated, intermittent, or continuing violations in the same manner and to the same extent as any person is subject to such requirements,*" as codified in 42 United States Code (U.S.C.) § 6991f.

6. Page 4, Paragraph 4(h): Findings of Fact: The underground storage tanks at Red Hill are field-constructed USTs and were formerly exempt from many Hawaii DOH and US EPA requirements (HAR Subchapter 1 §11-281-01(b)(2) and CFR Title 40, Chapter I, Subchapter I, Part 280.10(c)(5)). The AOC and SOW should be revised to state that the US EPA 1988 UST regulations have been updated (US EPA, 2015) and the exemptions for field-constructed USTs have been removed.

    a. The AOC and SOW should be revised to implement the newly updated US EPA regulations for field-constructed USTs, and to provide the timeline for completing these and any additional modifications to field-constructed USTs added by the Hawaii DOH.

    b. In addition, the AOC should dictate that the Parties agree that the Navy and DLA will be required to adhere to the most stringent and current US EPA regulations in anticipation of the Hawaii DOH incorporating these same new requirements into the Hawaii DOH UST program.

7. Recommend adding the US EPA Sole Source Aquifer provisions (Public Law 93-523, 42 U.S.C. 300 et seq Section 1424e) that govern activities at the federally funded Red Hill Facility to Page 2, Jurisdiction Paragraph 2(b), and to Page 5, Findings of Fact Paragraph 4(k). The AOC and SOW should be further amended to apply and enforce the regulations and processes stipulated under the Sole Source Aquifer provisions and Federal Register Citation 52 FR 45496 11/30/1987.

8. Page 5, Paragraphs 4(k)-4(n): Findings of Fact: This item should be revised to include important information about the Southern Oahu Basal Aquifer groundwater resources. The information shall include, but not be limited to, the following:

    a. A statement explaining that the Waimalu and Moanalua Aquifers are part of the US EPA-designated Sole Source Aquifer called the Southern Oahu Basal Aquifer.

    b. The location of the Waimalu and Moanalua Aquifers relative to Red Hill.

    c. The distance from the Facility to Halawa Shaft and to the BWS Moanalua Wells (note that there are three wells, not one well).

    d. The population served by the Halawa Shaft and Moanalua Wells.

    e. The distance from the Facility to other water supply wells and shafts.

    f. The population served by the Navy's Red Hill Well and Water Plant.

9. Page 5, Paragraph 4(r): Findings of Fact: The AOC states that approximately 27,000 gallons of fuel were released from Tank #5. Please revise to state the type of fuel released and the investigative analyses and studies done by the Navy and DLA to determine the basis and uncertainty for the estimated amount of leaked fuel. Additionally, this section states that the immediate action taken once the release was discovered was to empty the fuel from Tank #5. Per Hawaii DOH and US EPA regulations, were any additional steps taken over the five-day period to empty Tank #5 of its contents to prevent the further release of regulated substance to the environment at Red Hill? When a release is discovered, immediate action must be taken to prevent any further release of regulated substance into the environment (HAR Subchapter 7 §11-281-72(3); HRS §342L-35; and CFR Title 40, Chapter I, Subchapter I, Subpart F Part 280.61(b)). Please document any additional actions taken to prevent any further release in this paragraph of the AOC. Please revise the AOC to state whether Tank #5 has been repaired and is currently in use.

10. Page 5, Paragraph 4(t): Findings of Fact: The AOC states that following the January 2014 release from Tank #5, the Navy increased the frequency of monitoring and performed additional monitoring of Navy Well 2254-01. Per Hawaii DOH and US EPA requirements, it is imperative to carry out appropriate investigations to determine the presence of free product and begin free product removal (HAR Subchapter 7 §11-281-74(5) and CFR Title 40, Chapter I, Subchapter I, Subpart F Part 280.62(a)(5)). Please describe the steps that will be taken to find and recover the free product remaining from the fuel release documented by the Navy and DLA in 2014.

11. Page 5, Paragraph 4(s): Findings of Fact: The fate of the fuels that have been previously released into the environment on numerous occasions (Table 1 below; see also section

3.1.1 on pages 3-2 to 3-5 in TEC, 2008) should be required to be determined as part of the AOC. There is no specific mention within the AOC of any plan to conduct a "forensic" historical assessment of total potential fuel releases, which correspond to potential future contamination sources to the Waimalu and Moanalua Aquifers from this Facility.

12. Pages 5-6, Paragraph 4(t): Findings of Fact: The AOC states that no impact from release(s) has been measured in Navy Well 2254-01 and that groundwater results are in compliance with state and federal Maximum Contaminant Levels (MCLs).

    a. Please clarify which regulatory standards are used when evaluating groundwater results. The groundwater monitoring reports for the Facility compare groundwater results against Hawaii DOH Environmental Action Levels (EAL) for Drinking Water Toxicity standards (ESI, 2015a; ESI, 2015b).

    b. Clarification is needed regarding the definition of "impact." Does this mean petroleum hydrocarbons were not detected above laboratory reporting limits or limits of detection, above MCLs, above Hawaii DOH EALs, or another definition? The groundwater sample collected at Navy Well 2254-01 in November 2014 had a concentration of total petroleum hydrocarbon, diesel (TPH-d), detected above the laboratory reporting limit but below the Hawaii DOH EAL (ESI, 2015b); therefore, impacts have been observed after the January 2014 release.

    c. The AOC document should state that even though minimal impact has been measured in this well, there is inadequate characterization of the nature (LNAPL, sorbed, dissolved phases) and extent of the released fuel; therefore, additional wells are required to determine the impact to the underlying aquifer.

13. Page 5, Paragraph (k): Findings of Fact: The text should read "The Waimalu and Moanalua Aquifers…are located **beneath** the Facility…."

14. Page 5, Paragraph (n): Findings of Fact: The text should read "The BWS's Moanalua Wells, which are part of a public water system…."

15. Page 5, Paragraph (t): Findings of Fact: When will the Navy's Groundwater Protection Plan be "updated in accordance with the SOW"?

16. Page 7, Paragraph 5(b): EPA Conclusions of Law and Determinations: Add the requirements for characterization, remediation, and prevention of future fuel releases from this contamination site under the US EPA Sole Source Aquifer provisions.

17. Page 7, Paragraph 5(b)(ii): EPA Conclusions of Law and Determinations: The AOC states that US EPA has determined that any fuel released from the Facility would be a "solid waste" within the meaning of Section 1004(27) of RCRA, 42 U.S.C. § 6903(27). Revise the text to state that the released fuel is also defined as a "release" (CFR Title 40, Chapter I, Subchapter I, Part 280.12 and HRS §342L-1).

18. Page 9, Paragraph 7: Regulatory Agencies Approval of Deliverables: The AOC does not allow appropriate participation and review of AOC actions by non-"Party" stakeholders, i.e., BWS and others, in our view. The AOC should be revised to allow all major stakeholders to participate in developing work plans, evaluating data and other deliverables, and decision making. The Parties should seek and consider input from the

major stakeholders and resolve differences through discussion and negotiation prior to document approval or final decision-making. Given that the BWS is acknowledged as a subject matter expert in the SOW and a major stakeholder, this constitutes a gross oversight in the review process. Active stakeholder participation in review and decision-making processes is a key factor at other DOD contamination sites affecting the water supply for a major metropolitan area, such as the Kirtland Air Force Base Bulk Fuels Facility (KAFB BFF) fuel spill project. This lack of public transparency and openness in the proposed AOC and SOW processes should be corrected before the AOC can be approved.

19. Page 11, Paragraph 8(a)(i): The AOC should not permit modifications of the compliance date stipulated in the SOW that delay the implementation of BAPT.

20. Page 9, Paragraph 7(a): Regulatory Agencies Approval of Deliverables: Page 9, Paragraph (a): This paragraph discusses the submittal of deliverables to the regulatory agencies and discusses due dates to be specified by the AOC. It is appropriate to state in this paragraph that the deliverable due dates will adhere to the schedule set forth for corrective action plans as provided in HAR Title 11, Subchapter 7 §11-281-79(b). Because of the threat to groundwater, a corrective action plan was required to be submitted within 30 days of the January 2014 release. If a corrective action plan has been submitted, please provide an unredacted copy to BWS and the public. Additionally, the existence of the corrective action plan and the corrective action plan objectives should be discussed in AOC Section 4.0 FINDINGS OF FACT.

21. Page 12, Paragraph (ii): Does discovery of additional fuel leaks constitute “immediate threat to human health or the environment”? If so, what immediate actions would the Navy and/or DLA take? If not, why not? Is there a minimum amount of fuel leak that would constitute an immediate threat?

22. Page 12, Paragraph 8(b)(iii): Modification of the SOW and this AOC and Additional Work: The AOC should be revised so that it conforms to the most stringent and current state and federal standards when changes have been made to applicable regulations, such as US EPA’s newly updated UST regulations.

23. Page 14, Paragraph 10(a)(i): Sampling, Access, and Document Availability: No provision is made to allow BWS (or other stakeholders) access to raw data and information generated by this process. Given the very lengthy period (potentially years) between data collection, analysis, and public release of report documents as outlined in the SOW, major stakeholders should have immediate access to this data and information. Such data sharing is very common in the USA; examples include California’s statewide GeoTracker system and the Kirtland Air Force Base (KAFB) Bulk Fuels Facility (BFF) fuel spill project.

24. Page 14, Paragraph 10(a)(i): What documentation, if any, will be available to timestamp the Navy and DLA’s initial receipt of analytical data? Who at the Navy and DLA are the contacts for initial receipt of these data?

25. Page 17, Paragraph (d): Define the “burden of proof” that the Navy or DLA must meet to withhold records from disclosure via the AOC. Revise the AOC to begin immediate public

disclosure of all documents relating to tank inspection and maintenance, as well as historical fuel leak records.

26. Page 17, Paragraph 10(d): Sampling, Access, and Document Availability: BWS and other major stakeholders should have immediate access to documents, data, and records without having to wait (potentially years) for them to be released to the public.

    It is the BWS's experience that the Navy and DLA have improperly restricted access to information about fuel releases and other environmental impacts from the Facility. For example, out of eight FOIA requests filed with the Navy by BWS between 10 June 2014 and 19 May 2015, only two have been fulfilled (see Table 2 below). The AOC and SOW should be revised to explicitly state that these restrictions will be removed and that there will be full disclosure of all Facility records, studies, reports, documents about the nature, characterization, and remediation of all fuel releases since the Facility tanks and pipelines went into service, and provision of all studies and data on alternative tank options, corrosion and corrosion rates, pipeline leaks, leak detection, and corrosion protection.

27. Page 18, Paragraph 12(c): Funding of the Work: The lack of a funding commitment is a serious concern in the current AOC. The Navy and DLA should commit all necessary funding to support the protection of the vadose zone and Sole Source Aquifer surrounding the Facility from past and future fuel releases, just as the Air Force did last year for the KAFB BFF fuel spill. The AOC should state to what extent cost-saving measures or reworking the scope will affect the acquisition of sound scientific data and timely rehabilitation of the Facility. The BWS and other stakeholders should be included in any meeting involving potential changes/modifications to work plans.

28. Page 18, Paragraph (c): Do "rescoping measures" include reducing the total amount of work, or staggering the work schedule to fit annual budgets? If rescoping includes reducing the number of work activities or the amount of work, this implies that AOC tasks can be eliminated solely due to budgetary constraints. Such rescoping is not acceptable, and the AOC should be revised to ensure that all work activities are completely carried out in a timely manner.

29. Page 18, Paragraphs (b) and (c): Do these Paragraphs imply that the funding discussions are outside the Dispute Resolution Process outlined in Part 14 of the AOC? Can Hawaii DOH or US EPA take action against the Navy or DLA outside of the Dispute Resolution Process if it has to do with available funding? Under what circumstances does the AOC become null and void?

30. Page 19, Paragraphs (a) through (g): Dispute Resolution: The dispute resolution process has no apparent limit on duration, potentially continuing for many months or more, thereby delaying implementation of the needed protections for our drinking water supply Figure 1A and 1B below is a flow chart that illustrates the length and complexity of the combination of work planning and approval and dispute resolution processes, which, when taken together, can lead to many months or years of delays in completing the SOW tasks. We recommend that the dispute resolution section (AOC Section 14) be removed from the AOC and replaced with dispute resolution processes found in the applicable regulations. The AOC and SOW should be revised to explicitly specify the maximum

amount of time for planning and implementation of tasks, approval of deliverables, and funding of work. The AOC should state that the Navy and DLA should promptly comply with all appropriate regulations, as would be required of any other regulated person or party.

31. Page 23, Paragraph 16(b): The first sentence reads “Subject to the Dispute Resolution Provisions…nothing in this AOC shall preclude the State of Hawaii from seeking to enforce…” What if Hawaii DOH does not agree with a Dispute Resolution decision, which, if significant enough, may be elevated to the US EPA Assistant Administrator for a final decision? What recourse does Hawaii DOH have, if any?
32. Page 26, Paragraphs 19(a) and 19(b): Define “satisfactory performance by Navy and DLA of their obligations under this AOC” and the role of timeframes, quality of work, and other metrics.
33. Page 27, Paragraph 21(a): The period of all AOC-related records retention should be longer than 10 years after the AOC is terminated. Legal counsel should verify record-retention requirements, but we believe US EPA Superfund records have different retention schedules depending on the type of record. For example, we believe lab data are kept at least 30 years after cost recovery actions are completed or site closure is achieved.
34. Page 27, Paragraph 23(a): Does the term “settlement” carry any legal ramifications? Does this imply no other liability can be applied to the Navy or DLA during the term of the AOC?
35. Page 26, Paragraph 18(d): Reservation of Rights: This section states “*EPA or DOH’s review.*” The “or” needs to be replaced with “and”; per Paragraph 7(b), Page 9, it is required that both regulatory agencies approve of any deliverable required pursuant to the AOC.

3.0 SOW COMMENTS

3.1 Comment Summary for SOW

1. The SOW should be revised to clearly state that the Parties will determine the current location and appropriately characterize the fate of the approximately 27,000 gallons of fuel released in January 2014, and that the Parties will proceed with remediation of the LNAPL, sorbed, and dissolved-phase contamination caused by that fuel in the vadose zone and the Waimalu and Moanalua aquifers.
2. The SOW should be revised to account for the Sole Source Aquifer regulations. The Southern Oahu Basal Aquifer is designated by the US EPA as a Sole Source Aquifer and encompasses the Waimalu and Moanalua aquifers and the Facility. This designation requires appropriate assessment from all federally funded projects on the Southern Oahu Basal Aquifer; thus the SOW should be revised to incorporate work activities needed to meet the Sole Source Aquifer regulatory requirements.

3. The SOW's groundwater and fate and transport work elements do not contain sufficient detail to evaluate how the Parties will accomplish these important work tasks and so are inappropriately generic. The subsequent "scoping meetings" will apparently lead to specific work plans, but the SOW lacks appropriate and proper review of such key plans by the BWS and other major stakeholders.
4. The SOW will generate an extensive list of reports and work plans, but improperly limits stakeholder participation in their development, as well as public release of these reports and work plans. Deliverables include reports about Tank Inspection, Repair, and Maintenance; Tank Upgrade Alternatives, Piloting, and Re-evaluation; Release Detection/Tank Tightness Testing; Corrosion and Metal Fatigue Practices; Investigation and Remediation of Releases; Groundwater Protection and Evaluation; and Risk/Vulnerability Assessment. However, for each deliverable, the scoping and decision meetings will be attended only by the Parties, which improperly precludes participation by the major stakeholders, including the BWS. The SOW unacceptably limits public release of the reports to only synopses that "may" be made available to the public by the Parties. The SOW should be revised to include participation by major stakeholders during the design and pre-decisional meetings prior to finalization of the deliverables and to include public involvement throughout the entire process. The current SOW is seriously flawed by its lack of transparency and exclusion of major stakeholders from work activities.
5. Page 2, Paragraph 1.1 acknowledges BWS as a subject matter expert, but states that they will be consulted "as needed" as determined by the "Parties" to the AOC. The BWS and other major stakeholders have important contributions to make to protect the Southern Oahu Basal Aquifer and our drinking water supply. Ultimately, the outcomes of the work, successful or not, will be directly felt by the community in cost and quality of the environment. We believe the entire process should be transparent and embrace the collective effort and involvement by the entire community as the groundwater and environment is held in trust for all people on the island of Oahu, as is stated in the Hawaii State Constitution Article XI Section 1 (Conservation and Development of Resources) and Section 7 (Water Resources).
6. The SOW's subsurface characterization work activities lack a standalone Quality Assurance Project Plan (QAPP) and Sampling and Analysis Plan (SAP). The SAP and QAPP must be developed according to the appropriate state and federal regulations, approved, and strictly followed during all data acquisition activities at Red Hill. The SOW should be revised to include a SAP and a QAPP that are appropriately rigorous because the quality assurance and quality control (QA/QC) procedures outlined in those plans will improve the reliability and validity of field and laboratory measurements used for decision making purposes.
7. Please provide the scientific and engineering data and analyses for the choice of the apparently arbitrary 22-year period (with an allowable extension of up to 5 additional years) over which to deploy BAPT or cease tank use. The Red Hill fuel tanks have been in service for over 70 years, which is more than three times the average time-to-leak of about 20 years or less (Stephenson, 1998; Rogers, 1989; Rogers, 1981; Jacobs, 1987;

Flora, 1999).[1] No data or technical analyses have been presented to convincingly demonstrate that continued operation of the tanks will not lead to future fuel releases. The 22-year period appears arbitrary because there is no factual basis provided in the SOW that the tanks will not release fuel to the sub-surface during that period. More importantly, the SOW implies that the future release rate from the tanks will be acceptable, even though the risk of future releases will increase as the tanks continue to deteriorate.

8. The 22-year tank rehabilitation period is overly optimistic given the extent of corrosion damage observed in several of the tanks at the Facility over the years. For instance, following the January 2014 Tank #5 fuel release (Navy, 2014; US EPA and Hawaii DOH 2015a), a Navy investigation found that “poor workmanship and oversight resulted in a tank that could no longer hold fuel” (Navy Region Hawaii, 2015). The inspection and integrity report prepared in 2010 indicated the presence of corrosion areas and pits of varying depths and sizes on Tank #5 (WillBros, 2010). It also stated that if all defects of a critical size were repaired, the tank could safely be re-inspected after another 10 or 20 years of service (WillBros, 2010). Yet Tank #5 leaked in 2014. Given that the 10 or 20 year “safe re-inspection interval” was not achieved at Tank #5 because of “poor workmanship and oversight”, and given that it is not currently known how many of the other tanks may suffer from similar defects in workmanship and oversight, the deadline for implementing tank rehabilitation should be reduced to five years or a similarly short period.

9. Many leaks have been reported in the telltale system[2] of the subject tanks (Whitacre, 2014b). If these leaks have arisen due to internal or external corrosion, they may provide valuable information that has not been taken into account when estimating remaining tank life. In addition:

    - It is not clear if all the tanks that remain in service has been subjected to 100-percent non-destructive examination (NDE) and/or that all proposed repair recommendations have been implemented.
    - There is no indication that a detailed statistical analysis of the tank wall defects has been performed and factored into tank reliability and safe re-inspection intervals.
    - The corrosion rates used to establish remaining tank life do not appear to consider internal corrosion processes, statistical analysis, or appropriate safety factors.

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[1] We are aware that the data provided in the above references refer to steel USTs and not specially-engineered tanks like those at Red Hill. In particular, the database referred to in these documents is based on steel tanks exposed to soil, not concrete. However, it must be realized that many locations on the Red Hills tanks are no longer in intimate contact with the surrounding concrete and that extensive corrosion has been noted on the outside of the tanks.

[2] The “telltale system” is the leak release system incorporated into the Red Hill tank during construction; it consists of a series of pipes, and is intended to monitor leaks on the outside of the steel tanks. We have not been able to find detailed drawings showing how the telltale system was designed and constructed or records detailing the nature of the corrosion failures.

- There is insufficient information to independently verify the reported tank leak detection limit of 0.7 gallons/hour.

10. As described above, the SOW outlines tasks and requirements that the Navy and DLA must complete to comply with the AOC, including deploying the BAPT to prevent fuel releases (US EPA and Hawaii DOH, 2015b). As defined in the SOW, BAPT includes prevention methods and procedures that offer the best available protection to the environment, including protection against external and internal corrosion of tank metal components. As such, it is imperative that the SOW acknowledge previous studies. For instance, see Enterprise Engineering Inc. (2008a), in which BAPT alternatives for tank repair and rehabilitation could be engineered and implemented quickly, i.e., within 3.5 years. These schemes could be engineered and implemented quickly while additional BAPTs are being studied and deployed.

11. According to US EPA UST regulations, all metal UST system components that are in contact with the ground and routinely contain product must be protected from corrosion. The regulations stipulate that UST systems installed before December 22, 1988, must meet the current corrosion protection standards or implement one of the upgrade options listed below (or be properly closed):

    - Interior lining
    - Cathodic protection
    - Internal lining combined with cathodic protection

    However, newly revised US EPA UST regulations do not permit internal linings as an acceptable method of meeting the corrosion protection upgrade requirement as internal linings do not protect the steel in contact with the ground from corroding and causing environmental releases (US EPA, 2015). In fact, today's final UST regulation modifies the 1988 UST regulation by requiring owners and operators to permanently close a UST that uses internal lining as the sole method of corrosion protection for the tank when the lining inspection determines the internal lining is no longer performing according to original design specifications, and the internal lining cannot be repaired according to a code of practice developed by a nationally recognized association or independent testing laboratory. Furthermore, under these circumstances, US EPA regulations exclude options to add cathodic protection and/or to recoat the tank as alternatives to permanent closure, as internally lined tanks that fail the lining inspection and cannot be repaired are generally older and/or nearing/past the end of their useful lives.

    Given the extent of internal and external corrosion damage observed for the subject tanks, the Navy and DLA should give serious consideration to the immediate use of BAPTs to mitigate further internal and external corrosion of the fuel tanks and minimize the probability of future fuel releases (Enterprise Engineering Inc., 2008b). However, if the Navy or DLA now believes the remediation options listed in previous studies, e.g., the report by Enterprise Engineering Inc. (2008b) are not viable, or that funding for such repairs is not readily available, consideration should be given to the permanent closure of the corroded tanks or the temporary relocation of currently stored fuel until funding and rehabilitation actions are taken to upgrade the tanks to eliminate the risk to the water resources and environment . In addition, Navy and DLA should perform a comparative analysis of the cost and benefits of relocating the fuel to other facilities in lieu of renovating the Red Hill fuel facility.

12. The SOW lacks sufficient information to conduct a structural risk assessment based on the extent of external and internal corrosion damage observed on the subject tanks. In order to obtain accurate data regarding the condition of the subject tanks, it is recommended that additional NDE be performed, followed by destructive testing (to verify NDE results) on coupons removed from tanks. This could be implemented immediately on tanks that are now permanently out of service (i.e., Tank #1 and Tank #19). Appropriately sized coupons should be removed from these tanks to encompass areas where, NDE indicates significant corrosion, where damage is expected to be most severe based on previous inspection reports or where structural damage has been observed in other tanks. The data collected through these efforts would provide the necessary information required to effectively conduct a structural risk assessment of the subject tanks.

13. The SOW fails to address the critical need for non-destructive evaluation of tank-related piping, which includes lines up to 32-inches in diameter. There is no indication that the tank-related piping has been systematically inspected, despite indications of hydrostatic failures, weld cracks, and metal loss locations as recent as 2008. For example, when 2.1 miles of 32-inch pipeline (F-76 line) running from the Red Hill Complex to the Pearl Harbor pump house were examined in 2005, 27 external metal loss locations were discovered (Regin, et al., 2008). Multiple loss locations exceeded 50% wall loss, indicated as the wall loss that DOD generally repairs. When the study was performed, the DOD explicitly indicated that “internal integrity inspections” had never been performed on the subject line. Furthermore, when the piping associated with Tank #2 was hydrostatically tested in 2008, a 6” slop line failed the hydrotest (Enterprise Engineering Inc., 2008b). In addition, “slight cracks” were detected in the welds of the sampling line penetrations in the welded plate on the blind flange at the end of the casing in the lower tunnel. The details of repairs reportedly performed in response to these inspection initiatives are not available. In the approximately ten years since the initial inspections and repairs were reportedly performed, there is also no evidence that additional inspections and/or repairs have been carried out to address wall loss locations that have continued to thin (corrode) and/or locations where the coating has subsequently been compromised.

14. The SOW should be revised to specifically describe and require development of a hydrogeological conceptual site model (CSM). If a previously existing hydrogeological CSM is to be used, it should be described with references listed for all supporting documents and reports. All data and information used to develop the existing hydrogeological CSM will need to be vetted and requalified under the QA/QC requirements established for the SOW work.

15. The SOW should be revised to include evaluation of contaminant distribution and migration through the vadose zone beneath Red Hill and the vadose zone’s impact on movement of contaminants. All data and information used to develop the existing groundwater flow model will need to be vetted and requalified under the QA/QC requirements established for AOC/SOW work.

16. The SOW schedule for refining the existing groundwater flow model and contaminant fate and transport model and associated reporting is overly long and spans nearly three years. More importantly, the schedule for the monitoring well network component appears to occur in parallel with the refining of the groundwater flow model. It is unclear if and when additional monitoring wells will be installed. Given that the location and fate of the 27,000-gallon release still remain unknown, the Facility cannot be considered to be adequately characterized. Inadequate site characterization will lead to inadequate models, which will lead to inadequate and improper remediation decisions. The SOW must be revised to complete the appropriate site characterization before moving to fate and transport modeling that is to be used for remediation and other mitigation decisions.

3.2 Detailed Comments for SOW

1. Page 1, Introduction: The list of major components of work should be revised to include characterization of the nature and extent of contamination from past fuel releases in both the vadose zone and the underlying Sole Source Aquifer, as well as remediation of that NAPL, sorbed, and dissolved-phase contamination.
2. Page 2, Paragraph (4): According to the SOW, "*Implementation will occur in phases so that all Tanks in operation will deploy BAPT, as approved by the Regulatory Agencies, within twenty-two (22) years of the effective date of the AOC or as otherwise provided for in the AOC or this SOW.*"

   The rehabilitation schedule does not reflect variations in tank integrity from tank-to-tank, or address the need to prioritize the application of BAPT to high-risk tanks. Furthermore, the implication that these tanks can be operated safely for the next 22 years is untenable for the following reasons. Firstly, there is a lack of detailed information and analysis on the severity and extent of corrosion and other damage that has occurred over the last 70 years to the tanks and associated piping and equipment. Secondly, there is evidence that the tanks have suffered significant corrosion that resulted in through-wall holes and prior fuel releases (Enterprise Engineering Inc., 2008b; Whitacre, 2005; Whitacre, 2014b; Weston, 2007a; Whitacre, 2005; WillBros, 2012). Thirdly, there is the certainty that the tanks will continue to corrode and deteriorate unless immediate action is taken to prevent further corrosion damage. If action is not taken quickly, it is likely that the frequency and severity of fuel releases will increase. For these reasons, the SOW should be revised to replace the 22-year BAPT implementation period with a much shorter time period, such as five years.

   It is not clear if all the tanks that remaining in service has been subjected to 100-percent non-destructive examination and/or that all proposed repair recommendations have been implemented. For instance, more than 800 indications and flaws were found during the 2010 Tank #5 API 653 Inspection (WillBros, 2010). The depths found ranged from 0.015 to 0.195 inch. Two through-wall holes were found in the shell extension and upper dome, and 80% of the internal coating had disbonded, flaked, or deteriorated. The detailed information regarding "mandatory repairs" is contained in Section 7 of the document (and Tables 6-1 thru 6-4 and Tables 7-1). We have been unable to find these documents in the files provided for review; therefore, we do not have information on the depths or locations (inner or outer surface, top or bottom dome, barrel, etc.) to clearly understand the nature and extent of the damage or methodology used for defect repair. We also have limited information about the location and nature of the “poor workmanship” referenced in the context of the 2014 Tank #5 release (Navy Region Hawaii, 2015). Without this information, it is difficult to evaluate if other repairs on the remaining in-service tanks may also suffer from future leaks as a result of “workmanship and/or oversight” issues. The aforementioned information should be provided in order to allow an independent review of the nature and extent of the identified defects, determine which defects were repaired, and better understand why the 2014 release occurred.

As another example of the extent of corrosion, Tank #6 was subjected to NDE in 2007 (Weston, 2007b). Their report indicates that 80% of the entire tank area underwent NDE, including 100% of the barrel and extension, but only 31% of lower dome area. A total of 684 defects/flaws were located during this inspection; 476 were determined to require repair. The steel is 0.25-inch thick for the upper dome, extension, and barrel. The nominal plate thickness of the bottom is 0.5-inch thick. The tank was coated in the early 1980s with a thin film of polyurethane. The pitting corrosion found on the lower dome inner surface was found to be as deep as 0.300 inch in the 0.50-inch thick plate. Additionally, pitting as deep as 0.100 inch was found on the inner surface of the 0.25-inch thick plate. To date, we have not been able to find any documents regarding the incorporation of internal corrosion information or corrosion rates into API inspection and repair methodologies. Depth of corrosion of Tank #6 steel plate from the outside was as high as 0.136 inch out of 0.25-inch thickness. No corrosion was reported on the outside of the lower dome, but only 31% was inspected. The API inspection and repair report indicates that a 0.0045 inch per year corrosion rate based on Tank #15 and Tank #16 data was used to determine which of the 476 flaws needed to be repaired to set a safe 20 year re-inspection interval. The report stated that 0.090 inch of further corrosion (0.0045 inch per year x 20 years) can occur, meaning all defects greater than 0.06 inch must be repaired. However, the re-inspection and repair methodology does not appear to account for corrosion from both the inside as well as from the outside. In addition, no supporting analysis has been provided to support why an average corrosion rate is safe to use when determining which defects to repair and how frequently to inspect the tank.

A similar report prepared by WillBros for Tank #17 indicated similar corrosion damage with pit depths ranging from 0.015 to 0.210 inch (WillBros, 2012). Furthermore, 42 holes and leaks were found in the shell extension and upper dome. In another instance, as-built repair records for Tank #15 from 2005 show the presence of numerous through-wall holes on the upper dome and upper barrel (between the dome and stiffening ring) (Whitacre, 2005). Given that significant corrosion damage has been observed in a number of tanks (a chronology of leaks is provided in Table 1 below), it is likely that corrosion will continue to occur and result in future releases, likely at an accelerating frequency and with increasing severity. It is likely that all the tanks have areas where their wall thickness has been substantially reduced to the point of imminent fuel release. In fact, unless there is evidence, or persuasive arguments founded on sound scientific and engineering principles, to the contrary, it is expected that all tanks are in imminent danger of leaking.

The predicted corrosion rates used to establish remaining tank life do not appear to consistently consider internal corrosion processes or appropriate safety factors. Estimated corrosion rates of 0.0017 inch per year (Enterprise Engineering Inc., 2008a; Enterprise Engineering Inc., 2008b) appear to significantly underestimate actual corrosion rates; a rate as high as 0.0045 inch per year was reported for a through-wall hole in Tank #15 (Weston, 2007a). If we were to assume that such corrosion rates are likely to exist, at least in certain areas on the other tanks (not an unreasonable assumption), it becomes clear why there have been so many leaks in the past. That is, 0.0045 inch per year times 72 years is 0.328 inch, which is greater than the 0.25-inch wall thickness of the tanks. Likewise, pit depths of 0.300 inch found on tank bottoms (Weston, 2007b) do not appear to have been taken into account in the setting of repair and re-inspection intervals.

3. Page 2, Paragraph 1.1: Subject Matter Experts Involvement: BWS is a key stakeholder and acknowledged subject-matter expert by the Parties and should provide technical review and comments on all work plans and deliverables prior to their approval by the Regulatory Agencies.
4. Page 2, Paragraph 1.2: Community Involvement: the Parties should arrange and hold public meetings at certain intervals (i.e., quarterly, semi-annually, etc.).
5. Page 2, Paragraph 1.2: Community Involvement: According to the SOW, the Navy and DLA "*shall submit a synopsis of each final report developed under the AOC, and this SOW, to the Regulatory Agencies who may make that synopsis available to the public.*" The final reports developed for the Facility under the AOC and SOW should be made available to the public in their entirety. Additionally, public access should not only be limited to final reports but should include other documents including, but not limited, to scopes of work, regulatory agency written responses (page 2, paragraph 1.4), and technical memoranda. Public access to these reports should be provided in accordance with FOIA for federal agencies and the Hawaii Uniform Information Practices Act for Hawaii government offices and agencies. We strenuously object to any withholding of data and findings from the SOW work activities.
6. Page 2, Paragraph (5): The SOW describes a risk/vulnerability assessment. Please clarify provide more information about this assessment, especially how it will interrelate to the other SOW tasks and how it will affect the Navy's Contingency Plan.
7. Page 3, Paragraph 1.6: Quality Assurance: This section states that "*The Navy and DLA shall include a discussion of quality assurance and quality control ("QA/QC") procedures in each Scope of Work submitted to the Regulatory Agencies for approval. The QA/QC procedures shall be used to ensure that environmental or other data generated meets standards established by the Parties*."
    a. A stand-alone QAPP should be developed, approved, and strictly followed during all data acquisition activities at the Red Hill site. The QA/QC procedures outlined in the QAPP will improve the reliability and validity of field and laboratory measurements used for decision making purposes.

b. If this work is performed under US EPA RCRA and/or Sole Source Aquifer regulatory rules, then US EPA QA/QC requirements for these programs should be followed.

c. The term "*standards*" needs to be further defined. How and why will the Parties, defined in the SOW as including the Navy, DLA, Hawaii DOH, and US EPA (Page 1, Introduction), establish environmental or other data standards?

d. Furthermore, this section states that the Navy and DLA use laboratories that have a documented quality system that complies with federal regulations. The QAPP discussed in (a) above should also comply with these federal regulations.

8. Page 4, Section 3: Tank Upgrade Alternatives: Since the term Best Available Practicable Technology (BAPT) is not a state, federal, or industry term, additional clarification is required. The factors considered should include evaluating and quantifying the level of environmental protection (not limited to groundwater) that each BAPT alternative provides.

9. Page 4, Section 3: Tank Upgrade Alternatives: Please clarify the justification by which the Parties determined the need for additional studies of tank rehabilitation methods when the Navy has already conducted several similar studies since the late 1990s. For example, the 2008 Red Hill Repair Tank Options Study (Enterprise Engineering, 2008a) identified the following two alternatives for upgrading the tanks:

    a. Alternative 1 – Composite Tank: The Composite Tank consists of inspecting and repairing the existing steel liner in each tank, which would become the secondary containment system, and then constructing a new liner with a 3-inch-wide interstitial space between the new liner and the existing liner. The interstitial space would be filled with grout and have a leak detection system.

    b. Alternative 2 – Tank Within A Tank: The Tank Within A Tank concept consists of inspecting and repairing the existing steel liner in each tank, which would become the secondary containment system, and constructing a new tank inside the existing tanks with a 5-foot-wide annular space between the new tank and existing tank shell that is accessible for inspection and visual leak detection.

    Enterprise Engineering (2008a) recommended that the Navy authorize a single tank repair project as a means of proving up the concepts and confirming overall cost validity. According to this same report, Enterprise Engineering also performed a similar study in 1998 to develop possible repair options for Tank #19, which was driven by tank integrity issues, environmental concerns, lack of leak detection capability, and lack of secondary containment. These studies concluded that a composite tank option is a viable option for a long-term life extension renewal of the Red Hill tanks. The tank within a tank alternative also has merit in that it provides a long-term life extension, secondary containment, and the capability to detect and locate leaks as required by federal regulations (40 CFR Subpart D – Release Detection). Furthermore, the study by Enterprise Engineering Inc. (2008a) also concluded that the repair and recoating approach does not improve the service interval of the tanks beyond 20 years, at which point another cycle of repair and mitigation is required.

The SOW should address these conclusions and explain why the Parties ignored the previous work and now seek 22 years or more to carry out additional studies and implement their findings.

10. Page 6, last paragraph of section 3.5: Page 6 of the SOW states "*Tanks to which BAPT has not been successfully applied in accordance with a TUA Decision Document shall be taken out of use, temporarily closed, and emptied of all regulated substances no later than twenty-two (22) years from the effective date of this AOC unless an extension of time to implement BAPT has been granted pursuant to this Section…The Regulatory Agencies may grant an extension, or a series of extensions, of the twenty-two (22) year deadline, totaling no more than five (5) years, to allow additional time to apply BAPT….*"
    a. The stipulation that tanks be "temporarily" closed leaves open the possibility that tanks be reopened at a later point in time. The SOW does not articulate conditions under which the temporary closure may be reversed, or scenarios under which the closure must remain permanent.
    b. The SOW gives no sound engineering or scientific basis for the selection of a 22-year remediation period with an allowable extension of up to 5 years. Tank leaks were noted as early as 1948 (Whitacre, 2014h), and there is an extensive history of general and localized corrosion, weld discontinuities and defects, and hydrotesting failures for the tanks and associated piping. A number of tanks have patch plates, some with unknown provenance, installed to mitigate wall corrosion that resulted in through-wall holes (Dunkin & Bush, 2007a; Dunkin & Bush, 2007b; Enterprise Engineering Inc., 2008b). There is evidence of improper coating application, coating holidays, and premature coating degradation, calling into question the effectiveness of polyurethane coatings introduced in the late 1970s and early 1980s (Whitacre, 2014c; Whitacre, 2014d; Whitacre, 2014e; Whitacre, 2014i; WillBros, 2010). An engineering analysis performed in 2008 stipulated that Tank #2 should undergo an API 653 out-of-service internal inspection no later than 2028. However, there is no indication that the 22-year deadline takes into account the current assumed corrosion rate of 0.0045 inch/year with the factor of two on this estimated rate, i.e., it does not use a corrosion rate of 0.009 inch/year to estimate the safe re-inspection interval.

    Given these considerations, please clarify whether the Parties believe that the tanks will not release fuel over the 22-year time period, or whether the parties assume that the risk of release is acceptable to the Parties. If so, please provide the scientific and engineering justification for this belief or assumption. Please clarify what probability of release (as a function of quantities and frequency of release) the Parties have assumed are acceptable, and on what engineering and scientific basis, given that the tanks will continue to corrode and deteriorate if not upgraded.

11. Page 6, Paragraph 3.6: Pilot Programs: This section states that "*Any proposed pilot program shall at least be designed to provide environmental protection substantially equivalent to that of the currently approved BAPT at the time of the pilot program approval".* The timeline of events is unclear. Can a pilot program be initiated on tanks that have not had a BAPT implemented in accordance with Paragraph 3.5, Page 5?

12. Page 7, second and third paragraphs: The SOW mentions that "at least once every 5 years…Navy and DLA shall (re-evaluate) new (tank upgrade) technologies to determine if either Best Available Practicable Technologies, Tank Inspection/Repair/Maintenance procedures, or both, should be modified…." The SOW should not be allowed to propose less stringent BAPT or tank inspection, repair, and maintenance (TIRM).

13. Page 8, Section 4: Release Detection/Tank Tightness Testing: Please clarify the justification by which the Parties determined the need for additional studies to evaluate new release detection alternatives when the Navy has implemented and performed third-party evaluations on mass-based leak detection systems installed on Tank #16 and Tank #9 in the later 1990s and early 2000s (Karr, 2002). The Navy, under the *Environment Security Technology Certification Program (ESTCP)*, developed and validated a low-range differential pressure (LRDP) system for bulk USTs that reportedly exceed regulatory requirements for leak detection. According to the Navy's final report, a LRDP system was installed in Red Hill Tanks #16 and #9 in 1996 and 2001, respectively. According to this same report, a third-party evaluation was completed for Tank #9 (Karr, 2002).

    The SOW should (1) address the conclusions stemming from the aforementioned studies, (2) identify which previously studied/recommended leak detection methods have been rejected and on what basis, and (3) clarify on what basis the Parties now seek additional time and money to carry out similar studies to determine optimal methods for leak detection.

14. Page 11, Paragraph 6: Investigation and Remediation of Releases: The report, *Tank 5 Initial Release Response Report Red Hill Bulk Fuel Storage Facility,* was submitted in April 2014. How will the Investigation and Remediation of Releases deliverable discussed in this section differ from this 2014 report (Navy, 2014)? Several fundamental elements were missing from this 2014 report including, but not limited to the following:

    a. Initial responses to the release include the increased frequency of groundwater sampling and fluid level measurements at select wells. This increased frequency was only continued for a brief period immediately after the release was discovered. These results are discussed at length, but there is no reference to the anticipated travel time for LNAPL or dissolved-phase contamination to reach these wells (Navy, 2014). The brief increased monitoring frequency may not be the appropriate initial release response depending on travel times for contaminants to reach these wells.

    b. A detailed discussion of how LNAPL will move within the approximate 80-foot-thick vadose zone (distance between the bottoms of the tank and groundwater) is omitted. Additionally, a detailed discussion on the movement of contamination in the saturated zone is omitted (Navy, 2014). The movement of contaminants through the vadose zone to groundwater as a migration pathway is acknowledged, but the report does not discuss the importance of understanding the geologic and hydrogeologic framework at a site-specific scale to accurately assess the movement of contaminants (fuel and vapor) in the vadose zone (and the potential for retardation of movement/retention), contaminants (fuel and dissolved-phase) in the saturated zone, and contaminants (fuel and dissolved-phase) in potential perched groundwater zones (Navy, 2014). The reports reference migration pathways that are discussed in the 2007 Final Technical Report (TEC, 2007) and the 2008 Groundwater Protection Plan (TEC, 2008).

15. Page 11, Paragraph 6: Investigation and Remediation of Releases: The section also states that the deliverable shall include "*an evaluation and discussion of potential remediation methods for the January 2014 Tank #5 release and any future release.*" The mass of fuel lost during the January 2014 release has not been accounted for in the subsurface (Navy, 2014); additionally, the dissolved-phase contaminant plume has not been adequately defined (ESI, 2015a; ESI, 2015b). A comprehensive understanding of the nature and extent and fate and transport of contamination in the subsurface (vadose zone and saturated zone) is imperative to conducting a dependable evaluation of remedial technologies.

16. Page 11, Paragraph 6: Investigation and Remediation of Releases: This section of the SOW discusses the deliverables associated with "determining the feasibility of alternatives for investigating and remediating releases from the facility." This section of the SOW would be written more appropriately if it followed the Hawaii DOH Office of Hazard Evaluation and Emergency Response (HEER) technical guidance manual (TGM) (Hawaii DOH, 2008). The Hawaii DOH HEER TGM describes a three-stage site assessment process (Site Investigation, Environmental Hazard Evaluation, and Response Action) to determine whether further action is necessary for a site. It is important that Section 6.0 of the SOW be revised to reflect this three-stage regulatory process. Additional actions associated with these stages that must be addressed within the SOW should include, but are not limited, to the following:

    a. Stage 1: Site investigation to determine the extent and magnitude of contamination. Per section 3.1.2 of the Hawaii DOH HEED TGM, "*Consult with Stakeholders. Stakeholders are individuals or organizations who are affected by, who can affect, or who otherwise have interest, in the site (e.g., owners, operators, employees, government officials, past owners or occupants, nearby residents, developers, or lenders). It is critical to consult with stakeholders early in the investigation scoping process to aid in an understanding of site issues. Early consultation with stakeholders, especially with the HEER Office, will help minimize the risk of wasting time and effort on insufficient investigation designs. Stakeholders may also be a source of valuable site information (e.g., site employees may be aware of hazardous substance release areas, and locations of important site features).*" Please provide a detailed plan (including schedule) of stakeholder involvement relative to the site investigation process. Per Section 3.3 of the Hawaii DOH HEER TGM, "*the Conceptual Site Model (CSM) prepared during the first step of the systematic planning is a comprehensive representation of site environmental conditions with respect to recognized or potential environmental hazards. CSMs are also a necessary starting point for preparation of an Environmental Hazard Evaluation. The CSM is presented in a series of figures that depict current and future site conditions in three dimensions, with* *textual explanations of the figures, as needed. There are many ways to present a CSM.*"

The SOW should be revised to include development/update of a site-specific CSM. A CSM is an important document that assists in identifying data needs (data gaps), guiding data collection, and evaluating risk to human health and the environment (ASTM, 2014). A CSM serves as the backbone for planning additional work and guiding the decision making process. A new CSM needs to be developed or the CSM described in the 2007 Final Technical Report needs to be updated. It is strongly recommended that a CSM deliverable be included as its own component within the SOW. Once an updated CSM has been developed, the CSM should be updated in an iterative process as additional data are collected. Please include a plan and schedule for how the CSM will be updated as new site data are generated.

b. Stage 2: Environmental Hazard Evaluation (EHE) to determine the presence or absence of potential environmental hazards. Per Section 13.3 of the Hawaii DOH HEER TGM, "*the Tier 1 Environmental Action Levels (Tier 1 EALs) are concentrations of contaminants in soil, soil gas and groundwater below which the contaminants are assumed to not pose a significant threat to human health or the environment. Exceeding the Tier 1 EAL does not necessarily indicate that contamination at the site poses environmental hazards. It does, however, indicate that additional evaluation is warranted. This can include additional site investigation and a more detailed evaluation of the tentatively identified environmental hazards. For example, the Tier 1 EALs incorporate conservative, risk-based exposure assumptions that may not be applicable under current site conditions and warrant a more site-specific risk assessment (see also Hawaii DOH HEER TGM Section 13.5.3). The action levels, or approved alternatives, can be used to delineate specific areas of the site that require response actions. These actions can vary, depending on the hazard present and site conditions*." Due to the groundwater resource being threatened, the Navy and DLA must appropriately use both Tier 1 EALs for Drinking Water Toxicity, unless more stringent US EPA MCLs exist, and a site-specific action risk assessment with BWS inputs for exposure scenarios as part of determining any action levels. Additionally, an evaluation of unregulated substances should be considered.

c. Stage 3: Response Action to determine appropriate actions to address the identified hazards include two response action processes: the removal action process (typical for emergency responses) and the remedial action process. Because of the sensitivity of the underlying aquifer and potential groundwater receptors in the immediate area of the release, it is appropriate that the work at Red Hill should be conducted under Section 2.3 of the Hawaii DOH HEER TGM, Emergency Response.

17. Page 12, Paragraph 6.3: Investigation and Remediation of Release Report: We strongly advise including interim progress reports and meetings for the deliverable outlined in SOW Section 6 to guarantee the regulatory agency's approval of the deliverable. Characterization work on complex sites such as Red Hill requires an iterative approach

that involves the participation of all vested parties and stakeholders in the decision making process.

18. Page 12, Paragraph 6.4: Investigation and Remediation of Release Report: Investigation and Remediation of Releases Decision Meeting: This section of the SOW describes a decision meeting to be held once the Investigation and Remediation of Releases Report has been issued to "*evaluate the feasibility to investigate and remediate potential releases from the facility to the maximum extent possible*." This meeting would be more appropriately held in a public forum. Per Section 16.3.2 of the Hawaii DOH HEER TGM: "*For remedial response actions, public notice and a minimum 30-day public comment period to review the Draft Remedial Action Memorandum (RAM) and associated documents and provide comments are required under the Hawaii State Contingency Plan (SCP). This public notice and comment period must be completed prior to adopting the Final RAM and implementing the selected remedial alternative. A public meeting may also be held to review and discuss the Draft RAM, at the discretion of the HEER Office…In some cases, public participation and community involvement activities should be started long before the Draft RAM is prepared. Site assessment and remedial investigation activities can identify the presence of off-site contamination, and potentially affected human and ecological receptors. Early contact with adjacent property owners as well as affected and interested groups, such as neighborhood boards, community groups, and environmental or public interest organizations, may be valuable in helping to identify site-specific issues relevant to the remedial action that otherwise might be overlooked. At a minimum, it is recommended that a public participation plan be developed concurrent with, or as soon as the Draft RAM is completed.*" It is appropriate to develop a public participation plan immediately for the additional work to be conducted at the Red Hill facility. A meeting should be held with all stakeholders and other interested parties within 30 days of the signing of the AOC to discuss the scope of a public participation plan. A public participation plan should be developed for review and comment within 14 days following that meeting. All comments should be addressed within 30 days. Once all comments are addressed, the public participation plan should be adopted and followed. The public participation plan should include language that prior to the approval of any corrective action plan(s), public notice must be given and a minimum 30-day comment period to review the draft corrective action plan(s) must be allowed. The public participation plan should further allow for a review period following the addressing of comments to determine if all issues have been addressed to the satisfaction of the public.

19. Page 12, Paragraph 7: Groundwater Protection and Evaluation: This section states "*characterize the flow of groundwater around the Facility.*" The word "around" needs to be replaced with "around and beneath."

20. Page 12, Paragraph 7: Groundwater Protection and Evaluation: This section states "*this Section may include the installation of additional monitoring wells as needed.*" The word "may" needs to be replaced with "will." The current dissolved-phase plume is undefined; dissolved-phase contamination has been detected in groundwater samples from cross-gradient (HDMW2253-03) and up-gradient wells (RHMW04) (ESI, 2015a; ESI, 2015b). Note: HDMW2253-03 is a deep monitoring well.

21. Page 12, Paragraph 7: Groundwater Protection and Evaluation: None of the work descriptions in the subsequent sections specifically describe how site project data/information (both past and future) will be maintained and made available to the Parties, stakeholders, and the public. Will summary electronic databases be available for monitoring well water level data and water quality data? Again, there is no specific description of how past data/information will be “qualified for use” under the QA/QC procedures developed under this SOW.
22. Page 12, Paragraph 7: Groundwater Protection and Evaluation: This section describes the steps to be taken to “update” the existing Groundwater Protection Plan. It also states that work performed under this section “may” include the installation of additional monitoring wells. It is appropriate to include in this section a discussion that the Hawaii DOH agrees that the necessary information about the characteristics of the site and the nature of the release to adequately assess the impact or potential impact of the release on human health and the environment has been acquired, and that this information includes, at a minimum, data on the nature and estimated quantity of release, and data from available sources and any and all previous site investigations concerning surrounding populations, water quality, use and approximate locations of wells potentially affected by the release, subsurface soil conditions, locations of subsurface sewers, climate data, and land use (HAR Subchapter 7 §11-281-74(a)(b)). If this information is not available and/or inconclusive, then additional monitoring wells are needed and should be made part of the corrective action plan.
23. Page 12, Paragraph 7.1: Groundwater Flow Model Report: Part of the deliverable in this section includes refining the current groundwater flow model to *“improve the understanding of the direction and rate of groundwater flow within the aquifers around the Facility.”* The word “around” needs to be replaced with “around and beneath.”
24. Page 13, Paragraph 7.1.2: Groundwater Flow Model Report Scope of Work:
    a. The model has been developed on a much larger scale and may not accurately assess the contaminant fate and transport on a site-specific scale. Due to the complex hydrogeologic framework, it is imperative to understand the direction and rate of groundwater flow on a site-specific scale.
    b. The extraction rate for the regional aquifer test varied between 10 and 18 million gallons per day during the pumping period (TEC, 2007). The validity of this test and resulting data needs to be evaluated further as these data were used to calibrate the existing groundwater model which will be updated per the SOW (TEC, 2007). Additionally, the groundwater flow model needs to be created using site-specific hydraulic parameters, not parameters obtained from the literature.
25. Page 13, Paragraph 7.2: Contaminant Fate and Transport Model Report: The scale of the model is not appropriate for modeling contaminant transport beneath the Red Hill facility. The 2007 Final Technical Report explores fate and transport scenarios using the generalized groundwater flow model; this may not be appropriate and likely will result in inaccurate assessment of contaminant movement (TEC, 2007).

26. Page 14, Paragraph 7.3: Groundwater Monitoring Network: State that the purpose of this deliverable is to *"evaluate the number and placement of groundwater monitoring wells required to adequately identify possible contaminate migration…to obtain additional data for the Groundwater Flow Model and Contaminant Fate and Transport Model Report."*

    a. What is the decision making process with regard to the placement of new monitoring wells? The detections of TPH-d in the "up-gradient" monitoring well RHMW04 and "cross-gradient" deep monitoring well HDMW2553-03 suggest that the contaminant migration path does not only follow the anticipated groundwater flow direction, and that the vertical extent has not been defined (ESI, 2015a).

    b. The proposed schedule suggests that the groundwater flow model and fate and transport model will be updated in parallel with the groundwater monitoring well network. The SOW should be revised to first site and install additional monitoring wells before the flow and transport models are completed. Inadequate site characterization will lead to inadequate models which will lead to inadequate protections of our drinking water.

27. Page 14, Paragraph 7.3.3: Groundwater Monitoring Well Network Report: The statement *"including those already installed"* needs additional clarification. Does "those" mean existing monitoring wells, newly installed monitoring wells as part of the Groundwater Protection and Evaluation SOW Component (Paragraph 7, Page 12), or a combination of both?

28. Page 15, Paragraph 8: Risk/Vulnerability Assessment:

    a. This section states *"The Risk/Vulnerability Assessment Report may include."* The word "may" needs to be replaced with "shall."

    b. The purpose of this portion of the work scope is to evaluate hazards to the drinking water aquifers posed by failure of the field-constructed USTs at Red Hill. We presume that this is anticipated to be a formal, probabilistic risk assessment in which the likelihood of various failure modes and effects are quantified and compared. Typically this type of multi-hazard risk assessment has three fundamental aspects: (1) quantification of the hazards (e.g., return periods for earthquake ground shaking or rates of ground/slope movements), (2) given the hazards, calculation of the probability of triggering one or more failure modes, and (3) predicting the possible consequences of each failure mode.

       The probability of failure is calculated based on the ability of the structures to withstand anticipated loads, and will necessarily be a function of the expected structural condition of the tanks over the remainder of their design life. This calculation will likely need to be informed by the results of other aspects of the SOW, in particular, Section 2 – Tank Inspection, Repair and Maintenance, and Section 5 – Corrosion and Metal Fatigue Practices. The future structural condition of the Facility will change with time as a function of the ongoing corrosion and potential physical improvements. The Navy needs to provide additional detail regarding how (or if) the condition assessment results will be used in their risk/vulnerability assessment, and whether the timing of those results will affect the expected completion of the risk/vulnerability study. In addition, the Navy needs to specify which standard(s) will be used to design the risk study and by which standard(s) the results will be assessed.

29. Page 15, Paragraph 8: Risk/Vulnerability Assessment: This section describes the deliverables to be developed and work to be performed to assess the level of risk the facility may pose to the groundwater and drinking water aquifers. *The Risk/Vulnerability Assessment should also include the factors defined as part of an "exposure assessment" described in HRS §342L-50*.

30. General Comments regarding groundwater sampling and the approved Work Plan/Sampling Analysis Plan (WP/SAP) (TEC, 2014).

    a. The approved WP/SAP document appears to be omitted from the Administrative Record Index. Please provide this document for review immediately.

    b. Is future groundwater sampling to be completed under the already approved SAP? Several issues with the approved SAP are evident in the most recent 2015 1st Quarter Groundwater Report. The SOW should include a SAP deliverable that complies with state and federal regulations.

    c. Stabilization criteria for sampling at outside monitoring well RHMW04 and inside monitoring well RHMW01 do not follow the US EPA low-flow groundwater sampling guidance (Puls and Barcelona, 1996; ESI, 2015a; ESI, 2015b).

    d. Monitoring well OWDFMW01 (5L were purged, water column height is 24.2 feet) and Halawa deep monitoring well HDMW2253-03 (5 L were purged, water column height is 1,368 feet) had less than one well casing volume removed via bailing prior to sampling (ESI, 2015a). Confirm that sampling procedures comply with state and federal regulations.

    e. Contamination has been detected at HDMW2253-03, the deep monitoring well, indicating that the vertical extent is unknown.

    f. Several laboratory reporting limits exceed Hawaii DOH EAL for Drinking Water Toxicity; the presence of these contaminants with laboratory reporting limits greater than standards cannot be accurately assessed. The reports conclude that the elevated reporting limits do not affect the assessment of groundwater contamination with the exception of 1,2-dichloroethane. Groundwater samples are not analyzed for nitrate, iron, manganese, and sulfate, which are important petroleum hydrocarbon degradation indicators (ESI, 2015a; ESI, 2015b).

    g. The discussion on naphthalenes being biased low via US EPA Method 8270 should be a driver to include analysis of naphthalene by both US EPA Method 8260 and US EPA Method 8270. It is stated that the bias low should not bias project decisions (for outside wells), yet naphthalenes exceedances have been documented (for inside wells) and therefore should be considered a contaminant of concern (ESI, 2015a; ESI, 2015b). All efforts should be made to obtain the most reliable and representative data.

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Table 1: Site Chronology

1940	The existing Red Hill tanks were constructed between late 1940 and September 1943 (Enterprise Engineering Inc., 2008a).
1940 Dec. 15	Tank #1 construction started (Whitacre, 2014b).
1941 Jul.	Tank #16 excavation started (Whitacre, 2014a).
1942 Feb.	Finished gunniting side walls of Tank #1 (Whitacre, 2014b).
1942 Oct.	Tank #1 finished; turned over to Navy to fill with diesel oil (Whitacre, 2014b).
1943 May	Tank #16 turned over to Navy for operation (Whitacre, 2014a).
1947	Tanks #1 and #2 leaks reported (Whitacre, 2014b). Diesel oil draining from Tank #1 telltale at a rate of 0.625 gallons per minute (Whitacre, 2014b).
1947 Oct.	Tank #2 telltale leak of unknown severity noted; tank emptied (TEC, 2008; Whitacre, 2014h).
1948 Jul.	Tank #16 telltale leak noted; tank emptied (TEC, 2008).
1949 Jul.	Tank #16 telltale leak. Level down 2.25-inches in 11 days (approximately 11,000 gallons lost) (TEC, 2008).
1949 Mar.	No leaks reported for Tank #14 from Mar. 1949 to Feb. 1982 (TEC, 2008; Whitacre, 2014f).
1949 Dec.	Tank #16 was refilled and the level decreased 3.63-inches in about four days, indicating a loss of about 18,000 gallons. No information was given as to when the leakage was stopped (TEC, 2008).
1950 Dec.	No leaks were reported for Tank #18 from Dec. 1950 to Sep. 1975 (TEC, 2008; Whitacre, 2014g).
1952 Mar.	No leaks were reported for Tank #8 from Mar. 1952 to Apr. 1983 (TEC, 2008).
1953 Jan.	No leaks were reported for Tank #4 from Jan. 1953 to Apr. 1983 (TEC, 2008).
1953 Mar.	No leaks were reported for Tank #3 from Mar. 1953 to Dec. 1981 (TEC, 2008).
1953 Aug.	Tank #1 leak found on telltale number 7; crack found in tank (TEC, 2008; Whitacre, 2014b).
1954 May	Tank #2 second leak found. Reported leak rates of 3 pints in 2 hours and 10 gallons in 7 hours; no reported estimate of volume loss (Whitacre, 2014h).
1958 Apr.	Tank #9 leaked approximately 1,500 gallons from telltale in the Apr. to May timeframe (TEC, 2008).
1960 Aug.	No leaks were reported for Tank #20 from Aug. 1960 to Mar. 1979 (TEC, 2008; Whitacre, 2014i).

1963 Jun.	Tank #6 telltale system problems reported; no clear indication of external leaks (TEC, 2008).
1964 Jan.	Tank #12 dome section leak identified; no evidence of corrosion on bottom plates or piping (TEC, 2008; Whitacre, 2014e). Tank #11 found to be in good condition, with no evidence of liner plate corrosion in bottom section (Whitacre, 2014e).
1964 Apr.	Tank #7 cleaning completed. Stated to be in good shape; no corrosion found (Whitacre, 2014c).
1964 Jun.	Tank #19 weld leak discovered (Whitacre, 2014i). The telltale leak was estimated to be about 5 mL/hr. Other small holes discovered during inspection were repaired (TEC, 2008; Whitacre, 2014i).
1964 Aug.	Tank #1 leak discovered (1 quart per 2.5 minutes) (Whitacre, 2014b).
1965 Mar.	Tank #5 exhibits suspected leak in telltale system (1 gallon per 1.25 hours); tank was worked on intermittently for six months, but no leak found. It was suspected that the leak “partially rusted over” (Whitacre, 2014h).
1969 Jun.	Tank #17 reported as leaking about 1 gallon per 1.5 minutes based on telltale. Fuel was transferred (TEC, 2008; Whitacre, 2014g).
Late 1960s/Early 1970s	Full tank coating implemented (including aluminum metalizing of the floors) using the earliest versions of the NRL polyurethane coating system (Enterprise Engineering Inc., 2008a).
1970 Aug.	Tank #1 exhibited unexplained fuel drops amounting to 31,294 gallons between Aug. 1970 and Apr. 1972 (TEC, 2008; Whitacre, 2014b).
1972 Feb.	Tank #5 telltale leak at 2 quarts per day; response uncertain (TEC, 2008; Whitacre, 2014h).
1973 Jan.	Tank #10 leak suspected; tank emptied (TEC, 2008; Whitacre, 2014d).
1973 May	Tank #16 telltale leak of 1 drop per 20 seconds (TEC, 2008).
1973 Mar.	Tank #12 emptied due to suspected leak (TEC, 2008).
1973 Nov.	Tank #7 telltale leak (possibly only internal); tank emptied (TEC, 2008).
1975 Jan.	Tank #16 was emptied (TEC, 2008). Tank #17 started leaking based on telltale (Whitacre, 2014g).
1975 May	Tank #1 exhibited unexplained fuel drops amounting to 32,765 gallons between May 1975 and Aug. 1978 (TEC, 2008; Whitacre, 2014b).
1976	RCRA (Resource Conservation and Recovery Act of 1976) enacted (US EPA and Hawaii DOH, 2015a).
1976 Jan.	Tank #16 had tank bottom “magnafluxed” in between Jan. and May; large pits (approximately 0.5 inch) found (Whitacre, 2014a).
1976 Apr.	Tank #10 was emptied and removed from service as a result of a leak detected from telltale (TEC, 2008; Whitacre, 2014d).
1976 May	Tank #13 reported as leaking (TEC, 2008; Whitacre, 2014e).

1978 May	Tank #1 history refers to Contract N62471-77-C-1316 for MILCON Project P-060, Modernization of Red Hill POL Facility awarded to Dillingham Corp. (Hawaiian Dredging and Construction of Honolulu, HI);$19,912,000 with project administered by ROICC Pearl Harbor (Whitacre, 2014b).
1978 May	Tank #7 exhibits significant telltale leak; tank emptied (TEC, 2008; Whitacre, 2014c).
1978 Jul.	Tank #9 repair performed from Jul. 1978 to Feb. 1981; telemetering system installed. Leak test rates after the repair project were reported to range from 4.5 to 17.9 gallons/day; no documentation of any actions taken to mitigate Tank #9 leak(s) (TEC, 2008).
1978 Oct.	Tank #10 repair performed from Oct. 1978 to Apr. 1980; telemetering system installed (TEC, 2008).
1980s	Federal and State programs for the management of USTs first published (US EPA and Hawaii DOH, 2015a).
1980 Feb.	Tank #7 leak rate after filling measured, and approximately “6,505 gallons leakage measured until rate dropped to< 13 gallons per day below 207 foot fill level” (TEC, 2008; Whitacre, 2014c).
1980 Aug.	Tank #11 reported to be leaking 1,000 to 1,500 gallons per day according to Whitacre (2014e) and 165 to 2,412 gallons per day (Anonymous, Undated). Leak location determined to be at 51 feet from bottom of tank . Repairs made. Based on these volumetric flow rates, fuel loss was estimated to be between 10,000 to 20,000 gallons (TEC, 2008).
1980 Sep.	Tank #11 emptied and repaired (TEC, 2008).
1981	Tank #16 was found to be leaking badly after repairs when filled to 242-foot level (Anonymous, Undated).
1981 Jan.	Tank #10 found to have a severe leak near the top of the tank (between the 235- and 242-foot level) during refill (TEC, 2008). Fuel ran out on the concrete near the first platform on the stairway to top of dome; tank emptied (TEC, 2008; Whitacre, 2014d).
1981 Feb.	Tank #12 was found to be leaking at a rate of 1,440 gallons per day after repairs at the 100-foot level (TEC, 2008; Whitacre, 2014e). Tank #12 returned to service after leak testing (Whitacre, 2014e).
1981 Mar.	Tank #6 removed from service for repairs and lining (Whitacre, 2014c).
1981 Apr.	Tank #7 removed from service for repairs; put back in service in May 1981 (TEC, 2008).
1981 May	Tank #5 removed from service for repairs and lining (Whitacre, 2014h). Tank #12 removed from service for a second time for leak repairs (Whitacre, 2014e).
1981 Jul.	Tank #15 found to be leaking badly upon refilling after tank repair and lining (TEC, 2008; Whitacre, 2014f).

1981 Aug.	Tank #15 removed from service from Aug. to Oct. 1981. Following repair, leak testing showed continued leaking; tank repaired again (TEC, 2008).
1981 Sep.	Tank #4 removed from service for repairs and lining (Whitacre, 2014h). Tank #13 returned to service after lining and repairs; leaks found above the 188-foot level and repaired (TEC, 2008; Whitacre, 2014e).
1981 Oct.	Tank #1 modernization repair project started (TEC, 2008). Original telltale pipes removed and replaced; holes in tank shell patched (Whitacre, 2014b). Tank #10 refilled after repairs had been made as a result of leak in Jan. 1981 (TEC, 2008). Tank #16 refilled after repairs and lining and was found to be “leaking badly” (TEC, 2008; Whitacre, 2014a).
1981 Nov.	Tank #16 was removed from service; reworked and returned to service in Dec. (TEC, 2008; Whitacre, 2014a).
1981 Dec.	Tank #2 removed from service for repairs and lining (TEC, 2008; Whitacre, 2014h).
1982 Feb.	Tank #14 removed from service for leak repairs (Whitacre, 2014f).
1982 Mar.	Tank #3 removed from service for repairs and lining (Whitacre, 2014h).
1982 July	Tank #1 estimated as having leaked 5,517 gallons from Jul. 1982 to Jan. 1983 based on drops in fuel level (TEC, 2008; Whitacre, 2014b).
1985 Jan	Tank #19 cleaned and taken out of service for Automated Fuel Handling System Project by Asteroid Corp (Whitacre, 2014i). Tank not placed back in service, as “weeping” was observed from some of the channel doublers in the upper dome (Enterprise Engineering Inc., 2008a).
1988	Federal UST regulations issued (US EPA and Hawaii DOH, 2015a).
1992 – 1999	Ogden completed several investigations at the Red Hill oily waste disposal facility (OWDF) located approximately 3,200 feet west of the facility tanks. Remedial Investigation/Feasibility Study (RI/FS) initiated (TEC, 2006).
1995	Facility records declassified (TEC, 2007).
1995 Jun.	Tank #12 found to have a deep pit in upper section of “A” course bottom plate (Whitacre, 2014e).
1995 Sep.	Tank #8 side walls (0.25-inch thick) inspected between Sep. and Oct. and found to contain deep pits (Whitacre, 2014d). Pits were found as unbroken blisters in the coating surrounded by wet spots of fuel; when the blisters were opened, corrosion and pitting were found (Whitacre, 2014d). UT thickness measurements around 24-inch diameter patch indicated several areas where the shell thickness was only 0.05 to 0.07 inch thick (Whitacre, 2014d).

1996 Jan.	Tank #10 inspected for suspect areas of the shell plate in the upper dome and near the expansion joint. Several small through-wall holes in the shell plate found due to backside corrosion (Whitacre, 2014d). Several porous welds found that had fuel seeping through (Whitacre, 2014d). Several small areas of damaged polyurethane coating found that exposed the shell plate (Whitacre, 2014d).
1996 Apr.	Tank #9 middle 18-inch pipe support hole identified (TEC, 2008).
1998	Tank #19 repair option study performed by Enterprise Engineering Inc. (Repair Tank 19 Red Hill FISC Pearl Harbor, HI DESC Project PRL 98-9) (Enterprise Engineering Inc., 2008a).
1998	Tank #19 "back seepage" observed during tank maintenance project (TEC, 2008).
1998 Jul.	Tank #7 notes state that from Jul. to Sep., ultrasonic thickness testing and vacuum testing were done along with checks for pitting and chloride levels; flame-sprayed aluminum was applied; holidays found in coating (Whitacre, 2014c). Same notes are reported for Tank #8 (Whitacre, 2014d).
1998 Aug.	Tank #8's bottom plate found to be heavily pitted. (Whitacre, 2014d).
1998 Sep.	Tank #6 note indicates that NRL polyurethane coating system applied to inside of slop line under MILCON Project P-060 in the early 1980s had failed. Red rust found attached to bottom of coating samples, indicating improper surface preparation. Extreme thickness (0.375-inch) of coating sample indicated improper coating application (Whitacre, 2014c).
1998 Oct.	Tank #16 experienced a loss of 1,469 gallons (71 gal/day) over 30.7 days (Whitacre, 2014a). Cores removed from under the center of Tank #16 found to smell of fuel and contain oily sludge-like material (Whitacre, 2014a). Tank #16 emptied from Oct. to Nov. due to concerns over tank level drop; petroleum found under base of tank (Whitacre, 2014a).
1998 Nov. 10	First report by Navy to Hawaii DOH of a release from the Facility following the discovery of petroleum-stained basalt cores beneath the tanks (US EPA and Hawaii DOH, 2015a).
1999 Mar.	J. Gammon (FISC FUEL SUPT) compiled tank histories from all available sources between Mar. and Apr. 1999 (Whitacre, 2014b).
1999 Sep.	Tank #1 telltale pipe number 11 found to be leaking a steady stream into the Lower Access Tunnel. The pipe was capped to stop the leak (Whitacre, 2014b).
2000 Jan.	State of Hawaii promulgated rules requiring owners and operators to report suspected or confirmed releases from USTs (US EPA and Hawaii DOH, 2015a).
Early 2000s	Navy performed transverse cores beneath each tank and discovered evidence of staining beneath 19 of the 20 tanks (US EPA and Hawaii DOH, 2015a).

2002 Sep. 30	According to the AOC, Hawaii obtained US EPA state program approval for Hawaii's UST program to operate in lieu of US EPA's UST program under Subtitle I RCRA (US EPA and Hawaii DOH, 2015a).
2002 Apr.	Tank #6 taken out of service after a confirmed release (Sommer, 2002).
2004	Tank #1 was taken out of service (Anonymous, Undated).
2004 Sep.7	Contract No. N62742-02-D-1802 signed for the environmental investigation and risk assessment investigation of the Bulk Fuel Storage Facility at Red Hill by TEC Inc. and the Fleet and Industrial Supply Center (FISC) (TEC, 2007).
2007 Aug.	Report submitted for the environmental investigation and risk assessment investigation of the Bulk Fuel Storage Facility at Red Hill by TEC Inc. and the FISC (TEC, 2007).
2007 Aug.	TEC indicates that it is not currently known if the tanks are leaking (TEC, 2007); investigation results clearly confirm that petroleum was released from the Facility in the past (TEC, 2007). Soil vapor measurements from Soil vapor monitoring points (SVMPs) beneath seven of the USTs showed petroleum vapor throughout the subsurface and at greater concentrations at Tanks #6, #11, #12, #14 and #16 (TEC, 2007). TEC report notes that the age of the Facility and its storage capacity combine to present a future risk to the underlying groundwater.
2008 Sep.	Enterprise Engineering, Inc. completes a comprehensive engineering evaluation resulting in the programming of a MILCON project to repair the FISC Pearl Harbor Red Hill tanks (Enterprise Engineering Inc., 2008a). Project was to provide a long-term life extension renewal of the tanks (40 years additional expected tank life), secondary containment, and the capability to detect and locate leaks (Enterprise Engineering Inc., 2008a). The report evaluated and discussed various repair alternatives, and also identified new tank repair technologies and evaluated their applicability to the Red Hill tanks (Enterprise Engineering Inc., 2008a). It also stated that the existing steel liner (necessary for containment) needed to be 100% scanned for thinning due to corrosion and weld defects and repaired unless it was inspected within the past 5 years (Enterprise Engineering Inc., 2008a). Additionally, 100% scanning of the steel liner and welds of the barrel and lower dome of the existing tanks were to be performed if the steel liners had never been scanned (Enterprise Engineering Inc., 2008a). Inspections circa 2008 were the first inspections wherein Tanks #2, #6, #15, #16, and #20 received 100% scanning of the steel liner plates and welds (Enterprise Engineering Inc., 2008a).
2011 Nov. 18	US EPA proposed revisions to strengthen the 1988 federal UST regulations, including requirements for field-constructed USTs and new requirements for secondary containment and operator training (US EPA and Hawaii DOH, 2015a).

2012 Apr. 16	Public comment period closed for the US EPA proposed revisions to strengthen the 1988 UST regulations (US EPA and Hawaii DOH, 2015a).
2013 Dec. 9	Tank #5 back in service after routine scheduled maintenance, including cleaning, inspecting, and repairing multiple sites within the tank (US EPA and Hawaii DOH, 2015a).
2014 Jan. 13	Tank #5 fuel loss identified. Hawaii DOH and US EPA immediately notified. Fuel transferred from Tank #5 to other tanks at the Facility between Jan. 13 and 18 (US EPA and Hawaii DOH, 2015a).
2014 Jan. 16	Tank #5 release verbally confirmed to Hawaii DOH and US EPA (US EPA and Hawaii DOH, 2015a).
2014 Jan. 23	Tank #5 fuel loss estimated as approximately 27,000 gallons in written notification to Hawaii DOH (US EPA and Hawaii DOH, 2015a). Navy increases tank monitoring frequency (US EPA and Hawaii DOH, 2015a).
2015 May	Navy reports storing only three types of fuels (JP-5, JP-8, and diesel marine fuel) at the facility (US EPA and Hawaii DOH, 2015a).
2015	US EPA proposed revisions to the 1988 UST regulations should come into effect (US EPA and Hawaii DOH, 2015a).

Table 2: FOIA Request and Completion Chronology

FOIA Tracking Number	Date Submitted	Estimated Completion Date	Status	Records
DON-NAVY-2014-006708	6/10/2014	7/23/2014	Assignment	One of three requested reports released.
DON-NAVY-2014-006761	6/12/2014	7/25/2014	Closed	No records released; Final Disposition: No Records
DON-NAVY-2014-007031	6/24/2014	TBD	Closed	Letter referring BWS to contact the proper official.
DON-NAVY-2014-009060	8/25/2014	10/10/2014	Assignment	No records released; Final Disposition: Undetermined
DON-NAVY-2014-009167	8/28/2014	10/14/2014	Evaluation	No records released; Final Disposition: Undetermined
DON-NAVY-2015-000842	11/3/2014	12/18/2014	Assignment	No records released; Final Disposition: Undetermined
DON-NAVY-2015-001401	11/28/2014	1/13/2015	Evaluation	No records released; Final Disposition: Undetermined
DON-NAVY-2015-006109	5/19/2015	7/1/2015	Assignment	No records released; Final Disposition: Undetermined

TBD: to be determined

Figure 1A

Task 2: Tank Inspection, Repair, Maintenance (TIRM) – Scoping to Report Approval: No Cure or Dispute Resolution

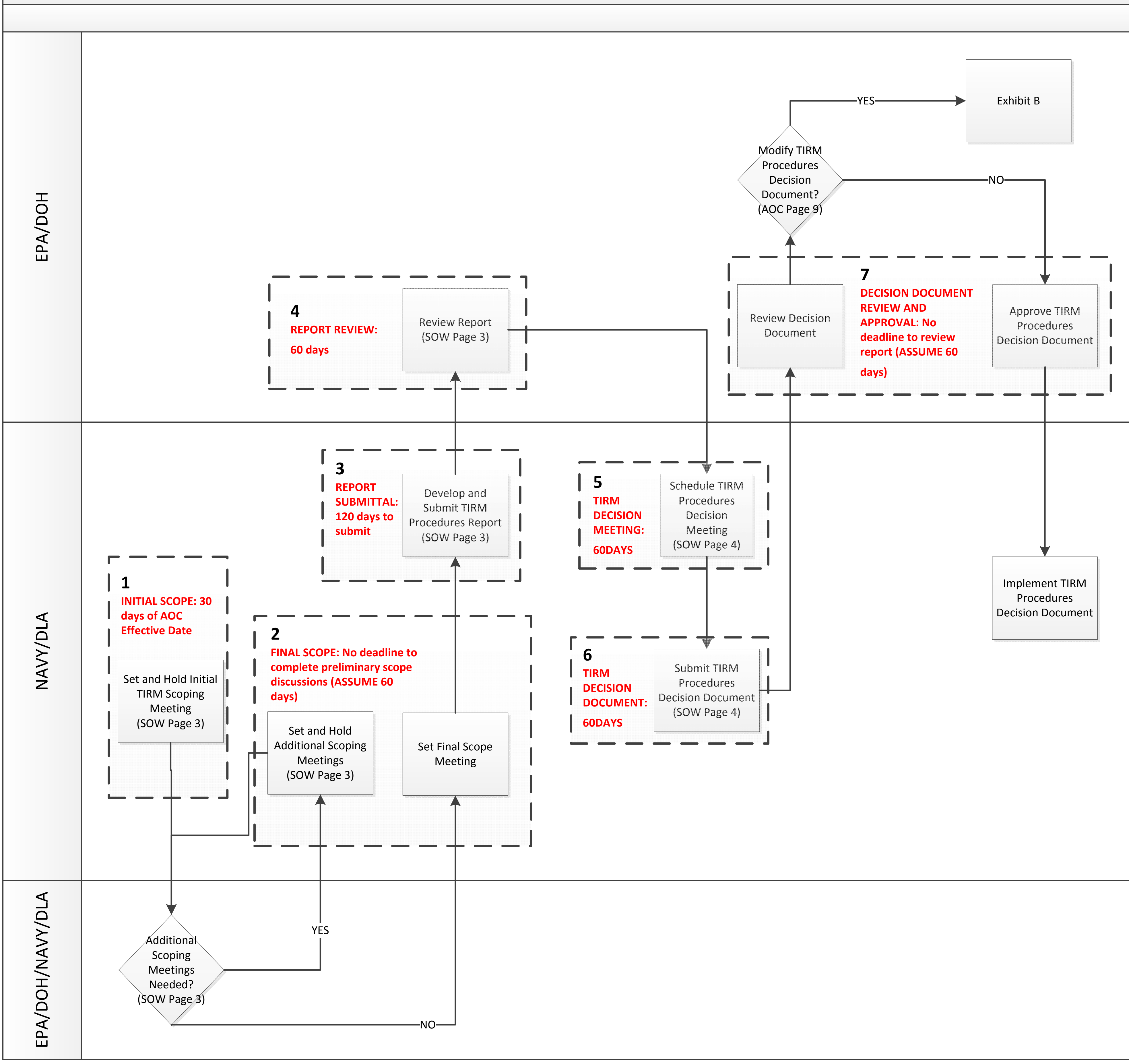

Figure 1B

Task 2: Tank Inspection, Repair, Maintenance (TIRM) – Scoping to Report Approval: With Cure or Dispute Resolution