Enclosure (1) – Response to DOH Comments on Tank Closure Plan Supplement 4

General Comments

1. We are not providing comments on Section 4. Update on Tank Cleaning Verification Plan at this time, as we understand the Navy Closure Task Force – Red Hill (NCTF-RH) is preparing a submission on this topic with more recent information.

Navy Response – Acknowledged. In consultation with DOH and EPA, NCTF-RH is developing an analytical wipe sampling methodology that will be provided to the Regulatory Agencies under separate cover.

2. Add a reference section with full references for all documents cited in Tank Closure Plan, Supplement 4, Detailed Closure Design (Supplement 4). We are unable to determine what citations such as "DON 2019" refer to.

Navy Response – NCTF-RH is willing to provide a reference list. However, after a full review of Supplement 4 and all enclosures, only one reference was found that did not have a full citation. Section 6.1 cites 'Earl and Wright 1962', which was previously cited in Tank Closure Plan Supplement 3. The full reference is provided below. We were unable to locate a reference to 'DON 2019' in Tank Closure Plan Supplement 4. Please provide the exact location of the reference.

Earl and Wright. 1962. *Manual of Operations for Aviation Fuel Systems Constructed Under Contract NBy-25540 for the Conversion of POL Facilities, Naval Supply Center, Pearl Harbor, Hawaii*. Prepared by Earl and Wright, Consulting Engineers, San Francisco, California. July 15.

3. As stated most recently in our March 13, 2025, response to the groundwater flow model, the NCTF-RH's modeling cannot be used as a line of evidence to support decision-making. The Hawai'i Department of Health (DOH) and U.S. Environmental Protection Agency disapproved the groundwater flow model on March 17, 2022, and have not approved subsequent versions.

Navy Response – Acknowledged.

Specific Comments

4. Page 9, 2.1 Update on Beneficial Non-Fuel Reuse Planning: Will copies of the "DoD [U.S. Department of Defense] feasibility and cost analysis performed by the RAND Corporation in accordance with the 2023 National Defense Authorization Act (NDAA), and an investigation into the potential for energy-related reuses completed by the University of Hawaii" be made available to the public?

Navy Response – Publicly available information related to beneficial non-fuel reuse planning is available at the following: https://cnrh.cnic.navy.mil/Operations-and-Management/Red-Hill/Red-Hill-Repurpose-and-Reuse/

https://www.rand.org/pubs/research_reports/RRA2719-1.html

5. Page 11, 3. Update on Removal of Fuel Pipelines: Refers to "a [redacted]-inch JP-5 pipeline" and "[redacted]-inch JP-8 (F-24) pipeline." Our understanding is that the [redacted]-inch pipeline was used for JP-8 and F-24, and the [redacted]-inch pipeline was used for JP-5. Please verify.

Navy Response – NCTF-RH confirms that the [redacted]-inch line was used for JP-5 and the [redacted]-inch line was used for JP-8.

6. Page 11, 3.1 Lower Access Tunnel Pipeline Removal:

a. States, "Since the existing pipes are coated in lead paint, a strip of coating will be removed at each location where the pipes will be cut." Our understanding from the NCTF-RH's August 2024 Demolition Work Plan, DE23-1592 Red Hill Pipeline Removal (PDF page 16) and January 24, 2025, Sectional Valve and Reducer Removal Concept of Operation (CONOP) (page 11), both of which have the DOH's conditional approval, is that the cut locations of pipe will be wrapped with tape. Provide clarification.

Navy Response – The approved Sectional Valve and Reducer Removal CONOP indicated that each pipe cut location would be wrapped with tape. Updated guidance was included in the Pipe Cutting and Removal CONOP that was provided for DOH review and comment on November 10, 2025. The CONOP indicated that 'lead paint disturbance controls…[would be executed] per approved Lead Compliance Plan'. NCTF-RH provided the updated lead compliance procedures to DOH via email in November 2025.

b. States, "Piping and appurtenances that are left in place will be maintained by re-painting and sealing . . . ." What piping will be left in-place, other than the former fuel-oil recovery (FOR) line and utility (e.g., electrical, ventilation) conduits?

Navy Response - The removal of the section of [redacted]-inch (F-76) pipe between pipe stand (PS)-[redacted] and PS-[redacted] at the [redacted] was not part of the conditionally-approved pipeline removal plans. This pipe segment was re-purposed to serve as temporary storage for oily fire water and continues to serve that purpose. In the event of a fire, water released from the fire suppression sprinklers would be collected in the legacy AFFF sumps and pumped via the legacy AFFF piping into this section of [redacted]-inch pipe. The entire length of the [redacted]-inch pipe has been pigged, and the AFFF fire suppression system in the tank gallery was drained and confirmed to contain no AFFF. The removal of this section of [redacted]-inch piping is currently being evaluated within the context of future Facility closure efforts, including the removal of the AFFF system and changes to fire suppression system requirements based on the re-assessment of the overall risk level of the RHBFSF.

7. Page 12, 3.1.1 Alternative Closure Strategy for Tank Gallery Pipe Headers:

a. In this submission, the NCTF-RH is proposing to fill some pipes with foam instead of removing them because "traditional pipeline removal will be time-consuming and hazardous to both workers and adjacent infrastructure."

i. What type of foam is the NCTF-RH proposing to use? Provide the foam's name and Safety Data Sheet information.

ii. The NCTF-RH previously removed an [redacted]-inch bulkhead pipeline from the lower tunnel, which demonstrates that piping can be removed safely from congested spaces in the tunnel. Why do these challenges now warrant leaving the pipe headers in-place in the tank gallery?

Navy Response - NCTF-RH intends to remove all tank gallery header pipes in accordance with the conditionally-approved pipeline removal work plans and Pipe Cutting and Removal CONOP, submitted to DOH on November 10, 2025.

b. States, "The foam will also absorb and encapsulate residual fuel and water . . . ." Why would there be residual fuel and water in the pipes? According to the NCTF-RH's August 2024 Demolition Work Plan, DE23-1592 Red Hill Pipeline Removal (PDF page 13) and Pigging CONOP, Version 3, both of which have the DOH's conditional approval, the pipes should be clean and free of residual fuel and water.

Navy Response - NCTF-RH intends to remove all tank gallery header pipes in accordance with the conditionally-approved pipeline removal work plans and Pipe Cutting and Removal CONOP, submitted to DOH on November 10, 2025. As proposed in those plans, the pipes will be clean and free of residual fuel and water.

c. Lower tunnel access will be required for long-term soil vapor and groundwater monitoring. Fully removing the [redacted]-inch, [redacted]-inch, and [redacted]-inch pipelines, as conditionally approved by the DOH, will potentially reduce future fall hazards for personnel accessing the lower tunnel.

Navy Response - NCTF-RH intends to remove all tank gallery header pipes in accordance with the conditionally-approved pipeline removal work plans and Pipe Cutting and Removal CONOP, submitted to DOH on November 10, 2025.

8. Page 12, 3.2 Surge Tank Pipeline Removal: Did Surge Tank 2 also have pressure safety loop piping removed?

Navy Response – No. A pressure safety loop was not installed on Surge Tank 2 so there was nothing to remove.

9. Page 14, 4.1.1 Tanks 13, 14, 17, and 18: States, "After the CIR [Clean, Inspect, Repair] was completed for Tanks 13 and 17 in 2021, Tank 13 was returned to operation but not to service, and Tank 17 was returned to service but not filled." Clarify the distinction between "return to operation but not to service."

Navy Response - NCTF-RH apologizes for the confusion and wishes to provide clarification. The statuses of Tanks 13 and 17 were incorrectly stated as 'returned to operation but not to service' and 'returned to service but not filled' respectively. Both Tanks 13 and 17 were Returned to Operator but not Returned to Service.

The terms 'Returned to Operator' and 'Returned to Service' refer to specific steps in the API 653 inspection process. The first step in the process is to perform a Clean Inspect Repair (CIR) assessment. This involves cleaning the tank to the extent needed to perform required inspections, performing the required inspections and testing, and then documenting the required (and recommended) repairs needed to bring the tank back into service. This information is consolidated into an API 653 OUT-OF-SERVICE INSPECTION AND

SUITABILITY FOR SERVICE EVALUATION (S4S) REPORT. After the repairs are done, a POST-REPAIR INSPECTION REPORT is issued, which includes another S4S, certifying that all required repairs have been completed. At this point, the contractor will turn the tank back over to the operator (government), and the tank's official status will be Returned to Operator (RTO). The operator will then go through the required internal procedures to bring the tank back into service. Once this occurs, the tank's status will officially be Returned to Service (RTS). Tanks 13 and 17 were both RTO but not RTS, due to the decision to defuel the RHBFSF.

10. Page 15, 4.1.2 Tank 19:

a. What documentation was used to support the following statement? "During the last CIR completed in 1999, cleaning steps 1-5, as described in Section 4 above, were conducted for Tank 19."

Navy Response - NCTF-RH must retract this statement and provides the following clarification. Since the submittal of Tank Closure Plan Supplement 4, NCTF-RH has conducted extensive research to reconstruct Tank 19's inspection and repair history, and available documentation cannot confirm the completion of these five steps (1. Sludge watering, 2. Degassing via forced ventilation, 3. Draining sludge water and manual removal of remaining sludge cake, 4. Structural assessment and repair of center tower and catwalk, and 5. Pressure washing of tank interior) during a 1999 CIR.

Tank 19 did not undergo a CIR in 1999. Multiple sources indicate that Tank 19's last full modified API 653 inspection was in 1968. This inspection would have included Steps 1-4 and possibly Step 5, but NCTF-RH does not have a copy of this report to confirm. Tank 19's estimated date of last use is confirmed as 1986, but there was a two-phase repair project started in 1991 (the "Repair Tank 19 Project" as referenced in the 2016 TIRM report). The scope of Phase I included installing two telescoping booms with man-baskets and a platform scaffold beneath the catwalk in preparation for Phase II, which was scoped to include a tank shell inspection and repairs. Phase II did not proceed, but boom installation would have required a structural assessment and repair of the center tower and catwalk. Unfortunately, NCTF-RH does not have a copy of this report to confirm. Tank 19 remained out of service following the completion of Phase I. In 1998, a Functional Analysis Concept Design study was scoped to determine a cost-effective solution to repair Tank 19 that would provide 'long-term life extension renewal of the tank, minimize fuel leaks and improve leak detection capability'. This project did not proceed, and Tank 19 remained offline until March 2007 when the DOH closure form (Appendix I) was filed to confirm it temporarily out of service.

NCTF-RH does have reports issued in 2010, 2016 and 2022 that document the three most recent structural inspections on the catwalk bridge, but these reports do not include any details regarding the inspection, status or repair of the center tower itself. In summary, NCTF-RH can only confirm through documentation that a full modified API 653 inspection was performed in 1968, and the a structural assessment of the center tower was likely performed in 1991. NCTF-RH cannot definitively state that Tank 19 was pressure washed during the 1968 modified API 653 inspection or that it was pressure-washed again after the estimated last date of use in 1986.

Based on this revised repair history, Tank 19's center tower will undergo a full structural assessment to inform the best way forward for closure. Prior to conducting the assessment, the elevator will need to be removed, and possibly the two legacy booms also. Although Tank 19 has been under forced ventilation since the early 1990s, the last structural assessment on the center tower that NCTF-RH has documentation of was 35 - 58 years ago, and NCTF-RH needs to understand the scope of the required repairs before determining a closure plan. Depending on how extensive they are, NCTF-RH may propose forgoing the cloth rub sampling to rely on the results of the analytical wipe test results for the representative JP-5 tank to confirm absence of fuel. In this event, NCTF-RH would also propose forgoing the removal or modification of interior components.

b. States, "DOH Form Appendix I Notification for Underground Storage Tanks was completed, but it is not known if it was submitted to DOH for review." The DOH received this form, which indicated Tanks 1 and 19 were permanently out of use. The Navy later sent a letter, dated August 19, 2021, clarifying that the tanks are temporarily out of use.

Navy Response – Acknowledged.

11. Page 16, 4.1.3 Tank 1:

a. States, "The cause of the deteriorated coating was not confirmed, but contributing factors are speculated to include a surface bulge of the spring line of the lower dome . . . ." Has it been verified that there is no trapped product between the liner and concrete tank behind the bulge?

Navy Response – NCTF-RH has not confirmed the presence or absence of trapped fuel between the steel liner and the concrete behind the bulge. The 2007 *Closeout Report for Tank 1* has a picture taken on August 26, 1942, with a caption indicating that the bulge was caused by grout pressure during prestressing, so it is most likely this space still contains grout. Please see NCTF-RH's response to comment 14e for additional discussion around legacy fuel behind the tank shell.

b. States, "DOH Form Appendix I Notification for Underground Storage Tanks was completed, but it is not known if it was submitted to DOH for review." The DOH received this form, which indicated Tanks 1 and 19 were permanently out of use. The Navy later sent a letter, dated August 19, 2021, clarifying that the tanks are temporarily out of use.

Navy Response – Acknowledged.

12. Pages 18-22, 5.1 The 20 USTs [Underground Storage Tanks]:

a. Center Tower and Catwalk: States, "Tanks 5, 6, and 12 have a spiral staircase around the center tower that will be dismantled and removed to the extent necessary to facilitate tank cleaning. The remainder of the spiral staircase will be abandoned in place." If the spiral staircase has no future use, it should be removed in its entirety and not abandoned in place.

Navy Response - The decision was made to remove only the sections of the staircase that interfered with performing the structural assessment of the center tower, cleaning, and mechanical closure modifications. Closure modifications are focused on functionality and confirming that all fuel has been removed from internal tank structures.

b. Fuel Oil Recovery (FOR) line(s):

i. States, "In the final closure configuration, the existing FOR line will be maintained to provide a long-term egress pathway for moisture that may accumulate inside the tank." What is the long-term plan for inspecting and maintaining the FOR line?

ii. Some of the tanks are not currently connected to the existing FOR line system, will these tanks be reconnected to the FOR line?

Navy Response - The FOR system is the primary engineering control for long-term, post-tank closure containment of groundwater infiltrate and any hazardous constituents that may remain on the tank walls. The Navy will continue to inspect and maintain the system, and to characterize and properly dispose of any effluent in Tank 311. These are critical post-tank closure activities that will allow the Navy to stay apprised of any issues with mechanical system functionality and changes to the analytical profile of Tank 311's effluent.

The current FOR system inspection program includes annual tank tightness testing on the main sump and Tank 311, as well as annual leak detection testing on the FOR line. Tank 311 also has a visual inspection and testing for metal thickness every 10 years. The effluent in Tank 311 is currently tested for VOCs, SVOCs, TPH-DRO, PCBs, metals, pH and ignitability. Anticipated additions or changes to the current inspection, maintenance and testing programs include the transition of the FOR system from a fuel system to a wastewater system, the addition of Tank 311 effluent analytes that exceed federal groundwater standards as per 40 CFR 285 to the groundwater analytical testing suite (if they are not already included) The flex-hose in Tank 5's retrofitted FOR line will also be inspected. A low-point drain will be installed on the flange that houses the flex-hose, and hose integrity will be verified by checking for drainage.

All tanks will be connected to the main FOR line. The FOR lines for Tanks 1, 14, 18 and 19 are currently disconnected but will be re-connected to the main FOR line as part of the closure modifications.

c. Sample Lines: States, "Any sample lines extending above the tank floor will be abandoned in place (if present)." This statement is acceptable if it pertains to Tank 1. In all other tanks, the sample lines should be removed above the tank floor and capped, as stated in the NCTF-RH's February 5, 2025, Response to DOH Comments on Principal Physical Modifications Memorandum (response 11).

Navy Response – The interior sample lines will be cut down to within 1-2 feet of the tank floor and capped for all tanks except for Tank 1 and Tank 19. Executing this closure modification for Tank 19 will depend on the results of the center tower structural assessment.

d. Tell-Tale Leak Detection System: How does the NCTF-RH plan to confirm there is no product trapped in tell-tale piping behind the liner in previously sealed off tanks? Does the NCTF-RH have documentation indicating the tell-tale space behind the plate welds were filled prior to sealing the opening?

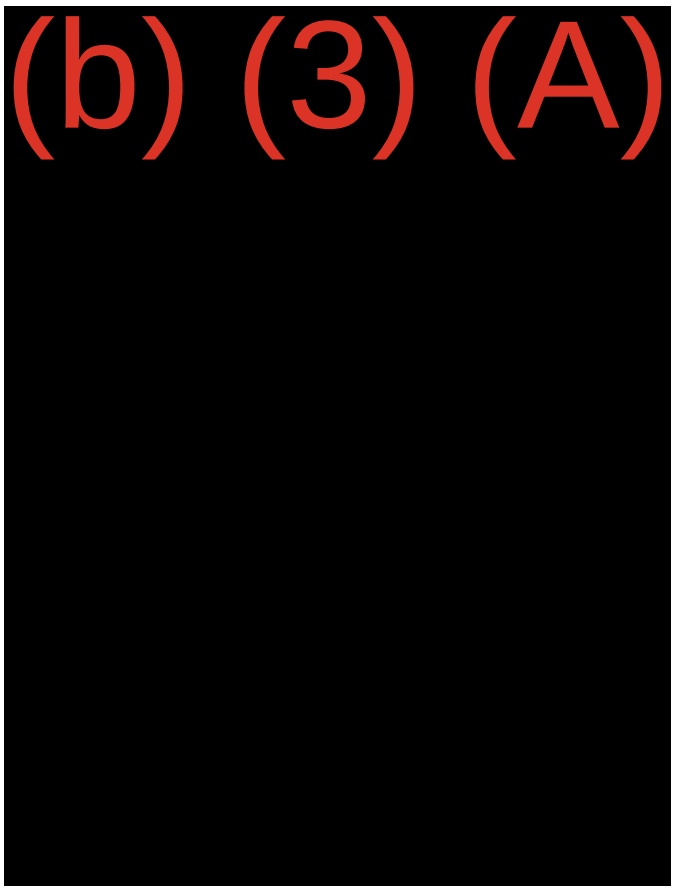
Navy Response – There is no tell-tale piping behind the shell liner but there are angle legs. The angle legs were created by placing backer strips behind each vertical and horizontal butt weld between the shell plates. For the vertical butt welds, the backer strip was a piece of flat bar. For

the horizontal butt welds, the backer strip was a piece of angle iron with one leg of the angle flush against the back side of the steel plates and the other leg embedded in the reinforced concrete surrounding the outside of the tank. Once welded together, these angle legs formed completed circles around the circumference of the tank behind the shell at various elevations. See the diagram below for a depiction of the angle leg construction and resulting leak storage space.

The vertical span of each tell-tale pipe had multiple T-junctions that corresponded to different elevations within the tank. The tell-tale pipes were attached to the shell by drilling a small hole through the shell plate and inserting these T-junctions. If fuel leaked through the shell plate, it would run down the back side of the plate until it came to the closest angle leg and collect there. The fuel would then flow horizontally along that angle leg until it reached one of the vertical T-junctions inserted through the shell. If enough fuel accumulated on the angle leg, it would flow out through the T-junction into the tell-tale pipe on the inside of the shell, and then down into the LAT where the pipe ends could be opened to check for fuel.

The degree of horizontal fuel travel along the angle leg would have depended upon how much fuel leaked out on to it. Similarly, fuel would have to accumulate at sufficient volume to allow it to flow back out of the angle leg space and into the tell-tale pipes. When the tell-tale pipes were removed from Tanks 1-18, and 20, the system was drained prior to cutting the pipes. NCTF-RH does not have documentation detailing the exact procedure for draining the tell-tale system prior to removal. However, NCTF-RH can confirm that this space was not filled in as part of the removal process. While it is reasonable to assume that some attempt was made to remove fuel from the angle leg space, it is probable that some legacy fuel remains there. This is supported by the recent observations in Tank 18 of what looks to be fuel weeping down the shell from several open tell-tale holes.

Historical records confirm that the RH USTs did leak into the angle leg space. NCTF-RH is developing a plan to estimate how much legacy fuel may be trapped there and what level of concern may be warranted. Please refer to NCTF-RH's response to comment 14e for further discussion.



e. Table 5-1. Summary of Interior Tank Modifications for 6 OOS [Out of Service] USTs: For Tank 1, has the NCTF-RH considered cutting the bottom of the instrument well to make sure there is no fuel trapped at the bottom?

Navy Response - The instrument well is still in Tank 1 and although the tank has been empty since circa 1997, some residual fuel may remain in the well. Accordingly, NCTF-RH proposes the following process in order to verify no fuel remains in the instrument well of Tank 1

Stilling wells are fabricated with pre-drilled holes that allow fuel to move in and out. While there may be some minor differences between them, the first pre-drilled hole is approximately [redacted] feet up from the tank floor so any residual fuel would be contained within this segment. Prior to the removal of the stilling well, a hole is drilled near the base to remove any residual fuel. Based on the [redacted]-inch diameter of the stilling well, the calculated volume of this pipe segment is [redacted] cubic feet, which is equivalent to 3.92 gallons. (A maximum of two gallons of fuel was found in the stilling wells of tanks that have already had their wells drained and removed). If an integrity breach occurs in the stilling well, this fuel would drain out onto the tank floor and either evaporate or drain to the FOR line.

In reference to Table 5-1, NCTF-RH has noted some discrepancies in Tank Closure Plan Supplement 4 with how the cleaning and closure plans for the six out of the service tanks were represented in different tables and text. Since the submittal of Tank Closure Plan Supplement 4,

NCTF-RH has refined some aspects of the closure design for these tanks and respectfully presents the following updated tables:

- Revised and combined Tables 4-1, 4-2 and 4-3: *Cleaning Verification Strategy for the 6 OOS USTs*
- Revised Table 5-1 *Summary of Interior Tank Modifications for 6 OOS USTs*

Revised and Combined Tables 4-1, 4-2 and 4-3: Cleaning verification strategy for 6 OOS USTs

	TK 13	**TK 14**	**TK 17**	**TK 18**	**TK 1**	**TK 19**
Degassing	No	No	No	No	No	No
Active Ventilation	Yes	Yes	Yes	Yes	No	Yes
CT & catwalk structural assessment & repair	Yes	Yes	Yes	Yes	No	Yes[2]
Cloth rub test	Yes	Yes	Yes	Yes	No	TBD[3]
Spot Clean / Pressure wash	TBD[1]	TBD[1]	TBD[1]	TBD[1]	No	TBD[3]
(b) (3) (A)" fuel line	Same as in-service tanks	Same as in-service tanks	Same as in-service tanks	Same as in-service tanks	N/A	TBD[3]
(b) (3) (A)" fuel line	Same as in-service tanks	Same as in-service tanks	Same as in-service tanks	Same as in-service tanks	N/A	TBD[3]
Interior sample lines	Same as in-service tanks	Same as in-service tanks	Same as in-service tanks	Same as in-service tanks	Legacy info	TBD[3]
Instrumentation well	Same as in-service tanks	Same as in-service tanks	Same as in-service tanks	Same as in-service tanks	Legacy info	TBD[3]
Interior tell-tales lines	N/A	N/A	N/A	Patch holes	N/A	TBD[3]

Notes: 1 – Depends on cloth rub test results; 2 – Repairs depend on extent of structural degradation; 3 – Depends on results of center tower structural assessment

Enclosure (1) – Response to DOH Comments on Tank Closure Plan Supplement 4

Revised Table 5-1: Summary of Interior Tank Modifications for 6 OOS USTs

	TK 13	TK 14	TK 17	TK 18	TK 1	TK 19
CT & catwalk structural assessment & repair	Yes	Yes	Yes	Yes	No	Yes[2]
Modify interior [redacted]" fuel line	Same as in-service tanks	Same as in-service tanks	Same as in-service tanks	Same as in-service tanks	N/A	TBD[3]
Modify interior [redacted]" fuel line	Same as in-service tanks	Same as in-service tanks	Same as in-service tanks	Same as in-service tanks	N/A	TBD[3]
Modify interior sample lines	Same as in-service tanks	Same as in-service tanks	Same as in-service tanks	Same as in-service tanks	N/A	TBD[3]
Remove stilling well	Same as in-service tanks	Same as in-service tanks	Same as in-service tanks	Same as in-service tanks	No	TBD[3]
Remove interior tell-tale lines	N/A	N/A	N/A	Patch holes	N/A	TBD[3]

Notes: 2 – Repairs depend on extent of structural degradation; 3 – Depends on results of center tower structural assessment

13. Page 26, 5.2 Surge Tanks: States, "The venting pathway will be plugged inside the tank in a manner to be determined." We understand the main fuel tanks will be passively vented to prevent condensate from accumulating. What is the rationale for plugging the Surge Tank venting pathway?

Navy Response - NCTF-RH concurs that leaving the surge tank vent lines open is preferable. The interior vent hole will remain open and a screen will be affixed to the candy cane vents at the line output to allow for passive air movement.

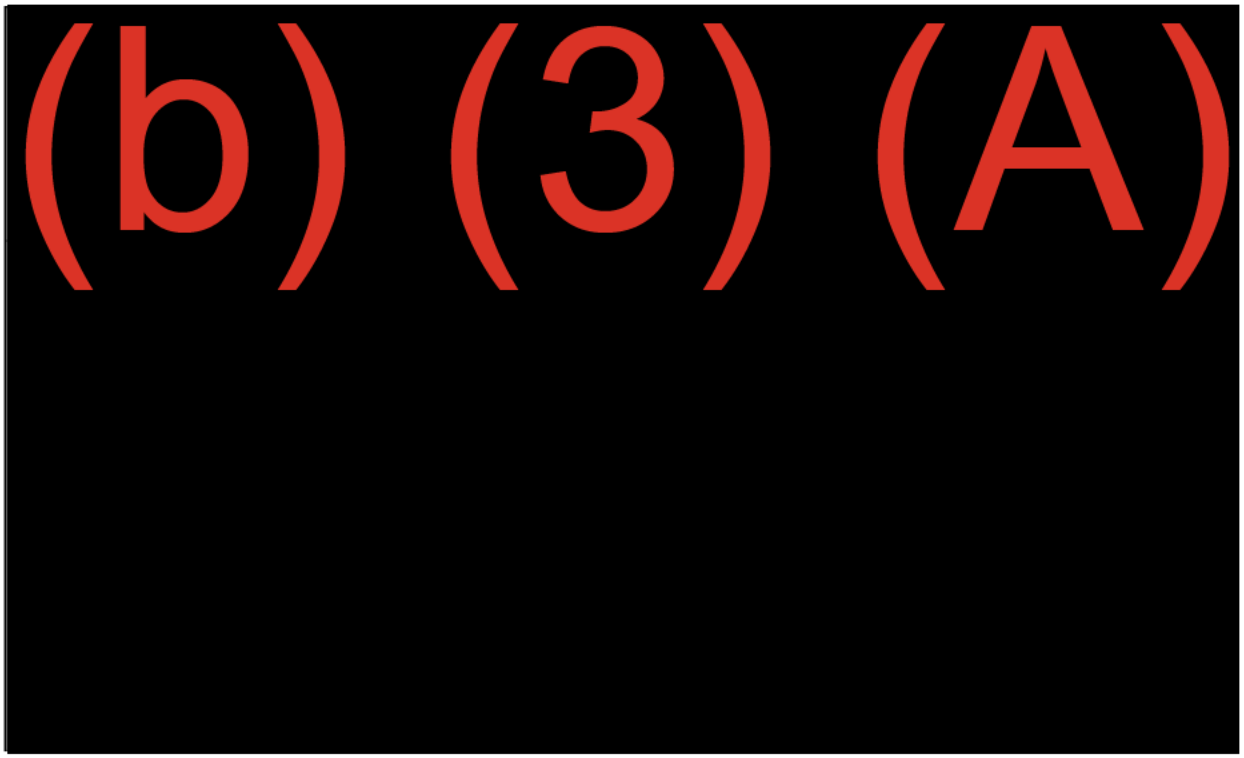
14. Pages 29-31, 7. Post-Closure Tank Monitoring:

a. For the Long-Term Structural Integrity Assessment of the Red Hill Underground Storage Tanks, dated May 26, 2023, the acronym "SGH" refers to the Navy contractor that prepared the report, Simpson Gumpertz & Heger Inc., not "Seismic and Geotechnical Hazard."

Navy Response – Acknowledged.

b. States, "Soil vapor probes installed at multiple depths (~5' and ~20') below each UST have been monitoring hydrocarbon vapors monthly since 2006." We understand there are two to three soil vapor probes under Tanks 2 through 18, but not under Tanks 1 and 19. Please verify.

Navy Response – Confirmed. There are no soil vapor monitoring probes under Tanks 1 or 19. Please see the figure below for additional detail.



d. States, "natural attenuation processes are actively degrading hydrocarbons over time . . . These lines of evidence collectively demonstrate that there is no active migration of legacy fuel trapped behind the tank shell . . . ." While there may be some natural attenuation, this is not a line of evidence that there is "no active migration of legacy fuel." Fuel can still migrate when natural attenuation is occurring.

Navy Response – NCTF-RH concurs that natural attenuation alone does not preclude the migration of fuel.

e. What is the NCTF-RH's plan to determine if the "legacy fuel trapped behind the tank shell" is present at volumes that may warrant concern? Provide details on how this determination will be made.

Navy Response – NCTF-RH acknowledges the importance of making the best determination possible as to how much void space exists, how much fuel may be trapped there, and what level of concern is warranted. This is a complex question, and although the answer is not yet complete, NCTF-RH appreciates the opportunity to begin the discussion with this response.

NCTF-RH made a concerted effort to review all available historical release information including tank inspection reports, tank repair notes, tell-tale system leak records and logs maintained by Naval Supply Systems Command (NAVSUP) Fleet Logistics Center (FLC), and the legacy release summary submitted as part of the Phase 1 Site Assessment Work Plan, conditionally approved by DOH on June 17, 2025. Total release volumes varied between approximately 180,000 – 245,000 gallons over the operational life of the RHBFSF. While resolving the total amount of historically released fuel is beyond the scope of Supplement 4,

NCTF-RH acknowledges that some amount of fuel may have moved out of the tank interior through the steel liner.

The existence of void space between the steel liner and the concrete behind it is supported by some observations of gaps in past tank investigations and repair reports. Based on information contained in these reports, NCTF-RH has made a preliminary assessment of the nature of the void space and the approximate volume of fuel that may be trapped there.

The Tank 5 warranty work (2016 AOC TIRM Report Appendices AN and AO) and subsequent free product recovery investigation following the 2014 JP-8 release documented observations of void space. The warranty work was conducted to assess and repair the welds over previously drilled, unrepaired gas test holes. It is standard practice to drill gas test holes to check for hydrocarbon vapors prior to welding, but these holes were also drilled "due to fuel which may have been in the tank shell to concrete interstice (TIRM Report Ch. 5-6.1)…since hydrocarbons have been found in contact with the back wall surfaces in past tanks (TIRM Report Appendix T)." The warranty work report also noted "Areas of [Tank 5's] internal steel liner appear to have separated from the concrete encasement surrounding the tank. This condition can allow water, fuel, liquid or vapor, to be trapped in a localized area between the two surfaces." Following the warranty work, the contractor conducted a free product recovery investigation at 13 locations in Tank 5. No free product was found but VOCs (40 – 1000 ppm) were detected at all 13 sample areas. After 'vacuuming' each sample location, VOCs returned to three sample locations (37 - 400 ppm), which could indicate liquid fuel in the vicinity. During the Tank 5 FOR line retrofit in 2026, holes were drilled in the tank floor to check for free product. VOCs were detected but no free product was found.

Void space was also noted in a 2018 investigative project in Tank 14. Pursuant to the 2015 Administrative Order on Consent Statement of Work Section 5.2, the Navy submitted the *Corrosion and Metal Fatigue Practices Report* in April 2016 that summarized the non-destructive evaluation (NDE) process for the clean, inspect, and repair (CIR) program at Red Hill. In 2018, the Navy conducted a study to validate these NDE results by using destructive testing methods on at least one tank at the Facility. Tank 14 was selected for this testing and 10, 12-inch by 12-inch steel coupons, and the concrete behind them, were evaluated. Although this report was disapproved by the regulatory agencies on March 16, 2020, estimates of void space behind each coupon were not disputed and form the basis for NCTF-RH's preliminary assessment of total void space area.

The table below summarizes key information from the report including measured void space behind coupons, and observations of fuel, moisture, and corrosion on the coupons.

Coupon #	Location	Void Space between concrete and steel liner	Petroleum between concrete and steel liner	Moisture on concrete behind coupon	Corrosion on backside of steel liner
1	Upper Dome	1/8" void on left side	No	dry	Yes
2	Ext Ring	1/8" void on upper left side	No	Slightly damp	Yes
3	Ext Ring	1/16" void on left side	Yes	Slightly damp	Yes
5	Barrel	1/16" void on top right side	No	dry	Yes
6	Barrel	No. Some loosely adhered grout	No	dry	Yes (minimal)
7	Barrel	3/8" void on left side; 1/16" void on top right	No	Wet (inferred)	Yes
8	Barrel	1/16" void on left side	No	dry	Yes
10	Lower Dome	None	No	Dry	Yes (minimal)
A1	Barrel	1/8" void on left side	No	Mostly dry	Yes
A2	Barrel	1/2" void on left side and bottom; 1/4" void on right side	No	Dry	Yes

Measurements of void space behind these 12 coupons ranged from 0 - 0.375 (3/8) inches and averaged 0.05 inches. Using an interior surface area of 92,000 square feet (which accounts for the entire interior surface area for simplicity) and assuming a uniform void space thickness of 0.05 inches, NCTF-RH calculated that there would be approximately 4600 cubic feet of void space behind each tank liner, which has the capacity to hold approximately 34,000 gallons of liquid.

This volume is likely overestimated due to several highly conservative assumptions, caveats and questions, some of which NCTF-RH is still exploring. First, the calculation uses the entire surface area of the tank, including the upper dome. The Navy did not typically fill tanks above the 'C' course (third course above the spring line), and never all the way to the top. Second, it assumes the void space is both uniform and contiguous. The results from both the Tank 5 free product investigation and Tank 14 destructive testing investigation strongly suggest lack of continuity. Third, all tanks did not leak uniformly or to the same degree. Fuel that leaked to the void space may have equalized at leak height by getting pulled back into the tank when the tank was drained for repairs or service changes. There was likely some degree of fuel absorption into the concrete which would have depleted some portion of the trapped fuel volume. Fourth, fuel trapped in the void space could have drained out into the vadose zone. This possibility depends on multiple factors including local void space contiguity, presence and location of concrete cracks or seams, and final egress point. Tank construction was designed to contain fuel so there are significant barriers to fuel getting out. Finally, the data set in the Tank 14 report is quite small and may not allow for a representative average value of void space thickness. In summary, it is highly probable that some amount of void space exists, but it is challenging to make a definitive determination of how much fuel is still there, if any.

NCTF-RH acknowledges that while the fuel capacity of the void space is central to determining what level of concern is warranted regarding any trapped fuel, there are other mitigating factors to consider when determining whether the trapped fuel warrants concern. As mentioned above,

tank construction presents significant barriers to any trapped fuel moving out of the tanks. Now that the tanks have been defueled, the hydrostatic pressure from the fuel has been removed, effectively immobilizing any trapped fuel. This assertion is supported by the Environmental Protection Agency's 2017 UST Inspection report which stated, "*it is most likely that if potential leak paths are present under the steel liner, the product would likely stay between the steel liner and the concrete outer shell*." Extensive high-pressure (pre-stress) grouting was performed around the tanks to fill in any interstitial seams and spaces between the rock and concrete, as well as adjacent lava tubes, through which fuel might be able to escape. High pressure grouting was designed to pre-stress the concrete and provide an inward push that would be greater than the outward push expected from a full tank of oil, thereby preventing the hydrostatic pressure of the fuel from bursting the welded seams of the steel liner. The concrete under the tank floor is a [redacted]-foot-thick slab painted with red earth paint which is underlain with a [redacted]-foot-thick plug of concrete, making it extremely difficult for any fuel to escape through the floor. As mentioned above, the concrete may have absorbed some amount of fuel over the years. NCTF-RH has conservatively estimated the intrinsic permeability of the concrete used for tank construction as [redacted] m^2, which accounts for expected disturbances (e.g. micro-cracking, leaching, etc.) in 1940s-era concrete subjected to over 80 years of vadose zone conditions. By modern standards, the concrete quality would be considered poor to moderate, but combined with the extensive pressure grouting, it has provided a durable barrier to fuel migration that is expected to endure for the next 300 years at minimum.

The 2016 TIRM Report stated concern regarding "…whether a fuel release from a Red Hill tank might migrate through the reinforced concrete, the layer of pressure injected grout, and the layer of gunite, into the surrounding lava rock, travel downward through the lava rock, and contaminate the aquifer underlying Red Hill at an elevation just above sea level".

As evidenced by the release of approximately 27,000 gallons of JP-8 fuel from Tank 5 in 2014, it is possible for fuel to get past the concrete containment. The cause of the fuel leak was determined to be 17 unrepaired ¼-inch gas test holes that were patched with poorly welded plates. Evidence of a fuel seep was observed below Tank 5 in the LAT near the exterior of the material encasing the lower part of Tank 5. The proposed release pathway does suggest some degree of void space contiguity for Tank 5, at least in the vicinity of the unrepaired gas test holes that were closest to the pathway leading to the LAT.

As the release from Tank 5 was a singular case of the convergence of multiple unfortunate events, it is not necessarily representative of all Red Hill USTs. It does represent a worst-case scenario though, where the presence of legacy fuel in a void space is highly probable, and there is a confirmed egress point through the concrete. Based on the evidence presented, there is some degree of void space between the steel liner and concrete in at least two of the RH tanks. It is not possible to confirm the presence or absence of cold joints or every other possible egress point for legacy fuel for all the tanks.

f. Page 30 states, "Initial testing of the temperature and humidity inside of Tanks 3 and 13 confirmed stable environmental conditions." However, page 16 states, "In 2021, approximately 1,600 gallons of non-hazardous water was drained from Tank 1. The source of the water was not confirmed but it was speculated that it could have been due to a lack of ventilation resulting from the blinds installed by Dunkin & Bush in 2006." Was the testing in Tanks 3 and 13 done under similar conditions as Tank 1, i.e. little ventilation? If conditions

were similar, why did 1,600 gallons of water collect in Tank 1, while the humidity in Tanks 3 and 13 was "stable?".

Navy Response – The atmospheric conditions in Tank 3 were not the same as in Tank 1 prior to the discovery of the water. Tank 3 had been degassed so there was a plywood door on the UAT manway and the [redacted]-inch nozzle in the LAT was open to the plenum. The conditions in Tank 13 were more similar, although the 24-inch ventilation line was open to the ridgeline and the FOR line was still connected.

When Tank 1's manway was opened in 2021, there was a strong musty smell and a foggy-looking atmosphere inside. Initial speculation was that cleaning water may have been left behind from the tank washing during the 2006 CIR. The pictures of the tank bottom in the 2007 *Closeout Report for Tank 1* (Tank Closure Plan Supplement 4 Enclosure 2) are slightly out of focus, making it difficult to confirm whether there was water there or not. However, as a full inspection of the tank bottom was completed and lines were pressure tested, this is an unlikely possibility.

The Navy also speculated that the water could have resulted from inadequate ventilation. The 2007 *Closeout Report for Tank 1* confirmed installation of blind flanges on the [redacted]-inch and [redacted]-inch nozzles in the lower access tunnel, and on both ends of the missing [redacted]-inch vent spool in the upper access tunnel, as well as the re-installation of the [redacted]-foot manway hatch in the upper access tunnel following the CIR. This configuration prevented any passive air movement into or out of the tank. However, preliminary estimates of potential condensate build-up over 14 years (2007 – 2021) based on average temperature, relative humidity and rainfall suggests the lack of ventilation alone cannot account for the 1,600 gallons that were found.

Analytical testing of the water on the tank floor indicated the presence of barium (49 ug/L) which is a naturally occurring element in Oahu's groundwater. The presence of barium suggests that the water in Tank 1 likely came from an external source (e.g. rainwater) that seeped through the concrete dome. Concrete is primarily made of cement which is rich in calcium compounds. Rainwater that infiltrated the concrete would dissolve these salts and carry them into the tank, leaving a white residue after the water evaporated. During the initial entry into Tank 1 in 2021, no pictures were taken of the upper dome, but one photo did show white streaks on the barrel. Subsequent pictures from 2026 showed extensive white residue across the entire upper dome.

After removing the water, replacing the [redacted]-foot upper access tunnel manway hatch with a plywood door, and installing a dummy spool with an open compartment on the [redacted]-inch nozzle in the lower access tunnel, Tank 1 has remained dry. This suggests that the passive ventilation configuration is likely sufficient to counterbalance any moisture accumulation from rainwater seepage. Combined with the open FOR line, these engineering controls should prevent any sustained accumulation of rainwater in the tanks.

As discussed in the *Site Assessment Work Plan*, the tank farm was constructed within the Red Hill Ridge which has a "horizon of soils and highly weathered basalt described as saprolite…[that] is approximately 15–25 ft thick". Saprolite is weathered rock material that retains textural features of the parent rock. Intense weathering of basaltic rocks can significantly reduce the permeability of the parent rock by transforming igneous minerals into clays and

oxides (Hunt Jr. 1996). An infiltration study conducted by Geolabs, Inc. and presented in Appendix G of the *Conceptual Site Model, Investigation and Remediation of Releases and Groundwater Protection and Evaluation, Red Hill Bulk Fuel Storage Facility* report in June 2019, was performed to characterize water infiltration rates in the surficial saprolite soils overlying much of the ridgetop area above the tank farm. The average infiltration rate calculated from three sample locations above Tanks 5, 12, and 16 were 8.11, 4.21, and 8.66 inches per hour respectively. The presence of this saprolite layer and the heterogenous nature of the fractured basalt that surrounds the tanks, makes it challenging to predict the degree to which individual tanks will experience groundwater infiltration. The water accumulation in Tank 1 may be the result of the specific geology in the immediate vicinity of Tank 1. Tank 1 has remained dry through several major rain events over the past two years, which underscores the efficacy of the passive ventilation in preventing the accumulation of any external water intrusion.

In summary, the water discovered in Tank 1 appears to be largely the result of rainwater infiltration and the ventilation configuration appears to be sufficient to counteract any sustained water buildup. NCTF-RH also intends to collect wind and air pressure readings from outside the ridgeline vents and inside the LAT plenums to further inform normal air movement patterns during "closure conditions" (e.g. normal tunnel ventilation only) in support of confirming the closure ventilation configuration efficacy.

g. This section states that the twenty main fuel tanks and four surge tanks were coated with zinc chromate. Provide a written risk evaluation of the potential for zinc chromate, and any of its constituents, to impact groundwater. Include a written description of how the risk evaluation will inform the NCTF-RH's approach to proactively address potential risk before contaminants impact the environment.

Navy Response – NCTF-RH is working on the risk evaluation for zinc chromate and respectfully requests more time to complete this. At present, NCTF-RH intends to continue maintaining the FOR system and characterizing the effluent in Tank 311. If the post-tank closure effluent analysis indicates that any analytes exceed federal ground water standards as per 40 CFR 258, the Navy will inform DOH and evaluate if any additional analytes need to be added to the list of analytes that groundwater samples are tested for. The Navy will also be performing visual inspections of the tank interior and removing any flaked, delaminated coating from the bottom and properly dispose of any effluent in Tank 311. Tank effluent and coating collected from the tank bottom will also be characterized and properly disposed of.

15. Page 36, Photo Log: There are no photos. Add missing photos.

Navy Response – The enclosed tank closure checklist and photo log was a draft template to illustrate how closure modifications might be summarized. There were no photos included intentionally.

Enclosure 3: Preliminary Engineering Report for Red Hill Tank #1 – Center Tower and Catwalk Inspection, Dated March 23, 2022

16. PDF page 3: States, "Once the repairs to the center tower and catwalk are complete and inspected, HEG will issue a final report . . . ." Were the repairs completed, and was the final report issued?

Navy Response – There were no repairs made to Tank 1's center tower after the preliminary report was issued. The Navy determined that the repairs were not cost-effective as there was already adequate JP-5 storage capability in the other Red Hill tanks. A final version of the structural assessment report was not issued.

Enclosure 5: Technical Report, Cleaning and Abandonment of Cross Country Pipelines, PRL 03-13, Pearl Harbor, Hawaii, Dated January 2005

17. Page 2-2, 2.1.3 Abandonment of Valve Chambers: Were there any historical leaks in the valve chambers?

Navy Response – NCTF-RH respectfully contends that this question is beyond the scope of Tank Closure Plan Supplement 4. Enclosure 5 was included to confirm that the Aviation Gasoline (AVGAS) pipeline was disconnected from the RHBFSF at valve chamber (VC)-40D, which is the closest valve chamber to the RHBFSF site boundary.

The AVGAS Line was constructed between approximately 1960 and 1963 to transport AVGAS between USTs 19 and 20, and out to the Former Pearl City Fuel Annex (PCFA), and Former Naval Air Station (NAS) Barbers Point. It consists of two underground sections: a [redacted]-inch line that ran from USTs 19 and 20 to the Former PCFA, and an [redacted]-inch line that ran from PCFA to the NAS Barbers Point. Each section is approximately [redacted] miles in length.

The Phase 1 Site Assessment Work Plan details the evaluation and sampling plan for the approximately [redacted]-mile section of the [redacted]-inch AVGAS line that extends from USTs 19 and 20 to [redacted] along Icarus Way to where it exits at the [redacted] RHBFSF site boundary, just [redacted] of the [redacted].

The Phase 1 Site Assessment Work Plan also states: *The Phase 2 Site Assessment will address the offsite portions of the JBPHH fuel system that are determined to be part of the Red Hill UST system. Prior to commencement of the Phase 2 Site Assessment, the Navy will evaluate the offsite components of the JBPHH fuel system, including components that were previously closed or abandoned or will be closed as part of Facility closure, to determine whether these components should be included in the Phase 2 investigation. The Navy will submit a separate Phase 2 SAWP to the Hawaii Department of Health (DOH) and the United States Environmental Protection Agency (EPA).*

No actual or suspected releases from the onsite section of the AVGAS Line have been documented.

18. Page 2-3, 2.2.2.2 VC-5 to VC-4 (East Bank of West Loch):

a. States "The leak repairs must be performed before this pipeline segment can be pigged." Were the leak repairs done, and was the segment pigged?

Navy Response – Please refer to NCTF-RH's response to comment 17.

b. States, "The cleaned pipeline was not filled with grout because the pipeline may be transferred from FISC [Fleet Industrial Supply Center] to the Board of Water Supply." Was it transferred? If not, does it need to be filled with grout?

Navy Response - Please refer to NCTF-RH's response to comment 17.

19. Page 2-3, 2.2.3 Abandonment of Valve Chambers: States, "The valve chambers were not backfilled or covered with a concrete cap because the pipeline may be transferred from FISC to the Board of Water Supply." Do these chambers need to be closed now, or were they transferred?

Navy Response - Please refer to NCTF-RH's response to comment 17.

Enclosure 7: Final Demolition Report, Demolish Abandoned Tank Cleaning Water Piping and JP-5 Pipeline and Appurtenances, Dated June 2012

20. Page 4-4, 4.4.1 Truck Fill Stand: States, "The pipeline sections remaining in place were plugged with concrete and the area was subsequently backfilled." Were the sections only plugged at the ends? If so, could there be residual fuel trapped inside?

Navy Response – NCTF-RH is working on locating drawings that might provide additional insight on if/how the truck fill stand was connected to water and/or fuel piping that was part of the 2012 demolition report. This report (Enclosure 7) is currently the best source of information available. Based on how other piping in the report was investigated and emptied, it is reasonable to assume that any residual fuel that was encountered during the excavation would have been captured and disposed of in accordance with proper waste management procedures. NCTF-RH will continue to investigate this and provide additional information as it becomes available.