



Drinking Water Distribution System Recovery Plan

JBPHH, O'ahu, Hawai'i

December 2021

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This Drinking Water Distribution System Recovery Plan was prepared by the Navy, Army, State of Hawaii Department of Health, and the United States Environmental Protection Agency.

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Subj: DRINKING WATER DISTRIBUTION SYSTEM RECOVERY PLAN

This Drinking Water Distribution System Recovery Plan is provided to support the unidirectional flushing (UDF) of the Joint Base Pearl Harbor-Hickam (JBPHH) drinking water system. Testing indicates that residual volume of distributed fuel is too dilute for targeted capture and treatment within our approximately 25M gallon system. This plan details the allowable method and procedures for flushing the JBPHH potable water transmission system with clean drinking water from the Waiawa Shaft, our sole remaining production facility. Multiple efforts (e.g., the hydrologic capture zone analysis, sampling) are currently underway and this flushing effort is one of multiple lines of evidence that will be used to determine when it is appropriate for residents to return home.

This plan was developed in conjunction with the Navy, Army, State of Hawaii (HI) Department of Health (DOH), and United States Environmental Protection Agency (i.e., Interagency Drinking Water System Team) and reflects the consensus approach (that was developed during Face-to-Face meetings between all parties) for unidirectional flushing in a hydraulically-informed operation in response to the release at the Red Hill Shaft with the overarching goal of returning residents to their homes and/or workplaces SAFELY and as quickly as possible.

It should be noted that this distribution system recovery plan is evergreen – Meaning that it may/will be updated/revised as analytical data (and/or) other information are obtained that indicate that it should be adjusted to ensure protection of human health.

References:

- (a) State of Hawaii Department of Health, Directive One– Flushing Requirements Navy Water System Incident, Case No.: 20211128-1848 (HI Directive One, dated December 8, 2021)
- (b) Joint Drinking Water Sampling Plan, signed December 14, 2021

Enclosures:

- (1) UDF Plan (Subject to change under advisement of the Interagency Drinking Water System Team)
- (2) Daily Flushing Report
- (3) National Pollutant Discharge Elimination System (NPDES), Notice of General Permit Coverage, authoring the discharge of treated effluent from drinking water distribution system recovery activities

1. BACKGROUND

1.1. EVENT: Portions of the Navy water distribution system serving JBPHH and surrounding areas were exposed to low levels of fuel contamination with initial indications in the form of smell reports occurring on or about 28 November 2021. Late in the evening of 28 November, the Navy's Red Hill Shaft was isolated from the water distribution system based on the clustering of reports in areas served primarily from the Red Hill Shaft. Since that time, sampling has identified and confirmed low level petroleum contamination in the distribution system, with the Red Hill Shaft as the source.

The Red Hill Shaft has remained isolated and the Navy water distribution system is currently being served solely from the Waiawa Shaft, which continues to be free of contamination. The Navy's Aiea Halawa shaft was also secured over migration concerns of the contaminant plume.

1.2. CRITICAL URGENCY: Protecting public health, safety and the environment is paramount. Flushing the JBPHH water distribution system is a critical step in ensuring access to safe drinking water. Firm resolve and a sense of urgency is necessary to provide support to impacted residents and to ensure our people have access to a safe water supply.

1.3. CONSTRAINTS: The DOH, Directive One– Flushing Requirements Navy Water System Incident, Case No.: 20211128-1848 (HI Directive One) outlined constraints on flushing activities. The details below reflect edits made to HI Directive One in coordination with the DOH.

1.3.1. Discharges to State waters conducted to recover the Navy and Army drinking water distribution systems in non-compliance with this plan are prohibited.

1.3.2. Treatment, such as using diffusers & granulated activated carbon, shall be conducted prior to discharge to land-based application or storm drains, consistent with the applicable NPDES (Enclosure 3) permit. Discharges to a sanitary sewer system shall be conducted consistent with permits issued by the respective sewer system operator/owner. Once area is flushed, tested and approved by the DOH, previously authorized normal system operation and maintenance activities may resume.

1.3.3. Discharges may only be made onto soil – not to asphalt, concrete or roadways, unless discharged in compliance with applicable NPDES or sanitary sewer system discharge permits. No discharges may leave the soil and enter any storm drains not in compliance with NPDES or sewer system discharge permits. All discharges must be conducted in a manner to prevent human contact and minimize exposure to wildlife.

1.3.4. Prior to the flushing activity, initial discharges must be arranged with a Wastewater Treatment Plant that will accept as much of the flushed water as the Navy expects to discharge.

1.3.5. The Navy must maintain personnel at each flushing location to ensure the discharge does not contact persons, pets, wildlife, etc.

1.3.6. The Navy personnel at each flushing location must also ensure that no discharge enters the storm drain or State waters (e.g. streams, ocean, etc.) unless in compliance with applicable NPDES permits and discharge requirements.

1.3.7. The Navy must immediately stop the flushing activity at the flushing location if the discharge results in adverse effects at the discharge point (impacts include, but are not limited to, fuel smells, flooding, injury to wildlife, presence of endangered species in area, erosion, etc.)

2. DRINKING WATER DISTRIBUTION SYSTEM RECOVERY PLAN:

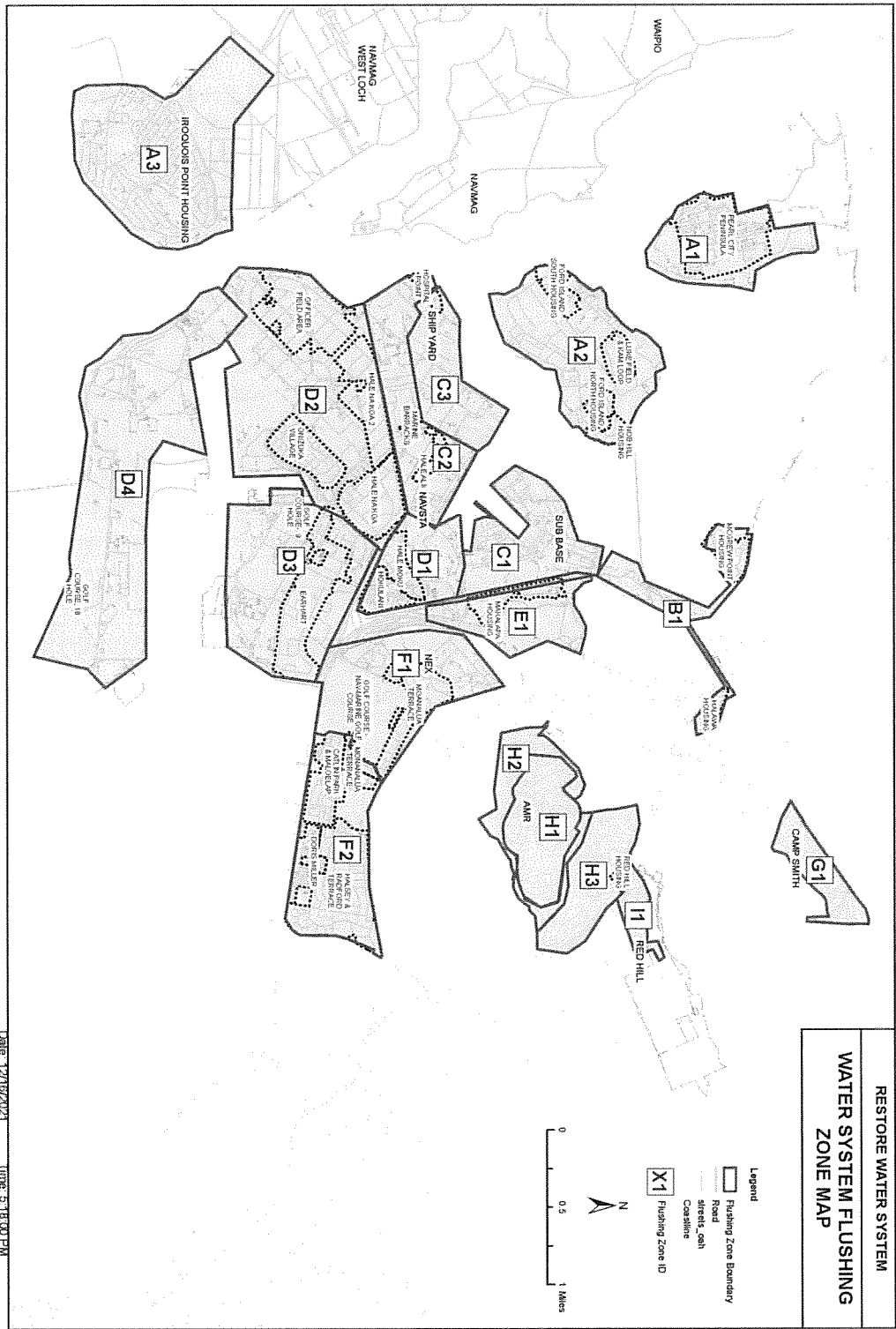
2.1. OBJECTIVE: Recover full functionality of the JBPHH drinking water distribution system as expeditiously as legally permissible through flushing of the system with clean drinking water from the Waiawa shaft. The water transmission system includes pressurized pipes and transmission system appurtenances.

2.2. DISTRIBUTION SYSTEM RECOVERY PLAN INTENT: For the purpose of potable water distribution lines and tank flushing, the US Navy shall strategically open fire hydrants at locations detailed in Enclosure 1. Flushing shall commence under the oversight of the State of Hawaii DOH, Interagency Drinking Water System Team, and under the direction of the US Navy leadership. All personnel associated with the flushing activities will be briefed regarding this plan and flushing shall only commence following the standard operating procedures detailed in this plan. A Flushing Report (Enclosure 2) shall be submitted for each flushing activity completed and compiled in a report submitted to the DOH daily.

2.2.1. EXECUTION: We will execute recovery of the system in four stages:

- 2.2.1.1. STAGE 1: Recover Distribution System and Tanks
- 2.2.1.2. STAGE 2: Flush Points of Service
- 2.2.1.3. STAGE 3: Certify to Potable Standards
- 2.2.1.4. STAGE 4: Monitor

2.3. DISTRIBUTION SYSTEM RECOVERY PLAN MAP:



The schematic diagram illustrates a power distribution system originating from a WAWWA source. The system is divided into four main phases, each containing specific components and numerical data:

- Phase #1:** Includes components A1 (Peak City Feeder), B1 (P. 1.25 MW), C1 (Hawthorn Feeder), D1 (Hill View Feeder), E1 (Surrey Ave), F1 (Hill View Feeder), and H1 (Air Quality). Numerical data is provided for each component.
- Phase #2:** Includes components G1 (Cann. 3000), C2 (Hawthorn Feeder), D2 (Hill View Feeder), E2 (Surrey Ave), F2 (Hill View Feeder), and H2 (Air Quality). Numerical data is provided for each component.
- Phase #3:** Includes components A2 (Tomball Feeder), B2 (P. 1.25 MW), C3 (Hawthorn Feeder), D3 (Hill View Feeder), E3 (Surrey Ave), F3 (Hill View Feeder), and H3 (Air Quality). Numerical data is provided for each component.
- Phase #4:** Includes components A3 (Hawthorn Feeder), B3 (P. 1.25 MW), C4 (Hawthorn Feeder), D4 (Hill View Feeder), E4 (Surrey Ave), F4 (Hill View Feeder), and H4 (Air Quality). Numerical data is provided for each component.

The diagram also shows a central storage tank labeled "RED HILL HOUSING 2X 0.25MG" and a "SUS 2X 0.5MG" tank, both connected to the distribution network. The numerical data in the boxes represents various parameters such as capacity, flow rate, and other system metrics.

2.5. FLUSHING PLAN PHASING: Areas where contamination has shown to be present by both testing and reporting are phased as follows:

2.5.1. PHASE 1: Mobile Granular Activated Carbon (GAC) units will be deployed to Flush Areas A1, H1, H2, H3, I1, D3, F1, and F2. For planning assumptions, the US Navy intends to flush each area with five volumetric turnovers minimum. Water will be tested to confirm that the flushed zone is indistinguishable from the source.

- 2.5.1.1. Flush Area A1
Area Pipe Volume (KGAL): 390
Total Minimum Turnover Volume (KGAL): 1,950
- 2.5.1.2. Flush Area H1 (includes Mid tank)
Area Pipe Volume (KGAL): 850
Total Minimum Turnover Volume (KGAL): 4,250
- 2.5.1.3. Flush Area H2 (includes South tank)
Area Pipe Volume (KGAL): 200
Total Minimum Turnover Volume (KGAL): 1,000
- 2.5.1.4. Flush Area H3 (includes North tank)
Area Pipe Volume (KGAL): 180
Total Minimum Turnover Volume (KGAL): 900
- 2.5.1.5. Flush Area I1 (includes Red Hill tanks)
Area Pipe Volume (KGAL): 820
Total Minimum Turnover Volume (KGAL): 4,100
- 2.5.1.6. Flush Area D3
Area Pipe Volume (KGAL): 280
Total Minimum Turnover Volume (KGAL): 1,400
- 2.5.1.7. Flush Area F1 (includes S1/S2 tanks)
Area Pipe Volume (KGAL): 12,270
Total Minimum Turnover Volume (KGAL): 61,350
- 2.5.1.8. Flush Area F2
Area Pipe Volume (KGAL): 290
Total Minimum Turnover Volume (KGAL): 1,450
- 2.5.1.9. Total Phase 1 Min. Turnover Volume (KGAL): 76,400

2.5.2. PHASE 2: Mobile GAC units will be deployed to Flush Areas D1, D2, D4, and E1. For planning assumptions the US Navy intends to flush each area with three volumetric turnovers minimum. Water will be tested to confirm that the flushed zone is indistinguishable from the source.

- 2.5.2.1. Flush Area D1

- Area Pipe Volume (KGAL): 260
- Total Minimum Turnover Volume (KGAL): 780
- 2.5.2.2. Flush Area D2
 - Area Pipe Volume (KGAL): 890
 - Total Minimum Turnover Volume (KGAL): 2,670
- 2.5.2.3. Flush Area D4
 - Area Pipe Volume (KGAL): 290
 - Total Minimum Turnover Volume (KGAL): 870
- 2.5.2.4. Flush Area E1
 - Area Pipe Volume (KGAL): 80
 - Total Minimum Turnover Volume (KGAL): 240
- 2.5.2.5. Total Phase 2 Min. Turnover Volume (KGAL): 4,560
- 2.5.3. PHASE 3: Mobile GAC units will be deployed to Flush Areas B1, C1, C2, C3, and G1. For planning assumptions, the US Navy intends to flush each area with two volumetric turnovers minimum. Water will be tested to confirm that the flushed zone is indistinguishable from the source.
 - 2.5.3.1. Flush Area C1
 - Area Pipe Volume (KGAL): 410
 - Total Minimum Turnover Volume (KGAL): 820
 - 2.5.3.2. Flush Area C2
 - Area Pipe Volume (KGAL): 250
 - Total Minimum Turnover Volume (KGAL): 500
 - 2.5.3.3. Flush Area C3
 - Area Pipe Volume (KGAL): 280
 - Total Minimum Turnover Volume (KGAL): 560
 - 2.5.3.4. Flush Area G1 (includes Camp Smith tanks)
 - Area Pipe Volume (KGAL): 620
 - Total Minimum Turnover Volume (KGAL): 1,240
 - 2.5.3.5. Flush Area B1
 - Area Pipe Volume (KGAL): 90
 - Total Minimum Turnover Volume (KGAL): 180
 - 2.5.3.6. Total Phase 3 Min. Turnover Volume (KGAL): 3,300
- 2.5.4. PHASE 4: Mobile GAC units will be deployed to Flush Areas A2 and A3. For planning assumptions, the US Navy intends to flush each area with one volumetric turnover minimum. Water will be tested to confirm that the flushed zone is indistinguishable from the source.

- 2.5.4.1. Flush Area A2
Area Pipe Volume (KGAL): 580
Total Minimum Turnover Volume (KGAL): 580
- 2.5.4.2. Flush Area A3
Area Pipe Volume (KGAL): 190
Total Minimum Turnover Volume (KGAL): 190
- 2.5.4.3. Total Phase 4 Min. Turnover Volume (KCAL): 770

2.6. DISCHARGE WASTE SITE PRIORITIZATION: Flushing locations were strategically located to optimize flow through all main line pipes within the flushing zone. The feasible discharge methods at each flush site were located and evaluated with the following prioritization:

2.6.1. SANITARY SEWER (Where WWTP permits): Discharge to sanitary sewer at locations indicated in this plan. Discharges will comply with permits issued by the respective wastewater treatment authority (i.e. City and County of Honolulu, Department of Environmental Services) and not be initiated until express authorization by the applicable wastewater treatment system owner or operator. The US Navy shall coordinate flushing into the sanitary sewer system with system owners and operators to prevent sanitary sewer overflows due to the drinking water distribution system flushing activities.

2.6.1.1. The US Navy will utilize, where feasible, the option to discharge hydrant effluent to the wastewater system if authorized by permit. If used, the same notification procedures outlined below will be used.

2.6.1.2. The US Army will utilize, where authorized, the option to discharge hydrant effluent to the City and County of Honolulu's wastewater system in accordance with applicable Industrial Wastewater Discharge Permit. The permit includes constraints for discharge connections, flows, and effluent limitations, to ensure that wastewater spills will not occur. Daily notification to the DOH Clean Water Branch when flushing to sanitary sewer will be provided along with gate access for their staff should inspection be warranted.

2.6.2. DIRECT LAND APPLICATION AFTER GAC TREATMENT: Discharge to flat, pervious areas where laminar flow is achievable in areas identified in this plan.

2.6.3. STORM DRAIN UNDER NPDES PERMIT AUTHORIZATION: Discharge to storm drains as identified in this plan.

2.7. FLUSHING STANDARD OPERATING PROCEDURES:

2.7.1. DAILY DIRECTION

2.7.1.1. Flushing operations are expected to run 24 hours, weather-permitting. The operation will be split into three shifts.

2.7.1.2. Prior to the start of each shift, crews will be provided with any critical updates then directed to specific geographic locations where fire hydrants will be opened as part of the flushing activities. Each crew will have one person designated as the crew chief which is responsible for supervising the crew and completing the Flushing Reports required. The maps included in this plan shall direct which geographic location will be flushed on the given day and be included in respective Flushing Reports. Navy personnel responsible for recording Field Observations shall be appraised of scheduled discharge locations and timing.

2.7.1.3. Deployed in phases upon availability and in phase order, the Navy has confirmed flight information for three of the twenty-one mobile GAC units. The daily production plan may therefore advance or slow based on the arrival of mobile GAC units. All flushing operations will be presented to the DOH 24 hours prior.

2.7.2. HYDRANT FLUSHING

2.7.2.1. Upon arrival to the designated location, the crew chief will confirm site conditions allow for flushing in compliance with this plan.

2.7.2.2. The crew chief shall fill out all parameters on the Flushing Report, including recording the time the hydrants are opened. Crew chiefs and all crew are responsible to ensure all requirements of this plan and Reference (c) are met, incorporating the modifications requested within this plan.

2.7.2.3. The crew chief will complete all notifications per the notification section of this plan (below) and complete preliminary site preparations per the site preparation section of this plan (below) before directing crews to open the designated hydrants.

2.7.2.4. At the direction of the crew chief, crews will commence with opening the designated hydrants and crew chief shall initiate the Flushing Report.

2.7.2.5. In the event of an unforeseen condition such as hose break/leakage, crews will cease all operations by closing the designated hydrant. Onsite team will notify crew chief who will report findings to officer in charge. Existing protocols (SOPs) to be used to address issue. Details of incident to be included in Flushing report.

2.7.2.6. Upon completion of the flushing, the report will go to the crew chief. The crew chief shall review the Flushing reports for completeness and submit the reports to the officer in charge.

2.7.2.7. The officer in charge shall review the Flushing Reports and submit to the DOH, Interagency Drinking Water System Team via email at cleanwaterbranch@doh.hawaii.gov.

2.7.3. NOTIFICATIONS. Prior to initiating flushing, the following notifications will be made:

2.7.3.1. NLT 24 hours prior: US Navy communication team to notify our Public-Private Venture (PPV) housing partner. PPV notifies affected community that flushing operations are to begin the following day. US Navy to ensure multiple communication methods are used to notify residents.

2.7.3.2. NLT 24 hours prior: Notification to State of Hawaii, DOH, Interagency Drinking Water System Team, State of Hawaii, Department of Health, Clean Water Branch, and applicable wastewater treatment system owners and operators (i.e. City and County of Honolulu, Aqua Engineers).

2.7.3.3. NLT noon the following day: Navy's designated Officer in Charge of flushing operations provides a consolidated report of the previous day's flushing operations IAW enclosure (2).

2.7.4. SITE PREPARATION. Sites where flushing will occur must be able to accommodate the volume of the water flushed onto it. The area must be free of wildlife, and the excess water must be dispersed in a manner that does not cause flooding or damage. Warning signs to avoid contact with the water must be placed. Navy personnel will be present during the entire duration of the flushing to prevent unintended contact.

3. COMPLIANCE SAMPLING: Discharge samples will be conducted in compliance with applicable NPDES or WWTP discharge permits. Sampling conducted shall be consistent with the overall sampling and analysis plan set forth in Reference (b) and approved of by Interagency Drinking Water System Team. US Navy and its representatives shall cooperate and coordinate any desired quality assurance practices such as split or replicate sampling requested by the State of Hawaii, Department of Health, in good faith. Specifically, for compliance with this plan, sampling shall be conducted as follows:

3.1. Samples shall be taken post-GAC treatment with a periodicity of one sample per flush area for Tier I analytes as described in Reference (b).

3.2. Treated effluent from the mobile GACs will meet the following quality standards in addition to NPDES effluent limits. Values are in the tables below are taken from HDOH standards and guidance and intended to address both impacts to aquatic habitats and potential odor and sheen issues. If there are any overlapping limits, the stricter of the limits shall apply.

CHEMICAL PARAMETER	Lowest Action Level (µg/L)
BENZENE	7.1E+01
ETHYLBENZENE	7.3E+00
METHYLNAPHTHALENE, 1-	2.1E+00
METHYLNAPHTHALENE, 2-	4.7E+00
NAPHTHALENE	1.2E+01
TOLUENE	9.8E+00
TPH (gasolines)	5.0E+02
TPH (middle distillates)	5.0E+02
TPH (residual fuels)	5.0E+02
Total TPH (sum of TPH values above)	5.0E+02
XYLENES	1.3E+01

Values in table from: HIDO, 2017, *Evaluation of Environmental Hazards at Sites with Contaminated Soil and Groundwater – Hawaii Edition* (Fall 2017): Hawaii'i Department of Health, Office of Hazard Evaluation and Emergency Response. <https://health.hawaii.gov/heer/guidance/ehe-and-eals/>

FIELD SAMPLING	Discharge Limit
DISSOLVED OXYGEN (mg/l)	Report
TEMPERATURE (degrees C)	Report
CONDUCTIVITY (us/cm)	Report
TURBIDITY (ntu)	Report

3.3. FIELD OBSERVATIONS: US Navy shall provide personnel to conduct visual observations of receiving water discharge locations. Visual observations under this section shall be conducted to ensure the discharges do not have easily recognizable adverse impacts as prohibited by section 1.3.7 of this plan. Person(s) directed to meet this requirement shall use field datasheets provided by the State of Hawaii, Department of Health, to record field observations and shall include photographs of site conditions at discharge locations during flushing. Field observation data sheets shall be submitted daily with the daily flush report.

3.4. OVERSIGHT BY OUTSIDE AGENCIES: US Navy and the US Department of Defense shall provide escorted access for oversight by State of Hawaii agencies charged with the protection of human and environmental health, natural resources, or related purpose. This includes, but is not limited to, providing access to discharge locations, flushing activities, or areas potentially impacted by flushing activities.

4. STANDARD FOR COMPLETION: Flushing activities are to cease sixty (60) days from the date the US Navy is authorized to commence with this plan or at the written direction of the State of Hawaii, Department of Health unless written extension is provided by the State of Hawaii, Department of Health. At the time of plan development, the US Navy is directed to conduct

water quality monitoring for Total Petroleum Hydrocarbons (TPH) at both the drinking water source (Waiawa Well) and at flushing end points to determine when: 1) the composition of the source water and flushing water are indistinguishable; or 2) when flushing of the JBPHH water transmission system is no longer reducing the level of TPH within the system.

ENCLOSURE 1

UNIDIRECTIONAL FLUSHING (UDF) PLAN

ENCLOSURE 2

DAILY FLUSH REPORT

ENCLOSURE 3

National Pollutant Discharge Elimination System

Notice of General Permit Coverage

Discharges of Treated Effluent Associated with Drinking Water
Distribution System Recovery

