Drinking Water Sampling Plan
JBPHH, O'ahu, Hawai'i

December 2021

Sherri R. Eng, N45
Commander, Navy Region Hawaii
By Direction of the Commander

Kathleen S. Ho
Deputy Director of Environmental Health
Hawaii Department of Health

Ben Castellana
On-Scene Coordinator
U.S. EPA Region 9

David K. Brixius
Chief of Environmental Division
U.S. Army Garrison Hawaii

This page intentionally left blank

Drinking Water Sampling Plan

JBPHH, O‘ahu, Hawai‘i

December 2021

Updated: January 2022

This Sampling Plan was prepared by the Navy, Army, State of Hawaii Department of Health, and the United States Environmental Protection Agency.

Record of Changes

Addendum	Change Summary	Date	Interagency Concurrence (Navy, Army, DOH, EPA)	
1	Adjustment of parameters for compliance samples, corrections to text, process clarification for house/building sampling after flushing, addition of Steps 2c, 2d, and POAM, removal of Section 2.2, and addition of stagnation sampling (24 and 72 hours after initial resident flush). Full track changes version will be saved in EDMS. All changes effective 01/04/2022, except for TOC and Chlorine which will be effective on 01/02/2022.	01/04/2022	[signature]	[signature] FOSC
			SLRS Navy	[signature]
2				
3				
4				
5				

This page intentionally left blank

Drinking Water Sampling Plan – Addendum 1

Amendments/ revisions/modifications to the signed Sampling Plan are jointly understood and were agreed upon by all members of the Interagency Drinking Water System Team (IDWST) as stated in Section 1.0 of the plan.

1. Clarification of Step 3 House/Building Flushing and Step 4 House/Building Sampling (Navy Initiated)

This addendum summarizes the jointly agreed clarification that the Navy may start sampling at 10% of residences in a flushing zone before flushing of all residences in the flushing zone has been completed. Sampling the zone is acceptable as long as the procedure follows a process which prohibits a flushing team from knowing they are working in a residence that will be sampled. The purpose of this process is to ensure resident flushing teams are not biased in their flushing effort, potentially altering the credibility of the 10% representative sampling approach for a Flushing Zone. This sampling is critical to ensuring compliant water quality and continuing to build trust with our regulatory partners and the public trust. The process for ensuring this is as follows:

> Note: The Teams performing the house flushing in Step 3 will not know in advance which residences will be sampled in Step 4. The intent is to keep the Flushing Teams and Sampling Teams totally isolated from each other (i.e., Double Blind) to ensure the quality/thoroughness of each house flushed is consistent with the plan regardless if it is sampled or not.

- The Navy will identify a dedicated house/building flushing team.
- The Navy will identify a dedicated house/building sampling team.
- House/Building flushing team members will not work on a sampling team and sampling team members will not work on a flushing team at any point during this effort.
- During the day of house/building flushing, the dedicated flushing team will receive their house/building flushing assignment for the day and perform their duties as scheduled.
- Sampling teams will receive their assignments as well, however, the start time for the sampling of a house/building will be no earlier than 24 hours after a flushing team completes their work at a given house/building.

As the teams for house/building flushing and sampling are dedicated for their respective work efforts, they will not interact during flushing effort, allowing for the opportunity to discuss schedules of upcoming work. This clarification will greatly increase the Navy's ability to schedule and complete house/building sampling in a Flushing Zone.

2. Laboratory Analytical Methods (Navy Initiated)

In accordance with Section 1.0 of the sampling plan, this addendum summarizes the jointly agreed clarification and adjustment to the list of Laboratory Analytical Methods found in Table 1 through Table 3. Tables 4 and 5 for Methods 8260 and 8270, Method Detection Limits, and Method Reporting Limits shall be completed by the Data Management Team. The intent of this addendum is to remove analytes from the list which are not related to fuel releases and therefore do not provide value-added data to the Red Hill response effort. Additionally, the collection of this unessential data results in a significant increase in the level of effort and logistical challenges, unnecessarily delaying the completion of sampling. DOH has requested the addition of Total Organic Carbon and free Chlorine (field test) with the drinking water compliance samples. The changes made to the Tables and text can be found in the "red line" version.

3. 24-hour and 72-hour Post-Flush (aka Stagnation Period) Samples and TOC (DOH Initiated) In order to ensure sampling accounts for the potential of leaching from lines within a house/building (Permeation and Leaching, EPA Office of Water Office of Ground Water and Drinking Water Distribution System Issue Paper, August 15, 2002), Hawaii Department of Health has also requested the inclusion of a subset of samples be collected from a vacant house/building. The 24-hour post-flush sample shall be collected no earlier than 24 hours after flushing in Step 3. The 72-hour post-flush sample shall be collected no earlier than 72 hours after flushing in Step 3. This sampling effort will include the analytes from Table 3b. The number of house/buildings in this subset is dependent on the number of available vacant house/buildings within a zone, with a target number of 10% of the identified sample locations. The Navy will provide the number of vacant houses/buildings to the DOH in advance of the sampling effort. The minimum number of buildings to be sampled in each zone is three or all of the buildings if there are less than three buildings in the zone. The 24-hour and 72-hour post-flush (aka stagnation) sample must be a first draw sample; no flushing shall occur before the first draw by either the Navy or the DOH. The purpose of this sampling is to evaluate the potential for contaminant leaching after a period of stagnation within a house/building.

Example for Zone A1:

a. 635 house and 16 buildings
b. 10% = 64 house and 3 buildings
c. 10% of 10% = 7 house/buildings for no earlier than *24-hour* and 72-hour post-flush samples taken by the Navy and DOH.
d. 57 remaining house/buildings for no earlier than 24-hour sampling by Navy

No flushing will occur before the first draw for either the Navy or DOH, similar to the method of collection used for lead and copper sampling methods. The first draw will be alternated between the Navy and DOH (e.g., house 1 = DOH; house 2 = Navy; house 3 = DOH; house 4 = Navy, etc.). Collection will begin with the smallest sample container for VOCs and TPH-g first. The faucet will be shut off between collection of samples to preserve the quantity of "first" draw.

Total Organic Carbon (TOC) and EPA Method 8021 for Chorine (field test) will be added to Table 3a and 3b. The purpose for adding these analytes is to ensure the drinking water system meets basic operating requirements in addition to the targeted sampling related fuel constituents.

This page intentionally left blank

Table of Contents

Appendices

Tables

This page intentionally left blank

Acronyms and Abbreviations

°C	degree Celsius
µg/L	micrograms per liter
COC	chain of custody
CTO	contract task order
DOH	State of Hawai‘i Department of Health
EAL	Environmental Action Level
EPA	United States Environmental Protection Agency
HCl	hydrochloric acid
HNO_3	nitric acid
JBPHH	Joint Base Pearl Harbor-Hickam
MCL	Maximum Contaminant Level
MDL	method detection limit
mg	milligram
mL	milliliter
NAVFAC	Naval Facilities Engineering Systems Command
QC	quality control
RL	reporting limit
SDWB	Safe Drinking Water Branch, State of Hawai‘i Department of Health
SGC	silica gel cleanup
SO_3	sulfur trioxide
SOP	standard operating procedure
TBD	to be determined
TPH	total petroleum hydrocarbons
VOA	volatile organic analysis

This page intentionally left blank

1.0 Introduction and Purpose

This Sampling Plan is provided to support the sampling of the Joint Base Pearl Harbor-Hickam (JBPHH) drinking water system (System) for analyses of petroleum hydrocarbons impacts from the Red Hill Shaft (one of the three water sources for JBPHH) that began on November 20, 2021. The purpose of this sampling is to support the effort to determine if the drinking water within the areas impacted by the release comply with State of Hawaii/United States Environmental Protection Agency Drinking Water standards. Multiple efforts (e.g., the hydraulic capture zone analysis, water-line flushing) are currently underway and this sampling effort is one of multiple lines of evidence that will be used to determine when it is appropriate for residents/occupants to return to their houses/buildings.

This plan was developed in conjunction with the Navy, Army, Hawaii Department of Health, and United States Environmental Protection Agency (i.e., IDWST) and reflects the consensus approach (that was developed during Face-to-Face meetings between all parties on 12/10/21, 12/11/21, and 12/13/21) for collecting and analyzing drinking water samples in response to the release at the Red Hill Shaft with the overarching goal of returning residents to their houses and/or workplaces SAFELY and as quickly as possible.

It should be noted that this Sampling 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.

1.1 Sampling Plan Overview

This section provides an overview of the primary steps that comprise this Sampling Plan and reflects the multiple lines of evidence approach that will be used to evaluate the data obtained from samples collected using this plan to make health-protective decisions regarding drinking water and the ability of families to return to their houses and/or workplaces. The significant steps of the plan are outlined below (and are discussed in detail in Section 2):

- **Step 0** – Collect Shaft water samples from the Waiawa Shaft, Aiea Halawa Shaft, and Red Hill Shaft to characterize concentrations of constituents in the source water.
- **Step 1** – Identify and Prioritize Contaminated Locations (Flushing Zones) in the JBPHH Water Distribution System and consecutive system (aka DOD Water Distribution System).
- **Step 2a** – Collect screening water samples from the Node(s) where flushing has been tentatively completed; therefore, requires confirmation compliance sampling. Note: These samples will be collected directly from the flushing point without any treatment/modification (e.g., GAC filtration will not be performed).
- **Step 2b** – Collect compliance water samples from the Node(s) where flushing has been tentatively completed. Note: These samples will be collected directly from the flushing point without any treatment/modification (e.g., GAC filtration will not be performed).

- **Step 2c –** If a sample from 2a and/or 2b exceeds Maximum Contaminant Levels (MCLs), DOH Environmental Action Levels (EALs) or Incident Specific Parameters (ISPs) as included in the *DOH Guidance to the Approach to Amend the Drinking Water Health Advisory*, the Navy will flush the localized zone again, in accordance with the Flushing Plan.
- **Step 2d** – Collect a screening and compliance sample from the Node identified in Step 1, the upstream Node, and the downstream Node.
- **Step 3** – Perform House/Building Specific Flushing for all structures in the Node(s) that was flushed in Step 2. This approach will follow the House/Building Flushing Plans that are currently under development or approved by the IDWST.
- **Step 4 –** Collect compliance drinking water samples from the taps in 10% of the houses/buildings in a Flushing Zone. A minimum of 15 houses/buildings, inclusive of a minimum of 3 buildings, shall be sampled in each Flushing Zone. These houses/buildings will be geographically distributed throughout the area to provide spatial coverage along the water supply line. In addition, the list of houses/buildings may be augmented based on additional information (e.g., houses/buildings where occupants reported specific health impacts, houses/buildings that are referred to the team by medical providers) may also be sampled. 24-hours and 72-hours after initial flushing is complete, the Navy and DOH will sample a subset (up to 10% of 10%) of the houses/buildings which are vacant for the same parameters (see Addendum 1 and Section 2.1).
- **Step 5 –** Long term drinking water monitoring:
    - **0 to 3 months after initial drinking water sampling**. Long-Term Monitoring (LTM) drinking water samples will be collected every month from 5% of the LTM houses/buildings in a Flushing Zone, with a minimum of 5 houses/buildings sampled in each Flushing Zone.
    - **4 to 24 months after initial drinking water sampling**. LTM drinking water samples will be collected every six months from 10% of the LTM houses/buildings in a Flushing Zone, with a minimum of 15 houses/buildings sampled in each Flushing Zone.

2.0 Sampling Locations and Schedules

2.1 Return to Occupancy/Normal Drinking Water Use Sampling Plan

This section discusses the primary steps that comprise this Sampling Plan and reflects the multiple lines of evidence approach that will be used to evaluate the data obtained from samples collected using this plan to make health-protective decisions regarding drinking water and the ability of families to return to their houses/buildings to use their drinking water. The significant steps of the plan are outlined below (see Flow-Chart 1 for more detail):

- **Step 0** – Collect Shaft water samples from the Waiawa Shaft, Aiea Halawa Shaft, and Red Hill Shaft to characterize concentrations of constituents in the source water. These samples will be analyzed via EPA Methods 8260 (VOCs), 8270 (SVOCs), 8015 (TPH-G, TPH-D, TPH-O) – plus Tentatively Identified Compounds (TICs).

  Purpose and Use of this information: This information will be used to identify/isolate contaminants of concern that will be used in subsequent sampling and analyses. Contaminants of concern in the source water will be the focus of the subsequent screening/investigation steps that are summarized below.

- **Step 1** – Identify and Prioritize Contaminated Locations (Flush Zones) in the JBPHH Water Distribution System and consecutive system.
  - This will incorporate information from:
    - Wide-spread, rapid Total Organic Carbon Testing Results
    - Results of phone calls/complaints of odors and other health related issues
    - Evaluating hydraulic transport information (Modeling) of the JPBHH water system to determine areas/locations of concern based on the location of the release and probable transport and ultimate fate in the water system.

  Purpose and Use of this information: This information will be used to identify the primary sample locations on the JBPHH water system (i.e., sample locations located off of specific water distribution lines that have been identified as potential concern (more details presented later in this Sampling Plan regarding these locations) and where line flushing will be performed. The flushing to follow Step 1 is to ensure that all water stored in pipes, tanks, etc., have been thoroughly flushed with clean water from the Waiawa Shaft prior to collecting drinking water samples in Step 2a, Step 2b, and possibly Step 2d.

- **Step 2a** – Collect screening water samples from distribution system Node(s) where flushing has been tentatively completed; therefore, requires confirmation compliance sampling. Note: These samples will be collected directly from the flushing point without any treatment/modification (i.e., GAC filtration will not be performed). Generally, a minimum of 1 to 5 volumes of water will be flushed with clean water from the Waiawa Shaft in a designated Flushing Zone prior to collecting screening samples (however, some

areas may be flushed with more volumes of water). One screening sample will be collected, post-flushing and will be analyzed for:

- EPA Methods 8260 (VOCs and TPH-G), 8270 (SVOCs), 8015 (TPH-D, TPH-O).[1]

Purpose and Use of this information: This information will be screened against Maximum Contaminant Levels (MCLs), DOH Environmental Action Levels (EALs) and Incident Specific Parameters (ISPs) as included in the *DOH Guidance to the Approach to Amend the Drinking Water Health Advisory*. If the results of the sample comply with the Table 2 of the *DOH Guidance to the Approach to Amend the Drinking Water Health Advisory* then this Zone will proceed to Step 3. If the results do not comply with the Table 2 of the *DOH Guidance to the Approach to Amend the Drinking Water Health Advisory* then agreement needs to be made with the IDWST to perform flushing and other remedial activities and the site will be re-tested.

- **Step 2b** – Collect compliance water samples from Node(s) where flushing has been tentatively completed. Note: These samples will be collected directly from the flushing point without any treatment/modification (e.g., GAC filtration will not be performed). Generally, a minimum of 1 to 5 volumes of water will be flushed with clean water from the Waiawa Shaft in a designated Flushing Zone prior to collecting compliance samples. One compliance sample will be collected, post-flushing and will be analyzed for:
  - EPA Methods 524.2, 525.2, 200.8/245.1, supplemented with 8015 (TPH-D, TPH-O), 8260 (TPH-G), TOC, and 8021 for free Chlorine (field test). Specific analytes can be found in Table 3a.[1]
  - Include on the Chain of Custody a note regarding the presence of fuel-like or chemical-like odor and/or sheen.

  The DOH shall collect one stratified compliance sample per Zone for drinking water compliance analytes only. The first sample will be alternated between the Navy and DOH (e.g., house 1 = DOH; house 2 = Navy; house 3 = DOH; house 4 = Navy, etc.). Collection will begin with the smallest sample container for VOCs and TPH-g first.

  For those Flushing Zones which have been completed before the approval of this Sampling Plan Addendum 1 (e.g., A1, A2, H1, H2, H3, I1, D1, D2), the DOH proposes to collect a stratified sample for TOC, Chlorine and drinking water analytes as "catch-up" samples to close the missing lines of evidence in these zones.

  Purpose and Use of this information: This information will be screened against MCLs, EALs, and ISPs as included in the *DOH Guidance to the Approach to Amend the Drinking Water Health Advisory*. If the results of the sample comply with the Table 2 of the *DOH Guidance to the Approach to Amend the Drinking Water Health Advisory* then this Zone will proceed to Step 3. If the results do not comply with the Table 2 of the *DOH Guidance*

[1] This list will be modified/adjusted based on the results of the Shaft Samples.

to the Approach to Amend the Drinking Water Health Advisory then the process continues on to Step 2c.

- **Step 2c** – If a sample from Step 2a and/or 2b exceeds MCLs, specified EALs, or DOH SPs included in the *DOH Guidance to the Approach to Amend the Drinking Water Health Advisory*, the Navy will reflush the localized zone again, in accordance with the Flushing Plan.
- **Step 2d** – Collect a screening and compliance sample from the Node identified in Step 1, the upstream Node, and the downstream Node. Screening and Compliance samples will be analyzed for:
    - EPA Methods 8260 (VOCs and TPH-G), 8270 (SVOCs), 8015 (TPH-D, TPH-O).[2]
    - EPA Methods 524.2, 525.2, 200.8/245.1, supplemented with 8015 (TPH-D, TPH-O), 8260 (TPH-G), TOC, and 8021 for free Chlorine (field test). Specific analytes can be found in Table 3a.[1]
    - Include on the Chain of Custody a note regarding the presence of fuel-like or chemical-like odor and/or sheen.

  Purpose of this information: This information will be screened against MCLs, EALs, and ISPs as included in the *DOH Guidance to the Approach to Amend the Drinking Water Health Advisory*. If the results of the sample comply with the Table 2 of the *DOH Guidance to the Approach to Amend the Drinking Water Health Advisory* then this Zone will proceed to Step 3. If the results do not comply with the Table 2 of the *DOH Guidance to the Approach to Amend the Drinking Water Health Advisory* then the process enters a Strategic Pause, in which the IDWST determines a Plan of Action and Milestones (POAM) which may include performing additional flushing or other remedial activities. If the remedial actives are successful the process continues to Step 3. If not, the IDWST returns to the Strategic Pause and development and implementation of a new POAM.
- **Step 3** – Perform House/Building Specific Flushing for all structures in the Node(s) that were flushed in Step 2. This approach will follow the House/Building Flushing Plans that are currently under development or approved by the IDWST.

  Purpose of this information: The purpose of this step is to ensure that all water stored in pipes, tanks, appliances, et cetera, of houses/buildings have been thoroughly flushed with clean water from the Waiawa Shaft prior to collecting drinking water samples in Step 4.
- **Step 4 –** Collect compliance drinking water samples from the taps in 10% of the houses/buildings in a Flushing Zone, with a minimum of 15 houses and 3 buildings for each Flushing Zone. Sampling of these houses/buildings will occur no earlier than 24-hours after initial flushing is complete. This sample must be a first draw sample; no

[2] This list will be modified/adjusted based on the results of the Shaft Samples.

flushing shall occur before the first draw by either the Navy or the DOH. DOH may collect stratified samples at these locations with 24-hour notice to the Navy.

Stagnation Samples – The Navy will identify vacant houses/buildings in each zone to collects samples focused on the impacts of stagnation within a house/building. These locations will be no more than 10% of the sample locations identified for Step 4 (dependent on availability). Samples in these locations will be collected during the initial round of sampling (described in Step 4) with DOH collecting stratified samples. Samples in these locations will be collected again no earlier than 72-hours after initial flushing is complete in the same manner (same parameters with DOH collecting stratified samples).

- Samples will be analyzed for Methods 524.2, 525.2, 200.8/245.1, supplemented with 8015 (TPH-D, TPH-O), 8260 (TPH-G), TOC, and 8021 for free Chlorine (field test). Specific analytes can be found in Table 3b[1].
- Include on the Chain of Custody a note regarding the presence of fuel-like or chemical-like odor and/or sheen.

These houses/buildings will be geographically distributed throughout the area to provide spatial coverage along the water supply line. In addition, the list of houses/buildings may be augmented based on additional information (e.g., houses/buildings that reported specific health impacts, houses/buildings that are referred to the team by medical providers) may also be sampled.

Purpose and Use of this information: The purpose of this step is to confirm that the water in the houses/buildings located in this area is safe to drink and that residents/occupants may return to their houses/buildings (if they left) and the drinking water is fit for human consumption in accordance with the *DOH Guidance to the Approach to Amend the Drinking Water Health Advisory*. A single drinking water sample will be collected as a first draw from each of the house/building selected for sampling in this area. If the drinking water results collected from all of the representative houses/buildings that were sampled comply with Table 2 of the *DOH Guidance to the Approach to Amend the Drinking Water Health Advisory*, then all residents/occupants within this designated area may return to their houses/buildings and the drinking water is fit for human consumption. If the drinking water results collected from all of the sampled representative houses/buildings do not comply with Table 2 of the *DOH Guidance to the Approach to Amend the Drinking Water Health Advisory*, then the residents/occupants will not be allowed to return to their houses/buildings and/or use the drinking water for human consumptive uses in their houses/buildings (in instances where they have not left their houses/buildings). In addition, the IDWST will develop and implement a Plan of Action and Milestones (POAM) for this Flushing Zone (e.g., performing additional flushing, performing targeted/flushing at specific houses/buildings, etc). The houses/buildings would be tested again after remedial actions have been implemented. Before the drinking water health advisory is amended for a zone, 10% of the data needs to meet Level 4 data validation (see Section 6.0).

Vacant Houses/Building Stratified Samples: In order to ensure sampling encompasses for the potential of leaching from lines within a residence, Hawaii Department of Health has also requested the inclusion of a subset of samples be collected from a vacant house/building, 72 hours after flushing. This sampling effort will include the analytes from Table 3b. The number of house/buildings in this subset is dependent on the number of available vacant house/buildings within a zone, with a target number of 10% of the identified sample locations. The Navy will provide the number of vacant houses/buildings to the DOH in advance of the sampling effort.

Example for Zone A1:

- 635 house and 16 buildings
- 10% = 64 house and 3 buildings
- 10% of 10% = 7 house/buildings for no earlier than *24-hour* and 72-hour post-flush samples taken by the Navy and DOH.
- 57 remaining house/buildings for no earlier than 24-hour sampling by Navy

- 24-hour Post Flush Stratified Samples: The 24-hour post flush sample must be a first draw sample; no flushing shall occur before the first draw by either the Navy or the DOH. No large-scale flushing will occur before the first draw for either the Navy or DOH, similar to the method of collection used for lead and copper sampling methods. The first draw will be alternated between DOH and the Navy in this stratified procedure. Less than 5 liters of first draw water is anticipated to be collected. The collections will begin with the smallest sample container for VOCs and TPH-g first. The faucet will be shut off between collection of samples to preserve the quantity of "first" draw. The process will be the same if the building is occupied.
- 72-hour Post Flush Stratified Samples: The 72-hour post-flush sample must be a first draw sample; no flushing shall occur before the first draw by either the Navy or the DOH. The purpose of this sampling is to evaluate the potential for contaminant leaching after a period of stagnation within a residence or building. No large-scale flushing will occur before the first draw for either the Navy or DOH, similar to the method of collection used for lead and copper sampling methods. The first draw will be alternated between DOH and the Navy in this stratified procedure. Less than 5 liters of first draw water is anticipated to be collected. The collections will begin with the smallest sample container for VOCs and TPH-g first. The faucet will be shut off between collection of samples to preserve the quantity of "first" draw. The sample volume at the 24-hour post flush point is small enough that it would still maintain the integrity of the 72-hour water that has been "stagnant" in premise plumbing.

- **Step 5 –** Long term drinking water monitoring:
    - **0 to 3 months after initial drinking water sampling**. Long-Term Monitoring drinking water samples will be collected every month from 5% of the LTM houses/buildings in a Flushing Zone, with a minimum of 5 houses/buildings sampled in each Flushing Zone. New houses/buildings should be sampled, if possible – to achieve more robust spatial/geographic coverage. Drinking water samples will be collected from the taps in these houses/buildings and analyzed for Methods 524.2, 525.2, 200.8/245.1, supplemented with 8015 (TPH-D, TPH-O), 8260 (TPH-G), TOC, and 8021 for free Chlorine (field test). Specific analytes can be found in Table 3b[1]. These houses/buildings will be geographically distributed throughout the area to provide spatial coverage along the water supply line and may or may not be the same houses/buildings that were sampled in Step 4.
        - The Navy shall provide a schedule and location of these samples to DOH at least 1 week before the collection of these samples. DOH may collect splits and/or stratified samples at these locations with 48-hour notice to the Navy. The DOH collected samples may be tested at the Navy third-party laboratory; and reserves the right to send the samples to a separate DOH-selected laboratory. The sampling team shall follow all safety protocols.
    - **4 to 24 months after initial drinking water sampling**. Long-Term Monitoring drinking water samples will be collected every six months from 10% of the LTM houses/buildings in a Flushing Zone, with a minimum of 15 houses/buildings sampled in each Flushing Zone. New houses/buildings should be sampled, if possible – to achieve more robust spatial/geographic coverage. Drinking water samples will be collected from the taps in these houses/buildings and analyzed for (Methods 524.2, 525.2, 200.8/245.1, supplemented with 8015 (TPH-D, TPH-O), 8260 (TPH-G), TOC, and 8021 for free Chlorine (field test). Specific analytes can be found in Table 3b[1]. These houses/buildings will be geographically distributed throughout the area to provide spatial coverage along the water supply line and may or may not be the same houses/buildings that were sampled in Step 4.
        - The Navy shall provide a schedule and location of these samples to DOH at least 2-weeks before the collection of these samples. DOH may collect splits and/or stratified samples at these locations with 1-week notice to the Navy. The DOH collected samples may be tested at the Navy third-party laboratory; and reserves the right to send the samples to a separate DOH-selected laboratory. The sampling team shall follow all safety protocols.

- **Purpose and Use of this information:** The purpose of this step is to confirm that the water in the houses/buildings located in this Flushing Zone continues to be Fit for Human Consumption. A single tap water sample will be collected from each of the houses/buildings selected for sampling in this Flushing Zone. If the tap water results collected from all of the

representative houses/buildings that were sampled comply with Table 2 of the *DOH Guidance to the Approach to Amend the Drinking Water Health Advisory*, then it will be confirmed that the drinking water this area remains Fit for Human Consumption. If the drinking water results collected from all of the sampled representative houses/buildings do not comply with Table 2 of the *DOH Guidance to the Approach to Amend the Drinking Water Health Advisory*, then the residents/occupants will not be allowed to return to houses/buildings and/or use the drinking water in their houses/buildings (in instances where they have not left houses/buildings). In addition, the IDWST will determine next steps for this Flushing Zone (e.g., performing additional flushing, performing targeted/flushing at specific houses/buildings). The houses/buildings would be tested again after remedial actions have been implemented.

Flow-Chart 1: JBPHH Drinking Water Investigation/Decision Flow-Chart <<See PDF>>

Step 0 - Collect Water Samples from the 3 Shaft Wells

Analyze via:
EPA Methods 8260 (VOCs), 8270 (SVOCs), 8015 (TPH-G, TPH-D, TPH-O) - plus Tentatively Identified Compounds (TICs)

Step 1 – Identify and Prioritize Contaminated Locations (Flush Zones) in the DOD Water Distribution System

Use multiple lines of evidence to identify candidate Flushing Locations (e.g., TOC Data, Complaint Line, Modeling)

Step 2a – Flush the Localized Zones in Accordance with the Flushing Plan and then Collect One Post-Flush (NO GAC TREATMENT) Screening Water Sample from the Node(s) Identified in Step 1

Screening Sample Analyzed via:
EPA Methods 8260 (VOCs, TPH-G), 8270 (SVOCs), 8015 (TPH-D, TPH-O)

*List may be modified/focused based on Shaft Well Sample Results

Step 2b – Collect One Post-Flush (24 hours after screening sample) (NO GAC TREATMENT) Compliance Water Sample from the Node(s) Identified in Step 1

Compliance Sample Analyzed via:
Drinking Methods 524.2, 525.2 (limited parameters), 200.8/245.1, supplemented with 8015 (TPH-D, TPH-O), 8260 (TPH-G), Total Organic Carbon, and 8021 for free Chlorine (field test).

*List may be modified/focused based on Shaft Well Sample Results

Do the results comply with MCLs, specified EALs, and DOH Incident Specific Parameters (ISP) specified in Table 2 of (DOH 2021?[a]

No

Step 2c – Reflush Localized Zone in Accordance with the Flushing Plan.

Step 2d – Collect One Post-Flush Screening and Compliance sample (NO GAC TREATMENT) from the Node(s) Identified in Step 1 and the Node immediately upgradient, and the Node immediately downgradient (as applicable)

Do the results comply with MCLs, specified EALs, and DOH Incident Specific Parameters (ISP) specified in Table 2 of (DOH 2021?[a]

No

Strategic pause for this Flushing Zone. IDWST determines Plan of Action and Milestones (POAM) which may include performing additional flushing and/or other remedial activities.

Remedial Action Successful?

No

Yes

Yes

Yes

The Interagency Drinking Water System Team agreed that vapor intrusion is not a health concern. However, windows will be opened in order promote air exchange/turnover during the flushing process. Pets will be protected by keeping them away from open windows.

Step 3 - Perform House/Building Specific Flushing for all locations downgradient of the Node(s) that were Flushed in Step 2

House/Building Flushing will be performed in accordance with the House/ Building Flushing Plan as approved by the IDWST.

*List may be modified/focused based on Shaft Well Sample Results

Note: The Teams performing the flushing (Step 3) will not know in advance which residences will be sampled in (Step 4). The intent is to keep the Flushing Teams and Sampling Teams totally isolated from each other (i.e., double Blind) to ensure the quality/thoroughness of each house flushed is consistent with the plan regardless if it is sampled or not.

Step 4 - Collect compliance drinking water samples from the taps in a representative number of houses/buildings located in the Flushing Station (Step 2)

The Navy will sample 10% of the houses/buildings in each Flushing Zone, with a minimum of 15 houses/buildings sampled.

Compliance Samples will be analyzed via Drinking Methods 524.2, 525.2 (limited parameters), 200.8/245.1, supplemented with 8015 (TPH-D, TPH-O), 8260 (TPH-G), Total Organic Carbon, and 8021 for free Chlorine (field test).

24-hours and 72-hours after initial flushing is complete, the Navy and DOH will sample a subset (10% of the 10%) of sample locations which are vacant for the same parameters (see Addendum 1).

*House/Building sampling list may be augmented by site-specific information (e.g., input from medical, input from complaint line)

*Analyte list may be modified/focused based on Shaft Well Sample Results

Do the results comply with MCLs, specified EALs, and DOH Incident Specific Parameters (ISP) specified in Table 2 of (DOH 2021?[a]

No

IDWST agree on POAM which may include performing additional flushing, performing targeted/ flushing at specific houses/ buildings or other remedial activities.

Remedial Action Successful?

No

Yes

Yes

DOH amends Health Advisory Drinking Water is Fit for Human Consumption and Residents May Use Drinking Water for all Purposes within the Flushing Zone

Step 5 - Long term drinking water monitoring. Collect compliance drinking water samples from the taps in a representative number of houses/buildings.

LTM for 0 to 3 Months after initial Drinking Water Sampling
The Navy will sample 5% of the LTM houses/buildings in each Flushing Zone per month, with a minimum of 5 houses/buildings sampled in each Flushing Zone. New houses/buildings should be sampled, if possible – to achieve more robust spatial/geographic coverage.

Compliance Samples will be analyzed via Drinking Methods 524.2, 525.2 (limited parameters), 200.8/245.1, supplemented with 8015 (TPH-D, TPH-O), 8260 (TPH-G), Total Organic Carbon, and 8021 for free Chlorine (field test).

*Houses/Buildings sampling list may be augmented by site-specific information (e.g., input from medical, input from complaint list)

*Analyte list may be modified/focused based on Shaft Well Sample Results

Do the results comply with MCLs, specified EALs, and DOH Incident Specific Parameters (ISP) specified in Table 2 of (DOH 2021?[a]

No

IDWST agree on POAM for this Flushing Zone (e.g., collecting additional samples, providing bottled water to specific locations, performing additional flushing, performing targeted flushing). The houses/buildings will be tested again upon completion of remedial actions

Remedial Action Successful?

No

Yes

Yes

Validated that Drinking Water is Fit for Human Consumption and Residents May Continue to Use Drinking Water for all Purposes

Yes

LTM for 4 to 24 Months after initial Drinking Water Sampling
The Navy will sample 10% of the LTM houses/buildings in each Flushing Zone every 6 months for two years, with a minimum of 15 houses/buildings sampled in each Flushing Zone. New houses/buildings should be sampled, if possible – to achieve more robust spatial/geographic coverage.

Compliance Samples will be analyzed via Drinking Methods 524.2, 525.2 (limited parameters), 200.8/245.1, supplemented with 8015 (TPH-D, TPH-O), 8260 (TPH-G), Total Organic Carbon, and 8021 for free Chlorine (field test).

*Houses/Buildings sampling list may be augmented by site-specific information (e.g., input from medical, input from complaint list)

*Analyte list may be modified/focused based on Shaft Well Sample Results

[a]**Subprocess:** Chemicals not listed in Table 2 of (DOH 2021) (i.e., Table 3 of DOH 2021 and/or other chemicals tested per the requirements of this Sampling Plan) that do not comply with MCLs, specified EALs, and DOH ISPs will be Investigated Outside of this Process under the direction of the DOH. DOH may, if appropriate, still make a determination to amend the Health Advisory for this Flushing Zone that Drinking Water is Fit for Human Consumption depending on a site-specific assessment of the exeedances.

3.0 Sample Control Procedures

Prior to sampling, the field team will inspect all supplies and consumables to ensure that they are acceptable for use. Table 1 lists, for each analyte group, the sample containers, preservatives, and applicable hold times as required by SW-846 and applicable state and federal drinking water methods. The analytical laboratories selected for the site characterization will provide the required sample containers. Chain-of-custody (COC) documentation will be maintained for samples during all phases of sample collection, transport, and receipt and internal transfer within the laboratory.

Table 1: Sample Containers, Preservatives, and Holding Times- Compliance Sampling

Parameter	Analytical Method	Container	Preservative	Holding Time
Volatile Organic Chemicals	524.2	3 x 40 mL Glass VOA	0.5 mL HCl (Unchlorinated); 25 mg Ascorbic / 3 drops HCl (Chlorinated)	14 days
Synthetic Organic Chemicals	525.2	2 x 1 L Amber Glass	2 mL HCl (unchlorinated); 45 mg Sodium Sulfite / 2 mL HCl (chlorinated)	14 days
Metals	200.8/245.1	250 mL Poly	1 mL HNO_3, pH<2	6 months /28 days
Total Petroleum Hydrocarbon (TPH), diesel/oil	8015	2 x 1 L Amber Glass	0.5 mL HCl	14 days
TPH gasoline	8260	3 x 40 mL Glass VOA	0.5 mL HCl	14 days
Total Organic Carbon (TOC)	EPA Approved	3 x 40 mL Glass VOA		14 days
Chlorine, Free (Field Test)	8021			

Note:
All samples will be chilled to < 6°C.
This list may be modified/adjusted based on the results of the Shaft Samples.

4.0 Laboratory Analytical Methods

Analytical activities will be separated into two phases 1) system flushing assessment phase and 2) drinking water compliance phase.

1) System flushing will be performed in a phased approach moving in accordance with the flushing plan. Analytical samples will be collected during the system flushing to assess

progress towards clearing the system of incident specific parameters. These samples will be analyzed for a JP-5-focused analyte list via SW-846 analytical methods for rapid assessment of the how the flush program is progressing. In general, an impacted area will move to the compliance phase after a minimum of three volumes[3] of water has been flushed through the specific impacted area.

2) During the compliance portion of the assessment (i.e., following System flushing and purification/decontamination of system piping and appurtenances), drinking water samples will be analyzed by United States Environmental Protection Agency (EPA) drinking water compliance methods and will include SW-846 methods for total petroleum hydrocarbons (TPH).

Table 2 and Table 3a and 3b present the analytical methods and associated analytes, reporting limits (RLs), and method detection limits (MDLs) along with regulatory standards, including the Federal and State of Hawaii Maximum Contaminant Levels (MCLs) and the State of Hawaii Environmental Action Levels (EALs), for drinking water and SW-846 analytical methods, respectively.

All analytical required supplies, sample containers and preservatives and shipping supplies shall be provided by the analytical laboratory, unless using the PHILIS EPA Modular Laboratory stationed at Naval Weapons Station Seal Beach in California.

Table 2: Summary of Drinking Water (Step 2b and 4) Analytical Methods, Analytes, Action Levels, and Method Detection Limits

Analytical Method	Analyte	CAS_RN	DOH SDWB / EPA MCL (µg/L)	DOH EAL (µg/L)	Incident Specific Parameter (µg/L)	Method Detection Limit (µg/L)	Method Reporting Limit (µg/L)
524.2	Benzene	71-43-2	5/5	5	5	0.5	
524.2	Ethylbenzene	100-41-4	700/700	7.3	700	0.5	
524.2	Toluene	108-88-3	1000/1000	9.8	1000	0.5	
524.2	m,p-Xylenes	1330-20-7	10000/10000	13	10000**	0.5**	
524.2	o-Xylenes	95-47-6	10000/10000	13	10000**	0.5**	
525.2	1-Methylnaphthalene	90-12-0	—	10	2.1		
525.2	2-Methylnaphthalene	91-57-6	—	10	4.7		
525.2	Naphthalene	91-20-3	—	17	12		
200.8	Lead	7439-92-1	15*		15	1.0	
TBD	2-(2-methoxyethoxy) ethanol	111-77-3	80[a]	—	80		
8260	TPH-Gasoline	PCHG	—	300	≤200	200	
8015	TPH-Diesel	PCHD	—	400	≤200	200	

[3] The flushing volume may be adjusted up or down based on site-specific information. For example, potentially impacted areas located more westerly in the system will generally require less flushing than potentially impacted areas located in the eastern area of the system.

Analytical Method	Analyte	CAS_RN	DOH SDWB / EPA MCL (µg/L)	DOH EAL (µg/L)	Incident Specific Parameter (µg/L)	Method Detection Limit (µg/L)	Method Reporting Limit (µg/L)
8015	TPH-Oil	MOIL	—	500	≤200	200	
EPA Approved	Total Organic Carbon (TOC)	—	—	—	2000	1500	
8021	Chlorine, free (field Test)	—	—	—	—		

Notes:

Method Detection Limit is the limit that determines when an analyte can be detected (either the LOD or the MDL). Detections above this level and below the Method Reporting Level (MRL or LOQ) are deemed "detected" and will be qualified as estimated (J).

* Action Level for Lead.

** 10,000 ug/L is the MCL for Total Xylenes.

[a.] 2-(2-methoxyethoxy) ethanol does not have an MCL or EAL, the value provided is the USEPA Regional Screening Level

MCLs: DOH Safe Drinking Water Branch (SDWB) regulatory constituents

DOH EALs: Table D-1a. Groundwater Action Levels (Drinking Water, Surface Water <150 meters) (DOH 2017). https://health.hawaii.gov/heer/files/2019/11/HDOH-EAL-Surfer-Fall-2017.xlsx; Volume 2 Appendix 1, Section 6.6.

This list may be modified/adjusted based on the results of the Shaft Samples.

Table 3a: Distribution Sampling (Step 2b) Summary Drinking Water Analytical Methods, Analytes, Action Levels, and Method Detection Limits

Analytical Method	Analyte	CAS_RN	DOH SDWB / EPA MCL (µg/L)	DOH EAL (µg/L)	Incident Specific Parameter (µg/L)	Method Detection Limit (µg/L)	Method Reporting Limit (µg/L)
More information to be provided when it becomes available.							
524.2	1,1,1-Trichloroethane	71-55-6	200/200	11	11	0.5	
524.2	1,1,2-Trichloroethane	79-00-5	5/3	5	5	0.5	
524.2	1,1-Dichloroethylene	75-35-4	7/7	7	7	0.5	
524.2	1,2,4-Trichlorobenzene	120-82-1	70/70	70	70	0.5	
524.2	1,2-Dichlorobenzene	95-50-1	600/600	10	10	0.5	
524.2	1,2-Dichloroethane (EDC)	107-06-2	5/5	5	5	0.5	
524.2	1,2-Dichloropropane (DCP)	78-87-5	5/5	5	5	0.5	
524.2	1,4-Dichlorobenzene	106-46-7	75/NA	5	5	0.5	
524.2	Benzene	71-43-2	5/5	5	5	0.5	
524.2	Carbon tetrachloride (CTC)	56-23-5	5/5	5	5	0.5	
524.2	Chlorobenzene	108-90-7	100/100	25	25	0.5	
524.2	cis-1,2-Dichloroethylene	156-59-2	70/70	70	70	0.5	
524.2	Dichloromethane	75-09-2	5/5	5	5	0.5	
524.2	Ethylbenzene	100-41-4	700/700	7.3	700	0.5	
524.2	Styrene	100-42-5	100/100	10	10	0.5	
524.2	Tetrachloroethylene	127-18-4	5/5	5	5	0.5	
524.2	Toluene	108-88-3	1000/1000	9.8	1000	0.5	
524.2	trans-1,2-Dichloroethylene	156-60-5	100/100	100	100	0.5	
524.2	Trichloroethylene (TCE)	79-01-6	5/5	5	5	0.5	
524.2	Vinyl Chloride	75-01-4	2/2	2	2	0.3	
524.2	m,p-Xylenes	1330-20-7	10000/10000	13	10000**	0.5**	
524.2	o-Xylenes	95-47-6	10000/10000	13	10000**	0.5**	
525.2	1-Methylnaphthalene	90-12-0	—	10	2.1		
525.2	2-Methylnaphthalene	91-57-6	—	10	4.7		
525.2	Naphthalene	91-20-3	—	17	12		
525.2	Alachlor	15972-60-8	2/2	—	2	2	
525.2	Atrazine	1912-24-9	3/3	3	3	0.1	
525.2	Benzo[a]pyrene	50-32-8	0.2/0.2	0.06	0.06	0.02	
525.2	Chlordane	12789-03-6	2/2	0.004	0.004	0.2	
525.2	Di(2-ethylhexyl)adipate	103-23-1	400/400	—	400	0.6	
525.2	Di(2-ethylhexyl)phthalate	117-81-7	6/6	3	3	0.6	
525.2	Endrin	72-20-8	2/2	0.0023	0.0023	0.01	

525.2	Heptachlor	76-44-8	0.4/0.4	0.0036	0.0036	0.04	
525.2	Heptachlor Epoxide	1024-57-3	0.2/0.2	0.0036	0.0036	0.02	
525.2	Hexachlorobenzene	118-74-1	1/1	0.0003	0.0003	0.1	
525.2	Hexachlorocyclopentadiene	77-47-4	50/50	—	50	0.1	
525.2	Lindane	58-89-9	0.2/0.2	0.063	0.063	0.02	
525.2	Methoxychlor	72-43-5	40/40	0.03	0.03	0.1	
525.2	PCBs (as Aroclors)	1336-36-3	0.5/0.5	—	0.5	0.1	
525.2	Pentachlorophenol	87-86-5	1/1	1	1	0.04	
525.2	Simazine	122-34-9	4/4	4	4	0.07	
200.8	Antimony	7440-36-0	6	6	6	0.4	
200.8	Arsenic	7440-38-2	10	10	10	1.4	
200.8	Barium	7440-39-3	2000	220	220	2	
200.8	Beryllium	7440-41-7	4	0.66	0.66	0.3	
200.8	Cadmium	7440-43-9	5	3	3	1	
200.8	Chromium	7440-47-3	100	11	11	7	
200.8	Copper	7440-50-8	1300	2.9	2.9	50	
200.8	Lead	7439-92-1	15*			1	
245.1	Mercury	7487-94-7	2	0.025	0.025	0.2	
200.8	Selenium	7782-49-2	50	5	5	2	
200.8	Thallium	7440-28-0	2	2	2	0.3	
EPA Approved	Total Organic Carbon (TOC)	TOC	—	—	2000	1500—	—
8260	Total Petroleum Hydrocarbon (TPH) Gasoline	PCHG	—	300	≤200	200	
8015	Total Petroleum Hydrocarbon (TPH) Oil	MOIL	—	500	≤200	200	
8015	Total Petroleum Hydrocarbon (TPH) Diesel	PCHD		400	≤200	200	
8021	Chlorine, Free (Field Test)	CHLORINE	—	—		—	—

Notes:

Method Detection Limit is the limit that determines when an analyte can be detected (either the LOD or the MDL). Detections above this level and below the Method Reporting Level (MRL or LOQ) are deemed "detected" and will be qualified as estimated (J).

* Action Level for Lead.

** 10,000 ug/L is the MCL for Total Xylenes.

[a.] 2-(2-methoxyethoxy) ethanol does not have an MCL or EAL, the value provided is the USEPA Regional Screening Level

MCLs: DOH Safe Drinking Water Branch (SDWB) regulatory constituents

DOH EALs: Table D-1a. Groundwater Action Levels (Drinking Water, Surface Water <150 meters) (DOH 2017). https://health.hawaii.gov/heer/files/2019/11/HDOH-EAL-Surfer-Fall-2017.xlsx; Volume 2 Appendix 1, Section 6.6.

This list may be modified/adjusted based on the results of the Shaft Samples.

Table 3b: House/Building Sampling (Step 4) Summary Drinking Water Analytical Methods, Analytes, Action Levels, and Method Detection Limits

Analytical Method	Analyte	CAS_RN	DOH SDWB / EPA MCL (µg/L)	DOH EAL (µg/L)	Incident Specific Parameter (µg/L)	Method Detection Limit (µg/L)	Method Reporting Limit (µg/L)
More information to be provided when it becomes available.							
524.2	1,1,1-Trichloroethane	71-55-6	200/200	11	11	0.5	
524.2	1,1,2-Trichloroethane	79-00-5	5/3	5	5	0.5	
524.2	1,1-Dichloroethylene	75-35-4	7/7	7	7	0.5	
524.2	1,2,4-Trichlorobenzene	120-82-1	70/70	70	70	0.5	
524.2	1,2-Dichlorobenzene	95-50-1	600/600	10	10	0.5	
524.2	1,2-Dichloroethane	107-06-2	5/5	5	5	0.5	
524.2	1,2-Dichloropropane	78-87-5	5/5	5	5	0.5	
524.2	1,4-Dichlorobenzene	106-46-7	75/NA	5	5	0.5	
524.2	Benzene	71-43-2	5/5	5	5	0.5	
524.2	Carbon tetrachloride	56-23-5	5/5	5	5	0.5	
524.2	Chlorobenzene	108-90-7	100/100	25	25	0.5	
524.2	cis-Dichloroethylene	156-59-2	70/70	70	70	0.5	
524.2	Dichloromethane	75-09-2	5/5	5	5	0.5	
524.2	Ethylbenzene	100-41-4	700/700	7.3	700	0.5	
524.2	Styrene	100-42-5	100/100	10	10	0.5	
524.2	Tetrachloroethylene	127-18-4	5/5	5	5	0.5	
524.2	Toluene	108-88-3	1000/1000	9.8	1000	0.5	
524.2	trans-Dichloroethylene	156-60-5	100/100	100	100	0.5	
524.2	Trichloroethylene	79-01-6	5/5	5	5	0.5	
524.2	Vinyl chloride	75-01-4	2/2	2	2	0.3	
524.2	m,p-Xylenes	1330-20-7	10000/10000	13	10000**	0.5**	
524.2	o-Xylenes	95-47-6	10000/10000	13	10000**	0.5**	
525.2	1-Methylnaphthalene	90-12-0	—	10	2.1		
525.2	2-Methylnaphthalene	91-57-6	—	10	4.7		
525.2	Naphthalene	91-20-3	—	17	12		
525.2	Benzo[a]pyrene	50-32-8	0.2/0.2	0.06	0.06	0.02	
525.2	Di(2-ethylhexyl)phthalate	117-81-7	6/6	3	3	0.6	
525.2	Hexachlorobenzene	118-74-1	1/1	0.0003	0.0003	0.1	
525.2	Hexachlorocyclopentadiene	77-47-4	50/50	—	50	0.1	
200.8	Antimony	7440-36-0	6	6	6	0.4	

Analytical Method	Analyte	CAS_RN	DOH SDWB / EPA MCL (µg/L)	DOH EAL (µg/L)	Incident Specific Parameter (µg/L)	Method Detection Limit (µg/L)	Method Reporting Limit (µg/L)
More information to be provided when it becomes available.							
200.8	Arsenic	7440-38-2	10	10	10	1.4	
200.8	Barium	7440-39-3	2000	220	220	2	
200.8	Beryllium	7440-41-7	4	0.66	0.66	0.3	
200.8	Cadmium	7440-43-9	5	3	3	1	
200.8	Chromium	7440-47-3	100	11	11	7	
200.8	Copper	7440-50-8	1300	2.9	2.9	50	
200.8	Lead	7439-92-1	15*			1	
245.1	Mercury	7487-94-7	2	0.025	0.025	0.2	
200.8	Selenium	7782-49-2	50	5	5	2	
200.8	Thallium	7440-28-0	2	2	2	0.3	
EPA Approved	Total Organic Carbon (TOC)	TOC	—	—	2000	1500—	—
8260	Total Petroleum Hydrocarbon (TPH) Gasoline	PCHG	—	300	≤200	200	
8015	Total Petroleum Hydrocarbon (TPH) Oil	MOIL	—	500	≤200	200	
8015	Total Petroleum Hydrocarbon (TPH) Diesel	PCHD		400	≤200	200	
8021	Chlorine, Free (Field Test)	CHLORINE	—	—		—	—

Notes:

Method Detection Limit is the limit that determines when an analyte can be detected (either the LOD or the MDL). Detections above this level and below the Method Reporting Level (MRL or LOQ) are deemed "detected" and will be qualified as estimated (J).

* Action Level for Lead.

** 10,000 ug/L is the MCL for Total Xylenes.

[a.] 2-(2-methoxyethoxy) ethanol does not have an MCL or EAL, the value provided is the USEPA Regional Screening Level

MCLs: DOH Safe Drinking Water Branch (SDWB) regulatory constituents

DOH EALs: Table D-1a. Groundwater Action Levels (Drinking Water, Surface Water <150 meters) (DOH 2017). https://health.hawaii.gov/heer/files/2019/11/HDOH-EAL-Surfer-Fall-2017.xlsx; Volume 2 Appendix 1, Section 6.6.

This list may be modified/adjusted based on the results of the Shaft Samples.

Table 4: Distribution Screening Sampling (Step 2a) Summary SW-846: 8260 Analytical Methods, Analytes, Action Levels, and Method Detection Limits

Analytical Method	Analyte	CAS_RN	DOH SDWB / EPA MCL (µg/L)	DOH EAL (µg/L)	Incident Specific Parameter (µg/L)	Method Detection Limit (µg/L)	Method Reporting Limit (µg/L)
8260	Acetone	67-64-1					
8260	Benzene	71-43-2	5/5	5	5	0.5	
8260	Bromodichloromethane	75-27-4					
8260	Bromoform	75-25-2					
8260	Bromomethane	74-83-9					
8260	Carbon Disulfide	75-15-0					
8260	Carbon Tetrachloride	56-23-5	5/5	5	5	0.5	
8260	Chlorobenzene	108-90-7	100/100	25	25	0.5	
8260	Chloroform	67-66-3					
8260	Chloromethane	74-87-3					
8260	Dibromochloromethane	124-48-1					
8260	Dichloroethane, 1,1-	75-34-3					
8260	Dichloroethane, 1,2-	107-06-2	5/5	5	5	0.5	
8260	Dichloroethene, 1,1-	75-35-4					
8260	Dichloroethylene, 1,2- (Mixed Isomers)	540-59-0					
8260	Dichloromethane	75-09-2					
8260	Dichloropropane, 1,2-	78-87-5					
8260	Dichloropropene, Cis-1,3-	10061-01-5					
8260	Dichloropropene, Trans-1,3-	10061-02-6					
8260	Ethyl Benzene	100-41-4					
8260	Ethyl Chloride	75-00-3					
8260	Hexanone, 2-	591-78-6					
8260	Methyl Ethyl Ketone	78-93-3					
8260	Methyl Isobutyl Ketone	108-10-1					
8260	Styrene	100-42-5					

Analytical Method	Analyte	CAS_RN	DOH SDWB / EPA MCL (µg/L)	DOH EAL (µg/L)	Incident Specific Parameter (µg/L)	Method Detection Limit (µg/L)	Method Reporting Limit (µg/L)
8260	Tetrachloroethane, 1,1,2,2-	79-34-5					
8260	Tetrachloroethylene	127-18-4					
8260	Toluene	108-88-3					
8260	Trichloroethane, 1,1,1-	71-55-6					
8260	Trichloroethane, 1,1,2-	79-00-5					
8260	Trichloroethylene	79-01-6					
8260	Vinyl Chloride	75-01-4					
8260	Xylenes	1330-20-7					

Notes:
This list may be modified/adjusted based on the results of the Shaft Samples.

Table 5: Distribution Screening Sampling (Step 2a) Summary SW-846: 8270 Analytical Methods, Analytes, Action Levels, and Method Detection Limits

Analytical Method	Analyte	CAS_RN	DOH SDWB / EPA MCL (µg/L)	DOH EAL (µg/L)	Incident Specific Parameter (µg/L)	Method Detection Limit (µg/L)	Method Reporting Limit (µg/L)
8270	Acenaphthene	83-32-9					
8270	Acenaphthylene	208-96-8					
8270	Anthracene	120-12-7					
8270	Benzo(a)anthracene	56-55-3					
8270	Benzo(a)pyrene	50-32-8					
8270	Benzo(b)fluoranthene	205-99-2					
8270	Benzo(g,h,i)perylene	191-24-2					
8270	Benzo(k)fluoranthene	207-08-9					
8270	Bis(2-Chloroethoxy)methane	111-91-1					
8270	Bis(2-ethylhexyl)Phthalate (DEHP)	117-81-7					
8270	Bis(Chloroethyl)ether	111-44-4					
8270	Bromodiphenyl ether, 4-	101-55-3					
8270	Butyl Benzyl Phthalate, N-	85-68-7					
8270	Carbazole	86-74-8					
8270	Chloro-3-methylphenol, 4-	59-50-7					
8270	Chloroaniline, 4-	106-47-8					
8270	Chloronaphthalene, 2-	91-58-7					
8270	Chlorophenol, 2-	95-57-8					
8270	Chlorophenyl-phenyl ether, 4-	7005-72-3					
8270	Chrysene	218-01-9					
8270	Dibenz(a,h)anthracene	53-70-3					
8270	Dibenzofuran	132-64-9					
8270	Dibutyl Phthalate	84-74-2					
8270	Dichlorobenzene, 1,2-	95-50-1					
8270	Dichlorobenzene, 1,3-	541-73-1					
8270	Dichlorobenzene, 1,4-	106-46-7					
8270	Dichlorobenzidine, 3,3'	91-94-1					

Analytical Method	Analyte	CAS_RN	DOH SDWB / EPA MCL (µg/L)	DOH EAL (µg/L)	Incident Specific Parameter (µg/L)	Method Detection Limit (µg/L)	Method Reporting Limit (µg/L)
8270	Dichlorophenol, 2,4-	120-83-2					
8270	Diethyl Phthalate	84-66-2					
8270	Dimethyl Phthalate	131-11-3					
8270	Dimethylphenol, 2,4-	105-67-9					
8270	Dinitro-o-Cresol, 4,6-	534-52-1					
8270	Dinitrophenol, 2,4-	51-28-5					
8270	Dinitrotoluene, 2,4-	121-14-2					
8270	Dinitrotoluene, 2,6-	606-20-2					
8270	Di-n-Octylphthalate	117-84-0					
8270	Fluoranthene	206-44-0					
8270	Fluorene	86-73-7					
8270	Hexachlorobenzene	118-74-1					
8270	Hexachlorobutadiene	87-68-3					
8270	Hexachlorocyclopentadiene	77-47-4					
8270	Hexachloroethane	67-72-1					
8270	Indeno(1,2,3-cd)pyrene	193-39-5					
8270	Isophorone	78-59-1					
8270	Methylphenol, 2-	95-48-7					
8270	Methylphenol, 4-	106-44-5					
8270	Naphthalene	91-20-3					
8270	Nitroaniline, 2-	88-74-4					
8270	Nitroaniline, 3-	99-09-2					
8270	Nitroaniline, 4-	100-01-6					
8270	Nitrobenzene	98-95-3					
8270	Nitrophenol, 4-	100-02-7					
8270	Nitrosodi-N-propylamine, N-	621-64-7					
8270	Nitrosodiphenylamine, N-	86-30-6					
8270	Pentachlorophenol	87-86-5					
8270	Phenanthrene	85-01-8					

Analytical Method	Analyte	CAS_RN	DOH SDWB / EPA MCL (µg/L)	DOH EAL (µg/L)	Incident Specific Parameter (µg/L)	Method Detection Limit (µg/L)	Method Reporting Limit (µg/L)
8270	Phenol	108-95-2					
8270	Pyrene	129-00-0					
8270	Trichlorobenzene, 1,2,4-	120-82-1					
8270	Trichlorophenol, 2,4,5-	95-95-4					
8270	Trichlorophenol, 2,4,6-	88-06-2					

Notes:
This list may be modified/adjusted based on the results of the Shaft Samples.

5.0 Field Sampling Standard Operating Procedures

These sampling activities shall be conducted in accordance with standard operating procedures (SOPs) presented in Appendix A.

6.0 Data Quality

Field quality control (QC) samples will be collected during each sampling event to include field duplicates, field reagent blanks, and trip blanks. Field duplicates will be collected at a frequency of 10 percent the number of the normal samples and field reagent blanks, and trip blanks will be collected for daily for each sampling event in accordance to the procedures described in NAVFAC Pacific Environmental Restoration Program Project Procedure III-B, *Field QC Samples* (Water, Soil) (DON 2015) and as specified in the respective Drinking Water methods.

The analytical laboratory will report non-detected results to the method detecting limit. Detections between the method detection limit (MDL/LOD) and the method reporting limit (MRL, LOQ) are detections and should be flagged as estimated (J).

Level 2 data validation packages will be provided by the laboratory for the Step 2a, Step 2b, Step 2d, Step 4, and Step 5 samples. Level 4 data validation packages will be provided by the laboratory for 10% of all house/building compliance samples that are collected by the Navy and DOH. Ten (10%) of the Drinking Water Compliance samples will undergo Level 4 data validation by an independent validated (i.e., the validator will be independent of the laboratory who performed the analyses). This percentage of samples requiring Level 4 validation may be increased depending on the number, type, severity of corrective actions that are identified by the data validator.

7.0 References

Department of Health, State of Hawaii (DOH). 2017. *Evaluation of Environmental Hazards at Sites with Contaminated Soil and Groundwater, Hawai'i Edition*. Hazard Evaluation and Emergency Response. Revised 2017. Fall.

Department of the Navy (DON). 2015. *Final Project Procedures Manual, U.S. Navy Environmental Restoration Program, NAVFAC Pacific*. JBPHH HI: Naval Facilities Engineering Command, Pacific. May.

Department of Health, State of Hawaii (DOH). 2021. *DOH Guidance to the Approach to Amend the Drinking Water Health Advisory,* December.

Appendix A - Standard Operating Procedures

This page intentionally left blank

1.0 TITLE: SOP 016 – Sampling Drinking Water for Volatile Organic Compounds (VOCs) and Total Trihalomethanes (TTHMs)

2.0 REFERENCE MATERIALS:

2.1 "DoD Environmental Field Sampling Handbook." Revision 1.0. April 2013.

2.2 40 CFR 141, National Primary Drinking Water Regulations

2.3 U.S. EPA. 2016. "Quick Guide to Drinking Water Sample Collection," 2nd Edition, Update. Golden, CO.

2.4 U.S. EPA. 1995. "Method 524.2: Measurement of Purgeable Organic Compounds in Water by Capillary Column Gas Chromatography/Mass Spectrometry." Revision 4.1. Cincinnati, OH.

3.0 SCOPE:

This procedure describes the sampling procedure for the analysis of drinking water by EPA Method 524.2, revision 4.1, for volatile organic compounds (VOCs) and total trihalomethanes (TTHMs). If other analytical methods are to be used by a laboratory, sampling requirements such as bottle type, preservation, and hold time must be verified with the laboratory. This procedure is written to the most stringent sampling requirements as a precaution.

4.0 PRESERVATION AND HOLDING TIME:

Samples must be collected in three 40 mL amber volatile organic analysis (VOA) glass vials with Teflon®-coated septum-caps. Vials received from the laboratory must contain ascorbic acid to dechlorinate the sample. DO NOT rinse the bottles prior to sample collection. A small bottle or vial containing hydrochloric acid (HCl) must accompany the sample bottle to the field so the pH can be adjusted to < 2 immediately following collection of the sample and dissolution of the ascorbic acid. Collected samples must contain no headspace prior to shipping. Samples must be protected from light and chilled to 4 °C prior to shipping. If properly preserved, the sample holding time is 14 days from the time of sampling to analysis.

5.0 SHIPPING:

Samples must be chilled during shipment to maintain a temperature of 4 °C during transit. Ensure the chain of custody is properly filled out, sealed in a sealable bag, and taped to the inside of the cooler with the samples. Coolers should be lined generously with packing materials. All sample bottles should have an affixed label and wrapped in bubble wrap for shipping. After samples are placed in the cooler, pack all remaining space inside the cooler with ice to maintain temperature. Prior to sampling, coordinate with the laboratory to verify hours of operations to ensure compliance with holding times once shipped. DO NOT sample if the laboratory is unable to receive sample shipment. Notify the laboratory to confirm shipment. For internal use, maintain tracking numbers to verify shipment arrival and compliance with the holding time. Samples should not be frozen at any point during sampling, shipment, and storage at the laboratory.

6.0 EQUIPMENT AND SUPPLIES:

6.1 Sample vials – three 40 mL amber VOA glass vials with Teflon®-coated septum-caps, containing ascorbic acid with an affixed label

6.2 Small bottles/vials containing 1:1 HCl

NOTE: HCl is an acid and should be handled with extreme care and using personal protective equipment. Consult the MSDS for additional handling information.

6.3 Indelible Ink Pen

6.4 Disposable Pipets

6.5 Field Logbook

6.6 Clipboard

6.7 Gloves

6.8 Safety Glasses

6.9 Chain of Custody

6.10 Chain of Custody Seals

6.11 Bubble Wrap

6.12 Packing Tape

6.13 Cooler

6.14 Frozen Ice Packs, frozen for two days prior to use

6.15 Paper Towels

6.16 Sealable Bags – i.e., Ziploc®

7.0 PROCEDURE:

7.1 Prior to the Day of Sampling:

7.1.1 At least two days prior to sample collection, place the ice packs in the freezer.

7.1.2 Ensure that all items in Section 6.0 have been obtained and are ready for transport into the field. Verify the number of vials available is equal to the number of samples to be collected x3, plus six additional vials for quality control samples. Additionally, extra sample vials should be included to account for sampling errors that may occur in the field.

7.1.3 Confirm that the sample vials contain ascorbic acid.

7.1.4 Ensure there are equal numbers of bottles/vials of HCl for each sample bottle to be collected.

7.1.5 Verify that all sample coolers are lined generously with packing material.

7.1.6 Coordinate with the laboratory to verify hours of operation to ensure compliance with holding times once shipped. Notify the laboratory to confirm shipment.

7.1.7 Verify there is a packet of bubble wrapped triplicate blanks in the cooler in which these samples will be sent. DO NOT OPEN THIS PACKET.

7.2 Day of Sampling:

7.2.1 Sampling personnel must wear safety glasses and gloves during the sampling process.

7.2.2 Remove the faucet aerator, strainer, or hose prior to turning on the faucet for sampling. Before collecting the sample, purge the faucet using the cold water spigot for a minimum of 10 minutes to allow the temperature to stabilize.

7.2.3 Adjust the flow rate to approximately 500 mL/minute (approximately 1/8th inch diameter stream or the width of a pencil). Do not change the water flow once sample collection has begun.

7.2.4 Collection of VOC Samples:

7.2.4.1 Select the sample vials identified for "VOC" on the affixed label. These are three 40 mL amber VOA glass vials with Teflon®-coated septum-caps containing ascorbic acid. Each sample is collected in triplicate.

7.2.4.2 Do not remove the septum-cap until immediately before sampling. Remove the septum-cap avoiding contact with the rim or inside of the vial. Do not set the septum-cap, open side down, on any surface or put it in a pocket. It is best to hold the cap in a gloved hand while sampling. DO NOT RINSE THE SAMPLE VIAL PRIOR TO USE.

7.2.4.3 Hold the open end of the vial away from you and place the vial under the spigot tilted so that the sample runs down the inside of the vial. Fill the vial to the top, but with a concave meniscus, NOT CONVEX. Do not allow the vial to overflow or spill over and do not agitate. Be aware of any unusual odor or physical characteristics (e.g., particulate, color) associated with the water coming from the spigot.

7.2.4.4 Replace the septum-cap securely on the vial and gently tip the vial several times to dissolve the ascorbic acid in the sample. Ensure the ascorbic acid is completely dissolved and the sample is thoroughly mixed before continuing.

7.2.4.5 Using a disposable pipet, add two drops of 1:1 HCl to the vial. If the meniscus is not convex, add more sample to create a convex meniscus, but do not overflow the sample.

7.2.4.6 If the sample foams vigorously after adding HCl, discard that sample and collect three new samples without adding the HCl. Notate this on the chain of custody form and the affixed label.

7.2.4.7 Immediately cap the vial so that the Teflon®-coated septum-cap contacts the sample. Some samples may overflow while tightening the cap. Tip the vial gently two or three times to distribute the HCl.

7.2.4.8 Turn the vial over and tap it to check for the presence of bubbles (headspace).

7.2.4.8.1 If bubbles are present, and the total volume of the bubbles is < 5 mm in diameter (roughly the size of a pea), the sample may be submitted.

7.2.4.8.2 If the total volume of the bubbles is > 5 mm in diameter, discard the vial and repeat steps 7.2.4.1 to 7.2.4.8.

7.2.4.9 Repeat Steps 7.2.4.1 through 7.2.4.8 two more times, resulting in a total of three 40 mL vials for one sample.

7.2.4.10 Rubber band the three vials together for each location. For each set of three vials, label the vials 1 of 3, 2 of 3, and 3 of 3. This set of three vials is one sample.

7.2.5 Collection of TTHM Samples:

7.2.5.1 Select the sample vials identified for "TTHM" on the affixed label. These are three 40 mL amber VOA glass vials with Teflon®-coated septum-caps containing ascorbic acid. Each sample is collected in triplicate.

7.2.5.2 Follow steps 7.2.4.2 through 7.2.4.10 for the collection of TTHM samples.

7.2.6 Dry the exterior surface of the collected sample using a clean paper towel.

7.2.7 Fill out the vial labels with the sample ID (limited to 20 characters including dashes and spaces), sample location, sampler's initials, and date and time of collection. Record the collection date as Day/Month (three letter abbreviation)/Year (four digits) (e.g., 01 Jan 2020). Time must be recorded as coordinated universal time (UTC) ± *x* hours depending on the time zone. Record all of this information in the field logbook as well.

7.2.8 Complete the chain of custody form. It is recommended, but not required, that a chain of custody seal is affixed to the vials and caps. This is required only if

samples are sent via commercial carrier without being accompanied by a formal chain of custody form. Note any observations on the chain of custody form and field logbook such as any unusual odors or physical characteristics of the sample.

7.2.9 Wrap the sample with bubble wrap and tape. Place each sample in its own sealable bag. Immediately place the collected sample into a cooler that has been adequately lined with packing material and contains ice. Close cooler to ensure temperature stability. Keep the cooler closed at all times when samples are not being added.

Repeat Steps 7.2.4 through 7.2.9 for any additional samples or quality control samples. At a minimum, one location per sampling event will be designated as the location for an additional six samples to be collected. These are quality control samples and are taken in exactly the same manner as the other samples.

1.0 TITLE: SOP 006 – Sampling Drinking Water for Semi-volatiles

2.0 REFERENCE MATERIALS:

2.1 DoD Environmental Field Sampling Handbook

2.2 40 CFR 141, National Primary Drinking Water Regulations

2.3 U.S. EPA. 1995. "Method 525.2: Determination of Organic Compounds in Drinking Water by Liquid-Solid Extraction and Capillary Column Gas Chromatography/Mass Spectrometry," Revision 2.0. Cincinnati, OH.

3.0 SCOPE:

This procedure describes the sampling procedure for the analysis of drinking water by EPA Method 525.2, Revision 2.0, for semi-volatiles. If other analytical methods are to be used by a laboratory, sampling requirements such as bottle type, preservation, and hold time must be verified with the laboratory. This procedure is written to the most stringent sampling requirements as a precaution.

4.0 PRESERVATION AND HOLDING TIME:

Samples must be collected in 1 L amber glass bottles fitted with Teflon®-lined caps. Bottles received from the laboratory must contain sodium sulfite to dechlorinate the sample. DO NOT rinse the bottles prior to sample collection. A small bottle or vial containing 5 mL of 6 N hydrochloric acid (HCl) must accompany the sample bottle to the field so the pH can be adjusted to <2 immediately following collection of the sample and dissolution of the sodium sulfite. Samples must be protected from light and chilled to 4 °C prior to shipping. If properly preserved, the sample holding time is 14 days from the time of sampling to analysis with the exception of the following analytes: carboxin, diazinon, disulfoton, disulfoton sulfoxide, fenamiphos, and terbufos. If the sample is to be analyzed for any of the analytes previously listed, the sample must be extracted immediately after collection and preservation.

If the sample is to be analyzed for cyanazine, a separate sample must be collected. Samples for cyanazine analysis must be collected in 1 L amber glass bottles fitted with Teflon®-lined caps that DO NOT contain sodium sulfite and are not preserved with HCl. The cyanazine sample must be protected from light and chilled to 4 °C prior to shipping. The sample holding time is 14 days from the time of sampling to analysis.

If the sample is to be analyzed for atraton and/or prometon, a separate sample must be collected. Samples for atraton and/or prometon analysis must be collected in 1 L amber glass bottles fitted with Teflon®-lined caps that contain sodium sulfite but are NOT preserved with HCl. The atraton and/or prometon sample must be protected from light and chilled to 4 °C prior to shipping. The sample holding time is 14 days from the time of sampling to analysis.

5.0 SHIPPING:

Samples must be chilled during shipment to maintain a temperature of 4 °C during transit. Ensure the chain of custody is properly filled out, sealed in a sealable bag, and taped to the inside of the cooler with the samples. Coolers should be lined generously with packing materials. All sample bottles should have an affixed label and wrapped in bubble wrap for shipping. After samples are placed in the cooler, pack all remaining space inside the cooler with ice to maintain temperature. Prior to sampling, coordinate with the laboratory to verify hours of operations to ensure compliance with holding times once shipped. DO NOT sample if the laboratory is unable to receive sample shipment. Notify the laboratory to confirm shipment. For internal use, maintain tracking numbers to verify shipment arrival and compliance with the holding time. Samples should not be frozen at any point during sampling, shipment, and storage at the laboratory.

6.0 EQUIPMENT AND SUPPLIES:

6.1 Samples for cyanazine analysis: 1 L amber glass bottles fitted with Teflon®-lined caps that have an affixed label and DO NOT contain sodium sulfite

6.2 Samples for all other semi-volatiles: 1 L amber glass bottles fitted with Teflon®-lined caps that contain sodium sulfite and an affixed label

6.3 Small bottles/vials containing 5 mL of 6 N hydrochloric acid (HCl)

6.4 Indelible Ink Pen

6.5 Field Logbook

6.6 Clipboard

6.7 Gloves

6.8 Safety Glasses

6.9 Chain of Custody

6.10 Chain of Custody Seals

6.11 Bubble Wrap

6.12 Packing Tape

6.13 Cooler

6.14 Frozen Ice Packs, frozen for two days prior to use

6.15 Paper Towels

6.16 Sealable Bags – i.e., Ziploc®

7.0 PROCEDURE:

7.1 Prior to the day of sampling:

7.1.1 At least two days prior to sample collection, place the ice packs in the freezer.

7.1.2 Ensure that all items in Section 6.0 have been obtained and are ready for transport into the field. Verify the number of bottles available is equal to the number of samples to be collected x2, plus four additional bottles for quality control samples. Additionally, extra sample bottles should be included to account for sampling errors that may occur in the field.

7.1.3 Confirm that the sample bottles contain sodium sulfite. If sampling for cyanazine, be sure to take samples bottles that DO NOT contain sodium sulfite.

7.1.4 Ensure there are equal numbers of bottles of HCl for each sample bottle to be collected.

7.1.5 Verify that all sample coolers are lined generously with packing material.

7.1.6 Coordinate with the laboratory to verify hours of operation to ensure compliance with holding times once shipped. Notify the laboratory to confirm shipment.

7.2 Day of sampling:

7.2.1 Sampling personnel must wear safety glasses and gloves during the sampling process.

7.2.2 Remove the faucet aerator, strainer, or hose prior to turning on the faucet for sampling. Before collecting the sample, purge the faucet using the cold water spigot for a minimum of 5 minutes to allow the temperature to stabilize.

7.2.3 Adjust the flow rate to approximately 500 mL/minute (approximately 1/8th inch diameter stream). Do not change the water flow once sample collection has begun.

7.2.4 Select the appropriate sample bottle identified by the affixed label. This is a 1 L amber glass bottle with a Teflon®-lined screw cap containing sodium sulfite (with the exception of samples collected for cyanazine, see Section 6.1).

7.2.5 Do not remove the screw cap until immediately before sampling. Remove the bottle cap avoiding contact with the rim or inside of the bottle. Do not set the cap, open side down, on any surface or put it in a pocket. It is best to hold the cap in gloved hand while sampling. DO NOT RINSE THE SAMPLE BOTTLE PRIOR TO USE.

7.2.6 Hold the open end of the bottle away from you and place the bottle under the spigot tilted so that the sample runs down the inside wall of the bottle. Fill the bottle to within one to two inches from the top (typically this is to the bottom of the bottle neck). Do not allow the bottle to overflow or spill over and do not agitate. Be aware of any odor or physical characteristics (e.g., particulate, color) associated with the water coming from the spigot.

7.2.7 Replace the screw cap securely on the bottle. If sodium sulfite is in the sample bottle, gently tip the bottle several times to dissolve the sodium sulfite in the

sample. Ensure the sodium sulfite is completely dissolved and the sample is thoroughly mixed before continuing.

7.2.8 Dry the exterior surface of the bottle using a clean paper towel.

7.2.9 Fill out the bottle labels with the sample ID (limited to 20 characters including dashes and spaces), sample location, sampler's initials, and date and time of collection. Record the collection date as Day/Month (three letter abbreviation)/Year (four digits) (e.g., 01 Jan 2020). Time must be recorded as coordinated universal time (UTC) ± *x* hours depending on the time zone. Record all of this information in the field logbook as well.

7.2.10 If the collected sample is for cyanazine, atraton, and/or prometon analysis, skip this step and move on to 7.2.11. Otherwise, remove the cap from the sample bottle and pour the entire contents of the small vial containing 5 mL of 6 N hydrochloric acid into the sample. Record the amount added in the field logbook and on the chain of custody form. Cap tightly and invert several times.

7.2.11 Complete the chain of custody form. It is recommended, but not required, that a chain of custody seal is affixed to the bottles and lids. This is required only if samples are sent via commercial carrier without being accompanied by a formal chain of custody form. Note any observations on the chain of custody form and field logbook such as any unusual odors or physical characteristics of the sample.

7.2.12 Wrap sample with bubble wrap and tape. Place each sample in its own zip lock bag. Immediately place collected sample into cooler that has been adequately lined with packing material and contains ice. Close cooler to ensure temperature stability. Keep the cooler closed at all times when samples are not being added.

7.2.13 Repeat Steps 7.2.4 through 7.2.12 for any additional samples or Quality Control samples. At a minimum, one location per sampling event will be designated as the location for an additional two samples to be collected. These

are quality control samples and are taken in exactly the same manner as the other samples.

1.0 TITLE: SOP 001 – Sampling Drinking Water for Metals and Hardness

2.0 REFERENCE MATERIALS:

2.1 "DoD Environmental Field Sampling Handbook." Revision 1.0. April 2013.

2.2 40 CFR 141, National Primary Drinking Water Regulations

2.3 U.S. EPA. 1994. "Method 200.8: Determination of Trace Elements in Waters and Wastes by Inductively Coupled Plasma-Mass Spectrometry," Revision 5.4. Cincinnati, OH. EPA/600/R-94/111.

2.4 U.S. EPA. 1994. "Method 200.7: Determination of Metals and Trace Elements in Water and Wastes by Inductively Coupled Plasma-Atomic Emission Spectrometry," Revision 4.4. Cincinnati, OH

2.5 U.S. EPA. 1982. "Method 130.2: Hardness, Total (mg/L as $CaCO_3$) (Titrimetric, EDTA)," Editorial Revision. Cincinnati, OH.

3.0 SCOPE:

This SOP describes the sampling procedure for drinking water samples that will be analyzed by EPA Method 200.8, revision 5.4, for aluminum, antimony, arsenic, barium, beryllium, cadmium, chromium, iron, manganese, nickel, selenium, silver, sodium, thallium, and zinc, EPA Method 200.7 for boron, and EPA Method 130.2, editorial revision, for hardness. If other analytical methods are to be used by a laboratory, sampling requirements such as bottle type, preservation, and hold time, must be verified with the laboratory. This method is not to be used for samples that contain lead or copper. This procedure is written to the most stringent sampling requirements as a precaution.

4.0 PRESERVATION AND HOLDING TIME:

Samples must be collected in a 1 L polyethylene (PE) bottle with PE screw caps. Bottles received from the laboratory for sampling will contain nitric acid (HNO_3) to preserve the sample at a pH of < 2. DO NOT rinse the bottles prior to sample collection. If properly acid preserved, samples for metals analysis can be held up to 6 months, at room temperature, before analysis. Samples for metals analysis are not required to be chilled prior to shipping but the

laboratory may require this. Please verify with the laboratory prior to sample collection. If samples require total hardness analysis, then samples must be stored at 4 ℃ following collection.

5.0 SHIPPING:

Samples should be chilled during shipment to maintain a temperature of 1-4 ℃ during transit (omit if not required by the laboratory). Ensure the chain of custody is properly filled out, sealed in a sealable bag, and taped to the inside of the cooler with the samples. Coolers should be lined generously with packing materials. All sample bottles should have an affixed label and wrapped in bubble wrap for shipping. After samples are placed in the cooler, pack all remaining space inside the cooler with ice to maintain temperature (omit if not required by the laboratory). Prior to sampling, coordinate with the laboratory to verify hours of operations to ensure compliance with holding times once shipped. DO NOT sample if the laboratory is unable to receive sample shipment. Notify the laboratory to confirm shipment. For internal use, maintain tracking numbers to verify shipment arrival and compliance with the holding time.

6.0 EQUIPMENT AND SUPPLIES:

6.1 1 L PE bottles with PE screw caps, containing HNO_3 and an affixed label
6.2 Indelible Ink Pen
6.3 Field Logbook
6.4 Clipboard
6.5 Gloves
6.6 Safety Glasses
6.7 Chain of Custody
6.8 Chain of Custody Seals
6.9 Bubble Wrap
6.10 Packing Tape
6.11 Frozen Ice Packs, frozen for two days prior to use
6.12 Cooler
6.13 Sealable Bags – i.e., Ziploc®

6.14 Paper Towels

7.0 PROCEDURE:

7.1 Prior to the day of sampling:

7.1.1 At least two days prior to sample collection, place the ice packs in the freezer.

7.1.2 Ensure that all items in Section 6.0 have been obtained and are ready for transport into the field. Verify the number of bottles available is equal to or greater than the number of samples to be collected plus two additional bottles for quality control samples. Additionally, extra sample bottles should be included to account for sampling errors that may occur in the field.

7.1.3 Confirm that the sample bottles to be used contain preservative and the affixed labels indicate that 5 mL HNO_3 has been added to the bottle.

7.1.4 Verify that all sample coolers are lined generously with packing material.

7.1.5 Coordinate with the laboratory to verify hours of operation to ensure compliance with holding times once shipped. Notify the laboratory to confirm shipment.

7.2 Day of sampling:

7.2.1 Sampling personnel must wear safety glasses and gloves during the sampling process.

7.2.2 Remove the faucet aerator, strainer, or hose prior to turning on the faucet for sampling. Before collecting the sample, purge the faucet using the cold-water spigot for a minimum of 5 minutes to allow the temperature to stabilize.

7.2.3 Adjust the flow rate to approximately 500 mL/minute (approximately $1/8^{th}$ inch diameter stream or the width of a pencil). Do not change the water flow once sample collection has begun.

7.2.4 Select the appropriate sample bottle identified by the affixed label. This bottle is a 1 L PE bottle with a PE screw cap containing HNO_3.

NOTE: The bottle contains acid which is corrosive and can burn; therefore, when filling the bottle, hold the opening of the bottle away from you prior to and during sampling.

7.2.5 Remove the bottle cap while avoiding all contact with the rim or inside of the bottle. Do not set the cap, open side down, on any surface or put it in a pocket. It is best to hold the cap in a gloved hand while sampling. DO NOT RINSE SAMPLE BOTTLES.

7.2.6 Hold the open end of the bottle away from you and place the bottle under the spigot tilted so that the sample runs down the inside wall of the bottle. Fill the bottle to within one to two inches from the top (typically this is to the bottom of the bottle neck). Do not allow the bottle to overflow or spill over and do not agitate. Be aware of any odor or physical characteristics (e.g., particulate, color) associated with the water coming from the spigot.

7.2.7 Replace the screw cap securely on the bottle and gently tip the bottle several times to mix the preservative with the sample.

7.2.8 Dry the exterior surface of the bottle using a clean paper towel.

7.2.9 Fill out the bottle labels with the sample ID (limited to 20 characters including dashes and spaces), sample location, sampler's initials, and date and time of collection. Record the collection date as Day/Month (three letter abbreviation)/Year (four digits) (e.g., 01 Jan 2020). Time must be recorded as coordinated universal time (UTC) ± x hours depending on the time zone. Record all of this information in the field logbook as well.

7.2.10 Complete the chain of custody form. It is recommended, but not required, that a chain of custody seal is affixed to the bottles and lids. This is required only if samples are sent via commercial carrier without being accompanied by a formal chain of custody form. Note any observations on the chain of custody and field logbook such as any unusual odors or physical characteristics of the sample.

7.2.11 Wrap the sample with bubble wrap and tape. Place each sample in its own sealable bag. Immediately place collected sample into cooler that has been adequately lined with packing material and contains ice (omit if not required by the laboratory). Close cooler to ensure temperature stability. Keep the cooler closed at all times when samples are not being added.

7.2.12 Repeat Steps 7.2.4 through 7.2.11 for any additional samples or quality control samples. At a minimum, one location per sampling event will be designated as the location for an additional two samples to be collected. These are quality control samples and are taken in exactly the same manner as the other samples.