Documentation to Amend Drinking Water Health Advisory in Zone B1

Joint Base Pearl Harbor Hickam (JBPHH)
O‘ahu, Hawai‘i

Interagency Drinking Water System Team
Zone B1 Removal Action Report
February 2022

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Note: Department of Defense critical infrastructure security information (DCRIT) is not included

Interagency Drinking Water System Team
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Introduction

Zone B1 Checklist to Amend the Public Health Advisory initiated November 29, 2021 for Joint Base Pearl Harbor -Hickam Public Water System No. 360
HEER Incident Case No.: 20211128-1848

Purpose: This checklist identifies the documentation and review that the Hawaii Department of Health (DOH) conducted to **amend** the Public Health Advisory (Advisory) in each Zone under the *DOH's Guidance on the Approach to Amending the Drinking Water Health Advisory, dated December 30, 2021*. This review was conducted as an oversight role in addition to the review conducted as a part of the Interagency Drinking Water System Team (IDWST).

DOH's priority is to protect the public health and environment of the people of Hawaii. DOH will evaluate the "lines of evidence" that must be met before amending the health advisory and issuing notices that the water can be used for all purposes including drinking. The Navy must also commit to following the long-term monitoring (LTM) of system water quality for this incident under the IDWST Drinking Water Sampling Plan, as amended.

Background: A chemical release of petroleum, which is a hazardous substance, entered the Joint Base Pearl Harbor-Hickam (JBPHH) drinking water distribution system and the Red Hill Shaft. This release triggered an emergency response and DOH issuance of an Advisory on November 29, 2021 for the entire JBPHH Public Water System No. 360. State and Federal Drinking Water (DW) Maximum Contaminant Levels (MCLs) under the Safe Drinking Water Act do not adequately address petroleum contamination of drinking water. DOH has established Environmental Action Levels (EALs) and Incident Specific Parameters (ISPs) to more comprehensively monitor and respond to petroleum contaminated drinking water. Any contaminants that exceed the State and Federal DW MCLs, EALs, or ISPs require additional action prior to amending the Advisory. Satisfaction of the lines of evidence will be achieved by evaluating the data generated during the investigation conducted by the IDWST. The data will be assessed for each Zone of the Drinking Water Distribution System Recovery Plan. All lines of evidence will require documentation.

DOH Project Screening Levels: State and Federal Drinking Water MCLs, specified State EALs, and ISPs are considered in development of Project Screening Levels. The actions for the thresholds for each contaminant are listed in *DOH's Guidance on the Approach to Amending the Drinking Water Health Advisory*.

Objective 0 - Introduction to Lines of Evidence Under Evaluation / Document Summary

Reference	Status	Documentation
Tab 0	Complete	DOH Checklist to Amend the Drinking Water Health Advisory.
Tab 0.1	Complete	• Executive Summary Memo for Zone B1 Removal Action Report • Signed statement by the Owner/Operator Representative of the Water System, that asserts that all lines of evidence have been met, including the following statement with a signature: "I certify under penalty of law that I have personally examined and am familiar with the information submitted and believe the submitted information is true, accurate, and complete."

Objective 1a – Line of Evidence: Reported sources of contamination are isolated and contained.

Incident Specific Criteria - Contamination from **Red Hill Shaft** is isolated from Navy's water distribution system.

Reference	Status	Documentation
Tab 1a.0	Complete	Executive Summary Memo.
Tab 1a.1	Complete	Memorandum for Record documenting that the Red Hill Shaft has been physically disconnected from the NAVFAC system.
Tab 1a.2	Complete	Memo for Record showing SCADA data that Waiawa Shaft is the single source of water for the NAVFAC system since 03 December 2021.
Tab 1a.3	Complete	Photograph of concrete blocking between air gapped isolation flanges.

Objective 1b – Line of Evidence: The regulated public water system's water quality data is compliant.

Incident Specific Criteria - Data does not exceed Federal DW MCLs, specified State EALs, and ISPs for **Waiawa Shaft (only source of the drinking water)**.

Reference	Status	Documentation
Tab 1b.0	Complete	Executive Summary Memo.
Tab 1b.1	Complete	• Sample Results for Waiawa Shaft (the source) taken 1/13/2022 Level 4 Validated Laboratory Report for EPA Methods 8260 (VOCs), 8270 (SVOCs), 8015 (TPH-G, TPH-D, TPH-O) plus Tentatively Identified Compounds (TICs) • Level 4 Validated Laboratory Report for EPA Methods 8260 (VOCs), 8270 (SVOCs), 8015 (TPH-G, TPH-D, TPH-O) plus Tentatively Identified Compounds (TICs) • Sample Results of Waiawa Shaft Entry Point (after treatment) taken 1/11/2022 Level 4 Validated Laboratory Report for Sampling Plan Addendum 1, Table 3a: Distribution Sampling (Step 2b) Summary Drinking Water Analytical Methods, Analytes, Action Levels, and Method Detection Limits • Level 4 Validated Laboratory Report for Sampling Plan Addendum 1, Table 3a: Distribution Sampling (Step 2b) Summary Drinking Water Analytical Methods, Analytes, Action Levels, and Method Detection Limits

Objective 1c – Line of Evidence: No additional contamination through the distribution system is occurring.

Incident Specific Criteria - Cross Connection Control investigation shows distribution system is protected, resulting in no additional sources of contamination.

Reference	Status	Documentation
Tab 1c.0	Complete	Executive Summary Memo.
Tab 1c.1	Complete	Certificate Regarding Cross-Connection Control Review and Confirmation – Zone B1, verifying that building and service connections with petroleum activities are protected from backflow risks with the following documentation: • A "gap analysis" of the petroleum related activities versus appropriate device inventory (i.e., inappropriate device, missing Cross-Connection Control protection, untested device, etc.). • A map that includes: All facilities with petroleum activities; locations of existing backflow prevention devices; and Water system infrastructure. • An inventory database: A list of petroleum-related activities and identified appropriate cross connection control (CCC) devices at these activities, as required, i.e., if there was human consumptive use and where cross connection potential or hazard was identified.
Tab 1c.2	Complete	COMNAVREG HAWAII INSTRUCTION 11330.2D, dated 19 Sep 2016, Backflow Prevention and Cross-Connection Control Program

Objective 2a – Line of Evidence: Water within the distribution system does not exceed State and Federal DW MCLs, specified State EALs, and ISPs.

Incident Specific Criteria –

- Zone flushing plan demonstrates entire distribution system is flushed.
- Sample results show the water in distribution system does not exceed State and Federal DW MCLs, specified State EALs, and ISPs. (Guidance Table 2 and Table 3)
- Drinking water does not show sheen, olfactory evidence, or other qualitative methods of petroleum.

Reference	Status	Documentation
Tab 2a.0	Complete	Executive Summary Memo.
Tab 2a.1	Complete	Memorandum for the Record of the Distribution System Recovery Plan Addendum – Zone B1 Analysis which includes: • Hydraulic model that exhibits and flushing line map(s) and plan to show that the flushing approach will achieve directional flushing. • A one-page high resolution zonal flushing map should be provided. • Narrative of assumptions in the development of their flushing model inclusive of any simulations that they ran.
Tab 2a.2	Complete	Summary with documentation from Dr. Whelton discussing flushing goals providing validity of volumetric exchange model.

Objective 2a – Line of Evidence: Water within the distribution system does not exceed State and Federal DW MCLs, specified State EALs, and ISPs.

Incident Specific Criteria –

- Zone flushing plan demonstrates entire distribution system is flushed.
- Sample results show the water in distribution system does not exceed State and Federal DW MCLs, specified State EALs, and ISPs. (Guidance Table 2 and Table 3)
- Drinking water does not show sheen, olfactory evidence, or other qualitative methods of petroleum.

Reference	Status	Documentation
Tab 2a.3	Complete	Identification of consecutive flushing zones and flushing phasing order. Time based contaminant slug model showing possible migration of contaminant from Red Hill Shaft used to identify zones requiring additional volumetric flushing (Hydraulic Model)
Tab 2a.4	Complete	Table showing volumetric goals and recorded flushing volumes that occurred in the field for the distribution system.
Tab 2a.5	Complete	Certification of Water Storage Facilities and Water Source for Zone B1 with Water Storage Tanks S1 and S2 Flushing Report.
Tab 2a.6	Complete	• Distribution System Exceedance Investigation Summary and Results. • Drinking Water Distribution System Recovery Plan: Stage 2 Sampling Results for Zone B1, JBPHH.

Objective 2b – Line of Evidence: Water in premise plumbing of homes/buildings does not exceed State and Federal DW MCLs, specified State EALs, and ISPs.

Incident Specific Criteria –

- Flushing Plan includes procedures to ensure no service connections will re-contaminate the distribution system.
- Sample Plan includes 72-hour stagnation to account for leaching of contaminants from premise plumbing.
- Sample results show water in premise plumbing of homes/buildings does not exceed State and Federal DW MCLs, specified State EALs, and ISPs.

Reference	Status	Documentation
Tab 2b.0	Complete	Executive Summary Memo.
Tab 2b.1	Complete	Records of Completed Residential and Non-Residential Flushing Zone B1 with: • EDMS Residential Flushing Records Zone B1 • EDMS Non-Residential Flushing Records Zone B1 • NAVFAC SCADA Data Zone B1 28 Dec 2021 to 12 Jan 2022 (for the Distribution System pressure logs during flushing and confirmation that the 30 psi within the distribution system was maintained).
Tab 2b.2	Complete	Sample Results, Level 2 and Level 4 Validated as required by Sampling Plan Section 6.0, report from EDMS.
Tab 2b.3	Complete	Exceedance Investigation Summary and Results Zone B1.
Tab 2b.4	Complete	Memorandum for Record showing that irrigation flushing is complete.

Objective 2b – Line of Evidence: Water in premise plumbing of homes/buildings does not exceed State and Federal DW MCLs, specified State EALs, and ISPs.

Incident Specific Criteria –

- Flushing Plan includes procedures to ensure no service connections will re-contaminate the distribution system.
- Sample Plan includes 72-hour stagnation to account for leaching of contaminants from premise plumbing.
- Sample results show water in premise plumbing of homes/buildings does not exceed State and Federal DW MCLs, specified State EALs, and ISPs.

Reference	Status	Documentation
Tab 2b.5	Complete	DOH Guidance for Active Irrigation Line Purging and Flushing

February 24, 2022

From: Naval Facilities Engineering Systems Command Representative, IDWS Team
To: Interagency Drinking Water System Team

SUBJ: ZONE B1 REMOVAL ACTION REPORT

Ref: (a) Drinking Water Sampling Plan, December 2021
(b) Drinking Water Distribution System Recovery Plan, December 2021
(c) Single Family Home Flushing Plan Checklist and Standard Operating Procedures, December 23, 2021
(d) Non-Residential Facility Flushing Plan Checklist and Standard Operating Procedures, January 4, 2022
(e) DOH's Guidance on the Approach to Amending the Drinking Water Health Advisory, December 30, 2021; HEER Incident Case No.: 20211128-1848
(f) DOH Checklist to Amend the Drinking Water Health Advisory

Encl: (1) Zone B1 Removal Action Report

1. The enclosed report documents completion of the requirements outlined in references (a) through (f). This is in response to HEER Incident Case No.: 20211128-1848 involving the Joint Base Pearl Harbor Hickam (JBPHH) Public Water System No. 360.

2. On November 20th, 2021, a spill of jet fuel, specifically JP-5 jet fuel, occurred at the Red Hill Bulk Fuel Storage Facility in an access tunnel that provides fire suppression and service lines for the facility. The fuel spill was cleaned up. On the 23rd of November, Admiral Paparo directed an independent investigation of the spill event and ordered the investigating officer to determine any connection between the 20 November event and the spill that occurred on May 6th, 2021. The results of the investigation are pending public release.

On November 27th, the Commander, Navy Region Hawaii, RDML Tim Kott, met with the Fleet Logistics Center Commander, who operates The Red Hill Fuel Storage Facility for the Navy. They jointly made the decision to stop Red Hill Tank fuel transfer operations based on the ongoing investigation into the recent spills.

On November 28th, the JBPHH HQs and Hawaii Department of Health (HDOH) began receiving phone calls from military residents reporting a chemical or petroleum taste and smell to the water in the Navy's drinking water system. As more calls were received, it became clear that the reports were clustered around neighborhoods fed by the Red Hill Shaft Well. On the evening of the 28th, the Navy shut down that well and stood up the Region's Emergency Operations Center to handle the issue. More reports of contaminated water continued to come in over the next 24 hours. On November 29th, Admiral Paparo, the senior Navy commander in Hawaii, ordered the establishment of a Joint Crisis Action Team, and the Navy immediately began flushing its potable water distribution system.

On December 8th, HDOH issued Directive One which provided requirements for flushing of the Navy Water System. The Navy began working with HDOH and the U.S. Environmental Protection Agency (EPA) to meet the requirements of this directive and resume flushing of the potable water system.

On December 14th, HDOH, the U.S. Navy, the U.S. Army and the EPA signed the Joint Drinking Water Sampling Plan. On December 17th, the parties established an Interagency Drinking Water System (IDWS) Team to restore safe drinking water to affected JBPHH housing communities. The working group was established to ensure that the agencies were coordinated in actions to restore safe drinking water to Navy water system users and that they had a clear, coordinated source of information as work continued to restore safe drinking water. On the same day, the U.S. Navy, U.S. Army, HDOH, and the EPA members of the IDWS Team jointly signed the Water Distribution System Recovery Plan agreement.

The flushing of the water distribution lines resumed on December 20, 2021. Residential and non-residential facilities were flushed and sampled after the completion of flushing and testing of the distribution system of a specific Zone. This report specifically documents the requirements outlined in references (a) through (f) for Zone B1.

3. The removal action report (RAR) for Zone B1 documents two specific lines of evidence necessary to amend the drinking water health advisory for Zone B1 as provided by HDOH. The two lines of evidence under evaluation included:

i. Ensure no contamination is entering the water system.
ii. Ensure no contamination remains in the system and water chemistry concerns are addressed.

Each line of evidence has several objectives with specific lines of evidence and incident specific criteria required to be met. Achievement of the criteria will be described and supported with documentation in the subsequent sections of the RAR.

4. I certify under penalty of law that I have personally examined and I am familiar with the information submitted and the submitted information is true, accurate, and complete.

MENO.MICHAEL.WAYNE.JR.1088310035
Digitally signed by MENO.MICHAEL.WAYNE.JR.1088310035
Date: 2022.02.24 16:59:09 -10'00'

M. W. Meno
CAPT, CEC, USN

Interagency Drinking Water System Team
Zone B1 Removal Action Report
February 2022

Line of Evidence 1a

All Reported Sources of Contamination Are Isolated and Contained

Table 1: Lines of Evidence Under Evaluation – Ensure no contamination is entering the water system.

Objective 1a - All reported sources of contamination are isolated and contained.

Incident Specific Criteria - Contamination from **Red Hill Shaft** is isolated from Navy's water distribution system.

Lines of Evidence	Completion Status	Outstanding Items
Navy confirmation that Red Hill Shaft is isolated from the Navy's water distribution system.	Complete.	• None.

February 19, 2022

From: Naval Facilities Engineering Systems Command Representative, IDWS Team
To: Interagency Drinking Water System Team

SUBJ: SUMMARY OF LINE OF EVIDENCE OBJECTIVE 1A – ALL REPORTED SOURCES OF CONTAMINATION ARE ISOLATED AND CONTAINED

Encl: (1) 1a.1 Memorandum for Record with Isolation Date
(2) 1a.2 Summary of Operator Logs and SCADA Data
(3) 1a.3 Photograph of Concrete Blocking Between Air Gapped Isolation Flanges

1. Enclosures (1), (2), and (3) document completion of Line of Evidence objective 1a, all reported sources of contamination are isolated and contained. On the evening of November 28, 2021, the Red Hill Shaft was secured from operation and all pumping operations ceased. The Aiea/Halawa shaft briefly served as the secondary source starting on November 28, 2021, but it was shut down on December 3, 2021 to prevent potential westward contaminant migration in the aquifer and because there were concerns over high chloride concentrations caused by saltwater intrusion. Since December 3, 2021, the Waiawa Shaft has been the sole water source providing potable water to the distribution network. It is located 5.5 miles west of the Red Hill Fuel Facility, and testing has not detected any water quality issues at this source. The Red Hill Shaft discharge pipes were physically re-arranged and encased in concrete on December 24, 2021 as shown in Enclosure (1) and (3), thereby isolating the system as required by Line of Evidence 1a. The Supervisory Control and Data Acquisition (SCADA) data in Enclosure (2) shows the previous statement to be true. All reported sources of contamination are isolated and contained.

2. The Red Hill Shaft pumps are now being used to control the spread of contamination by creating a capture zone in the aquifer by pumping to a 5 million gallons/day Granular Activated Carbon (GAC) system which discharges into the Halawa Stream. The new piping from the pumps to the GAC treatment came from the 20” header where the 20x24 reducer was removed on 24 DEC 2021. A thrust block was poured at this location around the existing blinded wye fitting as shown in Enclosure (3).

3. I certify under penalty of law that I have personally examined and I am familiar with the information submitted and I believe the submitted information is true, accurate, and complete.

WETZEL.CHRISTOPHER.JAMES.1540194862
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C. J. Wetzel
LT, CEC, USN

04 JANUARY 2022

MEMORANDUM FOR RECORD

SUBJECT: Red Hill Potable Water Pumping Station

ENC: (1) Red Hill Pump Station Photographs, Post Pump Isolation dated 12/26/2021
(2) JBPHH Potable Water LOTO Log

1. This Memorandum For Record (MFR) is to document the Red Hill Shaft pump status in relation to the Joint Base Pearl Harbor Hickam Potable Water System.

2. In response to fuel contaminants found in the Red Hill Shaft aquifer/development tunnel, the main Red Hill Pumping Station pumps were secured from the Potable Water system. On 3 December 2021, all four Red Hill pumps were electrically Locked Out, Tagged Out (LOTO), see Enclosure (2). (Note: Pump #1 was LOTO on 10 June 2020 due to an unrelated pump issue, and is still out of service, LOTO.) After initially being shut down operationally, and LOTO electrically, the Red Hill pumps were physically isolated from the Potable Water system on 24 December 2021.

3. Physical isolation was performed with in-house NAVFAC forces, with a completion date of 24 December 2021. This work was performed by isolating the system from the pumps at the "wye" fitting adjacent to Red Hill Pump #1. The wye fitting is shown on Enclosure (1). A blind flange was placed on the main header and the wye branch.

4. The 24" blind flange on the main header physically air-gapped and isolated Red Hill pumps #2, #3, and #4. The 16" blind flange in the wye branch physically air-gapped and isolated Red Hill pump #1. This work is shown on Enclosure 1.

5. The work the NAVFAC in-house forces performed removed any source or pathway from the Red Hill aquifer to the JBPHH Potable Water system.

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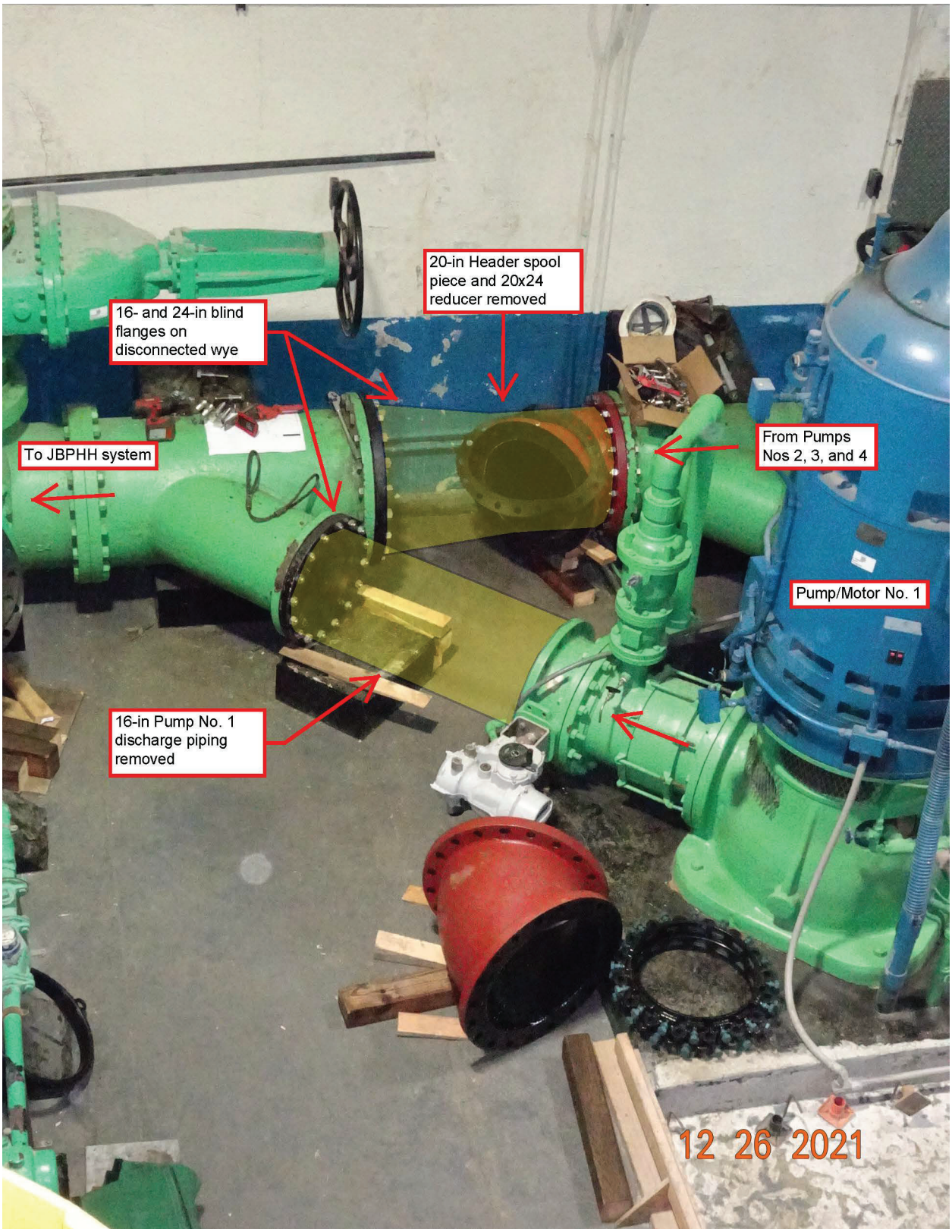
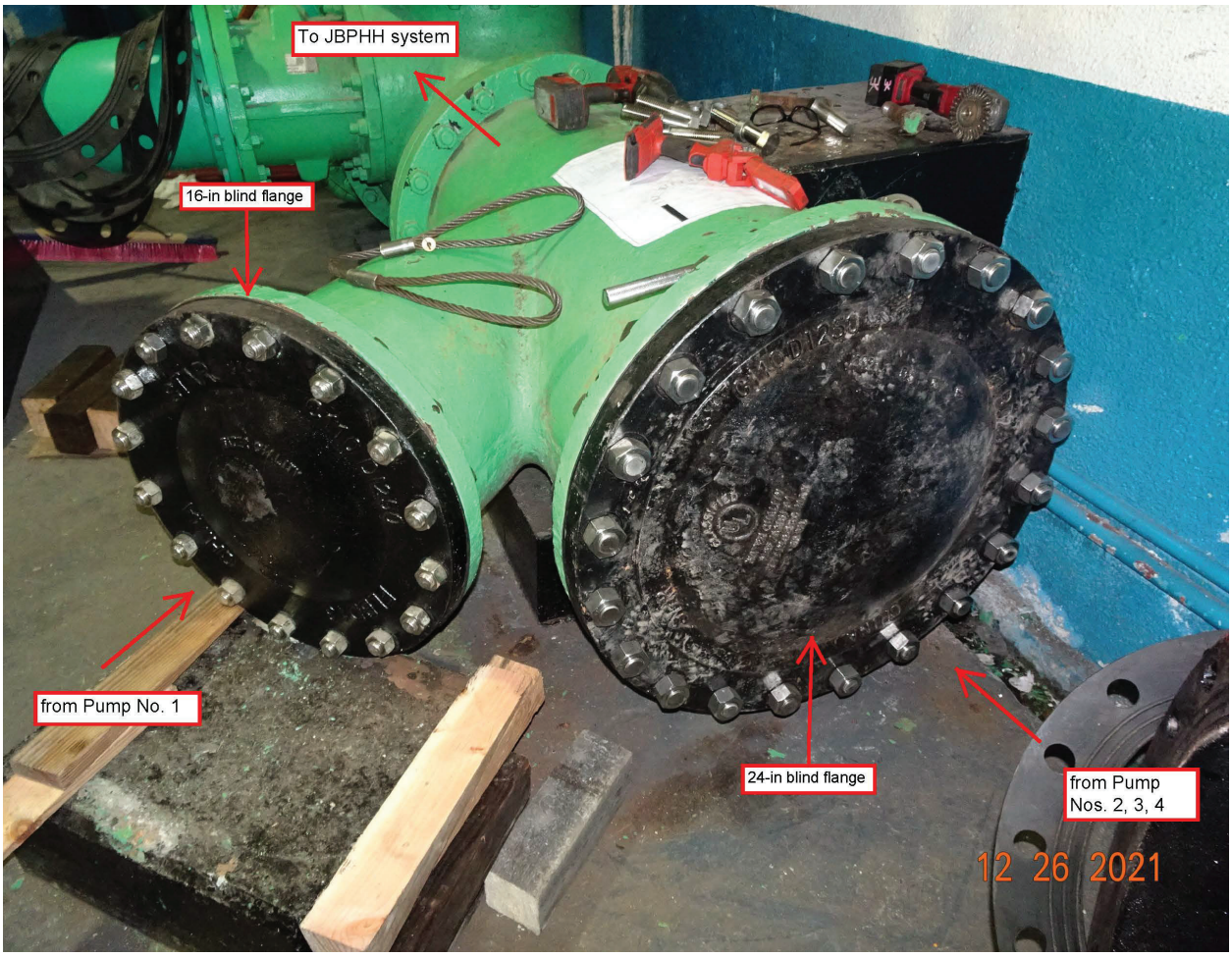
Date: 2022.01.04 07:56:02 -10'00'

J. MITCHELL
Deputy Public Works Officer
Joint Base Pearl Harbor Hickam


20-in Header spool piece and 20x24 reducer removed
16- and 24-in blind flanges on disconnected wye
To JBPHH system
From Pumps Nos 2, 3, and 4
Pump/Motor No. 1
16-in Pump No. 1 discharge piping removed
12 26 2021

Red Hill Pump Station Photographs
Post Pump Isolation dated 12/26/2021

Enclosure (1)



NAVFAC Hawaii - Potable Water Utilities
Lock Out Tag Out (LOTO) Form

Locked Out		Back in Service							
Date	Time	Date	Time	Location	Circuit / Equipment being LOTO	Reason for LOTO	Lock No.	Tag No.	Authorized Employee
12 MAR 20	0930			REDHILL	MP#1	PUMP OVERHAUL		010	[illegible]
5JUN20		20 MAY 21	1200	WAIAWA	CB #2B	FAULT IN BREAKER		1	
10JUN20	0900			REDHILL	PUMP CONTROL MP#1	PUMP OVERHAUL		011	[illegible]
10 JUN 20	0900			REDHILL	MCC MP#1	PUMP OVERHAUL		012	[illegible]
16JUN20	0945			WAIAWA	CB #4B	FAULT-PUMP CONTROLS		2	An
10 MAY 21				HALAWA	MCC#1	MOTOR FAULT		3	An
2JUN 21	0800			WAIAWA	CB# 8B	FAULT PUMP CONTROLS		5	An
2JUN21	0800	30JUN21	2030	WAIAWA	CB# 10B	HECO OUTAGE		4	An
2JUN21	0900			HALAWA	MCC #2	PUMP REMOVED		6	An
30 JUN 21	2330	7 JUL 21	1300	WAIAWA	CB#1B	FAIL TO CLOSE		8 9	An
19JUL 21	0745	19 JUL	0900	HALAWA	EXHAUST FAN	REPLACE BELT			DS
17 NOV 21	1230			MANANA	PUMP #1	PUMP FAIL			AN
17NOV 21	1230			MANANA	PUMP #2	MOTOR FAIL			AN
3DEC 21	0925			REDHILL	MCC MP#2	COMMAND INTEREST WORK IN WELL			AN

NAVFAC

Locked Out		Back in Service		Location	Circuit / Equipment being LOTO	Reason for LOTO	Lock No.	Tag No.	Authorized Employee
Date	Time	Date	Time						
3DEC 21	0920			REDHILL	MCC MP#3	COMMAND INTEREST WORK IN WELL			[illegible]
3DEC 21	0927			REDHILL	MCC MP#4	COMMAND INTEREST WORK IN WELL			[illegible]
3DEC 21				HALAWA	MCC #3	COMMAND INTEREST ISOLATE SYSTEM			[illegible]

February 10, 2022

SUMMARY OF OPERATOR LOGS AND SUPERVISORY CONTROL AND DATA ACQUISITION (SCADA) DATA

1. OBJECTIVE: Provide a description of water sources that supplied the Joint Base Pearl Harbor Hickam (JBPHH) potable water system (system) prior-to and after the fuel contamination incident that occurred in late November 2021.

2. BACKGROUND:

2.1. 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.

2.2. Prior to the aquifer contamination incident, water users connected to the Navy's system were supplied by three Navy owned water sources, Red Hill Shaft, Aiea/Halawa Shaft and Waiawa Shaft. In the time period prior to the incident, Waiawa Shaft was the main water source supplying water to the JBPHH system with at least one pump operating full time (100%). A single Red Hill Shaft pump was operated intermittently as a secondary source to the system. The Aiea/Halawa shaft was not being operated due to concerns over high chloride concentrations caused by saltwater intrusion into the aquifer.

2.3. On the evening of 28 November 2021, the Red Hill Shaft was secured and all pumping operations ceased. The Aiea/Halawa shaft briefly served as the secondary source starting on 28 November 2021 but was shut down on 03 December 2021 to prevent westward contaminant migration in the aquifer.

2.4. Since 03 December 2021, Waiawa Shaft has been the sole water source providing potable water to the distribution network. It is located 5.5 miles west of the Red Hill Fuel Facility and testing has not found any water quality issues at this source.

3. DATA INTERPERETATION: The Supervisory Control and Data Acquisition (SCADA) data provided in reference (a) includes tabular and graphical depictions of flow from the three source pump stations, aquifer water surface elevations above mean sea level (MSL) and the water level in the 6 million gallon (MG) S1 and S2 water storage tanks. The data was provided as a daily average (i.e. data was averaged over the 24 hours of each day from 00:00 to 23:59) and ranges from 01 November 2021 to 08 January 2022.

3.1 WAIAWA SHAFT/PUMP STATION: Prior to 28 November, The Waiawa Pump Station (PS) was supplying an average of 16.6 million gallons per day (MGD) of potable water to the system. After 28 November, demand reductions from turning off irrigation and smaller residential demand reduced the water supplied by the Waiawa PS to an average of 15.5 MGD. This was 76% of the 22 MGD total system demand prior to 28 November 2021.

There was an inverse correlation between the aquifer water surface elevation and water pumped out of the aquifer. When Waiawa PS was pumping between 16 and 18 MGD, the aquifer water surface elevation dropped to between 8.0 and 10.0 feet MSL. When pumping was reduced between 15 and 16 MGD, the aquifer water surface was raised to between 15.0 and 17.0 feet

above MSL. See Figure 1 below for a graphical depiction of the daily average aquifer water surface elevation and pumps flows from Waiawa Shaft.

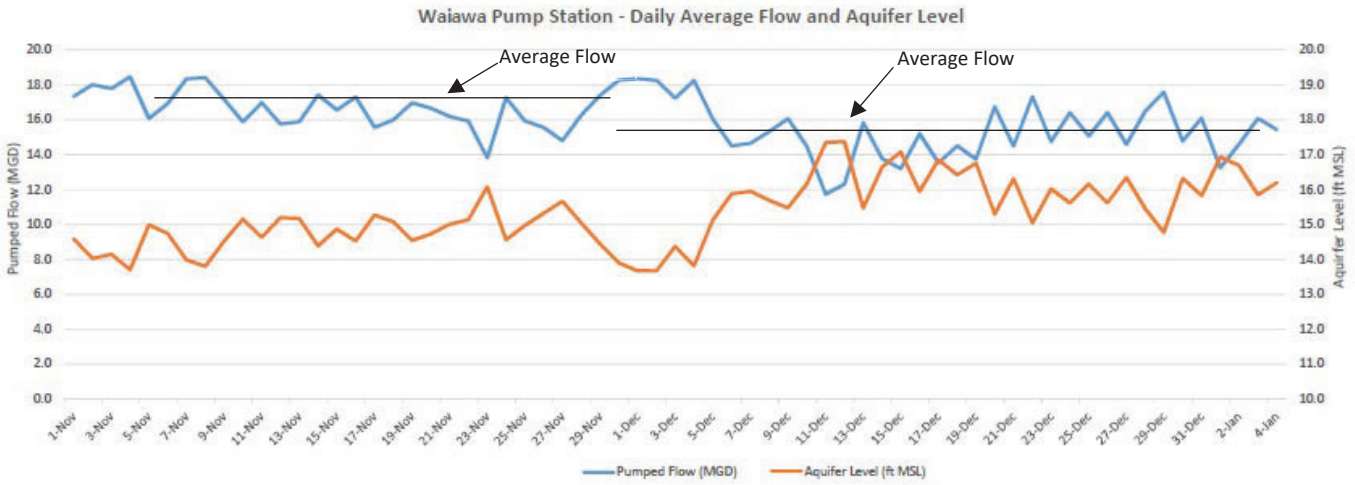


Figure 1. Waiawa Shaft Daily Average Flows and Aquifer Water Surface Elevation

3.2 RED HILL SHAFT/PUMP STATION: Prior to being shut down on 28 November 2021, the Red Hill PS was supplying an average of 5.3 MGD to the system. The represented 24% of the 22 MGD total system demand. A shown in Figure 2, the Red Hill Pump Station has not been operated since 28 November 2021.

Since pumping ceased, the aquifer water surface elevation has raised from approximately 2 ft MSL to almost 6 ft MSL

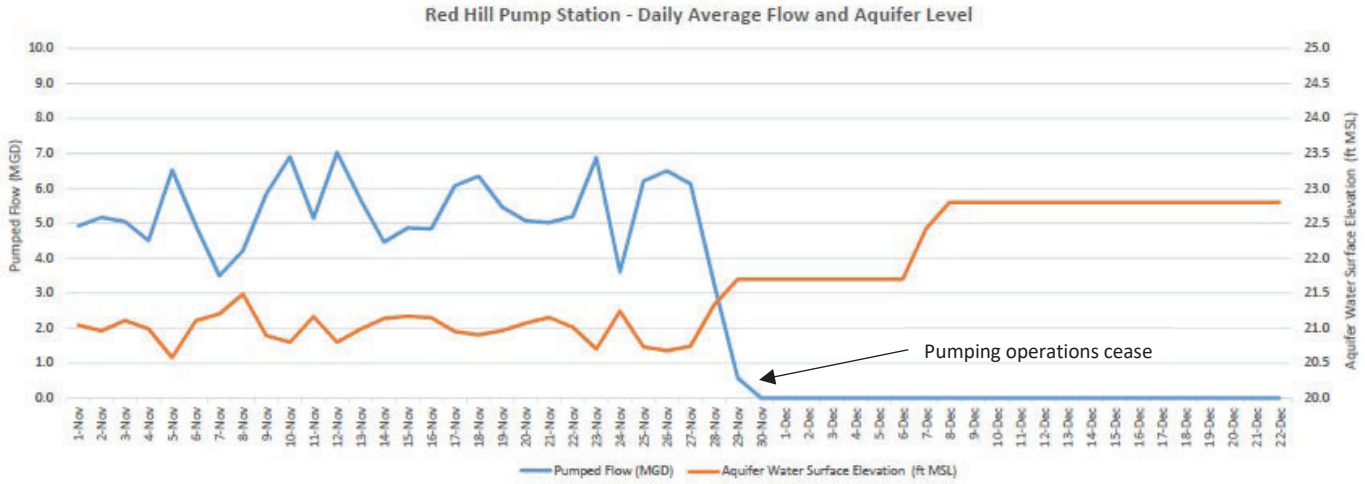


Figure 2. Red Hill Shaft Daily Average Flows and Aquifer Water Surface Elevation

3.3 HALAWA/AIEA SHAFT/PUMP STATION: Halawa Shaft was briefly operated from 28 November to 03 December 2021. The reasons for shutdown are as follows:

1. Demand reductions made it so that Waiawa Shaft could supply 100% of the water to the system,

2. there were concerns over westward plume migration from Red Hill if Halawa remained active,
3. water system operators had advised that high chloride concentrations in the Halawa/Aiea Shaft had caused water quality problems in the past.

The aquifer water surface elevation was around 12.0 ft MSL prior to turning the pumps on at the Halawa/Aiea PS. After the pumping ceased, the aquifer recovered to around 12.8 ft MSL.

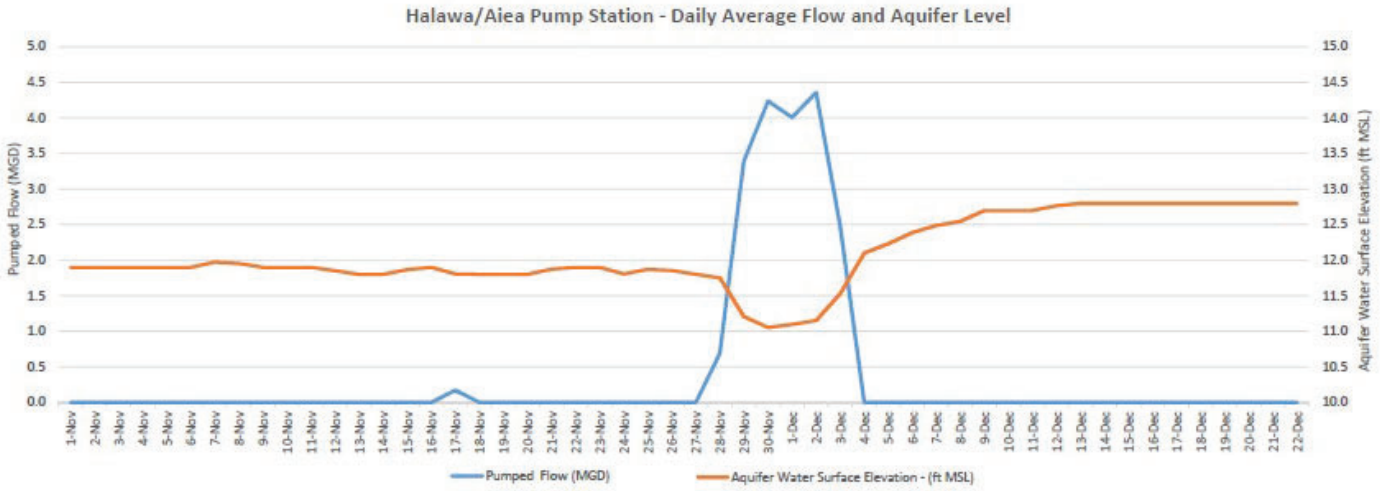


Figure 2. Halawa/Aiea Shaft Daily Average Flows and Aquifer Water Surface Elevation

Photograph of Concrete Blocking Between Air-gapped Isolation Flange

Interagency Drinking Water System Team
Zone B1 Removal Action Report
February 2022

Line of Evidence 1b

Regulated Public Water System's Water Quality Data is Compliant

Table 1: Lines of Evidence Under Evaluation – Ensure no contamination is entering the water system.

Objective 1b - The regulated public water system's water quality data is compliant.

Incident Specific Criteria - Data does not exceed Federal DW MCLs, specified State EALs, and ISPs for **Waiawa Shaft**.

Lines of Evidence *	Completion Status	Outstanding Items
Date Sample Taken at Step 0 of the Sampling Plan Addendum 1	Complete	• None.
Date Sample Taken at Entry Point to Distribution	Complete	• None.

February 17, 2022

From: Naval Facilities Engineering Systems Command Representative, IDWS Team
To: Interagency Drinking Water System Team

SUBJ: SUMMARY OF LINE OF EVIDENCE OBJECTIVE 1B – THE REGULATED PUBLIC WATER SYSTEM'S WATER QUALITY IS COMPLIANT

Encl: (1) 1b.1 Source Water and Entry Point of Distribution Sample

1. Enclosure (1) documents completion of Line of Evidence 1b, the regulated public water system's water quality is compliant. On the evening of November 28, 2021, the Red Hill Shaft was secured from operation and all pumping operations ceased. The Aiea/Halawa shaft briefly served as the secondary source starting on November 28, 2021, but it was shut down on December 3, 2021 to prevent potential westward contaminant migration in the aquifer and because there were concerns over high chloride concentrations caused by saltwater intrusion. Since December 3, 2021, the Waiawa Shaft has been the sole water source providing potable water to the distribution network. It is located 5.5 miles west of the Red Hill Fuel Facility, and testing has not detected any water quality issues at this source.

2. On January 11, 2022, water from the Waiawa shaft was sampled at the entry point to the distribution system (EPD). The results of the analysis are presented in Enclosure (1), Field Sample ID 20111-WS-ZT01. On January 13, 2022, additional samples were taken at the Waiawa shaft source. The results of these samples are also presented in Enclosure (1), Field Sample IDs 220113-WS-ZT01 and 220113-WS-ZT03. This data shows that the water from the Waiawa shaft does not exceed State of Hawaii and Federal Drinking Water standards, Maximum Contaminate Levels, Environmental Action Levels and Incident Specific Parameters, and the regulated public water system's water quality is complaint.

3. I certify under penalty of law that I have personally examined and I am familiar with the information submitted and I believe the submitted information is true, accurate, and complete.

RODRIGUEZ.ALBERTO.MAURICIO.1396316168

Digitally signed by RODRIGUEZ.ALBERTO.MAURICIO.1396316168
Date: 2022.02.19 17:19:01 -10'00'

A. M. Rodriguez
LT, CEC, USN

1b.1 Source Water and Entry Point of Distribution Sample
Well Shaft Sampling
Chemistry Results

Drinking Water Sampling, JBPHH, Oahu Hawaii

		EPD	Shaft	Shaft
Location ID:		I1-SHFTWAIA	I1-SHFTWAIA	I1-SHFTWAIA
Location Type:		Well	Well	Well
Residence:		Waiawa Shaft	Waiawa Shaft	Waiawa Shaft
Field Sample ID:		220111-WS-ZT01	220113-WS-ZT01	220113-WS-ZT03
Sample Date:		2022-01-11	2022-01-13	2022-01-13
Sample Type:		N (PostChlorination Sample)	N (PreChlorination Sample)	N (PreChlorination Sample)
GENCHEM (mg/L)	**Incident Specific Parameters**	**Environmental Action Levels Table D-1A Groundwater Action Levels**	**DOH Safe Drinking Water Branch (SDWB) Regulatory Constituents**	**Environmental Protection Agency Maximum Contaminant Levels**	**SDG: 2A12046**		**SDG: 810121191**
Total Organic Carbon	2	None	None	None	0.190 U	--	0.250 U
HC (µg/L)	**Incident Specific Parameters**	**Environmental Action Levels Table D-1A Groundwater Action Levels**	**DOH Safe Drinking Water Branch (SDWB) Regulatory Constituents**	**Environmental Protection Agency Maximum Contaminant Levels**	**SDG: 5801092421**	**SDG: 5801092721**	**SDG: 5801092711**
Petroleum Hydrocarbons (as Diesel)	200	400	None	None	90.0 U	91.0 U	92.0 U
Petroleum Hydrocarbons (as Gasoline)	200	300	None	None	31.0 U	31.0 U	31.0 U
Petroleum Hydrocarbons (as Motor Oil)	200	500	None	None	180 U	180 U	180 U
HERB (µg/L)	**Incident Specific Parameters**	**Environmental Action Levels Table D-1A Groundwater Action Levels**	**DOH Safe Drinking Water Branch (SDWB) Regulatory Constituents**	**Environmental Protection Agency Maximum Contaminant Levels**			**SDG: 980559**
Pentachlorophenol	None	None	None	None	--	--	0.0200 U
HG (µg/L)	**Incident Specific Parameters**	**Environmental Action Levels Table D-1A Groundwater Action Levels**	**DOH Safe Drinking Water Branch (SDWB) Regulatory Constituents**	**Environmental Protection Agency Maximum Contaminant Levels**	**SDG: 2A12046**		
Mercury	0.025	0.025	2	2	0.0170 U	--	--
METAL (µg/L)	**Incident Specific Parameters**	**Environmental Action Levels Table D-1A Groundwater Action Levels**	**DOH Safe Drinking Water Branch (SDWB) Regulatory Constituents**	**Environmental Protection Agency Maximum Contaminant Levels**	**SDG: 2A12046**		**SDG: 980559**
Antimony	6	6	6	6	**0.0915 J**	--	0.110 U
Arsenic	10	10	10	10	**0.207 J**	--	0.210 U
Barium	220	220	2000	2000	**1.72**	--	**1.80 J**
Beryllium	0.66	0.66	4	4	0.0624 U	--	0.0910 U
Cadmium	3	3	5	5	0.0416 U	--	0.0290 U
Chromium	11	11	100	100	**1.46**	--	**1.50**
Copper	2.9	2.9	1300	1300	**21.2**	--	**46.0**
Lead	15	5.6	15	15	**0.265**	--	**0.0630 J**
Selenium	5	5	50	50	**0.704**	--	**0.350 J**
Thallium	2	2	2	2	0.0210 U	--	0.0410 U
SVOC (µg/L)	**Incident Specific Parameters**	**Environmental Action Levels Table D-1A Groundwater Action Levels**	**DOH Safe Drinking Water Branch (SDWB) Regulatory Constituents**	**Environmental Protection Agency Maximum Contaminant Levels**	**SDG: 2A12046**	**SDG: 5801092721**	**SDG: 810121191**

1b.1 Source Water and Entry Point of Distribution Sample
Well Shaft Sampling
Chemistry Results
Drinking Water Sampling, JBPHH, Oahu Hawaii

					EPD	Shaft	Shaft
1,2,4-Trichlorobenzene	70	70	70	70	--	0.0930 U	--
1,2-Dichlorobenzene	10	10	600	600	--	0.0520 U	--
1,3-Dichlorobenzene	None	None	None	None	--	0.0410 U	--
1,4-Dichlorobenzene	5	5	75	None	--	0.0410 U	--
1-Methylnaphthalene	2.1	10	None	None	0.00801 U	--	0.0190 U
2,4,5-Trichlorophenol	None	None	None	None	--	0.100 U	--
2,4,6-Trichlorophenol	None	None	None	None	--	0.100 U	--
2,4-Dichlorophenol	None	None	None	None	--	0.210 U	--
2,4-Dimethylphenol	None	None	None	None	--	0.170 U	--
2,4-Dinitrophenol	None	None	None	None	--	1.70 U	--
2,4-Dinitrotoluene	None	None	None	None	--	0.100 U	--
2,6-Dinitrotoluene	None	None	None	None	--	0.100 U	--
2-Chloronaphthalene	None	None	None	None	--	0.0720 U	--
2-Chlorophenol	None	None	None	None	--	0.0520 U	--
2-Ethylhexyl adipate	None	None	None	None	0.00962 U	--	--
2-Methylnaphthalene	4.7	10	None	None	0.00904 U	--	0.0190 U
2-Methylphenol (o-Cresol)	None	None	None	None	--	0.0520 U	--
2-Nitroaniline	None	None	None	None	--	0.100 U	--
3,3'-Dichlorobenzidine	None	None	None	None	--	0.270 U	--
3-Nitroaniline	None	None	None	None	--	0.170 U	--
4,6-Dinitro-2-methylphenol	None	None	None	None	--	0.570 U	--
4-Bromophenyl phenyl ether	None	None	None	None	--	0.0620 U	--
4-Chloro-3-methylphenol	None	None	None	None	--	0.130 U	--
4-Chloroaniline	None	None	None	None	--	0.610 U	--
4-Chlorophenyl phenyl ether	None	None	None	None	--	0.0520 U	--
4-Nitroaniline	None	None	None	None	--	0.220 U	--
4-Nitrophenol	None	None	None	None	--	1.80 U	--
Acenaphthene	None	None	None	None	--	0.0520 U	--
Acenaphthylene	None	None	None	None	--	0.0620 U	--
Alachlor	None	None	None	None	0.0110 U	--	0.0480 U
Anthracene	None	None	None	None	--	0.0520 U	--
Atrazine	None	None	None	None	0.00734 U	--	0.0290 U
Benzo(a)anthracene	None	None	None	None	--	0.0520 U	--
Benzo(a)pyrene	0.06	0.06	0.2	0.2	0.0117 UJ	0.0410 U	0.00960 U
Benzo(b)fluoranthene	None	None	None	None	--	0.0410 U	--
Benzo(g,h,i)perylene	None	None	None	None	--	0.0410 U	--
Benzo(k)fluoranthene	None	None	None	None	--	0.0520 U	--
Benzyl butyl phthalate	None	None	None	None	--	0.280 U	--
Bis(2-chloroethoxy)methane	None	None	None	None	--	0.0520 U	--
Bis(2-chloroethyl) ether (2-Chloroethy ether)	None	None	None	None	--	0.0310 U	--
Bis(2-ethylhexyl)phthalate	3	3	6	6	0.437 U	0.770 U	0.580 U
Carbazole	None	None	None	None	--	0.100 U	--
Chlordane	None	None	None	None	0.0669 U	--	0.0320 U
Chrysene	None	None	None	None	--	0.0410 U	--

1b.1 Source Water and Entry Point of Distribution Sample
Well Shaft Sampling
Chemistry Results
Drinking Water Sampling, JBPHH, Oahu Hawaii

					EPD	Shaft	Shaft
Cresols, m- & p-	None	None	None	None	--	0.100 U	--
Dibenz(a,h)anthracene	None	None	None	None	--	0.0720 U	--
Dibenzofuran	None	None	None	None	--	0.100 U	--
Diethyl phthalate	None	None	None	None	--	0.160 U	--
Dimethyl phthalate	None	None	None	None	--	0.0620 U	--
Di-n-butyl phthalate	None	None	None	None	--	0.200 U	--
di-n-Octyl phthalate	None	None	None	None	--	0.130 U	--
Dioctyl adipate	None	None	None	None	--	--	0.580 U
Endrin	None	None	None	None	0.00991 U	--	0.00500 U
Fluoranthene	None	None	None	None	--	0.0620 U	--
Fluorene	None	None	None	None	--	0.0520 U	--
gamma-BHC (Lindane)	None	None	None	None	0.00633 U	--	0.00700 U
Heptachlor	None	None	None	None	0.00965 U	--	0.00300 U
Heptachlor epoxide	None	None	None	None	0.0122 U	--	0.00500 U
Hexachlorobenzene	0.0003	0.0003	1	1	0.0980 U	0.0410 U	0.00960 U
Hexachlorobutadiene	None	None	None	None	--	0.0620 U	--
Hexachlorocyclopentadiene	50	None	50	50	0.00594 U	0.140 U	0.00960 U
Hexachloroethane	None	None	None	None	--	0.0520 U	--
Indeno(1,2,3-c,d)pyrene	None	None	None	None	--	0.130 U	--
Isophorone	None	None	None	None	--	0.100 U	--
Methoxychlor	None	None	None	None	0.00863 U	--	0.0320 U
Naphthalene	12	17	None	None	0.0103 U	0.170 U	0.0190 U
Nitrobenzene	None	None	None	None	--	0.0410 U	--
N-Nitrosodi-n-propylamine	None	None	None	None	--	0.0620 UJ	--
N-Nitrosodiphenylamine	None	None	None	None	--	0.0720 U	--
PCB, Total	None	None	None	None	0.100 U	--	--
PCB-1016 (Aroclor 1016)	None	None	None	None	0.0157 U	--	0.0220 U
PCB-1221 (Aroclor 1221)	None	None	None	None	0.0436 U	--	0.0790 U
PCB-1232 (Aroclor 1232)	None	None	None	None	0.0102 U	--	0.0850 U
PCB-1242 (Aroclor 1242)	None	None	None	None	0.0737 U	--	0.0720 U
PCB-1248 (Aroclor 1248)	None	None	None	None	0.0941 U	--	0.0230 U
PCB-1254 (Aroclor 1254)	None	None	None	None	0.0869 U	--	0.0350 U
PCB-1260 (Aroclor 1260)	None	None	None	None	0.0379 U	--	0.0330 U
Pentachlorophenol	None	None	None	None	0.0242 U	0.530 U	--
Phenanthrene	None	None	None	None	--	0.120 U	--
Phenol	None	None	None	None	--	0.370 U	--
Pyrene	None	None	None	None	--	0.0410 U	--
Simazine	None	None	None	None	0.00734 U	--	0.0290 U

VOC (µg/L)	Incident Specific Parameters	Environmental Action Levels Table D-1A Groundwater Action Levels	DOH Safe Drinking Water Branch (SDWB) Regulatory Constituents	Environmental Protection Agency Maximum Contaminant Levels	SDG: 2A12046	SDG: 5801092721	SDG: C22A017REV1
1,1,1-Trichloroethane	11	11	200	200	0.256 U	0.390 U	0.119 U
1,1,2,2-Tetrachloroethane	None	None	None	None	--	0.520 U	--
1,1,2-Trichloroethane	5	5	3	5	0.190 U	0.240 U	0.288 U

1b.1 Source Water and Entry Point of Distribution Sample
Well Shaft Sampling
Chemistry Results
Drinking Water Sampling, JBPHH, Oahu Hawaii

					EPD	Shaft	Shaft
1,1-Dichloroethane	None	None	None	None	--	0.220 U	--
1,1-Dichloroethene	7	7	7	7	0.160 U	0.280 U	0.128 U
1,2,4-Trichlorobenzene	70	70	70	70	0.170 U	--	0.318 U
1,2-Dichlorobenzene	10	10	600	600	0.190 U	--	0.272 U
1,2-Dichloroethane	5	5	5	5	0.243 U	0.420 U	0.0884 U
1,2-Dichloroethene	None	None	None	None	--	0.390 U	--
1,2-Dichloropropane	5	5	5	5	0.130 U	0.180 U	0.129 U
1,4-Dichlorobenzene	5	5	75	None	0.180 U	--	0.245 U
2-Butanone (MEK)	None	None	None	None	--	4.70 U	--
2-Hexanone	None	None	None	None	--	4.00 U	--
4-Methyl-2-pentanone (MIBK)	None	None	None	None	--	2.50 U	--
Acetone	None	None	None	None	--	3.20 U	--
Benzene	5	5	5	5	0.150 U	0.240 U	0.0846 U
Bromodichloromethane	None	None	None	None	--	0.290 U	--
Bromoform	None	None	None	None	--	0.510 U	--
Bromomethane	None	None	None	None	--	0.210 U	--
Carbon disulfide	None	None	None	None	--	0.530 U	--
Carbon Tetrachloride	5	5	5	5	0.270 U	0.300 U	0.165 U
Chlorobenzene	25	25	100	100	0.150 U	0.440 U	0.146 U
Chloroethane	None	None	None	None	--	0.350 U	--
Chloroform	None	None	None	None	--	0.260 U	--
Chloromethane	None	None	None	None	--	0.280 U	--
cis-1,2-Dichloroethene	70	70	70	70	0.250 U	0.350 U	0.0570 U
cis-1,3-Dichloropropene	None	None	None	None	--	0.200 U	--
Dibromochloromethane	None	None	None	None	--	0.430 U	--
Ethylbenzene	700	7.3	700	700	0.210 U	0.500 U	0.141 U
m,p-Xylene	10000	13	None	None	0.330 U	0.530 U	0.317 U
Methylene chloride	5	5	5	5	0.303 U	1.40 U	2.15 U
o-Xylene	10000	13	None	None	0.200 U	0.390 U	0.157 U
Styrene	10	10	100	100	0.190 U	0.530 U	0.224 U
Tetrachloroethene (PCE)	5	5	5	5	0.180 U	0.410 U	0.125 U
Toluene	1000	9.8	1000	1000	0.294 U	0.390 U	0.120 U
trans-1,2-Dichloroethene	100	100	100	100	0.259 U	0.390 U	0.0958 U
trans-1,3-Dichloropropene	None	None	None	None	--	0.410 U	--
Trichloroethene (TCE)	5	5	5	5	0.180 U	0.260 U	0.0574 U
Vinyl chloride	2	2	2	2	0.180 U	0.220 U	0.611 U
Xylenes, Total	10000	13	10000	10000	--	0.530 U	--

Section 1b.1 Source Water and Entry Point of Distribution Sample

Notes:

-- indicates that the sample was Not Analyzed for the analyte

Results highlighted yellow exceed the ISP
Results in purple font also exceed the EALs
Results in green font also exceed the DOH MCL
Results in blue font also exceed the EPA MCL

µg/L = Micrograms per Liter

Interagency Drinking Water System Team
Zone B1 Removal Action Report
February 2022

Line of Evidence 1c

No Additional Contamination through the Distribution System is Occurring

Table 1: Lines of Evidence Under Evaluation – Ensure no contamination is entering the water system.

Objective 1c - No additional contamination through the distribution system is occurring**.**

Incident Specific Criteria - Cross Connection Control investigation shows distribution system is protected, resulting in no additional sources of contamination.

Lines of Evidence	Completion Status	Outstanding Items
No contamination of the distribution system is occurring from cross-connections with other petroleum sources during this incident	Complete	• None.
Cross Connection Control/Backflow Program-related documents	Complete	• None.

February 19, 2022

From: Naval Facilities Engineering Systems Command Representative, IDWS Team
To: Interagency Drinking Water System Team

SUBJ: SUMMARY OF LINE OF EVIDENCE OBJECTIVE 1C – NO ADDITIONAL CONTAMINATION THROUGH THE DISTRIBUTION SYSTEM IS OCCURRING

Encl: (1) 1c.1 Certification of Inventory and Petroleum Facility Locations with Associated Backflow Preventers.
(2) 1c.2 Backflow Prevention and Cross-Connection Control Program Instruction

1. Enclosures (1) and (2) document completion of Line of Evidence 1c, no additional contamination through the distribution system is occurring. On the evening of November 28, 2021, the Red Hill Shaft was secured from operation and all pumping operations ceased. The Aiea/Halawa shaft briefly served as the secondary source starting on November 28, 2021, but it was shut down on December 3, 2021 to prevent potential westward contaminant migration in the aquifer and because there were concerns over high chloride concentrations caused by saltwater intrusion. Since December 3, 2021, the Waiawa Shaft has been the sole water source providing potable water to the distribution network. It is located 5.5 miles west of the Red Hill Fuel Facility, and testing has not detected any water quality issues at this source.

2. Enclosure (1) identifies all water service connections where petroleum activities exist and documents adequate backflow prevention devices installed at those petroleum service activities. Enclosure (2) provides the governing instructions for backflow prevention devices referenced in Enclosure (1). This data shows that no additional contamination through the water distribution system is occurring.

3. I certify under penalty of law that I have personally examined and I am familiar with the information submitted and I believe the submitted information is true, accurate, and complete.

RODRIGUEZ.ALBERTO.MAURICIO.1396316168
Digitally signed by RODRIGUEZ.ALBERTO.MAURICIO.1396316168
Date: 2022.02.19 17:24:22 -10'00'

A. M. Rodriguez
LT, CEC, USN

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING SYSTEMS COMMAND, HAWAII
400 MARSHALL ROAD
JBPHH, HAWAII 96860-3139

11000
Ser PWO/0089
February 28, 2022

Director of the State of Hawaii
Department of Health (DOH)

Dear DOH Director:

SUBJECT: CERTIFICATE REGARDING CROSS CONNECTION CONTROL REVIEW AND CONFIRMATION – ZONE B1

Enclosure: [1] ZONE B1: POL Activities Backflow Prevention Devices
[2] ZONE B1: POL Activities Map

On behalf of the United States Department of the Navy, operator of the Joint Base Pearl Harbor-Hickam Public Water System (PWS ID No. 360 Water System), and in connection with and pursuant to the removal action required by the DOH Hazard Evaluation and Emergency Response Office Incident Case No. 20211128-1848, the undersigned certifies that the Navy has made all necessary inquiry into their Water System and represents and warrants as set forth below.

All service connections where petroleum activities exist in the Water System, **Zone B1**, are identified in Enclosure [1], "Zone B1: POL Activities Backflow Prevention Devices." Petroleum activities include, but are not limited to, operating or having gas stations, fuel storage, facilities with aboveground or underground storage tanks (>100-gallon capacity), fuel transfer, motor pools, vehicle maintenance facilities, fuel recovery pits, waste oil collection facilities or systems.

All service connections where petroleum activities exist, as identified in Enclosure [1] have adequate backflow protection as recommended by and in accordance with COMNAVREGHIINST 11330.2D, BACKFLOW PREVENTION AND CROSS-CONNECTION CONTROL PROGRAM. Adequate backflow protection includes installation of devices appropriate to the identified hazard condition, correct design and installation of the device, timely testing by a certified tester, and regular maintenance/repair/replacement.

All facilities identified with adequate backflow protection have had their assemblies tested by a DOH-approved certified tester in the past year in accordance with Hawaii Administrative Rules, Title 11-21-8(b) Maintenance requirements.

The Navy has committed to the funding and performance in FY2022 of a comprehensive cross connection control survey of the entire JBPHH water system per the December 2021 AH Engineers & Scientists Water Quality CAT Memorandum.

SUBJECT: CERTIFICATE REGARDING CROSS CONNECTION CONTROL REVIEW AND CONFIRMATION – ZONE B1

The undersigned has due authority to deliver to DOH this Certification on behalf of the Navy.

Sincerely,

HARMEYER.RANDALL.ERNEST.1186692663

Digitally signed by HARMEYER.RANDALL.ERNEST.1186692663
Date: 2022.02.28 10:45:05 -10'00'

R. E. HARMEYER
Captain, CEC, U.S. Navy
Public Works Officer
By Direction of the
Commanding Officer

Enclosure [1] - ZONE B1: POL Activities Backflow Prevention Devices

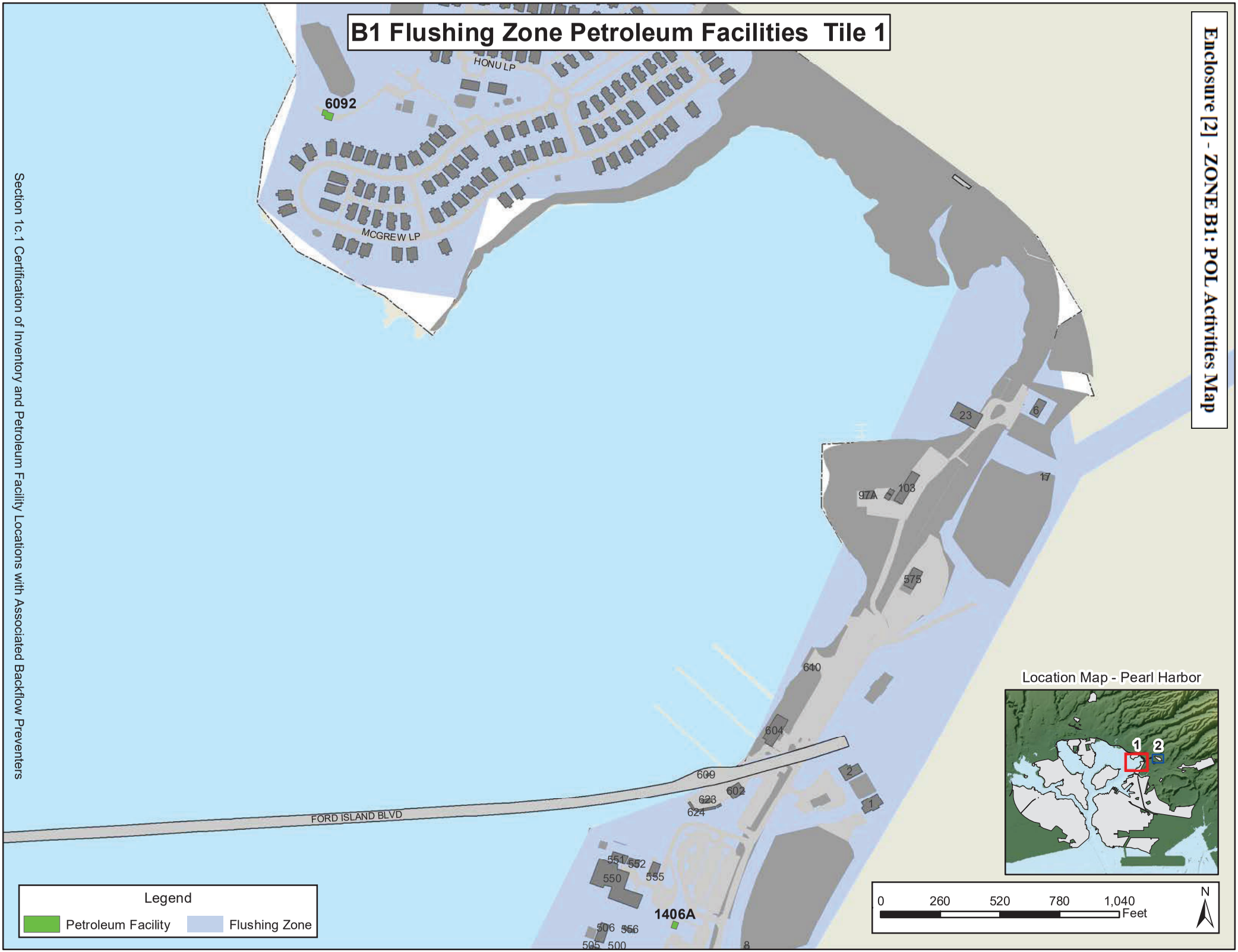
POL Activities Backflow Prevention Devices **Zone: B1**

ASSET NAME	Location (Bldg. #)	Reference Location	Description of petroleum -related activity	BFP Manufacturer	BFP Model	BFP Size	Serial # or VIN #	Installation Date or In Service Date	Changed (Replacement) Date	Last Tested Date	Last Repaired Date
SA-BFW 614	614 (1406A)	LIFT STATION 17(1406A)	AST C-22 / 500 GAL DIESEL	WATTS	909	1	14240	1/1/2015	N/A	2/19/2022	N/A
SA-FWT 0549BP	3227 (6092)	MCGREW PT. LIFT STATION(6092)	AST FOR GENERATOR	WATTS	909	2.5	101365	2/1/1991	N/A	8/18/2021	N/A
SA-FWT 141	3227 (6092)	MCGREW PT. LIFT STATION(6092)	AST FOR GENERATOR	WATTS	909M1	0.75	94240	1/1/1971	N/A	8/18/2021	N/A
SA-FWY 2938	2938	HALAWA HSNG LIFT STATION	AST FOR GENERATOR	WATTS	909	1	565114	1/1/1972	N/A	7/29/2021	N/A
NO BFP ASSETS, HOSE BIBS	408	HALAWA WATER PUMP STATION	FIXED GENERATOR	HOSE BIB W/ AVB	AVB	0.75	N/A	N/A	N/A	N/A	N/A

B1 Flushing Zone Petroleum Facilities Tile 1

Enclosure [2] - ZONE B1: POL Activities Map

Section 1c.1 Certification of Inventory and Petroleum Facility Locations with Associated Backflow Preventers

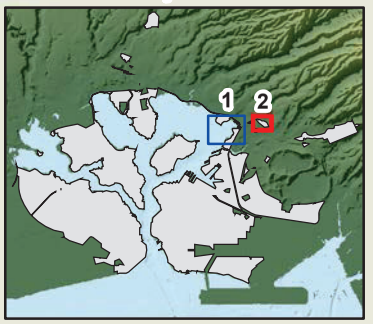


B1 Flushing Zone Petroleum Facilities Tile 2

Enclosure [2] - ZONE B1: POL Activities Map

Section 1c.1 Certification of Inventory and Petroleum Facility Locations with Associated Backflow Preventers

Location Map - Pearl Harbor



Legend

Petroleum Facility

Flushing Zone

0 130 260 390 520 Feet

N

DEPARTMENT OF THE NAVY
COMMANDER
NAVY REGION HAWAII
850 TICONDEROGA ST STE 110
JBPHH HI 96860-5101

COMNAVREGHIINST 11330.2D
N4
19 Sep 2016

COMNAVREG HAWAII INSTRUCTION 11330.2D

From: Commander, Navy Region Hawaii

Subj: BACKFLOW PREVENTION AND CROSS-CONNECTION CONTROL PROGRAM

Ref: (a) Recommended Practice for Backflow Prevention and Cross-Connection Control, (AWWA Manual M14), American Water Works Association
(b) MIL-HDBK-I 005/7, Military Handbook Water Supply Systems
(c) State of Hawaii, Department of Health, Administrative Rules Title 11, Chapter 21, Cross-Connection and Backflow Control
(d) NAVFACINST 11330.11E
(e) Manual of Cross-Connection Control, Foundation for Cross-Connection Control and Hydraulic Research, University of Southern California
(f) NAVFAC MO-210, Maintenance and Operation of Water Supply, Treatment, and Distribution Systems

1. Purpose. To supplement current Navy directives pertaining to the protection of the Base potable water supply.

2. Cancellation. COMNAVREGHIINST 11330.2C.

3. Definitions. References (a) through (c) define technical terms used herein as follows:

a. Backflow. The reversal of the normal flow of water caused by either backpressure or back-siphonage.

b. Back-pressure. The flow of water or other liquids, mixtures or substances under pressure into the distribution pipes of a potable water supply system from any source or sources other than the intended source.

c. Back-siphonage. The flow of water or other liquids, mixtures or substances into the distribution pipes of a potable water supply system from any source other than its intended source caused by the sudden reduction of pressure in the potable water supply system.

d. Backflow Preventer. A device or means designated to prevent backflow. These include:

(1) Air Gap. The unobstructed vertical distance through the free atmosphere between the lowest opening from any pipe or faucet supplying water to a tank, plumbing fixture, or other device and the flood level rim of said vessel. An approved air-gap must be at least double the diameter of the supply pipe, measured vertically, above the top of the overflow rim of the vessel, and in no case less than six inches.

(2) Reduced Pressure Principle Device. An approved assembly of two independently acting approved check valves together with a hydraulically operating, mechanically independent pressure relief valve located between the check valves, as described in reference (b) and specified in reference (d).

(3) Double Check Valve Assembly. An approved assembly of two independently operating approved check valves with tightly closing shut-off valves on each end of the check valves, plus properly located test cocks for the testing of each check valve.

(4) Atmospheric Vacuum Breaker. A device designed to not subject to static line pressure and contains a check valve and an air-let valve.

(5) Pressure Vacuum Breaker. A device that is designed to operate under conditions of static line pressure and contains one or two independently operating, spring-loaded air-inlet valves located on the discharge side of the check valve (or valves), plus properly located test cocks, and tightly closing shut-off valves.

e. Certified Tester. A certified tester means three classes of certified testers:

(1) A limited tester - A person trained and qualified to perform periodic testing, inspection, and repairs on the specific devices contained within a specific plant or institution. This person is usually an employee of the plant or institution and assigned the duty of taking care of the backflow prevention equipment as part of his or her overall plant duties, and does not extend to backflow prevention devices that are not part of the specific plant or institution.

(2) A general tester - A person trained and qualified to perform the periodic testing, inspection, and repairs on all devices that are on the market. This person may be an employee of a water agency, an employee of a municipal agency, or an individual operating a backflow device testing service.

(3) A manufacturer's agent - A person who is an employee of a manufacturer of backflow prevention equipment and is thoroughly familiar with the backflow prevention devices produced by his/her employer. This person maybe familiar with other makes and models of backflow prevention devices but is restricted to only his/her employer's products. The Director of the Department of Health, State of Hawaii or his duly authorized representative, must approve all certified testers.

f. Cross-Connection. Any physical connection or arrangement of piping or fixtures between two otherwise separate piping systems, one of which contains potable water for human consumption and the other water for irrigation, fire protection, industrial and other uses, or non-potable water or industrial fluids of questionable safety, through which, or because of which, backflow may occur into the potable water system. This would include bypass arrangements, jumper connections, removable sections, swivel or changeover devices, and any other temporary or permanent devices through which, or because of which backflow could occur.

4. Background

a. Reference (b) presents requirements for the design of water supply systems for naval shore activities. Reference (b) indicates the design requirements for protecting the potable system from contamination by cross-connections with non-potable supplies and units containing polluted water. Reference (b) further indicates the need to protect the potable system from contamination by irrigation systems.

b. Reference (d) sets forth criteria for specifying backflow preventers of the reduced pressure principle type. It requires that such devices have a current Certificate of Approval and provides a list of approved backflow prevention devices.

c. Reference (e) cites methods and devices by which hazards may be eliminated without interfering with the functions of plumbing or water supply distribution systems. It is a comprehensive reference, and covers all aspects of cross-connection control.

d. Reference (f) provides technical guidance for the operation and maintenance of water supply systems at naval shore activities. Chapter 8 of reference (f) describes how the water system becomes contaminated. Chapter 9 reference (f) further requires that approved backflow preventers be installed according to the degree of the hazard involved and indicates the need for periodic testing and inspection of the devices by certified personnel. It also suggests a time interval for inspection and indicates that all devices be tested according to the manufacturer's service instructions. It further points out the requirements for record keeping.

e. To assure the quality of the water at the customer's tap, both the customer and Navy Facilities Engineering Command, Hawaii(NAVFAC HI), the water supplier, must participate in a backflow prevention and cross-connection control program.

5. Policy. Protect the existing potable water system at all times from hazardous cross-connections by the installation, operation, and maintenance of approved backflow preventers. Backflow prevention and cross-connection control measures must be in accordance with the recommendations and requirements of references (a) through (f).

6. Discussion

a. The objectives of the backflow prevention and cross-connection control program are to achieve the following:

(1) Protection of the quality of the base water supply.

(2) Elimination of existing hazards.

(3) Prevention of future unprotected cross-connections.

b. The backflow prevention and cross-connection control program requires the following:

(1) The survey all existing cross-connections to determine they are adequately protected.

(2) The recording of data on all existing backflow preventers to enable up-to-date monitoring. The data must include at least the following information:

(a) Activity name.

(b) Building number (if appropriate).

(c) Sketch of approximate location of backflow preventer.

(d) Size, type, model number, and manufacturer of the backflow preventer.

(e) Date installed (if known).

(f) Type of Hazard.

(3) Operate, maintained and repair all known existing backflow preventers to ensure their proper operation for the protection of the water system.

(4) Inspect and test all existing backflow preventers at the minimum time intervals to determine their effectiveness as shown in the table. If successive tests on a backflow preventer indicate repeated failures, test preventer at more frequent interval to be determined by NAVFAC HI Utilities and Energy Management Department, Potable Water Division (OPC61). All testing must be performed in accordance with the manufacturer's instruction.

METHOD OR DEVICE	3 MONTHS	6 MONTHS	12 MONTHS
Pressure Type Vacuum Breaker			X
Double Check Valve Assembly			X
Reduce Pressure Principle devices used for shore-to ship connections	X		

METHOD OR DEVICE	3 MONTHS	6 MONTHS	12 MONTHS
Other Reduced Pressure Principle device		X	
Air Gap			X
Reduced Pressure Principle devices used to separate the Navy's potable water system from another agency's potable water system			X

(5) Review all plans and specifications or sketches and material description for new connections to NAVFAC HI Potable Water Systems by NAVFAC HI OPC61 to verify the safety of the cross-connections.

(6) Report all known or suspected accidental contamination immediately to NAVFAC HI OPC61 to enable corrective action, and avoid widespread contamination of the water system.

7. Implementation. Maintain the following provisions of the backflow prevention and cross-connection control program by the shore activities as indicated below:

a. All shore activities and other agencies who receive potable water from water systems owned and operated by NAVFAC HI must:

(1) Conduct a Cross-Connection Control and Backflow Prevention Survey of the areas under their jurisdiction including building plumbing, fire protection, exterior hose bibs, lawn irrigation systems, etc. The survey must include an inspection of the consumer's premises for hazards noted in references (a) and (e) and document any findings observed during the survey. The survey must also document all existing backflow preventers. The activity is responsible for funding the survey.

(2) Conduct follow-up surveys of the areas under their jurisdiction within 5 years after the initial survey to update the status of the initial findings and provide new information, findings, and recommendations as required. The activity funds the follow-up surveys as a lump sum amount or incremental amounts of the cost determined by NAVFAC HI OPC61.

(3) Take immediate action to eliminate hazards if the survey indicates that there are cross-connection hazards.

(4) Forward copy of all surveys to NAVFAC HI OPC61.

(5) The activity may submit a work request to have NAVFAC HI conduct the survey.

b. All shore activities and other agencies who have existing backflow preventers that do not conform to the requirements of reference (e) and the NAVFAC HI OPC61 and, who receive water from systems owned and operated by NAVFAC HI, must provide funding to have their backflow preventers tested and certified by certified testers from NAVFAC HI OPC61.

c. All shore activities and other agencies who have requirements for new backflow preventers and who receive water from systems owned and operated by NAVFAC HI must:

(1) Provide funding to have their backflow preventers installed, tested, and certified.

(2) Provide funding for the re-testing and re-certification of the backflow preventer should the backflow preventer fail the initial test.

(3) Ensure initial certification and all re-certification is performed by NAVFAC HI OPC61. Certification by other agencies is not accepted.

d. All shore activities and other agencies who have existing backflow preventers registered with NAVFAC HI OPC61 will have their devices inspected, maintained, and certified by NAVFAC HI funding for the inspection, maintenance, and certification must be provided by NAVFAC HI OPC61.

e. The activities who are responsible for the design of the connection to a NAVFAC HI Potable Water System must submit construction drawings and specifications for the connection to NAVFAC HI OPC61 for approval, prior to its construction.

f. NAVFAC HI job planners must obtain approval for the connection to the NAVFAC HI Potable Water System from NAVFAC HI OPC61, if NAVFAC HI is to perform the work and construction drawings are not required for the connection.

g. The activity who requires the connection to NAVFAC HI Potable Water System must obtain approval for the connection from NAVFAC HI OPC61 prior to construction of the connection.

h. All shore activities who install backflow preventers or administer contracts for their installation NAVFAC HI must ensure that all newly installed backflow preventers are tested and inspected by a certified tester from NAVFAC HI OPC61 at the same time that the water outage occurs for the connection to the water system. Backflow preventer must pass all tests prior to supplying potable water.

i. All activities that suspect that the potable water system may have been contaminated must call NAVFAC HI OPC61 Steam/Air/Potable Water Division Manager, telephone number 473-0388. In addition, warn all personnel in the area of the possible contamination to stop drinking the water.

8. Responsibility

a. Commanding Officers and Officers-in-Charge of shore activities must ensure that hazards from cross-connections are eliminated and that new connections are approved.

b. Commanding Officers and Officers-in-Charge of shore activities in doubt as to the proper methods of backflow prevention and cross-connection control may request engineering and technical assistance from NAVFAC HI (Code 431), Long Range Maintenance Planning Branch, telephone number (808) 474-3700.

9. Records Management. Manage all records created by this instruction, regardless of media or format per SECNAV Manual 5210.1 of January 2012.

10. Review and Effective Date. Per OPNAVINST 5215.17A of 26 May 2016, the Facilities and Environmental (N4) will review this instruction annually on the anniversary of its issuance date to ensure applicability, currency, and consistency with Federal, DoD, SECNAV, and Navy policy and statutory authority using OPNAV 5215/40. This instruction will automatically expire 5 years after its issuance date unless reissued or canceled prior to the 5-year anniversary date, or an extension has been granted.

R. A. ESPINOSA
Chief of Staff
Acting

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Interagency Drinking Water System Team
Zone B1 Removal Action Report
February 2022

Line of Evidence 2a

Water within the Distribution System does not exceed State and Federal Drinking Water MCLs, Specified State EALs, and ISPs

Table 1: Lines of Evidence Under Evaluation – Ensure no contamination remains in the system and water chemistry concerns are addressed.

Objective 2a - Water within the distribution system does not exceed State and Federal DW MCLs, specified State EALs, and ISPs.

Incident Specific Criteria –

- Zone flushing plan demonstrates entire distribution system is flushed.
- Sample results show the water in distribution system does not exceed State and Federal DW MCLs, specified State EALs, and ISPs. (Guidance Table 2 and Table 3)
- Drinking water does not show sheen, olfactory evidence, or other qualitative methods of petroleum.

Lines of Evidence	Completion Status	Outstanding Items
JBPHH water system's approach to flushing and their metrics for success.	Complete	• None.
Validity of the volumetric exchange model	Complete	• None.
Verification that the entire distribution system is flushed volumetrically.	Complete	• None.
Residential Sampling Report for Flushing Zone (Risk Management Summary)	Complete	• None.

February 19, 2022

From: Naval Facilities Engineering Systems Command Representative, IDWS Team
To: Interagency Drinking Water System Team

SUBJ: SUMMARY OF LINE OF EVIDENCE OBJECTIVE 2A – WATER WITHIN THE DISTRIBUTION SYSTEM DOES NOT EXCEED STATE AND FEDERAL DW MCLs, SPECIFIED STATE EALs, AND ISPs

Encl: (1) 2a.1 Memorandum for Record
(2) 2a.2 Validity and Application of Volumetric Exchange Method
(3) 2a.3 Hydraulic Model
(4) 2a.4 Records of Completed Volumetric Exchanges
(5) 2a.5 Water Source and Water Storage Facilities
(6) 2a.6 Distribution System Exceedance Investigation Summary and Results

1. Enclosures (1) through (6) document completion of Line of Evidence 2a, that water within the Zone B1 distribution system does not exceed State of Hawaii and Federal Drinking Water standards, Maximum Contaminate Levels, Environmental Action Levels and Incident Specific Parameters. On the evening of November 28, 2021, the Red Hill Shaft was secured from operation and all pumping operations ceased. The Aiea/Halawa shaft briefly served as the secondary source starting on November 28, 2021, but it was shut down on December 3, 2021 to prevent potential westward contaminant migration in the aquifer and because there were concerns over high chloride concentrations caused by saltwater intrusion. Since December 3, 2021, the Waiawa Shaft has been the sole water source providing potable water to the Joint Base Pearl Harbor-Hickam (JBPHH) distribution network. Zone B1 is part of the JBPHH Drinking Water system that is operated and maintained by the United States Navy. Flushing operations for Zone B1 are summarized in Enclosure (1), signed by LCDR Carl Chase, team lead for the Drinking Water Distribution System Recovery Team.

2. Details on the drinking water system and flushing operations and protocols are provided in Enclosures (1), (3), and (5). The guidance provided by Dr. Whelton on the recommended volume exchanges to be flushed in the distribution system is provided in Enclosure (2).

3. The records of the distribution system volumetric exchanges flushed are provided in Enclosure (4). Level 2 sampling data collected after distribution flushing is summarized in Enclosure (6).

4. Sample results with analyte detections exceeding the prescribed MCL, EAL, or ISP are documented in Enclosure (6). The follow-on investigation summary and additional sampling results are also documented in Enclosure (6).

5. The information provided in Section 2a, including the flushing process followed and the subsequent sampling results, demonstrate that water within the Zone B1 distribution system does not exceed State of Hawaii and Federal Drinking Water standards, Maximum Contaminate Levels, Environmental Action Levels and Incident Specific Parameters.

6. I certify under penalty of law that I have personally examined and I am familiar with the information submitted and I believe the submitted information is true, accurate, and complete.

WETZEL.CHRISTOPHER.JAMES.1540194862

Digitally signed by WETZEL.CHRISTOPHER.JAMES.1540194862
Date: 2022.02.19 19:37:51 -08'00'

C. J. Wetzel
LT, CEC, USN

24 Jan 2022

MEMORANDUM FOR THE RECORD

From: LCDR Carl Chase, JBPHH Drinking Water Distribution System Recovery Team
To: Interagency Drinking Water System Team

Subj: DISTRIBUTION SYSTEM RECOVERY PLAN ADDENDUM – ZONE B1 ANALYSIS

Ref: (a) Memorandum for the Record from LCDR John Daly regarding the Distribution System Zone Flushing, December 28, 2021
(b) State of Hawaii Department of Health, Directive One– Flushing Requirements Navy Water System Incident, Case No.: 20211128-1848 (HI Directive One, dated 08 December, 2021)
(c) Drinking Water Distribution System Recovery Plan, 17 December 2021
(d) Incident Specific Criteria to Meet Lines of Evidence Objectives 1c and 2a, dated 05 January 2022

1. OBJECTIVE: The Drinking Water Distribution System Recovery Plan (DWDSRP) was signed by the Interagency Working Group on 17 December 2021. This addendum provides additional technical information to document the system flushing methodology and engineering approach used to restore Flushing Zone B1 to service as requested by the State of Hawaii Department of Health (HI DoH) in reference (d).

2. BACKGROUND:

2.1. 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.

2.2. Prior to the aquifer contamination incident (incident), water users connected to the Navy's system were supplied by three Navy owned water sources, Red Hill Shaft, Aiea/Halawa Shaft and Waiawa Shaft. In the time period prior to the incident, Waiawa Shaft was the main water source supplying approximately 16 million gallons per day (MGD) to the JBPHH system with at least one pump operating full time (100%). A single Red Hill Shaft pump was operated intermittently as a secondary source to supply approximately 5.5 MGD to the system. The Aiea/Halawa shaft was not being operated due to concerns over high chloride concentrations caused by saltwater intrusion into the aquifer.

2.3. On the evening of 28 November 2021, the Red Hill Shaft was secured and all pumping operations ceased. The Aiea/Halawa shaft briefly served as the secondary source starting on 28 November 2021 but was shut down on 03 December 2021 to prevent westward contaminant migration in the aquifer.

2.4. Since 03 December 2021, Waiawa Shaft has been the sole water source providing potable water to the distribution network. It is located 5.5 miles west of the Red Hill Fuel Facility and testing has not found any water quality issues at this source.

3. ENGINEERING ANALYSIS AND TOOLS: DWDSRP development utilized engineering judgement informed by existing tools and data sources such as ArcGIS, Supervisory Control and Data Acquisition (SCADA) system historic/current data, hydraulic models, and input from water system infrastructure contamination subject matter experts (SMEs).

3.1. ArcGIS was the primary tool used for mapping, volumetric calculations, and spatial analysis of the JBPHH utility systems.

3.2. System flows were measured by meters at key points within the distribution system. Data was recorded and stored by the Navy's SCADA system historian. SCADA is also monitored 24/7 by water system operators.

3.3. A hydraulic model was developed in 2014 and calibrated to conditions at the time. It is a skeletonized model depicting major transmission lines to many areas of the base. It does not include all mainline pipes, the Hickam area, or laterals feeding residence and non-residence facilities. The model was considered to be of limited use in determining the effectiveness of system flushing. It was primarily used to determine areas that were most likely impacted by the contamination event. The results directly correlated with initial reporting from impacted residents.

3.4 Dr. Andrew Whelton, a Purdue University associate professor of civil, environmental, and ecological engineering and recognized for his expertise in disaster response and recovery, provided recommendations to the US Navy based on his research and experience. His work is often cited in EPA literature and he is a leading expert in the field of recovering contaminated drinking water plumbing. His recommendations were incorporated into the DWDSRP.

4. CONSTRAINTS: In addition to Section 1.3 of the DWDSRP, the following constraints were considered during development of the plan:

4.1. Waiawa Shaft pumps are capable of pumping 19 MGD with 2 pumps running at full speed. There are 4 pumps at Waiawa Shaft, 2 are operational, one is standby, and one is down for maintenance. Average daily demand at JBPHH since the incident has ranged from 11 to 14 MGD. Maximum potable water system flushing flows were limited to 5 MGD to avoid excessive drawdown of the S1/S2 tanks and stay within the capacity of Waiawa Shaft pumps.

4.2. The two 6 million gallon (each) tanks, S1 and S1 could not be drawn down below the 28-foot level. This constraint was imposed by the water system operators who wanted to avoid low water system pressures that would be caused by S1/S2 drawdown below 28-feet.

4.3. Discharge to the Navy's sanitary sewer system and the Fort Kamehameha Wastewater Treatment Plant (Ft. Kam WWTP) was limited to 1 MGD by wastewater operations staff. Much of the infrastructure Ft. Kam WWTP was considered to be in poor condition and some process elements do not have a backup unit. The direct discharge of too much potable water to the plant was also thought to pose the risk of "wash out" of the microbes that provide secondary treatment.

4.4. Discharges of potable water to land or storm sewers were required by HI Directive One to be treated prior to discharge. Treatment was provided through 1 MGD mobile granular activated carbon (GAC) units. The units had several constraints on their use including site access, adequate staging areas that were level with sufficient area for the units and support crews, impacts to the community, traffic control, and distance to discharge. Each GAC was kept in a single location for at least 24 hours due to labor and time required for unit setup and breakdown.

4.5. Water service was required be maintained to residents and JBPHH tenants. Many families have remained in their homes and mission essential Government activities require continuous water service.

4.6. JBPHH did not have an established unidirectional flushing plan developed prior to the incident. Unidirectional flushing typically involves inducing one-way flow through each pipe segment in a water distribution system by closing mainline isolation valves and opening hydrants for a short period of time. The number of hydrants required would be determined by the pipe size and the minimum water velocity required to flush sediments and other contaminants from the pipe segment. True unidirectional flushing of the system was determined not to be a feasible method for flushing the JBPHH potable water system for the following reasons:

4.6.1. Per section 1.2 of the DWDSRP, the distribution system was to be recovered with critical urgency. Additionally, SMEs advised that the longer contaminants remained in the system, the more likely it was that they would migrate into plastics, gaskets, sediments, etc. A unidirectional flushing program would take several months to develop and implement and the timeline was not considered feasible for a return to service.

4.6.2. Water system operators indicated that many mainline isolation valves would not properly close and could not be relied upon to isolate pipe segments.

4.7. Dr.Whelton recommended three volumetric turnovers for impacted pipe networks. Flushing zones with higher risk of contamination were identified and prioritized using water user complaint history, testing results, the hydraulic model, and the hydraulic proximity to Red Hill Shaft. A factor of safety was applied to the highest priority zones by specifying a minimum of five volumetric turnovers. Zones where the hydraulic modelling indicated that contamination may have travelled, were in close hydraulic proximity to Red Hill Shaft, and had few complaints were flushed with the recommended three volumetric turnovers. Low priority was given to zones where SCADA data indicated that water was fed solely from Waiawa Shaft before and after the incident. To reduce water waste, flush zones with lower risk of contamination were volumetrically turned over a minimum of once or twice.

5. Following Dr. Whelton's recommendation, the DWDSRP was designed with a directional flush of the distribution system starting from the clean water source and moving systematically through the entire system. The limited water source capacity at Waiawa Shaft and disposal constraints required that the system be broken down into smaller flush zones. 19 total zones were established that could be independently flushed without adverse hydraulic or water quality impacts to previously flushed zones. Section 2.4 of the DWDSRP depicts the network diagram and zone relationships.

6. FLUSH ZONE B1:

6.1. DESCRIPTION OF FLOW: This zone is fed by a single 36-inch transmission main that transfers water from Waiawa Shaft to the main JBPHH area. All other zones with the exception of Zone A1 are downstream of Zone B1. See Figure 1 for a schematic representation of the flows through Zone B1.

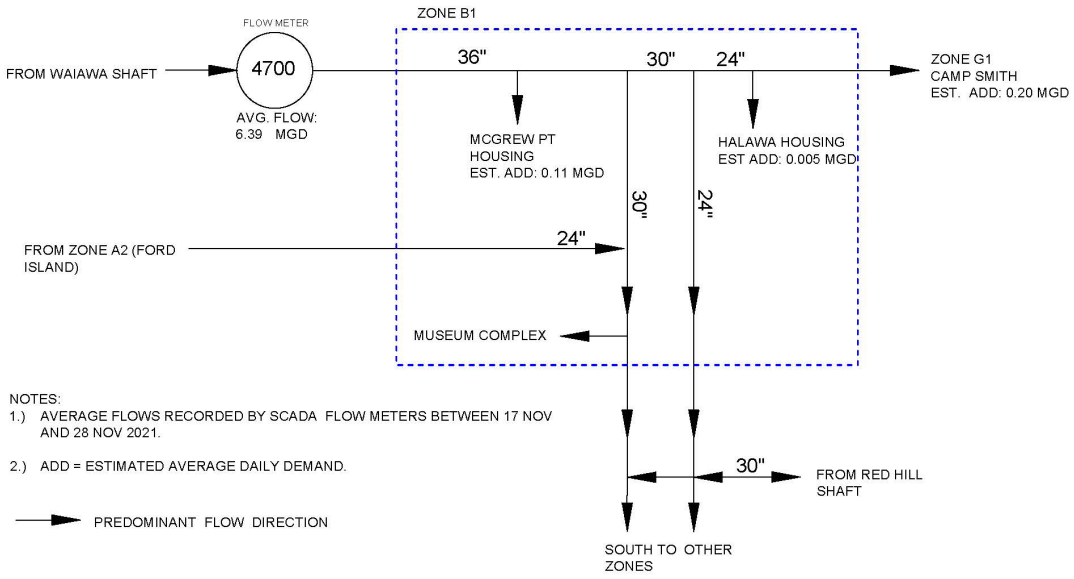


Figure 1: Zone B1 Flow Schematic

Flow to Zone B1 was recorded by Meter 7200 and for the 10-days of data prior to the 28 November 2021 incident, an average flow of 6.39 MGD was transferred from Waiawa Shaft through this zone. The data also indicates that flow in the 36-inch transmission main did not reverse.

The flow thorough Meter 7200 proves that Waiawa Shaft was the sole source of water to both McGrew Point and Halawa Housing. The museum complex is located south of the connection to Ford Island and it is unlikely that contaminated water entered this area. However, a combination of extreme water demand in Zone A2, source pumping conditions at Waiawa Shaft and Red Hill Shaft, and S1/S2 tank fill/draw status could theoretically cause flows to reverse in the B1 transmission mains from south to north. For this reason, the potential for contamination to enter the museum complex area cannot be ruled out with 100% certainty.

6.2. WATER USE/TENANTS: Water users in this zone include residential housing tenants at the small McGrew Point and Halawa Housing neighborhoods. Other water demands include the museum complex where the Pearl Harbor National Memorial and the Bowfin Museum are located.

6.3. PIPE VOLUME: Per section 2.5.1.1. of the DWDSRP, Flush Zone B1 has a mainline pipe volume of 90 thousand gallons (KGal) and a minimum turnover volume of 180 KGal. With the exception of the main transmission pipelines, mainline pipes in the zone are 4 to 8-inches in diameter. Transmission main pipes upstream of this zone were not included in the pipe volume since they are fed directly from Waiawa Shaft and were considered “clean”.

6.4. PRIORITY: Zone B1 was included in Phase #3 with two volumetric turnovers minimum. The likelihood of contamination entering this zone is very low because it is fed solely from Waiawa Shaft.

6.5. HYDRANT SELECTION: This zone is made up of 3 distinct sub-zones; McGrew Point, Halawa Housing, and the Museum Complex.

6.5.1. The flushing hydrants 3, 4, and PM-6 were selected to be near the hydraulic extremities of the pipe network so that "clean" water from Waiawa Shaft would be pulled from the transmission main connection through the pipe networks prior to discharge from the system.

6.5.2. Flushing hydrant 5 was located on a line directly off of the 30-inch transmission main and was selected as a conservative measure to induce additional flow in the 24-inch transmission main flowing to Ford Island (Zone A2).

6.5.3. Flushing Hydrant PM-2 was selected to induce additional flow in the 30-inch transmission main and the water line serving the Pearl Harbor National Memorial, a facility with high visitor activity.

6.6. DEAD-END LINES: It is possible that flushing was not induced in some small neighborhood loops. To address this concern, additional distribution water line samples were taken in locations selected in a joint effort by the Navy, DoH, and EPA. These samples are representative of other dead-end lines within the zone.

6.7. FLUSHING ACTUALS: Water was simultaneously discharged through:

2	Shift		Flush Time			Documentation	
Date	Begin	End	Start	Stop	RunTime	Email Summary	UT Log
7-Jan	8:00	20:00	16:44	18:47	2:03	20220107 0800-2000	Y

TOTAL RUN @ FLOW of 100	
TIME	2:03
VOLUME	12300 Gallons

5	Shift		Flush Time			Documentation	
Date	Begin	End	Start	Stop	RunTime	Email Summary	UT Log
7-Jan	8:00	20:00	16:17		3:43	20220107 0800-2000	Y
7-Jan	20:00	8:00		22:35	2:35	20220107 2000-0800	Y

TOTAL RUN @ FLOW of 100	
TIME	6:18
VOLUME	37800 Gallons

3	Shift		Flush Time			Documentation	
Date	Begin	End	Start	Stop	RunTime	Email Summary	UT Log
6-Jan	8:00	20:00	18:30		1:30	20220106 0800-2000	Y
6-Jan	20:00	8:00			12:00	20220106 2000-0800	N/A
7-Jan	8:00	20:00		11:09	3:09	20220107 0800-2000	Y

TOTAL RUN @ FLOW of 100	
TIME	16:39
VOLUME	99900 Gallons

8	Shift		Flush Time			Documentation	
Date	Begin	End	Start	Stop	RunTime	Email Summary	UT Log
7-Jan	8:00	20:00	15:30		4:30	20220107 0800-2000	Y
7-Jan	20:00	8:00		22:55	2:55	20220107 2000-0800	Y

TOTAL RUN @ FLOW of 100	
TIME	7:25
VOLUME	44500 Gallons

4	Shift		Flush Time			Documentation	
Date	Begin	End	Start	Stop	RunTime	Email Summary	UT Log
6-Jan	8:00	20:00	12:38		7:22	20220106 0800-2000	Y
6-Jan	20:00	8:00			12:00	20220106 2000-0800	N/A
7-Jan	8:00	20:00		11:32	3:32	20220107 0800-2000	Y

TOTAL RUN @ FLOW of 100	
TIME	22:54
VOLUME	137400 Gallons

Hydrant	Volume
2	12300
3	99900
4	137400
5	37800
8	44500
TOTAL	331900

6.7.1. The total volume flushed through the system was 332 KGal for 3.7 volumetric turnovers.

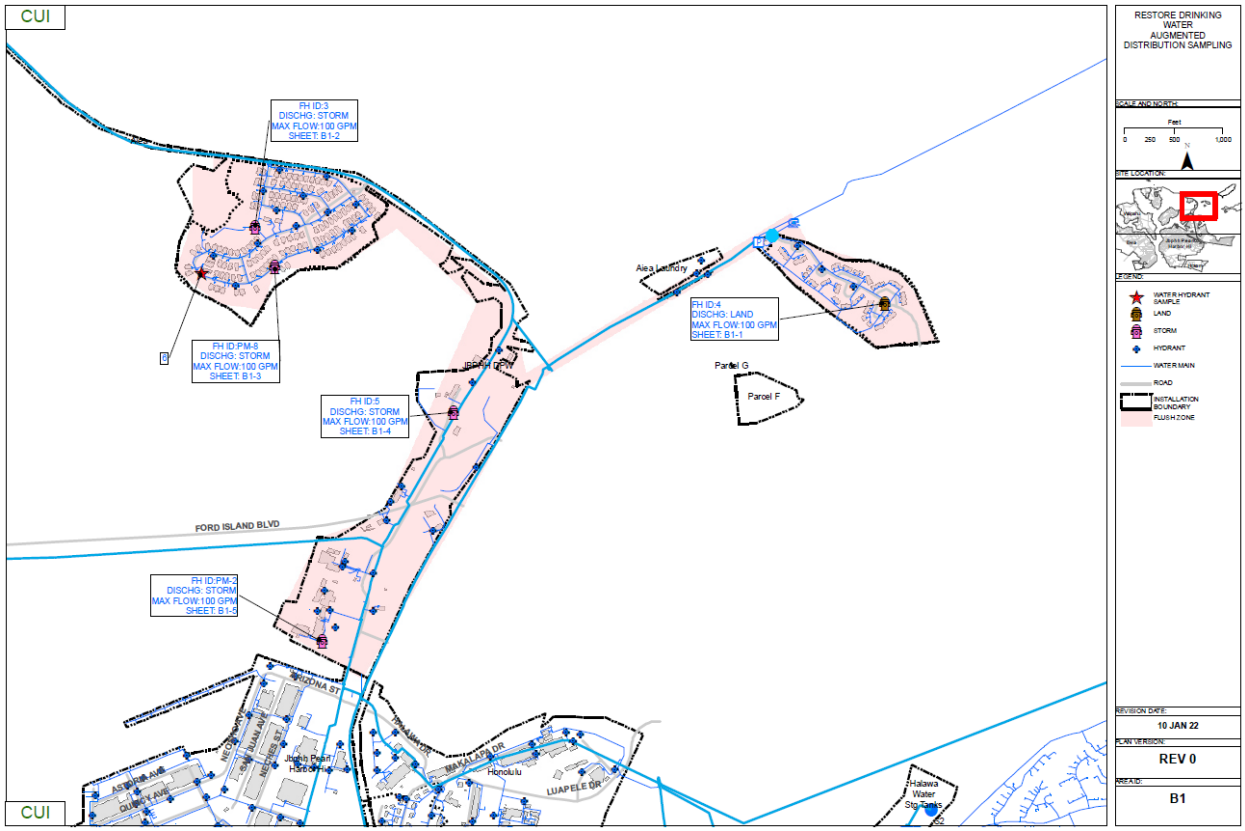


Figure 1: Flush Zone B1

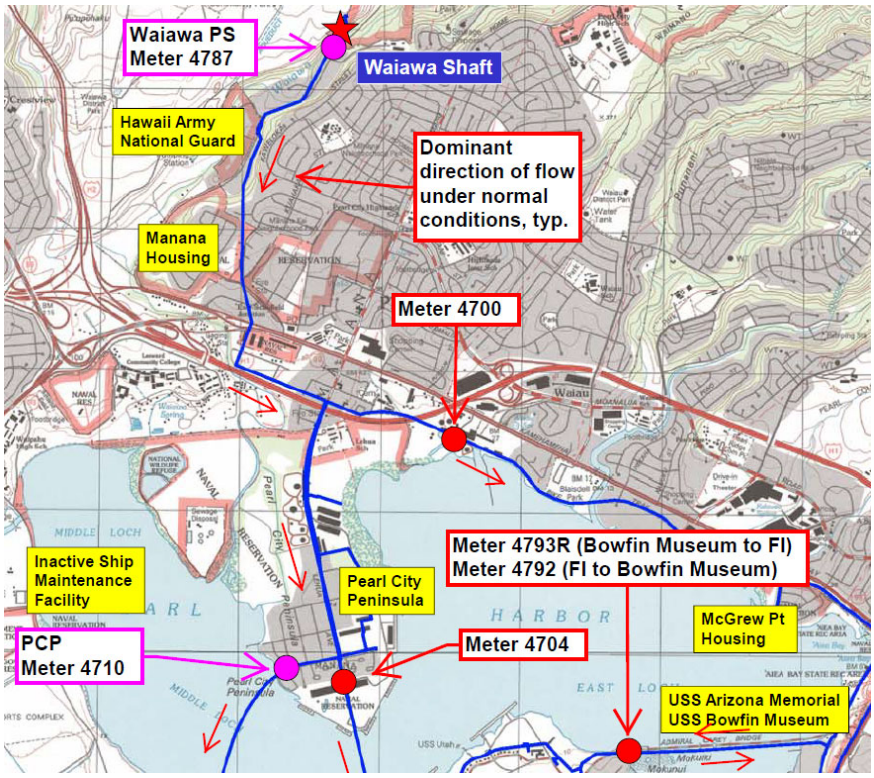


Figure 2: SCADA Meter Locations

6.8. SCADA Data: Daily average flow data collected between 18 November 2021 and 09 January 2022 is shown in Figure 3 below. Instantaneous (1 minute) flow data at meters 4700, 4710 and 4704 was also reviewed to ensure that the direction of flow did not reverse.:

6.8.1. Meter 4787 (Figure 1) at Waiawa Shaft shows an average flow of 15.53 MGD.

6.8.2. An average of 6.60 MGD continued through Meter 4700 towards McGrew Point. Flow did not reverse on this meter during this time period.

6.8.3. The majority of the remaining volume, approximately 8.9 MGD flowed through Zone A1.

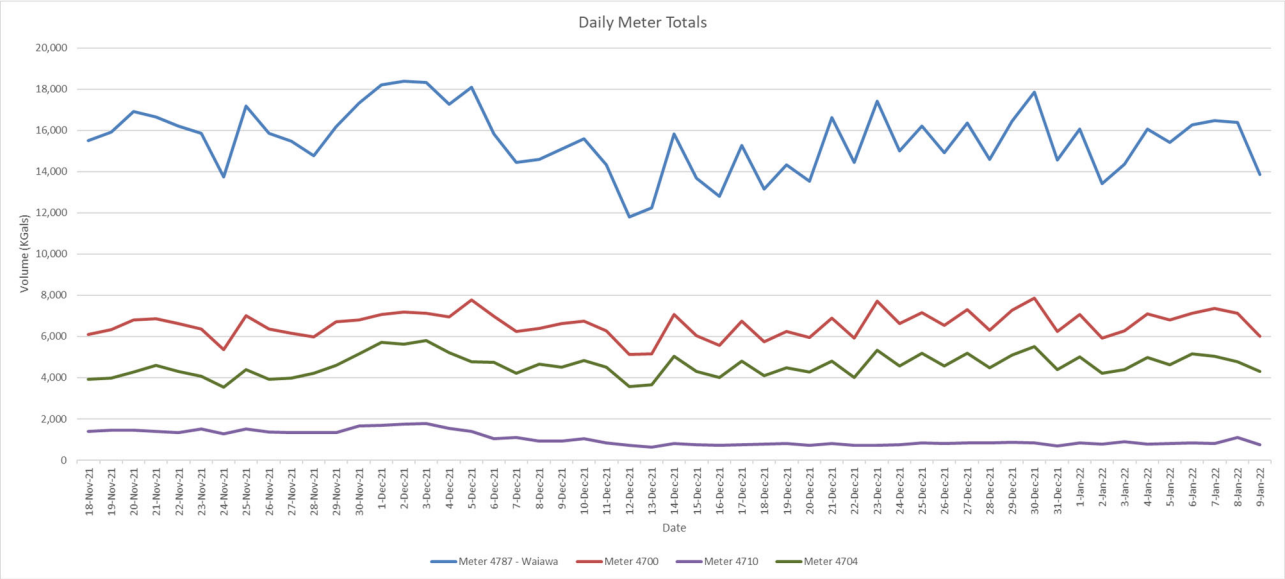


Figure 3: SCADA Daily Meter Totals 18Nov21 – 09Jan22

C. C. CHASE

February 15, 2022

From: Naval Facilities Engineering Systems Command Representative, IDWS Team
To: Interagency Drinking Water System Team

SUBJ: VALIDITY AND APPLICATION OF VOLUMETRIC EXCHANGE METHOD

Ref: (a) Drinking Water Distribution System Recovery Plan, December 2021

Encl: (1) Dr. Whelton email documenting volumetric exchange method dtd 08 JAN 22

1. This letter documents the basis of the volumetric exchange method used in the development of reference (a). The basis of the flushing method was based on two key recommendations from Dr. Whelton, who served as the Navy's consultant in the early stages of the incident. Enclosure (1) documents key recommendations from Dr. Whelton which included flushing from a clean source, systematically moving through the entire system, and flushing at least three times the pipe volume. Rules of three is what Dr. Whelton generally recommends.

2. Reference (a) incorporated the recommendations from Dr. Whelton by creating a flushing sequence that began with clean water from the Waiawa shaft and flushing systematically through the entire system. The volumetric exchanges for each zone and zone flushing sequence plan was developed by Navy engineers. This is outlined in table 2.4, Distribution System Recovery Plan Diagram, and section 2.5, Flushing Plan Phasing, of reference (a). A safety factor was applied to the rule of three to obtain five volumetric turnovers for the phase 1 zone areas. Phase 2 zone areas had three volumetric turnovers. Phase 3 zone area had two volumetric turnovers and phase 4 zone areas had one volumetric turnover. The phase 3 and phase 4 zone volumetric turnover determinations were made after considering the up-gradient zone flushing volumes and the non-potable use of water in the zones.

3. I certify under penalty of law that I have personally examined and I am familiar with the information submitted and the submitted information is true, accurate, and complete.

MENO.MICHAEL.WAYNE.JR.1088310035
Digitally signed by MENO.MICHAEL.WAYNE.JR.1088310035
Date: 2022.02.15 07:17:55 -10'00'

M. W. Meno
Captain, U.S. Navy Civil Engineer Corps

Phone numbers have been redacted

From: Whelton, Andrew J <awhelton@purdue.edu>
Sent: Saturday, January 8, 2022 4:58 AM
To: Lee, Andre K (NAVFAC HI BD) CIV USN NAVFAC HAWAII PEARL (USA) <andre.k.lee4.civ@us.navy.mil>
Cc: Isaacson, Kristofer P <isaacsok@purdue.edu>; Proctor, Caitlin Rose <proctoc@purdue.edu>
Subject: [URL Verdict: Neutral][Non-DoD Source] RE: Cross Connection Control Plan and Flushing Plan documentation requirements for DoH

LCDR Daly,

I am free to talk later this afternoon today if you want. I'm Mountain Standard Time.
Below is some information.

Andy
[redacted]

FEEDBACK

1. You applied unidirectional flushing and if you opened hydrants fully you likely maximized velocity in the pipes you were flushing. The issue they seem to be getting at is scouring velocity which you identify. This is used for removing sediment (typical cleaning of water pipes) as you know. There is no SOP for water contamination response and recovery, so you applied standard water distribution system maintenance practice of unidirectional flushing. This is good. The state I think invoked water main disinfection standard which, to my knowledge isn't applicable here unless you conducted shock disinfection.
    a. For perspective, per a Water Research Foundation study: Microbial Control Strategies for Main Breaks and Depressurization, Project 4307. Published 2014. Denver, Colorado.
        1. Scouring velocity helps removed sediment from water mains/pipes. To achieve 2.5 to 3 log removal of sand particles for 4-to-16-inch diameter PVC pipes, 3 ft/s is needed.
        2. In that report, to achieve this removal for a 6-inch diameter PVC pipe, Q was 308 GPM
        3. In that report, to achieve this removal for 4-inch diameter PVC pipe, Q was 137 GPM
    b. We recommended starting flushing from the clean water source and moving systematically through the entire system in a unidirectional way. If you all did this, be sure to explain that. That helps minimize the change residual "old" water gets untouched, or is left in the system.
    c. You could calculate scouring velocities in each of the areas. If any are lower than desired you can go back and just keep repeat flushing giving an added level of safely.
    d. The state's interest in scouring velocity may be of concern that (JP-5?) free product adsorbed to sediment/scales and they want to be certain it got scoured out. If it didn't, it could dissolve it's constituents into water over time.
    e. Dead-ends are really important. You need to specifically address how you will get that water out. In West Virginia, many weeks after the spill and utility had flushed out the black-licorice smelling contaminated water out someone in a distal part of the system complained about odor. To my recollection the utility thought it was psychological, but it turned out there was a dead-end they didn't flush. Somehow that contaminated water got drawn into a nearby home and someone was exposed.

f. Question: How long was each hydrant open typically?
g. I think we mentioned flushing 3 times the pipe volume. Rules of three is what I often recommend. Flushing velocity is certainly important. I vaguely remember NAVFAC had contracted a consultant to create the flushing plan.

2. JP-5 isn't a single contaminant which we've talked about before. It's a mixture of 100s-1000s of individual chemicals. Even if JP-5 itself is hydrophobic and primarily found in emulsions or floating on the surface, some of these constituents will still diffuse into the water itself. The question they are likely after is how do you know you removed all parts of JP-5 that may have gotten entrained in the water system? This goes back to what chemicals are you testing for in the water distribution system. JP-5 constituents have different water solubility and octanol-water partitioning coefficients (Log Kow = How much they like to be in biofilm and plastics, not water). Additionally, the different materials (Metal vs PVC vs HDPE vs. gaskets) may be more prone to soaking up some JP-5 contaminants and not others depending on their characteristics. For example, PVC has been shown to be less susceptible to soaking up some crude oil-based contaminants than HDPE pipes (Huang et al. study with Whelton). Ultimately, the fate of the chemicals in the drinking water system will not be the same for all JP-5 constituents. Remember the drawing I drew on the whiteboard when meeting with CDR Chase, NAVFAC, COE, and Army? It showed different constituents may be in different parts of the water system. That's what DOH is likely after. Question to you: What wide screen testing have you done in the water distribution system since December 22? This can help you hunt down that the contaminants are present or gone.

3. Escalation should be based on how much flushing you are okay with trying. If you want to remove and replace infrastructure (that has sometimes happened after other contamination events on the mainland and overseas), it's a viable but laborious option. As an extreme example, following the Camp Fire it was estimated it would take over a year of continuous flushing to return some contaminanted pipes to safe use, so for some conditions they removed and replaced pipes. However, this flushing timeline will vary significantly depending on the water distribution systems and water testing results – AND chemicals or individual JP-5 constituents present. If I knew what the chemicals were still being found and what was done to try to get rid of them, I could give a more informed opinion. Food grade surfactants were used in Israel after a drinking water contamination incident…BUT using surfactants is not trivial and can cause all sorts of damage to water system components and leave residual. This probably isn't an email, but more discussion. Happy to talk. If you decide you want to go this way we should be more engaged technically in what this means. It's not likely an email response/effort, but more involved.

4. Here's a paper where we reviewed petroleum (and other material) drinking water distribution and plumbing contamination incidents and flushing Decontaminating chemically contaminated residential premise plumbing systems by flushing - Environmental Science: Water Research & Technology (RSC Publishing) DOI:10.1039/C5EW00118H. Unfortunately, when we went to

review the underlying evidence of each incident, often the utility and state didn't document much. Even incidents overseas had little documentation. It seems groups simply tried something, it did or didn't work, and they moved on. They also didn't sample much and rarely it an entire water distribution system that was affected.

Again, I can get on a zoom call or phone this afternoon MST to connect. I was called into the Colorado wildfires to help the communities identify and design water sampling and recovery plans. We're getting data every day and meeting with state and federal agencies. This is the Marshall Fire and Middle Fork Fire. I apologize for the delayed response.

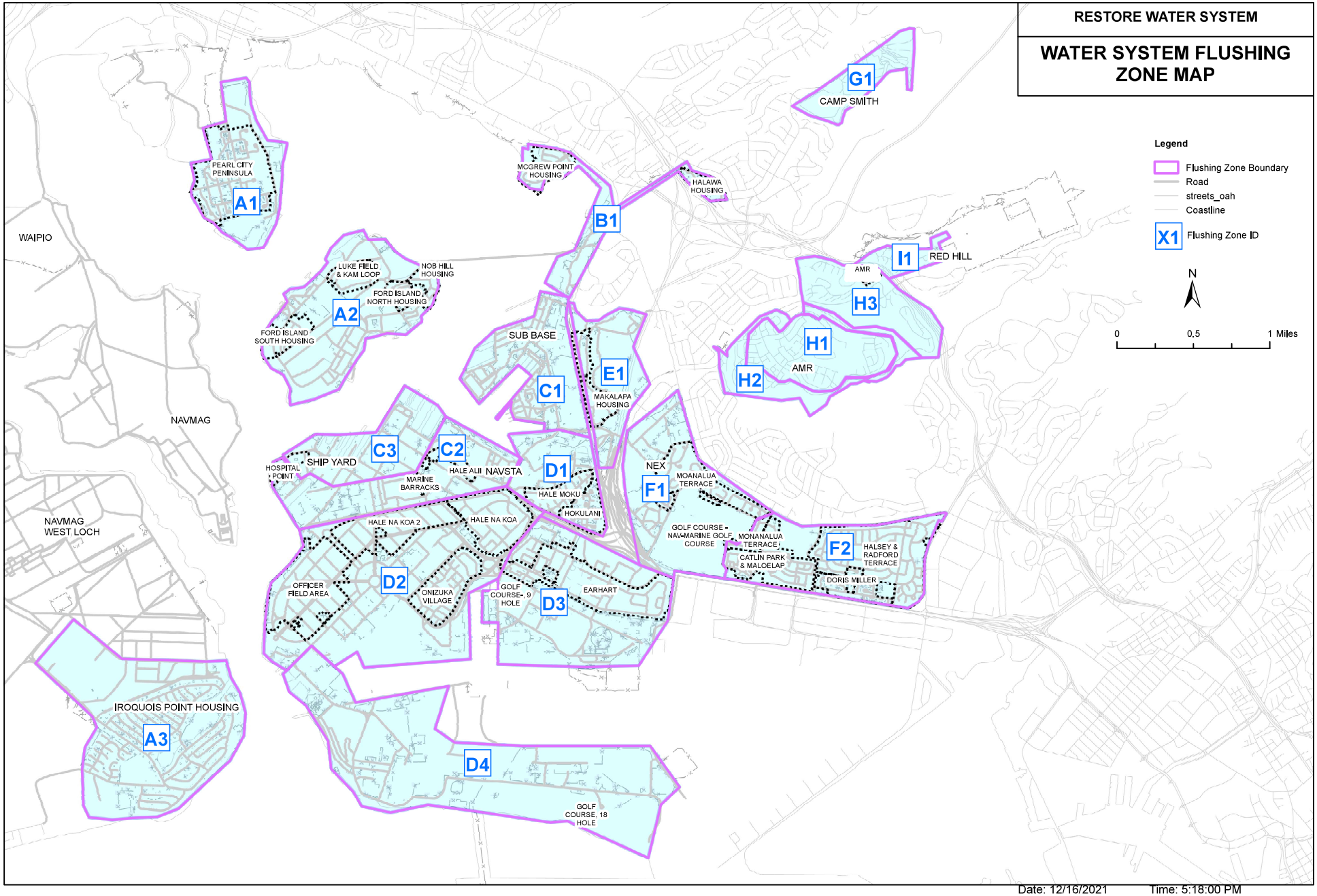
Andy

Cell/text: [redacted]

**Link to Dr.Whelton's Paper: https://pubs.rsc.org/en/content/articlelanding/2015/ew/c5ew00118h

RESTORE WATER SYSTEM

WATER SYSTEM FLUSHING ZONE MAP



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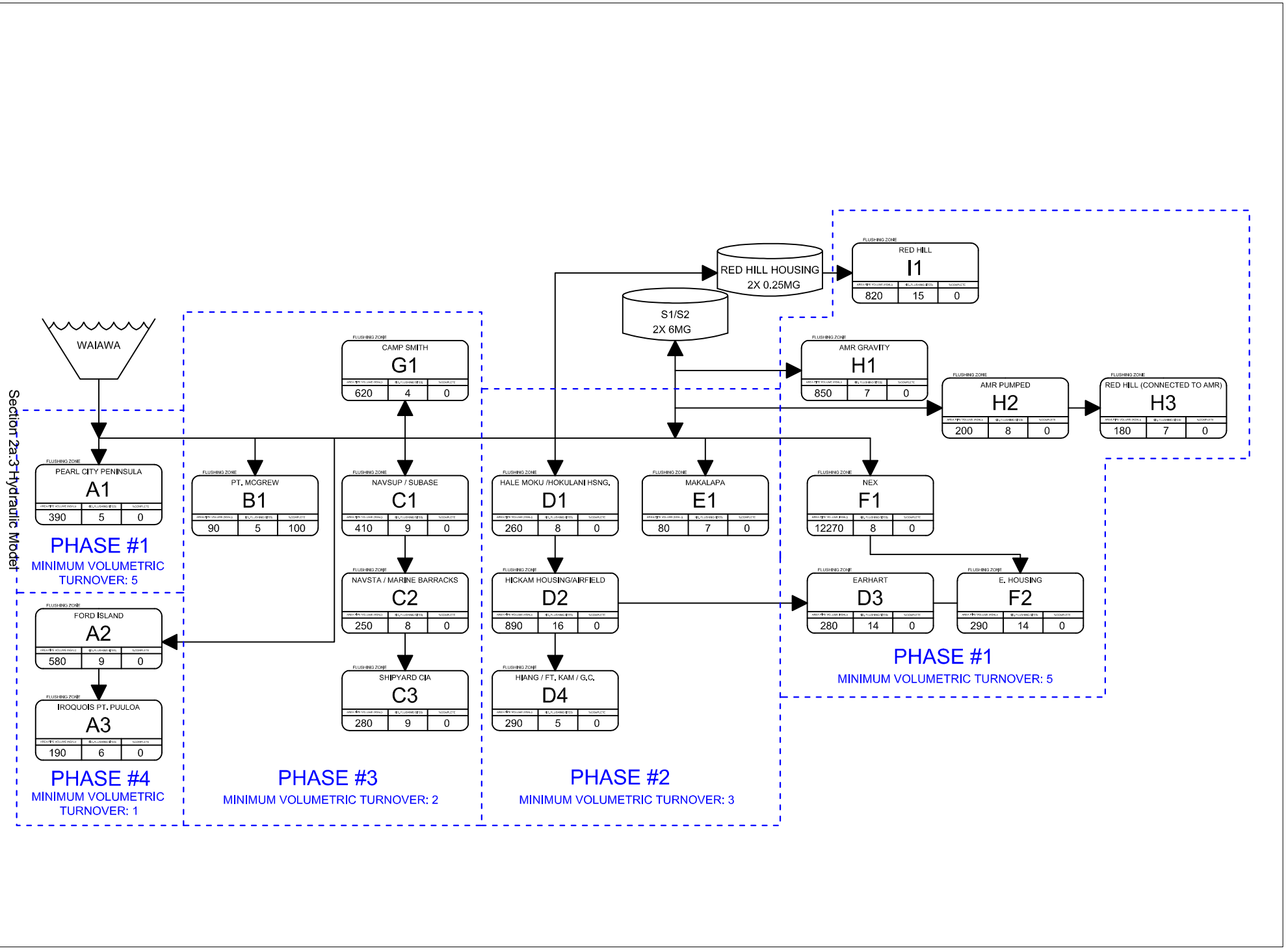
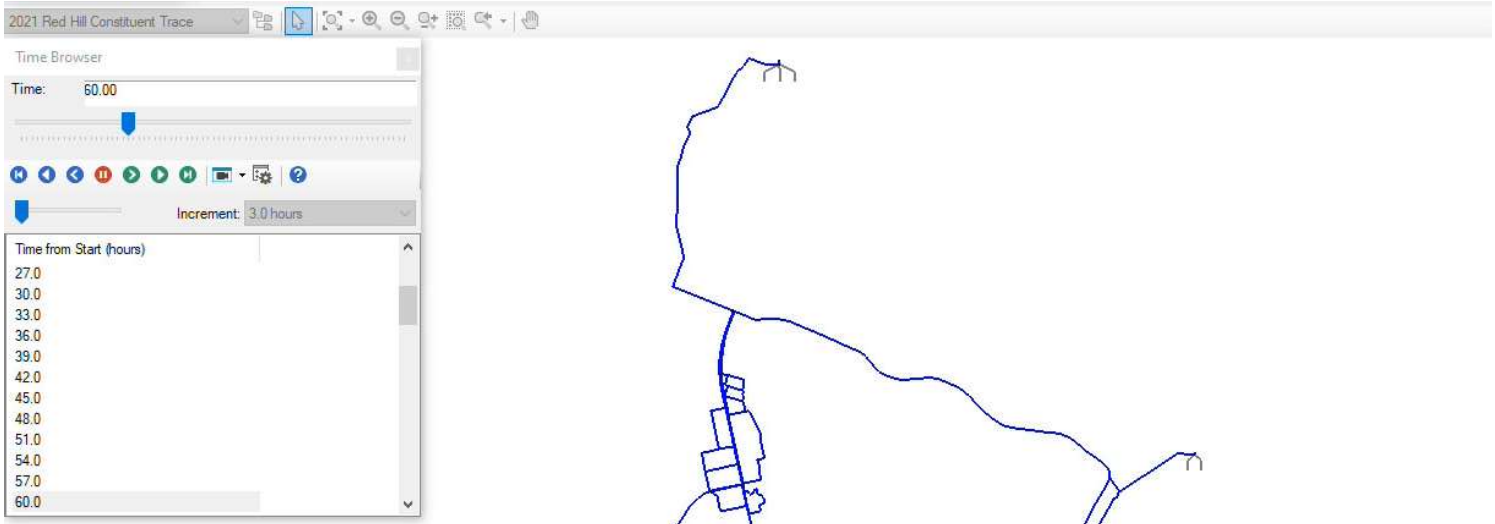

Section 2a:3-Hydraulic Model
WAIAWA
RED HILL HOUSING
2X 0.25MG
S1/S2
2X 6MG
FLUSHING ZONE
RED HILL
I1
820
15
0
FLUSHING ZONE
CAMP SMITH
G1
620
4
0
FLUSHING ZONE
AMR GRAVITY
H1
850
7
0
FLUSHING ZONE
AMR PUMPED
H2
200
8
0
FLUSHING ZONE
RED HILL (CONNECTED TO AMR)
H3
180
7
0
FLUSHING ZONE
PEARL CITY PENINSULA
A1
390
5
0
FLUSHING ZONE
PT. MCGREW
B1
90
5
100
FLUSHING ZONE
NAVSUP / SUBASE
C1
410
9
0
FLUSHING ZONE
HALE MOKU /HOKULANI HSNG.
D1
260
8
0
FLUSHING ZONE
MAKALAPA
E1
80
7
0
FLUSHING ZONE
NEX
F1
12270
8
0
PHASE #1
MINIMUM VOLUMETRIC TURNOVER: 5
FLUSHING ZONE
NAVSTA / MARINE BARRACKS
C2
250
8
0
FLUSHING ZONE
HICKAM HOUSING/AIRFIELD
D2
890
16
0
FLUSHING ZONE
EARHART
D3
280
14
0
FLUSHING ZONE
E. HOUSING
F2
290
14
0
PHASE #1
MINIMUM VOLUMETRIC TURNOVER: 5
FLUSHING ZONE
FORD ISLAND
A2
580
9
0
FLUSHING ZONE
SHIPYARD CIA
C3
280
9
0
FLUSHING ZONE
HIANG / FT. KAM / G.C.
D4
290
5
0
FLUSHING ZONE
IROQUOIS PT. PUULOA
A3
190
6
0
PHASE #4
MINIMUM VOLUMETRIC TURNOVER: 1
PHASE #3
MINIMUM VOLUMETRIC TURNOVER: 2
PHASE #2
MINIMUM VOLUMETRIC TURNOVER: 3

JBPHH Hydraulic Model

Interagency Drinking Water Supply Team

18 January 2022

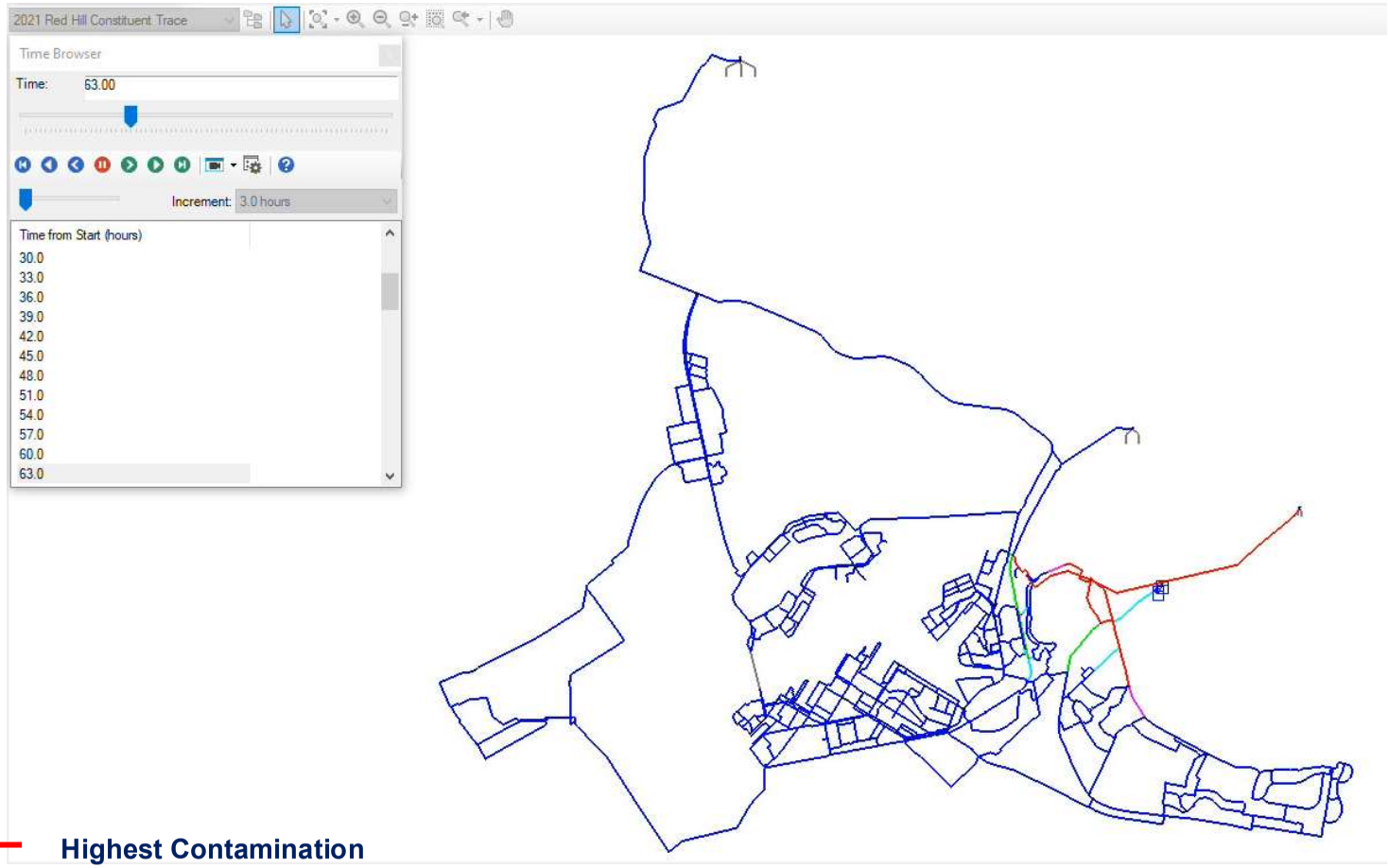
JBPHH Hydraulic Model



Highest Contamination

Lowest Contamination

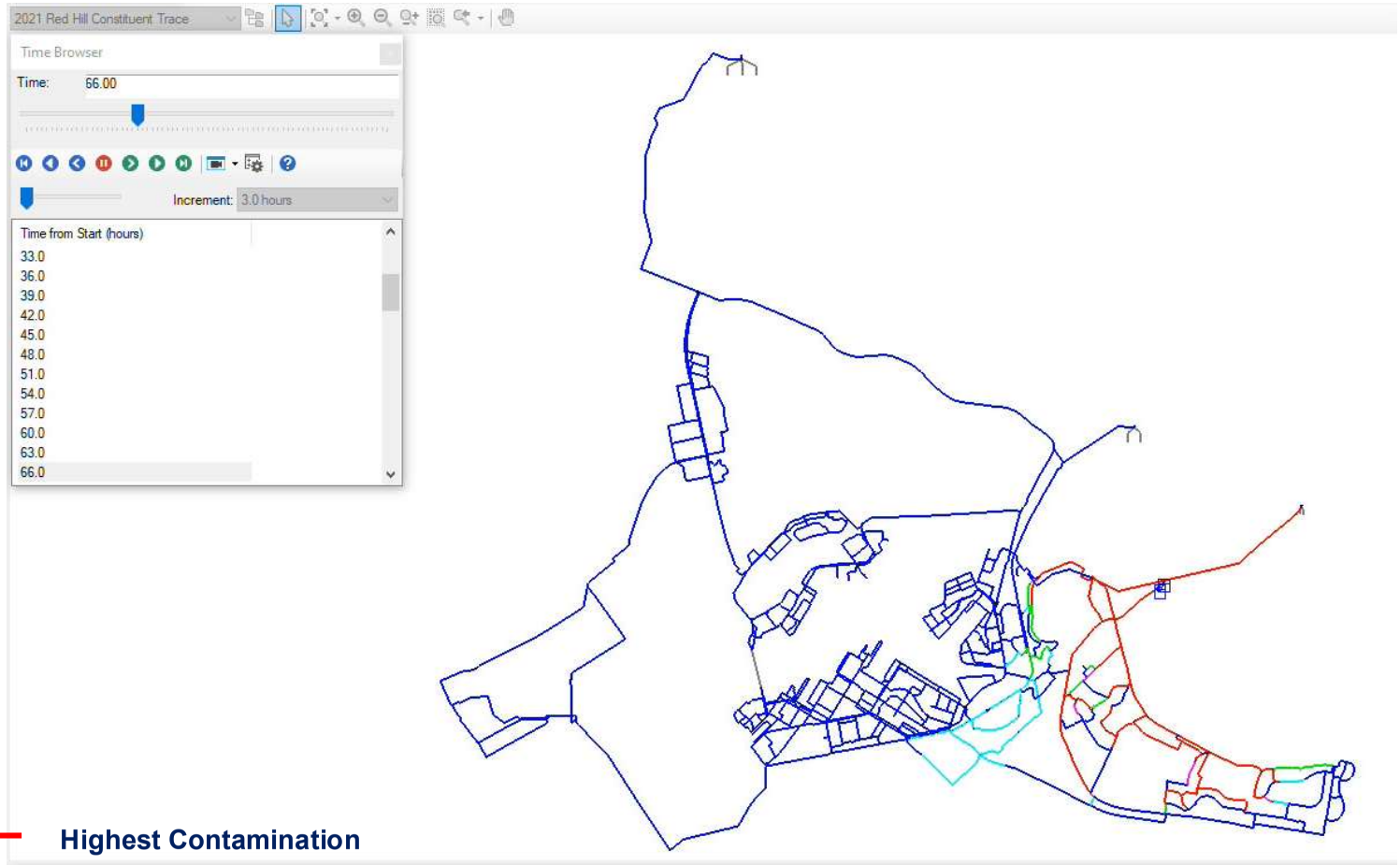
JBPHH Hydraulic Model



Highest Contamination

Lowest Contamination

JBPHH Hydraulic Model



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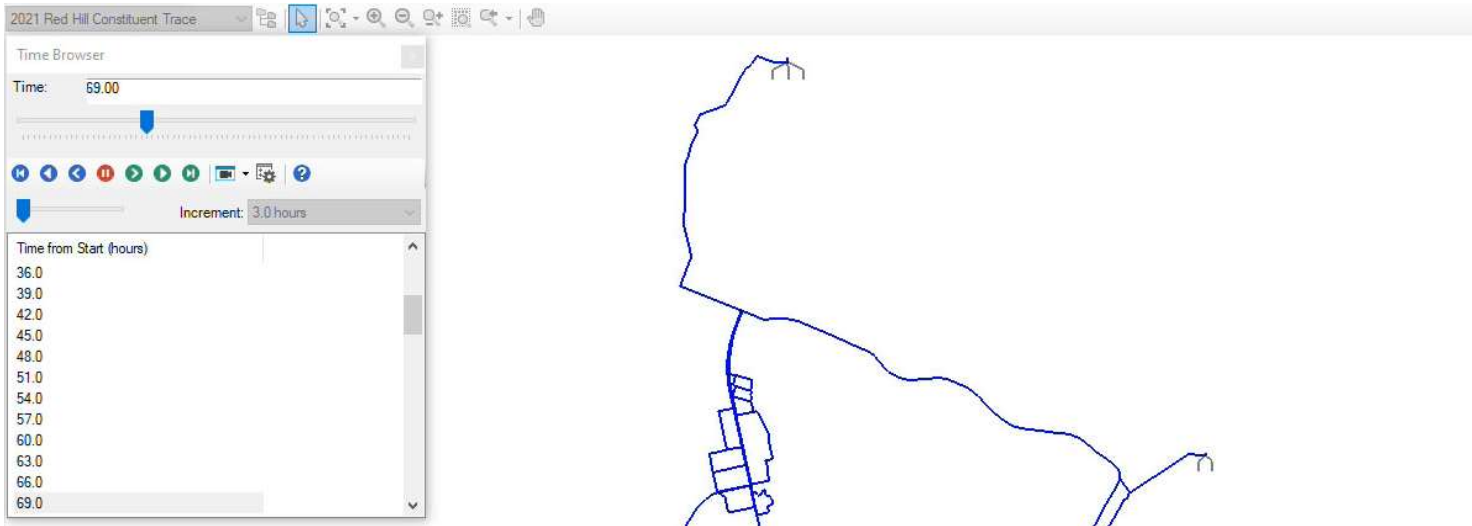

Highest Contamination

Lowest Contamination

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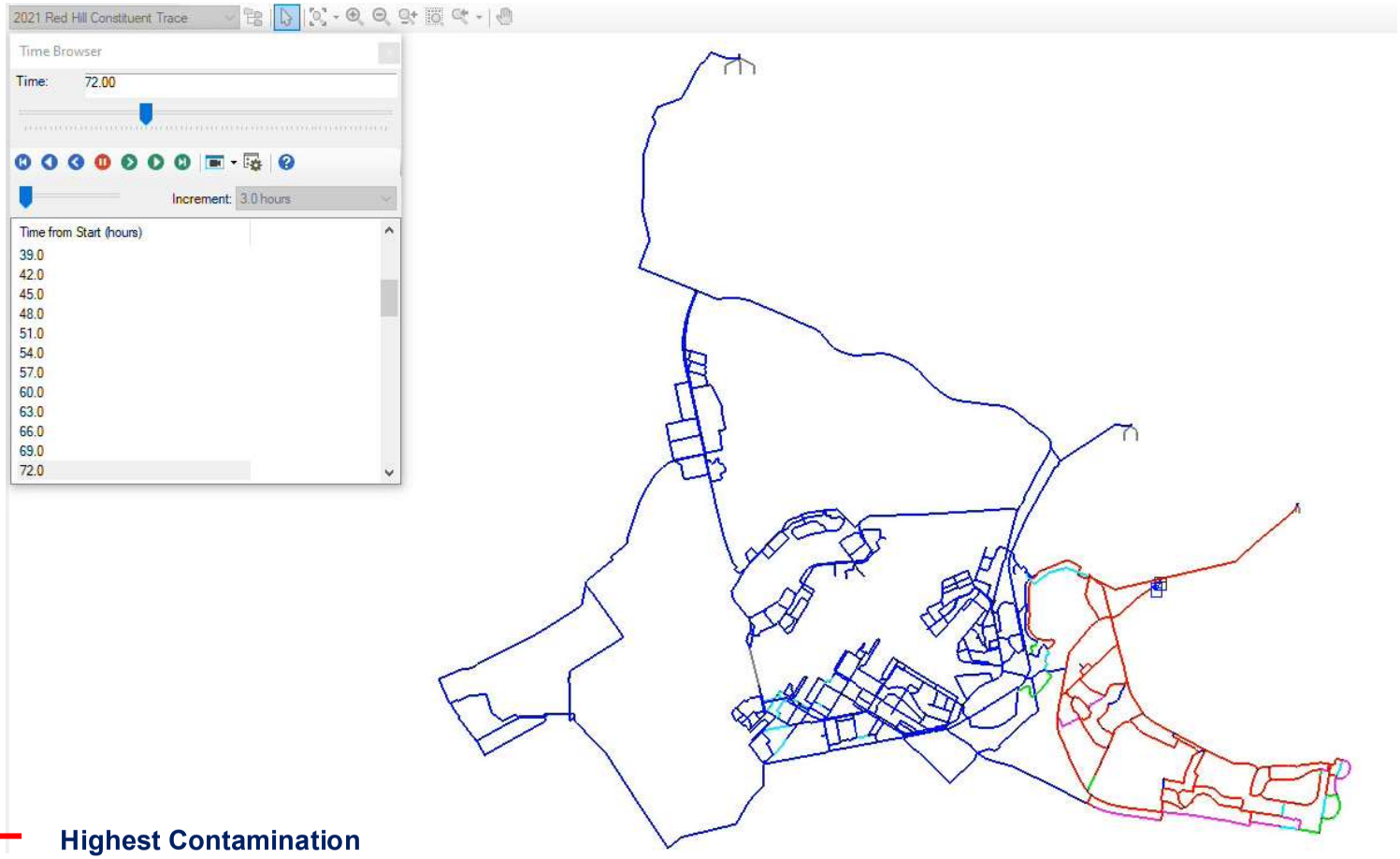

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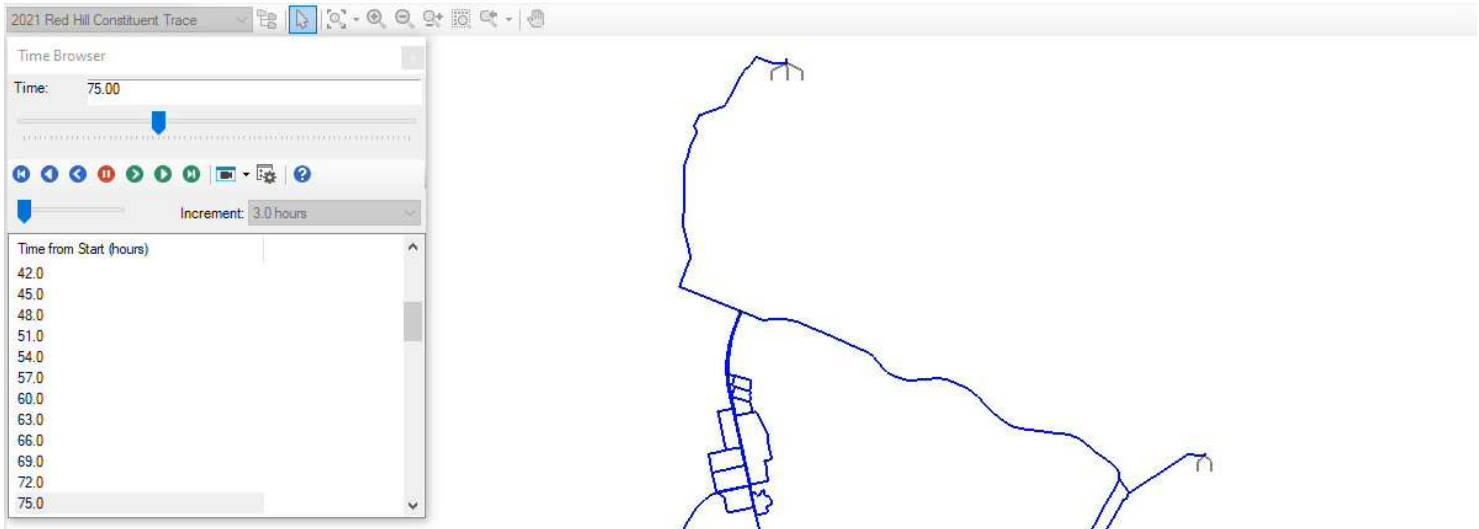

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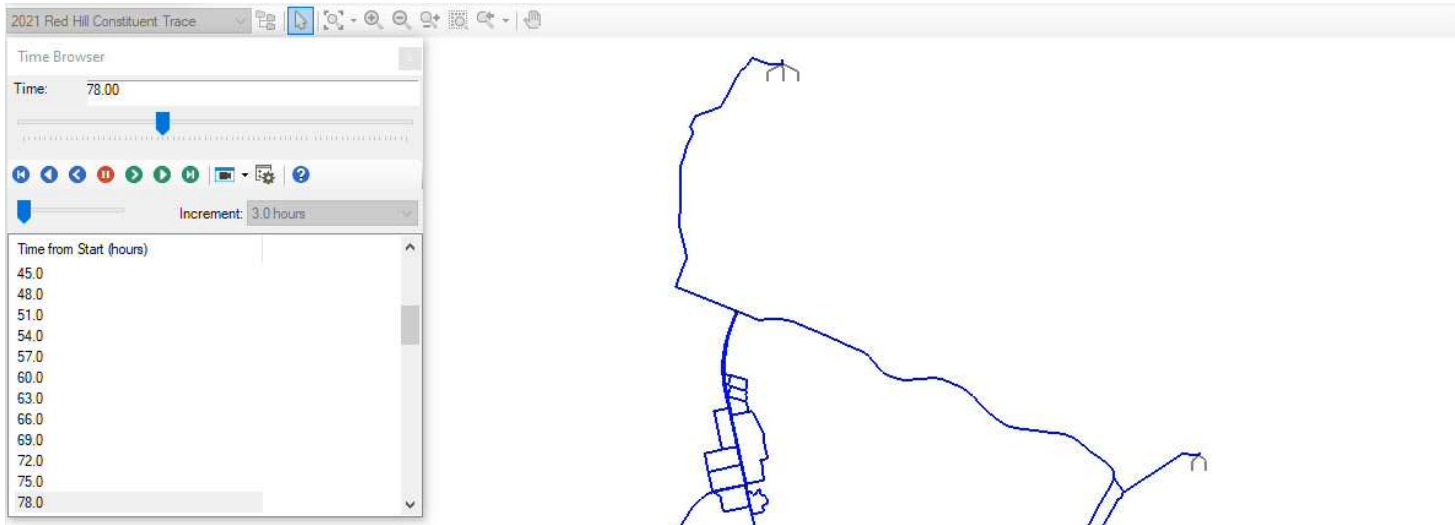

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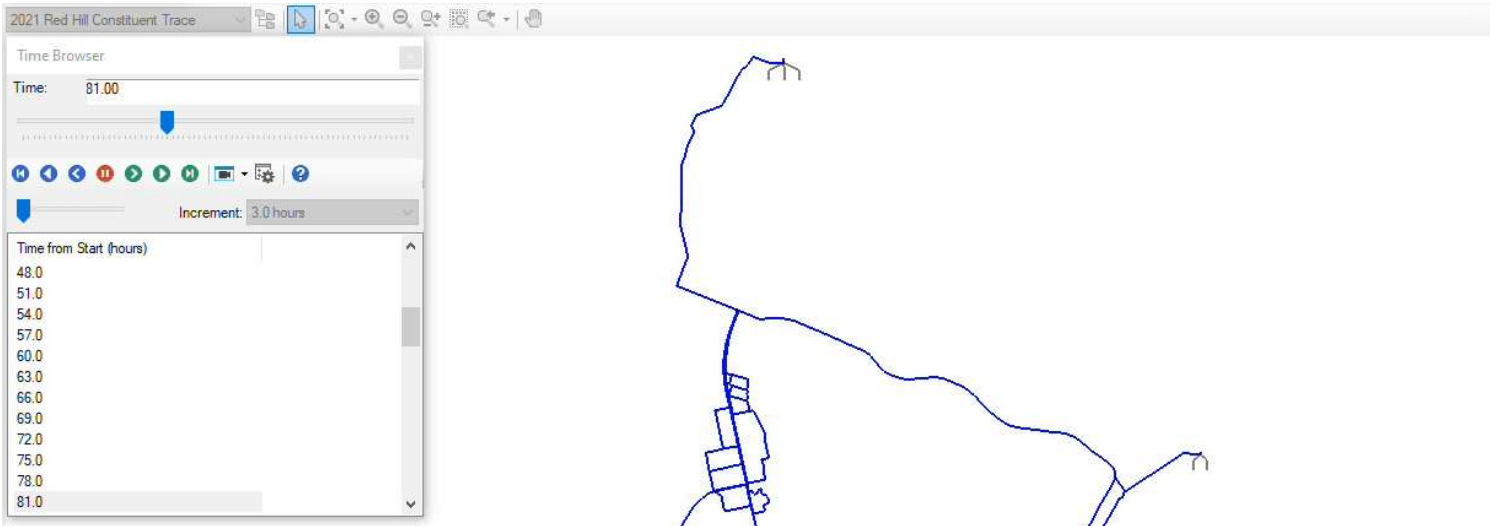

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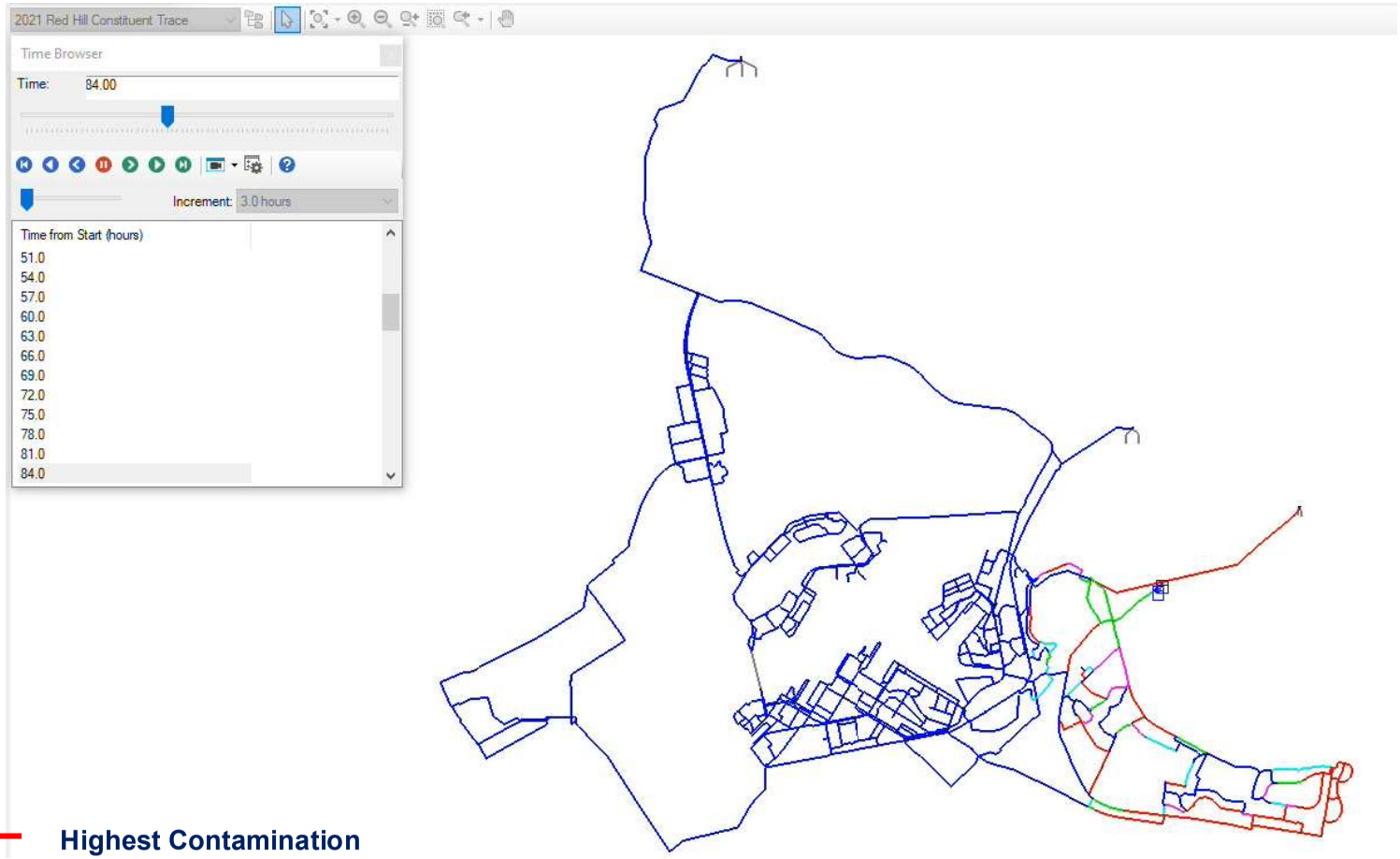

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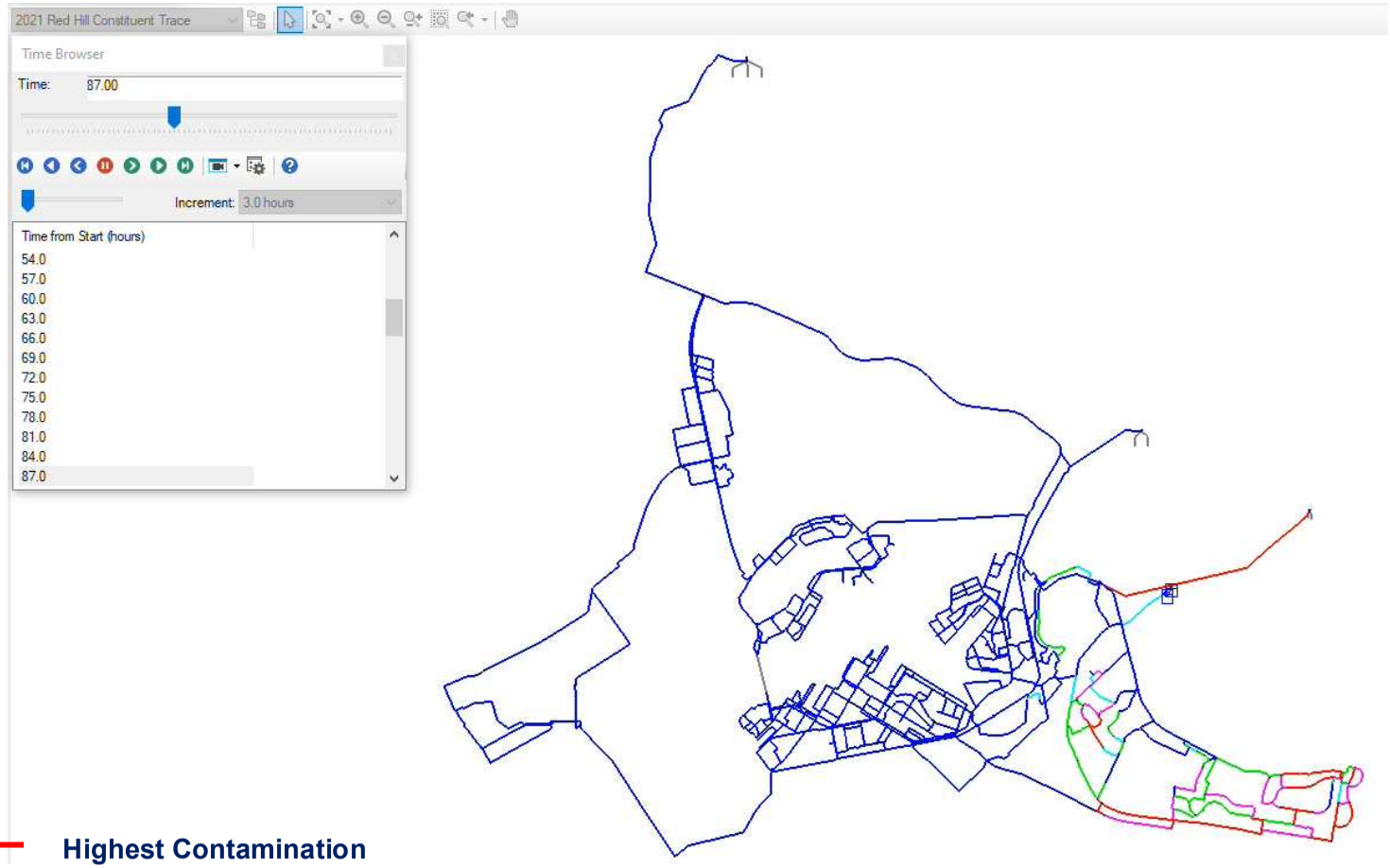

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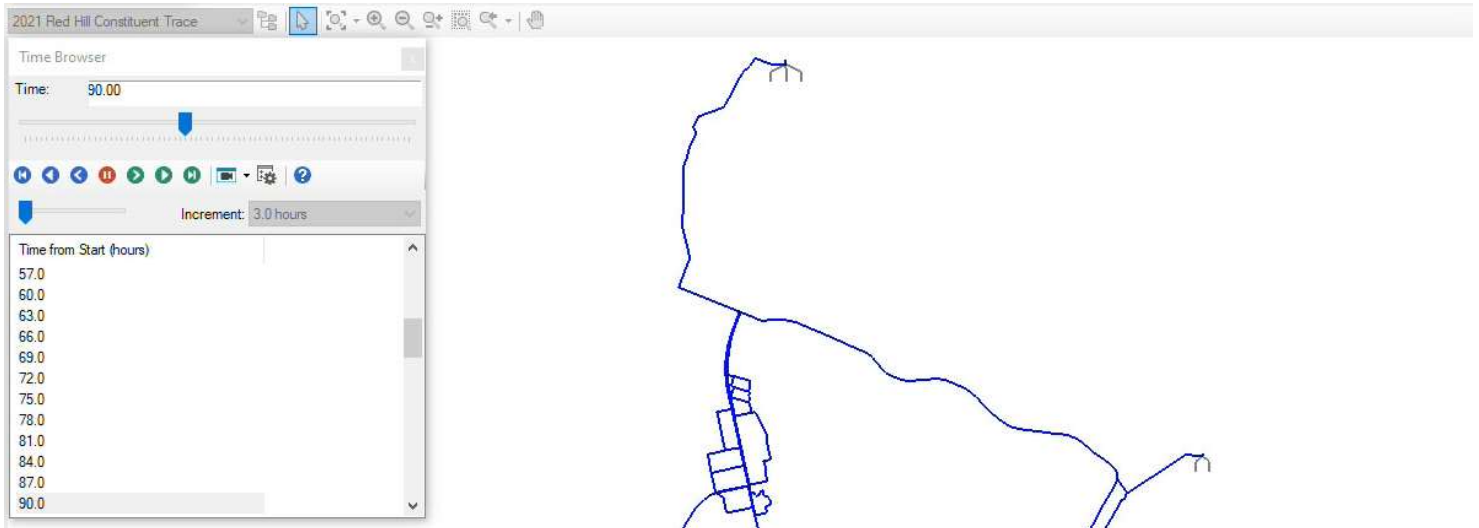

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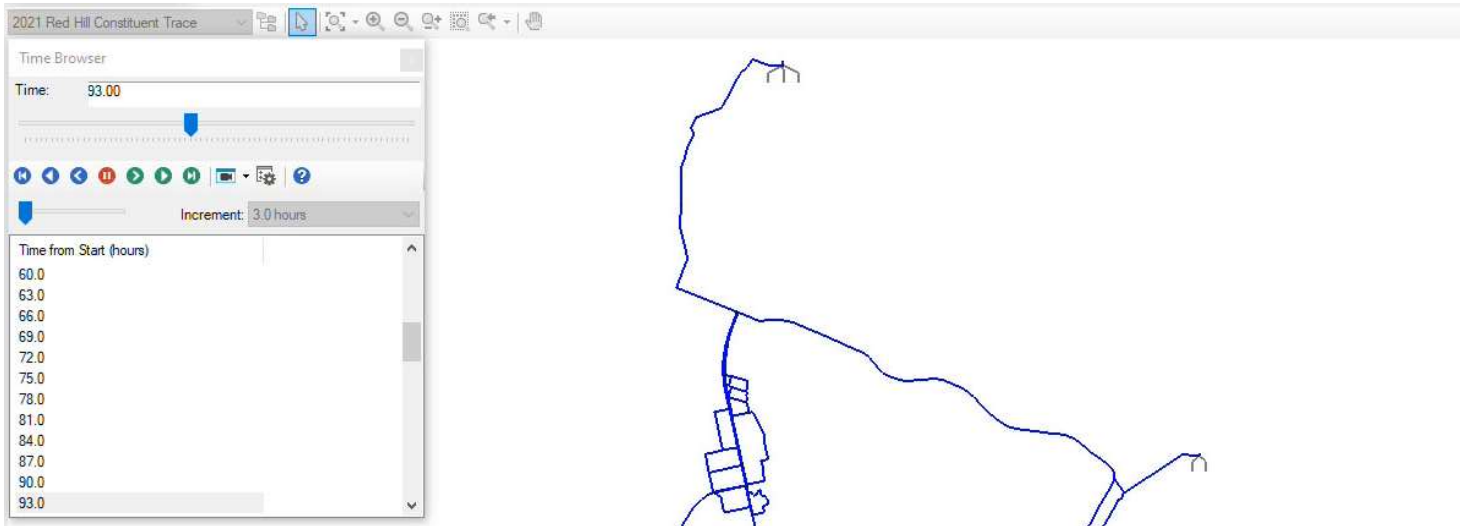

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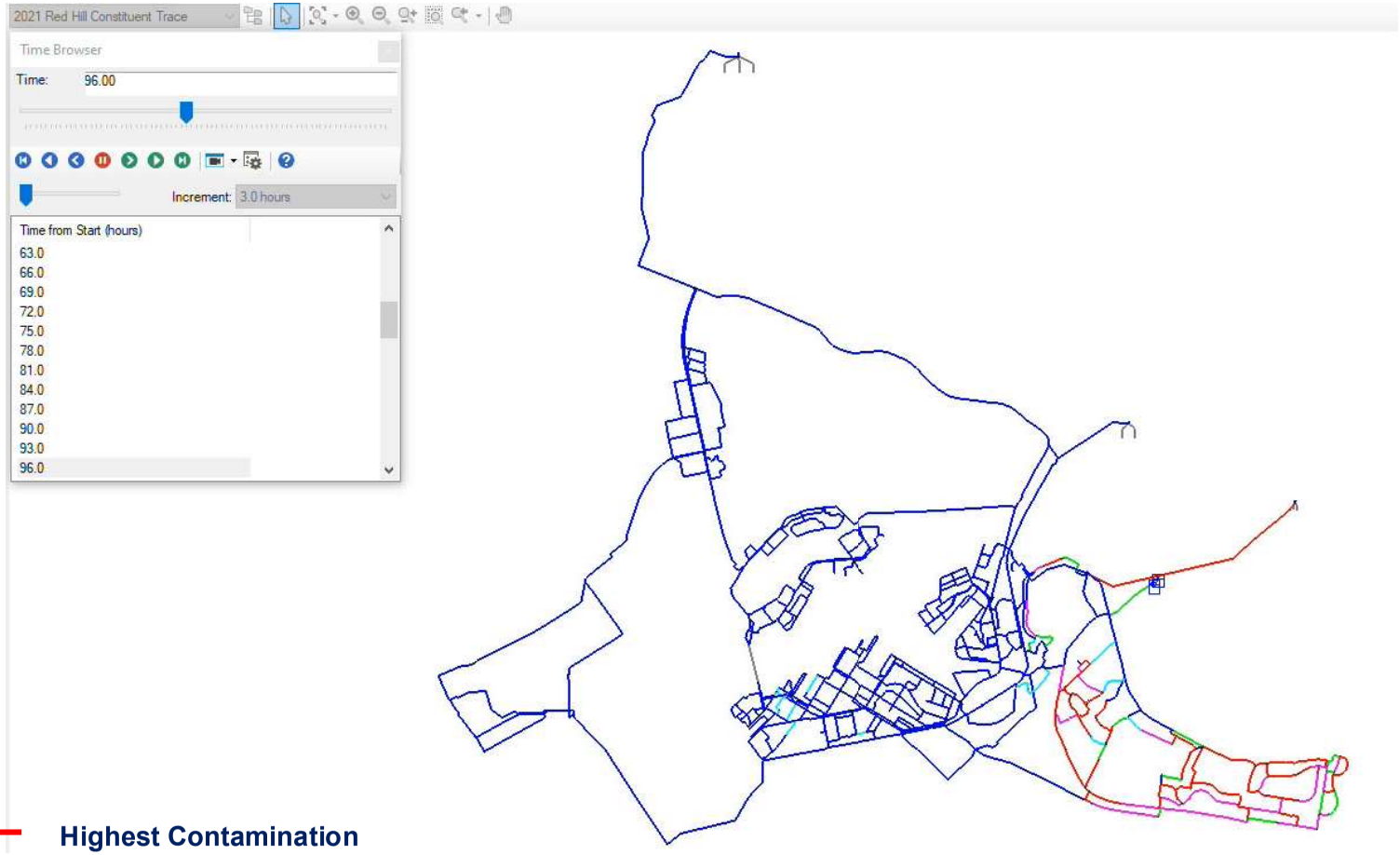

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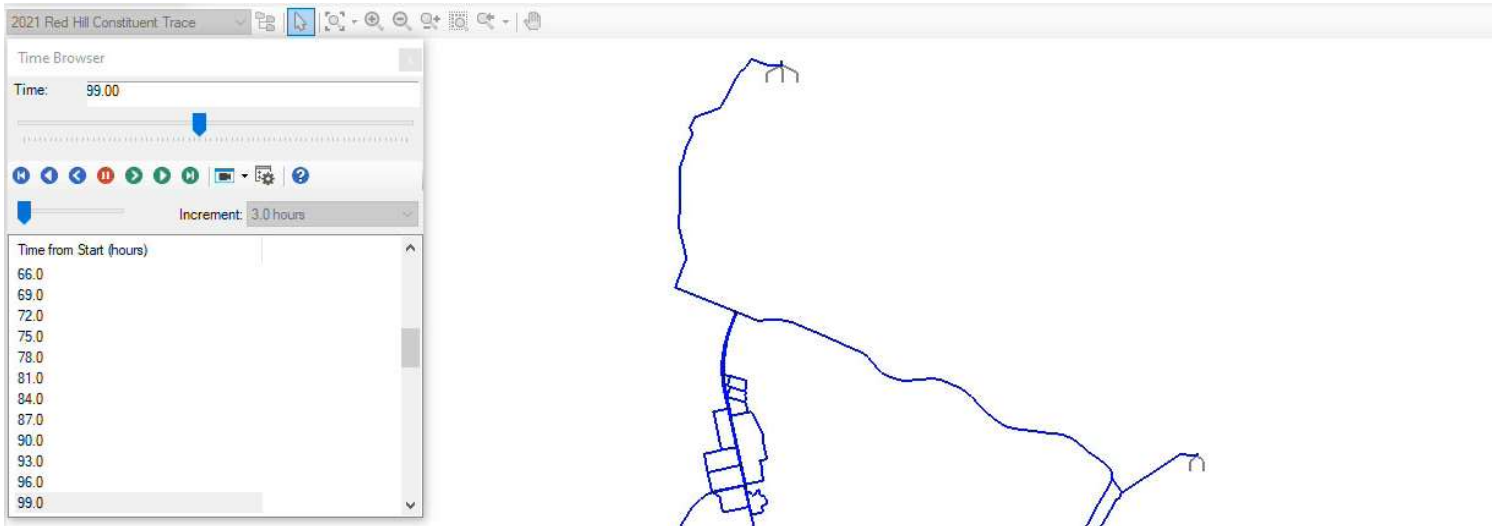

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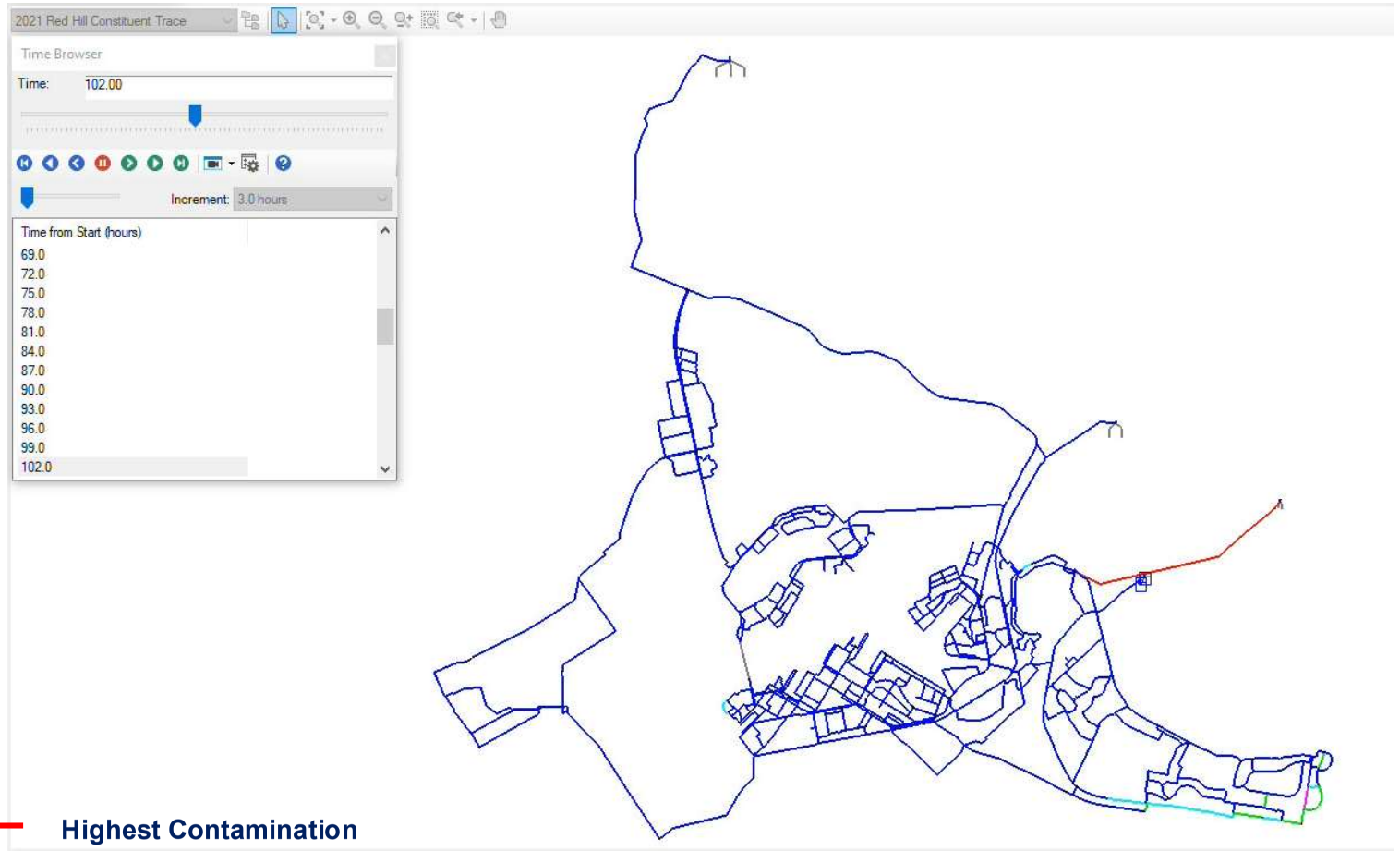

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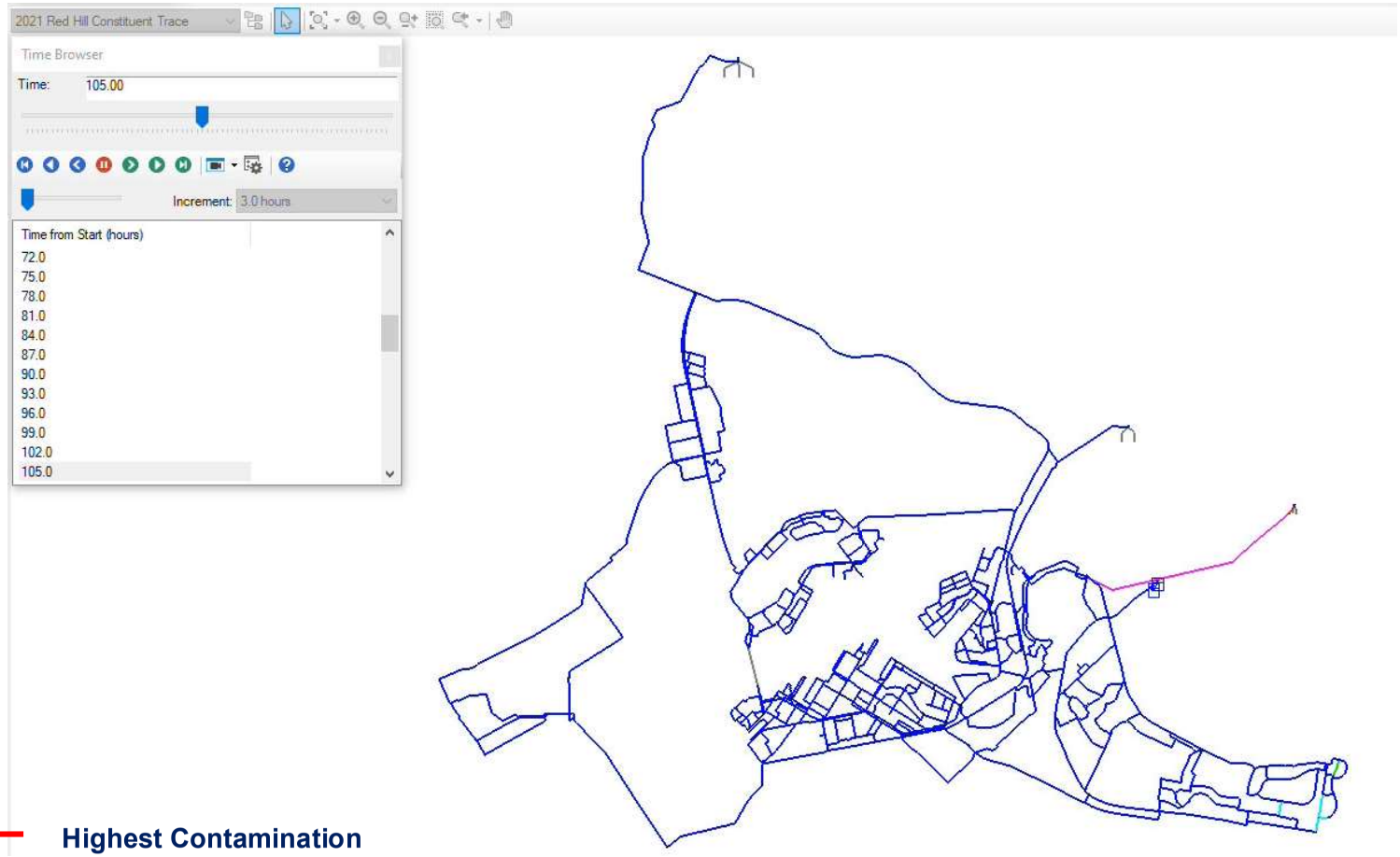

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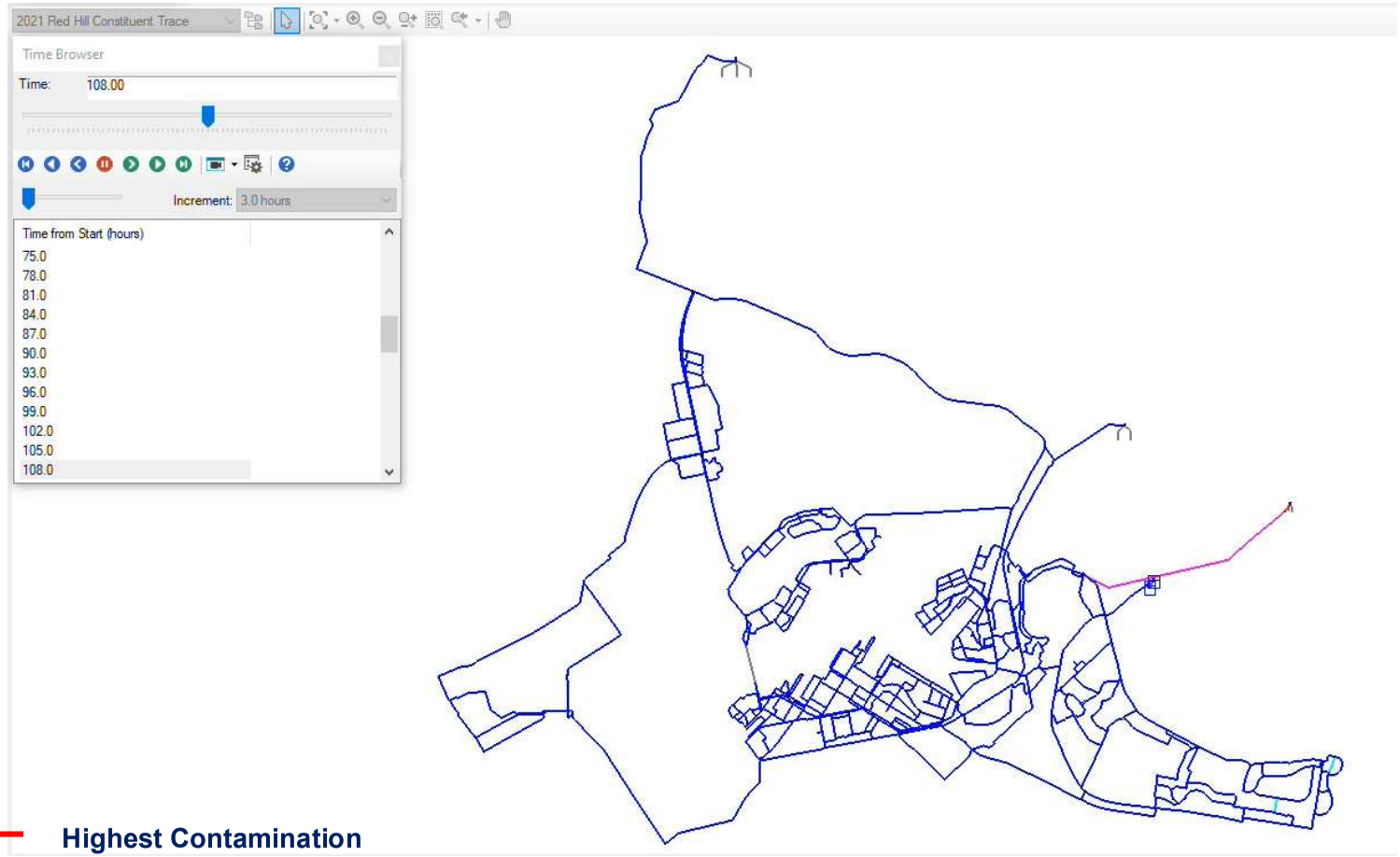

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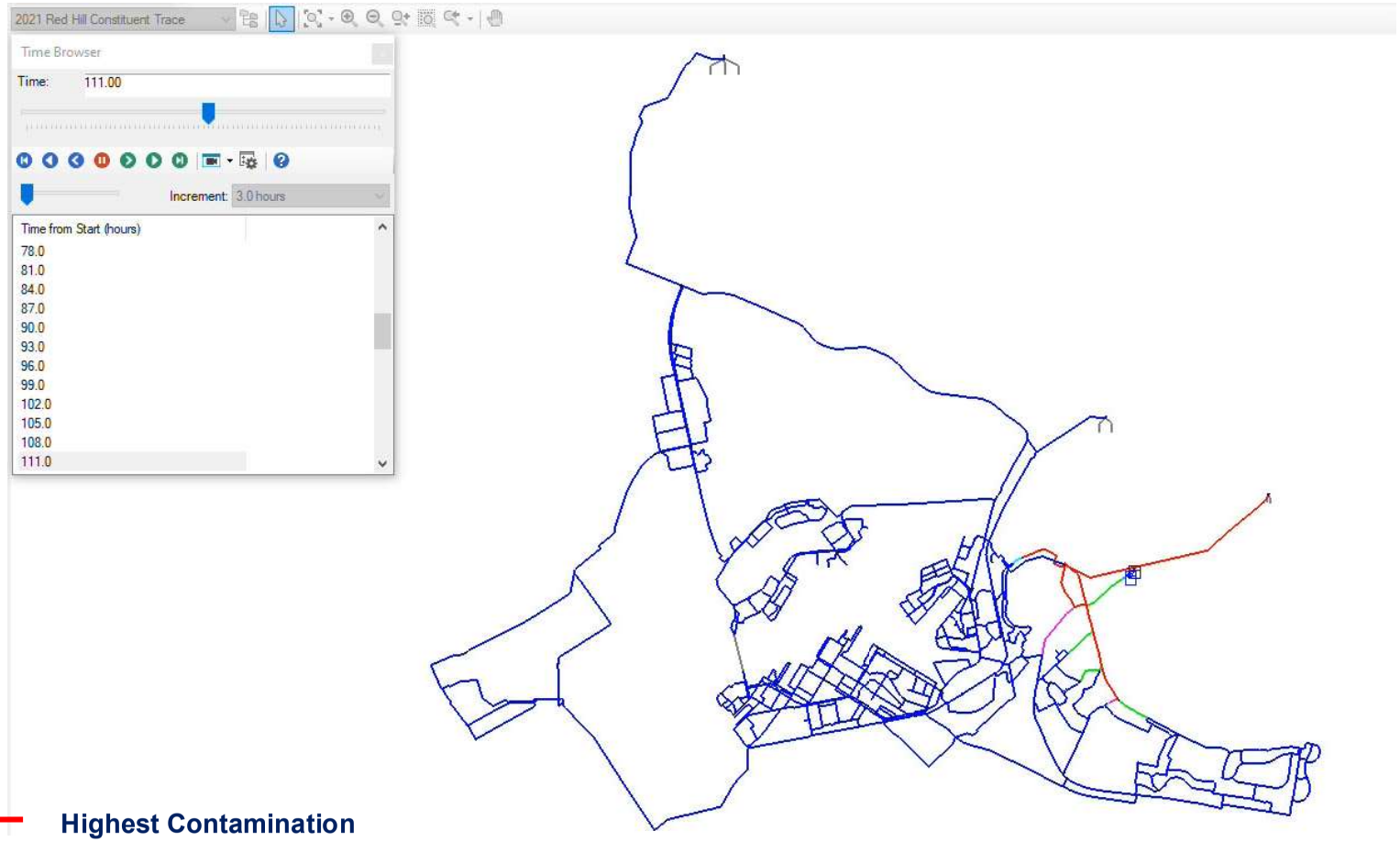

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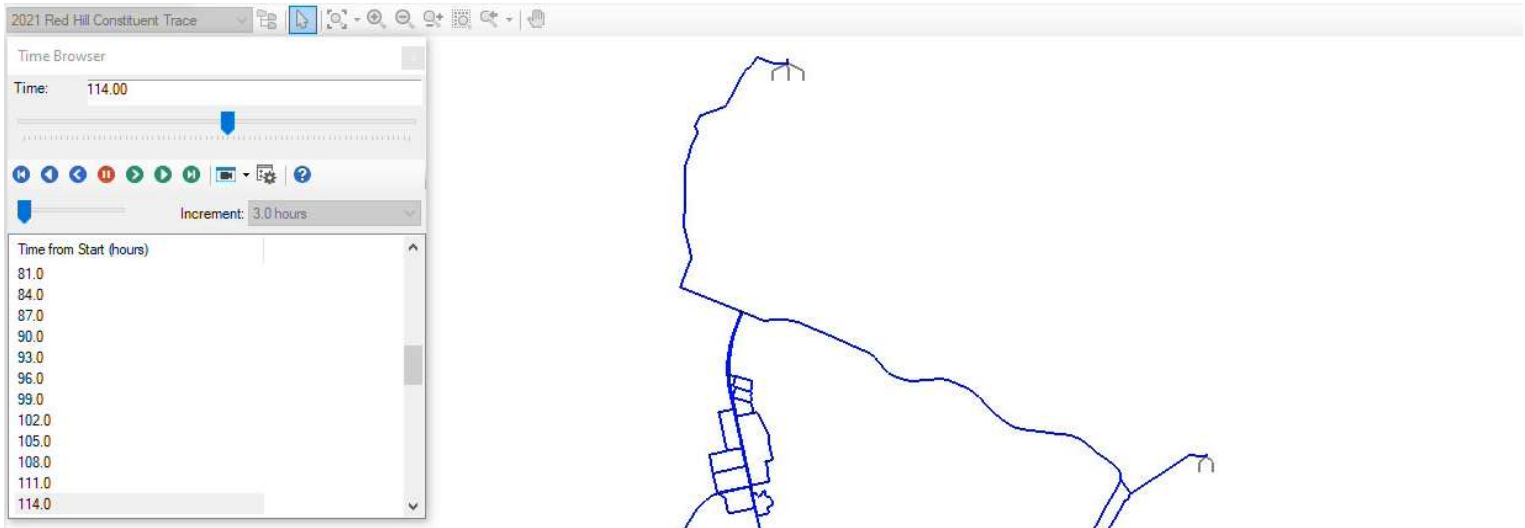

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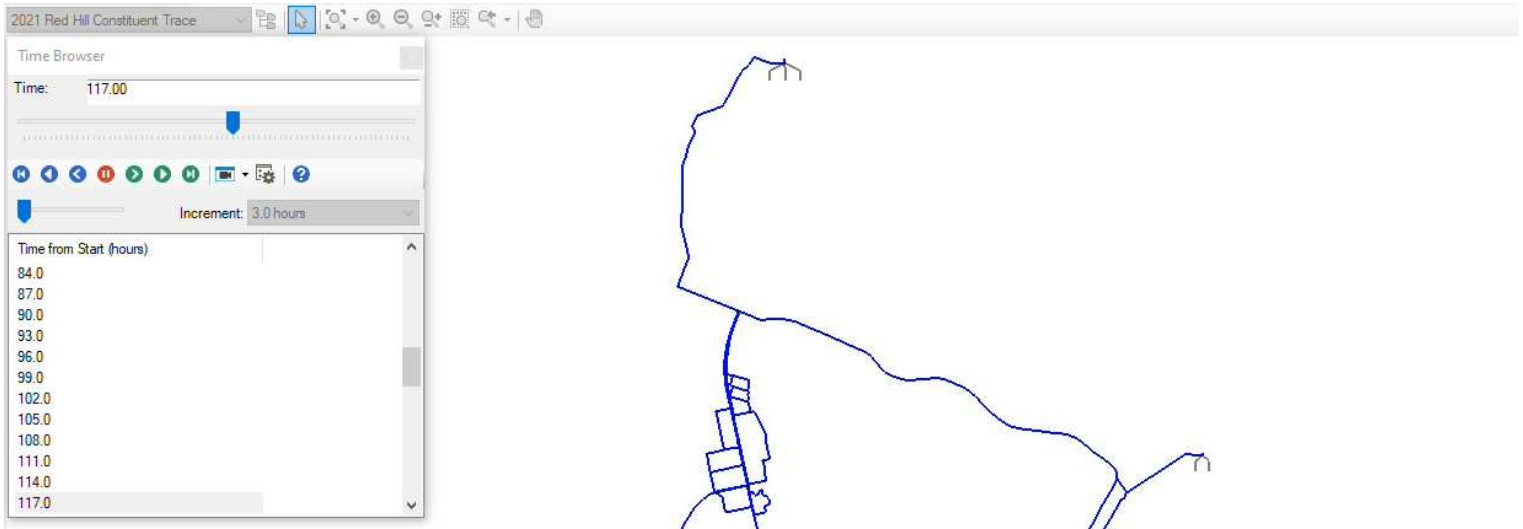

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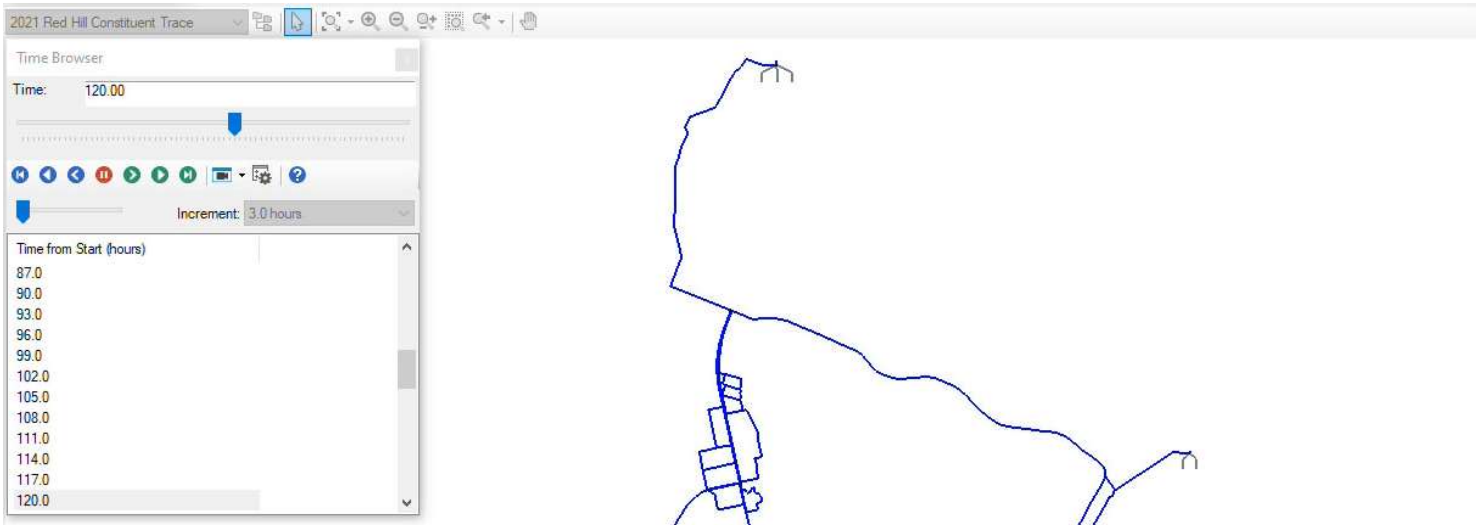

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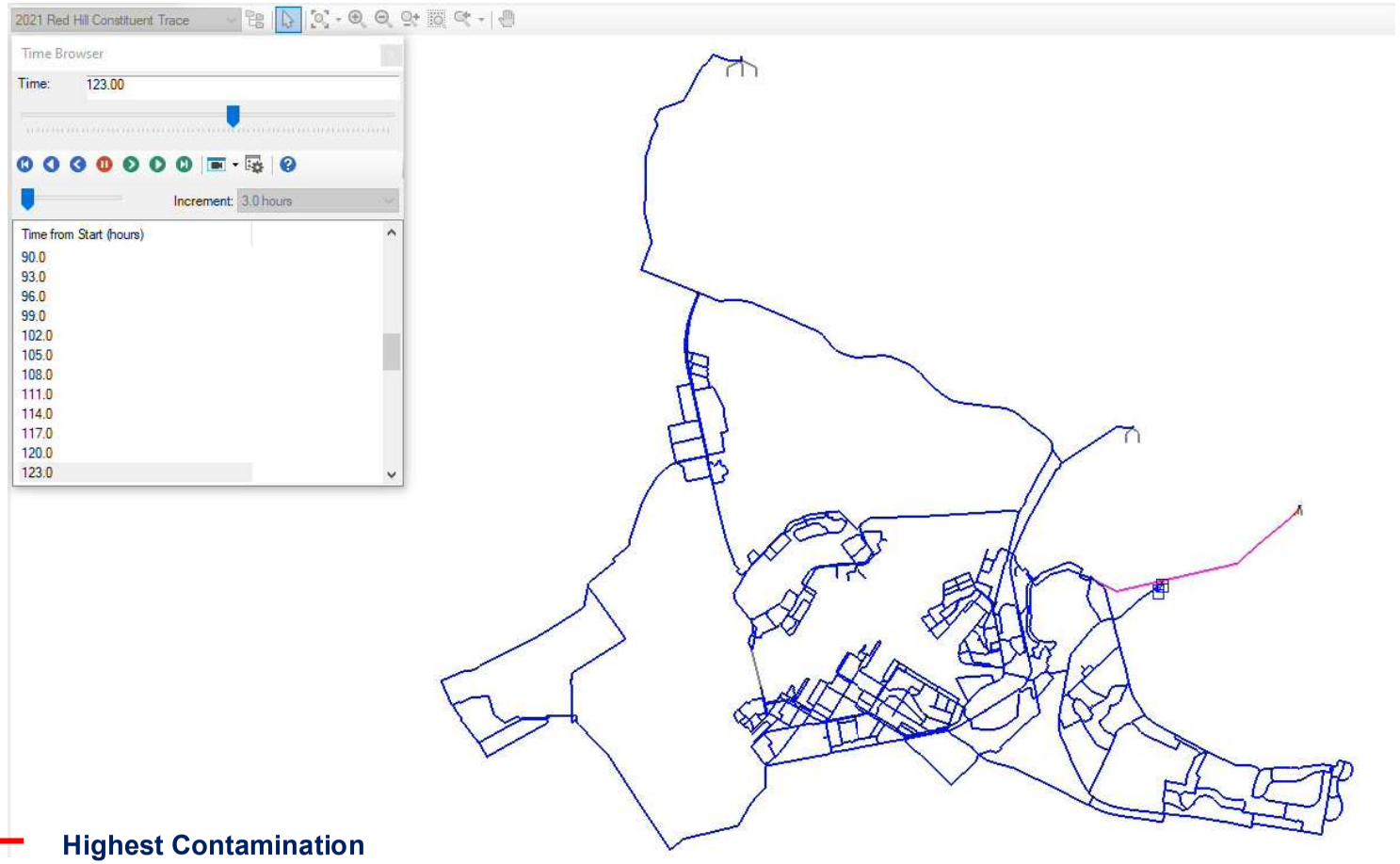

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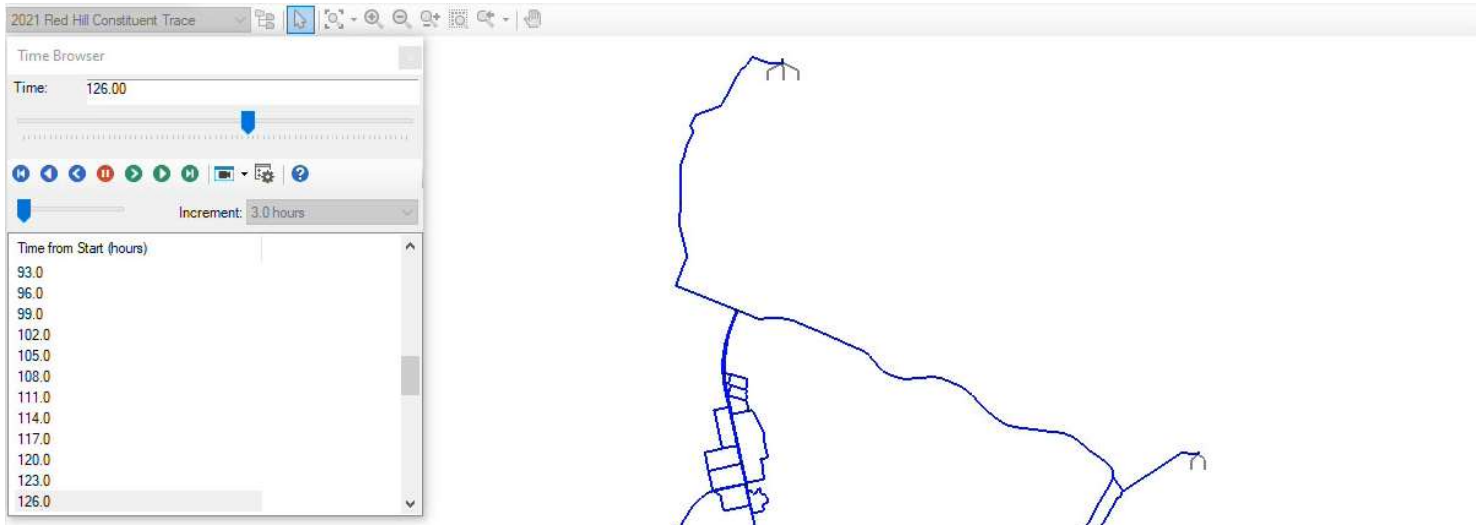

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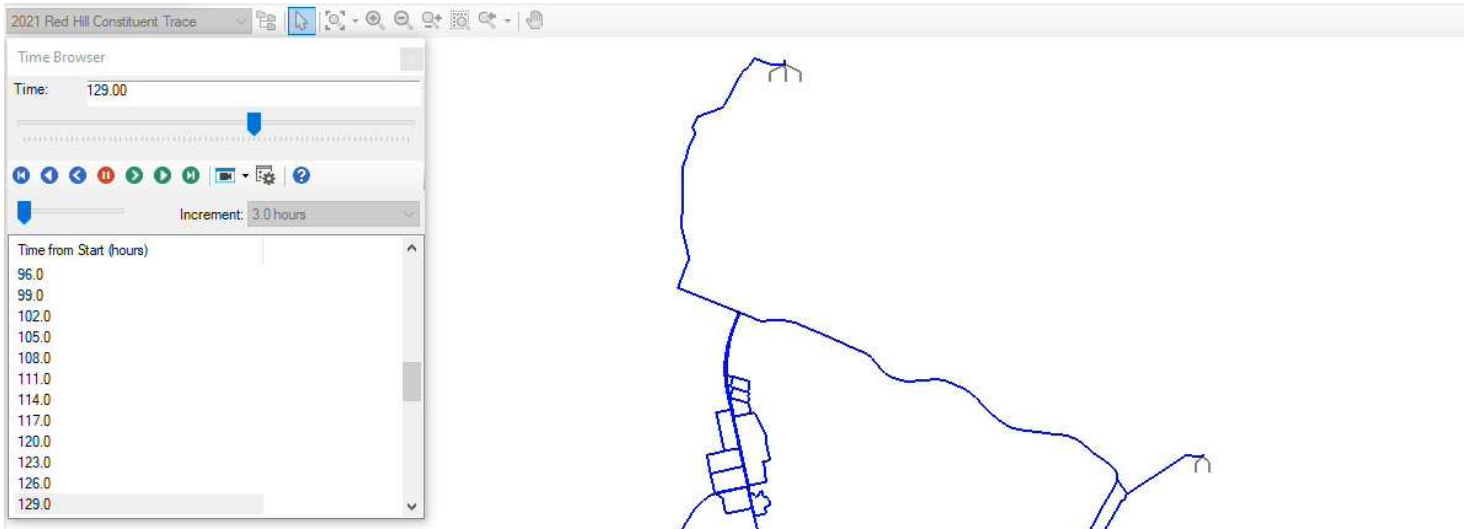

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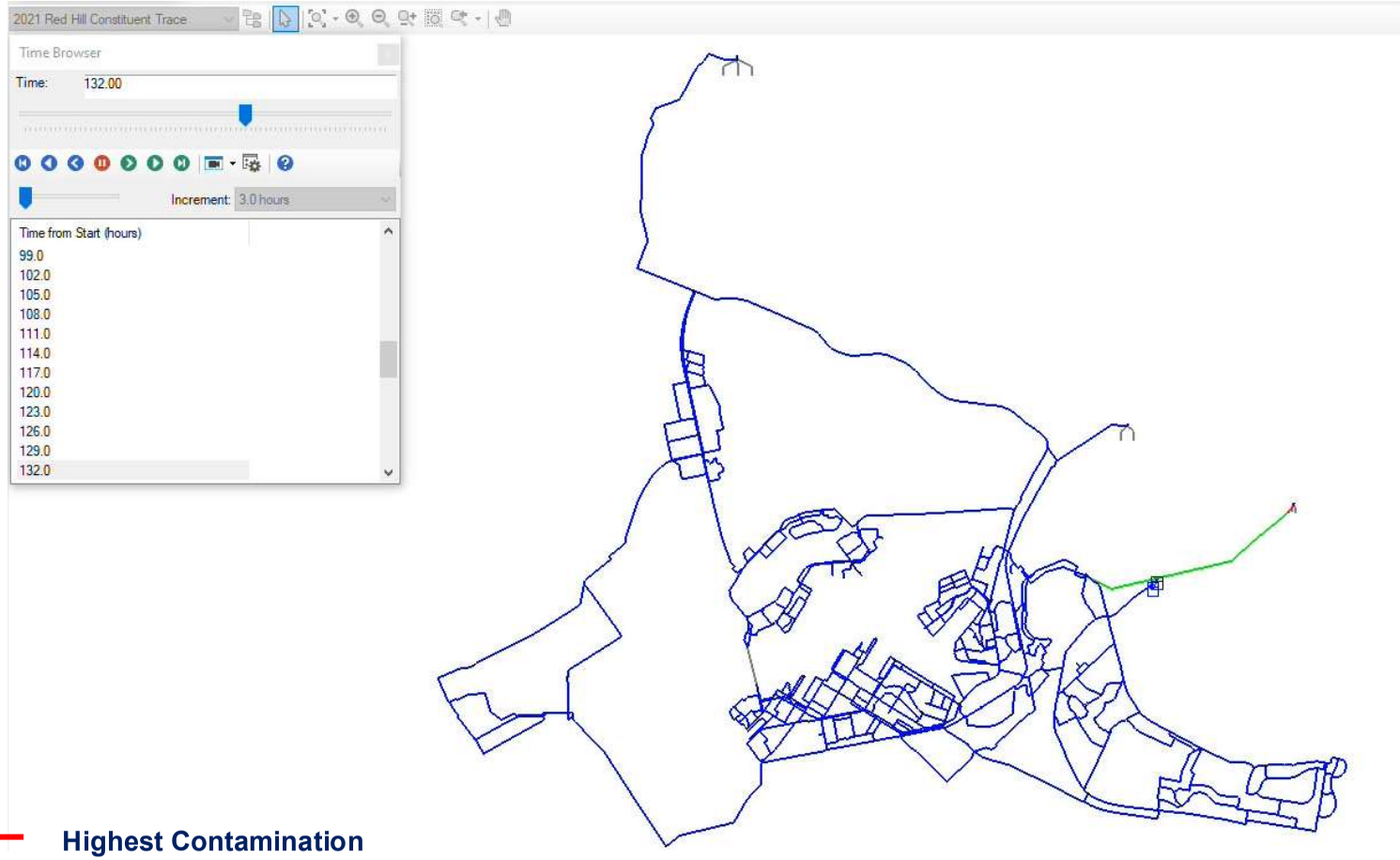

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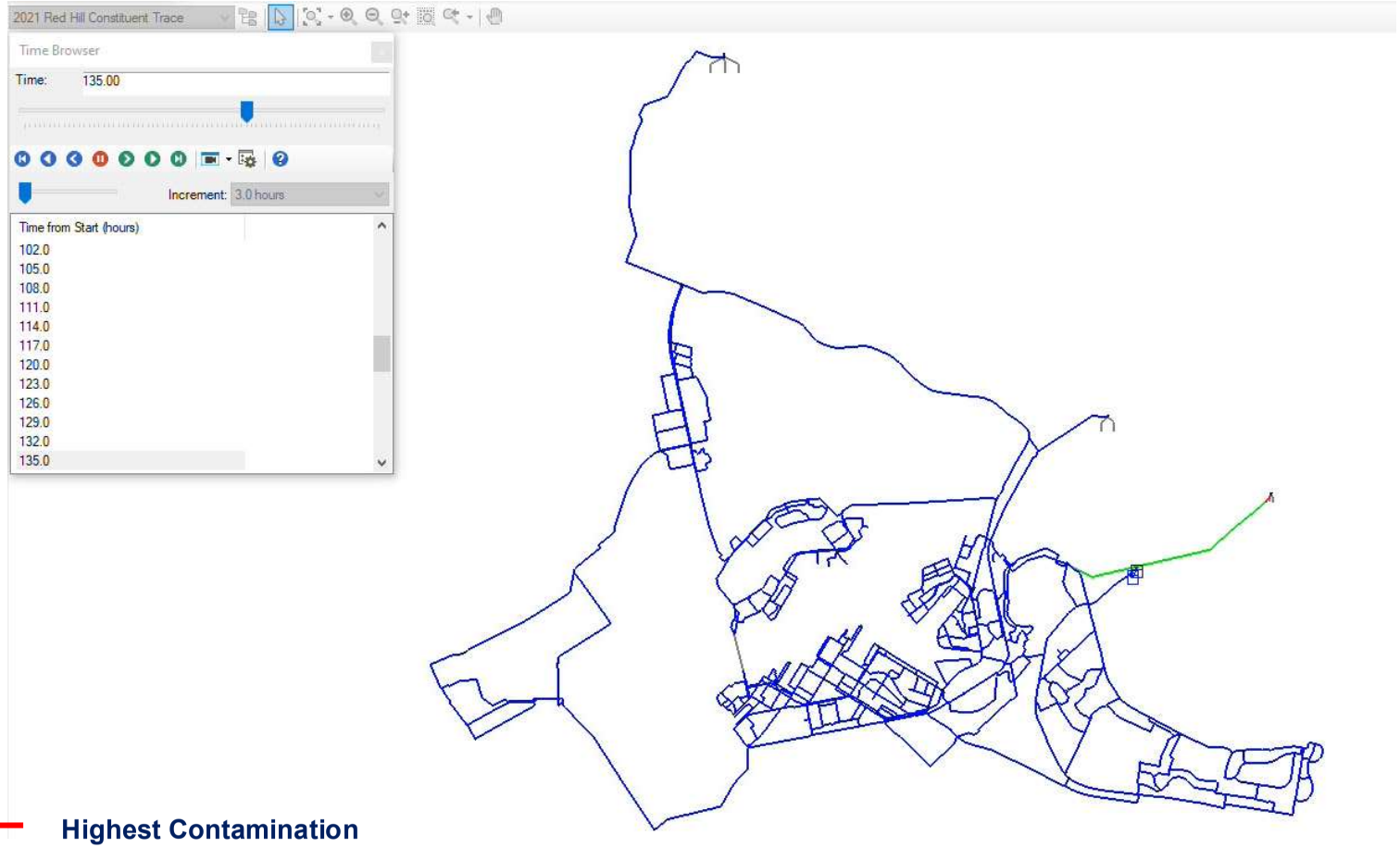

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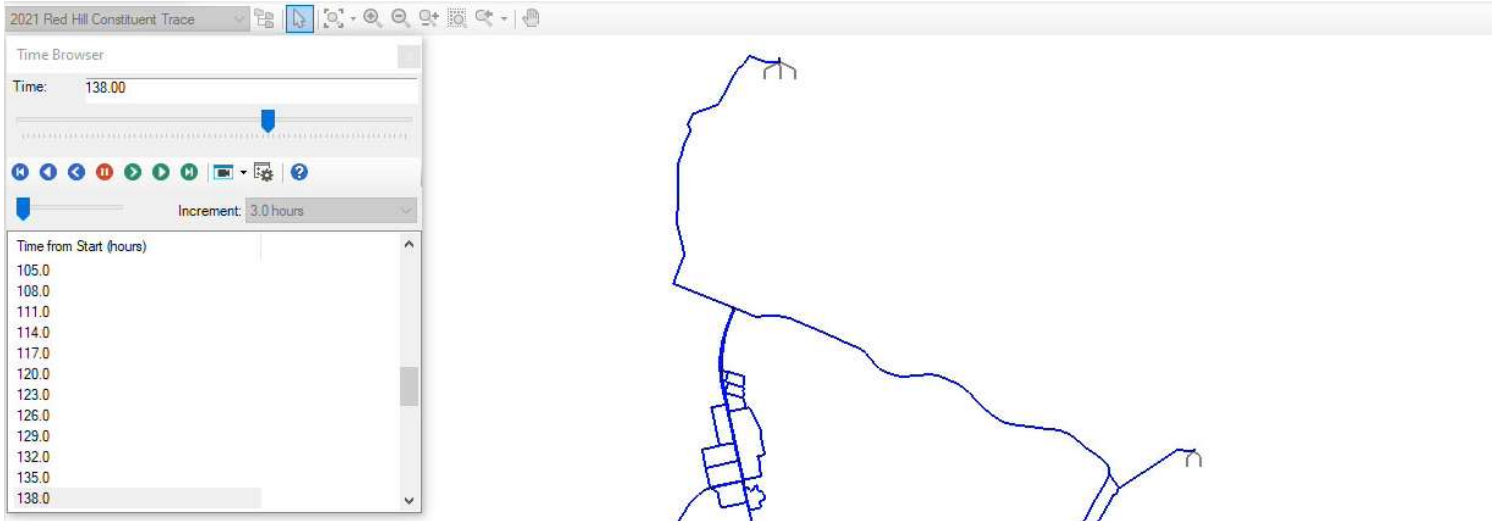

Highest Contamination

Lowest Contamination

28 February 2022

MEMORANDUM

From: Naval Facilities Engineering Systems Command Representative, EWG Team
To: Interagency Drinking Water System Team

Subj: RECORDS OF COMPLETED DISTRIBUTION SYSTEM FLUSHING ZONE B1

Ref: (a) Drinking Water Distribution System Recovery Plan, December 2021

Encl: (1) Distribution System Flushing Records Zone B1

1. The completed records as shown in Enclosure (1), document the flushing of 5 hydrants in Zone B1 in accordance with Reference (a).

2. Field logs documenting the completion of the distribution flushing are summarized below demonstrate fulfillment of the criterion established in Reference (a):

Hydrant Location ID	Discharge Location Type	Flushed Volume (gallons)
2	Storm Drain	12,300
3	Storm Drain	99,900
4	Land Application	137,400
5	Storm Drain	37,800
8	Storm Drain	44,500
	Total:	331,900 gallons

3. Zone B1 was required to flush 180,000 gallons per Reference (a), para 2.5.3.5, which was exceeded.

Very respectfully,

LCDR, CEC, USN

DALY.JOHN.FRANCIS.III.1365462468
2022.02.28 20:18:49 -10'00'

J. F. DALY III
LCDR, CEC, USN

TABLE OF CONTENTS

Section A Utilitiesmen Flushing Log Roll-up

2	Shift		Flush Time			Documentation	
Date	**Begin**	**End**	**Start**	**Stop**	**RunTime**	**Email Summary**	**UT Log**
7-Jan	8:00	20:00	16:44	18:47	2:03	20220107 0800-2000	Y

TOTAL RUN @ FLOW of 100		
TIME	2:03	
VOLUME	12300	Gallons

5	Shift		Flush Time			Documentation	
Date	**Begin**	**End**	**Start**	**Stop**	**RunTime**	**Email Summary**	**UT Log**
7-Jan	8:00	20:00	16:17		3:43	20220107 0800-2000	Y
7-Jan	20:00	8:00		22:35	2:35	20220107 2000-0800	Y

TOTAL RUN @ FLOW of 100		
TIME	6:18	
VOLUME	37800	Gallons

3	Shift		Flush Time			Documentation	
Date	**Begin**	**End**	**Start**	**Stop**	**RunTime**	**Email Summary**	**UT Log**
6-Jan	8:00	20:00	18:30		1:30	20220106 0800-2000	Y
6-Jan	20:00	8:00			12:00	20220106 2000-0800	N/A
7-Jan	8:00	20:00		11:09	3:09	20220107 0800-2000	Y

TOTAL RUN @ FLOW of 100		
TIME	16:39	
VOLUME	99900	Gallons

8	Shift		Flush Time			Documentation	
Date	**Begin**	**End**	**Start**	**Stop**	**RunTime**	**Email Summary**	**UT Log**
7-Jan	8:00	20:00	15:30		4:30	20220107 0800-2000	Y
7-Jan	20:00	8:00		22:55	2:55	20220107 2000-0800	Y

TOTAL RUN @ FLOW of 100		
TIME	7:25	
VOLUME	44500	Gallons

4	Shift		Flush Time			Documentation	
Date	**Begin**	**End**	**Start**	**Stop**	**RunTime**	**Email Summary**	**UT Log**
6-Jan	8:00	20:00	12:38		7:22	20220106 0800-2000	Y
6-Jan	20:00	8:00			12:00	20220106 2000-0800	N/A
7-Jan	8:00	20:00		11:32	3:32	20220107 0800-2000	Y

TOTAL RUN @ FLOW of 100		
TIME	22:54	
VOLUME	137400	Gallons

Hydrant	Volume
2	12300
3	99900
4	137400
5	37800
8	44500
TOTAL	331900

Section 2a.4 Records of Completed Volumetric Exchanges

ENCL (1)

06 JAN 2022

0001	START OF NEW DAY.
0145	START ROVE.
0317	WATER LEVEL 34' DOJ
03	
0450	FH 168 CLOSED DUE TO LACK OF PERSONNEL WITH FLIGHTLINE ACCESS.
	UCC NOTIFIED. LT CRUZ NOTIFIED.
0530	LOGBOOK SUBMITTED TO EOC.
0645	UT STIEFERMANN RELIEVED BY UT RHINE.
0700	CHECKED IN AT UCC
0729	931 OPENED
0805	924 SHUTDOWN
~~0740~~ LE	ARRIVED AT 931 TO WAIT FOR WATCH STANDARDS.
0840	~~DE~~ ARMY ARRIVE AT 931
0840	14 SHUT DOWN
0854	5 SHUT DOWN
0857	924 SHUT DOWN
0900	19 SHUT DOWN
0932	33 SHUT DOWN
1000	318 SHUT DOWN
LE 931	927 OPEN
1004	214 OPENED. CALL DOF 220-2746 FOR ACCESS
1033	315 SHUT DOWN
1104	TURNED ON 179 FOR TESTING
1145	TURNED ON 179 200GPM.

06 JAN 2022

1146	TURNED OFF 179 FOR FLOODING.
1147	TRACED NEW STORM DRAIN; REROUTE DISCHARGE.
1200	TURNED ON 179.
1201	931 REPORTED FLOODING.
1202	TURNED OFF 931.
1152 LE	457 SHUTDOWN
1215	TURNED ON 4 FOR TESTING.
1238	TURNED ON 4 FOR 2000 GPM.
1240	TURNED OFF 4; DUE TO WATER FLOOD FROM TOP OF GAL.
1250	243 ON.
1400	TURNED ON 337. NO WATCHES ON SITE.
1420	WATCHES ARRIVE; DUTY UT DEPARTS
1500	UTD DOMANSKI ASSUMES DUTY UT. UTI RHINE RELIEVED AT DUTY UT.
1540	FH-931 CLOSED. DUE TO FLOODING.
1600	FH-7 CLOSED.
1630	FH-25 CLOSED.
1719	FH-942 OPEN.
1725	FH-488 CONTACT INFO: MIKE-(789)289-4118
1802	FH-230 OPEN.
1806	FH-243 CLOSED, DUE TO FLOODING.
1830	FH-3 OPEN.
1920	FH-111 OPEN.
1950	FH-488 OPEN.
2006	FH-225 OPEN.
2245	FH-18 A2 OPEN.

06 JAN 2022

1300	LT DOMANSKI RELIEVED BY LT STIEFERMAN
2359	END OF DAY.

07 JAN 2022

0001	START OF NEW DAY,
0028	HYDRANT 26 CLOSED DUE TO FLOODING
0303	WATCHSTANDER AT HYDRANT 26 REPORTS STILL FLOODING,
0315	WATER LEVEL 36'
0440	WATCHSTANDER REPORTED FLOODING STOPPED AT FH-26.
0445	HYDRANT 498 CLOSED, SCHEDULED CLOSE.
0522	FH-26 OPEN, UCC NOTIFIED.
0530	LOGBOOK ENTRIES SUBMITTED TO EOC,
0645	LT STIEFERMANN RELIEVED BY LT RUNE,
0700	CHECKS IN AT UCC
0830	214 SHUTDOWN
0833	243 SHUTDOWN
0901	337 SHUT DOWN
0904	225 SHUT DOWN
0910	111 SHUTDOWN
0948	637 OPEN
0956	933 SHUT DOWN
0959	ARMY OPSITE 637 FOR WATCH
1015	236 SHUT DOWN
1015	567 OPEN
1021	230 SHUTDOWN
1042	942 SHUTDOWN
1043	637 OFF DUE TO TOO HIGH PM
LE, 759	26 SHUTDOWN

NF EXIP LT STIEFERMANN

7 JAN 22

1109	3 SHUT DOWN.
1132	4 SHUT DOWN.
1142	18 SHUT DOWN.
1207	19 SHUT DOWN.
1400	946 OPEN.
1530	8 OPEN.
1613	WATCH ON.
1434 LE.	56 OPEN.
1617	5 OPEN.
1444 LE	34 OPEN.
1715	56 CLOSED
1644 LE	2 OPENED
1700 LE	950 OPENED
N/A	BETWEEN 1700-1830 129, 135, 128 AND 119 ON.
1847	2 CLOSED REOPEN WHEN 2000 WATCH GETS ON 2087 #
1900	UT2 DOMANSKI ASSUMES DUTY UT. UT1 AMINE RELIEVED AS DUTY UT.
2015	FH-11 OPEN, (PM-2)
2100	FH-11 CLOSE (PM-2).
	FH-129, FH-109, FH-135, FH-128, FH-119
2224	FH-945 CLOSED.
2235	FH-5 CLOSED
2255	FH-8 CLOSED.
2300	FH-950 CLOSED.
2330	FH-567 CLOSED.
2345	FH-637 CLOSED.
2358	UT2 ZIELINSKI ASSUMES DUTY UT. UT2 DOMANSKI RELIEVED

2359	END OF DAY.

UT2 ZIELINSKI F.T.P.

Cruz, Nicholas D LT USN NAVFAC SE JAX FL (USA)

From: SZCZEPANIK, BRITTANY A 2d Lt USAF AETC 71 STUS/STU <brittany.szczepanik.1@us.af.mil>
Sent: Friday, January 7, 2022 10:16 PM
To: Wiley, Scottie R Maj USAF 647 ABG (USA); Kelly, Austin A 1st Lt USAF 647 ABG (USA); craig.m.joseph@navy.mil; Duarte, Israel A MSgt USAF (USA); peter.a.ahleong1@navy.mil; jason.a.collins2@navy.mil; Williams, Malcolm J Capt USAF 647 ABG (USA); carl.chase@navy.mil; nicholas.d.cruz@navy.mil; scott.d.wieser; Gruber, Marjorie J LCDR USN CBMU 303 (USA); nicholas.d.cruz@navy.mil; Asistio, Maria Angela Grace L 2d LT USAF USN NAVFAC HAWAII PEARL (USA); Huang, Andy D CIV USN NAVFAC HAWAII PEARL (USA); Spencer, Matthew A CIV USN COMNAVREG SW SAN CA (USA); Poche, Brennan W LT USN NAVFAC HAWAII PEARL (USA); malcolm.williams@navy.mil; Donovan, Luke T Lt Col USAF 49 MSG (USA); Beattie, Aaron J MAJ USARMY USARPAC (USA); 647 CES/UCC; Howard, Spencer L LT USN CBMU 303 (USA); brent.t.natsuhara@navy.mil; jimmy.cope@navy.mil; Baranowski, Phillip J CPO USN NAVFAC SE JAX FL (USA); john.parada@navy.mil; Hawkins, Brian A PO1 USN NAS KEY WEST FL (USA); Barr, Justin A PO2 USN (USA); Harris, Jamel W PO2 USN (USA); Johnson, Jamaria T PO2 USN (USA); gregory.e.credle@navy.mil; Lett, Julius J SMSgt USAF (USA); nicholas.d.cruz@navy.mil; kevin.lachat@navy.mil; Asistio, Maria Angela Grace L 2d LT USAF USN NAVFAC HAWAII PEARL (USA); EDWARDS, PHYLYSHA C SSgt USAF PACAF 647 CES/CEOER; Pendleton, Cole R SrA USAF 647 ABG (USA); Mchenry, Kevin G MSgt USAF 647 ABG (USA); Corum, Michael L II MSgt USAF 647 ABG (USA); CORUM, MICHAEL L II MSgt USAF PACAF 647 CES/CEN
Cc: 647 CES/UCC
Subject: INFO: 20220106 0800L - 2000L JBPHH DWDSRP Flush Report
Attachments: 20220107 0800L - 2000L JBPHH DWDSRP Flush Report.pdf
Signed By: brittany.szczepanik.1@us.af.mil

Ladies & Gentlemen,

Attached is the flush report for Friday, 07 Jan 22, 0800L – 2000L. Below is a summary of current distribution flushing.

Current Location Summary:

0800-2000 7 Jan 2022				
A3	FH 2	Flushing		
A3	FH 34	Flushing Complete	1409	UT LOG
D4	FH 637	Flushing	on 0942. off 1043	UT LOG
D4	FH 567	Flushing	1015	UT LOG
A3	FH 56	Flushing Complete	on 1434, off 1715	UT LOG
~~A3~~	~~FH 59~~	~~Flushing Complete~~		
A3	SA LFH-2 / 17	Flushing Complete	1617	UT LOG
B1	FH 2 / 22	Flushing Complete	1644-1847	UT LOG
B1	FH 5 / 7	Flushing	1617	UT LOG
B1	FH 8 / 5	Flushing	1530	UT LOG
E1	FH 950 / 19	Flushing	1700	UT LOG
E1	FH 946 / 11	Flushing	1400	UT LOG
C2	FH214	shut down	0830	UT LOG

ENCL (1)

C3	FH 105	Flushing	1757	KTR LOG
C2	FH243	shut down	0833	UT LOG
C2	FH337	shut down	0901	UT LOG
C2	FH225	shut down	0904	UT LOG
C3	FH111	shut down	0910	UT LOG
E1	FH933	shut down	0956	UT LOG
C3	FH236	shut down	1015	UT LOG
C3	FH230	shut down	1021	UT LOG
E1	FH942	shut down	1042	UT LOG
G1	FH26	shut down	0759	UT LOG
B1	FH3	shut down	1109	UT LOG
B1	FH4	shut down	1132	UT LOG
A3	FH18	shut down	1142	UT LOG
C3	FH179	shut down	1207	UT LOG

Parada, John J LT USN NCG 1 (USA)

From: SZCZEPANIK, BRITTANY A 2d Lt USAF AETC 71 STUS/STU <brittany.szczepanik.1@us.af.mil>
Sent: Thursday, January 6, 2022 10:36 PM
To: Wiley, Scottie R Maj USAF 647 ABG (USA); Kelly, Austin A 1st Lt USAF 647 ABG (USA); craig.m.joseph@navy.mil; Duarte, Israel A MSgt USAF (USA); peter.a.ahleong1@navy.mil; jason.a.collins2@navy.mil; Williams, Malcolm J Capt USAF 647 ABG (USA); carl.chase@navy.mil; nicholas.d.cruz@navy.mil; scott.d.wieser; Gruber, Marjorie J LCDR USN CBMU 303 (USA); nicholas.d.cruz@navy.mil; Asistio, Maria Angela Grace L 2d LT USAF USN NAVFAC HAWAII PEARL (USA); Huang, Andy D CIV USN NAVFAC HAWAII PEARL (USA); Spencer, Matthew A CIV USN COMNAVREG SW SAN CA (USA); Poche, Brennan W LT USN NAVFAC HAWAII PEARL (USA); malcolm.williams@navy.mil; Donovan, Luke T Lt Col USAF 49 MSG (USA); Beattie, Aaron J MAJ USARMY USARPAC (USA); 647 CES/UCC; Howard, Spencer L LT USN CBMU 303 (USA); brent.t.natsuhara@navy.mil; jimmy.cope@navy.mil; Baranowski, Phillip J CPO USN NAVFAC SE JAX FL (USA); john.parada@navy.mil; Hawkins, Brian A PO1 USN NAS KEY WEST FL (USA); Barr, Justin A PO2 USN (USA); Harris, Jamel W PO2 USN (USA); Johnson, Jamaria T PO2 USN (USA); gregory.e.credle@navy.mil; Lett, Julius J SMSgt USAF (USA); nicholas.d.cruz@navy.mil; kevin.lachat@navy.mil; Asistio, Maria Angela Grace L 2d LT USAF USN NAVFAC HAWAII PEARL (USA); EDWARDS, PHYLYSHA C SSgt USAF PACAF 647 CES/CEOER; Pendleton, Cole R SrA USAF 647 ABG (USA); Mchenry, Kevin G MSgt USAF 647 ABG (USA); Corum, Michael L II MSgt USAF 647 ABG (USA); CORUM, MICHAEL L II MSgt USAF PACAF 647 CES/CEN
Cc: 647 CES/UCC
Subject: INFO: 20220106 0800L - 2000L JBPHH DWDSRP Flush Report
Attachments: 20220106 0800L - 2000L JBPHH DWDSRP Flush Report.pdf
Signed By: brittany.szczepanik.1@us.af.mil

Ladies & Gentlemen,

Attached is the flush report for Thursday, 06 Jan 22, 0800L – 2000L. Below is a summary of current distribution flushing.

Current Location Summary:

Zone	Hydrant / GAC	Latest Status	Time	Source
F2	FH 5 / 20	Flushing Complete	0854	UT Log
C2	FH 318 / 25	Flushing Complete	1000	UT Log
C2	FH 300 / 23	Flushing Complete		
C2	FH 315 / 10	Flushing Complete	1033	UT Log
F2	FH 19 / 12	Flushing Complete	0900	UT Log
F2	FH 33	Flushing Complete	0932	UT Log
F2	FH 14 / 17	Flushing Complete	0840	UT Log
F2	FH 7	Flushing Complete	1600	UT Log
F2	FH 25	Flushing Complete	1630	UT Log
D4	FH 457	Flushing Complete	1152	UT Log
E1	FH 926	Flushing Complete		
G1	FH 26 / 4	Flushing		

ENCL (1)

			Time	Source
E1	FH ID 927 / 19	Flushing	0921	UT Log
E1	FH ID 931 / 18	Flushing	On 0729-Off 1202	UT Log
C3	FH 179 / 7	Flushing	1200	UT Log
B1	FH 4 / 22	Flushing	1033	UT Log
E1	FH 933 /11	Flushing		
C2	FH 337 / 17	Flushing	1400	UT Log
F2	FH 214 / 8	Flushing Complete	1004	UT Log
C2	FH 225 / 5	Flushing	2006	UT Log
A3	FH 18 / 14	Flushing	2245	UT Log
C2	FH 243 / 6	Flushing	On 1250-Off 1806	UT Log
D4	FH 488 / 16	Flushing	1950	UT Log
C3	FH 230 / 23	Flushing	1802	UT Log
E1	FH 942 / 20	Flushing	1719	UT Log
C3	FH 111 /10	Flushing	1920	UT Log
B1	FH 3 / 12	Flushing	1830	UT Log
C3	FH 236 / 25	Flushing		
D4	FH 168	Flushing Complete	0450	UT Log
E1	FH 924	Flushing Complete	0805	UT Log

Project Programmer/ ICAP Engineer
NAVFAC HI, FMD JBPHH
647 CES/CEN
DSN: 448-2795

Parada, John J LT USN NCG 1 (USA)

From: SZCZEPANIK, BRITTANY A 2d Lt USAF AETC 71 STUS/STU <brittany.szczepanik.1@us.af.mil>
Sent: Friday, January 7, 2022 10:18 PM
To: Wiley, Scottie R Maj USAF 647 ABG (USA); Kelly, Austin A 1st Lt USAF 647 ABG (USA); craig.m.joseph@navy.mil; Duarte, Israel A MSgt USAF (USA); peter.a.ahleong1@navy.mil; jason.a.collins2@navy.mil; Williams, Malcolm J Capt USAF 647 ABG (USA); carl.chase@navy.mil; nicholas.d.cruz@navy.mil; scott.d.wieser; Gruber, Marjorie J LCDR USN CBMU 303 (USA); nicholas.d.cruz@navy.mil; Asistio, Maria Angela Grace L 2d LT USAF USN NAVFAC HAWAII PEARL (USA); Huang, Andy D CIV USN NAVFAC HAWAII PEARL (USA); Spencer, Matthew A CIV USN COMNAVREG SW SAN CA (USA); Poche, Brennan W LT USN NAVFAC HAWAII PEARL (USA); malcolm.williams@navy.mil; Donovan, Luke T Lt Col USAF 49 MSG (USA); Beattie, Aaron J MAJ USARMY USARPAC (USA); 647 CES/UCC; Howard, Spencer L LT USN CBMU 303 (USA); brent.t.natsuhara@navy.mil; jimmy.cope@navy.mil; Baranowski, Phillip J CPO USN NAVFAC SE JAX FL (USA); john.parada@navy.mil; Hawkins, Brian A PO1 USN NAS KEY WEST FL (USA); Barr, Justin A PO2 USN (USA); Harris, Jamel W PO2 USN (USA); Johnson, Jamaria T PO2 USN (USA); gregory.e.credle@navy.mil; Lett, Julius J SMSgt USAF (USA); nicholas.d.cruz@navy.mil; kevin.lachat@navy.mil; Asistio, Maria Angela Grace L 2d LT USAF USN NAVFAC HAWAII PEARL (USA); EDWARDS, PHYLYSHA C SSgt USAF PACAF 647 CES/CEOER; Pendleton, Cole R SrA USAF 647 ABG (USA); Mchenry, Kevin G MSgt USAF 647 ABG (USA); Corum, Michael L II MSgt USAF 647 ABG (USA); CORUM, MICHAEL L II MSgt USAF PACAF 647 CES/CEN
Cc: 647 CES/UCC
Subject: INFO: 20220106 2000L - 0800L JBPHH DWDSRP Flush Report
Signed By: brittany.szczepanik.1@us.af.mil

Ladies & Gentlemen,

Attached is the flush report for Thursday/Friday, 06/07 Jan 22, 2000L – 0800L. Below is a summary of current distribution flushing.

Current Location Summary:

2000 - 0800 6/7 Jan 2022			Time	Source
E1	FH 926	Flushing Complete	On 0522-Off 0854	UT Log
G1	FH 26 / 4	Flushing Complete	On 0522-Off 0759	UT Log
E1	FH ID 927 / 19	Flushing Complete	0745	UT Log
E1	FH ID 931 / 18	Flushing Complete	0645	UT Log
C3	FH 179 / 7	Flushing Complete	1207	UT Log
B1	FH 4 / 22	Flushing Complete	1132	UT Log
E1	FH 933 /11	Flushing Complete	0956	UT Log
C2	FH 337 / 17	Flushing Complete	0901	UT Log
C2	FH 214 / 8	Flushing Complete	0830	UT Log
C2	FH 225 / 5	Flushing Complete	0904	UT Log
A3	FH 18 / 14	Flushing Complete	1142	UT Log
C2	FH 243 / 6	Flushing Complete	0833	UT Log
D4	FH 488 / 16	Flushing Complete	0445	UT Log

ENCL (1)

			Time	Source
C3	FH 230 / 23	Flushing Complete	1021	UT Log
E1	FH 942 / 20	Flushing Complete	1042	UT Log
C3	FH 111 /10	Flushing Complete	0910	UT Log
B1	FH 3 / 12	Flushing	No Change	KTR Log
C3	FH 236 / 25	Flushing Complete	1015	UT Log
D4	FH 637	Flushing	On 1814-Off 2345	UT & KTR Log
E1	FH 946	Flushing Complete	On 1400-Off 2224	UT Log
B1	FH 8	Flushing Complete	On 1530-Off 2255	UT Log
A3	FH 56	Flushing Complete	On 1434-Off 1715	UT Log
B1	FH 5	Flushing Complete	On 1617-Off 2235	UT Log
A3	FH 34	Flushing Complete	On 1409-Off 2124	KTR Log
A3	LFH 2	Flushing Complete	On 1644-Off 1847	UT Log
E1	FH 950	Flushing Complete	On 1700-Off 2308	UT Log
C3	FH 119	Flushing Complete	On 1615-Off 2100	EWG Log
C3	FH 128	Flushing Complete	On 1715-Off 2100	EWG Log
C3	FH 129	Flushing Complete	On 1620-Off 2100	EWG Log
C3	FH 135	Flushing Complete	On 1637-Off 2100	EWG Log
D4	FH 567	Flushing Complete	On 1015-Off 2330	UT Log

Cruz, Nicholas D LT USN NAVFAC SE JAX FL (USA)

From: SZCZEPANIK, BRITTANY A 2d Lt USAF AETC 71 STUS/STU <brittany.szczepanik.1@us.af.mil>
Sent: Friday, January 7, 2022 10:16 PM
To: Wiley, Scottie R Maj USAF 647 ABG (USA); Kelly, Austin A 1st Lt USAF 647 ABG (USA); craig.m.joseph@navy.mil; Duarte, Israel A MSgt USAF (USA); peter.a.ahleong1@navy.mil; jason.a.collins2@navy.mil; Williams, Malcolm J Capt USAF 647 ABG (USA); carl.chase@navy.mil; nicholas.d.cruz@navy.mil; scott.d.wieser; Gruber, Marjorie J LCDR USN CBMU 303 (USA); nicholas.d.cruz@navy.mil; Asistio, Maria Angela Grace L 2d LT USAF USN NAVFAC HAWAII PEARL (USA); Huang, Andy D CIV USN NAVFAC HAWAII PEARL (USA); Spencer, Matthew A CIV USN COMNAVREG SW SAN CA (USA); Poche, Brennan W LT USN NAVFAC HAWAII PEARL (USA); malcolm.williams@navy.mil; Donovan, Luke T Lt Col USAF 49 MSG (USA); Beattie, Aaron J MAJ USARMY USARPAC (USA); 647 CES/UCC; Howard, Spencer L LT USN CBMU 303 (USA); brent.t.natsuhara@navy.mil; jimmy.cope@navy.mil; Baranowski, Phillip J CPO USN NAVFAC SE JAX FL (USA); john.parada@navy.mil; Hawkins, Brian A PO1 USN NAS KEY WEST FL (USA); Barr, Justin A PO2 USN (USA); Harris, Jamel W PO2 USN (USA); Johnson, Jamaria T PO2 USN (USA); gregory.e.credle@navy.mil; Lett, Julius J SMSgt USAF (USA); nicholas.d.cruz@navy.mil; kevin.lachat@navy.mil; Asistio, Maria Angela Grace L 2d LT USAF USN NAVFAC HAWAII PEARL (USA); EDWARDS, PHYLYSHA C SSgt USAF PACAF 647 CES/CEOER; Pendleton, Cole R SrA USAF 647 ABG (USA); Mchenry, Kevin G MSgt USAF 647 ABG (USA); Corum, Michael L II MSgt USAF 647 ABG (USA); CORUM, MICHAEL L II MSgt USAF PACAF 647 CES/CEN
Cc: 647 CES/UCC
Subject: INFO: 20220106 0800L - 2000L JBPHH DWDSRP Flush Report
Attachments: 20220107 0800L - 2000L JBPHH DWDSRP Flush Report.pdf
Signed By: brittany.szczepanik.1@us.af.mil

Ladies & Gentlemen,

Attached is the flush report for Friday, 07 Jan 22, 0800L – 2000L. Below is a summary of current distribution flushing.

Current Location Summary:

0800-2000 7 Jan 2022				
A3	FH 2	Flushing	1644	UT LOG
A3	FH 34	Flushing Complete	1409	UT LOG
D4	FH 637	Flushing	on 0942. off 1043	UT LOG
D4	FH 567	Flushing	1015	UT LOG
A3	FH 56	Flushing Complete	on 1434, off 1715	UT LOG
~~A3~~	~~FH 59~~	~~Flushing Complete~~		
A3	SA LFH-2 / 17	Flushing Complete	1617	UT LOG
~~B1~~	~~FH 2 / 22~~	~~Flushing Complete~~		
B1	FH 5 / 7	Flushing	1617	UT LOG
B1	FH 8 / 5	Flushing	1530	UT LOG
E1	FH 950 / 19	Flushing	1700	UT LOG
E1	FH 946 / 11	Flushing	1400	UT LOG
C2	FH214	shut down	0830	UT LOG

ENCL (1)

C3	FH 105	Flushing	1757	KTR LOG
C2	FH243	shut down	0833	UT LOG
C2	FH337	shut down	0901	UT LOG
C2	FH225	shut down	0904	UT LOG
C3	FH111	shut down	0910	UT LOG
E1	FH933	shut down	0956	UT LOG
C3	FH236	shut down	1015	UT LOG
C3	FH230	shut down	1021	UT LOG
E1	FH942	shut down	1042	UT LOG
G1	FH26	shut down	0759	UT LOG
B1	FH3	shut down	1109	UT LOG
B1	FH4	shut down	1132	UT LOG
A3	FH18	shut down	1142	UT LOG
C3	FH179	shut down	1207	UT LOG

Parada, John J LT USN NCG 1 (USA)

From: SZCZEPANIK, BRITTANY A 2d Lt USAF AETC 71 STUS/STU <brittany.szczepanik.1@us.af.mil>
Sent: Thursday, January 6, 2022 10:36 PM
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Cc: 647 CES/UCC
Subject: INFO: 20220106 0800L - 2000L JBPHH DWDSRP Flush Report
Attachments: 20220106 0800L - 2000L JBPHH DWDSRP Flush Report.pdf
Signed By: brittany.szczepanik.1@us.af.mil

Ladies & Gentlemen,

Attached is the flush report for Thursday, 06 Jan 22, 0800L – 2000L. Below is a summary of current distribution flushing.

Current Location Summary:

Zone	Hydrant / GAC	Latest Status	Time	Source
F2	FH 5 / 20	Flushing Complete	0854	UT Log
C2	FH 318 / 25	Flushing Complete	1000	UT Log
C2	FH 300 / 23	Flushing Complete		
C2	FH 315 / 10	Flushing Complete	1033	UT Log
F2	FH 19 / 12	Flushing Complete	0900	UT Log
F2	FH 33	Flushing Complete	0932	UT Log
F2	FH 14 / 17	Flushing Complete	0840	UT Log
F2	FH 7	Flushing Complete	1600	UT Log
F2	FH 25	Flushing Complete	1630	UT Log
D4	FH 457	Flushing Complete	1152	UT Log
E1	FH 926	Flushing Complete		
G1	FH 26 / 4	Flushing		

ENCL (1)

			Time	Source
E1	FH ID 927 / 19	Flushing	0921	UT Log
E1	FH ID 931 / 18	Flushing	On 0729-Off 1202	UT Log
C3	FH 179 / 7	Flushing	1200	UT Log
B1	FH 4 / 22	Flushing	1238	UT Log
E1	FH 933 /11	Flushing		
C2	FH 337 / 17	Flushing	1400	UT Log
F2	FH 214 / 8	Flushing Complete	1004	UT Log
C2	FH 225 / 5	Flushing	2006	UT Log
A3	FH 18 / 14	Flushing	2245	UT Log
C2	FH 243 / 6	Flushing	On 1250-Off 1806	UT Log
D4	FH 488 / 16	Flushing	1950	UT Log
C3	FH 230 / 23	Flushing	1802	UT Log
E1	FH 942 / 20	Flushing	1719	UT Log
C3	FH 111 /10	Flushing	1920	UT Log
B1	FH 3 / 12	Flushing	1830	UT Log
C3	FH 236 / 25	Flushing		
D4	FH 168	Flushing Complete	0450	UT Log
E1	FH 924	Flushing Complete	0805	UT Log

Project Programmer/ ICAP Engineer
NAVFAC HI, FMD JBPHH
647 CES/CEN
DSN: 448-2795

Parada, John J LT USN NCG 1 (USA)

From: SZCZEPANIK, BRITTANY A 2d Lt USAF AETC 71 STUS/STU <brittany.szczepanik.1@us.af.mil>
Sent: Friday, January 7, 2022 10:18 PM
To: Wiley, Scottie R Maj USAF 647 ABG (USA); Kelly, Austin A 1st Lt USAF 647 ABG (USA); craig.m.joseph@navy.mil; Duarte, Israel A MSgt USAF (USA); peter.a.ahleong1@navy.mil; jason.a.collins2@navy.mil; Williams, Malcolm J Capt USAF 647 ABG (USA); carl.chase@navy.mil; nicholas.d.cruz@navy.mil; scott.d.wieser; Gruber, Marjorie J LCDR USN CBMU 303 (USA); nicholas.d.cruz@navy.mil; Asistio, Maria Angela Grace L 2d LT USAF USN NAVFAC HAWAII PEARL (USA); Huang, Andy D CIV USN NAVFAC HAWAII PEARL (USA); Spencer, Matthew A CIV USN COMNAVREG SW SAN CA (USA); Poche, Brennan W LT USN NAVFAC HAWAII PEARL (USA); malcolm.williams@navy.mil; Donovan, Luke T Lt Col USAF 49 MSG (USA); Beattie, Aaron J MAJ USARMY USARPAC (USA); 647 CES/UCC; Howard, Spencer L LT USN CBMU 303 (USA); brent.t.natsuhara@navy.mil; jimmy.cope@navy.mil; Baranowski, Phillip J CPO USN NAVFAC SE JAX FL (USA); john.parada@navy.mil; Hawkins, Brian A PO1 USN NAS KEY WEST FL (USA); Barr, Justin A PO2 USN (USA); Harris, Jamel W PO2 USN (USA); Johnson, Jamaria T PO2 USN (USA); gregory.e.credle@navy.mil; Lett, Julius J SMSgt USAF (USA); nicholas.d.cruz@navy.mil; kevin.lachat@navy.mil; Asistio, Maria Angela Grace L 2d LT USAF USN NAVFAC HAWAII PEARL (USA); EDWARDS, PHYLYSHA C SSgt USAF PACAF 647 CES/CEOER; Pendleton, Cole R SrA USAF 647 ABG (USA); Mchenry, Kevin G MSgt USAF 647 ABG (USA); Corum, Michael L II MSgt USAF 647 ABG (USA); CORUM, MICHAEL L II MSgt USAF PACAF 647 CES/CEN
Cc: 647 CES/UCC
Subject: INFO: 20220106 2000L - 0800L JBPHH DWDSRP Flush Report
Signed By: brittany.szczepanik.1@us.af.mil

Ladies & Gentlemen,

Attached is the flush report for Thursday/Friday, 06/07 Jan 22, 2000L – 0800L. Below is a summary of current distribution flushing.

Current Location Summary:

2000 - 0800 6/7 Jan 2022			Time	Source
E1	FH 926	Flushing Complete	On 0522-Off 0854	UT Log
G1	FH 26 / 4	Flushing Complete	On 0522-Off 0759	UT Log
E1	FH ID 927 / 19	Flushing Complete	0745	UT Log
E1	FH ID 931 / 18	Flushing Complete	0645	UT Log
C3	FH 179 / 7	Flushing Complete	1207	UT Log
B1	FH 4 / 22	Flushing Complete	1132	UT Log
E1	FH 933 /11	Flushing Complete	0956	UT Log
C2	FH 337 / 17	Flushing Complete	0901	UT Log
F2	FH 214 / 8	Flushing Complete	0830	UT Log
C2	FH 225 / 5	Flushing Complete	0904	UT Log
A3	FH 18 / 14	Flushing Complete	1142	UT Log
C2	FH 243 / 6	Flushing Complete	0833	UT Log
D4	FH 488 / 16	Flushing Complete	0445	UT Log

ENCL (1)

			Time	Source
C3	FH 230 / 23	Flushing Complete	1021	UT Log
E1	FH 942 / 20	Flushing Complete	1042	UT Log
C3	FH 111 /10	Flushing Complete	0910	UT Log
B1	FH 3 / 12	Flushing	No Change	KTR Log
C3	FH 236 / 25	Flushing Complete	1015	UT Log
D4	FH 637	Flushing	On 1814-Off 2345	UT & KTR Log
B1	FH 3	Flushing Complete	1109	UT Log
E1	FH 946	Flushing Complete	On 1400-Off 2224	UT Log
B1	FH 8	Flushing Complete	On 1530-Off 2255	UT Log
A3	FH 56	Flushing Complete	On 1434-Off 1715	UT Log
B1	FH 5	Flushing Complete	On 1617-Off 2235	UT Log
A3	FH 34	Flushing Complete	On 1409-Off 2124	KTR Log
A3	LFH 2	Flushing Complete	On 1644-Off 1847	UT Log
E1	FH 950	Flushing Complete	On 1700-Off 2308	UT Log
C3	FH 119	Flushing Complete	On 1615-Off 2100	EWG Log
C3	FH 128	Flushing Complete	On 1715-Off 2100	EWG Log
C3	FH 129	Flushing Complete	On 1620-Off 2100	EWG Log
C3	FH 135	Flushing Complete	On 1637-Off 2100	EWG Log
D4	FH 567	Flushing Complete	On 1015-Off 2330	UT Log

Cruz, Nicholas D LT USN NAVFAC SE JAX FL (USA)

From: SZCZEPANIK, BRITTANY A 2d Lt USAF AETC 71 STUS/STU <brittany.szczepanik.1@us.af.mil>
Sent: Friday, January 7, 2022 10:16 PM
To: Wiley, Scottie R Maj USAF 647 ABG (USA); Kelly, Austin A 1st Lt USAF 647 ABG (USA); craig.m.joseph@navy.mil; Duarte, Israel A MSgt USAF (USA); peter.a.ahleong1@navy.mil; jason.a.collins2@navy.mil; Williams, Malcolm J Capt USAF 647 ABG (USA); carl.chase@navy.mil; nicholas.d.cruz@navy.mil; scott.d.wieser; Gruber, Marjorie J LCDR USN CBMU 303 (USA); nicholas.d.cruz@navy.mil; Asistio, Maria Angela Grace L 2d LT USAF USN NAVFAC HAWAII PEARL (USA); Huang, Andy D CIV USN NAVFAC HAWAII PEARL (USA); Spencer, Matthew A CIV USN COMNAVREG SW SAN CA (USA); Poche, Brennan W LT USN NAVFAC HAWAII PEARL (USA); malcolm.williams@navy.mil; Donovan, Luke T Lt Col USAF 49 MSG (USA); Beattie, Aaron J MAJ USARMY USARPAC (USA); 647 CES/UCC; Howard, Spencer L LT USN CBMU 303 (USA); brent.t.natsuhara@navy.mil; jimmy.cope@navy.mil; Baranowski, Phillip J CPO USN NAVFAC SE JAX FL (USA); john.parada@navy.mil; Hawkins, Brian A PO1 USN NAS KEY WEST FL (USA); Barr, Justin A PO2 USN (USA); Harris, Jamel W PO2 USN (USA); Johnson, Jamaria T PO2 USN (USA); gregory.e.credle@navy.mil; Lett, Julius J SMSgt USAF (USA); nicholas.d.cruz@navy.mil; kevin.lachat@navy.mil; Asistio, Maria Angela Grace L 2d LT USAF USN NAVFAC HAWAII PEARL (USA); EDWARDS, PHYLYSHA C SSgt USAF PACAF 647 CES/CEOER; Pendleton, Cole R SrA USAF 647 ABG (USA); Mchenry, Kevin G MSgt USAF 647 ABG (USA); Corum, Michael L II MSgt USAF 647 ABG (USA); CORUM, MICHAEL L II MSgt USAF PACAF 647 CES/CEN
Cc: 647 CES/UCC
Subject: INFO: 20220106 0800L - 2000L JBPHH DWDSRP Flush Report
Attachments: 20220107 0800L - 2000L JBPHH DWDSRP Flush Report.pdf
Signed By: brittany.szczepanik.1@us.af.mil

Ladies & Gentlemen,

Attached is the flush report for Friday, 07 Jan 22, 0800L – 2000L. Below is a summary of current distribution flushing.

Current Location Summary:

0800-2000 7 Jan 2022				
A3	FH 2	Flushing	1644	UT LOG
A3	FH 34	Flushing Complete	1409	UT LOG
D4	FH 637	Flushing	on 0942. off 1043	UT LOG
D4	FH 567	Flushing	1015	UT LOG
A3	FH 56	Flushing Complete	on 1434, off 1715	UT LOG
~~A3~~	~~FH 59~~	~~Flushing Complete~~		
A3	SA LFH-2 / 17	Flushing Complete	1617	UT LOG
~~B1~~	~~FH 2 / 22~~	~~Flushing Complete~~		
B1	FH 5 / 7	Flushing	1617	UT LOG
B1	FH 8 / 5	Flushing	1530	UT LOG
E1	FH 950 / 19	Flushing	1700	UT LOG
E1	FH 946 / 11	Flushing	1400	UT LOG
C2	FH214	shut down	0830	UT LOG

ENCL (1)

C3	FH 105	Flushing	1757	KTR LOG
C2	FH243	shut down	0833	UT LOG
C2	FH337	shut down	0901	UT LOG
C2	FH225	shut down	0904	UT LOG
C3	FH111	shut down	0910	UT LOG
E1	FH933	shut down	0956	UT LOG
C3	FH236	shut down	1015	UT LOG
C3	FH230	shut down	1021	UT LOG
E1	FH942	shut down	1042	UT LOG
G1	FH26	shut down	0759	UT LOG
B1	FH3	shut down	1109	UT LOG
B1	FH4	shut down	1132	UT LOG
A3	FH18	shut down	1142	UT LOG
C3	FH179	shut down	1207	UT LOG

Cruz, Nicholas D LT USN NAVFAC SE JAX FL (USA)

From: SZCZEPANIK, BRITTANY A 2d Lt USAF AETC 71 STUS/STU <brittany.szczepanik.1@us.af.mil>
Sent: Friday, January 7, 2022 10:16 PM
To: Wiley, Scottie R Maj USAF 647 ABG (USA); Kelly, Austin A 1st Lt USAF 647 ABG (USA); craig.m.joseph@navy.mil; Duarte, Israel A MSgt USAF (USA); peter.a.ahleong1@navy.mil; jason.a.collins2@navy.mil; Williams, Malcolm J Capt USAF 647 ABG (USA); carl.chase@navy.mil; nicholas.d.cruz@navy.mil; scott.d.wieser; Gruber, Marjorie J LCDR USN CBMU 303 (USA); nicholas.d.cruz@navy.mil; Asistio, Maria Angela Grace L 2d LT USAF USN NAVFAC HAWAII PEARL (USA); Huang, Andy D CIV USN NAVFAC HAWAII PEARL (USA); Spencer, Matthew A CIV USN COMNAVREG SW SAN CA (USA); Poche, Brennan W LT USN NAVFAC HAWAII PEARL (USA); malcolm.williams@navy.mil; Donovan, Luke T Lt Col USAF 49 MSG (USA); Beattie, Aaron J MAJ USARMY USARPAC (USA); 647 CES/UCC; Howard, Spencer L LT USN CBMU 303 (USA); brent.t.natsuhara@navy.mil; jimmy.cope@navy.mil; Baranowski, Phillip J CPO USN NAVFAC SE JAX FL (USA); john.parada@navy.mil; Hawkins, Brian A PO1 USN NAS KEY WEST FL (USA); Barr, Justin A PO2 USN (USA); Harris, Jamel W PO2 USN (USA); Johnson, Jamaria T PO2 USN (USA); gregory.e.credle@navy.mil; Lett, Julius J SMSgt USAF (USA); nicholas.d.cruz@navy.mil; kevin.lachat@navy.mil; Asistio, Maria Angela Grace L 2d LT USAF USN NAVFAC HAWAII PEARL (USA); EDWARDS, PHYLYSHA C SSgt USAF PACAF 647 CES/CEOER; Pendleton, Cole R SrA USAF 647 ABG (USA); Mchenry, Kevin G MSgt USAF 647 ABG (USA); Corum, Michael L II MSgt USAF 647 ABG (USA); CORUM, MICHAEL L II MSgt USAF PACAF 647 CES/CEN
Cc: 647 CES/UCC
Subject: INFO: 20220106 0800L - 2000L JBPHH DWDSRP Flush Report
Attachments: 20220107 0800L - 2000L JBPHH DWDSRP Flush Report.pdf
Signed By: brittany.szczepanik.1@us.af.mil

Ladies & Gentlemen,

Attached is the flush report for Friday, 07 Jan 22, 0800L – 2000L. Below is a summary of current distribution flushing.

Current Location Summary:

0800-2000 7 Jan 2022				
A3	FH 2	Flushing	1644	UT LOG
A3	FH 34	Flushing Complete	1409	UT LOG
D4	FH 637	Flushing	on 0942. off 1043	UT LOG
D4	FH 567	Flushing	1015	UT LOG
A3	FH 56	Flushing Complete	on 1434, off 1715	UT LOG
~~A3~~	~~FH 59~~	~~Flushing Complete~~		
A3	SA LFH-2 / 17	Flushing Complete	1617	UT LOG
~~B1~~	~~FH 2 / 22~~	~~Flushing Complete~~		
B1	FH 5 / 7	Flushing	1617	UT LOG
B1	FH 8 / 5	Flushing	1530	UT LOG
E1	FH 950 / 19	Flushing	1700	UT LOG
E1	FH 946 / 11	Flushing	1400	UT LOG
C2	FH214	shut down	0830	UT LOG

ENCL (1)

C3	FH 105	Flushing	1757	KTR LOG
C2	FH243	shut down	0833	UT LOG
C2	FH337	shut down	0901	UT LOG
C2	FH225	shut down	0904	UT LOG
C3	FH111	shut down	0910	UT LOG
E1	FH933	shut down	0956	UT LOG
C3	FH236	shut down	1015	UT LOG
C3	FH230	shut down	1021	UT LOG
E1	FH942	shut down	1042	UT LOG
G1	FH26	shut down	0759	UT LOG
B1	FH3	shut down	1109	UT LOG
B1	FH4	shut down	1132	UT LOG
A3	FH18	shut down	1142	UT LOG
C3	FH179	shut down	1207	UT LOG

Parada, John J LT USN NCG 1 (USA)

From: AhLeong, Peter A MSgt USAF 647 ABG (USA) <peter.a.ahleong1@navy.mil>
Sent: Saturday, January 8, 2022 3:04 AM
To: Kelly, Austin A 1st Lt USAF 647 ABG (USA); Wiley, Scottie R Maj USAF 647 ABG (USA); Collins, Jason A CMSgt USAF USN NAVFAC HAWAII PEARL (USA); Duarte, Israel A MSgt USAF (USA); Gruber, Marjorie J LCDR USN CBMU 303 (USA); Mchenry, Kevin G MSgt USAF 647 ABG (USA); Credle, Gregory E III PO2 USN (USA); carl.chase@navy.mil; Cope, Jimmy Lee CPO USN COMEXSTRKGRU TWO (USA); Hawkins, Brian A PO1 USN NAS KEY WEST FL (USA); Szczepanik, Brittany A 2d LT USAF (USA); Huang, Andy D CIV USN NAVFAC HAWAII PEARL (USA); nicholas.d.cruz@navy.mil; scott.d.wieser; john.parada@navy.mil; Baranowski, Phillip J CPO USN NAVFAC SE JAX FL (USA); Natsuhara, Brent T LT USN NAVFAC MARIANAS GU (USA); Asistio, Maria Angela Grace L 2d LT USAF USN NAVFAC HAWAII PEARL (USA); Spencer, Matthew A CIV USN COMNAVREG SW SAN CA (USA); Poche, Brennan W LT USN NAVFAC HAWAII PEARL (USA); Donovan, Luke T Lt Col USAF 49 MSG (USA); kevin.lachat@navy.mil; Lett, Julius J SMSgt USAF (USA); Beattie, Aaron J MAJ USARMY USARPAC (USA); Huang, Andy D CIV USN NAVFAC HAWAII PEARL (USA); Barr, Justin A PO2 USN (USA); Diaz-Citan, Byron J CIV USN COMNAVFACENGCOM DC (USA); john.f.daly2@navy.mil; Yoshimoto, Barbara-jean A (Bobbi) CIV USN NAVFAC HAWAII PEARL (USA)
Cc: 647 CES/UCC
Subject: INFO: 20220107 - 20220108 2000L - 0800L JBPHH DWDSRP Flush Report
Attachments: 7 - 8 Jan 2022 2000L - 0800L JBPHH DWDSRP Flush Report.pdf
Signed By: peter.ahleong@us.af.mil

Ladies & Gentlemen,

Aloha, attached is the flush report for Friday, 07- 08 Jan 22, 2000L – 0800L. Below is a summary of current distribution flushing.

2000L - 0800L, 7 - 8 Jan 2022			
Zone	**Hydrant / GAC**	**Latest Status**	**Time (stop)**
A3	FH 2 / 20	Flushing Stopped (Complete)	1/8/2022 1:40
A3	FH 34 / 14	Flushing Stopped (Complete)	2105 7 Jan
D4	FH 637 / 21	Flushing Stopped (Complete)	2340 7 Jan
D4	FH 567 / 16	Flushing Stopped (Complete)	0009 8 Jan
A3	FH 59 / 23	Flushing Stopped (Complete)	0116 8 Jan
A3	SA LFH-2 / 17	Flushing Stopped (Complete)	2022 7 Jan
B1	FH 2 / 22	Flushing stopped (Complete)	2102 7 Jan
B1	FH 5 / 7	Flushing Stopped (Complete)	2235 7 Jan
B1	FH 8 / 5	Flushing Stopped (Complete)	2256 7 Jan
E1	FH 950 / 19	Flushing Stopped (Complete)	2312 7 Jan
E1	FH 946 / 11	Flushing Stopped (Complete)	2222 7 Jan
C3	FH 105 / 10	Flushing Stopped (Complete)	2221 7 Jan

C3	FH 119	Flushing Complete	On 1615-Off 2100	EWG Log
C3	FH 128	Flushing Complete	On 1715-Off 2100	EWG Log
C3	FH 129	Flushing Complete	On 1620-Off 2100	EWG Log
C3	FH 135	Flushing Complete	On 1637-Off 2100	EWG Log

ENCL (1)

Cruz, Nicholas D LT USN NAVFAC SE JAX FL (USA)

From: SZCZEPANIK, BRITTANY A 2d Lt USAF AETC 71 STUS/STU <brittany.szczepanik.1@us.af.mil>
Sent: Friday, January 7, 2022 10:16 PM
To: Wiley, Scottie R Maj USAF 647 ABG (USA); Kelly, Austin A 1st Lt USAF 647 ABG (USA); craig.m.joseph@navy.mil; Duarte, Israel A MSgt USAF (USA); peter.a.ahleong1@navy.mil; jason.a.collins2@navy.mil; Williams, Malcolm J Capt USAF 647 ABG (USA); carl.chase@navy.mil; nicholas.d.cruz@navy.mil; scott.d.wieser; Gruber, Marjorie J LCDR USN CBMU 303 (USA); nicholas.d.cruz@navy.mil; Asistio, Maria Angela Grace L 2d LT USAF USN NAVFAC HAWAII PEARL (USA); Huang, Andy D CIV USN NAVFAC HAWAII PEARL (USA); Spencer, Matthew A CIV USN COMNAVREG SW SAN CA (USA); Poche, Brennan W LT USN NAVFAC HAWAII PEARL (USA); malcolm.williams@navy.mil; Donovan, Luke T Lt Col USAF 49 MSG (USA); Beattie, Aaron J MAJ USARMY USARPAC (USA); 647 CES/UCC; Howard, Spencer L LT USN CBMU 303 (USA); brent.t.natsuhara@navy.mil; jimmy.cope@navy.mil; Baranowski, Phillip J CPO USN NAVFAC SE JAX FL (USA); john.parada@navy.mil; Hawkins, Brian A PO1 USN NAS KEY WEST FL (USA); Barr, Justin A PO2 USN (USA); Harris, Jamel W PO2 USN (USA); Johnson, Jamaria T PO2 USN (USA); gregory.e.credle@navy.mil; Lett, Julius J SMSgt USAF (USA); nicholas.d.cruz@navy.mil; kevin.lachat@navy.mil; Asistio, Maria Angela Grace L 2d LT USAF USN NAVFAC HAWAII PEARL (USA); EDWARDS, PHYLYSHA C SSgt USAF PACAF 647 CES/CEOER; Pendleton, Cole R SrA USAF 647 ABG (USA); Mchenry, Kevin G MSgt USAF 647 ABG (USA); Corum, Michael L II MSgt USAF 647 ABG (USA); CORUM, MICHAEL L II MSgt USAF PACAF 647 CES/CEN
Cc: 647 CES/UCC
Subject: INFO: 20220106 0800L - 2000L JBPHH DWDSRP Flush Report
Attachments: 20220107 0800L - 2000L JBPHH DWDSRP Flush Report.pdf
Signed By: brittany.szczepanik.1@us.af.mil

Ladies & Gentlemen,

Attached is the flush report for Friday, 07 Jan 22, 0800L – 2000L. Below is a summary of current distribution flushing.

Current Location Summary:

0800-2000 7 Jan 2022				
A3	FH 2	Flushing	1644	UT LOG
A3	FH 34	Flushing Complete	1409	UT LOG
D4	FH 637	Flushing	on 0942. off 1043	UT LOG
D4	FH 567	Flushing	1015	UT LOG
A3	FH 56	Flushing Complete	on 1434, off 1715	UT LOG
~~A3~~	~~FH 59~~	~~Flushing Complete~~		
A3	SA LFH-2 / 17	Flushing Complete	1617	UT LOG
~~B1~~	~~FH 2 / 22~~	~~Flushing Complete~~		
B1	FH 5 / 7	Flushing	1617	UT LOG
B1	FH 8 / 5	Flushing	1530	UT LOG
E1	FH 950 / 19	Flushing	1700	UT LOG
E1	FH 946 / 11	Flushing	1400	UT LOG
C2	FH214	shut down	0830	UT LOG

ENCL (1)

C3	FH 105	Flushing	1757	KTR LOG
C2	FH243	shut down	0833	UT LOG
C2	FH337	shut down	0901	UT LOG
C2	FH225	shut down	0904	UT LOG
C3	FH111	shut down	0910	UT LOG
E1	FH933	shut down	0956	UT LOG
C3	FH236	shut down	1015	UT LOG
C3	FH230	shut down	1021	UT LOG
E1	FH942	shut down	1042	UT LOG
G1	FH26	shut down	0759	UT LOG
B1	FH3	shut down	1109	UT LOG
B1	FH4	shut down	1132	UT LOG
A3	FH18	shut down	1142	UT LOG
C3	FH179	shut down	1207	UT LOG

Parada, John J LT USN NCG 1 (USA)

From: AhLeong, Peter A MSgt USAF 647 ABG (USA) <peter.a.ahleong1@navy.mil>
Sent: Saturday, January 8, 2022 3:04 AM
To: Kelly, Austin A 1st Lt USAF 647 ABG (USA); Wiley, Scottie R Maj USAF 647 ABG (USA); Collins, Jason A CMSgt USAF USN NAVFAC HAWAII PEARL (USA); Duarte, Israel A MSgt USAF (USA); Gruber, Marjorie J LCDR USN CBMU 303 (USA); Mchenry, Kevin G MSgt USAF 647 ABG (USA); Credle, Gregory E III PO2 USN (USA); carl.chase@navy.mil; Cope, Jimmy Lee CPO USN COMEXSTRKGRU TWO (USA); Hawkins, Brian A PO1 USN NAS KEY WEST FL (USA); Szczepanik, Brittany A 2d LT USAF (USA); Huang, Andy D CIV USN NAVFAC HAWAII PEARL (USA); nicholas.d.cruz@navy.mil; scott.d.wieser; john.parada@navy.mil; Baranowski, Phillip J CPO USN NAVFAC SE JAX FL (USA); Natsuhara, Brent T LT USN NAVFAC MARIANAS GU (USA); Asistio, Maria Angela Grace L 2d LT USAF USN NAVFAC HAWAII PEARL (USA); Spencer, Matthew A CIV USN COMNAVREG SW SAN CA (USA); Poche, Brennan W LT USN NAVFAC HAWAII PEARL (USA); Donovan, Luke T Lt Col USAF 49 MSG (USA); kevin.lachat@navy.mil; Lett, Julius J SMSgt USAF (USA); Beattie, Aaron J MAJ USARMY USARPAC (USA); Huang, Andy D CIV USN NAVFAC HAWAII PEARL (USA); Barr, Justin A PO2 USN (USA); Diaz-Citan, Byron J CIV USN COMNAVFACENGCOM DC (USA); john.f.daly2@navy.mil; Yoshimoto, Barbara-jean A (Bobbi) CIV USN NAVFAC HAWAII PEARL (USA)
Cc: 647 CES/UCC
Subject: INFO: 20220107 - 20220108 2000L - 0800L JBPHH DWDSRP Flush Report
Attachments: 7 - 8 Jan 2022 2000L - 0800L JBPHH DWDSRP Flush Report.pdf
Signed By: peter.ahleong@us.af.mil

Ladies & Gentlemen,

Aloha, attached is the flush report for Friday, 07- 08 Jan 22, 2000L – 0800L. Below is a summary of current distribution flushing.

2000L - 0800L, 7 - 8 Jan 2022			
Zone	**Hydrant / GAC**	**Latest Status**	**Time (stop)**
A3	FH 2 / 20	Flushing Stopped (Complete)	1/8/2022 1:40
A3	FH 34 / 14	Flushing Stopped (Complete)	2105 7 Jan
D4	FH 637 / 21	Flushing Stopped (Complete)	2340 7 Jan
D4	FH 567 / 16	Flushing Stopped (Complete)	0009 8 Jan
A3	FH 59 / 23	Flushing Stopped (Complete)	0116 8 Jan
A3	SA LFH-2 / 17	Flushing Stopped (Complete)	2022 7 Jan
B1	FH 2 / 22	Flushing stopped (Complete)	2102 7 Jan
B1	FH 5 / 7	Flushing Stopped (Complete)	2235 7 Jan
B1	FH 8 / 5	Flushing Stopped (Complete)	2256 7 Jan
E1	FH 950 / 19	Flushing Stopped (Complete)	2312 7 Jan
E1	FH 946 / 11	Flushing Stopped (Complete)	2222 7 Jan
C3	FH 105 / 10	Flushing Stopped (Complete)	2221 7 Jan

C3	FH 119	Flushing Complete	On 1615-Off 2100	EWG Log
C3	FH 128	Flushing Complete	On 1715-Off 2100	EWG Log
C3	FH 129	Flushing Complete	On 1620-Off 2100	EWG Log
C3	FH 135	Flushing Complete	On 1637-Off 2100	EWG Log

ENCL (1)

February 26, 2022

From: Naval Facilities Engineering Systems Command Representative, IDWS Team
To: Interagency Drinking Water System Team

SUBJ: WATER STORAGE FACILITIES AND WATER SOURCE FOR ZONES A1, A2, A3, B1, C1, C2, C3, D1, D2, D3, D4, G1, E1, F1, F2, H1, H2, H3, AND I1

Ref: (a) Drinking Water Sampling Plan, December 2021
(b) Drinking Water Distribution System Recovery Plan, December 2021

Encl: (1) Joint Base Pearl Harbor Hickam Potable Water System Description
(2) S1 and S2 Water Storage Tank Flushing Report Memo
(3) Inspection, Maintenance, and Cleaning of Potable Water Tanks Memo
(4) Ford Island/Shipyard Water Transmission Line Status
(5) JBPHH/Iroquois Point Water Transmission Line Status
(6) Board of Water Supply Interconnection Status

1. This letter and associated enclosures describes and documents the flushing of the water storage facilities that serve the Joint Base Pearl Harbor Hickam (JBPHH) public water system (PWS No. 360). The flushing of the JBPHH water storage facilities and distribution system was completed in accordance with reference (a) and (b). Enclosure (1) describes the JBPHH public water system and storage tanks associated with the system. Page 8 of reference (a) has the flushing zones and water storage facilities located in each zone. The flushing of each zone identified in phase 1 of reference (a) included five volumetric turnovers. The volumetric turnover requirement included the water tank storage and distribution system volume for each zone. The water testing of the distribution system after flushing a zone's water storage tank and distribution system was the confirmation that contamination was removed from the system and that the water tanks was not a source of contamination. Enclosure (2) documents the Hawaii Department of Health's approved change from reference (a) for the flushing of Halawa S-1 and Halawa S-2.

2. Zones A1, A2, A3, B1, C1, C2, C3, D1, D2, D3, D4, G1, E1, F1, F2, H1, H2, H3 and I1 are currently fed by the Waiawa Shaft water supply source. The pumps from the shafts generally run continuous and range from 6,000 to 14,000 gallons per minute based on the demand of the JBPHH potable water system. The pressure throughout the JBPHH distribution system is aided by the two Halawa water storage tanks. The Halawa S-1 tank is currently in service and the Halawa S-2 tank has been taken offline for maintenance as documented in enclosure (2). Enclosure (3) documents the planned timeline associated with the inspection, maintenance and cleaning of the Navy owned water storage tanks. The planned work is scheduled to be completed before the end of this calendar year. The inspection of the water storage tanks will be conducted in accordance with American Water Works Association (AWWA) Standard for Inspecting and Repairing Steel Water Tanks, Standpipes, Reservoirs, and Elevated Tanks by personnel with the requisite qualifications outlined in this AWWA standard. Zone I1 (Red Hill) is served by Navy owned water storage tanks. The Army operates the consecutive Aliamanu public water system (PWS No. 337) which receives its water from the JBPHH public water

system. The Army's public water system serves the Aliamanu Military Reservation (AMR). The AMR area was subdivided into three flushing zones which included Zones H1, H2, and H3. The planned timeline associated with the inspection, maintenance, and cleaning of the Army owned water storage tanks will be submitted as part of the removal action reports for Zones H1, H2, H3.

3. At this time, there are two water transmission lines that are not in operation. The water transmission line between Ford Island and the Shipyard was offline at the time of the incident as described in Enclosure (3) and is currently going through repairs. The valves at each end of the underwater water transmission line between JBPHH and Iroquois Point were closed on December 5, 2021 and the valves have remained closed since that date as documented in Enclosure (4). Enclosure (5) documents the method for reopening the underwater water transmission line between JBPHH and Iroquois Point to prevent potential contamination and adverse water quality issues. The Navy will notify the Hawaii Department of Health prior to reopening the underwater water transmission line the between JBPHH and Iroquois Point. Additional interconnections with Board of Water Supply (BWS) are described in Enclosure (6). Water being distributed in the system and being stored in water storage tanks that maintain pressure in Zones A1, A2, A3, B1, C1, C2, C3, D1, D2, D3, D4, G1, E1, F1, and F2 have been flushed in accordance with reference (b) and the distribution system tested in accordance with reference (a). The removal action reports for Zones H1, H2, H3, and I1 document the flushing of the water storage tanks that specifically serve those zones.

4. I certify under penalty of law that I have personally examined and I am familiar with the information submitted and the submitted information is true, accurate, and complete.

MENO.MICHAEL.WAYNE.JR.1088310035

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M. W. Meno
CAPT, CEC, USN

February 26, 2022

Joint Base Pearl Harbor Hickam (JBPHH) Potable Water Description

Major components of the JBPHH potable water system include:

- Supply sources
  - Waiawa Shaft/Pumping Station
  - Red Hill Shaft/Pumping Station
  - Halawa Shaft/Pumping Station
  - Emergency Interconnections (2 locations)
- Water storage facilities
- 2-6,000,000 gallon steel storage tanks at Halawa
  - 2-200,000 gallon concrete storage tanks at Camp Smith
  - 1-250,000 gallon glass-fused steel storage tank at Camp Smith with a usable storage capacity of 140,000 gallons
  - 2-250,000 gallon glass-fused steel storage tank at Red Hill
- Distribution system
  - Camp Smith Booster Pump (to convey water to the Camp Smith water system)
  - Red Hill Booster Pumps (to convey water to the storage tank)
  - Moanalua Terrace Booster Pumps (to pressurize the water system serving the
  - Moanalua Terrace Housing area)
  - Boneyard Booster Pumps (to pressurize the water system serving the upper elevation of Moanalua Terrace Housing area)
  - Manana Booster Pumps (to pressurize the water system servingthe Manana Housing area)
  - A network of pipes, meters, valves, and hydrants for distribution and fire protection

Water Storage Facilities:

Fresh water storage facilities store water for normal, fire, and maximum demand use, and serve to maintain relatively constant pressure in the water system. The JBPHH water system is equipped with two welded steel tanks, each with a storage capacity of six million gallons. These tanks are identified as the Halawa storage tanks S-1 and S-2. Both of these tanks are located adjacent to the Aliamanu Military Reservation at a ground elevation of 140 feet. The diameter of the tanks are 164 feet each, with a nominal height of 48 feet. The spillway elevations of the S-1 and S-2 tanks are 178.5 feet. The tanks are interconnected by a 10-inch line. Water from each of the tanks discharges through separate 24-inch mains and combines to a single 30-inch transmission main.

Other water storage tanks in the JBPHH system include the three tanks at Camp Smith, a storage tank serving the Red Hill Housing area, and three storage tanks serving the Army's Aliamanu Housing area. The Red Hill and Aliamanu tanks are supplied by separate booster pump stations located at the Red Hill Water Pumping Station and the Halawa Storage Tanks, respectively. These tanks are dedicated to serving these two non-Navy housing areas.

February 11, 2022

From: Naval Facilities Engineering Systems Command Representative, IDWS Team
To: Interagency Drinking Water System Team

SUBJ: S1 AND S2 WATER STORAGE TANK FLUSHING REPORT

Ref: (a) Drinking Water Distribution System Recovery Plan, December 2021

1. This letter documents the current status of the S1 and S2 water storage tanks. In accordance with reference (a), the S1 and S2 water storage tanks were part of the Zone F1 flushing plan. The flushing plan for Zone F1 included both water storage tanks in the five volumetric turnover calculations. The calculated turnover volume was 61.35 million gallons of water. The S1 tank was flushed by cycling the water tank for five volumetric flushes. In order to conserve the amount of water being used in the flushing of Zone F1, the S2 water storage tank was taken out of service and remains out of service to date. This decision resulted in the conservation of approximately 25 million gallons of water. The Hawaii Department of Health (HDOH) was notified of the Navy's modified flushing plan and provided concurrence. The S2 water storage tank is being scheduled for cleaning and maintenance. The Navy will provide details to HDOH on the method and procedures for cleaning and maintenance of the S2 water storage tank prior to the start of work. The Navy will notify the HDOH upon completion of the work and the tank being placed back into service.

2. I certify under penalty of law that I have personally examined and I am familiar with the information submitted and the submitted information is true, accurate, and complete.

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Date: 2022.02.12 14:33:42 -10'00'

M. W. Meno
Captain, U.S. Navy Civil Engineer Corps

ENCL(2)

25 February 2022

MEMORANDUM FOR RECORD

SUBJECT: Inspection, Maintenance, and Cleaning of Potable Water Tanks

1. This Memorandum for Record (MFR) is to document the summary processes for inspection, maintaining, and cleaning storage tanks within the Joint Base Pearl Harbor-Hickam potable water system. There are seven potable water storage tanks. Each tank holds water that is consistently in flux – rising and falling according to the dynamic demands for water under certain pressures at specific times. As such, the tanks are continually cycling fresh water recently pumped from the well and chlorinated at the treatment plant. JBPH-H does not drain and clean the tanks per a schedule, however the following records indicate recent cleaning. Tank cleaning follows AWWA M42 - Steel Water Storage Tanks.
    a. S1 tank inspected and cleaned in 2010, cleaned by in-house EV remediation shop, mainly to remove sediment from the tank floor.
    b. S2 tank inspected and cleaned 2007, cleaned by in-house remediation shop, mainly to remove sediment from the tank floor.
    c. Red Hill tank No. 685 was inspected in 2013, via remote camera vehicle
    d. Red Hill tank No. 316 was installed in 2017 and has not yet been inspected
    e. Camp Smith tanks (3) were inspected and cleaned in 2013.

2. As the seven tanks have not been inspected a group for several years, the Public Works Department shall funds and contract a complete inspection and cleaning for all tanks in accordance with AWWA standards by then end CY 2022.

3. Tanks are monitored and operated using a Supervisory Control and Data Acquisition (SCADA) system to ensure that they are at the right levels and pumps and valves are operating at prescribed times and speeds, overseen by Utilities staff 24/7. Our field team is regularly physically engaged with these tanks to ensure functionality, condition, and security of the tanks. There are frequent field actions near and connected to the tanks – they are routinely inspected per the requirements to manage the system.

4. As the tank hardware ages and requires repair and replacement, a tank may be isolated, drained and taken out of service to conduct this work. At these times, when work involved the interior of the tank, a full cleaning and refilling is conducted. This is typically done with a contract.

5. The S2 tank, a 6 MG tank that, with the S1 tank, provides the ability to keep pressurized water in the system for firefighting while serving the domestic demand, has been secured from the rest of the system since December 22, 2021. The water in the tank has been sampled and the results have shown a non-detect for TPH. Public work will make repairs and clean this tank within the next 90 days. The process to flush, clean and return the tank to the system is as follows:
    a. Repair S1/S2 overflow 24” drain line with Cured-in-Place Pipe
    b. Drain S2 tank via existing drain line, leading to the city storm drainage system
    c. Clean and Disinfect S2 tank (Following ANSI/AWWA C652-02: Disinfection of Water-Storage Facilities)
    d. Perform bacteriological and TPH sampling and testing
    e. Return S2 tank to service

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CAPT R. Harmeyer
Public Works Officer
Joint Base Pearl Harbor Hickam

22 February 2022

MEMORANDUM FOR RECORD

SUBJECT: Ford Island/Shipyard Water Transmission Line Status

1. This Memorandum for Record (MFR) is to document the status of the underwater crossing water transmission line (pipe) that connects the Ford Island and Shipyard areas of the Joint Base Pearl Harbor-Hickam Potable Water System.

2. As part of the P-209 Dry Dock 3 Replacement design effort, a contractor was performing soil borings at Hospital Point near the Shipyard. The contractor damaged the 24-inch underwater crossing during one of their borings on 15 June 21, by drilling through the casing and pipe.

3. JBPHH has begun plans for repairing or replacing this damaged line. A Design consultant is scheduled to start the design on the repairs in March of 2022. Construction funds for the repair are allocated for Fiscal Year 2023.

4. The water transmission line was secured from the JBPHH system via an isolation valve on the Ford Island side, and physical pipe removal on the Shipyard side. Enclosure [1] is a picture taken on 22 January 2022 of the physical pipe removal at Hospital Point.

5. The Ford Island isolation valve is less than 5 years old, and PWD personnel have verified in the field that there are no indications of leak-by, via audible tests and noting the lack of vibrations.

6. a pitot-style flow meter that has been sending false readings is located in the currently isolated section is, as there is no water flow in this not-in-service piping. Isolation was performed with in-house NAVFAC forces on 5 Dec 2021. PWD has not explored the root cause of the false reading, as the piping is isolated, and the meter is not used for any other purposes. Possible cause of the flow readings may be air trapped in the lines that shows pressure differentials as tide changes.

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CAPT R. Harmeyer
Public Works Officer
Joint Base Pearl Harbor Hickam

ENCL(4)

25 February 2022

MEMORANDUM FOR RECORD

SUBJECT: Joint Base Pearl Harbor-Hickam – Iroquois Point Water Connection

ENCL.: (1) Interconnection line drainage schematic

1. This Memorandum for Record (MFR) is to document the process to reopen and flush the 24" potable water system interconnection line between Iroquois Point and Bishop Point on Joint Base Pearl Harbor-Hickam.

2. Like most looped systems, the water in this interconnection flows in both directions depending on demand. On work days, when residents are typically not on Iroquois Point and the Joint Base is operating, water typically flows from west to east. On nights and weekends, the water may flow from east to west, depending on if the Kapilina Homes in Iroquois Point is operating the irrigation system, and similarly, what the demand is on the Joint Base proper from housing communities near Bishop Point. The long-term closure of the line is possible because each zone has multiple feeds. The presence of these looped interconnections allows redundancy – if one feed goes off-line for maintenance or unexpectedly, the area has a redundant feed to continue service.

3. The interconnection was secured on 05 Dec. 2021 by closing the gate valve on each end (shore) of the interconnection. The water between these valves has not moved since then. When we bring this section back online, the process will be as follows, and according to the diagram in Enclosure (1).

    a. Secure two additional valves (126 and 130 at West Loch). See Enclosure (1).
    b. Open valve 128 (currently shut) at West Loch
    c. Open valve at Hickam that is currently shut
    d. Open and flush from hydrant no. 64 at West Loch, located between valves 126 and 128.
    e. Flush transmission line for 6-8 hours to the sanitary sewer.
    f. Flushing, chlorination and testing of the transmission main will follow ANSI/AWWA C651-05: Disinfecting Water Mains.
    g. Collect first sample for bacteriological testing after flushing.
    h. Collect second sample (at least 24 hours after first sample) for bacteriological testing.
    i. Open valves 126 and 130 and valves on Bishop Point, completing the loop.

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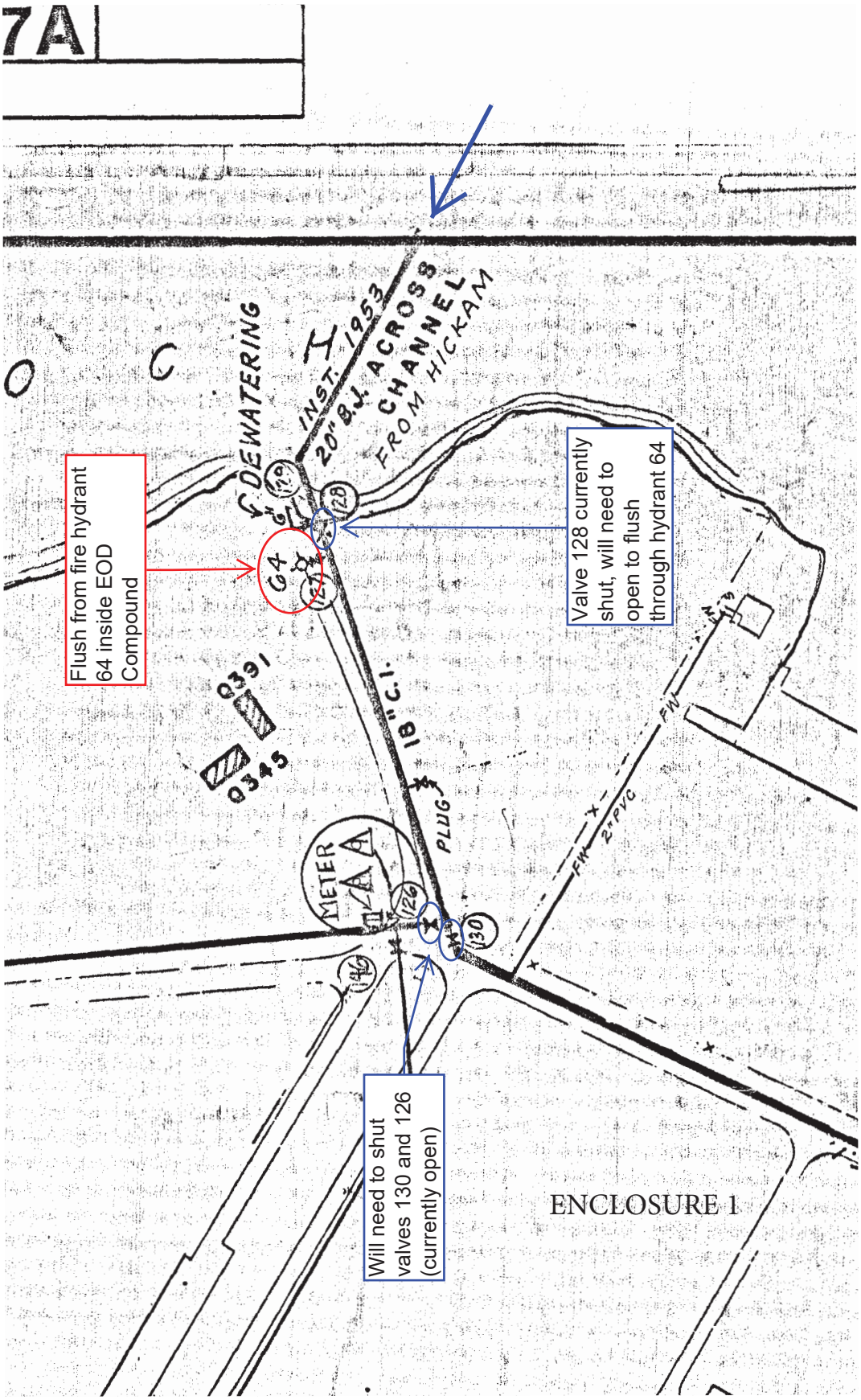
CAPT R. Harmeyer
Public Works Officer
Joint Base Pearl Harbor Hickam


7A
INST. 1953
20" B.J. ACROSS
CHANNEL
FROM HICKAM
DEWATERING
Flush from fire hydrant
64 inside EOD
Compound
Valve 128 currently
shut, will need to
open to flush
through hydrant 64
Will need to shut
valves 130 and 126
(currently open)
ENCLOSURE 1

22 February 2022

MEMORANDUM FOR RECORD

SUBJECT: Board of Water Supply Interconnection Status

Ref: [1] Management Inquiry Into Manana Booster/BWS dtd 29 Dec 2021

1. This Memorandum for Record (MFR) is to document the status of the Board of Water Supply (BWS) interconnections with the Joint Base Pearl Harbor Hickam Potable Water System. The JBPHH system has four interconnection points with BWS: (1) Puuloa Road, (2) Halawa Heights Road, (3) Manana Housing, and (4) Red Hill.

2. BWS physically removed the meters from two of the interconnections, creating an "air gap" between the BWS system and the Navy system at both the Puuloa Road location and the Halawa Heights Road location. BWS performed that work on or around 10 December 2021. PWD personnel confirmed that the meters were removed on 14 December 2021.

3. Red Hill and Manana Housing BWS interconnections are still physically connected. The Red Hill interconnection is isolated on both the BWS side and Navy side of the connection. Manana interconnection was opened on 16 November 2021, and is feeding Manana housing. Isolation valves have been secured from the Navy supply to Manana, to isolate Manana Housing from the JBPHH System (Reference [1]).

4. Prior to December 2017, there was a fifth BWS interconnection with the JBPHH system, located at Geiger Road. The Kalaeloa area of the JBPHH water system was transferred from Navy to the Kalaeloa Water Company in December 2017. The BWS interconnection was included in the transfer. Shortly after the transfer, PWD Utilities personnel physically removed the connection from West Loch to Geiger Road piping, "air gapping" the KWC system and the JBPHH system.

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CAPT R. Harmeyer
Public Works Officer
Joint Base Pearl Harbor Hickam

ENCL(6)

February 24, 2022

From: Naval Facilities Engineering Systems Command Representative, IDWS Team
To: Interagency Drinking Water System Team

SUBJ: ZONE B1 DISTRIBUTION SYSTEM EXCEEDANCE INVESTIGSTION SUMMARY AND RESULTS

Encl: (1) Stage 2 Distribution Sampling Report
(2) Zone B1 Distribution System Sampling Report
(3) AECOM Technical Review of BCEE in sample results

1. The Zone B1 Distribution System sampling results are listed in enclosures (1) and (2). The samples of the distribution system were taken at the hydrants. The categories of the results are broken down into non-detect, detect below limit levels, and exceedance. A non-detect occurs when the laboratory does not detect a measurable amount of an analyte. A detect below limit levels occurs when the laboratory detects a measurable amount of an analyte below Incident Specific Paramaters (ISPs), Department of Health (DoH) Environmental Action Levels (EALs) or Maximum Contaminant Levels (MCLs), or Environmental Protection Agency (EPA) MCLs. An exceedance occurs when the laboratory detects a chemical and the amount detected is higher than established acceptable thresholds. All chemical and metal detections are shown in enclosures (1) and (2). The various agency limits are listed for reference and the result along with the location of the exceedance sample is listed in tabular form. Results highlighted in yellow exceed the ISP. Results in purple font also exceed the EAL. Results in green font also exceed the DOH MCL. Results in blue font also exceed the EPA MCL.

2. Enclosure (1) contains the initial distribution system sample results for Zone B1. The sample results included a detection of bis (2-chloroethyl) ether (BCEE) at 2.6 ppb. After the initial review, the IDWST members suspected that using the SW-846 8270 analytical method may be resulting in false positives. Enclosure (2) documents additional distribution samples that were taken in Zone B1. The sample results were below the MCLs and applicable ISPs. Enclosure (3) documents the technical review of BCEE sample results. Enclosure (3) states: “a thorough re-evaluation of the referenced analytical data and professional judgment, the results of these twelve indicated samples were preliminarily reported in error and have been amended in the final results to be non-detect for Bis(2-chloroethyl)ether.” Subsequent sample results shown in enclosure (3) were non-detect for BCEE. Based on this information, there were no sample results above the MCLs or sample results above an ISP for the Zone B1 distribution system that required further investigation.

3. I certify under penalty of law that I have personally examined and I am familiar with the information submitted and the submitted information is true, accurate, and complete.

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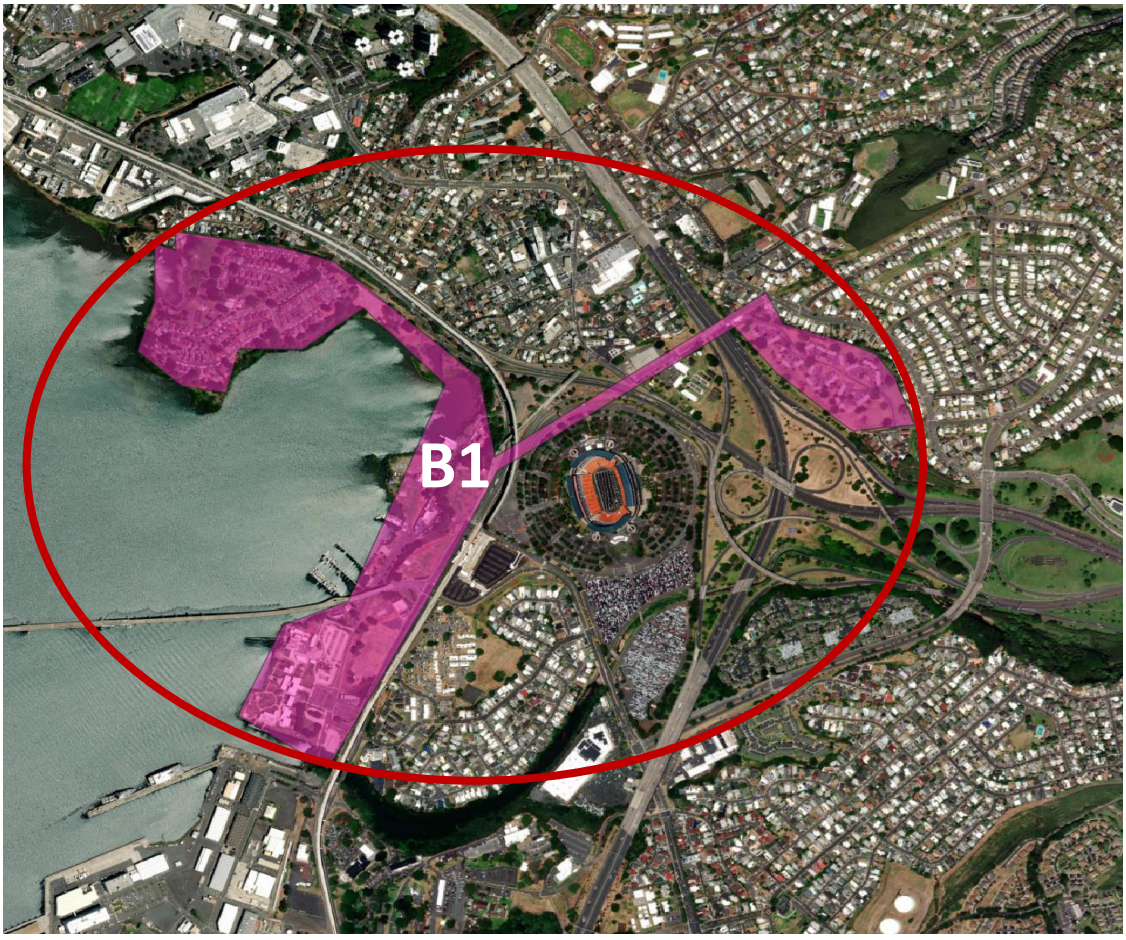
M. W. Meno
CAPT, CEC, USN

Interagency Drinking Water System Team

Drinking Water Distribution System Recovery Plan: *Stage 2 Sampling Results for Zone B1*

Joint Base Pearl-Hickam (JBPHH)

01 February 2022



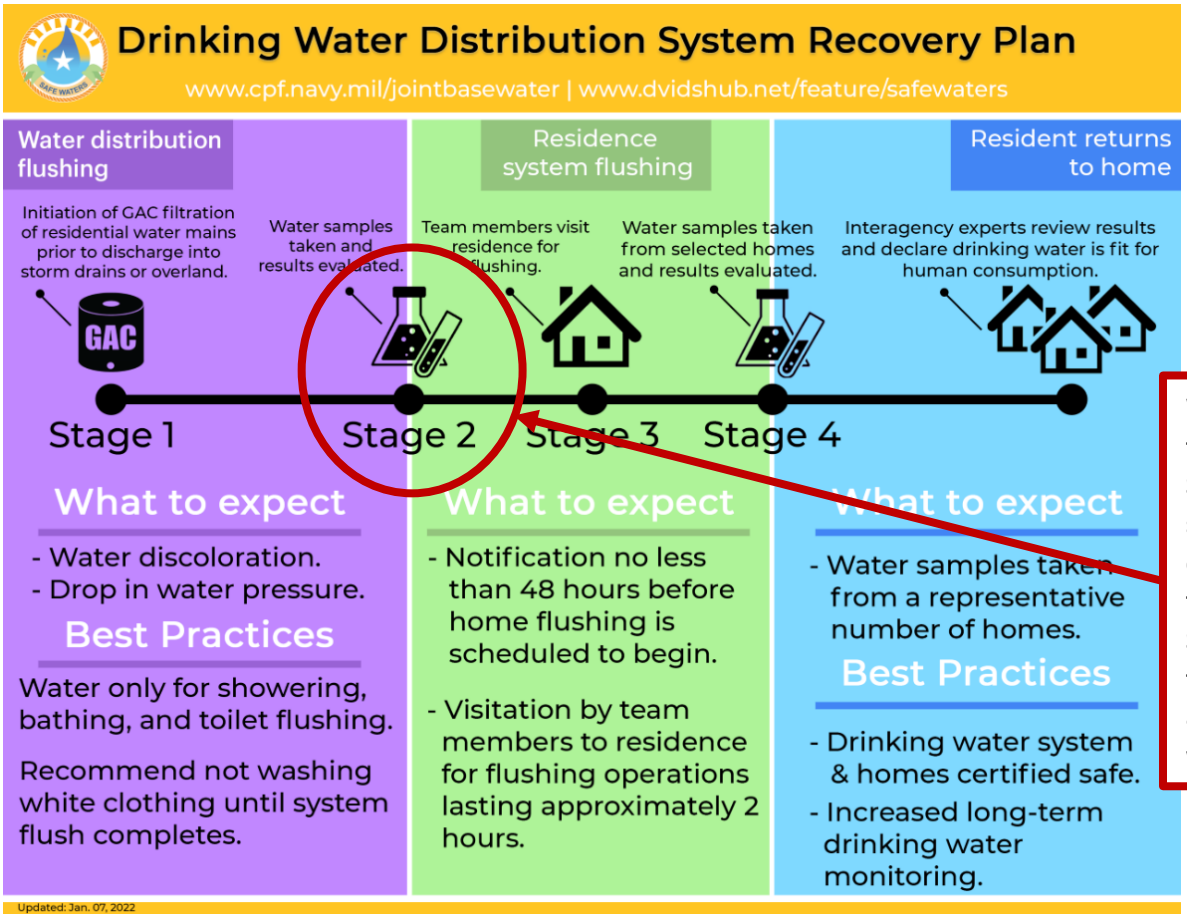
Neighborhoods included in Zone B1: Halawa and McGrew Point

EXECUTIVE SUMMARY FOR ZONE B1

The State of Hawaii Department of Health's (DOH) November 29, 2021 Public Health Advisory for the JPBHH Public Water System for Zone B1 remains in effect. DOH recommends all Navy water system users should avoid using the water for drinking, cooking, or oral hygiene. This includes consumption by pets. Navy water system users who detect a fuel-like odor from their water should also avoid using the water for bathing, dishwashing or laundry.

We have thoroughly flushed, sampled, and tested the water distribution system lines (Water Mains) in Zone B1. This Zone has moved to Stage 3–Building Flushing/Stage 4-Building Sampling, in the Drinking Water Distribution System Recovery Plan (see the Figure below). Based on the samples collected and tested, to date, this water meets all U.S. Environmental Protection Agency (EPA) and State of Hawaii Department of Health (DOH) standards that are applicable to the Navy Water System Incident.

No final conclusions or recommendations can be made at this time for the drinking water in your zone because more drinking water samples are being collected and tested from Water Mains, residences, buildings, schools, and child development centers (after they have been flushed). We are sharing this information to keep you updated on our progress towards restoring the water supply being provided to your community.



For additional information, please visit: https://www.cpf.navy.mil/JBPHH-Water-Updates/.

ENCL(1)

Table 1. Contaminants Detected in Drinking Water Samples Collected from Water Mains in Zone B1

Contaminant	Sampling Date	Units	DOH Project Screening Level	Basis of DOH Screening Level[2]	Highest Level Detected	Meets DOH Screening Level? (Yes / No)	Typical Source of Contaminant
Contaminants of Concern[1]							
Benzene	01/09/2022	ppb	5	MCL	ND	**Yes**	Discharge from factories; Leaching from gas storage tanks and landfills
Ethylbenzene	01/09/2022	ppb	700	MCL	ND	**Yes**	Discharge from petroleum refineries
Toluene	01/09/2022	ppb	1000	MCL	ND	**Yes**	Discharge from petroleum factories
m,p-Xylenes	01/09/2022	ppb	10000	MCL	ND	**Yes**	Discharge from petroleum factories; Discharge from chemical factories
o-Xylenes	01/09/2022	ppb	10000	MCL	ND	**Yes**	
1-Methylnaphthalene	01/09/2022	ppb	2.1	ISP	ND	**Yes**	Used to make other chemicals such as dyes, and resins; also, present in cigarette smoke, wood smoke, tar, asphalt, and at some hazardous waste sites
2-Methylnaphthalene	01/09/2022	ppb	4.7	ISP	0.00962	**Yes**	Used to make other chemicals such as dyes, and resins; also used to make vitamin K; and is present in cigarette smoke, wood smoke, tar, asphalt, and at some hazardous waste sites
Naphthalene	01/09/2022	ppb	12	ISP	ND	**Yes**	Naphthalene is found in coal tar or crude oil and is used in the manufacture of plastics, resins, fuels, and dyes, and as a fumigant
Lead	01/09/2022	ppb	15	ISP	0.351	**Yes**	Corrosion of household plumbing systems; Erosion of natural deposits
Total Petroleum Hydrocarbons (TPH)-Gasoline (C6-C12)	01/09/2022	ppb	200	ISP	ND	**Yes**	Gasoline is a petroleum product that can contaminate drinking water through spills and other releases into the environment
TPH-Diesel (C9-C25)	01/09/2022	ppb	200	ISP	ND	**Yes**	Diesel is a petroleum product that can contaminate drinking water through spills and other releases into the environment
TPH-Oil (C24-C40)	01/09/2022	ppb	200	ISP	ND	**Yes**	Oil is a petroleum product that can contaminate drinking water through spills and other releases into the environment
Total Organic Carbon (TOC)	01/09/2022	ppb	2000	ISP	ND	**Yes**	Naturally present in the environment, but also can be an indicator of contamination, including petroleum or other sources

Contaminant	Sampling Date	Units	DOH Project Screening Level	Basis of DOH Screening Level[2]	Highest Level Detected	Meets DOH Screening Level? (Yes / No)	Typical Source of Contaminant
Metals							
Barium	01/09/2022	ppb	2000	MCL	1.98	**Yes**	Discharge of drilling wastes; Discharge from metal refineries; Erosion of natural deposits
Chromium	01/09/2022	ppb	100	MCL	1.43	**Yes**	Corrosion of galvanized pipes; Erosion of natural deposits; Discharge from metal refineries; Runoff from waste batteries and paints
Copper	01/09/2022	ppb	1300	AL	7.01	**Yes**	Corrosion of household plumbing systems; Erosion of natural deposits
Selenium	01/09/2022	ppb	50	MCL	0.165	**Yes**	Discharge from petroleum and metal refineries; Erosion of natural deposits; Discharge from mines
Volatile Organic Compounds - ND							
Synthetic Organic Compounds (SOCs) or Semi-Volatile Organic Compounds (SVOCs)							
Bis(2-Chloroethy)ether	01/08/2022	ppb	0.014	EAL	2.6	**No[5]**	Man-made intermediate chemical used in other compounds or pesticides; It can also be used as a solvent, cleaner, component of paint and varnish, and rust inhibitor; Enters the environment as the result of manufacture and use
2-Methylphenol (commonly referred to as ortho-Cresol)	01/08/2022	ppb	–	–	0.097	**Yes**	Cresols are used to dissolve other chemicals, to make other chemical compounds, and as disinfectants and deodorizers; Enters the environment as the result of manufacture and use

Notes:

1. *These contaminants are listed whether detected or non-detect (ND) because these are incident specific. All other contaminants are only listed if detected.*
2. *DOH uses multiple criteria to assess the safety of the drinking water including maximum contaminant levels (MCLs) previously established environmental action levels (EALs) and incident specific parameters (ISPs).*
3. *Acronyms and explanation of terms used in this table are presented on the following pages. For assistance in understanding and interpreting information in this table, refer to FACT SHEET, Understanding You Water Quality Summary Table, available online at: https://www.cpf.navy.mil/JBPHH-Water-Updates/.*
4. *For more information regarding Total Petroleum Hydrocarbons, refer to the FACT SHEET What Are Petroleum Hydrocarbons?, available online at: https://health.hawaii.gov/about/files/2021/12/21.12.16_What-Are-Petroleum-Hydrocarbons.pdf.*
5. *In addition to testing drinking water for contaminants regulated under the Safe Drinking Water Act, we also tested for some contaminants that are not regulated. Unregulated contaminants do not have legal limits for drinking water (i.e., they do not have MCLs) but may have a screening level (e.g., Tier 1 EAL). Tier 1 EALs are concentrations of contaminants in drinking water and other media (e.g., soil, soil gas, and groundwater) below which the contaminants are assumed to not pose a significant threat to human health or the environment. Exceeding the Tier 1 EAL does not necessarily indicate that contamination at the site poses environmental hazards and may be set at levels that are impossible for water systems to meet (for example, large-scale treatment technology may not exist for a given*

contaminant). Per DOH's 12/30/2021 DOH's Guidance on the Approach to Amending the Drinking Water Health Advisory, if the Tier 1 EAL is exceeded, the Navy shall investigate the source(s) of the contamination under direction of the DOH. The DOH EAL is based on the EPA tapwater Regional Screening Level for Bis(2-Chloroethyl)ether (https://semspub.epa.gov/src/document/HQ/401655). Bis(2-Chloroethyl)ether (BCEE) was not detected in JP-5 product samples from the Red Hill Shaft. "In the past, BCEE has been used as a solvent for fats, waxes, greases, and esters (Schrenk et al. 1933). It has also been used as a constituent of paints and varnishes, as a cleaning fluid for textiles, in the purification of oils and gasoline, in the manufacture of medicines and pharmaceuticals, as an intermediate in the synthesis of other chemicals, and as an insecticide and a soil fumigant (Browning 1965; Hake and Rowe 1963; HSDB 1988; Verschueren 1977; Windholz 1983)." See the following link for more information: https://www.atsdr.cdc.gov/toxprofiles/tp127.pdf.

Drinking Water Distribution System Recovery Plan: Stage 2 Sampling Results for Zone B1

What is the purpose of this Stage 2 Sampling Results Report?

This is a progress report and presents the testing results from drinking water distribution system samples that have been collected, to date, from the water distribution system lines (Water Mains) in your Zone. These samples were collected after extensive flushing of the distribution system was performed using clean water from the Navy Waiawa Shaft. This is Stage 2 of the 4-Stage process described in the Drinking Water Distribution System Recovery Plan.

No final conclusions or recommendations can be made at this time for the drinking water in your zone because more drinking water samples are being collected and tested from Water Mains, residences, buildings, schools, and child development centers. We are sharing this information to keep you updated on our progress towards restoring the water supply being provided to your community.

What was found?

The table presented above (Table 1) presents all contaminants that were detected in drinking water samples that have been collected, to date, from the Water Mains in your Zone during Stage 2. Hawaii DOH used multiple standards/criteria (called DOH Project Screening Levels) to assess the safety of the drinking water to include:

- EPA and Hawaii DOH Maximum Contaminant Levels (MCLs) standards for drinking water,
- Previously established Environmental Action Levels (EALs); and
- Incident Specific Parameters (ISPs).

Based on these data, this Zone moved to Stage 3–Building/Home Flushing, in the Drinking Water Distribution System Recovery Plan.

What contaminants were tested?

Drinking water, including bottled water, can contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk. More information about contaminants tested can be obtained by calling the Hawaii DOH Safe Drinking Water Branch at 808-586-4258.

In order to ensure that drinking water is safe to drink, EPA and Hawaii DOH regulate the amount of certain contaminants in water provided by public water systems. The primary categories of monitored contaminants include volatile organic compounds (VOCs), synthetic organic chemicals (SOCs)/semi-volatile organic compounds (SVOCs), metals, Total Petroleum Hydrocarbons (TPH), Total Organic Carbon (TOC) chlorine and pH. A description of these contaminant categories can be found under Explanation of Terms located at the end of this report. The full list of contaminants that were tested for are

presented in the laboratory reports are located at: https://www.cpf.navy.mil/JBPHH-Water-Updates/.

What happened leading up to Public Health Advisory being issued?

After receiving reports of a fuel-like smell or visual sheen in the drinking water from residents of Joint Base Pearl Harbor – Hickam (JBPHH) on November 28, 2021, the Navy immediately stopped using water from the Red Hill Shaft. Out of abundance of caution, the Navy also stopped using water from the Navy Aiea Halawa Shaft. The Navy's water system provides drinking water to JBPHH, including the Army, Air Force, Marine Corps, and Hawaii residents in some neighborhoods close to JBPHH. The Hawaii DOH issued a Public Health Advisory on November 29, 2021. The Hawaii DOH, the United States Environmental Protection Agency (EPA), Navy, and Marine Corps Public Health Center, and Army formed the Interagency Drinking Water System Team (IDWST) to work on a coordinated effort to restore safe drinking water to all Navy Water System users.

Has the Public Health Advisory been amended or lifted?

No. Please continue to follow the Public Health Advisory for Navy Water System users and only use your drinking water for non-consumptive purposes as long as your water does not have a visible sheen and remains odor free. Your service may have provided more restrictive guidance. As stated above, we are at Stage 2 of the 4-Stage process described in the Drinking Water System Recovery Plan and the Public Health Advisory will be re-evaluated by Hawaii DOH after Stage 4 in the process.

Where does our water come from?

The source of all water for all Navy Water System users now comes only from the Navy Waiawa Shaft, which was not impacted by the release of Jet Fuel (JP-5) that occurred at Red Hill in late November 2021. The Waiawa Shaft has been sampled and EPA and DOH confirmed that it meets all federal and state drinking water standards and it will continue to be sampled in accordance with EPHA and DOH requirements.

What is the IDWST doing to clean the drinking water distribution system?

The IDWST evaluated multiple options for cleaning the Navy drinking water distribution system and determined that high-volume flushing of the Navy drinking water distribution system (all water mains/laterals/buildings) with 3 to 5 volumes of clean water from the Waiawa Shaft, followed by extensive testing to confirm that flushing worked, would restore safe drinking water to all Navy Water System users.

When was Water Main flushing conducted in Zone B1?

The final round of distribution water main flushing in Zone B1 was completed on January 07, 2022.

How much water was flushed through the water distribution system in Zone B1?

From January 06 – 07, 2022, a total of 0.2 million gallons was flushed through Zone B1.

Where can I get more information about the potential health effects associated with these contaminants?

Hawaii Department of Health (DOH)
https://health.hawaii.gov/about/navy-water-system-quality-updates/.
Call the DOH Safe Drinking Water Branch at 808-586-4258

US Environmental Protection Agency (EPA)
https://www.epa.gov/ground-water-and-drinking-water/forms/online-form-epas-office-ground-water-and-drinking-water.
Call EPA Region 9's Environmental Information Center at 1-866-372-9378

See the FACT SHEET, Understanding Your Water Quality Summary Table, available online at: https://www.cpf.navy.mil/JBPHH-Water-Updates/.

Acronyms used in the Table

AL	Action Level (for Lead and Copper)
DOH	Hawaii Department of Health
EAL	Environmental Action Level
EPA	U.S. Environmental Protection Agency
ISP	Incident Specific Parameter
MCL	Maximum Contaminant Level
ND	Non-Detect
ppb	parts per billion (or ug/L)
SDWA	Safe Drinking Water Act
SOCs	Synthetic Organic Compounds (also known as SVOCs)
SVOCs	Semi-Volatile Organic Compounds (same as SOCs)
TPH	Total Petroleum Hydrocarbons
TOC	Total Organic Carbon
ug/L	micrograms per liter (or ppb)
VOCs	Volatile Organic Compounds

Explanation of Terms used in this Report

Action Level (AL). This AL is for Lead and Copper. The AL is a measure of the effectiveness of the corrosion control treatment in water systems. The AL is not a standard for establishing a safe level of lead or copper. The AL is the point at which certain provisions of the proposed standards must be initiated.

Contaminant. Contaminant is any physical, chemical, biological, or radiological substance or matter in water, and can be either healthy or unhealthy, depending on the particular substance and concentration. It could also be a physical parameter monitored like pH or temperature.

Incident Specific Parameters (ISP). To more comprehensively monitor and respond to this specific petroleum contamination of drinking water, the DOH identified contaminants that require additional action prior to amending the Health Advisory. The ISP is used as a line of evidence to evaluate the data generated in each Zone during the investigation conducted by the IDWST.

Maximum Contaminant Level (MCL). An MCL is the maximum permissible level of a contaminant in water which is delivered to any user of a public water system. The MCL is set to protect the public from acute and chronic health risks associated with consuming water containing these contaminants.

Metals. Metals are chemicals that are not derived from living sources and in general do not contain carbon. Metals include antimony, arsenic, asbestos, barium, beryllium, cadmium, chromium, copper, cyanide, fluoride, lead, mercury, nitrate, nitrite, selenium, and thallium. These contaminants get into drinking water supplies through industrial discharge or spills, erosion of natural deposits, corrosion, sewage discharge, fertilizer runoff, and other sources.

Project Specific Screening Level. DOH uses multiple criteria to assess the safety of the drinking water including maximum contaminant levels (MCLs), previously established environmental action levels (EALs) and incident specific parameters (ISPs).

Synthetic Organic Compounds (SOCs)/Semi-Volatile Organic Compounds (SVOCs). SOCs and SVOCs may be used interchangeably and are man-made, organic (carbon-based) chemicals that are less volatile than Volatile Organic Contaminants (VOCs). They are used as pesticides, defoliants, fuel additives, and as ingredients for other organic chemicals.

Tier 1 Environmental Action Level (EAL). Tier 1 Environmental Action Levels (Tier 1 EALs) are concentrations of contaminants in drinking water and other media (e.g., soil, soil gas, and groundwater) below which the contaminants are assumed to not pose a significant threat to human health or the environment. Exceeding the Tier 1 EAL does not necessarily indicate that contamination at the site poses environmental hazards but generally warrants additional investigation.

Total Petroleum Hydrocarbons (TPH). TPH is a term used to describe a large family of several hundred chemical compounds that come from crude oil. Crude oil is used to make petroleum products, which can contaminate the environment. TPH is grouped by TPH-Gasoline, TPH-Diesel, and TPH-Oil.

Total Organic Carbon (TOC). TOC is naturally present in the environment, but also can be an indicator of contamination, including petroleum or other sources.

Units. A unit is the concentration of contaminant found in the water. For this report, the units are expressed in U.S. Standard Units.

U.S. Standard Unit (Name)	Acronym	Equivalent International System of Units (Name)	Acronym
parts per million	ppm*	milligrams per Liter	mg/L
parts per billion	ppb*	micrograms per Liter	ug/L

*One (1) part per million (ppm) is 1,000 parts per billion (ppb).

Volatile Organic Compounds (VOCs). VOCs are a class of chemicals that contain carbon and evaporate, or volatilize, easily into air at room temperature. VOCs are found in a variety of commercial, industrial, and residential products, including gasoline, solvents, cleaners and degreasers, paints, inks and dyes, and pesticides.

B1 Zone Distribution Sampling
Chemistry Results
Drinking Water Sampling, JBPHH, Oahu Hawaii

Residence:					FH ID: 8	FH ID: 8	FH 6	FH ID: 8
Field Sample ID:					20220108-B1-ZT04	220109-B1-ZT-03	220118-B1-WT11	220203B1ZT04
Sample Date:					2022-01-08	2022-01-09	2022-01-18	2022-02-03
Sample Type:					N	N	N	N
GENCHEM (mg/L)	**Incident Specific Parameters**	**DOH Environmental Action Levels Table D-1A Groundwater Action Levels**	**DOH Safe Drinking Water Branch (SDWB) Regulatory Constituents**	**Environmental Protection Agency Maximum Contaminant Levels**		**SDG: 2A10041**	**SDG: 2A19066**	
Total Organic Carbon	2	None	None	None	--	0.190 U	0.190 U	--
HC (µg/L)	**Incident Specific Parameters**	**DOH Environmental Action Levels Table D-1A Groundwater Action Levels**	**DOH Safe Drinking Water Branch (SDWB) Regulatory Constituents**	**Environmental Protection Agency Maximum Contaminant Levels**	**SDG: 5801091178**	**SDG: 5801091695**	**SDG: 5801094873**	
Petroleum Hydrocarbons (as Diesel)	200	400	None	None	44.0 U	92.0 U	92.0 U	--
Petroleum Hydrocarbons (as Gasoline)	200	300	None	None	31.0 U	31.0 U	31.0 U	--
Petroleum Hydrocarbons (as Motor Oil)	200	500	None	None	88.0 U	180 U	180 U	--
HG (µg/L)	**Incident Specific Parameters**	**DOH Environmental Action Levels Table D-1A Groundwater Action Levels**	**DOH Safe Drinking Water Branch (SDWB) Regulatory Constituents**	**Environmental Protection Agency Maximum Contaminant Levels**		**SDG: 2A10041**	**SDG: 2A19066**	
Mercury	0.025	0.025	2	2	--	0.0170 U	0.0170 U	--
METAL (µg/L)	**Incident Specific Parameters**	**DOH Environmental Action Levels Table D-1A Groundwater Action Levels**	**DOH Safe Drinking Water Branch (SDWB) Regulatory Constituents**	**Environmental Protection Agency Maximum Contaminant Levels**		**SDG: 2A10041**	**SDG: 2A19066**	
Antimony	6	6	6	6	--	0.0889 U	0.0889 U	--
Arsenic	10	10	10	10	--	0.0741 U	**0.321 J**	--
Barium	220	220	2000	2000	--	**1.98**	**1.94**	--
Beryllium	0.66	0.66	4	4	--	0.0624 U	0.0624 U	--
Cadmium	3	3	5	5	--	0.0416 U	0.0416 U	--
Chromium	11	11	100	100	--	**1.43**	**1.47**	--
Copper	2.9	2.9	1300	1300	--	**7.01**	**3.91**	--
Lead	15	5.6	15	15	--	**0.351**	**0.290**	--
Selenium	5	5	50	50	--	**0.165 J**	**1.46**	--
Thallium	2	2	2	2	--	0.0210 U	0.0210 U	--
SVOC (µg/L)	**Incident Specific Parameters**	**DOH Environmental Action Levels Table D-1A Groundwater Action Levels**	**DOH Safe Drinking Water Branch (SDWB) Regulatory Constituents**	**Environmental Protection Agency Maximum Contaminant Levels**	**SDG: 5801091178**	**SDG: 2A10041**	**SDG: 2A19066**	**SDG: 5801100381**
1,2,4-Trichlorobenzene	70	70	70	70	0.0930 U	--	--	0.0860 U
1,2-Dichlorobenzene	10	10	600	600	0.0510 U	--	--	0.0480 U
1,3-Dichlorobenzene	None	None	None	None	0.0410 U	--	--	0.0380 U

B1 Zone Distribution Sampling
Chemistry Results
Drinking Water Sampling, JBPHH, Oahu Hawaii

Residence:					FH ID: 8	FH ID: 8	FH 6	FH ID: 8
Field Sample ID:					20220108-B1-ZT04	220109-B1-ZT-03	220118-B1-WT11	220203B1ZT04
Sample Date:					2022-01-08	2022-01-09	2022-01-18	2022-02-03
Sample Type:					N	N	N	N
SVOC (µg/L)	**Incident Specific Parameters**	**DOH Environmental Action Levels Table D-1A Groundwater Action Levels**	**DOH Safe Drinking Water Branch (SDWB) Regulatory Constituents**	**Environmental Protection Agency Maximum Contaminant Levels**	**SDG: 5801091178**	**SDG: 2A10041**	**SDG: 2A19066**	**SDG: 5801100381**
1,4-Dichlorobenzene	5	5	75	None	0.0410 U	--	--	0.0380 U
1-Methylnaphthalene	2.1	10	None	None	--	0.00801 U	0.00801 U	--
2,4-Dinitrotoluene	None	None	None	None	0.100 U	--	--	0.0950 U
2,6-Dinitrotoluene	None	None	None	None	0.100 U	--	--	0.0950 U
2-Chloronaphthalene	None	None	None	None	0.0720 U	--	--	0.0670 U
2-Ethylhexyl adipate	None	None	None	None	--	0.00962 U	5.00 U	--
2-Methylnaphthalene	4.7	10	None	None	--	0.0500 U	0.00904 U	--
2-Methylphenol (o-Cresol)	None	None	None	None	**0.0970 J**	--	--	--
2-Nitroaniline	None	None	None	None	0.100 U	--	--	0.0950 U
3,3'-Dichlorobenzidine	None	None	None	None	0.270 U	--	--	0.250 U
3-Nitroaniline	None	None	None	None	0.160 U	--	--	0.150 U
4-Bromophenyl phenyl ether	None	None	None	None	0.0620 U	--	--	0.0570 U
4-Chloroaniline	None	None	None	None	0.610 U	--	--	0.560 U
4-Chlorophenyl phenyl ether	None	None	None	None	0.0510 U	--	--	0.0480 U
4-Nitroaniline	None	None	None	None	0.220 U	--	--	0.200 U
Acenaphthene	None	None	None	None	0.0510 U	--	--	0.0480 U
Acenaphthylene	None	None	None	None	0.0620 U	--	--	0.0570 U
Alachlor	None	None	None	None	--	0.0110 U	0.0110 U	--
Anthracene	None	None	None	None	0.0510 U	--	--	0.0480 U
Atrazine	None	None	None	None	--	0.00734 U	0.00734 U	--
Benzo(a)anthracene	None	None	None	None	0.0510 U	--	--	0.0480 U
Benzo(a)pyrene	0.06	0.06	0.2	0.2	0.0410 U	0.0117 UJ	0.0117 U	0.0380 U
Benzo(b)fluoranthene	None	None	None	None	0.0410 U	--	--	0.0380 U
Benzo(g,h,i)perylene	None	None	None	None	0.0410 U	--	--	0.0380 U
Benzo(k)fluoranthene	None	None	None	None	0.0510 U	--	--	0.0480 U
Benzyl butyl phthalate	None	None	None	None	0.280 U	--	--	0.260 U
Bis(2-chloroethoxy)methane	None	None	None	None	0.0510 U	--	--	0.0480 U
Bis(2-chloroethyl) ether (2-Chloroethyl ether)	None	None	None	None	0.0310 U	--	--	0.0290 U
Bis(2-ethylhexyl)phthalate	3	3	6	6	0.760 U	0.437 U	0.437 U	0.700 U
Carbazole	None	None	None	None	0.100 U	--	--	0.0950 U
Chlordane	None	None	None	None	--	0.0669 U	0.0669 U	--
Chrysene	None	None	None	None	0.0410 U	--	--	0.0380 U
Dibenz(a,h)anthracene	None	None	None	None	0.0720 U	--	--	0.0670 U
Dibenzofuran	None	None	None	None	0.100 U	--	--	0.0950 U

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Chemistry Results
Drinking Water Sampling, JBPHH, Oahu Hawaii

Residence:					FH ID: 8	FH ID: 8	FH 6	FH ID: 8
Field Sample ID:					20220108-B1-ZT04	220109-B1-ZT-03	220118-B1-WT11	220203B1ZT04
Sample Date:					2022-01-08	2022-01-09	2022-01-18	2022-02-03
Sample Type:					N	N	N	N
SVOC (µg/L)	**Incident Specific Parameters**	**DOH Environmental Action Levels Table D-1A Groundwater Action Levels**	**DOH Safe Drinking Water Branch (SDWB) Regulatory Constituents**	**Environmental Protection Agency Maximum Contaminant Levels**	**SDG: 5801091178**	**SDG: 2A10041**	**SDG: 2A19066**	**SDG: 5801100381**
Diethyl phthalate	None	None	None	None	0.150 U	--	--	0.140 U
Dimethyl phthalate	None	None	None	None	0.0620 U	--	--	0.0570 U
Di-n-butyl phthalate	None	None	None	None	0.200 U	--	--	0.180 U
di-n-Octyl phthalate	None	None	None	None	0.130 U	--	--	0.120 U
Endrin	None	None	None	None	--	0.00991 U	0.00991 U	--
Fluoranthene	None	None	None	None	0.0620 U	--	--	0.0570 U
Fluorene	None	None	None	None	0.0510 U	--	--	0.0480 U
gamma-BHC (Lindane)	None	None	None	None	--	0.00633 U	0.00633 U	--
Heptachlor	None	None	None	None	--	0.00965 UJ	0.00965 U	--
Heptachlor epoxide	None	None	None	None	--	0.0122 U	0.0122 U	--
Hexachlorobenzene	0.0003	0.0003	1	1	0.0410 U	0.0980 U	0.0980 U	0.0380 U
Hexachlorobutadiene	None	None	None	None	0.0620 U	--	--	0.0570 U
Hexachlorocyclopentadiene	50	None	50	50	--	0.00594 U	0.00594 U	0.130 U
Hexachloroethane	None	None	None	None	0.0510 U	--	--	0.0480 U
Indeno(1,2,3-c,d)pyrene	None	None	None	None	0.130 U	--	--	0.120 U
Isophorone	None	None	None	None	0.100 U	--	--	0.0950 U
Methoxychlor	None	None	None	None	--	0.00863 U	0.00863 U	--
Naphthalene	12	17	None	None	0.160 U	0.0103 U	0.0103 U	0.150 U
Nitrobenzene	None	None	None	None	0.0410 U	--	--	0.0380 U
N-Nitrosodi-n-propylamine	None	None	None	None	0.0620 U	--	--	0.0570 U
N-Nitrosodiphenylamine	None	None	None	None	0.0720 U	--	--	0.0670 UJ
PCB, Total	None	None	None	None	--	0.100 U	0.0940 U	--
PCB-1016 (Aroclor 1016)	None	None	None	None	--	0.0157 U	0.0157 U	--
PCB-1221 (Aroclor 1221)	None	None	None	None	--	0.0436 U	0.0436 U	--
PCB-1232 (Aroclor 1232)	None	None	None	None	--	0.0102 U	0.0102 U	--
PCB-1242 (Aroclor 1242)	None	None	None	None	--	0.0737 U	0.0737 U	--
PCB-1248 (Aroclor 1248)	None	None	None	None	--	0.0941 U	0.0941 U	--
PCB-1254 (Aroclor 1254)	None	None	None	None	--	0.0869 U	0.0869 U	--
PCB-1260 (Aroclor 1260)	None	None	None	None	--	0.0379 U	0.0379 U	--
Pentachlorophenol	None	None	None	None	--	0.0242 U	1.00 U	--
Phenanthrene	None	None	None	None	0.120 U	--	--	0.110 U
Pyrene	None	None	None	None	0.0410 U	--	--	0.0380 U
Simazine	None	None	None	None	--	0.00734 U	0.00734 U	--

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Chemistry Results
Drinking Water Sampling, JBPHH, Oahu Hawaii

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Field Sample ID:						20220108-B1-ZT04	220109-B1-ZT-03	220118-B1-WT11	220203B1ZT04
Sample Date:						2022-01-08	2022-01-09	2022-01-18	2022-02-03
Sample Type:						N	N	N	N
VOC (µg/L)	**Incident Specific Parameters**	**DOH Environmental Action Levels Table D-1A Groundwater Action Levels**	**DOH Safe Drinking Water Branch (SDWB) Regulatory Constituents**	**Environmental Protection Agency Maximum Contaminant Levels**		**SDG: 2A10041**	**SDG: 2A19066**		
1,1,1-Trichloroethane	11	11	200	200	--	0.260 U	0.256 U	--	
1,1,2-Trichloroethane	5	5	3	5	--	0.190 U	0.190 U	--	
1,1-Dichloroethene	7	7	7	7	--	0.160 U	0.160 U	--	
1,2,4-Trichlorobenzene	70	70	70	70	--	0.170 U	0.170 U	--	
1,2-Dichlorobenzene	10	10	600	600	--	0.190 U	0.190 U	--	
1,2-Dichloroethane	5	5	5	5	--	0.240 U	0.243 U	--	
1,2-Dichloropropane	5	5	5	5	--	0.130 U	0.130 U	--	
1,4-Dichlorobenzene	5	5	75	None	--	0.180 U	0.180 U	--	
Benzene	5	5	5	5	--	0.150 U	0.150 U	--	
Carbon Tetrachloride	5	5	5	5	--	0.270 U	0.270 U	--	
Chlorobenzene	25	25	100	100	--	0.150 U	0.150 U	--	
cis-1,2-Dichloroethene	70	70	70	70	--	0.250 U	0.250 U	--	
Ethylbenzene	700	7.3	700	700	--	0.210 U	0.210 U	--	
m,p-Xylene	10000	13	None	None	--	0.330 U	0.330 U	--	
Methylene chloride	5	5	5	5	--	0.300 U	0.303 U	--	
o-Xylene	10000	13	None	None	--	0.200 U	0.200 U	--	
Styrene	10	10	100	100	--	0.190 U	0.190 U	--	
Tetrachloroethene (PCE)	5	5	5	5	--	0.180 U	0.180 U	--	
Toluene	1000	9.8	1000	1000	--	0.290 U	0.294 U	--	
trans-1,2-Dichloroethene	100	100	100	100	--	0.260 U	0.259 U	--	
Trichloroethene (TCE)	5	5	5	5	--	0.180 U	0.180 U	--	
Vinyl chloride	2	2	2	2	--	0.180 U	0.180 U	--	

Notes:

-- indicates that the sample was Not Analyzed for the analyte

Results highlighted yellow exceed the ISP
Results in purple font also exceed the EALs
Results in green font also exceed the DOH MCL
Results in blue font also exceed the EPA MCL

µg/L = Micrograms per Liter

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21 Feb 2022

NAVFAC Hawaii
400 Marshall Road
JBPHH HI 96860-3139

Subject: **Red Hill Bulk Fuel Storage Facility**
AECOM Follow-up Technical Review of Bis(2-chloroethyl)ether in Hydrant Flushing Samples
Sample ID: Multiple
Zone: A3, B1, C1, C2, F2, H1, H2 and H3
Address: Multiple
Collection Date: 15 Jan 2022

Attention Engineering Working Group:

Bis(2-chloroethyl)ether (BC2EE) is primarily used as a chemical intermediate for the manufacture of pesticides and as a solvent for fats, waxes, greases, and esters. It has also been used as a constituent in paints and varnishes, as a cleaning fluid for textiles, and in the purification of oils and gasoline. This analyte is not regulated under the Safe Drinking Water Act and for that reason does not have an associated Maximum Contamination Level.

BC2EE properties and Chemical Abstracts Service (CAS):

- CAS number: 111-44-4.
- BC2EE is a colorless, nonflammable liquid with a strong unpleasant odor.
- The odor threshold for BC2EE is 0.049 part per million.
- The chemical formula for BC2EE is $C_4H_8Cl_2O$, and the molecular weight is 143.01-gram moles.
- The vapor pressure for BC2EE is 0.71 millimeter of mercury at 20 degrees Celsius, and it has a log octanol/water partition coefficient of 1.58.

Table 1 below summarizes the sample delivery groups (SDGs) initially issued reporting of Bis(2-chloroethyl)ether (BC2EE) form fire hydrant zone screening samples in error. On February 12, 2022, AECOM issued a Technical Review of Bis(2-chloroethyl)ether Hydrant Flushing Samples memo which detailed the findings of an in-depth review of the analytical data and supporting documents. As a result of the findings, Eurofins Seattle concurred with the finding conclusions and implemented the required corrective action in accordance with the laboratories standard operating procedure (SOP) for EPA Method SW-846 8270E.

The corrective action also determined the qualitative identification of BC2EE did not meet the analytical method or laboratories SOP requirements and the detections for BC2EE were retracted and the laboratory certificates of analysis reissued indicating the referenced analytes were non-detect. **Table 2** provides a list of the SDGs re-issued and the revised results.

Table 1

Laboratory Sample ID	Sampling Date	Field Sample ID	LOC ID	Analyte	Result	Unit
580-109090-4	01/06/22	20220106-F2-ZT08	FH17	BC2EE	1.6	µg/L
580-109117-5	01/08/22	20220208-B1-ZT04	B1-8	BC2EE	2.6	µg/L
580-109117-6	01/08/22	20220108-A3-ZT01	SA-LFH2	BC2EE	3	µg/L
580-109117-8	01/07/22	20220107-C2-YT02	FH315	BC2EE	0.76	µg/L
580-109054-1	01/05/22	20220105-C1-ZT03	FH512	BC2EE	0.1	µg/L
580-109239-2	01/11/22	20220111-H1-YT12	FH1396	BC2EE	3.3	µg/L
580-109243-1	01/11/22	2022011-H2-YT02	FH377	BC2EE	1.2 F1	µg/L
580-109243-3	01/11/22	2022011-H2-YT04	FH1331	BC2EE	1.7	µg/L
580-109243-4	01/11/22	2022011-H2-YT06	FH1646	BC2EE	2.3	µg/L
580-109289-1	01/12/22	2022112-H3-ZT13	FH1651	BC2EE	1.7	µg/L
580-109289-3	01/12/22	2022112-H3-ZT09	FH1641	BC2EE	2.4	µg/L
580-109289-5	01/12/22	2022112-H3-ZT05	FH1676	BC2EE	1.7	µg/L

F1 MS and/or MSD recovery exceeds the control limit

Table 2

Laboratory Sample ID	Sampling Date	Field Sample ID	LOC ID	Analyte	Result	Unit
580-109090-4	01/06/22	20220106-F2-ZT08	FH17	BC2EE	0.031 U	µg/L
580-109117-5	01/08/22	20220208-B1-ZT04	B1-8	BC2EE	0.031 U	µg/L
580-109117-6	01/08/22	20220108-A3-ZT01	SA-LFH2	BC2EE	0.030 U	µg/L
580-109117-8	01/07/22	20220107-C2-YT02	FH315	BC2EE	0.031 U	µg/L
580-109054-1	01/05/22	20220105-C1-ZT03	FH512	BC2EE	0.031 U	µg/L
580-109239-2	01/11/22	20220111-H1-YT12	FH1396	BC2EE	0.031 U	µg/L

Laboratory Sample ID	Sampling Date	Field Sample ID	LOC ID	Analyte	Result	Unit
580-109243-1	01/11/22	2022011-H2-YT02	FH377	BC2EE	0.032 F1	µg/L
580-109243-3	01/11/22	2022011-H2-YT04	FH1331	BC2EE	0.032 U	µg/L
580-109243-4	01/11/22	2022011-H2-YT06	FH1646	BC2EE	0.030 U	µg/L
580-109289-1	01/12/22	2022112-H3-ZT13	FH1651	BC2EE	0.031	µg/L
580-109289-3	01/12/22	2022112-H3-ZT09	FH1641	BC2EE	0.031 U	µg/L
580-109289-5	01/12/22	2022112-H3-ZT05	FH1676	BC2EE	0.031 U	µg/L

F1 MS and/or MSD recovery exceeds the control limit

U Indicates the analyte was analyzed for but not detected

It was suspected the disinfection process (residual chlorine) was having an adverse effect on the recovery of the acid surrogates used in EPA Method 8270E for samples collected from 1/6/2022 through 1/11/2022. The failing acid surrogate recoveries could result in the rejection of the associated data. As a result, when AECOM re-collected the samples from the locations where the initial laboratory results indicated the presence of BC2EE, both unpreserved and samples preserved samples were collected with the exception of location IDs FH512, FH17, FH315 and B1-8, only unpreserved samples were collected because these samples were collected before the decision to collect an additional preserved sample was made.

Sample location FH512 exhibited low but passing surrogate recoveries whereas locations FH17, FH315 and B1-8 all had failing acid surrogate recoveries. All four of the referenced samples were also non-detect for BC2EE. Two empty bottles were also sent to the lab as reagent/bottle blanks to eliminate both a bottle or a preservative contribution to the detection of BC2EE by having the lab fill the bottles with laboratory reagent grade laboratory ASTM Type II water and then analyzed. Both the reagent and bottle blank were non-detect for BC2EE. The 525.2 preservative, 45 milligrams (mg) sodium sulfite was used as the preservation method.

The results from the unpreserved samples collected from 2/3/2022 through 2/4/2022 exhibited a suppression of the acid surrogate recoveries as suspected, however the samples preserved with the 525.2 preservative exhibited passing acid surrogate recoveries for all samples analyzed. In addition, BC2EE was non-detect for all samples analyzed, both unpreserved and preserved, confirming the absence of BC2EE at the sampling locations in question.

Table 3 provides a list of the SDGs for the zone locations that were re-sampled, extracted and analyzed to confirm the absence of BC2EE for the referenced sampling locations. A complete listing of all the samples discussed is provided in **Attachment 1**, *Bis(2-chloroethyl)ether Fire Hydrant Zone Screening Sample Resolution Cross Walk*. This attachment provides the original sample results and SDGs, prior to the lab restating the results as well as the resample results with notes as to whether they were unpreserved or preserved.

Table 3

Laboratory Sample ID	Sampling Date	Field Sample ID	LOC ID	Analyte	Result	Unit
580-110026-1	02/04/22	220204H2HT02	FH377	BC2EE	0.029 U	µg/L
580-110026-2	02/04/22	220204H2HT02-1	FH377	BC2EE	0.029 U	µg/L
580-110026-3	02/04/22	220204H2HT03	FH1331	BC2EE	0.029 U	µg/L
580-110026-4	02/04/22	220204H2HT04	FH1646	BC2EE	0.029 U	µg/L
580-110026-5	02/04/22	220204H2HT03-1	FH1331	BC2EE	0.029 U	µg/L
580-110026-6	02/04/22	220204H2HT04-1	FH1646	BC2EE	0.029 U	µg/L
580-110026-7	02/04/22	A3-TW-HYDLFH2-22035	SA-FLH2	BC2EE	0.029 U	µg/L
580-110026-8	02/04/22	A3-TW-HYDLFH2-22035-1	SA-FLH2	BC2EE	0.029 U	µg/L
580-110029-1	02/04/22	220204H3IT01	FH1641	BC2EE	0.028 U	µg/L
580-110029-2	02/04/22	220204H3IT02	FH1641	BC2EE	0.028 U	µg/L
580-110029-3	02/04/22	220204H3IT01-1	FH1641	BC2EE	0.028 U	µg/L
580-110029-4	02/04/22	220204H3IT02-1	FH1641	BC2EE	0.028 U	µg/L
580-110029-5	02/04/22	220204H3IT03	FH1651	BC2EE	0.028 U	µg/L
580-110029-6	02/04/22	220204H3IT04	FH1676	BC2EE	0.028 U	µg/L
580-110029-7	02/04/22	220204H3IT03-1	FH1651	BC2EE	0.028 U	µg/L
580-110029-8	02/04/22	220204H3IT04-1	FH1676	BC2EE	0.028 U	µg/L
580-110034-1	02/03/22	220203C2ZT02	PEAR0315	BC2EE	0.029 U	µg/L
580-110035-1	02/04/22	220204H1HT01	FH1396	BC2EE	0.029 U	µg/L
580-110035-2	02/04/22	220204H1HT01-1	FH1396	BC2EE	0.029 U	µg/L
580-110036-1	02/03/22	220203C1ZT03	FH 512	BC2EE	0.029 U	µg/L
580-110037-1	02/03/22	220203F2ZT01	FH17	BC2EE	0.029 U	µg/L
580-110038-1	02/03/22	220203B1ZT04	B1-8	BC2EE	0.029 U	µg/L

Therefore, based on a thorough re-evaluation of the referenced analytical data and professional judgment, the results of these twelve indicated samples were preliminarily reported in error and have been amended in the final results to be non-detect for Bis(2-chloroethyl)ether.

Questions regarding this memo should be addressed to the Red Hill Drinking Water Task Manager, Reid Campbell.

Yours sincerely,

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Attachments

Attachment 1*:* *Bis(2-chloroethyl)ether Fire Hydrant Zone Screening Sample Resolution Cross Walk*.

cc:
Reid Campbell, AECOM Task Manager
Ken Vinson, AECOM Senior VP Program Manager
Jim Refermat, AECOM Senior Program Chemist
Contracting Officer
Victor Gonzalez, NAVFAC

Attachment 1*:* *Bis(2-chloroethyl)ether Fire Hydrant Zone Screening Sample Resolution Cross Walk*.

Field Sample ID	Original Sampling Date	Zone	Lab SDG	EDMS Status	Analyte	Originial Result**	Restated Results	Unit	Loc Id	Field Sample ID	Sample Type	Sampling Date	Zone	Lab SDG	EDMS Status	Analyte	Result	Unit	Loc Id
20220108-A3-ZT01	1/8/2022	A3	580-109117-5	Approved	BC2EE	3	0.030 U	µg/L	SA-LFH2	A3-TW-HYDLFH2-22035	Unpreserved	2/4/2022	A3	580-110026-2	Approved	BC2EE	0.029 U	µg/L	SA-LFH2
										A3-TW-HYDLFH2-22035-1*	Preserved	2/4/2022					0.029 U	µg/L	
2022011-H2-YT02	1/11/2022	H2	580-109243-1	Approved	BC2EE	1.2 F1	0.032 F1	µg/L	FH377	220204H2HT02	Unpreserved	2/4/2022	H2	580-110026-1	Finalized (Not Approved)	BC2EE	0.029 U	µg/L	FH377
										220204H2HT02-1*	Preserved	2/4/2022					0.029 U	µg/L	
2022011-H2-YT04	1/11/2022	H2	580-109243-1	Approved	BC2EE	1.7	0.032 U	µg/L	FH1331	220204H2HT03	Unpreserved	2/4/2022	H2	580-110026-1	Finalized (Not Approved)	BC2EE	0.029 U	µg/L	FH1331
										220204H2HT03-1*	Preserved	2/4/2022					0.029 U	µg/L	
2022011-H2-YT06	1/11/2022	H2	580-109243-1	Approved	BC2EE	2.3	0.030 U	µg/L	FH1646	220204H2HT04	Unpreserved	2/4/2022	H2	580-110026-1	Finalized (Not Approved)	BC2EE	0.029 U	µg/L	FH1646
										220204H2HT04-1*	Preserved	2/4/2022					0.029 U	µg/L	
20220111-H1-YT12	1/11/2022	H1	580-109239-1	Approved	BC2EE	3.3	0.031 U	µg/L	FH1396	220204H1HT01	Unpreserved	2/4/2022	H1	580-110035-1	Approved	BC2EE	0.029 U	µg/L	FH1396
										220204H1HT01-1*	Preserved	2/4/2022					0.029 U	µg/L	
2022112-H3-ZT09	1/12/2022	H3	580-109289-1	Certified (Not Approved	BC2EE	2.4	0.031 U	µg/L	FH1641	220204H3IT01	Unpreserved	2/4/2022	H3	580-110029-1	Approved	BC2EE	0.028 U	µg/L	FH1641
										220204H3IT01-1*	Preserved	2/4/2022					0.028 U	µg/L	
										220204H3IT02 (FD)	Unpreserved	2/4/2022					0.028 U	µg/L	
										220204H3IT02-1* (FD)	Preserved	2/4/2022					0.028 U	µg/L	
2022112-H3-ZT13	1/12/2022	H3	580-109289-1	Certified (Not Approved	BC2EE	1.7	0.031	µg/L	FH1651	220204H3IT03	Unpreserved	2/4/2022	H3	580-110029-1	Approved	BC2EE	0.028 U	µg/L	FH1651
										220204H3IT03-1*	Preserved	2/4/2022					0.028 U	µg/L	
2022112-H3-ZT05	1/12/2022	H3	580-109289-1	Certified (Not Approved	BC2EE	1.7	0.031 U	µg/L	FH1676	220204H3IT04-1*	Preserved	2/4/2022	H3	580-110029-1	Approved	BC2EE	0.028 U	µg/L	FH1676
										220204H3IT04	Unpreserved	2/4/2022					0.028 U	µg/L	
20220105-C1-ZT03	1/5/2022	C1	580-109054	Certified (Not Approved	BC2EE	0.1	0.031 U	µg/L	FH512	220203C1ZT03	Unpreserved	2/3/2022	C1	580-110036-1	Certified (Not Approved)	BC2EE	0.029 U	µg/L	FH512
20220106-F2-ZT08	1/6/2022	F2	580-109090	Loaded	BC2EE	1.6	0.031 U	µg/L	FH17	220203F2ZT01	Unpreserved	2/3/2022	F2	580-110037-1	Approved	BC2EE	0.029 U	µg/L	FH17
20220107-C2-YT02	1/7/2022	C2	580-109117-4	Loaded (Not Approved	BC2EE	0.76	0.031 U	µg/L	FH315	220203C2ZT02	Unpreserved	2/3/2022	C2	580-110034-1	Loaded (Not Approved)	BC2EE	0.029 U	µg/L	FH315
20220208-B1-ZT04	1/8/2022	B1	580-109117-8	Loaded (Not Approved	BC2EE	2.6	0.031 U	µg/L	B1-8	220203B1ZT04	Unpreserved	2/3/2022	B1	580-110038-1	Approved	BC2EE	0.029 U	µg/L	B1-8

(FD) = Field Duplicate
* - Preserved with sodium sulfite
** - Lab retracted results and restated as non-detections.

eurofins	Always check on-line for validity.	Level:
Document number: **EFGS-T-MSS-SOP41389**	**Semivolatile Organic Compound (Base/Neutrals and Acids) Analysis by GC/MS [Method 8270E]**	**Standard Operating Procedure**
Old Reference: **TA-MS-0317**		
Version: **1**		Organisation level: **4-Business Unit**
Approved by: **FH5J, KOJ6** Effective Date **27-AUG-2021**	Document users: **EFGS_GCMS SVOA Chemist**	Responsible: **EFGS_SVOA_M**

1) Revision Log:

Revision: 1	**Effective Date:** This version	
Section	**Justification**	**Changes**
Throughout	Required	Replaced TestAmerica Seattle with EFGS
Section 2	Required	Updated DoD QSM reference to Version 5.3
Section 7	Addition	Added definition for Isotopic Dilution analog
Section 9.2	Addition	Added Acetone to the Materials list
Section 6	Correction	Removed reference to pesticide surrogate
Table 1	Required	Updated SIM list
Throughout	Correction	Fixed incorrect links to SOP CW-E-M-001
Section 13.2	Correction	Replaced erroneous pesticide calibration standards with 8270 standards

2) Reference:

2.1 SW-846, Test Methods for Evaluating Solid Waste, Update VI, June 2018, Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometry, Method 8270E.

2.2 U.S. Department of Defense (DoD)/Department of Energy (DOE) Consolidated Quality Systems Manual (QSM) for Environmental Laboratories, *Version 5.3, 2019*

3) Cross Reference:

Document	**Document Title**
EFGS-Q-QM-QM5805	QA Manual
EFGS-S-HS-12066	Chemical Hygiene Plan
EFGS-T-OP-SOP41411	Liquid-Liquid Extraction by Separatory Funnel, SW846 3510C and EPA 600 Series
EFGS-T-OP-SOP41432	Microwave Extraction Procedure, SW846 3546
EFGS-S-HS-SOP2991	Waste Disposal Procedures for Client Sample Waste
EFGS-T-OP-SOP41420	Waste Dilution [Method 3580A]
EFGS-Q-QD-SOP41922	Receipt, Preparation, Storage and Verification of Standards and Reagents and Traceability Protocols
CW-E-M-001	Corporate Environmental Health and Safety Manual

Document	Document Title
EFGS-Q-QD-SOP41889	Quality Control Program
EFGS-Q-QD-SOP2835	Incident Reports, Out-of-Specification Reports and Client Complaints
EFGS-WC-SOP41035	Percent Moisture/Percent Solids
EFGS-P-DR-SOP2801	Data Review and Validation and Monthly Logbook Reviews
EFGS-M-MC-SOP42521	Manual Integrations
EFGS-QP42518	Calibration Curves & Selection of Calibration Points
EFGS-M-MC-SOP42524	Detection and Quantitation Limits
EFGS-Q-QD-SOP2814	Personnel Training and Demonstration of Capability Procedures

4) Purpose:

4.1 Aqueous samples are extracted with methylene chloride using a continuous extractor or Separatory Funnel. The extract is dried, concentrated, and analyzed by GC/MS.

4.2 Solid samples are extracted with methylene chloride / acetone using microwave extraction. The extract is dried, concentrated, and analyzed by GC/MS.

4.3 Waste dilution is used for samples that are miscible with the solvent.

4.4 Extraction procedures are detailed in the following SOPs:

EFGS-T-OP-SOP41411 Separatory Funnel Extraction (3510C)
EFGS-T-OP-SOP41432 Microwave Extraction (3546)

4.5 Qualitative identification of the analytes in the extract is performed using the retention time and the relative abundance of characteristic ions. Quantitative analysis is performed using the internal standard technique with a single characteristic ion.

5) Scope:

5.1 This method is based upon standard method SW846 8270E, and is applicable to the determination of the concentration of semivolatile organic compounds in extracts prepared from solid and aqueous matrices.

5.1.1 Direct injection of a sample may be used in limited applications.

5.1.2 Refer to Table 1 for the list of compounds applicable for this method. This method may be amenable to additional compounds. If non-standard analytes are required, they must be validated by the procedures described in section 17 before sample analysis.

5.2 The following compounds may require special treatment when being determined by this method:

- Benzidine can be subject to oxidative losses during solvent concentration and exhibits poor chromatography.
- Hexachlorocyclopentadiene is subject to thermal decomposition in the inlet of the gas chromatograph, chemical reaction in acetone solution, and photochemical decomposition.
- N-Nitrosodiphenylamine decomposes in the gas chromatographic inlet and cannot be distinguished from diphenylamine.
- Pentachlorophenol, 2,4-dinitrophenol, 4-nitrophenol, 4,6-dinitro-2-methylphenol, 4-chloro-3-methylphenol, benzoic acid, 2-nitroaniline, 3-nitroaniline, 4-chloroaniline, and benzyl alcohol are subject to erratic chromatographic behavior, especially if the GC system is contaminated with high boiling material.
- 3-Methylphenol cannot be separated from 4-methylphenol by the conditions specified in this method. They are reported as 3- and 4-methylphenol.
- Hexachlorophene and famphur analysis are not quantitatively reliable by this method.

5.1 The reporting limit (RL) of this method for determining an individual compound is approximately 10 ug/kg to 4,000 ug/kg for soil/sediment samples and 0.02 µg/L to 15 µg/L for water samples. Some compounds have higher reporting limits. The current reporting limits are all updated in TALS. Reporting limits will be proportionately higher for sample extracts that require dilution.

5.2 On occasion clients may request modifications to this SOP. These modifications are handled following the procedures outlined in Section 14.2.1 in the Quality Assurance Manual.

6) Reference Modifications:

Item	Method	Modification
1	8270D/8270E	Calibration verification criteria will be set at +25% due to the low level concentrations analyzed

7) Definitions:

7.1 Batch - The batch is a set of up to 20 samples of the same matrix processed using the same procedures and reagents within the same time period. The Quality Control batch must contain a matrix spike / matrix spike duplicate (MS/MSD), a Laboratory Control Sample (LCS), and a method blank (MB). In some cases, at client request, the MS/MSD may be replaced with a matrix spike and sample duplicate. Batches are defined at the sample preparation stage. Batches should be kept together through the whole analytical process to the extent possible, but it is not mandatory to analyze prepared extracts on the same instrument or in the same sequence. Refer to the TestAmerica Seattle SOP *EFGS-Q-QD-SOP41889* Quality Control Program for further details of the batch definition.

7.2 Method Blank (MB) - An analytical control consisting of all reagents, internal standards and surrogate standards that is carried through the entire analytical procedure. The method blank is used to define the level of laboratory background and reagent contamination.

7.3 Laboratory Control Sample (LCS) - A blank matrix (reagent water or Ottawa Sand) spiked with the analytes of interest that is carried through the entire analytical procedure. Analysis of this sample with acceptable recoveries of the spiked analytes demonstrates that the laboratory techniques for this method are acceptable.

7.4 Matrix Spike (MS) – An aliquot of a matrix (water or soil) fortified (spiked) with known amounts of specific analytes and subjected to the entire analytical procedure in order to indicate the appropriateness of the method for the matrix by measuring recovery.

7.5 Matrix Spike Duplicate (MSD) - A second aliquot of the same sample as the matrix spike (above) that is spiked in order to determine the precision of the method by measuring the relative percent difference (RPD) between the MS and MSD results.

7.6 Surrogates - Organic compounds which are similar to the target analyte(s) in chemical composition and behavior in the analytical process, but which are not normally found in environmental samples. Each sample, blank, LCS, MS, and MSD is spiked with surrogate standards. Surrogate spike recoveries must be evaluated by determining whether the concentration (measured as percent recovery) falls within the required recovery limits.

8) Interferences:

8.1 Matrix interferences may be caused by contaminants that are co-extracted from the sample. The extent of matrix interferences will vary considerably from source to source, depending upon the nature of the sample. Dilution or cleanup procedures may help to eliminate select interferences

8.2 Contaminants in solvents, reagents, glassware, and other processing apparatus that lead to discrete artifacts may cause method interferences. All of these materials must be routinely demonstrated to be free from interferences under conditions of the analysis by running laboratory method blanks as described in the Quality Control section (Section 18.0). Raw GC/MS data from all blanks, samples, and spikes must be evaluated for interferences. If interference is detected, it is necessary to determine if the source of interference is in the preparation and/or cleanup of the samples; then take corrective action to eliminate the problem.

8.3 The use of high purity reagents, solvents, and gases helps to minimize interference problems.

8.4 Contamination by carryover can occur whenever high-level and low-level samples are sequentially analyzed. To reduce carryover, the sample syringe must be rinsed with solvent between samples. Whenever an unusually concentrated sample is encountered, it should be followed by the analysis of solvent to check for cross contamination.

9) Safety Precautions, Pollution Prevention and Waste Handling:

Employees must abide by the policies and procedures in the Corporate Environmental Health and Safety Manual (CW-E-M-001) and this document. This procedure may involve hazardous material, operations and equipment. This SOP does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of the method to follow appropriate safety, waste disposal and health practices under the assumption that all samples and reagents are potentially hazardous. Safety glasses, gloves, lab coats and closed-toe, nonabsorbent shoes are a minimum. Cut resistant gloves must be worn when using sharp tools or when washing glassware.

9.1 Specific Safety Concerns

9.1.1 Disposable gloves that have been contaminated must be removed and discarded; non-disposable gloves must be cleaned immediately.

NOTE: Latex and vinyl gloves provide no protection against the organic solvents used in this method. Nitrile or similar gloves must be used.

9.1.2 The gas chromatograph and mass spectrometer contain zones that have elevated temperatures. The analyst needs to be aware of the locations of those zones, and must cool them to room temperature prior to working on them.

9.1.3 The mass spectrometer is under deep vacuum. The mass spectrometer must be brought to atmospheric pressure prior to working on the source.

9.1.4 There are areas of high voltage in both the gas chromatograph and the mass spectrometer. Depending on the type of work involved, either turn the power to the instrument off, or disconnect it from its source of

power before performing any maintenance.

9.1.5 The toxicity or carcinogenicity of each reagent used in this method has not been fully established. Each chemical should be regarded as a potential health hazard and exposure should be as low as reasonably achievable. Cautions are included for known extremely hazardous materials.

9.2 Primary Materials Used

The following is a list of the materials used in this method, which have a serious or significant hazard rating. **Note: This list does not include all materials used in the method. The table contains a summary of the primary hazards listed in the SDS for each of the materials listed in the table.** A complete list of materials used in the method can be found in the reagents and materials section. Employees must review the information in the SDS for each material before using it for the first time or when there are major changes to the SDS.

Materials with Significant or Serious Hazard Rating

Material (1)	Hazards	Exposure Limit (2)	Signs and Symptoms of Exposure
Methanol	Flammable Poison Irritant	200 ppm-TWA	A slight irritant to the mucous membranes. Toxic effects exerted upon nervous system, particularly the optic nerve. Symptoms of overexposure may include headache, drowsiness and dizziness. Methyl alcohol is a defatting agent and may cause skin to become dry and cracked. Skin absorption can occur; symptoms may parallel inhalation exposure. Irritant to the eyes.
Methylene Chloride	Carcinogen Irritant	25 ppm-TWA 125 ppm-STEL	Causes irritation to respiratory tract. Has a strong narcotic effect with symptoms of mental confusion, light-headedness, fatigue, nausea, vomiting and headache. Causes irritation, redness and pain to the skin and eyes. Prolonged contact can cause burns. Liquid degreases the skin. May be absorbed through skin.
(1) Always add acid to water to prevent violent reactions. (2) Exposure limit refers to the OSHA regulatory exposure limit.			

9.3 Pollution Control

It is Eurofins Frontier Global Sciences policy to evaluate each method and look for opportunities to minimize waste generated (i.e., examine recycling options, ordering chemicals based on quantity needed, preparation of reagents based on anticipated usage and reagent stability). Employees must abide by the policies in Section 13 of the Corporate Environmental Health and Safety Manual (CW-E-M-001) for "Waste Management and Pollution Prevention".

9.4 Waste Management

Waste management practices are conducted consistent with all applicable rules and regulations. Excess reagents, samples and method process wastes are disposed of in an accepted manner. Waste description rules and land disposal restrictions are followed. Waste disposal procedures are incorporated by reference to SOP *EFGS-S-HS-SOP2991*.

9.4.1 Waste Streams Produced by the Method

9.4.1.1 Extracted sample and QC wastewater. After the extraction has been completed the spent water is collected into the organics extraction water conical reservoir. The collected wastewater is then purged with air to remove any remaining methylene chloride. The wastewater can then be discarded down the drain.

9.4.1.2 Methylene chloride waste. Solvent/Methylene Chloride waste. Any waste solvents are collected in beakers and then poured into a 4-liter amber bottle labeled "Hazardous Waste" located in the hood. After the extraction has been completed the MeCl2 collected in the 4 L bottles is emptied into the MeCl2 satellite waste barrel located next to the neutralization tank in lab hood #17. The funnel lid on the drum must be closed after each use At or before the satellite waste reaches 55 gallons the barrel is transferred to the waste disposal room from where it is sent out for recycling or fuel blending.

9.4.1.3 Vialed extract waste. Sample extracts that have been placed in vials for analysis are discarded into plastic satellite waste buckets labeled "Hazardous Waste" located underneath the bench top. Once the buckets are full the GC vials are bulked into the non-PCB GC vial waste barrel located in the waste room and sent out for incineration.

9.4.1.4 Extract waste. Unused sample extracts are held for at least 40 days, in case further testing is deemed necessary. After at least 40 days has passed these extracts are transported to the waste room in racks of 100 were they are bulked into a flammable loose pack waste stream and sent out for incineration.

10) Personnel Training and Qualifications:

10.1 An analyst must perform an initial demonstration of capability (IDOC) that includes four replicates of a secondary source before being qualified to analyze samples without supervision. Continuing DOC will be maintained and monitored via performance on LCSs and other QC samples, as well as obtaining acceptable results on proficiency testing exercises.

10.2 Training is documented by the employee and supervisor, and is kept on file in the QA Office. The employee must read, understand, and by signing the training document, agree to perform the procedures as stated in all Standard Operating Procedures (SOPs) related to this method.

10.3 All employees must also, on a yearly basis, read the Quality Manual (QM), and complete the yearly Ethics training.

10.4 All training documents including IDOCs, CDOCs, Initial QA orientation, and Ethics training are stored by the Quality Assurance Manager in the employees training file for ten years after the employee is no longer working for Eurofins Frontier Global Sciences.

10.5 Chemical Safety Training, Compressed Gas Training, Chemical Hygiene Plan documentation, and Shipping of Hazardous goods, are stored by the Health and Safety Officer for ten years after the employee is no longer working for Eurofins Frontier Global Sciences.

11) Sample Collection, Preservation and Handling:

11.1 Water samples are collected in pre-cleaned, amber glass bottles fitted with a Teflon-lined cap. To achieve routine reporting limits, a full one-liter of sample is required. Additional one-liter portions are needed to satisfy the requirements for matrix spikes and duplicate matrix spikes.

11.2 Samples and extracts are stored at 0-6°C.

Matrix	Sample Container	Min. Sample Size	Preservation	Extraction Holding Time	Analysis Holding Time	Reference
Waters	Amber glass	1 Liter	Cool 0-6ºC	7 Days	40 Days from extraction	40 CFR Part 136.3

12) Apparatus and Equipment:

12.1 Instrumentation

- Gas chromatograph- Agilent 6890 or equivalent
- Mass spectrometer Agilent 5973 Inert or 5975 w/turbo pump – 70 volt electron ionization source capable of scanning m/z range of 50 to 550 amu once every 1 second or less, operating in a selected ion monitoring (SIM) mode, and meeting the tuning requirements listed in Table 3 when 25 ng of the GC/MS tuning standard is injected through the GC.
- Gas chromatograph/mass spectrometer system: an analytical system complete with a
- Autosampler: LEAP Technologies CTC A200S, HP7683 Autosampler or equivalent
- Computer with a minimum 1GB memory, Pentium 4 processor, 80 G hard drive or equivalent or as recommended by instrument manufacturer.
- GC/MS Interface: Any GC-to-MS interface that gives acceptable calibration points and achieves acceptable tuning performance criteria may be used
- Data System: A computer system must be interfaced to the mass spectrometer. The system must allow the continuous acquisition and storage on machine-readable media of all mass spectra obtained throughout the duration of the chromatographic program. The computer must have software that can search any GC/MS data file for ions of a specific mass and that can plot such ion abundances versus time or scan number. This type of plot is defined as the Extracted Ion Current Profile (EICP). Software must also be available that allows integrating the abundances in any EICP between specified time or scan-number limits. The most recent version of the NIST Mass Spectral Library is recommended. Agilent (Hewlett Packard) ChemStation for Windows 95 (version G1701AA) or equivalent. Agilent's ChemStation, is used for data acquisition and storage on machine-readable media. Since no processing is done by ChemStation and since there are no audit trail functions associated with data acquisition, the audit trail feature for ChemStation may be either enabled or disabled. The other component, Chrom, is used for data processing such as the measurement of peak area or peak height. By design, the audit trail feature for Chrom is always enabled.
- Data processing: Chrom version 1.2 or higher.
- LIMS system: TALS version 1.0 or higher

12.2 Supplies

- Column – Phenomenex part number 7HG-G030-11-GGA 30 m x 0.25 mm x 0.25 µm film thickness fused-silica capillary column, or equivalent.
  Note: Other columns may be used. This was the column in place at the time the SOP was prepared. The serial number of the column used is documented in the instrument maintenance logbook.

- Gas-tight syringes (Hamilton 1700 Series, or 1000 Series or equivalent).
- 10 ml scintillation vials with polypropylene closures or 10, 20, 40 or 60 ml VOA vials with Teflon-lined silicone septa enclosures (or equivalent).
- 2 mL crimp top glass vials with PTFE lined caps.
- 100 µL Tri-spring inserts for 2 mL crimp top glass vials.
- Restek Gooseneck Splitless liners P/N 22406 or equivalent
- Analytical balance, capable of reading to 0.0001g. Analysts must verify calibration has been preformed on the balance before using it. The calibration must bracket the weights to be determined.
- Class A volumetric flasks; 10 mL, 25 mL, 50 mL, 100 mL, 250 mL.
- Carrier gas: Ultra high-purity helium

13) Reagents and Standards:

13.1 Document reagent/standards and reagent/standard preparation in TALS using the reagent module as described in SOP *EFGS-Q-QD-SOP41922*.

13.2 A minimum five-point calibration curve is prepared when average response factors or linear regression curve fitting is used. Six calibration points are required for second-order curve fits. The low point should be at or below the reporting limit. Other calibration levels may be used, depending on instrument capability, but the low standard must support the reporting limit and the high standard defines the range of the calibration.

13.2.1 8270 Calibration standards.

13.2.1.1 8270 Initial calibration stock standards

1000 ug/ml 8270 List 1 / Std#1 MegaMix – Restek 571995
2000 ug/ml 8270 List 1 / Std#9 - Restek 569730
2000 ug/ml 8270 List 1 / Std#10 - Restek 569731
2000 ug/ml 8270 List 1 / Std#11 - Restek 569732
5000 ug/ml Surrogate stock – Phenova AL0-130489

13.2.1.2 8270 Intermediate calibration standard
Dilute 1.0-mL of stock solutions listed in section 13.2.1.1. For the surrogate standard, dilute 200 uL. Mix to a final volume of 10-mL to make a 100-500 µg/mL intermediate stock solution.

13.2.1.3 From the intermediate stock solution make the following calibration levels:

Level	uL of stock	Final Volume (mL)	Final Concentration (ug/L)
1	5	50	10
2	10	50	20
3	25	50	50
4	50	50	100
5	100	50	200
6	250	50	500
7	500	50	1000
8	1000	50	2000
9	2500	50	5000
10	5000	50	10000

13.2.2 DDT breakdown/GCMS tuning standard

13.2.2.1 A methylene chloride solution containing 25 µg/mL of decafluorotriphenylphosphine (DFTPP) is prepared. Pentachlorophenol, benzidine, and DDT should also be included in the Tuning Standard at 25 µg/mL. 2uL of this solution should be injected for an on column concentration of 50ng.

13.2.3 ICV Standard

13.2.3.1
8270 List 1 / Std#1 MegaMix – Restek 571995.SEC
8270 List 1 / Std#9 - Restek 569730.SEC
8270 List 1 / Std#10 - Restek 569731.SEC
8270 List 1 / Std#11 - Restek 569732.SEC
8270 Surrogate mix – Phenova 13489 (MUST be a different lot than what is present in the calibration mix)

13.2.3.2 1.0ug/mL working ICV standard is prepared by diluting 100uL of each standard in section 13.2.3.1 to 100mL final volume with methylene chloride.

13.3 An internal standard (IS) solution is prepared. Compounds in the IS Mix are acenaphthene-d10, chrysene-d12, 1,4-dichlorobenzene-d4, naphthalene-d8, perylene-d12, and phenanthrene-d10.

13.3.1 4000 ug/ml 8270 Internal Standard Restek# 31006; 100 ug/ml 8270 Internal Standard is prepared by diluting 5.0 ml of the 2000 ug/ml Restek Standard to 100 ml with methylene chloride.

13.3.2 Internal standards are added to all standards and extracts to result in a final concentration of 1000 µg/L for full scan and 100 µg/L for SIM. For example, if the volume of an extract aliquot used was 1 mL, 10 µL of a 100 µg/mL internal standard solution would be added to the aliquot.

13.4 Laboratory Control Spiking Solution, Matrix Spike Solution, and surrogate spike solutions: Prepare as indicated in the extraction SOPs.

13.5 The standards listed in sections 13.1 to 13.4 must be refrigerated at 0-6°C. Stock standards expire 1 year after preparation.

13.6 ICAL reagents should be replaced after one month if the vials have been opened frequently (more than 5 times in a month).

13.7 Managers/supervisors or a designee are expected to check their areas on a monthly basis for expired standards and dispose of them according to SOP *EFGS-S-HS-SOP2991*.

14) Calibration:

14.1 Instrument Operating Conditions

14.1.1 Typical instrument operating conditions are listed in Table 2. Actual instrument operating conditions are posted in each maintenance logbook.

14.1.2 The instrument is tuned for DFTPP, calibrated initially with a minimum of a five levels, and verified each 12-hour shift with one or more continuing calibration standard(s).

14.1.3 All standards and extracts are allowed to warm to room temperature before injecting.

14.2 SIM

14.2.1 SIM (selected ion monitoring) is an alternative to analyzing samples under full scan mode. SIM selects specific target ions for analysis. SIM can be up to ten times more sensitive. In order to achieve maximum sensitivity the selected ions should be broken up in to several groups. Each of the target analytes should have 1 ion used for quantitation and 2 qualifier ions. The suggested ions are in Table 1. Other parameters can be used as long as sufficient sensitivity is achieved.

14.2.1.1 The internal standards and surrogates do not need to have 2 qualifier ions.

14.3 Instrument Tuning

14.3.1 A MS tuning compound (DFTPP) is analyzed every twelve hours during instrument operation, prior to analysis of standards, samples, or QC samples. Method tuning criteria must be met before sample analysis can proceed.

14.3.2 Tuning Procedure: 2.0 ul of a 25 ng/uL solution of decafluorotriphenylphosphine (DFTPP) must be analyzed in a scanning mode of 40 - 450 m/z.

14.3.3 Inject the GC/MS tuning/breakdown standard (Section 13.2.2) into the GC/MS system. Obtain background-corrected mass spectra of DFTPP and confirm that all the key m/z criteria are achieved. If all the criteria are not achieved, the analyst must retune the mass spectrometer and repeat the test until all criteria are achieved. The performance criteria must be achieved before any samples, blanks, or standards are analyzed. DFTPP Tuning Criteria (per EPA method 525.1):

Mass	Ion Abundance Criteria
51	10 - 80% of base peak
68	< 2% of mass 69
69	present
70	< 2% of mass 69
127	10 - 80% of base peak
197	< 2% of mass 198
198	Base peak or > 50% of 442
199	5 - 9% of mass 198
275	10 - 60% of base peak
365	> 1% of base peak
441	Present, but less than mass 443
442	Base peak or > 50% of mass 198
443	15 - 24% of mass 442

14.3.4 The results of the analysis of the GC/MS tuning/breakdown standard standard solution are used to calculate column degradation in terms of DDT percent breakdown (%B) are as follows:

$$\text{DDT } \%B = \frac{A_{DDD} + A_{DDE}}{A_{DDD} + A_{DDE} + A_{DDT}} \times 100\%$$

Where A_{DDD}, A_{DDE}, and A_{DDT} are the peak responses for 4,4'-DDD, 4,4'-DDE, and 4,4'-DDT, respectively, in the EVAL B chromatogram.

14.3.5 Acceptance Criteria**:** The %Breakdown for DDT must be less than 20%.

14.3.6 Corrective Action: If the breakdown of DDT exceeds the 20% limit, corrective action must be taken. This action may include any or all of the following:

- Replacing the injection port liner
- Replacing the septa.
- Cutting off a portion of the injection end of the column or guard column.
- Replacing the GC column or guard column
- Replace inlet seal

After taking the appropriate corrective action, the degradation evaluation standard must be reanalyzed and must pass acceptance criteria before conducting any calibration events.

14.4 Initial Calibration

14.4.1 Internal Standard (IS) Calibration Procedure: Internal standards are listed in Section 13.3. Use the base peak m/z as the primary m/z for quantitation of the standards. If interferences are noted, use one of the next two most intense masses for quantitation. 10 uL of internal standard solution is added for every 1 mL of extract to all calibration standards, QC samples, and samples prior to analysis. The autosampler injects up to 5 uL of standard and extract volumes into the instrument for analysis.

14.4.2 Compounds are assigned to the IS with the closest retention time.

14.4.3 Prepare calibration standards at a minimum of five concentration levels for each parameter of interest when average response factors or linear regression curve fits are used. Six standards must be used for a quadratic least-squares calibration. It may also be useful to analyze six calibration levels and use the lower five for most analytes and the upper five for analytes that have poor response.

14.4.4 Rejection of Calibration Points

14.4.4.1 Generally, it is NOT acceptable to remove points from a calibration. If calibration acceptance criteria are not met, the normal corrective action is to examine conditions such as instrument maintenance and accuracy of calibration standards. Any problems must be fixed and documented in the run log or maintenance log. Then the calibration standard(s) must be reanalyzed.

14.4.4.2 If no problems are found or there is documented evidence of a problem with a calibration point (e.g., obvious misinjection explained in the run log), then points may be rejected, but only if all of the following conditions are met:

- The rejected point(s) are the highest or lowest on the curve, i.e., the remaining points used for calibration must be contiguous; and
- The lowest remaining calibration point is still at or below the project reporting limit; and
- The highest remaining calibration point defines the upper concentration of the working range, and all samples producing results above this concentration are diluted and reanalyzed; and
- The calibration must still have the minimum number of calibration levels required by the method, i.e. five levels for calibrations modeled with average response factors or linear regressions, or six levels for second-order curve fits.

14.4.5 Add the internal standard mixture to result in a 1,000-µg/L final concentration. (For example, if the volume of the calibration standard used is 0.5 mL, add 5 µL of the 100 µg/L internal standard).

14.4.6 Analyze each calibration standard and tabulate the area of the primary characteristic m/z against the concentration for each compound and internal standard. Calculate the response factors (RF), average response factors, and the percent RSD of the response factors for each compound using the equations in section 12 and Corporate SOP *EFGS-QP42518*. No sample analysis may be performed unless these criteria are met.

14.4.7 If the software in use is capable of routinely reporting curve coefficients for data validation purposes, and the necessary calibration reports can be generated, then the analyst should evaluate analytes with RSD > 15% for calibration on a curve. If it appears that substantially better accuracy would be obtained using quantitation from a curve fit, then the appropriate curve should be used for quantitation.

14.4.8 If the RSD for a compound in the initial calibration is > 15%, then calibration using a curve fit, must be used. Linear or quadratic curve fits may be used. Use of 1/Concentration2 weighting is recommended to improve the accuracy of quantitation at the low end of the curve. The analyst should consider instrument maintenance to improve the linearity of response.

14.4.9 If a linear regression equation is used, the correlation coefficient (r) must be greater than 0.995.

14.4.10 Use of second-order equations (quadratic) may be used on rare occasions and must consist of a minimum of six data points. In these cases, the intercept and degree of curvature should be examined to be sure that results will be reliable throughout the working range, and the coefficient of determination (r2) must be greater than 0.990.

14.4.11 Weighting of Calibration Data Points

14.4.12 In a linear or quadratic calibration fit, the points at the lower end of the calibration curve have less weight in determining the curve generated than points at the high concentration end of the curve. However, in environmental analysis, accuracy at the low end of the curve is very important. For this reason, it is preferable to increase the weighting of the lower concentration points. 1/Concentration2 weighting (often called 1/X2 weighting) will improve accuracy at the low end of the curve and should be used if the data system has this capability.

14.4.13 In addition to meeting %RSD requirements, each analyte must meet a minimum RF requirement of 0.020. Method 8270 states the minimum acceptable average RF for SPCC compounds is 0.050; however, as the analytes and the system are different, a minimum of 0.020 will be used as the cutoff.

14.4.14 See Corporate SOP *EFGS-QP42518* for information on acceptable initial calibration models and associated algorithms.

14.4.15 An initial calibration verification containing all components from a second source (an alternate vendor or a unique lot from the same vendor) must be analyzed after the initial calibration. Acceptance criteria for ICV percent recovery (%R) are 70-130% of all target analytes.

14.4.16 If the percent difference for the second-source verification falls outside acceptance criteria, then sample analysis cannot be performed. Reanalyze the second-source verification standard to confirm the original result. If the second result fails, then re-prepare the verification standard, and/or re-prepare and rerun the ICAL.

14.4.17 If time remains in the 12-hour period initiated by the DFTPP injection before the initial calibration, samples may be analyzed. Otherwise, proceed to continuing calibration, Section 15.2.

NOTE: Quantitation is performed using the calibration curve or average response factor from the initial curve, not the continuing calibration.

14.4.18 If a calibration is in use for greater than 3 months a check at the low and high ends of the calibration will be performed once per month of continued use and the %D and evidence of saturation for the high end check will be used to evaluate the continued effectiveness of the calibration.

15) Procedure:

Procedural variations are allowed only if deemed necessary in the professional judgment of the supervisor to accommodate variation in sample matrix, radioactivity, chemistry, sample size, or other parameters. Any variation in procedure shall be completely documented using a Nonconformance Memo (NCM). The NCM is approved by the supervisor and then automatically sent to the laboratory Project Manager by e-mail so that the client can be notified as appropriate. The QA department also receives NCMs by e-mail for tracking and trending purposes. The nonconformance shall be addressed in the case narrative, and the NCM shall be filed in the project file. The NCM process is described in more detail in SOP *EFGS-Q-QD-SOP2835*.

15.1 Sample Preparation

Samples are prepared according to the following organic preparation SOPs, as applicable:

EFGS-T-OP-SOP41411 Separatory Funnel Extraction (3510C)
EFGS-T-OP-SOP41432 Microwave Extraction (3546)
EFGS-T-OP-SOP41420 Waste Dilution (3580A)

15.2 Continuing Calibration Verification (CCV)

15.2.1 Prior to sample analysis, or following a successful DFTPP analysis (if required), the continuing calibration verification (CCV) standard(s) are analyzed. The standard(s) must contain all semivolatile analytes, including all required surrogates. A mid level calibration standard is used for the CCV.

15.2.2 The following criteria must be met for the CCV to be acceptable:

- For DOD samples, the percent difference or drift (%D) must be within ± 20% for all reported analytes. Any samples associated with a continuing calibration verification standard where the response for an analyte in the verification standard is above the acceptance limit and the analyte is not detected in any of the samples analyzed in the 12-hour window, do not need to be reanalyzed, as the verification standard has demonstrated that the analyte would have been detected if it were present (for DOD samples this requires client pre-approval). If a compound in the CCV fails low, the analyst may elect to analyze a RL (CCVL)standard immediately after the CCV. If the compounds of concern are detected in the RL standard,

it demonstrates that they would be detected in the samples, if present. This allows for the reporting of non detect sample results. Any compounds using a linear calibration fit in the initial calibration must undergo a low level readback on the CCVL. The readback concentration must be within 30% of the true value unless the analyte has been identified as a poor performer in which case the readback value must be within 50% of the true value. Compounds failing the readback value must be re-analyzed. For situations where the failed compound is present in a sample, the results must be qualified or the problem must be fixed and the CCV and affected samples must be re-analyzed. Possible problems include standard mixture degradation, column contamination and active sites.

If the subsequent calibration verification injection fails, a new initial calibration curve must be processed. (i.e., no more than two consecutive injections of the calibration verification may be processed.

- Analysis of DOD samples also requires a closing CCV to be analyzed at the end of the analytical run. Closing CCV requirements are 50%D for all analytes.
- For non-DOD samples, >80% of target compounds listed in Table 1 must meet 20%D except those listed as poorly performing compounds in Table 5 which must be within ± 50%D. (See Section 12 for calculations)
- For SIM PAH analysis of samples analyzed under the BP Lamp program, all target analytes must meet ± 15% D. See above for corrective actions.
- For non BP SIM samples, the percent drift must be ± 20% for all compounds.
- NOTE: Some analytes are included in both Tables 1 and 5. Those analytes that are in Table 1 will be controlled to ± 20% for projects reported under the DoD QSM and will be controlled to ± 50%D for commercial projects.
- The internal standard response of the CCV must be within 50 - 200% of the response in the same level of the corresponding calibration.
- If any internal standard retention time in the CCV changes by more than 30 seconds from that of the same level of the corresponding initial calibration, the chromatographic system must be inspected for malfunctions and corrections made, as required.

15.2.3 Once the above criteria have been met, sample analysis may begin. Initial calibration average RFs (or the calibration curve) will be used for sample quantitation, not the continuing calibration RFs. Analysis may proceed until 12 hours from the injection of the CCV have passed. A sample injected less than or equal to 12 hours after the CCV is acceptable.

15.2.3.1 If multiple CCVs are required for sample analysis, the analysis window ends 12 hours after the injection time of the first CCV.

15.3 Sample Analysis

15.3.1 Calibrate the instrument as described in Section 14. Depending on the target compounds required by the client, it may be necessary to use more than one set of calibration standards.

15.3.2 All samples must be analyzed using the same instrument conditions as the preceding continuing calibration verification (CCV) standard.

15.3.3 Add internal standard to an aliquot of the extract to result in a 1000-µg/L concentration (for example, 10 µL of internal standard solution at 100 µg/mL in 1000 µL of extract). Mix thoroughly before injection into the instrument. The internal standard response must be within 50-200% of the response in the daily CCVIS.

15.3.4 Inject the aliquot into the GC/MS system using the same injection technique as used for the standards.

15.3.5 The data system will determine the concentration of each analyte in the extract using calculations equivalent to those in Section 16. Quantitation is based on the initial calibration, not the continuing calibration verification.

15.3.6 Identified compounds are reviewed for proper integration. Manual integrations are performed if necessary and are documented by the analyst (see Corporate SOP *EFGS-M-MC-SOP42521*) or automatically by the data system. Chrom generates a report of the before and after chromatograms.

15.3.7 Target compounds identified by the data system are evaluated using the criteria listed in Section 16.1.

15.3.8 Library searches of peaks present in the chromatogram that are not target compounds, i.e., Tentatively Identified Compounds (TIC), may be performed if required by the client. They are evaluated using the criteria in Section 16.2.

15.4 Dilutions

If the response for any compound exceeds the working range of the GC/MS system, a dilution of the extract is prepared and analyzed. An appropriate dilution should be in the midrange of the calibration range. Samples may be screened to determine the appropriate dilution for the initial run. If the initial diluted run has no hits and the matrix allows for analysis at a lesser dilution, the sample may be reanalyzed at a lesser dilution.

15.4.1 Guidance for Dilutions Due to Matrix

If the sample is initially run at a dilution and the baseline rise is less than the height of the internal standards, or if individual non-target peaks are significantly less than two times the height of the internal standards, the sample may be reanalyzed at a more concentrated dilution. **This requirement is approximate and subject to analyst judgment.** For example, samples containing organic acids may need to be analyzed at a higher dilution to avoid destroying the column.

15.4.2 Reporting Dilutions

The most concentrated dilution with no target compounds above the calibration range will be reported. Other dilutions will be reported only at client request.

15.5 Perform all qualitative and quantitative measurements. When the extracts are not being used for analyses, refrigerate them at 0-6°C, protected from light in screw cap vials equipped with unpierced Teflon lined septa.

15.6 Retention Time Criteria for Samples

If the retention time for any internal standard changes by more than 0.5 minutes from the last continuing calibration standard, the chromatographic system must be inspected for malfunctions and corrected. Reanalysis of samples analyzed while the system was malfunctioning is required.

15.7 Percent Moisture

Analytical results may be reported as dry or wet weight, as required by the client. Percent moisture must be determined if results will be reported as dry weight. Refer to SOP EFGS-WC-SOP41035 for determination of percent moisture.

15.8 Procedural Variations

One-time procedural variations are allowed only if deemed necessary in the professional judgment of supervision to accommodate variation in sample matrix, chemistry, sample size, or other parameters. Any variation in procedure shall be completely documented using an NCM. The NCM is approved by the supervisor and then automatically sent to the laboratory Project Manager by e-mail so that the client can be notified as appropriate. The QA department also receives NCMs by e-mail for tracking and trending purposes. The NCM process is described in more detail in SOP *EFGS-Q-QD-SOP2835*. The NCM shall be filed in the project file and addressed in the case narrative. Any unauthorized deviations from this procedure must also be documented as a nonconformance, with a cause and corrective action described.

15.9 Maintenance Guide for GC/MS systems

15.9.1 Routine Instrument Maintenance

In addition to the schedules listed in Appendix A, the following activities constitute routine maintenance procedures and are performed as necessary.

- Clip Column;
- Install new injection port liner;
- Install new septum;
- Install new inlet seal and washer, or equivalent;

15.9.2 Injector port maintenance is performed whenever the following conditions exist:

- High column bleed
- Peak broadening and/or tailing for polar analytes such as phenols
- Loss of sensitivity
- Calibration failures due to a loss of response
- Retention time drift
- Long or training solvent tail
- Overall loss of instrument response

15.9.2.1 Turn the GC oven off and let the system cool to room temperature. Remove the column nut and column from the injector body. Remove the injector nut, removing the septum and liner from the injector body. (See Illustration 6-10 in the instrument manual).

15.9.2.2 Clean the inside of the injector body with a cotton swab dipped in methanol. Follow with a wash of methanol, collecting the washings below at the column inlet port. Allow to air dry, and then replace the liner with a new or reconditioned liner that has been boiled in mineral acid, solvent rinsed, and muffled at 400°C. Replace the septum and tighten the nut just past finger tight.

15.9.2.3 Using a ceramic column cutter, remove at least 4 cm of the column end, depending on the severity of the system contamination. Place a column nut and new ferrule over the end of the column and re-cut one inch from the column end to ensure that no ferrule fragments remain in the column. Feed the column into the tapered liner until seated, then hold pressure on the column while the nut is tightened to one turn past finger tight. At this point, the GC oven is turned on and brought up to operating temperature. The system should then be leak checked.

15.9.3 Column installation is performed when the following conditions are encountered;

- Heavy column bleed that cannot be eliminated by thermal conditioning.
- Loss of early eluting peaks due to column cutting.
- Inability to chromatographically resolve method performance compound peaks (i.e. chrysene from benzo(a)anthracene).
- Distortion of peak shapes i.e.; broadening, ghost peaks, split peaks that can't be resolved by injection port maintenance or flow control.

15.9.3.1 Turn the GC oven off and let the system cool to room temperature. Remove the column nut, liner, septum, and presstight inlet connector. Dispose of old column appropriately.

15.9.3.2 Cut approximately six inches off of the end of new columns. Attach the column to the presstight inlet connector on the injector end and proceed as in 5.3.1.4 to connect to the injector.

15.9.3.3 Turn the GC on and set the injector temperature to 280°C. Allow helium to flow through the column for a couple minutes, and then turn the oven to 310°C and condition for at least an hour.

15.9.3.4 Perform a leak check on the system following the instructions contained in the operator's manual chapter on **Miscellaneous Procedures of Operation**. When the air water spectrum shows acceptable levels, proceed with the mass calibration procedure. For additional information of column replacement see the operator's manual chapter on **Selected Routine GC Maintenance** (pages 6-33 to 6-41).

15.9.4 Major Maintenance

A new initial calibration is necessary following certain maintenance procedures. These maintenance procedures include changing the column, cleaning the ion volume or repeller, cleaning the source, replacing the multiplier, and replacing the "top board" or RF-related electronics. Refer to the manufacturer's manual for specific guidance.

15.9.5 Tuning the MS

After major maintenance an re-tune of the MS must be performed. Using an Agilent 5973 or equivalent MS, Select whatever tune parameters are used by the laboratory and run a tune to tune the MS.

All maintenance and repairs need to be documented in the instrument's maintenance logbook. The logbook must include the instrument name, serial number for each major component (e.g., GC, autosampler, column) and the date of start-up. When an instrument is not capable of analyzing samples, it needs to be tagged "Out of Service". Logbook entries must include a description of the problem and what actions were taken to address the problem. After an instrument has undergone maintenance or repairs, the system is evaluated using a tune, CCV or ICAL. If the evaluation is successful, the analyst documents in the logbook that the "System returned to control as indicated by a passing CCV" (or ICAL, MB, tune, etc as may be the case).

If columns were replaced during maintenance procedures the specific make, model and serial numbers of the columns installed need to be entered in the instruments maintenance logbook.

15.10 Troubleshooting

1. If a DFTPP tune fails spectra, replace vial with fresh tuning solution and reanalyze the tune sample
   a. If it fails a second time, evaluate MS conditions
   b. Continued failures may result in retuning the instrument (10.13.5)
2. If tailing fails for either benzidine or PCP, minimum routine maintenance is required (see section 10.13.)
   a. Continued failure. Check column positioning into the source
   b. Replace column if all other options are exhausted
3. If DDT breakdown fails, minimum routine maintenance is required
   a. Continued failure. Check column positioning into the source
   b. Replace column if all other options are exhausted
4. IF CCV fails for TC target analytes, re-analyze a fresh CCV, if it fails a second time minimum routine maintenance is required. If the 2nd CCV is acceptable, the samples may be analyzed
   a. A second CCV failure requires additional instrument maintenance and possibly generating a new ICAL.

15.11 Examples of Analytical Sequences:

Example 1

RB
DFTPP
STD IC 10 8270
STD IC 20 8270
STD IC 50 8270
STD IC 100 8270
STD IC 200 8270
STD IC 500 8270
STD IC 1000 8270

STD IC 2000 8270
STD IC 5000 8270
STD IC 10000 8270
ICV
QC and Samples (up to a 12 hour time limit)

Example 2

RB
DFTPP
CCV
QC and Samples (and CCVC if DOD) up to a 12 hour time limit

16) Calculations:

16.1 Qualitative Identification

An analyte is identified by retention time and by comparison of the sample mass spectrum with the mass spectrum of a standard of the suspected compound (standard reference spectrum). Mass spectra for standard reference may be obtained on the user's GC/MS by analysis of the calibration standards or from the NIST library**.** Two criteria must be satisfied to verify identification: (1) elution of sample component at the same GC retention time as the standard component; and (2) correspondence of the sample component and the standard component characteristic ions.

NOTE: Sometimes extract matrix and high targets can cause the analytes to shift outside the retention time found in the CCV. Identification can still be determined using the characteristic ions. Also, dilutions to lessen the matrix effects may be necessary to verify the identification.

NOTE: Care must be taken to ensure that spectral distortion due to co-elution is evaluated.

16.1.1 Full Scan Analysis

16.1.1.1 The sample component retention time must compare to within ± 0.06 min. of the retention time of the standard component. For reference, the standard must be run within the same twelve hours as the sample.

16.1.1.2 All ions present in the standard mass spectra at a relative intensity greater than 10% (most abundant ion in the spectrum equals 100%) should be present in the sample spectrum.

16.1.1.3 The characteristic ions of a compound must maximize in the same scan or within one scan of each other.

16.1.1.4 The relative intensities of ions should agree to within ±30% between the standard and sample spectra. (Example: For an ion with an abundance of 50% in the standard spectra, the corresponding sample abundance must be between 20% and 80%).

16.1.1.5 If a compound cannot be verified by all the above criteria, but in the technical judgment of the analyst the identification is correct, the analyst shall report that identification and proceed with quantitation.

16.1.2 SIM Analysis

The reference mass spectrum must be generated using the conditions of this method on the same instrument used for sample analysis. The characteristic ions from the reference mass spectrum are defined as the three ions of greatest relative intensity, or any ions >30% relative intensity, if less than three such ions occur in the reference spectrum. The mass spectrum of the peak is evaluated to confirm the presence of the compound. Spectra are compared against the reference spectra of each compound by an analyst competent in the interpretation of mass spectra. The following requirements must be met:

16.1.2.1 DFTTP tune (run in SCAN mode) runs before a 12 hour clock.

16.1.2.2 The quantitation and qualifier ions must be used for the identification of target compounds. Characteristic ions for the target compounds are presented in Table 7. The monitoring ions must agree within 20% of the relative intensities of the same ions in the reference standard.

16.1.2.3 The RT of the secondary ion must elute within 2 seconds of the primary ion in the sample.

16.1.2.4 The relative RT (RRT) of the compound in the sample must be within ±0.006 RRT of the standard compound. Matrix may affect the RT and the analyst should use their technical judgement for identification. Further dilutions may be necessary to verify identification.

16.1.2.5 A result should be reported as non-detect if, after careful review and in the technical judgment of the mass spectral interpretation specialist, the GC/MS identification cannot be considered a qualitatively confident mass spectral identification (regardless of the concentration).

16.2 For samples containing components not associated with the calibration standards, a library search may be made for the purpose of tentative identification. The necessity to perform this type of identification will be determined by the type of analyses being conducted. Computer generated library search routines should not use normalization routines that would misrepresent the library or unknown spectra when compared to each other. Only after visual comparison of sample spectra with the nearest library searches shall the mass spectral interpretation specialist assign a tentative identification. Following are guidelines for making tentative identification:

16.2.1 Relative intensities of major ions in the reference spectrum (ions >10% of the most abundant ion) should be present in the sample spectrum.

16.2.2 The relative intensities of the major ions should agree to within ±20%. (Example: For an ion with an abundance of 50% in the standard spectrum, the corresponding sample ion abundance should be between 30% and 70%.)

16.2.3 Molecular ions present in the reference spectrum should be present in the sample spectrum.

16.2.4 Ions present in the sample spectrum, but not in the reference spectrum, should be reviewed for possible background contamination or the presence of co-eluting compounds.

16.2.5 Ions present in the reference spectrum, but not in the sample spectrum, should be reviewed for possible subtraction from the sample spectrum because of background contamination or co-eluting peaks. Data system library reduction programs can sometimes create these discrepancies.

16.2.6 Automatic background subtraction can severely distort spectra from samples with unresolved hydrocarbons.

16.3 Isomers with identical mass spectra and close elution times pose problems for definitive identification. The following compounds fall into this category:

Aniline and bis(2-chloroethyl) ether
Dichlorobenzenes
Methylnaphthalenes
Methylphenols
Trichlorophenols
Tetrachlorophenols
Phenanthrene, anthracene
Fluoranthene, pyrene
Benzo(b), (k), and (j)fluoranthene
Chrysene, benzo(a)anthracene

Identification of these compounds requires both experience and extra precautions on the part of the analyst. To begin, the isomers in a standard mix must be completely resolved (i.e., the baseline to valley height between the isomers is less than 50% of the sum of the two peak heights). Otherwise, the isomers must be identified as isomeric pairs. Next, the analyst must carefully compare the retention times between the unknown and the calibration standard.

16.4 A second category of problem compounds consist of the poor responders or compounds that exhibit poor chromatography. The integrations for these types of compounds should be checked manually. *These compounds are listed in Table 5.*

16.5 Calculating the Percent Relative Standard Deviation for Initial Calibration

$$\%RSD = \frac{SD}{RF} \times 100\%$$

Where:
RF = Mean of RFs from the initial calibration for a compound
SD = Standard deviation for the mean RF from the initial calibration for a compound

$$SD = \sqrt{\frac{\sum_{i=1}^{n} \left(RF_i - \overline{RF}\right)^2}{n-1}}$$

RFi = RF for each of the calibration levels
n = Number of RF values

16.6 Calculating the Continuing Calibration Percent Drift

$$\%Drift = \frac{C_{actual} - C_{found}}{C_{actual}} \times 100\%$$

Where:
Cactual = Known concentration in standard

Cfound = Measured concentration using selected quantitation method

16.7 Calculating the Concentration in the Extract

The concentration of each identified analyte and surrogate in the extract is calculated from the linear or quadratic curve fitted to the initial calibration points, or from the average RF of the initial calibration.

16.7.1 Average Response Factor Calibration

If the average of all the RSDs of the response factors in the initial calibration is £ 15%, the average response factor from the initial calibration may be used for quantitation.

$$C_{ex} = \frac{R_x C_{is}}{R_{is}\overline{RF}}$$

Where:
Cex = Concentration in the extract, µg/mL
Rx = Response for the analyte
Ris = Response for the internal standard
Cis = Concentration of the internal standard
$\overline{RF}$ = Average response factor

16.7.2 Linear Fit Calibration

$$C_{ex} = A + B\frac{(R_x C_{is})}{R_{is}}$$

Where:
Cex = Concentration in the extract, µg/mL
Rx = Response for the analyte
Ris = Response for the internal standard
Cis = Concentration of the internal standard
A = Intercept of linear calibration line
B = Slope of linear calibration line

16.7.3 Quadratic Fit Calibration

$$C_{ex} = A + B\left(\frac{R_x C_{is}}{R_{is}}\right) + C\left(\frac{R_x C_{is}}{R_{is}}\right)$$

Where:
Cex = Concentration in the extract, µg/mL
Rx = Response for the analyte
Ris = Response for the internal standard
Cis = Concentration of the internal standard
A = Intercept
B = Factor for the linear term of the quadratic calibration function
C = Factor for the curvature term of the quadratic calibration function

16.8 Calculating the Concentration in the Sample

16.8.1 Calculation for Aqueous Samples

$$\text{Concentration, } \mu g / L = \frac{C_{ex} V_t}{V_o}$$

Where:
Cex = Concentration in the extract
Vt = Volume of total extract in µL, taking into account dilutions (i.e., a 1-to-10 dilution of a 1-mL extract will mean that Vt = 10,000 µL. If half of the base/neutral extract and half of the acid extract are combined, then Vt = 2,000.)
Vo = Volume of the sample that was extracted (mL)

16.8.2 Calculation for Sediment, Soil, Sludge, and Waste Samples

Results for sediments, sludges, and soils are usually calculated on a dry-weight basis, and for waste, on a wet-weight basis.

$$\text{Concentration, } \mu g / kg = \frac{C_{ex} V_t}{W_s D}$$

Where:

Cex = Concentration in the extract
Vt = Volume of total extract in µL, taking into account dilutions (i.e., a 1-to-10 dilution of a 1-mL extract will mean that Vt = 10,000 µL. If half of the base/neutral extract and half of the acid extract are combined, then Vt = 2,000.)
Ws = Weight of sample extracted or diluted in grams
D = (100 - % moisture in sample)/100, for a dry-weight basis or 1 for a wet-weight basis

16.9 MS/MSD Percent Recovery Calculation

$$\text{Matrix Spike Recovery} = \frac{S_{SR} - S_R}{S_A} \times 100\%$$

Where:
SSR = Spike sample result
SR = Sample result
SA = Spike added

16.10 Calculating the Relative Percent Difference (RPD) MS/MSD Pair

$$RPD = \frac{MS_R - MSD_R}{1/2(MS_R + MSD_R)} \times 100$$

Where:
RPD = Relative percent difference
MSR = Matrix spike result
MSDR = Matrix spike duplicate result

16.11 Relative Response Factor Calculation

$$RF = \frac{A_x C_{is}}{A_{is} C_x}$$

Where:
Ax = Area of the characteristic ion for the compound being measured
Ais = Area of the characteristic ion for the specific internal standard
Cx = Concentration of the compound being measured (µg/L)
Cis = Concentration of the specific internal standard (µg/L)

16.12 Calculation of TICs

The calculation of TICs (tentatively identified compounds) is identical to the above calculation (0) with the following exceptions:

Ax = Area of the total ion chromatogram for the compound being measured
Ais = Area of the total ion chromatogram for the nearest internal standard without interference
RF = 1

16.13 Calculating Percent DDT Breakdown

$$\%\,\text{DDT breakdown} = \frac{\text{DDEarea} + \text{DDDarea}}{\text{DDTarea} + \text{DDEarea} + \text{DDDarea}}$$

The areas for the 235 ion are used for this calculation.

16.14 Calculating the Peak Tailing Factor

$$TailingFactor = \frac{BC}{AB}$$

Where:
Peak width (AC) is measured at 10% peak height, and divided into two line segments at the peak centroid, so that.
AC = AB + BC, with
AB = left-hand segment
BC = right-hand segment

16.15 Upon completion of the analytical sequence:

16.15.1 Create a worklist on Chrom that reflects the machine run sequence. The Chrom worklist will serve as the instrument sequence logbook. For the Rinse Blank in the sequence, add the solvent to the sample reagent tab. This will serve as the record of the solvent lot used to dilute the samples.

16.15.2 Review chromatograms online and determine whether manual data manipulations are necessary.

16.15.3 All manual integrations must be justified and documented. See Corporate SOP *EFGS-M-MC-SOP42521* for requirements for manual integration.

16.15.4 Manual integrations are processed using Chrom which saves the before and after chromatograms, the reason for the change, and attaches the analyst's electronic signature.

16.16 Compile the raw data for all the samples and QC samples in an analytical batch.

16.16.1 Perform a level 1 data review, acknowledge any Data Review Checker (DRC) findings, and document the review on the data review checklist.

16.16.2 Submit the review checklist to the peer reviewer for the level 2 review. The data review process is explained in SOP *EFGS-P-DR-SOP2801*.

17) Statistical Information and Method Performance:

17.1 Method Detection Limit Study (MDL)

The method detection limit (MDL) is the lowest concentration that can be detected for a given analytical method and sample matrix with 99% confidence that the analyte is present. The MDL is determined according to the laboratory's MDL procedure (see SOP *EFGS-M-MC-SOP42524*). MDLs reflect a calculated (statistical) value determined under ideal laboratory conditions in a clean matrix, and may not be achievable in all environmental matrices. The laboratory maintains MDL studies for analyses performed; these are verified at least annually unless method requirements require a greater frequency.

17.1.1 Instrumentation software must have each target limit set to the lowest MDL. CHROM (DL)

17.2 Non-standard Analytes

For non-standard analytes, an MDL study must be performed and calibration curve generated before analyzing any samples, unless lesser requirements are previously agreed to with the client. In any event, the minimum initial demonstration should include the analysis of an extracted standard at the reporting limit and a single point calibration.

18) Quality Assurance/Quality Control and Corrective Action:

18.1 The minimum quality controls (QC), acceptance criteria, and corrective actions are described in this section and in Table 6. The process of establishing control limits, and the use of control charts are described more completely in *EFGS-Q-QD-SOP41889*, Quality Control Program. When processing samples in the laboratory, use the LIMS QC program code and special instructions to determine specific QC requirements that apply.

18.1.1 The laboratory's standard QC requirements, the process of establishing control limits, and the use of control charts are described more completely in SOP *EFGS-Q-QD-SOP41889*, Quality Control Program.

18.1.2 Project-specific requirements can override the requirements presented in this section when there is a written agreement between the laboratory and the client, and the source of those requirements should be described in the project documents. Project-specific requirements are communicated to the analyst via instructions in the LIMS.

18.1.3 Any QC result that fails to meet control criteria must be documented in a Nonconformance Memo (NCM). The NCM is approved by the supervisor and then automatically sent to the laboratory Project Manager by e-mail so that the client can be notified as appropriate. The QA group also receives NCMs by e-mail for tracking and trending purposes. The NCM process is described in more detail in SOP *EFGS-Q-QD-SOP2835*. This is in addition to the corrective actions described in the following sections.

18.2 Quality Control Batch

The batch is a set of up to 20 samples of the same matrix processed together using the same reagents and standards. Each quality control batch must contain a method blank (MB), a laboratory control sample (LCS), matrix spike (MS), and/or matrix spike duplicate (MSD) or duplicate (DUP) pair. For more details see SOP *EFGS-Q-QD-SOP41889*.

18.3 Method Blank (MB)

For aqueous sample batches, the method blank is reagent water; for solid sample batches, the method blank is clean sand. In either case, the method blank is free of the analytes of interest and is spiked with the surrogates. At least one method blank must be processed with each preparation batch.

Acceptance Criteria: The result for the method blank must be less than the reporting limit or less than 10% of the analyte concentration found in the associated samples, whichever is higher.

NOTE: Some programs (e.g., DOD and BP) require that the maximum blank concentration must be less than one-half of the reporting limit or less than 10% of the lowest sample concentration.

Corrective Action: Re-preparation and reanalysis of all samples associated with an unacceptable method blank. If the analyte was not detected in the samples, the data may be reported with qualifiers (check project requirements to be sure this is allowed) and it must be addressed in the project narrative.

18.4 Laboratory Control Sample (LCS)

The LCS is prepared using reagent water for aqueous methods and Ottawa sand for solid sample methods. A laboratory control sample (LCS) is prepared and analyzed with every batch of samples. For DOD and BP, an LCSD must be analyzed if there is not sufficient volume for a MS/MSD. The LCSD must pass the same control criteria as the LCS. Ongoing monitoring of the LCS provides evidence that the laboratory is performing the method within accepted QC guidelines for accuracy and precision.

Acceptance Criteria: All analytes must be within established control limits. See QC SOP *EFGS-Q-QD-SOP41889* for details on establishing control limits.

Corrective Action: If any analyte in the LCS is outside the laboratory-established historical control limits or project-specific control limits, as applicable, corrective action must occur. Corrective action may include re-extraction and reanalysis of the batch.

- If the LCS recovery is high and there are non-detect samples. An NCM is initiated. The non-detect samples are flagged and reported.

NOTE: DOD programs do not allow reporting data from high LCS's with sample non-detects. If data is to be reported, it must be authorized by the client via a variance on a site by site basis.

- If the batch is not re-extracted and reanalyzed, the reasons for accepting the batch must be clearly presented in the project records and the report. An example of acceptable reasons for not reanalyzing might be that the matrix spike and matrix spike duplicate are acceptable, and sample surrogate recoveries are good, demonstrating that the problem was confined to the LCS. This type of justification should be reviewed and documented with the client before reporting.
- If re-extraction and reanalysis of the batch are not possible due to limited sample volume or other constraints, the LCS is reported, all associated samples are flagged, and appropriate comments are made in a narrative to provide further documentation.

18.5 Matrix Spike/Matrix Spike Duplicate (MS/MSD)

The matrix spike is a second aliquot of one of the samples in the batch. The matrix spike duplicate is a third aliquot of the same sample. The MS and MSD are spiked with the same analytes as the LCS. An MS/MSD pair is prepared and analyzed with every batch of samples when sufficient sample volume is available.

Acceptance Criteria: The percent recovery (%R) must fall within either historical limits or project-specific limits, as applicable. The relative percent difference (RPD) between the MS and MSD results must be less than or equal to the established historical or project-specific limit. See QC SOP *EFGS-Q-QD-SOP41889* for details on establishing control limits

Corrective Action: If any individual recovery or RPD fails the acceptance criteria, then corrective action must occur. Initially check the recovery of the analyte in question in the LCS. Generally, if the recovery of the analyte in the LCS is within limits, then the laboratory operation is considered to be in control and analysis may proceed. The reasons for accepting the batch must be documented.

- If the recovery for any analyte fails acceptance criteria for the MS, MSD, and the LCS, the laboratory operation is considered to be out of out of control and corrective action must be taken. Corrective action will normally include re-preparation and reanalysis of the batch.
- If it is not possible to prepare both an MS and MSD due to limitations of sample amount, then a duplicate LCS should be prepared and analyzed. The RPD between the LCS and LCSD must be less than or equal to the RPD limit established for the MS/MSD.
- The MS/MSD pair must be analyzed at the same dilution as the unspiked sample, even if the matrix spike compounds will be diluted to concentrations below the calibration range.

18.6 Surrogates

18.6.1 Each sample, blank, and QC sample is spiked with the surrogate standards. Surrogate compounds are spiked at 100 µg/mL. The compounds routinely included in the surrogate spiking solution, along with recommended standard concentrations, are listed in Table 4.

Acceptance Criteria: Surrogate spike recoveries must be evaluated by determining whether the concentration (measured as percent recovery) falls within the required recovery limits.

Corrective Action: For particular sublists, such as PAH only, acid surrogates may fail with no corrective action required. However, the failure must be documented in an NCM if the surrogates are reported. Otherwise, if any surrogates are outside of the limits, then the following corrective actions must take place (except for dilutions):

- Check all calculations for error.
- Ensure that instrument performance is acceptable.

- Recalculate the data and/or reanalyze the extract if either of the above checks reveals a problem.
- Re-extract and reanalyze the sample or flag the data as "Estimated Concentration" if neither of the above resolves the problem.

Note: For BP LaMP samples, if the surrogate %R fails, the recovery must be confirmed by re-extraction and reanalysis with the following exceptions:

- The lab has unequivocally demonstrated a sample matrix effect and informed the BP representative.
- The recovery exceeds upper control limits and all target analytes in the sample are non-detect.

NOTE: The decision to reanalyze or flag the data should be made in consultation with the client. It is only necessary to reprepare/ reanalyze a sample once to demonstrate that poor surrogate recovery is due to matrix effect, unless the analyst believes that the repeated out-of-control results are not due to matrix effect.

18.6.2 If the sample with failed surrogate recoveries was a sample used for an MS/MSD pair and the surrogate recoveries in the MS/MSD are also outside of the control limits, then the sample and the MS and the MSD do not require reanalysis. This phenomenon indicates a possible matrix problem.

18.6.3 If the sample is reanalyzed and the surrogate recoveries in the reanalysis are acceptable, then the problem was within the analyst's control and only the reanalyzed data should be reported. (Unless the reanalysis was outside holding times, in which case reporting both sets of results may be appropriate).

18.6.4 If the reanalysis does confirm the original results, the original analysis is reported and the data flagged as estimated due to matrix effects.

18.7 Instrument QC

Any extra QC that is analyzed in a batch or sequence must be evaluated using the same criteria as the corresponding QC above.

18.7.1 Instrument Control Blanks

18.7.1.1 After a calibration has been performed and prior to analysis of samples, an Instrument Control Blank must be analyzed to prove the instrument is free from contamination. An ICB must meet the same requirements as a Method blank as specified in section 18.3.

21) List of Attachments:

Table 1: Current Compounds Applicable to Method
Table 2: Suggested Instrument Conditions
Table 3: DFTPP Key Ions and Ion Abundance Criteria
Table 4: 8270E Surrogate Compounds
Table 5: Table of Poorly Performing Compounds
Table 6: Summary of QC Requirements
Table 7: Characteristic Ions – SIM
Table 8: 8270E Minimum RF criteria

Attachment 1: Example Internal Standard Evaluation Custom Report
Attachment 2: Example Breakdown Evaluation Custom Report
Attachment 3: Example Tailing Evaluation Custom Report

APPENDIX A: Instrument Maintenance Schedules - Mass Spectrometer & Gas Chromatograph

Table 1: Current Compounds Applicable to Method

8270E Full Scan

1,1'-Biphenyl	2-Fluorophenol	Atrazine1	Di-n-octyl phthalate
1,2,4,5-Tetrachlorobenzene	2-Methylnaphthalene	Azobenzene	Fluoranthene
1,2,4-Trichlorobenzene	2-Methylphenol	Benzidine	Fluorene
1,2-Dichlorobenzene	2-Nitroaniline	Benzo[a]anthracene	Hexachlorobenzene
1,3-Dichlorobenzene	2-Nitrophenol	Benzo[a]pyrene	Hexachlorobutadiene
1,3-Dinitrobenzene	3 & 4 Methylphenol	Benzo[b]fluoranthene	Hexachlorocyclopentadiene
1,4-Dichlorobenzene	3,3'-Dichlorobenzidine	Benzo[g,h,i]perylene	Hexachloroethane
1,4-Dioxane1	3-Nitroaniline	Benzo[k]fluoranthene	Hexadecane
1-Methylnaphthalene	4,4'-DDD1	Benzofluoranthene	Indene
2,2'-oxybis[1-chloropropane]	4,4'-DDE1	Benzoic acid	Indeno[1,2,3-cd]pyrene
2,3,4,6-Tetrachlorophenol	4,4'-DDT1	Benzyl alcohol	Isophorone
2,4,5-Trichlorophenol	4,6-Dinitro-2-methylphenol	Bis(2-chloroethoxy)methane	Naphthalene
2,4,6-Trichlorophenol	4-Bromophenyl phenyl ether	Bis(2-chloroethyl)ether	n-Decane1
2,4'-DDE1	4-Chloro-3-methylphenol	Bis(2-ethylhexyl) phthalate	Nitrobenzene
2,4-Dichlorophenol	4-Chloroaniline	Butyl benzyl phthalate	N-Nitrosodimethylamine
2,4-Dimethylphenol	4-Chlorophenyl phenyl ether	Caprolactam1	N-Nitrosodi-n-propylamine
2,4-Dinitrophenol	4-Nitroaniline	Carbazole	N-Nitrosodiphenylamine
2,4-Dinitrotoluene	4-Nitrophenol1	Chrysene	n-Octadecane1
2,6-Dichlorophenol1	Acenaphthene	Dibenz(a,h)anthracene	Pentachlorophenol
2,6-Dinitrotoluene	Acenaphthylene	Dibenzofuran	Phenanthrene
2-Chloronaphthalene	Acetophenone	Diethyl phthalate	Phenol
2-Chlorophenol	Aniline	Dimethyl phthalate	Pyrene
2-Fluorobiphenyl	Anthracene	Di-n-butyl phthalate	Pyridine1

1: Non-standard compounds

8270E SIM

1-Methylnaphthalene	Benzo[g,h,i]perylene
2-Methylnaphthalene	Benzo[k]fluoranthene
4,4'-DDD1	Bis(2-ethylhexyl) phthalate
4,4'-DDE1	Chrysene
4,4'-DDT1	Dibenz(a,h)anthracene
1,4-Dioxane	Fluoranthene
Acenaphthene	Fluorene
Acenaphthylene	Indeno[1,2,3-cd]pyrene
Anthracene	Naphthalene
Benzo[a]anthracene	Pentachlorophenol
Benzo[a]pyrene	Phenanthrene
Benzo[b]fluoranthene	Pyrene

Table 2: Suggested Instrument Conditions

Mass Range:	35 - 550 amu for SCAN, select ions for SIM
Scan Time:	About 3 scan/sec
Initial Column Temperature/Hold Time:	45 °C hold 3 min
Column Temperature Program:	30 °C/min to 280 °C 9 °C/min to 325 °C
Final Column Temperature/Hold Time:	325 °C hold for 2 min
Injector Temperature:	260 °C
Transfer Line Temperature:	280 °C
Source Temperature:	According to manufacturer's specifications
Injector:	Pulsed splitless
Sample Volume:	1.0 µl or 2.0 µl
Carrier Gas:	Helium at 3.3 mL/min.

Current instrument conditions can be found noted in the maintenance logbook for each instrument.

Table 3: DFTPP Key Ions and Ion Abundance Criteria

Mass	**Ion Abundance Criteria**
51	10 - 80% of base peak
68	<2% of mass 69
69	Present
70	<2% of mass 69
127	10 - 80% of base peak
197	<2% of mass 198
198	Base peak or >50% of mass 442
199	5 - 9% of mass 198
275	10 - 60% of base Peak
365	>1% of base Peak
441	Present and < mass 443
442	Base peak or >50% of mass 198
443	15 - 24% of mass 442

Table 4: Surrogate Compounds

8270E Full Scan

Surrogate Compounds	Spiking Level, µg/mL in standard
Nitrobenzene-d5	100
2-Fluorobiphenyl	100
Terphenyl-d14	100
Phenol-d5	100
2-Fluorophenol	100
2,4,6-Tribromophenol	100

Recovery limits for surrogates are generated from historical data and are maintained in the LIMS.

8270E SIM PAH

Surrogate Compounds	Spiking Level, µg/mL in standard
Terphenyl-d14	100
2,4,6-Tribromophenol2	100
2-methylnaphthalene-d101	100
Fluoroanthene-d101	100

Recovery limits for surrogates are generated from historical data and are maintained in the LIMS.
1. Included in standard mix, but not routinely evaluated for method 8270C SIM PAH list, non-DoD projects.
2. Included in standard mix, but not routinely evaluated for method 8270C, unless Pentachlorophenol or other associated compound is a target analyte.

8270E SIM Alternative Analyte List

Surrogate Compounds	Spiking Level, µg/mL in standard
1,4-Dioxane-d8 (Isotope Dilution Analog)	500
Nitrobenzene-d5	100
2-Fluorobiphenyl	100
Terphenyl-d14	100
2-Fluorophenol	100
2,4,6-Tribromophenol	100
2-methylnaphthalene-d101	100
Fluoroanthene-d101	100

Recovery limits for surrogates are generated from historical data and are maintained in the LIMS.
1. Included in standard mix, but not routinely evaluated for method 8270D SIM PAH list, non-DoD projects.

Table 5: Table of Poor Performing Compounds*

2,3,4,6-Tetrachlorophenol	4-Nitrophenol
2,3,5,6-Tetrachlorophenol	Aniline
2,4-Dinitrophenol	Benzidine
3-Nitroaniline	Benzoic Acid
3,3' Dichlorobenzidine	Carbazole
4-Chloroaniline	N-Nitrosodimethylamine
4-Nitroaniline	

* - This is not a comprehensive list and is subject to change. Each project's target list should be evaluated for poor performers.

Table 6: Summary of QC Requirements

QC Parameter	Frequency	Acceptance Criteria	Corrective Action
DFTPP Tune	Prior to ICAL and at the beginning of each 12-hour period.	See Section 14.5	Retune instrument and verify. Rerun affected samples.
Breakdown Check	At the beginning of each 12-hour period and prior to analyzing samples.	Degradation ≤ 20% for DDT. Benzidine tailing < 2.0 and PCP tailing < 2.0. **For DoD:** Benzidine and PCP should be present at their normal responses, and should not exceed a tailing factor of 2.	Correct problem then repeat breakdown check. No samples can be run until degradation is acceptable.
Minimum 5-point Initial Calibration	Initial calibration prior to sample analysis	Option 1: RSD for each analyte ≤ 20% (<15% for DOD) Option 2: Linear regression r ≥ 0.990 **Option 2 for DOD:** Linear regression r ≥ 0.995. Option 3: Non linear regression r2 ≥ 0.990 and 6 points must be used.	Terminate analysis; correct the problem; recalibrate. Problem must be corrected. No samples may be run until ICAL has passed.
ICV	Following initial calibration.	70-130% for non-DoD projects (e.g., 8270D HSL components); and 50-150% for poor performers **For DoD:** 80 - 120% recovery	Terminate analysis; correct the problem; recalibrate.
Relative Retention Times (RRT)	With each sample	RRT of each target analyte within ± 0.06 RRT units.	Correct problem, then rerun ICAL. Laboratory may update RTs based on the CCV to account for minor performance fluctuations or after routine system maintenance (e.g. column clipping).
CCV	Daily before sample analysis and every 12 hours of analysis time.	**For non-DoD projects:** 80-120% recovery for all 8270 standard compounds in Table 1 and surrogates; 50-150% recovery for 8270 poor performing compounds in Table 5. **For DoD/BP LaMP projects:** ; 1. %D/Drift for all standard target compounds in Table 1 and surrogates ≤ 20%D; 2. Closing CCV requires 50-150%D for all compounds.	Correct problem, then rerun CCV. If that fails, then repeat ICAL. Reanalyze all samples since the last successful CCV.

QC Parameter	Frequency	Acceptance Criteria	Corrective Action
Internal Standards (IS) verification	Every field sample, standard, and QC sample	Retention time ± 30 seconds from RT of the midpoint standard in ICAL; EICP area within -50% to +100% of ICAL midpoint standard. **For DOD:** Retention time must be + or – 10 seconds from the RT of the midpoint standard in the ICAL.	Inspect mass spectrometer and GC for malfunctions. Reanalysis of samples while system was malfunctioning is mandatory.
Method Blank	One per batch of 20 field samples or fewer.	The result must be < RL or < 1/10 the amount measured in any sample or 1/10 the regulatory limit. **For DoD:** No analytes detected > ½ RL and > 1/10 the amount measured in any sample or 1/10 the regulatory limit. For common laboratory contaminants no analytes detected > RL.	Re-extract and reanalyze samples. Note exceptions under criteria section. See Section 18.3 for additional requirements.
LCS	One per batch of 20 field samples or fewer.	Must be within laboratory control limits. **For DoD:** Must contain all analytes to be reported. Must be within acceptance criteria specified by DOD, if available. Otherwise, use in-house control limits.	See Section 18.4 for additional requirements.
Surrogate	All field and QC samples.	Must be within laboratory control limits, **For DoD:** Must be within acceptance criteria specified by DOD, if available. Otherwise, use in-house control limits.	See Section 18.6 for additional requirements.
Matrix Spike/Laboratory Fortified Matrix	One per lot of 20 field samples or fewer.	Must be within laboratory control limits. **For DoD:** Must contain all analytes to be reported. Must be within acceptance criteria specified by DOD, if available. Otherwise, use in-house control limits.	See Section 18.5 for additional requirements.

Table 7A: Characteristic Ions – SIM PAHs

SIM Group	Quantitation Ion	Qualifier Ions	Compound
1	136	108	Naphthalene-d8 (istd)
1	128	102, 127	Naphthalene
2	152	122	2-methylnaphthalene-d10 (surr)
2	142	141, 115	2-methylnaphthalene
2	142	141, 115	1-methylnaphthalene
3	152	151, 153	Acenaphthylene
3	164	162	Acenapthene-d10 (istd)
3	153	154, 152	Acenaphthene
4	166	165, 167	Fluorene
4	330	141	2,4,6-Tribromophenol (surr)
5	266	264, 268	Pentachlorophenol
5	188		Phenanthrene-d10 (istd)
5	178	179, 176	Phenanthrene
5	178	179, 176	Anthracene
6	212	106	Fluoranthene-d10
6	202	101, 203	Fluoranthene
6	202	101, 203	Pyrene
6	244	122	Terphenyl-d14 (surr)
7	228	229, 226	Benzo(a)anthracene
7	240	236	Chrysene-d12 (istd)
7	228	226, 229	Chrysene
8	252	253, 126	Benzo(b)fluoranthene
8	252	253, 126	Benzo(k)fluoranthene
8	252	253, 126	Benzo(a)pyrene
8	264	260	Perylene-d12 (istd)
9	276	138, 277	Indeno(1,2,3-cd)pyrene
9	278	276, 138	Dibenz(a,h)anthracene
9	276	138, 277	Benzo(g,h,i)perylene

Table 7B: Characteristic Ions – Alternative SIM Method

SIM Group	Quantitation Ion	Qualifier Ions	Compound
1	88	58, 43	1,4-Dioxane
1	74	42, 43	N-Nitrosodimethylamine
1	112	64	2-Fluorophenol (surr)
2	99	71	Phenol-d5 (surr)
2	93	63, 95	Bis(2-chloroethyl)ether
2	152	150	1,4-Dichlorobenzene-d4 (istd)
3	70	42, 130	N-Nitrosodi-n-propylamine
3	117	201, 199	Hexachloroethane
3	82	128	Nitrobenzene-d5 (surr)
3	77	123, 65	Nitrobenzene
4	136	108	Napthalene-d8 (istd)
4	127	129, 65	4-Chloroaniline
4	225	190, 118	Hexachlorobutadiene
5	152	122	2-methylnaphthalene-d10 (surr)
5	237	235, 272	Hexachlorocyclopentadiene
5	196	198, 200	2,4,6-Trichlorophenol
5	172	171	2-Fluorobiphenyl (surr)
6	168	122, 76	1,3-Dintrobenzene
6	165	89, 63	2,6-Dinitrotoluene
6	164	162	Acenaphthene-d10 (istd)
6	184	63, 154	2,4-Dinitrophenol
6	165	89, 63	2,4-Dinitrotoluene
7	330	332	2,4,6-Tribromophenol (surr)
7	284	142, 249	Hexachlorobenzene
7	266	264, 268	Pentachlorophenol
7	188	94	Phenanthrene-d10 (istd)
8	212	106	Fluoranthene-d10 (surr)
8	244	122	Terphenyl-d14 (surr)
9	252	254, 154	3,3'-Dichlorobenzidine
9	240	236	Chrysene-d12 (istd)
10	252	253, 126	Benzo(a)pyrene
10	264	260	Perylene-d12 (istd)
11	278	276, 138	Dibenz(a,h)anthracene

Table 8: 8270E Minimum RF criteria

Analyte	Minimum RF for initial and continuing calibration
1,2,4-Trichlorobenzene	0.01
Acenaphthene	0.9
2,4-Dinitrotoluene	0.2
Pyrene	0.6
N-Nitroso-di-n-propylamine	0.5
1,4-Dichlorobenzene	0.01
Pentachlorophenol	0.05
Phenol	0.8
2-Chlorophenol	0.8
4-Chloro-3-methylphenol	0.2
N-Nitrosodimethylamine	0.01
Bis(2-chloroethyl)ether	0.7
n-Decane	0.01
1,3-Dichlorobenzene	0.01
Benzyl alcohol	0.01
1,2-Dichlorobenzene	0.01
2-Methylphenol	0.7
2,2'-oxybis[1-chloropropane]	0.01
3 & 4-Methylphenol	0.6
Hexachloroethane	0.3
Nitrobenzene	0.2
Isophorone	0.4
2-Nitrophenol	0.1
2,4-Dimethylphenol	0.2
Benzoic Acid	0.01
Bis(2-chloroethoxy)methane	0.3
2,4-Dichlorophenol	0.2
Naphthalene	0.7
4-Chloroaniline	0.01
Acetophenone	0.01
Hexachlorobutadiene	0.01
4-Nitrophenol	0.01
2-Methylnaphthalene	0.4
1-Methylnaphthalene	0.4
Hexachlorocyclopentadiene	0.05
2,4,6-Trichlorophenol	0.2
2,4,5-Trichlorophenol	0.2
2-Chloronaphthalene	0.8
2-Nitroaniline	0.01
Dimethyl phthalate	0.01
2,6-Dinitrotoluene	0.2
Acenaphthylene	0.9
3-Nitroaniline	0.01
2,4-Dinitrophenol	0.01
Dibenzofuran	0.8
2,3,4,6-Tetrachlorophenol	0.01
Diethyl phthalate	0.01
4-Chlorophenyl phenyl ether	0.4
4-Nitroaniline	0.01
Fluorene	0.9
4,6-Dinitro-2-methylphenol	0.01
N-Nitrososdiphenylamine	0.01
Azobenzene	0.01
4-Bromophenyl phenyl ether	0.1
Hexachlorobenzene	0.1
n-Octadecane	0.01
Phenanthrene	0.7
Anthracene	0.7
Di-n-butyl phthalate	0.01
Fluoranthene	0.6
Butyl benzyl phthalate	0.01
3,3'-Dichlorobenzidine	0.01
Bis(2-ethylhexyl) phthalate	0.01
Benzo(a)anthracene	0.8
Chrysene	0.7
Di-n-octyl phthalate	0.01
Benzo(b)fluoranthene	0.7

Benzo(k)fluranthene	0.7
Benzo(a)pyrene	0.7
Indeno(1,2,3-cd)pyrene	0.5
Dibenz(a,h)anthracene	0.4
Benzo(g,h,i)perylene	0.5
Carbazole	0.01

Attachment 1: Example Internal Standard Evaluation Custom Report

FORM VIII
GC/MS SEMI VOA INTERNAL STANDARD AREA AND RETENTION TIME SUMMARY

Lab Name: TestAmerica Tacoma Job No.: 580-12197-1

SDG No.:

Sample No.: CCVIS 580-39026/2 Date Analyzed: 12/10/2008 13:19

Instrument ID: TAC040 GC Column: ZB-5MS ID: 0.25(mm)

Lab File ID (Standard): ak018739.D Heated Purge: (Y/N) N

		DCB		NPT		ACN	
		AREA #	RT #	AREA #	RT #	AREA #	RT #
12 HOUR STD		11172	3.20	17716	4.18	11176	5.59
UPPER LIMIT							
LOWER LIMIT							
LAB SAMPLE ID	CLIENT SAMPLE ID						
MB 580-38946/1-A		7654	3.20	18328	4.18	11486	5.59
LCS 580-38946/2-A		8484	3.20	19108	4.18	11938	5.59
580-12197-3	08FTW336B-32	7980	3.20	19016	4.18	11411	5.59
580-12197-3 MS	08FTW336B-32 MS	7765	3.20	17983	4.18	11310	5.59
580-12197-3 MSD	08FTW336B-32 MSD	7232	3.20	18301	4.18	11655	5.59

DCB = 1,4-Dichlorobenzene-d4
NPT = Naphthalene-d8
ACN = Acenaphthene-d10

Area Upper Limit = 200% of Internal Standard Area
Area Lower Limit = 50% of Internal Standard Area

Column used to flag values outside QC limits

FORM VIII 8270C

Attachment 2: Example Breakdown Evaluation Custom Reports

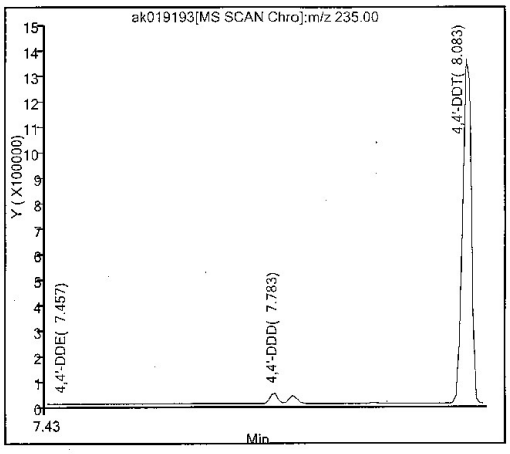
Report Date: 01-Apr-2009 15:08:23 Chrom Revision: 1.0.2009.312

Preliminary Report

Breakdown Report

Data File:	\\TACSVR5\Chromdata\TAC040\20090401-1.b\ak019193.D		
Inj Date:	01-Apr-2009 07:56:30	Limit Group:	8270C Standard
Lims Batch ID:	42046	Lims Sample ID:	1
Client ID:		Instrument:	TAC040
Sample Info:	dftpp		
Sample Amount:	1.00 uL	Operator:	RBF

93 4,4'-DDT, Detector: MS SCAN



SW-846 Method

%Breakdown =
(Area Breakdown Cpnds/
Total Area Breakdown Cpnds) * 100

93 4,4'-DDT Area = 1276732
89 4,4'-DDE Area = 2208
91 4,4'-DDD Area = 33705

%Breakdown: 2.74%, Max Limit: 20.00%
Passed

Attachment 3: Example Tailing Evaluation Custom Reports

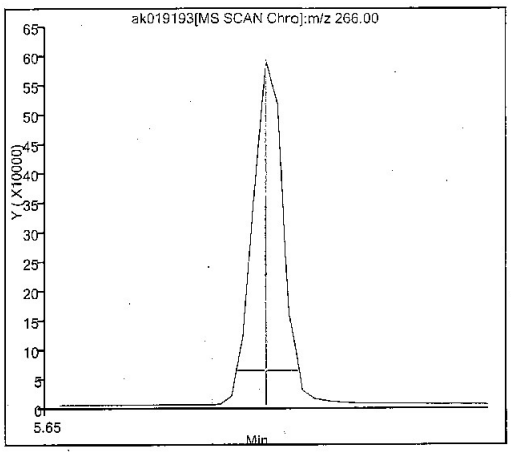
Report Date: 01-Apr-2009 15:09:32 Chrom Revision: 1.0.2009.312

Preliminary Report

Peak Tailing Report

Data File:	\\TACSVR5\Chromdata\TAC040\20090401-1.b\ak019193.D		
Inj Date:	01-Apr-2009 07:56:30	Limit Group:	8270C Standard
Lims Batch ID:	42046	Lims Sample ID:	1
Client ID:		Instrument:	TAC040
Sample Info:	dftpp		
Sample Amount:	1.00 uL	Operator:	RBF

60 Pentachlorophenol_T, Detector: MS SCAN

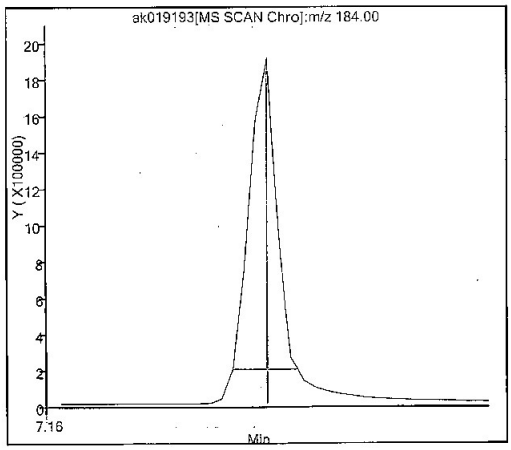


Peak Tailing Factor =
BackWidth/FrontWidth @ 10% Peak Height

Back Width = 0.015 (min.)
Front Width = 0.014 (min.)

Tailing Factor = 1.1, Max. Tailing < 5.00
Passed

85 Benzidine_T, Detector: MS SCAN



Peak Tailing Factor =
BackWidth/FrontWidth @ 10% Peak Height

Back Width = 0.013 (min.)
Front Width = 0.016 (min.)

Tailing Factor = 0.8, Max. Tailing < 3.00
Passed

APPENDIX A
Instrument Maintenance Schedules - Mass Spectrometer & Gas Chromatograph

MASS SPECTROMETER Instrument Maintenance Schedule				
Daily	**Weekly**	**As Needed**	**Quarterly**	**Annually**
Check for sufficient gas supply. Check for correct column flow and/or inlet pressure	Check mass calibration (PFTBA or FC-43).	Check level of oil in mechanical pumps and diffusion pump if vacuum is insufficient. Add oil if needed between service contract maintenance.	Check vacuum, relays, gas pressures, and flows.	Replace the exhaust filters on the mechanical rough pump every 1 to 2 years.
Check temperatures of injector, detector. Verify temperature programs.		Replace electron multiplier when the tuning voltage approaches the maximum and/or when sensitivity falls below required levels.		Change the oil in the mechanical rough pump.
Check inlets, septa.		Clean source, including all ceramics and lenses. Source cleaning is indicated by a variety of symptoms, including inability of the analyst to tune the instrument to specifications, poor response, and high background contamination.		Relubricate the turbomolecular pump-bearing wick.
Check baseline level.		Repair/replace jet separator.		
Check values of lens voltages, electron multiplier, and relative abundance and mass assignments of the calibration compounds.		Replace filaments when both filaments burn out or performance indicates the need for replacement.		

APPENDIX A (continued)
Instrument Maintenance Schedules - Mass Spectrometer & Gas Chromatograph

GAS CHROMATOGRAPH Instrument Maintenance Schedule (For GC/MS only.)	
Daily	**As Needed**
Check for sufficient supply of carrier and detector gases. Check for correct column flow and/or inlet pressures.	Replace front portion of column packing or guard column or break off front portion of capillary columns. Replace column if this fails to restore column performance or when column performance indicates it is required (e.g., peak tailing, poor resolution, high backgrounds, etc.).
Check temperatures of injectors and detectors. Verify temperature programs.	Change glass wool plug in injection port and/or replace injection port liner when front portion of column packing is changed or front portion of capillary column is removed.
Check inlets, septa. Clean injector port.	Replace septa.
Check baseline level.	Perform gas purity check (if high baseline indicates that impure carrier gas may be in use).
Inspect chromatogram to verify symmetrical peak shape and adequate resolution between closely eluting peaks.	Repair or replace flow controller if constant gas flow cannot be maintained.
	Reactivate flow controller filter dryers when the presence of moisture is suspected.
	Autosampler: Replace syringe, fill wash bottle, dispose of waste bottle contents.

EFGS-M-MC-SOP42521 Manual Integrations
EFGS-M-MC-SOP42524 Detection and Quantitation Limits
EFGS-P-DR-SOP2801 Data Review and Validation and Monthly Logbook Reviews
EFGS-Q-QD-SOP2814 Personnel Training and Demonstration of Capability Procedures
EFGS-Q-QD-SOP2835 Incident Reports, Out-of-Specification Reports and Client Complaints
EFGS-Q-QD-SOP41889 Quality Control Program
EFGS-Q-QD-SOP41922 Receipt, Preparation, Storage and Verification of Standards and Reagents and Traceability Protocols
EFGS-Q-QM-QM5805 Quality Assurance Manual
EFGS-QP42518 Calibration Curves and the Selection of Calibration Points
EFGS-S-HS-SOP2991 Waste Disposal Procedures for Client Sample Waste
EFGS-T-OP-SOP41411 Liquid-Liquid Extraction by Separatory Funnel [Methods EPA 3510C and 600 Series]
EFGS-T-OP-SOP41420 Waste Dilution [Method 3580A]
EFGS-T-OP-SOP41432 Microwave Extraction Procedure [Method 3546]
EFHS-S-HS-12066.0004 Chemical Hygiene Plan

End of document

Version history

Version	Approval	Revision information	
1	27.AUG.2021		

Interagency Drinking Water System Team
Zone B1 Removal Action Report
February 2022

Line of Evidence 2b

Water in Premise Plumbing of Homes/Buildings does not exceed State and Federal Drinking Water MCLs, specified State EALs, and ISPs

Table 1: Lines of Evidence Under Evaluation – Ensure no contamination remains in the system and water chemistry concerns are addressed.

Objective 2b - Water in premise plumbing of homes/buildings does not exceed State and Federal DW MCLs, specified State EALs, and ISPs.

Incident Specific Criteria –

- Flushing Plan includes procedures to ensure no service connections will re-contaminate the distribution system.
- Sample Plan includes 72-hour stagnation to account for leaching of contaminants from premise plumbing.
- Sample results show water in homes/buildings does not exceed State and Federal DW MCLs, specified State EALs, and ISPs.

Lines of Evidence	Completion Status	Outstanding Items
Flushing Plan includes procedures to ensure no service connections will re-contaminate the distribution system.	Complete	• None.

February 20, 2022

From: Naval Facilities Engineering Systems Command Representative, IDWS Team
To: Interagency Drinking Water System Team

SUBJ: SUMMARY OF LINE OF EVIDENCE OBJECTIVE 2B – WATER IN PREMISE OF PLUMBING OF HOMES/BUILDINGS DOES NOT EXCEED STATE AND FEDERAL DW MCLs, SPECIFIED STATE EALs, AND ISPs

Encl: (1) 2b.1 Flushing Records and Distribution System Pressure Logs During Residential Flushing
(2) 2b.2 Residential Sampling Report for Flushing Zone
(3) 2b.3 Exceedance Investigation Summary and Results
(4) 2b.4 Certification of Completed Irrigation Flushing
(5) 2b.5 DOH Guidance for Active Irrigation Line Purging and Flushing

1. Enclosures (1) through (5) document completion of Line of Evidence 2b, that water in premise of plumbing of homes/buildings does not exceed State of Hawaii and Federal Drinking Water standards, Maximum Contaminate Levels, Environmental Action Levels and Incident Specific Parameters. On the evening of November 28, 2021, the Red Hill Shaft was secured from operation and all pumping operations ceased. The Aiea/Halawa shaft briefly served as the secondary source starting on November 28, 2021, but it was shut down on December 3, 2021 to prevent potential westward contaminant migration in the aquifer and because there were concerns over high chloride concentrations caused by saltwater intrusion. Since December 3, 2021, the Waiawa Shaft has been the sole water source providing potable water to the Joint Base Pearl Harbor-Hickam (JBPHH) distribution network. Zone B1 is part of the JBPHH Drinking Water system that is operated and maintained by the United States Navy. Flushing operations are summarized in Enclosure (1), signed by CDR Trevor Bingham, team lead for the Drinking Water Residential and Non-residential Recovery Team.

2. Enclosure (1) documents the flushing records for all facilities within Zone B1, as well as pressure logs for the distribution system during facility flushing operations. The completion of irrigation flushing in Zone B1, described in Enclosure (5), is documented in Enclosure (4). Sampling data collected after flushing is summarized in Enclosure (2).

3. Sample results with analyte detections exceeding the prescribed Maximum Contaminant Level (MCL), Environmental Action Level (EAL), or Incident Specific Parameter (ISP) are documented in Enclosure (3). The follow-on investigation summary and additional sampling results are also documented in Enclosure (3).

4. This information documents completion of Line of Evidence 2b, that water in premise of plumbing of homes/buildings does not exceed State of Hawaii and Federal Drinking Water standards, MCLs, EALs, or ISPs.

5. I certify under penalty of law that I have personally examined and I am familiar with the information submitted and I believe the submitted information is true, accurate, and complete.

RODRIGUEZ.ALBERTO.MAURICIO.1396316168

Digitally signed by RODRIGUEZ.ALBERTO.MAURICIO.1396316168
Date: 2022.02.20 14:50:39 -10'00'

A. M. Rodriguez
LT, CEC, USN

28 February 2022

MEMORANDUM

From: Naval Facilities Engineering Systems Command Representative, EWG Team
To: Interagency Drinking Water System Team

Subj: RECORDS OF COMPLETED RESIDENTIAL AND NON-RESIDENTIAL FLUSHING ZONE B1

Ref: (a) Single Family Home Flushing Plan Checklist and Standard Operating Procedures, December 2021
(b) Non-Residential Flushing Plan, January 2022

Encl: (1) EDMS Residential Flushing Records Zone B1
(2) EDMS Non-Residential Flushing Records Zone B1
(3) JBPHH System Pressure SCADA Data
(4) Distribution System Pressure Log Zone B1

1. This memo documents the completion of residential and non-residential flushing in Zone B1. The completed records of residential flushing, as shown in Enclosure (1), document the flushing of 227/227 homes in EDMS. The completed records of non-residential flushing, as shown in Enclosure (2), document the flushing of all 38 facilities in EDMS.

2. The distribution system pressure was monitored by Construction Battalion Maintenance Unit (CBMU) 303. Enclosure (4) demonstrates sustained pressure above 30 pounds per square inch (psi) during the flushing period.

3. Meter 7158, located near Zone B1 at the Fleet and Industrial Supply Center Print Shop, documents that the distribution system maintained a pressure of at least 30 psi for the duration of residential and non-residential flushing, as shown in Enclosure (3).

4. I certify under penalty of law that I have personally examined and I am familiar with the information submitted, and the submitted information is true, accurate, and complete.

Very respectfully,

BINGHAM.TREVOR.AMMON.1131940048

Digitally signed by BINGHAM.TREVOR.AMMON.1131940048
Date: 2022.02.28 08:56:56 -10'00'

T. A. BINGHAM
CDR, CEC, USN

Flushing Zone B1

2022-01-23 - 2022-02-08

Total Homes	Percent Complete	No Access	Flushed on Selected Dates
227	100.0 %	0	227

Zone	Address	Arrive Date	Start Time	Finish Time	Certified	Summary General Notes	Unable To Access	Access Reason
Flushing Zone B1	2865A Hapue Loop (B1-HAPU2865A)	25-Jan-22	10:30	12:12	☑		☐	
Flushing Zone B1	2865B Hapue Loop (B1-HAPU2865B)	25-Jan-22	10:15	12:12	☑		☐	
Flushing Zone B1	2869A Hapue Loop (B1-HAPU2869A)	25-Jan-22	10:02	12:13	☑		☐	
Flushing Zone B1	2869B Hapue Loop (B1-HAPU2869B)	25-Jan-22	09:45	12:14	☑		☐	
Flushing Zone B1	2873A Hapue Loop (B1-HAPU2873A)	25-Jan-22	09:15	12:15	☑		☐	
Flushing Zone B1	2873B Hapue Loop (B1-HAPU2873B)	25-Jan-22	09:15	12:17	☑		☐	
Flushing Zone B1	2873C Hapue Loop (B1-HAPU2873C)	25-Jan-22	09:02	12:18	☑		☐	
Flushing Zone B1	2873D Hapue Loop (B1-HAPU2873D)	25-Jan-22	08:15	12:22	☑		☐	
Flushing Zone B1	2879A Hapue Loop (B1-HAPU2879A)	25-Jan-22	08:40	12:23	☑		☐	
Flushing Zone B1	2879B Hapue Loop (B1-HAPU2879B)	25-Jan-22	08:00	12:24	☑		☐	
Flushing Zone B1	2879C Hapue Loop (B1-HAPU2879C)	25-Jan-22	08:00	12:26	☑		☐	
Flushing Zone B1	2879D Hapue Loop (B1-HAPU2879D)	25-Jan-22	08:00	12:37	☑		☐	
Flushing Zone B1	1123 Hekau Street (B1-HEKA1123)	23-Jan-22	08:00	10:20	☑		☐	
Flushing Zone B1	1131 Hekau Street (B1-HEKA1131)	25-Jan-22	08:39	10:53	☑		☐	
Flushing Zone B1	1132 Hekau Street (B1-HEKA1132)	25-Jan-22	08:00	10:57	☑		☐	
Flushing Zone B1	1137 Hekau Street (B1-HEKA1137)	25-Jan-22	08:11	10:33	☑		☐	
Flushing Zone B1	1140 Hekau Street (B1-HEKA1140)	25-Jan-22	08:08	09:55	☑		☐	
Flushing Zone B1	1145 Hekau Street (B1-HEKA1145)	25-Jan-22	08:08	09:54	☑		☐	
Flushing Zone B1	1148 Hekau Street (B1-HEKA1148)	25-Jan-22	08:09	10:49	☑		☐	
Flushing Zone B1	1153 Hekau Street (B1-HEKA1153)	25-Jan-22	08:47	10:50	☑		☐	
Flushing Zone B1	1156 Hekau Street (B1-HEKA1156)	25-Jan-22	08:00	11:40	☑		☐	
Flushing Zone B1	1159 Hekau Street (B1-HEKA1159)	25-Jan-22	08:00	13:06	☑		☐	
Flushing Zone B1	1162 Hekau Street (B1-HEKA1162)	25-Jan-22	08:00	13:00	☑		☐	
Flushing Zone B1	1167 Hekau Street (B1-HEKA1167)	25-Jan-22	08:00	13:02	☑		☐	
Flushing Zone B1	1170 Hekau Street (B1-HEKA1170)	01-Feb-22	08:00	10:53	☑		☐	
Flushing Zone B1	1176 Hekau Street (B1-HEKA1176)	25-Jan-22	08:00	10:54	☑		☐	
Flushing Zone B1	1177 Hekau Street (B1-HEKA1177)	25-Jan-22	08:00	11:16	☑		☐	
Flushing Zone B1	1061 Honu Loop (B1-HONU1061)	25-Jan-22	11:38	14:04	☑		☐	
Flushing Zone B1	1069 Honu Loop (B1-HONU1069)	25-Jan-22	08:02	11:20	☑		☐	
Flushing Zone B1	1077 Honu Loop (B1-HONU1077)	25-Jan-22	08:16	11:24	☑		☐	
Flushing Zone B1	1085 Honu Loop (B1-HONU1085)	25-Jan-22	09:15	11:30	☑		☐	
Flushing Zone B1	1091 Honu Loop (B1-HONU1091)	25-Jan-22	10:00	11:43	☑		☐	
Flushing Zone B1	1100 Honu Loop (B1-HONU1100)	25-Jan-22	09:35	10:46	☑		☐	
Flushing Zone B1	1102 Honu Loop (B1-HONU1102)	25-Jan-22	08:39	10:46	☑		☐	
Flushing Zone B1	1104 Honu Loop (B1-HONU1104)	25-Jan-22	10:46	11:47	☑		☐	
Flushing Zone B1	1106 Honu Loop (B1-HONU1106)	25-Jan-22	10:09	11:39	☑		☐	
Flushing Zone B1	1134 Honu Loop (B1-HONU1134)	25-Jan-22	08:30	09:53	☑		☐	
Flushing Zone B1	1136 Honu Loop (B1-HONU1136)	25-Jan-22	08:15	09:52	☑		☐	
Flushing Zone B1	1138 Honu Loop (B1-HONU1138)	25-Jan-22	10:17	11:51	☑		☐	
Flushing Zone B1	1140 Honu Loop (B1-HONU1140)	25-Jan-22	10:18	11:51	☑		☐	
Flushing Zone B1	1161 Honu Loop (B1-HONU1161)	25-Jan-22	08:17	11:52	☑		☐	
Flushing Zone B1	1169 Honu Loop (B1-HONU1169)	25-Jan-22	08:18	09:35	☑		☐	
Flushing Zone B1	1177 Honu Loop (B1-HONU1177)	25-Jan-22	10:08	12:46	☑		☐	
Flushing Zone B1	1185 Honu Loop (B1-HONU1185)	25-Jan-22	10:29	12:46	☑		☐	
Flushing Zone B1	1191 Honu Loop (B1-HONU1191)	25-Jan-22	10:15	11:58	☑		☐	
Flushing Zone B1	1199 Honu Loop (B1-HONU1199)	25-Jan-22	08:31	10:54	☑		☐	
Flushing Zone B1	1207 Honu Loop (B1-HONU1207)	25-Jan-22	08:12	11:11	☑		☐	
Flushing Zone B1	1213 Honu Loop (B1-HONU1213)	25-Jan-22	08:03	10:00	☑		☐	
Flushing Zone B1	1221 Honu Loop (B1-HONU1221)	25-Jan-22	08:07	10:02	☑		☐	
Flushing Zone B1	1229 Honu Loop (B1-HONU1229)	25-Jan-22	10:21	11:51	☑		☐	
Flushing Zone B1	2853A Kaee Loop (B1-KAEE2853A)	25-Jan-22	10:00	12:42	☑		☐	
Flushing Zone B1	2853B Kaee Loop (B1-KAEE2853B)	25-Jan-22	08:00	12:40	☑		☐	
Flushing Zone B1	2853C Kaee Loop (B1-KAEE2853C)	25-Jan-22	08:00	12:43	☑		☐	
Flushing Zone B1	2853D Kaee Loop (B1-KAEE2853D)	25-Jan-22	11:30	12:44	☑		☐	
Flushing Zone B1	2853E Kaee Loop (B1-KAEE2853E)	25-Jan-22	08:30	13:07	☑		☐	
Flushing Zone B1	2853F Kaee Loop (B1-KAEE2853F)	25-Jan-22	08:30	12:50	☑		☐	
Flushing Zone B1	2855A Kaee Loop (B1-KAEE2855A)	25-Jan-22	08:00	12:45	☑		☐	
Flushing Zone B1	2855B Kaee Loop (B1-KAEE2855B)	25-Jan-22	08:00	12:43	☑		☐	

Flushing Zone B1

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Flushing Zone B1	2855C Kaee Loop (B1-KAEE2855C)	25-Jan-22	08:00	12:43	☑	☐
Flushing Zone B1	2855D Kaee Loop (B1-KAEE2855D)	25-Jan-22	08:00	12:41	☑	☐
Flushing Zone B1	2855E Kaee Loop (B1-KAEE2855E)	25-Jan-22	10:00	12:15	☑	☐
Flushing Zone B1	2855F Kaee Loop (B1-KAEE2855F)	25-Jan-22	10:30	12:41	☑	☐
Flushing Zone B1	2850A Kokio Loop (B1-KOKI2850A)	25-Jan-22	08:15	12:10	☑	☐
Flushing Zone B1	2850B Kokio Loop (B1-KOKI2850B)	25-Jan-22	08:10	12:11	☑	☐
Flushing Zone B1	2850C Kokio Loop (B1-KOKI2850C)	25-Jan-22	09:10	12:12	☑	☐
Flushing Zone B1	2850D Kokio Loop (B1-KOKI2850D)	25-Jan-22	09:10	12:14	☑	☐
Flushing Zone B1	2856A Kokio Loop (B1-KOKI2856A)	25-Jan-22	08:00	12:15	☑	☐
Flushing Zone B1	2856B Kokio Loop (B1-KOKI2856B)	25-Jan-22	08:00	12:17	☑	☐
Flushing Zone B1	2856C Kokio Loop (B1-KOKI2856C)	25-Jan-22	09:30	12:36	☑	☐
Flushing Zone B1	2856D Kokio Loop (B1-KOKI2856D)	25-Jan-22	09:15	12:37	☑	☐
Flushing Zone B1	2862A Kokio Loop (B1-KOKI2862A)	25-Jan-22	09:30	12:39	☑	☐
Flushing Zone B1	2862B Kokio Loop (B1-KOKI2862B)	25-Jan-22	08:10	12:40	☑	☐
Flushing Zone B1	2862C Kokio Loop (B1-KOKI2862C)	25-Jan-22	09:30	12:41	☑	☐
Flushing Zone B1	2862D Kokio Loop (B1-KOKI2862D)	25-Jan-22	09:30	12:42	☑	☐
Flushing Zone B1	2868A Kokio Loop (B1-KOKI2868A)	25-Jan-22	08:20	12:43	☑	☐
Flushing Zone B1	2868B Kokio Loop (B1-KOKI2868B)	25-Jan-22	08:20	12:44	☑	☐
Flushing Zone B1	2868C Kokio Loop (B1-KOKI2868C)	25-Jan-22	11:00	12:45	☑	☐
Flushing Zone B1	2868D Kokio Loop (B1-KOKI2868D)	25-Jan-22	08:10	12:46	☑	☐
Flushing Zone B1	2872A Kupalii Loop (B1-KUPA2872A)	25-Jan-22	08:10	12:47	☑	☐
Flushing Zone B1	2872B Kupalii Loop (B1-KUPA2872B)	25-Jan-22	08:10	12:51	☑	☐
Flushing Zone B1	2872C Kupalii Loop (B1-KUPA2872C)	25-Jan-22	09:20	12:52	☑	☐
Flushing Zone B1	2872D Kupalii Loop (B1-KUPA2872D)	25-Jan-22	09:25	12:53	☑	☐
Flushing Zone B1	2872E Kupalii Loop (B1-KUPA2872E)	25-Jan-22	08:20	12:53	☑	☐
Flushing Zone B1	2872F Kupalii Loop (B1-KUPA2872F)	25-Jan-22	08:20	12:54	☑	☐
Flushing Zone B1	2880A Kupalii Loop (B1-KUPA2880A)	25-Jan-22	09:15	12:55	☑	☐
Flushing Zone B1	2880B Kupalii Loop (B1-KUPA2880B)	25-Jan-22	09:20	12:56	☑	☐
Flushing Zone B1	2880C Kupalii Loop (B1-KUPA2880C)	25-Jan-22	09:00	12:57	☑	☐
Flushing Zone B1	2880D Kupalii Loop (B1-KUPA2880D)	25-Jan-22	08:00	12:51	☑	☐
Flushing Zone B1	2880E Kupalii Loop (B1-KUPA2880E)	25-Jan-22	10:25	12:53	☑	☐
Flushing Zone B1	2880F Kupalii Loop (B1-KUPA2880F)	25-Jan-22	09:25	12:54	☑	☐
Flushing Zone B1	2888A Kupalii Loop (B1-KUPA2888A)	25-Jan-22	11:10	12:55	☑	☐
Flushing Zone B1	2888B Kupalii Loop (B1-KUPA2888B)	25-Jan-22	11:40	12:56	☑	☐
Flushing Zone B1	2888C Kupalii Loop (B1-KUPA2888C)	25-Jan-22	10:30	12:57	☑	☐
Flushing Zone B1	2888D Kupalii Loop (B1-KUPA2888D)	25-Jan-22	10:40	12:58	☑	☐
Flushing Zone B1	2888E Kupalii Loop (B1-KUPA2888E)	25-Jan-22	10:40	12:59	☑	☐
Flushing Zone B1	2888F Kupalii Loop (B1-KUPA2888F)	25-Jan-22	10:40	12:58	☑	☐
Flushing Zone B1	2885A Makuu Loop (B1-MAKU2885A)	25-Jan-22	08:00	12:12	☑	☐
Flushing Zone B1	2885B Makuu Loop (B1-MAKU2885B)	25-Jan-22	08:00	12:13	☑	☐
Flushing Zone B1	2885C Makuu Loop (B1-MAKU2885C)	25-Jan-22	09:00	12:14	☑	☐
Flushing Zone B1	2885D Makuu Loop (B1-MAKU2885D)	25-Jan-22	10:00	12:15	☑	☐
Flushing Zone B1	2891A Makuu Loop (B1-MAKU2891A)	25-Jan-22	12:00	12:16	☑	☐
Flushing Zone B1	2891B Makuu Loop (B1-MAKU2891B)	25-Jan-22	10:00	12:17	☑	☐
Flushing Zone B1	2891C Makuu Loop (B1-MAKU2891C)	25-Jan-22	10:00	12:18	☑	☐
Flushing Zone B1	2891D Makuu Loop (B1-MAKU2891D)	25-Jan-22	10:00	12:19	☑	☐
Flushing Zone B1	2899A Makuu Loop (B1-MAKU2899A)	25-Jan-22	10:00	12:21	☑	☐
Flushing Zone B1	2899B Makuu Loop (B1-MAKU2899B)	25-Jan-22	13:00	12:22	☑	☐
Flushing Zone B1	2899C Makuu Loop (B1-MAKU2899C)	25-Jan-22	09:23	12:32	☑	☐
Flushing Zone B1	2899D Makuu Loop (B1-MAKU2899D)	25-Jan-22	09:00	12:24	☑	☐
Flushing Zone B1	2907A Makuu Loop (B1-MAKU2907A)	25-Jan-22	10:00	12:26	☑	☐
Flushing Zone B1	2907B Makuu Loop (B1-MAKU2907B)	08-Feb-22	09:00	12:27	☑	☐
Flushing Zone B1	2907C Makuu Loop (B1-MAKU2907C)	25-Jan-22	08:00	12:28	☑	☐
Flushing Zone B1	2907D Makuu Loop (B1-MAKU2907D)	25-Jan-22	11:00	12:29	☑	☐
Flushing Zone B1	2907E Makuu Loop (B1-MAKU2907E)	25-Jan-22	07:45	12:32	☑	☐
Flushing Zone B1	2907F Makuu Loop (B1-MAKU2907F)	25-Jan-22	07:45	12:30	☑	☐
Flushing Zone B1	358 McGrew Loop (B1-MCGR0358)	25-Jan-22	08:06	10:26	☑	☐
Flushing Zone B1	359 McGrew Loop (B1-MCGR0359)	25-Jan-22	08:06	10:58	☑	☐
Flushing Zone B1	364 McGrew Loop (B1-MCGR0364)	25-Jan-22	08:22	10:59	☑	☐
Flushing Zone B1	365 McGrew Loop (B1-MCGR0365)	25-Jan-22	08:22	11:04	☑	☐
Flushing Zone B1	371 McGrew Loop (B1-MCGR0371)	25-Jan-22	08:30	11:05	☑	☐
Flushing Zone B1	372 McGrew Loop (B1-MCGR0372)	25-Jan-22	07:52	11:06	☑	☐
Flushing Zone B1	378 McGrew Loop (B1-MCGR0378)	25-Jan-22	07:53	11:30	☑	☐

Flushing Zone B1

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Flushing Zone B1	379 McGrew Loop (B1-MCGR0379)	25-Jan-22	08:30	10:03	☑	☐
Flushing Zone B1	386 McGrew Loop (B1-MCGR0386)	25-Jan-22	07:55	11:12	☑	☐
Flushing Zone B1	394 McGrew Loop (B1-MCGR0394)	25-Jan-22	08:16	11:30	☑	☐
Flushing Zone B1	397 McGrew Loop (B1-MCGR0397)	25-Jan-22	11:18	13:05	☑	☐
Flushing Zone B1	400 McGrew Loop (B1-MCGR0400)	25-Jan-22	08:44	11:12	☑	☐
Flushing Zone B1	405 McGrew Loop (B1-MCGR0405)	25-Jan-22	08:00	10:30	☑	☐
Flushing Zone B1	408 McGrew Loop (B1-MCGR0408)	25-Jan-22	08:00	11:34	☑	☐
Flushing Zone B1	413 McGrew Loop (B1-MCGR0413)	25-Jan-22	08:40	13:00	☑	☐
Flushing Zone B1	414 McGrew Loop (B1-MCGR0414)	25-Jan-22	08:00	11:41	☑	☐
Flushing Zone B1	436 McGrew Loop (B1-MCGR0436)	25-Jan-22	08:00	10:15	☑	☐
Flushing Zone B1	442 McGrew Loop (B1-MCGR0442)	25-Jan-22	08:00	10:35	☑	☐
Flushing Zone B1	450 McGrew Loop (B1-MCGR0450)	25-Jan-22	08:00	10:24	☑	☐
Flushing Zone B1	460 McGrew Loop (B1-MCGR0460)	25-Jan-22	08:00	10:40	☑	☐
Flushing Zone B1	470 McGrew Loop (B1-MCGR0470)	25-Jan-22	09:23	10:50	☑	☐
Flushing Zone B1	486 McGrew Loop (B1-MCGR0486)	25-Jan-22	08:04	09:22	☑	☐
Flushing Zone B1	489 McGrew Loop (B1-MCGR0489)	25-Jan-22	11:00	12:21	☑	☐
Flushing Zone B1	494 McGrew Loop (B1-MCGR0494)	25-Jan-22	10:00	11:35	☑	☐
Flushing Zone B1	497 McGrew Loop (B1-MCGR0497)	25-Jan-22	08:00	11:37	☑	☐
Flushing Zone B1	500 McGrew Loop (B1-MCGR0500)	25-Jan-22	09:00	10:57	☑	☐
Flushing Zone B1	503 McGrew Loop (B1-MCGR0503)	25-Jan-22	08:00	10:24	☑	☐
Flushing Zone B1	506 McGrew Loop (B1-MCGR0506)	25-Jan-22	09:00	12:31	☑	☐
Flushing Zone B1	512 McGrew Loop (B1-MCGR0512)	25-Jan-22	08:00	09:19	☑	☐
Flushing Zone B1	515 McGrew Loop (B1-MCGR0515)	25-Jan-22	09:05	10:06	☑	☐
Flushing Zone B1	525 McGrew Loop (B1-MCGR0525)	25-Jan-22	10:04	11:26	☑	☐
Flushing Zone B1	528 McGrew Loop (B1-MCGR0528)	25-Jan-22	10:54	12:03	☑	☐
Flushing Zone B1	534 McGrew Loop (B1-MCGR0534)	25-Jan-22	08:19	10:03	☑	☐
Flushing Zone B1	537 McGrew Loop (B1-MCGR0537)	25-Jan-22	10:15	12:03	☑	☐
Flushing Zone B1	540 McGrew Loop (B1-MCGR0540)	25-Jan-22	09:15	10:14	☑	☐
Flushing Zone B1	545 McGrew Loop (B1-MCGR0545)	25-Jan-22	10:17	11:11	☑	☐
Flushing Zone B1	546 McGrew Loop (B1-MCGR0546)	25-Jan-22	08:10	09:08	☑	☐
Flushing Zone B1	553 McGrew Loop (B1-MCGR0553)	25-Jan-22	09:09	10:00	☑	☐
Flushing Zone B1	559 McGrew Loop (B1-MCGR0559)	25-Jan-22	09:45	10:37	☑	☐
Flushing Zone B1	565 McGrew Loop (B1-MCGR0565)	25-Jan-22	09:51	10:58	☑	☐
Flushing Zone B1	568 McGrew Loop (B1-MCGR0568)	25-Jan-22	08:01	10:52	☑	☐
Flushing Zone B1	573 McGrew Loop (B1-MCGR0573)	25-Jan-22	08:11	11:11	☑	☐
Flushing Zone B1	579 McGrew Loop (B1-MCGR0579)	25-Jan-22	08:49	11:11	☑	☐
Flushing Zone B1	584 McGrew Loop (B1-MCGR0584)	25-Jan-22	08:04	12:12	☑	☐
Flushing Zone B1	599 McGrew Loop (B1-MCGR0599)	25-Jan-22	10:53	13:02	☑	☐
Flushing Zone B1	600 McGrew Loop (B1-MCGR0600)	25-Jan-22	08:32	10:40	☑	☐
Flushing Zone B1	627 McGrew Loop (B1-MCGR0627)	25-Jan-22	07:54	09:25	☑	☐
Flushing Zone B1	628 McGrew Loop (B1-MCGR0628)	25-Jan-22	08:01	09:36	☑	☐
Flushing Zone B1	634 McGrew Loop (B1-MCGR0634)	25-Jan-22	09:47	11:20	☑	☐
Flushing Zone B1	635 McGrew Loop (B1-MCGR0635)	25-Jan-22	09:40	11:09	☑	☐
Flushing Zone B1	641 McGrew Loop (B1-MCGR0641)	25-Jan-22	08:08	09:52	☑	☐
Flushing Zone B1	642 McGrew Loop (B1-MCGR0642)	25-Jan-22	08:08	09:52	☑	☐
Flushing Zone B1	652 McGrew Loop (B1-MCGR0652)	25-Jan-22	10:01	12:23	☑	☐
Flushing Zone B1	657 McGrew Loop (B1-MCGR0657)	25-Jan-22	10:02	12:08	☑	☐
Flushing Zone B1	660 McGrew Loop (B1-MCGR0660)	25-Jan-22	08:16	10:13	☑	☐
Flushing Zone B1	663 McGrew Loop (B1-MCGR0663)	25-Jan-22	08:48	10:35	☑	☐
Flushing Zone B1	679 McGrew Loop (B1-MCGR0679)	25-Jan-22	11:41	13:51	☑	☐
Flushing Zone B1	680 McGrew Loop (B1-MCGR0680)	25-Jan-22	11:00	13:26	☑	☐
Flushing Zone B1	690 McGrew Loop (B1-MCGR0690)	25-Jan-22	07:48	09:27	☑	☐
Flushing Zone B1	698 McGrew Loop (B1-MCGR0698)	25-Jan-22	08:07	10:12	☑	☐
Flushing Zone B1	706 McGrew Loop (B1-MCGR0706)	25-Jan-22	09:15	10:38	☑	☐
Flushing Zone B1	714 McGrew Loop (B1-MCGR0714)	25-Jan-22	10:05	11:23	☑	☐
Flushing Zone B1	719 McGrew Loop (B1-MCGR0719)	25-Jan-22	08:18	09:58	☑	☐
Flushing Zone B1	720 McGrew Loop (B1-MCGR0720)	25-Jan-22	08:03	10:04	☑	☐
Flushing Zone B1	729 McGrew Loop (B1-MCGR0729)	25-Jan-22	10:07	11:52	☑	☐
Flushing Zone B1	730 McGrew Loop (B1-MCGR0730)	25-Jan-22	10:25	12:23	☑	☐
Flushing Zone B1	736 McGrew Loop (B1-MCGR0736)	25-Jan-22	07:47	10:06	☑	☐
Flushing Zone B1	744 McGrew Loop (B1-MCGR0744)	25-Jan-22	07:54	10:06	☑	☐
Flushing Zone B1	752 McGrew Loop (B1-MCGR0752)	25-Jan-22	10:51	11:42	☑	☐
Flushing Zone B1	760 McGrew Loop (B1-MCGR0760)	25-Jan-22	10:51	11:46	☑	☐

Flushing Zone B1

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Flushing Zone B1	777 McGrew Loop (B1-MCGR0777)	25-Jan-22	07:47	09:42	☑	☐
Flushing Zone B1	778 McGrew Loop (B1-MCGR0778)	25-Jan-22	07:49	09:42	☑	☐
Flushing Zone B1	785 McGrew Loop (B1-MCGR0785)	25-Jan-22	09:42	12:19	☑	☐
Flushing Zone B1	786 McGrew Loop (B1-MCGR0786)	25-Jan-22	09:43	12:50	☑	☐
Flushing Zone B1	793 McGrew Loop (B1-MCGR0793)	25-Jan-22	07:46	10:18	☑	☐
Flushing Zone B1	796 McGrew Loop (B1-MCGR0796)	25-Jan-22	10:25	12:58	☑	☐
Flushing Zone B1	799 McGrew Loop (B1-MCGR0799)	25-Jan-22	07:57	10:21	☑	☐
Flushing Zone B1	804 McGrew Loop (B1-MCGR0804)	25-Jan-22	10:31	13:17	☑	☐
Flushing Zone B1	807 McGrew Loop (B1-MCGR0807)	25-Jan-22	09:47	11:42	☑	☐
Flushing Zone B1	812 McGrew Loop (B1-MCGR0812)	25-Jan-22	09:36	11:41	☑	☐
Flushing Zone B1	815 McGrew Loop (B1-MCGR0815)	25-Jan-22	08:03	10:14	☑	☐
Flushing Zone B1	821 McGrew Loop (B1-MCGR0821)	25-Jan-22	08:04	10:12	☑	☐
Flushing Zone B1	824 McGrew Loop (B1-MCGR0824)	25-Jan-22	08:04	12:42	☑	☐
Flushing Zone B1	832 McGrew Loop (B1-MCGR0832)	25-Jan-22	10:14	12:03	☑	☐
Flushing Zone B1	837 McGrew Loop (B1-MCGR0837)	25-Jan-22	08:05	12:42	☑	☐
Flushing Zone B1	838 McGrew Loop (B1-MCGR0838)	25-Jan-22	08:05	12:43	☑	☐
Flushing Zone B1	846 McGrew Loop (B1-MCGR0846)	25-Jan-22	08:07	10:19	☑	☐
Flushing Zone B1	853 McGrew Loop (B1-MCGR0853)	25-Jan-22	08:10	12:33	☑	☐
Flushing Zone B1	857 McGrew Loop (B1-MCGR0857)	25-Jan-22	08:37	09:35	☑	☐
Flushing Zone B1	865 McGrew Loop (B1-MCGR0865)	25-Jan-22	10:10	11:22	☑	☐
Flushing Zone B1	873 McGrew Loop (B1-MCGR0873)	25-Jan-22	10:14	12:02	☑	☐
Flushing Zone B1	879 McGrew Loop (B1-MCGR0879)	25-Jan-22	07:58	09:38	☑	☐
Flushing Zone B1	593 McGrew Point (B1-MCGR0593)	25-Jan-22	12:00	14:06	☑	☐
Flushing Zone B1	2915A Oliana Loop (B1-OLIA2915A)	25-Jan-22	10:00	12:53	☑	☐
Flushing Zone B1	2915B Oliana Loop (B1-OLIA2915B)	25-Jan-22	08:00	12:54	☑	☐
Flushing Zone B1	2915C Oliana Loop (B1-OLIA2915C)	25-Jan-22	08:00	12:55	☑	☐
Flushing Zone B1	2915D Oliana Loop (B1-OLIA2915D)	25-Jan-22	08:00	12:56	☑	☐
Flushing Zone B1	2915E Oliana Loop (B1-OLIA2915E)	25-Jan-22	10:00	12:57	☑	☐
Flushing Zone B1	2915F Oliana Loop (B1-OLIA2915F)	25-Jan-22	10:00	12:58	☑	☐
Flushing Zone B1	2919A Oliana Loop (B1-OLIA2919A)	25-Jan-22	10:00	12:59	☑	☐
Flushing Zone B1	2919B Oliana Loop (B1-OLIA2919B)	25-Jan-22	08:00	13:00	☑	☐
Flushing Zone B1	2921A Oliana Loop (B1-OLIA2921A)	25-Jan-22	09:00	13:01	☑	☐
Flushing Zone B1	2921B Oliana Loop (B1-OLIA2921B)	25-Jan-22	09:00	13:08	☑	☐
Flushing Zone B1	2927A Oliana Loop (B1-OLIA2927A)	25-Jan-22	08:00	13:00	☑	☐
Flushing Zone B1	2927B Oliana Loop (B1-OLIA2927B)	25-Jan-22	08:00	12:58	☑	☐
Flushing Zone B1	2927C Oliana Loop (B1-OLIA2927C)	25-Jan-22	10:00	12:55	☑	☐
Flushing Zone B1	2927D Oliana Loop (B1-OLIA2927D)	25-Jan-22	10:00	12:54	☑	☐
Flushing Zone B1	2931A Oliana Loop (B1-OLIA2931A)	25-Jan-22	08:00	12:53	☑	☐
Flushing Zone B1	2931B Oliana Loop (B1-OLIA2931B)	25-Jan-22	10:00	13:08	☑	☐
Flushing Zone B1	2931C Oliana Loop (B1-OLIA2931C)	25-Jan-22	10:00	12:20	☑	☐
Flushing Zone B1	2931D Oliana Loop (B1-OLIA2931D)	25-Jan-22	10:00	12:22	☑	☐
Flushing Zone B1	2931E Oliana Loop (B1-OLIA2931E)	25-Jan-22	10:00	12:24	☑	☐
Flushing Zone B1	2931F Oliana Loop (B1-OLIA2931F)	25-Jan-22	10:00	12:26	☑	☐

Key

- Not Started
- No Access
- In Progress
- Complete

Flushing Zone B1

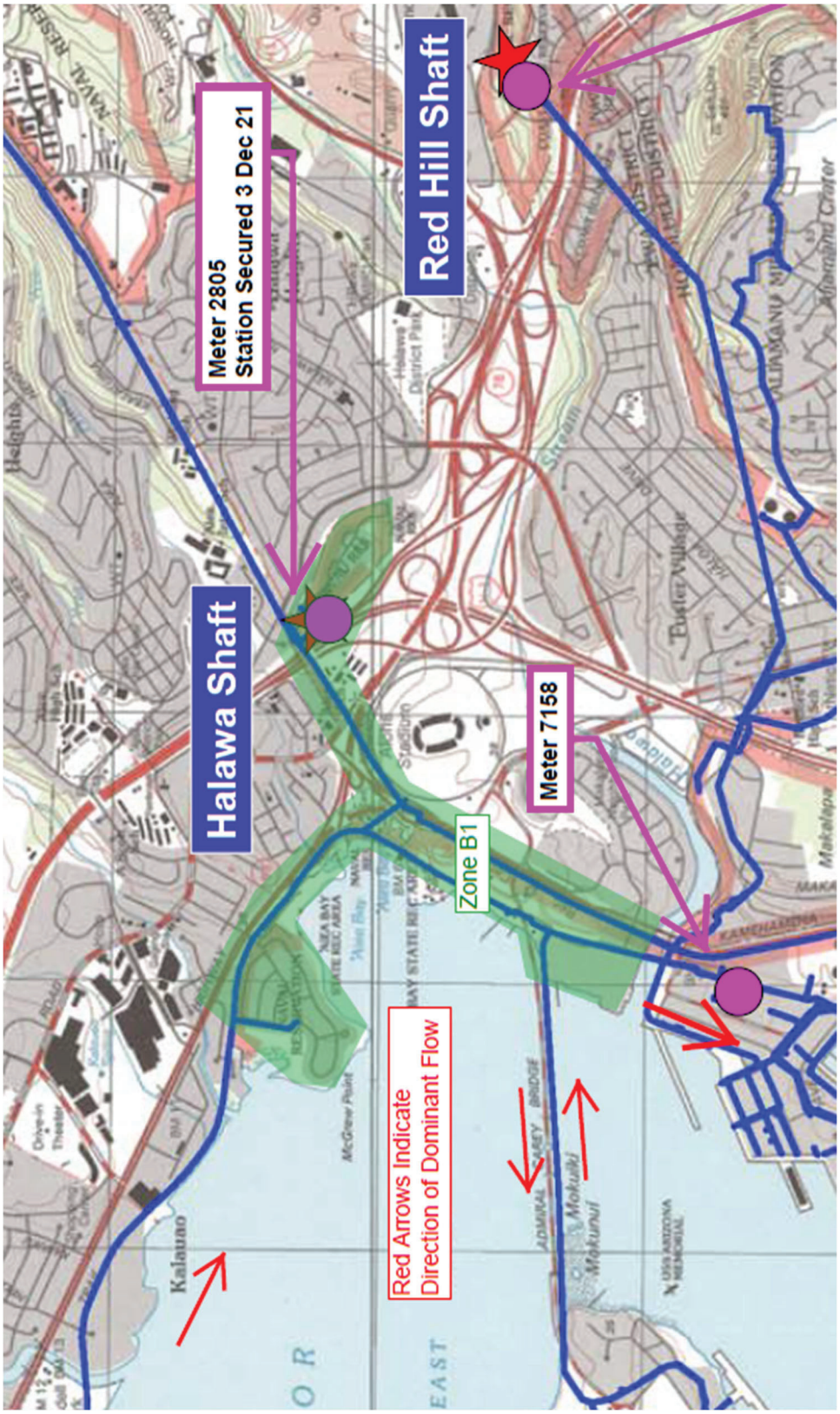
2022-01-23 - 2022-02-02

Total Facilities	Total	Percent Complete	No	Flushed on Selected Dates
38	38	100.0 %	0	38

Zone	Address	Arrive Date	Start Time	Finish Time	Certified	Summary General Notes	Unable To Access	Access Reason
Flushing Zone B1	Building 1,RECREATION FACILITY-	25-Jan-22	11:00	16:42	☑		☐	
Flushing Zone B1	Building 103,MWR COMMUNITY MTG	25-Jan-22	11:00	12:39	☑		☐	
Flushing Zone B1	Building 103A,MWR STORAGE (B1-	25-Jan-22	13:00	12:37	☑		☐	
Flushing Zone B1	Building 103B,MWR STORAGE (B1-	25-Jan-22	11:00	12:38	☑		☐	
Flushing Zone B1	Building 1406A,STDY GEN BLDG FOR	25-Jan-22	00:00	09:50	☑		☐	
Flushing Zone B1	Building 17,LATRINE-RICHARDSON REC	25-Jan-22	08:00	09:10	☑		☐	
Flushing Zone B1	Building 1A,PUMP STA ACCESS -	02-Feb-22	08:00	13:23	☑		☐	
Flushing Zone B1	Building 2,BATH HOUSE-LOCKER ROOM-	25-Jan-22	11:00	09:12	☑		☐	
Flushing Zone B1	Building 23,COMPACFLT BOAT HOUSE	25-Jan-22	13:00	09:10	☑		☐	
Flushing Zone B1	Building 486,CABLE HUT N-13/AIEA (B1-	25-Jan-22	13:00	13:42	☑		☐	
Flushing Zone B1	Building 488,CHLORINE BLDG-POT	25-Jan-22	10:00	13:19	☑		☐	
Flushing Zone B1	Building 500,ARIZONA/BOWFIN	24-Jan-22	11:00	14:19	☑		☐	
Flushing Zone B1	Building 501,ARIZONA MUSEUM	24-Jan-22	11:00	14:22	☑		☐	
Flushing Zone B1	Building 502,ARIZONA MUSEUM, 1	24-Jan-22	10:00	14:24	☑		☐	
Flushing Zone B1	Building 503,ARIZONA	24-Jan-22	11:00	15:34	☑		☐	
Flushing Zone B1	Building 505,ARIZONA MUSEUM/TICKET	24-Jan-22	08:00	15:36	☑		☐	
Flushing Zone B1	Building 506,ARIZONA	24-Jan-22	08:00	15:37	☑		☐	
Flushing Zone B1	Building 550,USS BOWFIN MUSEUM, 11	24-Jan-22	11:00	14:27	☑		☐	
Flushing Zone B1	Building 551,USS BOWFIN OFFICE, 11	24-Jan-22	11:00	14:28	☑		☐	
Flushing Zone B1	Building 552,USS BOWFIN MUSEUM	24-Jan-22	10:00	15:43	☑		☐	
Flushing Zone B1	Building 555,USS BOWFIN SHOP/BREAK	24-Jan-22	10:00	15:44	☑		☐	
Flushing Zone B1	Building 556,USS BOWFIN LOCKER, 11	24-Jan-22	10:00	15:45	☑		☐	
Flushing Zone B1	Building 6,SWITCHING STATION G/AIEA	28-Jan-22	09:00	09:51	☑		☐	
Flushing Zone B1	Building 602, Marina Support Restrooms	25-Jan-22	11:00	17:03	☑		☐	
Flushing Zone B1	Building 604, Restaurant (MWR) (B1-	25-Jan-22	13:00	17:04	☑		☐	
Flushing Zone B1	Building 610,MARINA OFFICE - CROWS	25-Jan-22	11:00	12:35	☑		☐	
Flushing Zone B1	Building 612A,NPS SERVICE/MAINT	23-Jan-22	11:00	15:52	☑		☐	
Flushing Zone B1	Building 622,MARINA SUPPORT LOCKERS	25-Jan-22	11:00	13:35	☑		☐	
Flushing Zone B1	Building 623,MARINA SUPPORT LOCKERS	25-Jan-22	11:00	13:40	☑		☐	
Flushing Zone B1	Building 624,MARINA SUPPORT LOCKERS	25-Jan-22	11:00	13:23	☑		☐	
Flushing Zone B1	Building 625,MARINA SUPPORT LOCKERS	25-Jan-22	13:00	13:28	☑		☐	
Flushing Zone B1	Building 632,GUARD SHACK MCGREW	23-Jan-22	17:00	15:53	☑		☐	
Flushing Zone B1	Building 8,RESTROOM-RICHARDSON	25-Jan-22	00:00	13:38	☑		☐	
Flushing Zone B1	Building 97,MARINA AREA RESTROOM,	25-Jan-22	11:00	09:13	☑		☐	
Flushing Zone B1	Building S2A,SUBSTATION/HALAWA	25-Jan-22	10:00	13:36	☑		☐	
Flushing Zone B1	Building S5,BOOSTER PUMP/HALAWA	25-Jan-22	10:00	13:40	☑		☐	
Flushing Zone B1	Building S7,WELL EQUIPMENT BLDG (B1-	25-Jan-22	10:00	13:11	☑		☐	
Flushing Zone B1	MWR BOATHOUSE (B1-BLDG0575)	25-Jan-22	13:00	16:15	☑		☐	

Key

- Not Started
- No Access
- In Progress
- Complete


Meter 2805
Station Secured 3 Dec 21
Red Hill Shaft
Halawa Shaft
Meter 7158
Zone B1
Red Arrows Indicate
Direction of Dominant Flow
Kalauao

			Meter										
Date	Time	Date/Time	4787	4127	2805	4710	5004	5002	9050	7158	6780	2550	1846	1485
23-Jan-22	0:00:00	23-Jan-2200:00	64.6	33.6	3.2	76.6	73.7	73.3	71.9	73.1	64.8	36.9	63.2	64.8
23-Jan-22	0:30:00	23-Jan-2200:30	62.4	32.2	3.2	73.0	70.0	70.0	70.0	71.3	64.0	36.0	62.0	64.0
23-Jan-22	1:00:00	23-Jan-2201:00	62.4	32.2	3.2	73.0	70.0	70.0	70.0	71.0	63.7	36.0	61.9	64.0
23-Jan-22	1:30:00	23-Jan-2201:30	62.4	33.7	3.2	73.0	70.0	70.0	70.0	71.0	63.0	36.0	61.5	64.0
23-Jan-22	2:00:00	23-Jan-2202:00	62.4	34.2	3.2	73.0	69.4	70.0	69.7	71.0	63.0	35.7	61.6	63.4
23-Jan-22	2:30:00	23-Jan-2202:30	62.4	34.2	3.2	73.0	70.0	70.0	69.7	71.0	63.0	35.6	61.0	63.0
23-Jan-22	3:00:00	23-Jan-2203:00	60.3	34.2	3.2	73.0	69.7	70.0	69.3	71.0	63.0	35.0	61.0	63.0
23-Jan-22	3:30:00	23-Jan-2203:30	60.3	34.6	3.2	72.2	69.2	69.7	69.0	70.7	63.0	35.0	61.0	63.0
23-Jan-22	4:00:00	23-Jan-2204:00	60.3	35.1	3.2	72.0	69.0	69.1	69.0	70.0	62.8	34.8	60.9	62.8
23-Jan-22	4:30:00	23-Jan-2204:30	60.3	36.0	3.2	71.7	68.5	69.2	68.2	70.0	62.0	34.0	59.0	62.0
23-Jan-22	5:00:00	23-Jan-2205:00	61.2	37.1	3.2	71.0	68.3	68.6	67.6	69.2	61.2	33.2	59.0	61.2
23-Jan-22	5:30:00	23-Jan-2205:30	68.8	37.1	3.2	77.2	74.1	74.2	69.5	72.6	63.9	34.8	60.8	63.8
23-Jan-22	6:00:00	23-Jan-2206:00	68.8	36.5	3.2	79.0	75.7	76.0	70.7	73.0	64.0	35.0	61.0	64.0
23-Jan-22	6:30:00	23-Jan-2206:30	68.8	35.0	3.2	79.0	76.0	76.0	70.7	73.3	64.3	35.6	61.0	64.0
23-Jan-22	7:00:00	23-Jan-2207:00	69.8	34.2	3.2	79.0	75.7	75.7	71.1	74.0	64.2	36.2	61.6	64.2
23-Jan-22	7:30:00	23-Jan-2207:30	70.8	34.2	3.2	79.0	76.0	76.0	71.4	74.0	65.0	36.7	63.0	65.0
23-Jan-22	8:00:00	23-Jan-2208:00	70.8	32.5	3.2	79.0	76.0	76.0	72.0	74.0	65.0	37.0	62.7	65.0
23-Jan-22	8:30:00	23-Jan-2208:30	70.8	33.7	3.2	79.0	75.7	75.8	71.2	74.0	65.0	37.0	63.0	65.0
23-Jan-22	9:00:00	23-Jan-2209:00	70.8	34.2	3.2	79.0	75.9	75.7	71.3	74.0	65.0	37.0	63.0	65.0
23-Jan-22	9:30:00	23-Jan-2209:30	70.8	35.1	3.2	79.0	75.8	76.0	71.0	74.0	65.0	37.0	62.8	65.0
23-Jan-22	10:00:00	23-Jan-2210:00	70.8	35.5	3.2	79.0	75.7	76.0	71.0	74.0	65.0	36.2	62.0	65.0
23-Jan-22	10:30:00	23-Jan-2210:30	68.6	36.1	3.2	79.0	76.0	76.0	71.6	74.0	64.9	37.0	62.6	64.9
23-Jan-22	11:00:00	23-Jan-2211:00	61.5	36.1	3.2	72.5	69.5	69.4	69.2	71.0	62.8	35.0	60.3	62.8
23-Jan-22	11:30:00	23-Jan-2211:30	60.2	36.1	3.2	71.8	68.2	68.5	68.1	69.6	61.7	33.6	59.2	61.4
23-Jan-22	12:00:00	23-Jan-2212:00	59.5	36.1	3.2	71.0	68.0	68.0	67.0	69.0	61.0	33.0	58.0	61.0
23-Jan-22	12:30:00	23-Jan-2212:30	62.9	36.4	3.2	71.0	69.3	68.9	67.5	70.0	61.4	33.3	58.2	61.0
23-Jan-22	13:00:00	23-Jan-2213:00	68.3	37.1	3.2	77.3	75.0	75.2	70.0	73.0	64.0	35.0	60.5	63.7
23-Jan-22	13:30:00	23-Jan-2213:30	68.3	37.1	3.2	78.0	75.0	74.7	70.0	73.0	64.0	35.0	61.0	64.0
23-Jan-22	14:00:00	23-Jan-2214:00	69.7	34.6	3.2	78.6	75.3	75.6	70.5	73.3	65.0	35.7	61.5	64.7
23-Jan-22	14:30:00	23-Jan-2214:30	70.3	34.2	3.2	79.0	76.0	76.0	71.0	74.0	65.0	37.0	62.9	65.0
23-Jan-22	15:00:00	23-Jan-2215:00	70.3	33.3	3.2	79.0	76.0	76.0	71.2	74.0	65.0	37.0	63.0	65.0
23-Jan-22	15:30:00	23-Jan-2215:30	70.3	33.0	3.2	79.0	76.0	76.0	71.7	74.0	65.8	37.0	63.0	65.0
23-Jan-22	16:00:00	23-Jan-2216:00	70.3	33.2	3.2	79.2	76.0	76.3	72.0	74.0	66.0	37.0	63.0	65.0
23-Jan-22	16:30:00	23-Jan-2216:30	70.3	33.2	3.2	79.7	76.3	76.0	72.0	74.0	66.0	37.1	63.3	66.0
23-Jan-22	17:00:00	23-Jan-2217:00	65.2	33.2	3.2	76.8	73.5	73.8	71.0	72.7	65.1	36.7	63.0	65.4
23-Jan-22	17:30:00	23-Jan-2217:30	61.5	33.2	3.2	73.0	69.1	69.4	69.0	71.0	63.0	35.0	61.4	63.3
23-Jan-22	18:00:00	23-Jan-2218:00	61.5	33.2	3.2	72.0	68.6	68.5	69.0	70.5	62.7	35.0	60.6	63.0
23-Jan-22	18:30:00	23-Jan-2218:30	61.5	33.2	3.2	72.0	68.3	68.6	68.5	70.0	62.6	34.9	60.3	62.6
23-Jan-22	19:00:00	23-Jan-2219:00	60.1	33.2	3.2	71.6	68.0	69.0	68.0	70.0	62.0	34.0	60.0	62.0
23-Jan-22	19:30:00	23-Jan-2219:30	59.5	33.2	3.2	71.0	68.0	68.2	68.0	69.4	61.9	34.0	59.5	62.0
23-Jan-22	20:00:00	23-Jan-2220:00	59.5	33.2	3.2	71.0	68.0	68.0	67.7	69.2	61.0	34.0	59.6	62.0

23-Jan-22	20:30:00	23-Jan-2220:30	65.6	33.2	3.2	74.8	71.7	71.8	69.1	72.0	62.2	34.4	60.3	62.4
23-Jan-22	21:00:00	23-Jan-2221:00	68.6	33.2	3.2	78.0	74.7	75.0	70.0	72.5	64.0	35.7	61.1	64.0
23-Jan-22	21:30:00	23-Jan-2221:30	68.6	33.2	3.2	78.2	75.2	75.3	70.2	73.0	64.0	36.0	62.0	64.0
23-Jan-22	22:00:00	23-Jan-2222:00	68.6	33.2	3.2	79.0	75.1	75.7	71.0	73.0	64.0	36.0	62.0	64.0
23-Jan-22	22:30:00	23-Jan-2222:30	68.6	33.2	3.2	79.0	75.7	76.0	71.0	73.3	64.1	36.0	62.0	64.6
23-Jan-22	23:00:00	23-Jan-2223:00	69.1	33.2	3.2	79.0	76.0	76.0	71.0	73.7	65.0	36.2	62.0	65.0
23-Jan-22	23:30:00	23-Jan-2223:30	70.6	33.2	3.2	79.2	76.0	76.2	71.8	74.0	65.0	37.0	63.0	65.3
24-Jan-22	0:00:00	24-Jan-2200:00	70.6	33.2	3.2	79.1	76.0	76.1	71.4	74.0	65.0	37.0	63.0	65.2
24-Jan-22	0:30:00	24-Jan-2200:30	70.6	33.7	3.2	79.8	76.5	77.0	72.0	74.0	65.9	37.0	63.4	65.9
24-Jan-22	1:00:00	24-Jan-2201:00	70.6	34.0	3.2	79.4	76.7	77.0	72.0	74.7	66.0	37.6	63.1	66.0
24-Jan-22	1:30:00	24-Jan-2201:30	65.0	31.4	3.2	78.5	73.6	73.7	71.1	72.5	65.3	35.6	62.9	65.4
24-Jan-22	2:00:00	24-Jan-2202:00	62.0	31.2	3.2	73.0	69.7	70.1	69.4	71.3	63.4	36.0	61.2	63.4
24-Jan-22	2:30:00	24-Jan-2202:30	62.0	33.4	3.2	73.0	70.0	70.0	70.0	71.0	64.0	36.0	61.9	64.0
24-Jan-22	3:00:00	24-Jan-2203:00	62.0	34.2	3.2	73.0	70.0	70.6	70.0	71.0	63.3	36.0	61.2	64.0
24-Jan-22	3:30:00	24-Jan-2203:30	62.0	34.2	3.2	73.0	70.0	70.0	69.7	71.0	63.0	35.4	61.3	63.4
24-Jan-22	4:00:00	24-Jan-2204:00	61.0	35.1	3.2	72.7	69.4	70.0	69.4	71.0	63.0	35.0	61.0	63.0
24-Jan-22	4:30:00	24-Jan-2204:30	60.0	34.4	3.2	72.2	69.3	69.5	68.8	70.2	62.7	35.0	60.9	63.0
24-Jan-22	5:00:00	24-Jan-2205:00	60.0	34.6	3.2	71.9	68.7	69.0	68.0	70.0	62.0	34.0	60.0	62.0
24-Jan-22	5:30:00	24-Jan-2205:30	62.6	35.1	3.2	72.2	69.2	69.7	67.9	70.3	61.2	33.7	59.4	62.9
24-Jan-22	6:00:00	24-Jan-2206:00	67.9	34.4	3.2	78.0	74.9	74.7	69.0	72.0	63.0	34.7	60.0	63.0
24-Jan-22	6:30:00	24-Jan-2206:30	67.9	34.0	3.2	78.0	74.8	74.5	69.3	72.0	63.0	35.0	60.0	63.0
24-Jan-22	7:00:00	24-Jan-2207:00	67.9	33.2	3.2	78.0	74.7	74.3	69.3	72.0	63.5	35.0	60.8	63.0
24-Jan-22	7:30:00	24-Jan-2207:30	67.9	33.2	3.2	78.0	74.7	75.3	70.0	72.8	64.0	35.0	60.4	63.6
24-Jan-22	8:00:00	24-Jan-2208:00	67.9	33.4	3.2	78.0	74.7	75.0	70.0	72.6	63.7	35.0	61.0	63.6
24-Jan-22	8:30:00	24-Jan-2208:30	67.9	34.8	3.2	78.0	74.5	75.0	70.0	72.8	64.0	35.0	61.0	63.3
24-Jan-22	9:00:00	24-Jan-2209:00	67.9	36.8	3.2	78.0	75.0	74.7	70.0	72.7	64.0	35.0	61.0	64.0
24-Jan-22	9:30:00	24-Jan-2209:30	69.8	37.1	3.2	78.0	74.7	75.0	70.6	73.0	64.0	35.2	61.0	64.0
24-Jan-22	10:00:00	24-Jan-2210:00	70.1	35.8	3.2	78.0	75.0	75.5	70.0	73.0	64.0	35.1	61.0	64.0
24-Jan-22	10:30:00	24-Jan-2210:30	70.2	35.1	3.2	78.3	75.0	75.0	70.0	73.0	64.0	35.0	61.0	64.0
24-Jan-22	11:00:00	24-Jan-2211:00	70.2	34.1	3.2	78.0	75.0	74.7	70.0	73.0	64.0	35.0	61.0	64.0
24-Jan-22	11:30:00	24-Jan-2211:30	70.2	32.2	3.2	78.3	75.0	75.3	70.0	73.0	64.0	35.3	61.0	64.0
24-Jan-22	12:00:00	24-Jan-2212:00	69.6	31.9	3.2	78.0	74.8	74.2	70.0	73.0	64.0	35.0	61.0	64.0
24-Jan-22	12:30:00	24-Jan-2212:30	68.7	32.6	3.2	78.1	74.6	74.9	70.0	73.0	64.0	35.7	61.0	64.0
24-Jan-22	13:00:00	24-Jan-2213:00	68.8	33.3	3.2	78.5	75.5	74.7	70.3	73.0	64.6	36.0	61.0	64.0
24-Jan-22	13:30:00	24-Jan-2213:30	68.8	33.8	3.2	78.0	74.9	74.7	70.6	73.0	64.5	36.0	61.0	64.0
24-Jan-22	14:00:00	24-Jan-2214:00	68.7	35.0	3.2	78.5	75.6	74.9	71.0	73.0	64.6	36.0	61.4	64.0
24-Jan-22	14:30:00	24-Jan-2214:30	68.5	35.1	3.2	79.0	76.0	75.7	71.0	73.0	65.0	36.0	62.0	64.5
24-Jan-22	15:00:00	24-Jan-2215:00	68.5	34.6	3.2	79.0	75.2	75.7	71.0	73.0	65.0	36.0	62.0	64.7
24-Jan-22	15:30:00	24-Jan-2215:30	68.5	34.2	3.2	79.0	75.3	75.4	71.0	73.0	65.0	36.0	61.7	64.7
24-Jan-22	16:00:00	24-Jan-2216:00	68.5	34.2	3.2	78.7	75.0	75.0	71.0	73.2	65.0	36.0	62.0	64.7
24-Jan-22	16:30:00	24-Jan-2216:30	68.5	34.2	3.2	78.4	75.0	75.6	71.0	74.0	65.0	36.0	62.0	65.0
24-Jan-22	17:00:00	24-Jan-2217:00	68.5	34.2	3.2	78.6	75.3	75.0	71.0	73.7	65.0	36.0	62.0	64.7
24-Jan-22	17:30:00	24-Jan-2217:30	68.5	34.2	3.2	78.9	75.0	75.0	71.0	73.4	65.0	36.0	62.0	64.7

24-Jan-22	18:00:00	24-Jan-2218:00	68.5	34.2	3.2	78.3	74.9	74.6	71.0	73.0	65.0	36.0	62.0	64.5
24-Jan-22	18:30:00	24-Jan-2218:30	63.2	34.2	3.2	76.3	71.2	71.1	69.5	70.3	63.2	33.6	60.4	63.2
24-Jan-22	19:00:00	24-Jan-2219:00	60.1	34.2	3.2	71.0	67.7	67.6	67.1	69.0	61.0	33.0	58.4	60.7
24-Jan-22	19:30:00	24-Jan-2219:30	60.4	34.2	3.2	71.0	67.0	67.5	67.0	69.0	61.0	33.0	58.0	61.0
24-Jan-22	20:00:00	24-Jan-2220:00	59.1	33.9	3.2	70.9	67.0	67.3	67.0	69.0	60.5	33.0	58.0	60.3
24-Jan-22	20:30:00	24-Jan-2220:30	58.4	33.2	3.2	70.0	66.7	67.0	66.5	68.4	60.0	32.2	58.0	60.3
24-Jan-22	21:00:00	24-Jan-2221:00	63.7	33.2	3.2	72.5	69.5	69.6	67.3	70.3	63.4	33.2	58.6	61.6
24-Jan-22	21:30:00	24-Jan-2221:30	67.8	33.6	3.2	77.8	74.5	74.0	69.8	72.0	63.4	34.9	60.0	63.0
24-Jan-22	22:00:00	24-Jan-2222:00	67.8	34.2	3.2	78.0	75.0	74.9	70.0	72.1	63.8	35.0	60.0	63.0
24-Jan-22	22:30:00	24-Jan-2222:30	67.8	34.1	3.2	78.0	75.0	75.0	70.0	73.0	63.9	35.0	61.0	63.6
24-Jan-22	23:00:00	24-Jan-2223:00	67.8	32.3	3.2	78.0	75.0	75.0	70.0	72.4	64.0	35.0	61.0	64.0
24-Jan-22	23:30:00	24-Jan-2223:30	67.8	32.2	3.2	78.0	75.0	75.0	70.5	73.0	64.0	35.6	61.0	64.0
25-Jan-22	0:00:00	25-Jan-2200:00	67.8	32.4	3.2	78.0	75.0	75.4	70.1	73.0	64.0	35.1	61.0	64.0
25-Jan-22	0:30:00	25-Jan-2200:30	69.4	34.1	3.2	78.5	75.5	76.0	71.0	73.0	64.3	36.0	61.1	64.0
25-Jan-22	1:00:00	25-Jan-2201:00	69.9	34.2	3.2	78.7	75.7	76.0	71.0	73.0	65.0	36.0	61.7	64.0
25-Jan-22	1:30:00	25-Jan-2201:30	69.9	34.7	3.2	79.0	76.0	76.0	71.0	73.3	65.0	36.0	62.0	64.9
25-Jan-22	2:00:00	25-Jan-2202:00	69.9	34.3	3.2	79.0	76.0	76.0	71.0	74.0	65.0	36.0	62.0	65.0
25-Jan-22	2:30:00	25-Jan-2202:30	69.9	34.2	3.2	79.0	76.0	76.0	71.0	74.0	65.0	36.0	62.0	65.0
25-Jan-22	3:00:00	25-Jan-2203:00	69.9	34.2	3.2	79.0	76.0	76.6	71.9	73.7	65.0	36.0	62.0	65.0
25-Jan-22	3:30:00	25-Jan-2203:30	69.9	34.2	3.2	80.0	76.6	77.0	72.0	74.0	65.0	36.8	62.0	65.0
25-Jan-22	4:00:00	25-Jan-2204:00	69.9	34.2	3.2	79.4	76.0	76.1	71.2	74.0	65.0	36.7	62.0	65.0
25-Jan-22	4:30:00	25-Jan-2204:30	64.1	34.2	3.2	76.5	73.3	73.7	70.2	72.3	63.6	35.8	59.6	63.7
25-Jan-22	5:00:00	25-Jan-2205:00	60.3	34.2	3.2	72.0	69.0	69.0	68.2	70.1	62.1	34.1	60.0	62.1
25-Jan-22	5:30:00	25-Jan-2205:30	60.9	34.2	3.2	72.0	69.0	69.4	69.0	70.2	62.1	35.0	61.0	63.0
25-Jan-22	6:00:00	25-Jan-2206:00	59.9	33.4	3.2	72.0	68.7	68.5	68.1	70.0	62.3	34.3	60.2	62.3
25-Jan-22	6:30:00	25-Jan-2206:30	59.9	34.2	3.2	71.5	68.3	68.8	68.0	70.0	61.7	34.0	60.0	62.0
25-Jan-22	7:00:00	25-Jan-2207:00	59.9	34.2	3.2	71.0	68.0	68.3	68.0	70.0	62.0	34.0	60.0	62.0
25-Jan-22	7:30:00	25-Jan-2207:30	59.9	34.2	3.2	71.0	68.0	68.3	67.9	69.8	62.0	34.0	60.0	62.0
25-Jan-22	8:00:00	25-Jan-2208:00	59.9	34.2	3.2	71.0	67.7	68.0	67.6	69.0	61.6	33.9	59.5	61.9
25-Jan-22	8:30:00	25-Jan-2208:30	59.9	33.3	3.2	70.3	67.0	67.0	67.0	69.0	61.0	33.3	59.0	61.0
25-Jan-22	9:00:00	25-Jan-2209:00	63.6	33.5	3.2	70.9	69.4	69.5	67.6	70.4	61.3	34.7	59.5	61.2
25-Jan-22	9:30:00	25-Jan-2209:30	67.5	34.2	3.2	77.0	74.0	73.3	69.4	72.0	63.3	35.0	61.0	63.0
25-Jan-22	10:00:00	25-Jan-2210:00	68.4	34.2	3.2	77.0	73.2	74.7	69.7	72.3	63.0	35.0	61.0	63.3
25-Jan-22	10:30:00	25-Jan-2210:30	69.4	34.2	3.2	77.3	74.2	74.3	70.0	72.0	64.0	35.0	61.0	63.7
25-Jan-22	11:00:00	25-Jan-2211:00	69.3	34.5	3.2	78.0	74.6	74.1	70.0	72.6	64.0	35.8	61.7	63.4
25-Jan-22	11:30:00	25-Jan-2211:30	69.3	33.9	3.2	77.9	74.8	74.7	70.2	72.6	64.0	35.7	62.0	64.3
25-Jan-22	12:00:00	25-Jan-2212:00	69.3	31.5	3.2	78.1	74.8	74.8	70.7	73.0	64.6	36.0	62.0	64.0
25-Jan-22	12:30:00	25-Jan-2212:30	69.3	31.4	3.2	78.8	75.3	75.0	71.0	73.0	64.9	36.0	62.0	64.9
25-Jan-22	13:00:00	25-Jan-2213:00	69.3	33.2	3.2	78.9	75.9	75.5	71.0	73.9	65.0	37.0	62.3	65.0
25-Jan-22	13:30:00	25-Jan-2213:30	69.3	33.2	3.2	79.0	76.0	76.0	71.3	73.3	65.0	36.4	62.7	65.0
25-Jan-22	14:00:00	25-Jan-2214:00	69.3	33.2	3.2	79.0	76.0	76.0	71.6	74.0	65.3	37.0	63.0	65.0
25-Jan-22	14:30:00	25-Jan-2214:30	69.3	32.3	3.2	79.2	76.0	76.2	72.0	74.0	65.9	37.0	63.1	65.0
25-Jan-22	15:00:00	25-Jan-2215:00	69.3	32.4	3.2	80.0	76.0	76.1	72.0	74.3	66.0	37.0	63.2	66.0

25-Jan-22	15:30:00	25-Jan-2215:30	69.3	32.2	3.2	79.3	76.0	76.0	72.0	74.0	65.7	37.0	63.0	65.5
25-Jan-22	16:00:00	25-Jan-2216:00	63.6	32.8	3.2	75.8	72.3	72.2	70.6	72.3	65.6	36.6	62.0	62.9
25-Jan-22	16:30:00	25-Jan-2216:30	61.9	33.2	3.2	72.8	69.0	69.6	69.6	71.0	63.3	35.5	61.0	63.7
25-Jan-22	17:00:00	25-Jan-2217:00	61.9	33.2	3.2	72.0	69.0	69.0	69.0	71.0	63.0	35.0	61.0	63.0
25-Jan-22	17:30:00	25-Jan-2217:30	61.0	33.2	3.2	72.0	68.6	69.0	68.9	70.2	63.0	35.0	60.7	63.0
25-Jan-22	18:00:00	25-Jan-2218:00	59.9	33.2	3.2	72.0	68.0	68.2	68.0	70.0	62.0	34.4	60.0	62.4
25-Jan-22	18:30:00	25-Jan-2218:30	59.9	33.2	3.2	71.1	68.0	68.0	68.0	69.3	62.0	34.0	60.0	62.0
25-Jan-22	19:00:00	25-Jan-2219:00	59.9	33.2	3.2	71.0	67.5	67.2	68.0	69.0	61.1	33.7	59.6	61.7
25-Jan-22	19:30:00	25-Jan-2219:30	64.9	33.2	3.2	73.0	69.3	69.3	68.0	70.2	62.4	33.8	59.8	62.0
25-Jan-22	20:00:00	25-Jan-2220:00	68.3	33.6	3.2	78.0	74.0	74.3	70.0	72.0	64.0	35.3	61.0	64.0
25-Jan-22	20:30:00	25-Jan-2220:30	68.3	34.2	3.2	78.0	74.6	74.9	70.0	72.6	64.0	36.0	61.8	64.0
25-Jan-22	21:00:00	25-Jan-2221:00	68.3	33.3	3.2	78.0	75.0	75.0	70.9	73.0	64.0	36.0	62.0	64.0
25-Jan-22	21:30:00	25-Jan-2221:30	68.3	33.2	3.2	78.4	75.1	75.1	71.0	73.2	64.6	36.0	62.0	64.8
25-Jan-22	22:00:00	25-Jan-2222:00	68.5	33.5	3.2	79.0	75.4	76.0	71.0	73.7	65.0	36.6	63.0	65.0
25-Jan-22	22:30:00	25-Jan-2222:30	70.3	33.2	3.2	79.0	76.0	76.1	71.4	74.0	65.0	37.0	63.0	65.0
25-Jan-22	23:00:00	25-Jan-2223:00	70.3	33.2	3.2	79.0	76.0	76.7	72.0	74.0	65.3	37.0	63.0	65.0
25-Jan-22	23:30:00	25-Jan-2223:30	70.3	33.6	3.2	79.9	76.3	77.0	72.0	74.1	65.8	37.0	63.0	66.0
26-Jan-22	0:00:00	26-Jan-2200:00	70.3	34.2	3.2	80.0	76.3	76.4	72.0	74.2	66.0	37.0	63.0	66.0
26-Jan-22	0:30:00	26-Jan-2200:30	70.3	34.2	3.2	80.0	76.9	77.0	72.3	74.9	66.0	37.7	63.5	66.0
26-Jan-22	1:00:00	26-Jan-2201:00	66.7	33.3	3.2	79.0	76.0	76.0	72.0	74.4	65.4	37.6	61.8	65.5
26-Jan-22	1:30:00	26-Jan-2201:30	62.2	33.4	3.2	73.3	70.3	70.6	70.0	71.7	64.0	36.0	62.0	64.0
26-Jan-22	2:00:00	26-Jan-2202:00	62.2	34.7	3.2	73.0	70.0	70.6	70.0	71.2	64.0	36.0	62.0	64.0
26-Jan-22	2:30:00	26-Jan-2202:30	62.2	36.1	3.2	73.0	70.0	70.0	70.0	71.0	64.0	36.0	62.0	64.0
26-Jan-22	3:00:00	26-Jan-2203:00	62.2	36.1	3.2	73.0	70.0	70.3	70.0	71.0	64.0	36.0	61.7	64.0
26-Jan-22	3:30:00	26-Jan-2203:30	61.5	36.0	3.2	73.0	70.0	70.0	70.0	71.0	63.7	35.7	61.2	64.0
26-Jan-22	4:00:00	26-Jan-2204:00	60.2	33.3	3.2	72.7	69.7	70.0	69.3	71.0	63.2	35.2	61.1	63.2
26-Jan-22	4:30:00	26-Jan-2204:30	60.2	33.2	3.2	72.5	69.5	70.0	69.0	70.7	63.0	35.0	60.8	63.0
26-Jan-22	5:00:00	26-Jan-2205:00	60.2	33.6	3.2	71.6	68.6	68.6	68.3	69.5	61.6	34.3	59.9	61.7
26-Jan-22	5:30:00	26-Jan-2205:30	60.2	36.1	3.2	71.0	67.4	67.7	67.2	69.0	61.0	33.0	58.3	61.0
26-Jan-22	6:00:00	26-Jan-2206:00	66.6	35.1	3.2	74.5	69.1	65.9	68.4	70.8	62.1	33.8	59.2	62.6
26-Jan-22	6:30:00	26-Jan-2206:30	67.2	34.1	3.2	75.5	69.5	64.7	69.0	71.0	63.0	34.3	60.3	62.7
26-Jan-22	7:00:00	26-Jan-2207:00	67.2	33.5	3.2	75.4	69.1	64.4	69.0	71.5	63.0	34.0	60.0	63.0
26-Jan-22	7:30:00	26-Jan-2207:30	67.2	34.2	3.2	76.0	70.0	65.0	69.0	71.1	63.0	34.3	60.0	63.0
26-Jan-22	8:00:00	26-Jan-2208:00	67.2	33.3	3.2	75.6	69.6	65.0	69.0	71.3	63.0	34.6	60.0	63.0
26-Jan-22	8:30:00	26-Jan-2208:30	68.5	33.2	3.2	76.5	70.8	70.3	69.5	72.1	63.3	34.9	60.3	63.0
26-Jan-22	9:00:00	26-Jan-2209:00	69.4	32.6	3.2	78.0	75.0	75.1	70.0	72.9	64.0	35.0	60.9	63.3
26-Jan-22	9:30:00	26-Jan-2209:30	69.4	33.2	3.2	78.0	74.4	74.7	69.4	72.5	63.7	35.0	61.0	63.0
26-Jan-22	10:00:00	26-Jan-2210:00	69.4	33.8	3.2	78.0	74.4	75.0	70.0	73.0	64.0	35.0	61.0	63.7
26-Jan-22	10:30:00	26-Jan-2210:30	69.4	34.2	3.2	78.1	75.1	75.0	70.0	73.0	64.0	35.0	61.0	64.0
26-Jan-22	11:00:00	26-Jan-2211:00	69.4	34.8	3.2	77.9	74.7	74.0	69.8	73.0	64.0	35.4	61.0	64.0
26-Jan-22	11:30:00	26-Jan-2211:30	69.4	35.1	3.2	78.4	74.7	72.6	70.3	73.0	64.0	35.7	61.6	64.0
26-Jan-22	12:00:00	26-Jan-2212:00	69.4	32.7	3.2	79.0	76.2	75.6	71.2	73.9	64.0	36.9	62.4	64.9
26-Jan-22	12:30:00	26-Jan-2212:30	69.5	32.2	3.2	79.0	76.4	76.3	71.4	74.0	64.0	37.0	63.0	65.0

26-Jan-22	13:00:00	26-Jan-2213:00	71.5	33.1	3.2	79.7	76.4	77.0	72.0	74.0	64.0	37.0	63.0	65.4
26-Jan-22	13:30:00	26-Jan-2213:30	71.5	34.2	3.2	80.0	76.9	77.0	71.7	74.1	64.0	37.0	63.0	65.5
26-Jan-22	14:00:00	26-Jan-2214:00	70.1	34.2	3.2	80.0	77.0	77.0	72.0	74.8	64.0	37.2	63.9	66.0
26-Jan-22	14:30:00	26-Jan-2214:30	60.5	34.2	3.2	74.2	71.3	71.2	70.4	71.3	64.0	35.9	62.3	64.1
26-Jan-22	15:00:00	26-Jan-2215:00	60.5	34.2	3.2	72.7	69.7	69.7	69.4	71.0	64.0	35.0	61.2	63.2
26-Jan-22	15:30:00	26-Jan-2215:30	60.5	34.2	3.2	72.0	69.0	69.7	69.0	71.0	64.0	35.0	61.0	63.2
26-Jan-22	16:00:00	26-Jan-2216:00	60.5	34.2	3.2	72.0	69.0	69.2	69.0	70.1	64.0	35.0	61.0	63.0
26-Jan-22	16:30:00	26-Jan-2216:30	60.5	34.2	3.2	72.0	68.7	69.0	69.0	70.0	64.0	35.0	60.4	63.0
26-Jan-22	17:00:00	26-Jan-2217:00	60.5	34.2	3.2	71.2	68.2	68.7	68.5	70.0	64.0	34.4	60.0	62.4
26-Jan-22	17:30:00	26-Jan-2217:30	60.5	34.2	3.2	71.6	68.0	68.6	68.0	69.9	64.0	34.0	60.0	62.0
26-Jan-22	18:00:00	26-Jan-2218:00	68.1	34.2	3.2	76.1	72.5	72.6	69.6	72.4	64.0	35.8	61.5	63.8
26-Jan-22	18:30:00	26-Jan-2218:30	69.4	34.2	3.2	77.6	74.6	74.6	70.0	72.6	64.0	36.0	62.0	64.0
26-Jan-22	19:00:00	26-Jan-2219:00	69.8	34.2	3.2	78.0	74.4	74.7	70.0	72.3	64.0	36.0	61.7	63.7
26-Jan-22	19:30:00	26-Jan-2219:30	69.8	34.2	3.2	78.0	75.3	75.1	70.6	72.7	64.0	36.0	62.0	64.0
26-Jan-22	20:00:00	26-Jan-2220:00	69.8	34.2	3.2	78.0	75.0	75.5	70.3	73.0	64.0	36.0	62.0	64.0
26-Jan-22	20:30:00	26-Jan-2220:30	69.8	34.2	3.2	78.3	75.0	75.6	70.6	73.0	64.0	36.0	62.0	64.2
26-Jan-22	21:00:00	26-Jan-2221:00	69.8	33.4	3.2	79.0	75.7	76.0	71.0	73.0	64.0	36.3	62.0	65.0
26-Jan-22	21:30:00	26-Jan-2221:30	69.8	33.2	3.2	79.0	76.0	76.0	71.3	74.0	64.0	36.1	62.5	65.0
26-Jan-22	22:00:00	26-Jan-2222:00	69.8	32.0	3.2	80.0	76.5	77.0	72.0	74.0	64.0	37.0	63.0	65.3
26-Jan-22	22:30:00	26-Jan-2222:30	69.8	31.9	3.2	80.0	76.7	77.0	72.0	74.1	64.0	37.1	63.5	66.0
26-Jan-22	23:00:00	26-Jan-2223:00	69.8	32.9	3.2	80.0	77.3	77.2	72.4	75.0	64.0	38.0	64.0	66.0
26-Jan-22	23:30:00	26-Jan-2223:30	69.8	33.7	3.2	80.0	77.0	77.3	73.0	75.0	64.0	38.0	64.0	66.0
27-Jan-22	0:00:00	27-Jan-2200:00	61.1	34.2	3.2	74.9	71.9	72.4	70.9	72.6	64.0	36.4	60.7	64.3
27-Jan-22	0:30:00	27-Jan-2200:30	61.1	34.6	3.2	73.0	70.0	70.9	70.0	71.4	64.0	36.0	62.0	64.0
27-Jan-22	1:00:00	27-Jan-2201:00	61.1	35.1	3.2	73.0	70.0	70.5	70.0	71.0	64.0	36.0	62.0	64.0
27-Jan-22	1:30:00	27-Jan-2201:30	61.1	34.7	3.2	73.0	70.0	70.6	70.0	71.0	64.0	36.0	61.7	64.0
27-Jan-22	2:00:00	27-Jan-2202:00	61.1	33.2	3.2	73.0	70.0	70.0	70.0	71.0	64.0	36.0	61.1	63.8
27-Jan-22	2:30:00	27-Jan-2202:30	61.1	33.2	3.2	73.0	69.7	70.0	70.0	71.0	64.0	36.0	61.0	63.9
27-Jan-22	3:00:00	27-Jan-2203:00	61.1	33.9	3.2	73.0	70.0	70.6	69.7	71.0	64.0	35.0	61.0	63.0
27-Jan-22	3:30:00	27-Jan-2203:30	61.1	35.6	3.2	73.0	70.0	70.0	69.6	71.0	64.0	35.0	61.0	63.0
27-Jan-22	4:00:00	27-Jan-2204:00	61.1	35.1	3.2	72.4	69.4	70.0	69.0	70.6	64.0	35.0	60.8	63.0
27-Jan-22	4:30:00	27-Jan-2204:30	61.1	35.1	3.2	72.0	69.3	69.7	69.0	70.0	64.0	35.0	60.6	62.7
27-Jan-22	5:00:00	27-Jan-2205:00	60.0	35.1	3.2	72.0	68.7	68.8	67.8	69.6	64.0	33.9	58.9	61.6
27-Jan-22	5:30:00	27-Jan-2205:30	62.4	35.1	3.2	72.1	68.8	69.2	67.4	69.7	64.0	33.2	58.2	62.3
27-Jan-22	6:00:00	27-Jan-2206:00	69.1	34.2	3.2	77.7	75.0	74.7	69.7	72.0	64.0	35.0	60.0	63.1
27-Jan-22	6:30:00	27-Jan-2206:30	69.1	34.2	3.2	77.6	74.8	74.8	69.7	72.0	64.0	35.0	60.0	63.0
27-Jan-22	7:00:00	27-Jan-2207:00	69.1	34.3	3.2	77.0	74.6	74.6	70.0	72.0	64.0	35.0	60.5	63.1
27-Jan-22	7:30:00	27-Jan-2207:30	69.1	35.1	3.2	78.0	75.0	75.0	70.0	72.3	64.0	35.0	60.7	63.5
27-Jan-22	8:00:00	27-Jan-2208:00	69.1	35.1	3.2	78.0	75.0	75.0	70.0	72.6	64.0	35.0	61.0	64.0
27-Jan-22	8:30:00	27-Jan-2208:30	69.1	34.5	3.2	78.0	75.0	75.6	70.0	73.0	64.0	35.0	61.0	64.0
27-Jan-22	9:00:00	27-Jan-2209:00	69.1	34.2	3.2	78.0	75.0	75.0	70.3	73.0	64.0	35.0	61.0	64.0
27-Jan-22	9:30:00	27-Jan-2209:30	69.1	34.2	3.2	78.0	74.4	73.6	70.0	72.6	64.0	35.2	61.0	63.8
27-Jan-22	10:00:00	27-Jan-2210:00	69.2	34.4	3.2	79.0	75.4	76.2	70.9	73.6	64.0	35.9	62.0	64.4

27-Jan-22	10:30:00	27-Jan-22	10:30:00	69.2	35.1	3.2	79.0	76.0	76.0	70.3	73.7	64.0	36.9	63.0	65.0
27-Jan-22	11:00:00	27-Jan-22	11:00:00	70.1	35.1	3.2	79.6	76.0	76.3	71.3	73.4	64.0	36.4	62.7	65.0
27-Jan-22	11:30:00	27-Jan-22	11:30:00	71.3	35.1	3.2	79.3	76.0	76.0	71.5	74.0	64.0	37.0	63.0	65.0
27-Jan-22	12:00:00	27-Jan-22	12:00:00	71.3	34.6	3.2	79.9	76.3	76.9	71.6	74.0	64.0	37.0	63.0	65.8
27-Jan-22	12:30:00	27-Jan-22	12:30:00	71.3	32.3	3.2	79.8	76.8	76.8	71.8	74.0	64.0	37.0	63.3	66.0
27-Jan-22	13:00:00	27-Jan-22	13:00:00	68.9	33.2	3.2	79.6	76.6	77.0	71.9	74.3	64.0	37.3	63.5	65.0
27-Jan-22	13:30:00	27-Jan-22	13:30:00	61.7	35.1	3.2	73.0	70.0	71.6	69.7	71.6	64.0	36.2	61.1	63.4
27-Jan-22	14:00:00	27-Jan-22	14:00:00	61.7	35.1	3.2	72.7	69.4	70.0	69.4	70.9	64.0	35.6	61.0	63.8
27-Jan-22	14:30:00	27-Jan-22	14:30:00	61.6	35.1	3.2	72.6	69.9	70.0	68.7	70.6	64.0	35.0	60.7	62.8
27-Jan-22	15:00:00	27-Jan-22	15:00:00	61.7	34.4	3.2	72.0	69.0	69.4	69.0	70.0	64.0	35.0	60.7	63.0
27-Jan-22	15:30:00	27-Jan-22	15:30:00	63.4	34.2	3.2	72.8	69.4	70.3	69.2	70.7	64.0	35.4	62.5	63.5
27-Jan-22	16:00:00	27-Jan-22	16:00:00	68.7	34.2	3.2	78.7	75.6	75.6	71.0	73.1	64.0	36.1	62.5	65.0
27-Jan-22	16:30:00	27-Jan-22	16:30:00	68.7	34.2	3.2	78.4	75.3	75.3	71.0	73.0	64.0	36.2	62.0	65.0
27-Jan-22	17:00:00	27-Jan-22	17:00:00	68.7	34.2	3.2	78.2	75.0	75.5	71.0	73.0	64.0	36.1	62.2	65.0
27-Jan-22	17:30:00	27-Jan-22	17:30:00	68.7	34.2	3.2	79.0	75.6	76.0	71.0	73.0	64.0	37.0	62.9	65.0
27-Jan-22	18:00:00	27-Jan-22	18:00:00	68.7	34.2	3.2	78.7	75.2	75.4	71.0	73.3	64.0	37.0	62.0	65.0
27-Jan-22	18:30:00	27-Jan-22	18:30:00	68.7	34.2	3.2	78.7	75.6	75.4	71.0	73.9	64.0	37.0	62.8	65.0
27-Jan-22	19:00:00	27-Jan-22	19:00:00	68.7	34.2	3.2	79.0	75.4	75.3	71.0	74.0	64.0	37.0	63.0	65.0
27-Jan-22	19:30:00	27-Jan-22	19:30:00	68.7	34.2	3.2	79.0	76.0	75.8	71.2	74.0	64.0	37.0	63.0	65.0
27-Jan-22	20:00:00	27-Jan-22	20:00:00	64.0	34.2	3.2	76.8	73.5	74.1	70.7	72.7	64.0	36.7	61.5	64.4
27-Jan-22	20:30:00	27-Jan-22	20:30:00	61.0	34.2	3.2	73.0	69.0	69.7	69.0	71.0	64.0	35.0	61.0	63.0
27-Jan-22	21:00:00	27-Jan-22	21:00:00	61.0	34.2	3.2	72.7	69.0	69.7	69.0	71.0	64.0	35.0	61.0	63.0
27-Jan-22	21:30:00	27-Jan-22	21:30:00	61.0	34.2	3.2	72.4	69.0	69.4	69.0	71.0	64.0	35.0	61.0	63.0
27-Jan-22	22:00:00	27-Jan-22	22:00:00	61.0	31.9	3.2	72.4	69.0	70.0	69.0	70.4	64.0	35.0	61.0	63.0
27-Jan-22	22:30:00	27-Jan-22	22:30:00	61.0	32.2	3.2	72.0	69.0	69.8	69.0	70.0	64.0	35.0	61.0	63.0
27-Jan-22	23:00:00	27-Jan-22	23:00:00	61.0	32.6	3.2	72.0	68.7	69.3	69.0	70.0	64.0	35.0	61.0	63.0
27-Jan-22	23:30:00	27-Jan-22	23:30:00	61.0	33.7	3.2	72.0	69.0	69.2	69.0	70.0	64.0	35.0	60.6	62.7
28-Jan-22	0:00:00	28-Jan-22	0:00:00	62.8	34.0	3.2	72.0	68.4	69.2	68.2	70.2	64.0	34.5	60.0	62.3
28-Jan-22	0:30:00	28-Jan-22	0:30:00	69.4	32.2	3.2	77.0	75.9	76.0	71.0	73.5	64.0	36.0	61.9	64.8
28-Jan-22	1:00:00	28-Jan-22	1:00:00	69.4	32.2	3.2	79.0	76.0	76.0	71.2	74.0	64.0	36.9	62.7	65.0
28-Jan-22	1:30:00	28-Jan-22	1:30:00	69.4	32.9	3.2	79.4	76.1	76.4	72.0	74.2	64.0	37.0	63.0	65.0
28-Jan-22	2:00:00	28-Jan-22	2:00:00	69.4	35.1	3.2	80.0	77.0	77.0	72.0	74.4	64.0	37.0	63.0	65.9
28-Jan-22	2:30:00	28-Jan-22	2:30:00	70.0	35.2	3.2	80.0	77.0	77.1	72.7	75.0	64.0	37.5	63.9	66.0
28-Jan-22	3:00:00	28-Jan-22	3:00:00	71.4	36.1	3.2	80.3	77.5	78.0	73.0	75.0	64.0	38.0	64.0	66.4
28-Jan-22	3:30:00	28-Jan-22	3:30:00	68.0	36.1	3.2	81.0	77.3	77.1	72.8	74.5	64.0	37.8	63.9	66.4
28-Jan-22	4:00:00	28-Jan-22	4:00:00	62.2	35.5	3.2	74.6	70.2	71.0	70.2	71.7	64.0	36.1	62.0	64.0
28-Jan-22	4:30:00	28-Jan-22	4:30:00	62.2	35.1	3.2	73.0	70.0	70.7	69.7	71.2	64.0	36.0	61.7	63.8
28-Jan-22	5:00:00	28-Jan-22	5:00:00	61.0	36.1	3.2	72.7	69.7	70.2	68.7	70.7	64.0	34.8	60.5	62.6
28-Jan-22	5:30:00	28-Jan-22	5:30:00	60.0	36.1	3.2	72.0	69.0	69.0	68.0	70.0	64.0	34.0	59.1	62.0
28-Jan-22	6:00:00	28-Jan-22	6:00:00	60.0	36.1	3.2	71.2	68.2	69.0	67.8	69.4	64.0	33.7	59.0	61.4
28-Jan-22	6:30:00	28-Jan-22	6:30:00	60.0	36.1	3.2	71.7	68.4	68.7	68.0	69.8	64.0	34.0	60.8	61.8
28-Jan-22	7:00:00	28-Jan-22	7:00:00	65.3	35.8	3.2	73.5	70.8	70.8	68.8	70.2	64.0	34.8	60.5	62.9
28-Jan-22	7:30:00	28-Jan-22	7:30:00	69.8	36.1	3.2	79.0	75.4	76.3	71.0	73.5	64.0	36.0	62.0	64.7

28-Jan-22	8:00:00	28-Jan-22	8:00:00	69.8	35.7	3.2	79.0	76.0	76.0	71.0	74.0	64.0	36.6	62.8	65.0
28-Jan-22	8:30:00	28-Jan-22	8:30:00	69.8	34.2	3.2	79.3	76.0	76.6	71.1	73.7	64.0	36.7	62.7	65.0
28-Jan-22	9:00:00	28-Jan-22	9:00:00	69.8	33.6	3.2	79.0	76.0	76.3	71.2	74.0	64.0	37.0	63.0	65.0
28-Jan-22	9:30:00	28-Jan-22	9:30:00	69.8	33.2	3.2	79.3	76.0	76.0	72.0	74.0	64.0	37.0	63.0	65.2
28-Jan-22	10:00:00	28-Jan-22	10:00:00	69.9	33.3	3.2	79.3	76.0	76.6	71.7	74.0	64.0	37.0	63.0	66.0
28-Jan-22	10:30:00	28-Jan-22	10:30:00	63.4	30.8	3.2	77.2	73.9	74.1	71.2	73.2	64.0	36.5	62.1	65.0
28-Jan-22	11:00:00	28-Jan-22	11:00:00	60.4	30.3	3.2	73.0	70.0	69.4	69.7	71.0	64.0	36.0	61.0	63.4
28-Jan-22	11:30:00	28-Jan-22	11:30:00	60.3	29.3	3.2	72.0	69.1	69.0	69.1	70.6	64.0	35.0	61.0	63.3
28-Jan-22	12:00:00	28-Jan-22	12:00:00	60.1	29.3	3.2	72.2	69.2	69.2	69.0	70.6	64.0	35.0	61.0	63.0
28-Jan-22	12:30:00	28-Jan-22	12:30:00	60.1	29.3	3.2	72.1	69.1	69.4	69.0	70.6	64.0	35.0	61.0	63.0
28-Jan-22	13:00:00	28-Jan-22	13:00:00	60.1	29.3	3.2	72.0	69.0	69.0	69.0	70.0	64.0	35.0	61.0	63.0
28-Jan-22	13:30:00	28-Jan-22	13:30:00	60.1	29.3	3.2	72.0	68.4	69.0	68.1	70.0	64.0	34.9	60.2	62.6
28-Jan-22	14:00:00	28-Jan-22	14:00:00	60.1	29.3	3.2	72.0	68.3	69.0	68.3	70.0	64.0	34.0	60.0	62.0
28-Jan-22	14:30:00	28-Jan-22	14:30:00	67.0	30.5	3.2	75.3	72.1	72.0	69.6	71.8	64.0	35.2	60.0	63.0
28-Jan-22	15:00:00	28-Jan-22	15:00:00	68.4	32.2	3.2	78.7	75.0	75.1	71.0	73.0	64.0	36.0	61.8	64.5
28-Jan-22	15:30:00	28-Jan-22	15:30:00	68.4	32.2	3.2	79.0	75.5	75.5	71.0	73.3	64.0	36.3	62.7	65.0
28-Jan-22	16:00:00	28-Jan-22	16:00:00	68.4	32.5	3.2	79.0	75.1	76.0	71.0	73.7	64.0	36.7	62.7	65.0
28-Jan-22	16:30:00	28-Jan-22	16:30:00	68.4	33.2	3.2	79.0	76.0	76.0	71.0	74.0	64.0	37.0	63.0	65.0
28-Jan-22	17:00:00	28-Jan-22	17:00:00	69.6	33.2	3.2	79.0	76.0	76.0	71.9	74.0	64.0	37.0	63.0	65.0
28-Jan-22	17:30:00	28-Jan-22	17:30:00	70.5	33.2	3.2	79.0	76.0	76.3	72.0	74.0	64.0	37.0	63.0	65.0
28-Jan-22	18:00:00	28-Jan-22	18:00:00	70.5	33.2	3.2	79.0	75.7	75.4	72.0	74.0	64.0	37.0	63.0	65.6
28-Jan-22	18:30:00	28-Jan-22	18:30:00	66.1	33.2	3.2	78.1	75.1	75.2	72.0	73.6	64.0	36.8	62.3	65.0
28-Jan-22	19:00:00	28-Jan-22	19:00:00	60.6	33.2	3.2	73.0	69.4	69.6	70.1	71.0	64.0	35.4	61.0	63.7
28-Jan-22	19:30:00	28-Jan-22	19:30:00	60.6	33.2	3.2	72.6	69.3	69.7	69.0	71.0	64.0	35.0	61.0	63.2
28-Jan-22	20:00:00	28-Jan-22	20:00:00	60.6	33.2	3.2	72.0	69.0	69.7	69.0	70.1	64.0	35.0	60.5	63.0
28-Jan-22	20:30:00	28-Jan-22	20:30:00	60.6	33.2	3.2	72.0	68.7	69.0	68.4	70.0	64.0	34.8	60.0	62.2
28-Jan-22	21:00:00	28-Jan-22	21:00:00	60.6	33.2	3.2	72.0	68.5	69.0	68.2	70.0	64.0	34.6	60.3	62.0
28-Jan-22	21:30:00	28-Jan-22	21:30:00	62.9	33.2	3.2	72.4	68.9	69.0	68.1	70.3	64.0	34.3	60.0	62.3
28-Jan-22	22:00:00	28-Jan-22	22:00:00	69.0	33.2	3.2	79.0	75.5	74.4	71.0	73.0	64.0	36.0	62.0	64.0
28-Jan-22	22:30:00	28-Jan-22	22:30:00	69.0	33.2	3.2	79.0	75.7	76.3	71.0	73.7	64.0	36.3	62.0	64.7
28-Jan-22	23:00:00	28-Jan-22	23:00:00	69.0	33.2	3.2	79.0	76.0	76.0	71.0	73.7	64.0	36.5	62.9	65.0
28-Jan-22	23:30:00	28-Jan-22	23:30:00	69.3	33.2	3.2	79.6	76.3	76.3	71.9	74.0	64.0	37.0	63.0	65.1
29-Jan-22	0:00:00	29-Jan-22	0:00:00	71.0	33.2	3.2	79.7	76.4	76.7	72.0	74.0	64.0	37.0	63.0	65.4
29-Jan-22	0:30:00	29-Jan-22	0:30:00	71.0	33.2	3.2	80.0	77.0	77.0	72.3	74.3	64.0	37.3	63.2	66.0
29-Jan-22	1:00:00	29-Jan-22	1:00:00	71.0	33.2	3.2	80.0	77.0	77.0	72.4	75.0	64.0	38.0	64.0	66.0
29-Jan-22	1:30:00	29-Jan-22	1:30:00	66.6	32.4	3.2	80.5	75.6	75.5	72.5	74.0	64.0	37.9	63.6	65.1
29-Jan-22	2:00:00	29-Jan-22	2:00:00	61.4	31.2	3.2	73.8	70.6	71.0	70.6	72.0	64.0	37.0	62.0	64.2
29-Jan-22	2:30:00	29-Jan-22	2:30:00	61.4	31.2	3.2	73.6	70.3	70.7	70.0	72.0	64.0	36.1	62.0	64.0
29-Jan-22	3:00:00	29-Jan-22	3:00:00	61.4	32.1	3.2	74.0	70.6	71.0	70.3	71.8	64.0	36.0	62.0	64.0
29-Jan-22	3:30:00	29-Jan-22	3:30:00	61.4	35.1	3.2	73.4	70.0	71.0	70.0	71.6	64.0	35.9	61.6	63.9
29-Jan-22	4:00:00	29-Jan-22	4:00:00	61.4	34.6	3.2	72.6	69.0	70.0	69.0	71.0	64.0	35.0	60.0	63.0
29-Jan-22	4:30:00	29-Jan-22	4:30:00	61.4	34.2	3.2	72.3	69.3	70.0	69.0	70.4	64.0	35.0	60.0	62.3
29-Jan-22	5:00:00	29-Jan-22	5:00:00	61.4	34.9	3.2	72.0	69.0	69.0	68.3	70.0	64.0	34.2	60.0	62.0

29-Jan-22	5:30:00	29-Jan-22	05:30	61.4	35.6	3.2	72.0	69.0	69.0	68.0	70.0	64.0	34.0	59.8	62.0
29-Jan-22	6:00:00	29-Jan-22	06:00	60.6	36.1	3.2	72.0	68.9	69.0	68.0	69.8	64.0	34.0	59.0	62.0
29-Jan-22	6:30:00	29-Jan-22	06:30	68.9	35.7	3.2	77.0	73.0	72.4	70.5	72.3	64.0	35.5	60.4	64.5
29-Jan-22	7:00:00	29-Jan-22	07:00	68.8	35.1	3.2	78.0	74.3	73.0	71.0	73.0	64.0	36.0	62.0	65.0
29-Jan-22	7:30:00	29-Jan-22	07:30	68.8	28.3	3.2	78.0	74.0	73.0	71.0	73.0	64.0	36.3	62.0	65.0
29-Jan-22	8:00:00	29-Jan-22	08:00	68.8	29.1	3.2	78.0	74.0	73.0	71.0	73.0	64.0	36.8	62.6	65.0
29-Jan-22	8:30:00	29-Jan-22	08:30	68.8	29.1	3.2	78.0	74.0	72.5	71.0	73.9	64.0	37.0	63.0	65.0
29-Jan-22	9:00:00	29-Jan-22	09:00	68.8	29.1	3.2	78.0	74.0	72.9	71.0	74.0	64.0	37.0	63.0	65.0
29-Jan-22	9:30:00	29-Jan-22	09:30	68.8	29.6	3.2	78.0	74.0	73.0	71.5	74.0	64.0	37.0	63.0	65.0
29-Jan-22	10:00:00	29-Jan-22	10:00	68.8	30.1	3.2	78.0	74.0	73.0	72.0	74.0	64.0	37.0	63.0	65.1
29-Jan-22	10:30:00	29-Jan-22	10:30	60.6	29.0	3.2	74.2	70.0	70.4	70.2	71.7	64.0	35.4	62.3	63.5
29-Jan-22	11:00:00	29-Jan-22	11:00	60.9	29.0	3.2	72.0	68.0	66.4	69.0	70.7	64.0	35.0	61.0	63.0
29-Jan-22	11:30:00	29-Jan-22	11:30	60.9	29.0	3.2	72.0	67.7	66.9	69.0	70.3	64.0	35.0	61.0	63.0
29-Jan-22	12:00:00	29-Jan-22	12:00	60.9	28.5	3.2	72.0	67.5	66.2	69.0	70.0	64.0	35.0	61.0	62.7
29-Jan-22	12:30:00	29-Jan-22	12:30	60.9	28.0	3.2	71.4	67.3	66.4	68.7	70.0	64.0	34.6	60.5	62.3
29-Jan-22	13:00:00	29-Jan-22	13:00	60.9	28.0	3.2	71.0	67.0	66.0	68.0	70.0	64.0	34.0	60.0	62.0
29-Jan-22	13:30:00	29-Jan-22	13:30	61.2	28.0	3.2	71.0	67.0	66.0	68.0	70.1	64.0	34.1	60.0	62.2
29-Jan-22	14:00:00	29-Jan-22	14:00	68.1	28.3	3.2	77.8	73.2	71.9	70.3	73.0	64.0	36.0	61.8	64.0
29-Jan-22	14:30:00	29-Jan-22	14:30	68.1	29.0	3.2	77.5	73.2	72.0	70.2	72.4	64.0	36.0	62.0	64.0
29-Jan-22	15:00:00	29-Jan-22	15:00	68.1	29.0	3.2	77.7	73.6	71.8	70.6	72.7	64.0	36.0	62.0	64.8
29-Jan-22	15:30:00	29-Jan-22	15:30	68.1	29.0	3.2	78.0	74.0	72.8	71.0	73.0	64.0	36.3	62.0	65.0
29-Jan-22	16:00:00	29-Jan-22	16:00	68.1	29.0	3.2	78.0	74.0	72.3	71.0	73.3	64.0	37.0	62.5	65.0
29-Jan-22	16:30:00	29-Jan-22	16:30	68.1	29.0	3.2	78.0	74.0	73.0	71.0	73.8	64.0	37.0	63.0	65.0
29-Jan-22	17:00:00	29-Jan-22	17:00	68.1	29.7	3.2	78.3	74.6	73.0	71.6	74.0	64.0	37.0	63.0	65.0
29-Jan-22	17:30:00	29-Jan-22	17:30	68.1	29.9	3.2	78.9	74.3	73.0	71.7	74.0	64.0	37.0	63.0	65.0
29-Jan-22	18:00:00	29-Jan-22	18:00	69.9	29.9	3.2	78.0	74.0	73.0	72.0	74.0	64.0	37.0	63.0	65.0
29-Jan-22	18:30:00	29-Jan-22	18:30	70.1	29.9	3.2	78.3	74.3	73.0	72.0	73.8	64.0	37.0	63.0	65.0
29-Jan-22	19:00:00	29-Jan-22	19:00	64.0	29.3	3.2	74.6	70.3	69.3	70.2	71.0	64.0	36.4	61.8	64.3
29-Jan-22	19:30:00	29-Jan-22	19:30	61.2	28.9	3.2	71.3	67.3	66.0	68.4	70.0	64.0	34.7	60.1	62.2
29-Jan-22	20:00:00	29-Jan-22	20:00	59.8	28.1	3.2	71.0	67.0	66.0	68.2	70.0	64.0	34.1	60.0	62.0
29-Jan-22	20:30:00	29-Jan-22	20:30	59.1	27.9	3.2	71.0	67.0	66.0	68.0	70.0	64.0	34.0	60.0	62.0
29-Jan-22	21:00:00	29-Jan-22	21:00	59.1	27.9	3.2	71.0	67.0	65.7	68.0	69.1	64.0	34.0	60.0	62.0
29-Jan-22	21:30:00	29-Jan-22	21:30	64.0	27.3	3.2	73.1	69.1	68.1	68.7	70.2	64.0	34.4	60.0	62.5
29-Jan-22	22:00:00	29-Jan-22	22:00	67.8	26.8	3.2	77.0	73.0	72.0	70.0	72.5	64.0	35.5	62.0	63.9
29-Jan-22	22:30:00	29-Jan-22	22:30	67.8	26.8	3.2	77.9	73.6	72.3	70.6	73.0	64.0	36.0	62.0	64.0
29-Jan-22	23:00:00	29-Jan-22	23:00	67.8	26.8	3.2	78.0	73.5	72.2	70.7	73.0	64.0	36.0	62.0	64.0
29-Jan-22	23:30:00	29-Jan-22	23:30	68.3	28.5	3.2	78.0	73.9	72.0	71.0	73.0	64.0	36.0	62.0	64.7
30-Jan-22	0:00:00	30-Jan-22	00:00	69.7	28.9	3.2	78.0	74.0	73.0	71.0	73.0	64.0	36.2	62.4	65.0
30-Jan-22	0:30:00	30-Jan-22	00:30	69.7	29.0	3.2	78.3	74.0	73.0	71.0	73.1	64.0	37.0	63.0	65.0
30-Jan-22	1:00:00	30-Jan-22	01:00	69.7	29.9	3.2	79.0	75.0	73.0	71.7	74.0	64.0	37.0	63.0	65.0
30-Jan-22	1:30:00	30-Jan-22	01:30	69.7	29.9	3.2	79.0	75.0	73.3	72.0	74.0	64.0	37.0	63.0	65.7
30-Jan-22	2:00:00	30-Jan-22	02:00	69.7	29.9	3.2	79.0	75.0	74.0	72.0	74.0	64.0	37.3	63.0	66.0
30-Jan-22	2:30:00	30-Jan-22	02:30	69.7	29.9	3.2	79.2	75.2	74.2	72.3	74.9	64.0	37.9	64.0	66.0

30-Jan-22	3:00:00	30-Jan-22	03:00:00	67.4	30.1	3.2	79.7	75.8	74.7	72.5	74.7	64.0	37.8	64.0	65.7
30-Jan-22	3:30:00	30-Jan-22	03:30:00	60.8	29.2	3.2	72.5	68.5	67.8	69.6	71.5	64.0	35.5	62.0	63.4
30-Jan-22	4:00:00	30-Jan-22	04:00:00	60.1	28.8	3.2	72.0	68.0	67.0	69.3	70.7	64.0	35.1	60.7	63.1
30-Jan-22	4:30:00	30-Jan-22	04:30:00	60.1	28.8	3.2	72.0	68.5	67.5	69.4	71.0	64.0	35.2	61.1	63.2
30-Jan-22	5:00:00	30-Jan-22	05:00:00	60.1	28.8	3.2	72.0	68.1	67.0	69.4	70.1	64.0	35.0	61.0	63.0
30-Jan-22	5:30:00	30-Jan-22	05:30:00	60.1	27.9	3.2	71.6	67.3	66.6	68.3	69.4	64.0	34.2	59.1	61.9
30-Jan-22	6:00:00	30-Jan-22	06:00:00	60.1	27.8	3.2	71.0	67.0	66.0	68.0	69.7	64.0	33.4	59.3	61.4
30-Jan-22	6:30:00	30-Jan-22	06:30:00	65.6	28.3	3.2	73.7	69.7	68.9	69.1	71.3	64.0	34.9	60.7	62.7
30-Jan-22	7:00:00	30-Jan-22	07:00:00	69.3	28.8	3.2	78.0	74.0	72.0	71.0	73.0	64.0	36.0	62.0	64.0
30-Jan-22	7:30:00	30-Jan-22	07:30:00	69.3	28.8	3.2	78.0	73.9	71.9	71.0	73.0	64.0	36.0	62.0	64.0
30-Jan-22	8:00:00	30-Jan-22	08:00:00	69.3	28.8	3.2	77.8	73.0	71.3	71.0	73.0	64.0	36.0	62.0	64.3
30-Jan-22	8:30:00	30-Jan-22	08:30:00	69.3	28.8	3.2	77.9	73.0	71.9	71.0	73.0	64.0	36.0	62.0	64.5
30-Jan-22	9:00:00	30-Jan-22	09:00:00	69.3	28.8	3.2	78.0	73.6	71.3	71.0	73.0	64.0	36.0	62.0	65.0
30-Jan-22	9:30:00	30-Jan-22	09:30:00	69.3	28.8	3.2	78.0	73.6	71.6	71.0	73.0	64.0	36.6	62.0	64.7
30-Jan-22	10:00:00	30-Jan-22	10:00:00	69.3	28.8	3.2	78.0	73.4	71.7	71.0	73.0	64.0	36.0	62.6	64.7
30-Jan-22	10:30:00	30-Jan-22	10:30:00	69.3	28.8	3.2	78.0	73.7	72.0	71.0	73.0	64.0	36.3	62.0	65.0
30-Jan-22	11:00:00	30-Jan-22	11:00:00	69.3	28.8	3.2	78.0	73.7	71.8	71.0	73.3	64.0	36.8	62.3	64.8
30-Jan-22	11:30:00	30-Jan-22	11:30:00	69.3	29.0	3.2	78.0	74.0	71.6	71.0	73.0	64.0	36.9	63.0	64.9
30-Jan-22	12:00:00	30-Jan-22	12:00:00	69.3	29.8	3.2	78.0	74.0	72.0	71.0	73.1	64.0	37.0	63.0	65.0
30-Jan-22	12:30:00	30-Jan-22	12:30:00	69.3	29.8	3.2	78.0	74.0	72.0	71.0	74.0	64.0	37.0	63.0	65.0
30-Jan-22	13:00:00	30-Jan-22	13:00:00	69.3	29.8	3.2	78.0	74.0	72.3	71.6	74.0	64.0	37.0	63.0	65.0
30-Jan-22	13:30:00	30-Jan-22	13:30:00	65.7	29.4	3.2	77.9	73.3	71.3	71.4	74.0	64.0	36.6	62.3	64.6
30-Jan-22	14:00:00	30-Jan-22	14:00:00	60.0	28.8	3.2	72.0	68.0	66.3	69.0	71.3	64.0	35.0	61.0	63.0
30-Jan-22	14:30:00	30-Jan-22	14:30:00	60.0	28.8	3.2	72.0	67.7	66.3	69.0	70.0	64.0	35.0	61.0	63.0
30-Jan-22	15:00:00	30-Jan-22	15:00:00	60.0	28.6	3.2	71.8	67.2	66.0	69.0	70.0	64.0	34.7	60.0	62.4
30-Jan-22	15:30:00	30-Jan-22	15:30:00	60.0	27.8	3.2	71.0	67.0	66.0	68.1	70.0	64.0	34.3	60.0	62.2
30-Jan-22	16:00:00	30-Jan-22	16:00:00	60.0	27.8	3.2	71.0	67.0	65.8	68.0	69.7	64.0	34.0	60.0	62.0
30-Jan-22	16:30:00	30-Jan-22	16:30:00	65.2	27.8	3.2	72.7	68.6	67.0	68.6	70.1	64.0	34.5	60.5	62.3
30-Jan-22	17:00:00	30-Jan-22	17:00:00	68.2	27.8	3.2	77.3	73.3	72.6	70.0	72.2	64.0	35.7	61.7	64.0
30-Jan-22	17:30:00	30-Jan-22	17:30:00	69.0	28.8	3.2	77.9	73.9	74.1	70.0	73.0	64.0	36.0	62.0	64.0
30-Jan-22	18:00:00	30-Jan-22	18:00:00	70.2	28.8	3.2	78.0	74.3	75.3	70.6	73.0	64.0	36.0	62.0	64.0
30-Jan-22	18:30:00	30-Jan-22	18:30:00	70.2	28.8	3.2	78.3	74.6	75.5	70.6	73.0	64.0	36.0	62.0	64.0
30-Jan-22	19:00:00	30-Jan-22	19:00:00	70.2	28.8	3.2	78.0	75.0	75.1	70.4	73.0	64.0	36.0	62.0	64.0
30-Jan-22	19:30:00	30-Jan-22	19:30:00	70.2	28.8	3.2	78.3	75.0	75.1	70.7	73.0	64.0	36.0	62.0	64.3
30-Jan-22	20:00:00	30-Jan-22	20:00:00	70.2	28.8	3.2	78.6	75.0	75.4	71.0	73.0	64.0	36.0	62.0	64.5
30-Jan-22	20:30:00	30-Jan-22	20:30:00	70.2	28.8	3.2	78.3	75.0	76.0	71.0	73.0	64.0	36.0	62.2	64.7
30-Jan-22	21:00:00	30-Jan-22	21:00:00	70.2	28.8	3.2	79.0	75.7	75.9	71.0	73.0	64.0	37.0	62.1	65.0
30-Jan-22	21:30:00	30-Jan-22	21:30:00	70.2	29.8	3.2	79.0	75.8	75.8	71.0	73.9	64.0	37.0	63.0	65.0
30-Jan-22	22:00:00	30-Jan-22	22:00:00	70.2	29.8	3.2	79.0	76.0	76.4	71.7	74.0	64.0	37.0	63.0	65.2
30-Jan-22	22:30:00	30-Jan-22	22:30:00	70.2	29.8	3.2	79.8	76.5	77.0	72.0	74.0	64.0	37.0	63.0	65.7
30-Jan-22	23:00:00	30-Jan-22	23:00:00	70.2	29.2	3.2	79.6	76.3	77.0	72.0	74.0	64.0	37.0	63.0	66.0
30-Jan-22	23:30:00	30-Jan-22	23:30:00	65.8	28.4	3.2	78.2	75.2	75.1	71.6	73.1	64.0	36.7	60.9	65.4
31-Jan-22	0:00:00	31-Jan-22	00:00:00	61.5	27.8	3.2	73.0	69.6	69.7	69.4	71.0	64.0	35.3	61.1	63.2

31-Jan-22	0:30:00	31-Jan-22	00:30	61.5	27.8	3.2	73.0	69.4	70.0	69.4	71.0	64.0	35.0	61.0	63.0
31-Jan-22	1:00:00	31-Jan-22	01:00	61.5	27.7	3.2	72.2	69.7	70.0	69.2	71.0	64.0	35.0	61.0	63.0
31-Jan-22	1:30:00	31-Jan-22	01:30	61.5	27.8	3.2	72.0	69.0	70.0	69.1	71.0	64.0	35.0	61.0	63.0
31-Jan-22	2:00:00	31-Jan-22	02:00	61.5	27.8	3.2	72.0	69.3	70.0	69.2	70.7	64.0	35.0	61.0	63.0
31-Jan-22	2:30:00	31-Jan-22	02:30	61.5	27.8	3.2	72.0	69.0	70.0	69.0	70.0	64.0	35.0	61.0	63.0
31-Jan-22	3:00:00	31-Jan-22	03:00	67.9	28.8	3.2	76.1	73.1	73.9	70.5	72.6	64.0	36.8	61.9	63.1
31-Jan-22	3:30:00	31-Jan-22	03:30	71.1	29.8	3.2	80.0	76.7	77.9	72.0	74.3	64.0	37.0	63.0	65.6
31-Jan-22	4:00:00	31-Jan-22	04:00	71.1	29.8	3.2	79.7	77.0	76.7	72.0	74.0	64.0	37.0	63.0	65.0
31-Jan-22	4:30:00	31-Jan-22	04:30	71.1	29.8	3.2	80.0	77.0	77.3	72.0	74.0	64.0	37.0	63.0	65.0
31-Jan-22	5:00:00	31-Jan-22	05:00	71.1	29.8	3.2	79.2	76.5	77.0	71.6	74.0	64.0	36.8	62.6	64.7
31-Jan-22	5:30:00	31-Jan-22	05:30	71.1	29.8	3.2	79.0	76.0	76.4	71.0	73.6	64.0	36.0	62.0	64.0
31-Jan-22	6:00:00	31-Jan-22	06:00	71.1	29.8	3.2	79.0	76.0	76.3	71.0	73.2	64.0	36.0	61.7	64.0
31-Jan-22	6:30:00	31-Jan-22	06:30	71.1	29.8	3.2	79.0	76.0	76.0	70.8	73.2	64.0	36.0	61.3	64.1
31-Jan-22	7:00:00	31-Jan-22	07:00	71.1	29.8	3.2	79.0	75.9	76.4	71.0	73.8	64.0	36.0	61.9	64.5
31-Jan-22	7:30:00	31-Jan-22	07:30	71.1	29.8	3.2	79.0	75.8	76.5	71.0	73.9	64.0	36.0	62.0	64.3
31-Jan-22	8:00:00	31-Jan-22	08:00	71.1	29.8	3.2	79.0	76.0	77.0	71.0	74.0	64.0	36.3	62.0	65.0
31-Jan-22	8:30:00	31-Jan-22	08:30	62.7	29.0	3.2	75.2	72.2	72.6	70.0	71.6	64.0	34.8	60.3	63.0
31-Jan-22	9:00:00	31-Jan-22	09:00	59.5	27.9	3.2	71.7	68.3	68.6	66.3	70.0	64.0	34.0	59.3	61.5
31-Jan-22	9:30:00	31-Jan-22	09:30	59.5	27.8	3.2	72.0	68.5	68.5	68.0	70.0	64.0	34.0	59.3	61.6
31-Jan-22	10:00:00	31-Jan-22	10:00	59.0	27.5	3.2	71.0	68.1	68.0	66.8	69.7	64.0	32.9	58.2	60.7
31-Jan-22	10:30:00	31-Jan-22	10:30	59.0	26.8	3.2	70.2	67.2	67.2	67.0	68.8	64.0	32.9	58.0	60.7
31-Jan-22	11:00:00	31-Jan-22	11:00	60.2	26.8	3.2	70.2	67.4	67.4	67.0	68.9	64.0	32.9	58.3	60.6
31-Jan-22	11:30:00	31-Jan-22	11:30	68.0	27.9	3.2	79.3	76.9	73.0	68.5	71.1	64.0	34.0	59.8	62.4
31-Jan-22	12:00:00	31-Jan-22	12:00	68.3	27.9	3.2	77.6	74.0	75.3	69.2	72.0	64.0	34.7	60.0	63.0
31-Jan-22	12:30:00	31-Jan-22	12:30	69.1	27.9	3.2	77.7	74.4	74.7	69.4	72.0	64.0	34.4	60.6	63.0
31-Jan-22	13:00:00	31-Jan-22	13:00	67.9	27.9	3.2	78.0	75.0	75.0	70.0	72.6	64.0	35.0	60.3	63.3
31-Jan-22	13:30:00	31-Jan-22	13:30	67.9	27.9	3.2	78.0	74.9	75.0	70.0	72.7	64.0	35.0	60.9	63.5
31-Jan-22	14:00:00	31-Jan-22	14:00	67.9	27.9	3.2	78.0	74.8	74.7	69.7	72.4	64.0	35.0	61.0	64.0
31-Jan-22	14:30:00	31-Jan-22	14:30	69.6	28.0	3.2	78.0	75.0	75.0	68.8	72.4	64.0	35.0	61.8	63.4
31-Jan-22	15:00:00	31-Jan-22	15:00	70.0	28.8	3.2	78.4	75.0	75.5	70.1	73.0	64.0	35.0	61.1	64.0
31-Jan-22	15:30:00	31-Jan-22	15:30	70.0	28.8	3.2	78.1	75.0	75.4	70.4	73.0	64.0	35.0	61.0	64.0
31-Jan-22	16:00:00	31-Jan-22	16:00	70.0	28.8	3.2	78.0	75.0	75.1	70.3	73.0	64.0	35.0	61.0	64.0
31-Jan-22	16:30:00	31-Jan-22	16:30	70.0	28.8	3.2	78.0	75.0	75.5	70.0	73.0	64.0	35.0	61.0	64.0
31-Jan-22	17:00:00	31-Jan-22	17:00	70.0	28.8	3.2	78.0	75.0	75.3	70.0	73.0	64.0	35.0	61.0	64.0
31-Jan-22	17:30:00	31-Jan-22	17:30	70.0	28.8	3.2	78.0	75.0	75.0	70.3	73.0	64.0	35.3	61.0	64.0
31-Jan-22	18:00:00	31-Jan-22	18:00	70.0	28.8	3.2	78.0	74.4	74.3	70.0	73.0	64.0	35.0	61.0	64.0
31-Jan-22	18:30:00	31-Jan-22	18:30	70.0	28.8	3.2	78.0	74.5	74.5	70.0	72.4	64.0	35.0	61.0	64.0
31-Jan-22	19:00:00	31-Jan-22	19:00	70.0	28.8	3.2	78.0	74.7	74.4	70.0	72.3	64.0	35.0	61.0	64.0
31-Jan-22	19:30:00	31-Jan-22	19:30	70.0	28.8	3.2	78.0	74.5	74.7	70.0	72.0	64.0	35.0	61.0	63.7
31-Jan-22	20:00:00	31-Jan-22	20:00	70.0	28.8	3.2	78.0	74.7	75.0	70.0	72.7	64.0	35.0	61.0	64.0
31-Jan-22	20:30:00	31-Jan-22	20:30	70.0	28.8	3.2	78.0	75.0	75.0	70.3	73.0	64.0	35.6	61.0	64.0
31-Jan-22	21:00:00	31-Jan-22	21:00	70.0	28.8	3.2	78.6	75.0	75.6	70.3	73.0	64.0	36.0	61.0	64.0
31-Jan-22	21:30:00	31-Jan-22	21:30	70.0	28.8	3.2	79.0	75.5	75.8	71.0	73.0	64.0	36.0	61.4	64.0

31-Jan-22	22:00:00	31-Jan-2222:00	70.0	28.8	3.2	79.0	76.0	76.2	71.0	73.4	64.0	36.0	62.0	64.1
31-Jan-22	22:30:00	31-Jan-2222:30	70.0	29.1	3.2	79.0	76.0	76.7	71.0	74.0	64.0	36.0	62.0	65.0
31-Jan-22	23:00:00	31-Jan-2223:00	70.0	29.7	3.2	79.0	76.0	76.4	71.0	74.0	64.0	36.0	62.0	65.0
31-Jan-22	23:30:00	31-Jan-2223:30	70.0	28.8	3.2	79.0	76.0	76.0	71.0	74.0	64.0	36.0	62.0	65.0
1-Feb-22	0:00:00	01-Feb-2200:00	70.0	28.8	3.2	79.0	76.0	76.0	71.0	74.0	64.0	36.0	62.0	65.0
1-Feb-22	0:30:00	01-Feb-2200:30	70.0	28.8	3.2	79.0	76.0	76.4	71.4	74.0	64.0	36.2	62.0	65.0
1-Feb-22	1:00:00	01-Feb-2201:00	70.0	29.1	3.2	79.2	76.0	76.4	72.0	74.0	64.0	37.0	62.0	65.0
1-Feb-22	1:30:00	01-Feb-2201:30	67.4	29.6	3.2	79.3	76.3	76.3	71.9	73.5	64.0	36.7	62.8	64.8
1-Feb-22	2:00:00	01-Feb-2202:00	61.5	28.8	3.2	73.0	70.0	70.0	69.5	71.0	64.0	35.0	60.9	63.1
1-Feb-22	2:30:00	01-Feb-2202:30	61.5	28.8	3.2	72.9	69.6	70.0	69.0	71.0	64.0	35.0	60.6	63.0
1-Feb-22	3:00:00	01-Feb-2203:00	61.5	28.8	3.2	72.3	69.6	70.0	69.0	70.8	64.0	34.8	60.0	62.7
1-Feb-22	3:30:00	01-Feb-2203:30	61.5	28.8	3.2	72.0	69.0	70.0	69.0	70.0	64.0	34.0	60.0	62.3
1-Feb-22	4:00:00	01-Feb-2204:00	61.0	28.0	3.2	72.0	69.0	69.6	68.3	70.0	64.0	34.0	59.4	62.0
1-Feb-22	4:30:00	01-Feb-2204:30	67.6	28.6	3.2	72.8	72.4	72.8	69.0	70.9	64.0	34.9	60.2	63.3
1-Feb-22	5:00:00	01-Feb-2205:00	69.0	28.8	3.2	78.4	75.1	76.0	70.0	73.0	64.0	35.4	61.3	64.3
1-Feb-22	5:30:00	01-Feb-2205:30	69.0	28.8	3.2	79.0	75.7	76.0	71.0	73.0	64.0	36.0	62.0	64.6
1-Feb-22	6:00:00	01-Feb-2206:00	69.0	28.8	3.2	79.0	76.0	76.0	71.0	73.1	64.0	36.7	62.6	65.0
1-Feb-22	6:30:00	01-Feb-2206:30	69.0	29.0	3.2	79.0	76.0	75.7	71.0	73.4	64.0	36.7	62.0	65.0
1-Feb-22	7:00:00	01-Feb-2207:00	69.0	29.8	3.2	79.0	75.7	76.0	71.0	74.0	64.0	37.0	62.5	65.0
1-Feb-22	7:30:00	01-Feb-2207:30	69.0	29.8	3.2	79.0	76.0	76.3	71.0	74.0	64.0	37.0	63.3	65.0
1-Feb-22	8:00:00	01-Feb-2208:00	70.8	29.8	3.2	79.3	75.7	76.0	71.3	74.0	64.0	37.0	63.0	65.0
1-Feb-22	8:30:00	01-Feb-2208:30	68.4	29.8	3.2	78.8	75.4	76.4	72.3	74.0	64.0	37.0	62.2	65.0
1-Feb-22	9:00:00	01-Feb-2209:00	61.2	28.8	3.2	73.8	70.7	70.5	70.5	71.3	64.0	35.8	60.6	63.3
1-Feb-22	9:30:00	01-Feb-2209:30	61.0	28.8	3.2	71.8	68.7	69.7	68.4	71.0	64.0	35.0	61.6	62.8
1-Feb-22	10:00:00	01-Feb-2210:00	61.1	28.8	3.2	72.5	69.0	69.2	69.2	70.5	64.0	35.0	61.0	63.0
1-Feb-22	10:30:00	01-Feb-2210:30	61.1	28.8	3.2	72.0	69.0	69.3	68.7	70.6	64.0	35.0	60.5	62.6
1-Feb-22	11:00:00	01-Feb-2211:00	60.1	28.0	3.2	71.7	68.6	69.0	68.4	69.7	64.0	34.1	60.3	62.0
1-Feb-22	11:30:00	01-Feb-2211:30	59.8	27.9	3.2	72.0	67.4	68.1	68.2	69.7	64.0	34.1	60.0	62.0
1-Feb-22	12:00:00	01-Feb-2212:00	60.3	27.9	3.2	71.1	67.6	68.3	68.0	69.3	64.0	34.0	60.0	62.0
1-Feb-22	12:30:00	01-Feb-2212:30	60.0	27.9	3.2	71.0	68.3	68.3	67.7	69.0	64.0	33.7	59.7	62.0
1-Feb-22	13:00:00	01-Feb-2213:00	60.0	27.2	3.2	71.0	68.0	68.0	68.0	69.3	64.0	34.0	59.0	62.0
1-Feb-22	13:30:00	01-Feb-2213:30	59.8	26.9	3.2	71.0	68.0	67.7	67.4	68.6	64.0	33.7	59.3	62.0
1-Feb-22	14:00:00	01-Feb-2214:00	58.4	26.9	3.2	71.0	67.3	67.9	67.6	68.8	64.0	33.5	59.0	62.0
1-Feb-22	14:30:00	01-Feb-2214:30	67.6	27.8	3.2	76.4	70.7	73.2	69.2	71.5	64.0	34.7	60.4	62.0
1-Feb-22	15:00:00	01-Feb-2215:00	67.6	27.9	3.2	78.0	75.0	75.0	70.0	72.3	64.0	35.0	61.0	62.0
1-Feb-22	15:30:00	01-Feb-2215:30	67.6	27.9	3.2	78.0	75.0	75.0	70.3	72.3	64.0	35.4	61.0	62.0
1-Feb-22	16:00:00	01-Feb-2216:00	68.2	27.9	3.2	78.0	75.0	75.0	70.5	72.5	64.0	35.4	61.1	62.0
1-Feb-22	16:30:00	01-Feb-2216:30	69.6	27.9	3.2	78.0	75.0	75.3	70.2	73.0	64.0	36.0	62.0	62.0
1-Feb-22	17:00:00	01-Feb-2217:00	69.6	28.3	3.2	78.0	75.0	75.0	70.1	73.0	64.0	35.6	62.0	62.0
1-Feb-22	17:30:00	01-Feb-2217:30	69.6	28.9	3.2	78.0	75.0	75.0	70.5	73.0	64.0	35.8	62.0	62.0
1-Feb-22	18:00:00	01-Feb-2218:00	69.6	28.9	3.2	78.0	75.0	75.0	70.9	73.0	64.0	36.0	62.0	62.0
1-Feb-22	18:30:00	01-Feb-2218:30	69.6	28.9	3.2	78.0	74.3	74.9	70.6	73.0	64.0	36.0	62.0	62.0
1-Feb-22	19:00:00	01-Feb-2219:00	69.6	28.9	3.2	78.0	74.5	74.3	70.0	73.0	64.0	36.0	61.7	62.0

1-Feb-22	19:30:00 01-Feb-2219:30	69.6	28.9	3.2	78.0	75.0	74.9	70.3	73.0	64.0	36.0	61.7	62.0
1-Feb-22	20:00:00 01-Feb-2220:00	69.6	28.9	3.2	78.0	75.0	75.0	70.0	73.0	64.0	36.0	62.0	62.0
1-Feb-22	20:30:00 01-Feb-2220:30	69.6	28.9	3.2	78.0	75.0	75.6	70.3	73.0	64.0	36.0	62.0	62.0
1-Feb-22	21:00:00 01-Feb-2221:00	69.6	28.9	3.2	78.7	75.3	76.0	71.0	73.3	64.0	36.0	62.0	62.0
1-Feb-22	21:30:00 01-Feb-2221:30	69.6	29.3	3.2	79.0	75.8	76.0	71.0	73.9	64.0	36.9	63.0	62.0
1-Feb-22	22:00:00 01-Feb-2222:00	69.6	29.9	3.2	79.1	76.1	76.6	71.3	74.0	64.0	37.0	63.0	62.0
1-Feb-22	22:30:00 01-Feb-2222:30	69.6	29.9	3.2	79.7	76.2	77.0	71.5	74.0	64.0	37.0	63.0	62.0
1-Feb-22	23:00:00 01-Feb-2223:00	69.6	29.9	3.2	79.4	76.6	77.0	72.0	74.3	64.0	37.3	63.0	62.0
1-Feb-22	23:30:00 01-Feb-2223:30	69.6	29.9	3.2	80.0	76.7	77.0	71.7	74.2	64.0	37.5	63.4	62.0
2-Feb-22	0:00:00 02-Feb-2200:00	60.6	29.0	3.2	76.1	71.1	72.1	69.7	72.2	64.0	36.7	62.4	62.0
2-Feb-22	0:30:00 02-Feb-2200:30	60.3	28.9	3.2	73.0	70.0	70.0	70.0	71.0	64.0	36.0	61.1	62.0
2-Feb-22	1:00:00 02-Feb-2201:00	60.3	28.9	3.2	72.8	69.8	70.0	69.5	71.0	64.0	35.1	61.4	62.0
2-Feb-22	1:30:00 02-Feb-2201:30	60.3	28.9	3.2	72.9	69.6	70.0	69.0	71.0	64.0	35.0	61.2	62.0
2-Feb-22	2:00:00 02-Feb-2202:00	60.3	28.9	3.2	72.0	69.0	70.0	69.0	71.0	64.0	35.0	61.0	62.0
2-Feb-22	2:30:00 02-Feb-2202:30	60.3	28.9	3.2	72.0	69.0	70.0	69.0	70.7	64.0	35.0	61.0	62.0
2-Feb-22	3:00:00 02-Feb-2203:00	60.3	28.9	3.2	72.3	69.0	70.0	69.0	70.3	64.0	35.3	61.0	62.0
2-Feb-22	3:30:00 02-Feb-2203:30	60.3	28.9	3.2	72.0	69.2	70.2	69.0	70.0	64.0	35.0	61.0	62.0
2-Feb-22	4:00:00 02-Feb-2204:00	60.3	28.1	3.2	72.0	69.1	69.5	68.7	70.0	64.0	34.6	60.2	62.0
2-Feb-22	4:30:00 02-Feb-2204:30	67.9	28.6	3.2	75.0	72.0	72.5	69.8	70.6	64.0	35.3	61.3	62.0
2-Feb-22	5:00:00 02-Feb-2205:00	69.3	28.9	3.2	78.4	75.7	76.1	70.5	73.0	64.0	35.7	61.5	62.0
2-Feb-22	5:30:00 02-Feb-2205:30	68.5	28.9	3.2	78.0	75.0	75.3	70.0	73.0	64.0	35.0	61.0	62.0
2-Feb-22	6:00:00 02-Feb-2206:00	68.5	28.9	3.2	78.0	75.0	75.3	70.0	73.0	64.0	35.0	61.0	62.0
2-Feb-22	6:30:00 02-Feb-2206:30	68.5	28.9	3.2	78.0	75.0	75.3	69.7	72.7	64.0	35.0	61.0	62.0
2-Feb-22	7:00:00 02-Feb-2207:00	68.5	28.9	3.2	78.0	75.0	75.3	69.1	72.5	64.0	35.0	60.7	62.0
2-Feb-22	7:30:00 02-Feb-2207:30	68.5	28.9	3.2	78.0	75.0	75.0	70.0	72.9	64.0	35.3	61.0	62.0
2-Feb-22	8:00:00 02-Feb-2208:00	68.9	28.9	3.2	78.0	75.0	75.3	70.0	73.0	64.0	36.0	61.3	62.0
2-Feb-22	8:30:00 02-Feb-2208:30	69.2	28.9	3.2	78.0	75.0	74.6	69.1	73.0	64.0	35.7	61.0	62.0
2-Feb-22	9:00:00 02-Feb-2209:00	68.4	28.9	3.2	78.0	73.4	71.7	69.7	73.0	64.0	35.2	61.0	62.0
2-Feb-22	9:30:00 02-Feb-2209:30	68.2	28.9	3.2	77.7	73.6	72.3	70.1	73.0	64.0	35.6	61.0	62.0
2-Feb-22	10:00:00 02-Feb-2210:00	68.3	28.9	3.2	78.0	73.8	71.8	71.3	73.0	64.0	36.6	61.8	62.0
2-Feb-22	10:30:00 02-Feb-2210:30	68.3	29.3	3.2	78.3	74.6	73.5	71.0	73.7	64.0	37.0	63.0	62.0
2-Feb-22	11:00:00 02-Feb-2211:00	69.3	29.9	3.2	78.3	74.4	73.7	71.0	73.5	64.0	36.8	63.0	62.0
2-Feb-22	11:30:00 02-Feb-2211:30	70.5	29.9	3.2	78.8	75.0	74.5	71.5	73.9	64.0	36.9	63.0	62.0
2-Feb-22	12:00:00 02-Feb-2212:00	70.5	29.9	3.2	79.0	75.9	75.0	72.0	74.0	64.0	37.0	63.0	62.0
2-Feb-22	12:30:00 02-Feb-2212:30	63.1	29.1	3.2	76.1	72.5	72.8	70.7	72.3	64.0	36.1	60.7	62.0
2-Feb-22	13:00:00 02-Feb-2213:00	61.2	28.8	3.2	72.9	69.3	69.1	69.7	70.7	64.0	35.0	61.0	62.0
2-Feb-22	13:30:00 02-Feb-2213:30	61.4	28.8	3.2	72.0	69.0	68.9	69.0	71.0	64.0	35.0	60.4	62.0
2-Feb-22	14:00:00 02-Feb-2214:00	59.7	28.5	3.2	72.0	68.4	67.7	68.8	70.1	64.0	35.0	60.4	62.0
2-Feb-22	14:30:00 02-Feb-2214:30	61.0	28.0	3.2	71.4	67.5	68.0	68.6	70.1	64.0	34.4	60.8	62.0
2-Feb-22	15:00:00 02-Feb-2215:00	69.4	28.9	3.2	77.9	74.3	74.4	71.0	72.5	64.0	35.7	61.5	62.0
2-Feb-22	15:30:00 02-Feb-2215:30	69.4	28.9	3.2	77.7	74.8	74.2	70.5	73.3	64.0	36.0	62.2	62.0
2-Feb-22	16:00:00 02-Feb-2216:00	69.4	28.9	3.2	78.3	75.0	74.9	70.9	73.3	64.0	36.4	62.7	62.0
2-Feb-22	16:30:00 02-Feb-2216:30	69.4	28.9	3.2	79.0	75.7	75.8	71.0	73.5	64.0	37.0	63.0	62.0

2-Feb-22	17:00:00 02-Feb-2217:00	69.4	29.4	3.2	79.0	75.7	76.0	71.0	74.0	64.0	37.0	63.0	62.0
2-Feb-22	17:30:00 02-Feb-2217:30	69.4	29.9	3.2	79.0	76.0	75.7	71.3	74.0	64.0	36.7	63.0	62.0
2-Feb-22	18:00:00 02-Feb-2218:00	69.4	29.9	3.2	78.7	74.9	75.8	71.2	73.7	64.0	37.3	62.9	62.0
2-Feb-22	18:30:00 02-Feb-2218:30	69.4	29.9	3.2	78.7	75.0	75.6	71.4	73.7	64.0	36.7	62.8	62.0
2-Feb-22	19:00:00 02-Feb-2219:00	69.4	29.1	3.2	79.3	76.2	75.5	71.6	73.7	64.0	36.7	63.0	62.0
2-Feb-22	19:30:00 02-Feb-2219:30	69.4	28.8	3.2	79.0	75.3	76.0	71.0	74.0	64.0	37.0	63.0	62.0
2-Feb-22	20:00:00 02-Feb-2220:00	66.1	28.3	3.2	78.3	75.3	75.3	70.8	73.4	64.0	36.7	62.9	62.0
2-Feb-22	20:30:00 02-Feb-2220:30	59.3	26.8	3.2	72.0	69.0	69.0	68.2	70.0	64.0	35.0	60.1	62.0
2-Feb-22	21:00:00 02-Feb-2221:00	59.3	26.8	3.2	72.0	68.7	69.0	68.0	70.0	64.0	35.0	60.7	62.0
2-Feb-22	21:30:00 02-Feb-2221:30	59.3	26.8	3.2	72.0	69.0	69.3	69.0	70.0	64.0	35.0	60.9	62.0
2-Feb-22	22:00:00 02-Feb-2222:00	59.3	27.3	3.2	72.0	69.0	69.0	68.7	70.0	64.0	34.7	60.2	62.0
2-Feb-22	22:30:00 02-Feb-2222:30	59.3	27.7	3.2	72.0	68.6	69.0	68.0	70.0	64.0	34.5	60.1	62.0
2-Feb-22	23:00:00 02-Feb-2223:00	59.3	27.7	3.2	71.7	68.3	69.0	68.0	70.0	64.0	34.0	60.0	62.0
2-Feb-22	23:30:00 02-Feb-2223:30	62.0	28.0	3.2	71.7	68.7	69.4	68.1	70.3	64.0	34.0	60.0	62.0
3-Feb-22	0:00:00 03-Feb-2200:00	68.8	28.8	3.2	78.5	75.2	76.0	70.4	73.0	64.0	35.7	61.9	62.0
3-Feb-22	0:30:00 03-Feb-2200:30	68.8	28.8	3.2	79.0	76.0	76.0	71.0	73.3	64.0	36.0	62.0	62.0
3-Feb-22	1:00:00 03-Feb-2201:00	68.8	28.8	3.2	79.0	76.0	76.6	71.0	74.0	64.0	36.6	62.6	62.0
3-Feb-22	1:30:00 03-Feb-2201:30	68.8	29.2	3.2	79.0	76.0	76.5	71.2	74.0	64.0	36.9	63.0	62.0
3-Feb-22	2:00:00 03-Feb-2202:00	70.4	29.7	3.2	79.9	76.9	77.0	72.0	74.1	64.0	37.0	63.0	62.0
3-Feb-22	2:30:00 03-Feb-2202:30	70.8	29.7	3.2	80.0	77.0	77.2	72.0	75.0	64.0	37.0	63.4	62.0
3-Feb-22	3:00:00 03-Feb-2203:00	70.8	29.7	3.2	80.0	77.3	78.0	72.0	75.0	64.0	37.9	64.0	62.0
3-Feb-22	3:30:00 03-Feb-2203:30	70.8	30.5	3.2	80.7	77.7	77.8	72.7	75.0	64.0	38.0	64.0	62.0
3-Feb-22	4:00:00 03-Feb-2204:00	66.0	30.3	3.2	79.4	78.0	76.5	72.4	74.1	64.0	37.4	62.8	62.0
3-Feb-22	4:30:00 03-Feb-2204:30	61.0	29.7	3.2	73.7	71.5	71.0	70.0	71.6	64.0	36.0	62.0	62.0
3-Feb-22	5:00:00 03-Feb-2205:00	61.0	29.7	3.2	73.0	70.0	70.4	70.0	71.0	64.0	35.8	61.6	62.0
3-Feb-22	5:30:00 03-Feb-2205:30	61.0	29.0	3.2	72.5	69.5	70.2	69.2	71.0	64.0	35.0	61.0	62.0
3-Feb-22	6:00:00 03-Feb-2206:00	61.0	28.7	3.2	72.0	69.0	69.3	68.9	70.6	64.0	34.7	60.7	62.0
3-Feb-22	6:30:00 03-Feb-2206:30	60.0	28.7	3.2	72.0	69.0	68.8	68.2	70.0	64.0	34.1	60.0	62.0
3-Feb-22	7:00:00 03-Feb-2207:00	59.0	27.9	3.2	71.4	68.1	68.3	67.8	69.3	64.0	33.3	58.9	62.0
3-Feb-22	7:30:00 03-Feb-2207:30	59.0	27.7	3.2	70.7	67.7	67.7	67.0	69.0	64.0	33.0	58.0	62.0
3-Feb-22	8:00:00 03-Feb-2208:00	60.7	27.0	3.2	70.3	67.0	66.7	66.2	68.4	64.0	32.7	58.2	62.0
3-Feb-22	8:30:00 03-Feb-2208:30	66.8	27.8	3.2	75.5	71.5	70.4	68.0	71.5	64.0	33.9	60.0	62.0
3-Feb-22	9:00:00 03-Feb-2209:00	68.1	27.8	3.2	77.0	73.6	73.0	68.9	72.0	64.0	34.7	60.0	63.0
3-Feb-22	9:30:00 03-Feb-2209:30	68.8	27.8	3.2	77.0	73.3	73.0	69.6	72.2	64.0	34.2	60.1	62.5
3-Feb-22	10:00:00 03-Feb-2210:00	68.8	27.8	3.2	77.0	73.3	72.4	69.2	72.1	64.0	34.9	60.7	62.4
3-Feb-22	10:30:00 03-Feb-2210:30	68.2	27.8	3.2	77.0	73.7	73.0	70.0	72.0	64.0	35.0	60.4	63.0
3-Feb-22	11:00:00 03-Feb-2211:00	68.7	27.8	3.2	77.3	74.4	73.5	69.7	72.0	64.0	35.0	61.0	63.0
3-Feb-22	11:30:00 03-Feb-2211:30	67.8	27.8	3.2	77.9	74.2	74.0	70.0	72.3	64.0	35.0	60.7	63.2
3-Feb-22	12:00:00 03-Feb-2212:00	67.4	27.8	3.2	77.3	73.8	73.5	69.9	72.0	64.0	35.0	60.7	62.9
3-Feb-22	12:30:00 03-Feb-2212:30	67.4	28.0	3.2	77.0	73.6	72.7	69.6	72.0	64.0	34.7	61.0	63.1
3-Feb-22	13:00:00 03-Feb-2213:00	67.6	28.8	3.2	77.7	74.0	73.7	70.0	72.8	64.0	35.0	61.0	64.0
3-Feb-22	13:30:00 03-Feb-2213:30	69.4	28.8	3.2	78.0	74.3	74.0	70.8	73.0	64.0	35.9	62.0	64.9
3-Feb-22	14:00:00 03-Feb-2214:00	69.4	28.8	3.2	78.0	74.3	74.0	71.0	73.0	64.0	36.3	62.0	65.0

3-Feb-22	14:30:00 03-Feb-2214:30	69.4	28.8	3.2	78.0	74.3	73.5	70.7	73.0	64.0	36.3	62.7	64.7
3-Feb-22	15:00:00 03-Feb-2215:00	69.4	28.8	3.2	78.0	74.9	73.6	71.0	73.1	64.0	36.7	63.2	65.0
3-Feb-22	15:30:00 03-Feb-2215:30	69.4	29.7	3.2	78.3	74.9	74.4	71.0	74.0	64.0	37.0	62.8	65.0
3-Feb-22	16:00:00 03-Feb-2216:00	69.4	29.7	3.2	78.2	74.8	74.4	71.2	74.0	64.0	37.0	63.2	65.0
3-Feb-22	16:30:00 03-Feb-2216:30	69.4	29.7	3.2	79.0	75.6	75.9	72.0	74.0	64.0	37.0	63.0	66.0
3-Feb-22	17:00:00 03-Feb-2217:00	67.5	29.5	3.2	79.2	76.0	76.0	72.0	74.0	64.0	37.0	62.7	65.9
3-Feb-22	17:30:00 03-Feb-2217:30	61.0	27.3	3.2	73.2	71.6	69.7	69.3	70.9	64.0	35.0	60.7	63.0
3-Feb-22	18:00:00 03-Feb-2218:00	61.0	26.8	3.2	72.8	69.0	69.0	69.0	70.0	64.0	35.0	60.6	63.0
3-Feb-22	18:30:00 03-Feb-2218:30	61.0	26.8	3.2	71.4	68.4	68.7	68.1	70.0	64.0	34.3	60.0	62.3
3-Feb-22	19:00:00 03-Feb-2219:00	59.0	25.8	3.2	71.0	67.7	68.0	67.6	69.2	64.0	33.7	59.6	61.7
3-Feb-22	19:30:00 03-Feb-2219:30	62.7	27.4	3.2	72.8	69.5	69.8	68.0	71.4	64.0	34.7	59.5	62.1
3-Feb-22	20:00:00 03-Feb-2220:00	68.4	28.8	3.2	78.0	74.7	75.0	70.0	72.5	64.0	35.7	61.7	64.0
3-Feb-22	20:30:00 03-Feb-2220:30	68.4	28.8	3.2	78.0	75.0	75.5	70.0	72.9	64.0	36.0	62.0	64.0
3-Feb-22	21:00:00 03-Feb-2221:00	68.4	28.8	3.2	78.0	75.3	75.0	70.7	73.0	64.0	36.0	62.0	64.2
3-Feb-22	21:30:00 03-Feb-2221:30	68.4	28.8	3.2	78.8	75.8	75.5	71.0	73.3	64.0	36.0	62.4	65.0
3-Feb-22	22:00:00 03-Feb-2222:00	68.9	29.1	3.2	79.0	76.0	76.4	71.0	74.0	64.0	36.7	62.4	65.0
3-Feb-22	22:30:00 03-Feb-2222:30	70.4	29.8	3.2	79.0	76.0	76.7	71.3	74.0	64.0	37.0	63.0	65.0
3-Feb-22	23:00:00 03-Feb-2223:00	70.4	29.8	3.2	79.9	76.0	76.4	71.6	74.0	64.0	37.0	63.0	65.0
3-Feb-22	23:30:00 03-Feb-2223:30	70.4	29.8	3.2	80.0	76.3	77.0	72.0	74.0	64.0	37.0	63.3	65.5
4-Feb-22	0:00:00 04-Feb-2200:00	70.4	29.8	3.2	79.8	76.0	76.7	71.7	74.0	64.0	37.0	63.0	65.7
4-Feb-22	0:30:00 04-Feb-2200:30	69.5	30.0	3.2	80.0	77.0	77.0	72.0	74.7	64.0	38.0	63.9	66.0
4-Feb-22	1:00:00 04-Feb-2201:00	61.4	29.7	3.2	74.4	71.5	71.4	70.5	72.7	64.0	36.3	62.0	64.2
4-Feb-22	1:30:00 04-Feb-2201:30	61.4	29.7	3.2	73.0	70.0	70.3	70.0	71.0	64.0	36.0	61.7	64.0
4-Feb-22	2:00:00 04-Feb-2202:00	61.4	29.5	3.2	73.0	70.0	70.0	70.0	71.0	64.0	36.0	61.6	63.7
4-Feb-22	2:30:00 04-Feb-2202:30	61.4	28.8	3.2	73.0	70.0	70.0	69.7	71.0	64.0	35.9	61.0	63.6
4-Feb-22	3:00:00 04-Feb-2203:00	61.4	28.8	3.2	73.0	69.7	70.3	69.6	71.0	64.0	35.5	61.0	63.0
4-Feb-22	3:30:00 04-Feb-2203:30	61.4	28.8	3.2	72.7	69.7	69.7	69.3	71.0	64.0	35.1	61.0	63.0
4-Feb-22	4:00:00 04-Feb-2204:00	61.4	28.8	3.2	72.1	69.1	70.0	69.0	70.7	64.0	35.0	61.0	63.0
4-Feb-22	4:30:00 04-Feb-2204:30	61.4	28.8	3.2	72.1	69.4	69.4	69.0	70.1	64.0	35.0	61.0	63.0
4-Feb-22	5:00:00 04-Feb-2205:00	60.2	28.2	3.2	71.6	68.5	68.6	68.0	69.6	64.0	34.1	60.1	62.0
4-Feb-22	5:30:00 04-Feb-2205:30	62.9	27.6	3.2	71.0	69.0	69.6	67.6	69.8	64.0	33.6	58.9	61.3
4-Feb-22	6:00:00 04-Feb-2206:00	67.6	27.8	3.2	73.2	74.7	75.0	69.4	72.0	64.0	35.0	60.0	63.0
4-Feb-22	6:30:00 04-Feb-2206:30	67.6	27.8	3.2	78.0	74.3	75.0	69.1	72.0	64.0	35.0	60.0	63.0
4-Feb-22	7:00:00 04-Feb-2207:00	67.6	27.8	3.2	78.0	74.6	74.7	69.1	72.0	64.0	35.0	60.3	63.0
4-Feb-22	7:30:00 04-Feb-2207:30	67.6	27.8	3.2	78.0	74.6	74.8	70.0	72.3	64.0	35.0	60.6	63.0
4-Feb-22	8:00:00 04-Feb-2208:00	67.6	27.8	3.2	77.7	74.0	73.7	70.0	72.0	64.0	35.0	60.8	63.0
4-Feb-22	8:30:00 04-Feb-2208:30	67.6	27.8	3.2	77.0	73.0	71.7	69.7	72.0	64.0	35.0	60.7	62.7
4-Feb-22	9:00:00 04-Feb-2209:00	67.6	28.3	3.2	77.5	73.5	72.2	70.0	72.3	64.0	35.0	60.7	63.0
4-Feb-22	9:30:00 04-Feb-2209:30	68.8	28.8	3.2	78.0	73.7	72.7	69.8	72.7	64.0	35.4	61.6	64.5
4-Feb-22	10:00:00 04-Feb-2210:00	69.6	28.8	3.2	78.0	74.0	73.8	71.0	73.0	64.0	36.3	62.1	64.7
4-Feb-22	10:30:00 04-Feb-2210:30	69.6	28.8	3.2	78.0	74.6	73.6	71.0	73.0	64.0	37.0	63.0	65.0
4-Feb-22	11:00:00 04-Feb-2211:00	69.6	28.8	3.2	78.3	74.5	73.2	70.3	73.5	64.0	37.0	63.0	65.3
4-Feb-22	11:30:00 04-Feb-2211:30	69.6	29.8	3.2	78.3	75.0	74.0	70.9	74.0	64.0	37.0	63.0	65.0

4-Feb-22	12:00:00 04-Feb-2212:00	69.6	29.8	3.2	78.3	74.6	73.3	71.0	73.7	64.0	36.5	62.7	65.0
4-Feb-22	12:30:00 04-Feb-2212:30	69.6	29.8	3.2	78.6	74.8	73.3	71.2	73.7	64.0	36.9	63.0	65.0
4-Feb-22	13:00:00 04-Feb-2213:00	69.6	29.8	3.2	78.9	74.7	73.9	72.0	73.7	64.0	37.0	63.0	65.2
4-Feb-22	13:30:00 04-Feb-2213:30	62.7	29.1	3.2	75.4	69.1	64.6	70.2	72.0	64.0	36.6	61.7	65.3
4-Feb-22	14:00:00 04-Feb-2214:00	60.8	28.3	3.2	71.7	68.2	67.6	68.7	70.3	64.0	34.7	61.0	62.7
4-Feb-22	14:30:00 04-Feb-2214:30	61.0	27.8	3.2	71.6	68.0	67.3	69.0	69.7	64.0	34.7	61.0	62.7
4-Feb-22	15:00:00 04-Feb-2215:00	61.2	27.8	3.2	71.6	68.0	67.6	68.5	70.0	64.0	34.1	60.0	62.4
4-Feb-22	15:30:00 04-Feb-2215:30	63.6	28.3	3.2	73.7	70.6	69.4	69.1	72.8	64.0	34.6	60.6	62.0
4-Feb-22	16:00:00 04-Feb-2216:00	68.5	28.8	3.2	78.0	74.7	74.2	70.7	73.0	64.0	36.0	62.0	63.8
4-Feb-22	16:30:00 04-Feb-2216:30	69.6	28.8	3.2	78.9	75.6	75.3	71.0	73.7	64.0	36.7	62.8	65.0
4-Feb-22	17:00:00 04-Feb-2217:00	69.6	29.3	3.2	79.0	76.0	76.0	71.3	74.0	64.0	37.0	62.7	65.0
4-Feb-22	17:30:00 04-Feb-2217:30	69.6	29.8	3.2	79.0	76.0	76.0	71.5	74.0	64.0	37.0	63.0	65.0
4-Feb-22	18:00:00 04-Feb-2218:00	69.6	29.8	3.2	79.0	75.3	75.4	72.0	74.0	64.0	37.0	63.0	65.0
4-Feb-22	18:30:00 04-Feb-2218:30	69.6	29.8	3.2	79.0	75.8	76.0	71.5	74.0	64.0	37.0	63.0	65.0
4-Feb-22	19:00:00 04-Feb-2219:00	69.6	29.8	3.2	79.0	75.7	75.7	71.3	74.0	64.0	37.0	63.0	65.0
4-Feb-22	19:30:00 04-Feb-2219:30	63.7	28.2	3.2	75.5	72.5	72.7	70.6	72.0	64.0	36.1	62.2	62.7
4-Feb-22	20:00:00 04-Feb-2220:00	60.9	26.9	3.2	72.0	68.7	69.3	68.7	70.0	64.0	34.6	60.2	62.6
4-Feb-22	20:30:00 04-Feb-2220:30	60.9	26.9	3.2	72.0	68.6	69.0	68.0	70.0	64.0	34.0	60.0	62.0
4-Feb-22	21:00:00 04-Feb-2221:00	60.9	26.9	3.2	72.0	68.0	69.0	68.0	70.0	64.0	34.0	60.0	62.0
4-Feb-22	21:30:00 04-Feb-2221:30	62.5	27.0	3.2	72.0	69.5	70.9	69.1	70.0	64.0	34.0	60.0	62.0
4-Feb-22	22:00:00 04-Feb-2222:00	69.1	28.9	3.2	76.9	76.0	77.2	71.0	72.6	64.0	35.8	62.0	64.1
4-Feb-22	22:30:00 04-Feb-2222:30	69.1	28.9	3.2	78.0	75.6	76.0	71.0	73.1	64.0	36.4	62.0	64.7
4-Feb-22	23:00:00 04-Feb-2223:00	69.1	28.9	3.2	79.0	75.7	75.7	71.0	73.7	64.0	36.7	62.7	65.0
4-Feb-22	23:30:00 04-Feb-2223:30	69.1	29.3	3.2	79.0	76.0	76.3	71.3	74.0	64.0	37.0	63.0	65.0
5-Feb-22	0:00:00 05-Feb-2200:00	69.1	29.9	3.2	79.0	76.0	76.0	71.6	74.0	64.0	37.0	63.0	65.0
5-Feb-22	0:30:00 05-Feb-2200:30	69.1	29.9	3.2	79.5	76.0	76.5	71.8	74.0	64.0	37.0	63.0	65.4
5-Feb-22	1:00:00 05-Feb-2201:00	69.1	29.9	3.2	80.0	76.3	77.0	72.0	74.2	64.0	37.5	63.6	66.0
5-Feb-22	1:30:00 05-Feb-2201:30	70.6	30.2	3.2	80.0	76.8	77.3	72.2	74.7	64.0	37.7	64.0	66.0
5-Feb-22	2:00:00 05-Feb-2202:00	71.1	30.9	3.2	80.6	77.6	78.0	73.0	75.0	64.0	38.0	64.0	66.0
5-Feb-22	2:30:00 05-Feb-2202:30	71.1	30.9	3.2	80.8	77.8	78.0	73.0	75.3	64.0	38.0	64.3	66.9
5-Feb-22	3:00:00 05-Feb-2203:00	69.0	30.9	3.2	80.4	77.7	78.2	73.4	75.0	64.0	38.0	64.8	67.0
5-Feb-22	3:30:00 05-Feb-2203:30	61.5	30.9	3.2	74.0	71.0	71.3	71.0	72.1	64.0	36.5	63.0	65.2
5-Feb-22	4:00:00 05-Feb-2204:00	61.5	30.1	3.2	73.4	70.4	70.7	70.3	71.4	64.0	36.3	61.9	64.1
5-Feb-22	4:30:00 05-Feb-2204:30	61.5	29.9	3.2	73.0	70.0	70.8	69.8	71.2	64.0	35.4	61.0	63.0
5-Feb-22	5:00:00 05-Feb-2205:00	61.5	29.0	3.2	73.0	70.0	70.0	69.1	71.0	64.0	35.0	60.7	63.0
5-Feb-22	5:30:00 05-Feb-2205:30	61.5	28.9	3.2	73.0	69.6	70.0	69.0	71.0	64.0	35.0	60.6	63.0
5-Feb-22	6:00:00 05-Feb-2206:00	61.5	28.9	3.2	73.0	69.6	69.7	69.6	71.0	64.0	35.7	60.8	63.7
5-Feb-22	6:30:00 05-Feb-2206:30	61.5	28.9	3.2	73.0	70.0	70.0	69.9	71.0	64.0	35.5	61.4	63.5
5-Feb-22	7:00:00 05-Feb-2207:00	61.5	28.9	3.2	72.7	69.4	70.0	69.0	71.0	64.0	35.0	61.2	63.0
5-Feb-22	7:30:00 05-Feb-2207:30	61.5	28.9	3.2	72.0	69.0	69.6	69.0	70.5	64.0	35.0	61.0	63.0
5-Feb-22	8:00:00 05-Feb-2208:00	61.3	28.4	3.2	72.0	69.0	69.0	69.0	70.0	64.0	35.0	60.3	63.0
5-Feb-22	8:30:00 05-Feb-2208:30	65.3	28.4	3.2	74.5	70.9	71.2	69.1	72.0	64.0	34.9	60.6	62.6
5-Feb-22	9:00:00 05-Feb-2209:00	69.2	28.9	3.2	78.6	75.0	75.5	71.0	73.4	64.0	36.0	62.0	64.6

5-Feb-22	9:30:00	05-Feb-22	09:30	69.2	28.9	3.2	78.9	75.1	75.7	71.0	73.0	64.0	36.0	62.6	65.0
5-Feb-22	10:00:00	05-Feb-22	10:00	69.4	28.9	3.2	78.5	75.3	76.0	70.8	73.0	64.0	36.3	62.6	64.7
5-Feb-22	10:30:00	05-Feb-22	10:30	69.6	29.0	3.2	78.6	75.8	76.0	71.5	74.0	64.0	37.0	62.8	65.0
5-Feb-22	11:00:00	05-Feb-22	11:00	69.6	29.9	3.2	79.0	75.7	76.0	71.7	74.0	64.0	37.0	62.9	65.0
5-Feb-22	11:30:00	05-Feb-22	11:30	69.6	29.9	3.2	79.3	75.7	76.3	72.3	74.0	64.0	37.0	62.8	65.3
5-Feb-22	12:00:00	05-Feb-22	12:00	69.6	29.9	3.2	79.4	76.0	76.7	72.0	74.0	64.0	37.0	63.0	65.8
5-Feb-22	12:30:00	05-Feb-22	12:30	69.6	29.9	3.2	79.8	76.0	76.8	72.0	74.3	64.0	37.0	63.3	65.4
5-Feb-22	13:00:00	05-Feb-22	13:00	62.2	29.1	3.2	78.7	71.6	71.5	70.2	71.9	64.0	36.2	61.9	64.1
5-Feb-22	13:30:00	05-Feb-22	13:30	61.2	28.9	3.2	72.5	69.3	69.6	69.0	71.0	64.0	35.3	61.0	63.0
5-Feb-22	14:00:00	05-Feb-22	14:00	61.2	28.9	3.2	72.0	69.0	69.0	69.0	70.7	64.0	35.0	60.8	63.0
5-Feb-22	14:30:00	05-Feb-22	14:30	61.2	28.9	3.2	72.0	68.0	69.0	69.0	70.0	64.0	35.0	60.0	63.0
5-Feb-22	15:00:00	05-Feb-22	15:00	61.2	28.0	3.2	72.0	68.6	69.0	68.8	70.0	64.0	34.4	60.0	62.4
5-Feb-22	15:30:00	05-Feb-22	15:30	62.4	28.0	3.2	72.2	68.4	68.9	68.6	70.4	64.0	34.5	60.0	62.0
5-Feb-22	16:00:00	05-Feb-22	16:00	69.2	28.9	3.2	78.4	75.0	75.4	71.0	73.4	64.0	36.6	61.9	63.7
5-Feb-22	16:30:00	05-Feb-22	16:30	69.2	28.9	3.2	79.0	75.5	76.0	71.0	73.0	64.0	36.0	62.0	65.0
5-Feb-22	17:00:00	05-Feb-22	17:00	69.2	27.9	3.2	78.0	75.0	75.6	71.0	73.5	64.0	36.0	62.0	64.7
5-Feb-22	17:30:00	05-Feb-22	17:30	69.2	27.9	3.2	78.8	75.0	75.5	71.0	73.0	64.0	36.0	62.0	65.0
5-Feb-22	18:00:00	05-Feb-22	18:00	69.2	27.9	3.2	79.0	75.0	75.6	71.0	73.0	64.0	36.1	62.0	65.0
5-Feb-22	18:30:00	05-Feb-22	18:30	69.2	27.9	3.2	78.8	75.0	75.0	71.0	73.0	64.0	36.2	62.1	65.0
5-Feb-22	19:00:00	05-Feb-22	19:00	69.2	28.3	3.2	78.9	75.3	75.3	71.0	73.4	64.0	36.7	62.7	65.0
5-Feb-22	19:30:00	05-Feb-22	19:30	69.2	29.4	3.2	79.0	75.7	76.0	71.0	74.0	64.0	36.7	62.4	65.0
5-Feb-22	20:00:00	05-Feb-22	20:00	69.2	29.9	3.2	79.0	75.7	76.0	71.0	74.0	64.0	37.0	62.8	65.0
5-Feb-22	20:30:00	05-Feb-22	20:30	69.2	29.9	3.2	79.0	76.0	76.1	71.1	74.0	64.0	37.0	63.0	65.0
5-Feb-22	21:00:00	05-Feb-22	21:00	67.2	29.8	3.2	79.5	76.2	76.7	72.0	74.0	64.0	37.0	62.2	65.2
5-Feb-22	21:30:00	05-Feb-22	21:30	60.9	28.9	3.2	73.3	72.2	70.2	69.8	71.8	64.0	35.8	60.6	64.0
5-Feb-22	22:00:00	05-Feb-22	22:00	60.9	28.9	3.2	73.0	69.4	70.0	69.0	71.0	64.0	35.0	61.0	63.1
5-Feb-22	22:30:00	05-Feb-22	22:30	60.9	28.9	3.2	72.1	69.1	69.4	69.0	70.6	64.0	35.0	61.0	63.0
5-Feb-22	23:00:00	05-Feb-22	23:00	60.9	28.9	3.2	72.0	69.0	69.2	69.0	70.0	64.0	35.0	60.4	63.0
5-Feb-22	23:30:00	05-Feb-22	23:30	60.9	28.9	3.2	72.0	69.0	69.0	69.0	70.0	64.0	35.0	60.4	63.0
6-Feb-22	0:00:00	06-Feb-22	00:00	60.9	28.0	3.2	72.0	68.3	68.7	68.0	70.0	64.0	34.2	60.1	62.2
6-Feb-22	0:30:00	06-Feb-22	00:30	60.9	27.9	3.2	72.0	68.6	68.7	68.0	70.0	64.0	34.0	60.0	62.0
6-Feb-22	1:00:00	06-Feb-22	01:00	60.9	27.9	3.2	71.7	68.0	69.0	68.0	70.0	64.0	34.0	60.0	62.0
6-Feb-22	1:30:00	06-Feb-22	01:30	68.2	28.7	3.2	80.8	77.3	73.5	71.6	71.9	64.0	35.3	61.5	63.1
6-Feb-22	2:00:00	06-Feb-22	02:00	68.9	28.9	3.2	79.0	76.0	76.4	71.0	73.7	64.0	36.0	62.0	65.0
6-Feb-22	2:30:00	06-Feb-22	02:30	68.9	28.9	3.2	79.2	76.2	76.4	71.5	74.0	64.0	36.9	63.0	65.0
6-Feb-22	3:00:00	06-Feb-22	03:00	70.9	29.8	3.2	80.0	77.0	77.3	72.0	74.4	64.0	37.0	63.0	65.4
6-Feb-22	3:30:00	06-Feb-22	03:30	70.9	29.9	3.2	80.0	76.8	77.6	72.0	74.8	64.0	36.7	63.2	65.4
6-Feb-22	4:00:00	06-Feb-22	04:00	70.9	29.9	3.2	79.4	76.0	76.4	71.4	74.0	64.0	36.0	62.0	65.0
6-Feb-22	4:30:00	06-Feb-22	04:30	70.9	29.9	3.2	79.7	76.4	76.7	72.0	74.0	64.0	36.5	62.0	65.0
6-Feb-22	5:00:00	06-Feb-22	05:00	70.9	29.9	3.2	80.0	76.4	77.0	72.0	74.0	64.0	37.0	62.0	65.0
6-Feb-22	5:30:00	06-Feb-22	05:30	70.9	29.9	3.2	80.0	77.0	77.0	72.0	74.3	64.0	37.0	62.3	65.0
6-Feb-22	6:00:00	06-Feb-22	06:00	70.9	29.9	3.2	80.0	77.0	77.0	72.0	74.0	64.0	37.0	63.0	65.3
6-Feb-22	6:30:00	06-Feb-22	06:30	65.2	30.2	3.2	78.0	76.9	75.0	72.0	74.7	64.0	36.9	62.7	65.4

6-Feb-22	7:00:00 06-Feb-2207:00	61.8	29.9	3.2	73.0	70.0	70.3	70.0	72.0	64.0	36.0	62.0	64.0
6-Feb-22	7:30:00 06-Feb-2207:30	61.8	29.7	3.2	73.0	69.7	70.3	70.0	71.1	64.0	36.0	61.8	63.9
6-Feb-22	8:00:00 06-Feb-2208:00	61.8	28.9	3.2	73.0	69.4	69.3	69.6	71.0	64.0	35.8	61.0	63.0
6-Feb-22	8:30:00 06-Feb-2208:30	61.8	28.9	3.2	72.2	69.2	69.0	69.0	70.7	64.0	35.0	61.0	63.0
6-Feb-22	9:00:00 06-Feb-2209:00	61.5	28.9	3.2	72.0	69.0	69.0	69.0	70.3	64.0	35.0	61.0	63.0
6-Feb-22	9:30:00 06-Feb-2209:30	59.8	28.3	3.2	72.0	68.2	68.5	69.0	70.0	64.0	35.0	60.9	63.0
6-Feb-22	10:00:00 06-Feb-2210:00	64.8	28.4	3.2	73.9	70.5	70.6	69.1	70.4	64.0	34.9	60.6	64.1
6-Feb-22	10:30:00 06-Feb-2210:30	69.2	28.9	3.2	78.5	75.0	75.0	71.0	73.0	64.0	36.0	62.0	65.1
6-Feb-22	11:00:00 06-Feb-2211:00	69.2	28.9	3.2	79.0	75.0	75.0	71.0	73.6	64.0	36.0	62.3	65.0
6-Feb-22	11:30:00 06-Feb-2211:30	69.2	28.9	3.2	79.0	75.2	75.0	71.0	73.8	64.0	36.8	63.0	65.0
6-Feb-22	12:00:00 06-Feb-2212:00	69.2	29.0	3.2	79.0	76.0	75.9	71.3	74.0	64.0	37.0	63.0	65.0
6-Feb-22	12:30:00 06-Feb-2212:30	69.2	29.9	3.2	79.0	76.0	76.0	72.0	74.0	64.0	37.0	63.0	65.0
6-Feb-22	13:00:00 06-Feb-2213:00	69.2	29.9	3.2	79.0	76.0	76.0	72.0	74.0	64.0	37.0	63.0	65.7
6-Feb-22	13:30:00 06-Feb-2213:30	68.4	29.9	3.2	79.7	76.1	76.1	72.0	74.0	64.0	37.2	63.3	66.0
6-Feb-22	14:00:00 06-Feb-2214:00	60.9	28.9	3.2	74.5	71.6	71.5	70.5	71.5	64.0	36.3	61.4	64.8
6-Feb-22	14:30:00 06-Feb-2214:30	60.8	28.9	3.2	72.4	69.1	69.7	69.1	71.0	64.0	35.9	61.2	63.3
6-Feb-22	15:00:00 06-Feb-2215:00	60.8	28.9	3.2	72.0	69.0	69.0	69.0	70.5	64.0	35.0	60.9	63.0
6-Feb-22	15:30:00 06-Feb-2215:30	60.8	28.9	3.2	72.0	68.7	69.0	69.0	70.0	64.0	35.0	60.3	63.0
6-Feb-22	16:00:00 06-Feb-2216:00	60.8	28.1	3.2	71.7	68.3	68.0	68.6	70.0	64.0	34.2	60.0	62.5
6-Feb-22	16:30:00 06-Feb-2216:30	60.8	28.0	3.2	71.5	68.3	68.6	68.0	70.0	64.0	34.3	60.0	62.0
6-Feb-22	17:00:00 06-Feb-2217:00	62.6	28.0	3.2	71.6	68.5	68.6	68.1	70.4	64.0	34.0	60.0	62.0
6-Feb-22	17:30:00 06-Feb-2217:30	69.2	28.0	3.2	78.0	74.5	75.0	70.0	73.4	64.0	35.7	62.0	63.8
6-Feb-22	18:00:00 06-Feb-2218:00	69.2	28.0	3.2	77.4	73.4	74.4	70.0	72.3	64.0	36.0	62.0	64.0
6-Feb-22	18:30:00 06-Feb-2218:30	69.2	28.0	3.2	78.0	74.1	74.7	70.0	72.5	64.0	36.0	61.4	64.0
6-Feb-22	19:00:00 06-Feb-2219:00	69.2	28.7	3.2	78.0	74.4	74.4	70.0	73.0	64.0	36.0	61.8	64.0
6-Feb-22	19:30:00 06-Feb-2219:30	69.2	28.9	3.2	78.0	75.0	75.0	70.1	73.0	64.0	36.0	62.0	64.0
6-Feb-22	20:00:00 06-Feb-2220:00	69.2	28.9	3.2	78.0	75.0	75.0	70.2	73.0	64.0	36.0	62.0	64.0
6-Feb-22	20:30:00 06-Feb-2220:30	69.2	28.9	3.2	78.0	75.0	75.6	70.6	73.0	64.0	36.0	62.0	64.1
6-Feb-22	21:00:00 06-Feb-2221:00	69.2	28.9	3.2	78.7	75.0	75.4	71.0	73.2	64.0	36.3	62.3	65.0
6-Feb-22	21:30:00 06-Feb-2221:30	69.2	29.4	3.2	79.0	75.8	76.0	71.0	74.0	64.0	36.9	63.0	65.0
6-Feb-22	22:00:00 06-Feb-2222:00	69.2	29.9	3.2	79.0	76.0	76.1	71.6	74.0	64.0	37.0	63.0	65.0
6-Feb-22	22:30:00 06-Feb-2222:30	69.2	29.9	3.2	79.6	76.3	76.8	71.8	74.0	64.0	37.0	63.0	65.0
6-Feb-22	23:00:00 06-Feb-2223:00	69.2	29.4	3.2	79.3	76.3	76.3	72.0	74.0	64.0	37.0	63.0	65.5
6-Feb-22	23:30:00 06-Feb-2223:30	62.9	27.6	3.2	76.7	72.9	73.1	71.7	72.4	64.0	36.4	62.5	64.7
7-Feb-22	0:00:00 07-Feb-2200:00	60.6	26.9	3.2	72.4	69.1	69.1	69.1	70.4	64.0	35.0	61.0	63.3
7-Feb-22	0:30:00 07-Feb-2200:30	60.6	26.9	3.2	72.0	69.0	69.3	69.0	70.2	64.0	35.0	61.0	63.0
7-Feb-22	1:00:00 07-Feb-2201:00	60.6	27.4	3.2	72.0	69.0	69.3	69.0	70.0	64.0	35.0	61.0	63.0
7-Feb-22	1:30:00 07-Feb-2201:30	60.6	27.9	3.2	72.0	69.0	69.1	69.0	70.0	64.0	35.0	61.0	63.0
7-Feb-22	2:00:00 07-Feb-2202:00	60.6	27.9	3.2	72.0	69.0	69.8	69.0	70.0	64.0	35.0	60.8	63.0
7-Feb-22	2:30:00 07-Feb-2202:30	60.6	27.9	3.2	72.0	69.0	69.9	69.0	70.0	64.0	35.0	60.9	63.0
7-Feb-22	3:00:00 07-Feb-2203:00	60.6	27.9	3.2	72.0	68.8	69.7	68.8	70.0	64.0	35.0	60.9	63.0
7-Feb-22	3:30:00 07-Feb-2203:30	67.5	28.5	3.2	74.2	73.4	74.4	70.7	73.6	64.0	36.7	61.9	63.8
7-Feb-22	4:00:00 07-Feb-2204:00	69.7	28.8	3.2	79.0	76.1	76.3	71.1	73.4	64.0	36.2	62.1	65.0

7-Feb-22	4:30:00 07-Feb-2204:30	69.7	28.8	3.2	79.0	76.2	76.6	71.2	73.7	64.0	36.6	63.0	65.0
7-Feb-22	5:00:00 07-Feb-2205:00	69.7	28.8	3.2	79.0	75.7	76.0	71.0	73.7	64.0	37.0	62.1	64.2
7-Feb-22	5:30:00 07-Feb-2205:30	69.7	28.8	3.2	78.5	75.2	75.7	70.4	73.2	64.0	36.4	62.0	64.3
7-Feb-22	6:00:00 07-Feb-2206:00	69.7	28.8	3.2	78.0	75.0	75.1	70.1	73.0	64.0	36.0	61.8	64.0
7-Feb-22	6:30:00 07-Feb-2206:30	69.7	28.8	3.2	78.1	75.3	75.6	70.3	73.0	64.0	36.0	61.0	64.0
7-Feb-22	7:00:00 07-Feb-2207:00	69.7	28.8	3.2	78.5	75.0	75.0	70.0	73.0	64.0	36.0	61.0	64.0
7-Feb-22	7:30:00 07-Feb-2207:30	69.7	28.8	3.2	78.0	75.0	75.0	70.0	73.0	64.0	36.0	61.0	64.0
7-Feb-22	8:00:00 07-Feb-2208:00	68.9	28.8	3.2	77.6	73.6	73.0	69.7	72.8	64.0	35.8	61.0	64.0
7-Feb-22	8:30:00 07-Feb-2208:30	67.7	28.8	3.2	77.5	73.5	72.4	70.0	72.9	64.0	35.6	61.0	64.0
7-Feb-22	9:00:00 07-Feb-2209:00	67.7	28.8	3.2	77.3	73.6	72.3	70.1	72.6	64.0	35.3	61.0	64.0
7-Feb-22	9:30:00 07-Feb-2209:30	68.5	28.8	3.2	77.0	72.5	71.3	70.0	72.8	64.0	35.3	60.7	64.0
7-Feb-22	10:00:00 07-Feb-2210:00	69.7	28.8	3.2	77.0	73.0	71.6	70.0	73.0	64.0	36.0	61.3	64.0
7-Feb-22	10:30:00 07-Feb-2210:30	68.4	28.8	3.2	77.6	71.0	67.4	70.0	72.7	64.0	35.7	61.0	64.0
7-Feb-22	11:00:00 07-Feb-2211:00	68.2	28.8	3.2	77.6	73.9	72.2	70.3	73.0	64.0	36.0	61.0	64.0
7-Feb-22	11:30:00 07-Feb-2211:30	68.2	28.8	3.2	77.7	73.7	72.4	70.0	72.7	64.0	36.0	61.0	64.0
7-Feb-22	12:00:00 07-Feb-2212:00	68.2	28.8	3.2	78.5	74.3	73.0	70.0	73.0	64.0	35.4	61.0	63.1
7-Feb-22	12:30:00 07-Feb-2212:30	68.2	28.8	3.2	78.4	74.0	73.0	70.3	73.0	64.0	35.9	61.0	63.9
7-Feb-22	13:00:00 07-Feb-2213:00	68.2	28.8	3.2	78.0	74.0	73.0	70.4	73.0	64.0	35.8	61.5	64.2
7-Feb-22	13:30:00 07-Feb-2213:30	68.2	29.2	3.4	78.2	74.7	73.7	71.0	73.0	64.0	37.0	63.0	65.0
7-Feb-22	14:00:00 07-Feb-2214:00	68.3	29.8	4.2	78.1	74.4	73.7	70.7	73.0	64.0	36.7	62.5	64.9
7-Feb-22	14:30:00 07-Feb-2214:30	68.7	29.8	4.2	78.1	75.0	74.0	71.0	73.2	64.0	36.7	62.9	65.3
7-Feb-22	15:00:00 07-Feb-2215:00	70.0	29.8	4.2	79.0	75.2	74.8	71.4	74.0	64.0	37.3	63.6	65.7
7-Feb-22	15:30:00 07-Feb-2215:30	61.3	29.0	4.2	74.6	71.7	70.9	70.3	71.3	64.0	35.6	60.5	64.3
7-Feb-22	16:00:00 07-Feb-2216:00	60.4	28.8	4.2	72.0	68.7	69.0	69.0	70.7	64.0	35.3	60.4	63.2
7-Feb-22	16:30:00 07-Feb-2216:30	60.8	28.8	4.2	72.0	68.7	69.3	69.0	70.1	64.0	34.1	60.7	62.4
7-Feb-22	17:00:00 07-Feb-2217:00	61.3	28.8	4.2	72.0	69.0	69.0	69.0	70.3	64.0	34.8	61.0	63.0
7-Feb-22	17:30:00 07-Feb-2217:30	60.4	28.0	4.2	71.8	68.2	68.5	68.2	70.0	64.0	34.3	60.0	62.4
7-Feb-22	18:00:00 07-Feb-2218:00	59.2	27.9	4.2	71.0	67.4	67.6	68.0	69.3	64.0	34.0	59.7	62.0
7-Feb-22	18:30:00 07-Feb-2218:30	60.4	27.7	4.2	70.5	67.0	67.3	67.6	69.0	64.0	33.8	59.3	61.4
7-Feb-22	19:00:00 07-Feb-2219:00	67.3	27.9	4.2	76.2	73.1	72.9	69.6	71.8	64.0	34.9	59.0	62.9
7-Feb-22	19:30:00 07-Feb-2219:30	67.3	27.9	4.2	77.0	74.0	73.9	69.7	72.1	64.0	35.0	60.8	63.2
7-Feb-22	20:00:00 07-Feb-2220:00	67.3	27.9	4.2	77.2	74.0	73.8	70.0	72.2	64.0	35.0	61.0	64.0
7-Feb-22	20:30:00 07-Feb-2220:30	67.3	27.9	4.2	78.0	74.6	74.0	70.0	72.7	64.0	35.4	61.3	64.0
7-Feb-22	21:00:00 07-Feb-2221:00	68.5	28.8	4.2	78.0	74.6	75.0	70.0	72.7	64.0	36.0	61.9	64.0
7-Feb-22	21:30:00 07-Feb-2221:30	69.3	28.8	4.2	78.0	74.8	75.0	70.8	73.0	64.0	36.0	62.0	64.4
7-Feb-22	22:00:00 07-Feb-2222:00	69.3	28.8	4.2	78.1	75.0	75.0	71.0	73.0	64.0	36.3	62.3	65.0
7-Feb-22	22:30:00 07-Feb-2222:30	69.3	28.8	4.2	79.0	75.5	75.8	71.0	73.6	64.0	36.6	62.6	65.0
7-Feb-22	23:00:00 07-Feb-2223:00	69.3	28.4	4.2	79.0	75.4	75.3	71.0	73.3	64.0	37.0	62.6	65.0
7-Feb-22	23:30:00 07-Feb-2223:30	69.3	27.9	4.2	79.0	75.2	75.5	71.2	73.8	64.0	37.0	63.0	65.0
8-Feb-22	0:00:00 08-Feb-2200:00	69.3	27.9	4.2	79.0	76.0	76.0	71.1	74.0	64.0	37.0	63.0	65.0
8-Feb-22	0:30:00 08-Feb-2200:30	69.3	27.9	4.2	79.0	76.0	76.0	71.2	74.0	64.0	37.0	63.0	65.0
8-Feb-22	1:00:00 08-Feb-2201:00	69.3	29.3	4.2	79.0	76.0	76.0	72.0	74.0	64.0	37.1	63.3	66.0
8-Feb-22	1:30:00 08-Feb-2201:30	60.3	29.2	4.2	76.9	71.6	71.5	70.6	71.6	64.0	36.4	62.3	64.3

8-Feb-22	2:00:00 08-Feb-2202:00	60.6	29.2	4.2	73.0	69.4	70.0	70.0	71.0	64.0	36.0	62.0	63.6
8-Feb-22	2:30:00 08-Feb-2202:30	60.6	29.2	4.2	73.0	69.0	69.7	69.6	71.0	64.0	35.8	61.1	63.5
8-Feb-22	3:00:00 08-Feb-2203:00	60.6	29.2	4.2	73.0	69.0	69.7	69.3	71.0	64.0	35.0	61.0	63.4
8-Feb-22	3:30:00 08-Feb-2203:30	60.6	29.2	4.2	72.9	69.3	69.4	69.3	71.0	64.0	35.0	61.0	63.0
8-Feb-22	4:00:00 08-Feb-2204:00	60.6	28.3	4.2	72.3	69.0	69.0	69.2	70.2	64.0	35.0	61.0	63.0
8-Feb-22	4:30:00 08-Feb-2204:30	60.6	28.2	4.2	72.0	69.0	68.6	69.0	70.0	64.0	35.0	60.7	62.3
8-Feb-22	5:00:00 08-Feb-2205:00	67.2	28.9	4.2	74.9	71.8	71.3	68.9	71.3	64.0	35.0	61.3	63.2
8-Feb-22	5:30:00 08-Feb-2205:30	69.0	29.2	4.2	78.0	74.4	74.7	70.0	72.4	64.0	35.0	60.7	63.3
8-Feb-22	6:00:00 08-Feb-2206:00	69.0	29.2	4.2	77.7	74.1	74.3	69.7	72.2	64.0	35.0	60.4	63.0
8-Feb-22	6:30:00 08-Feb-2206:30	69.0	29.2	4.2	77.7	74.2	74.0	69.8	72.0	64.0	35.0	60.6	63.0
8-Feb-22	7:00:00 08-Feb-2207:00	69.0	29.2	4.2	77.6	74.3	74.0	69.2	72.3	64.0	35.0	60.0	63.2
8-Feb-22	7:30:00 08-Feb-2207:30	69.0	29.2	4.2	77.5	74.3	74.3	69.0	72.5	64.0	35.0	60.0	63.3
8-Feb-22	8:00:00 08-Feb-2208:00	68.9	29.2	4.2	77.9	74.2	73.3	70.3	72.3	64.0	34.7	60.6	63.5
8-Feb-22	8:30:00 08-Feb-2208:30	69.0	29.2	4.2	77.5	73.1	72.8	69.7	72.5	64.0	35.0	60.7	63.4
8-Feb-22	9:00:00 08-Feb-2209:00	69.0	29.2	4.2	78.0	74.1	73.9	69.7	73.0	64.0	35.0	61.0	63.7
8-Feb-22	9:30:00 08-Feb-2209:30	69.0	29.2	4.2	77.7	74.7	74.4	69.4	73.0	64.0	35.2	61.0	64.0
8-Feb-22	10:00:00 08-Feb-2210:00	69.0	29.2	4.2	78.3	74.7	74.7	70.3	73.0	64.0	35.8	61.4	64.4
8-Feb-22	10:30:00 08-Feb-2210:30	69.0	29.2	4.2	78.7	75.0	75.1	71.0	73.0	64.0	36.7	62.7	65.0
8-Feb-22	11:00:00 08-Feb-2211:00	69.0	29.2	4.2	79.0	74.7	75.2	70.7	73.6	64.0	37.0	62.4	65.0
8-Feb-22	11:30:00 08-Feb-2211:30	69.0	29.2	4.2	79.0	75.0	75.0	71.0	73.9	64.0	37.0	63.0	65.0
8-Feb-22	12:00:00 08-Feb-2212:00	69.0	29.2	4.2	79.0	75.0	75.3	71.3	73.8	64.0	37.0	63.0	65.0
8-Feb-22	12:30:00 08-Feb-2212:30	69.0	29.2	4.2	79.0	75.6	75.0	71.3	74.0	64.0	37.0	63.0	65.0
8-Feb-22	13:00:00 08-Feb-2213:00	60.6	29.2	4.2	76.1	70.7	70.6	69.3	72.3	64.0	35.4	58.4	63.4
8-Feb-22	13:30:00 08-Feb-2213:30	60.6	29.2	4.2	72.0	69.0	69.0	68.7	70.1	64.0	35.0	59.5	63.0
8-Feb-22	14:00:00 08-Feb-2214:00	60.6	28.2	4.2	72.0	68.6	68.3	68.7	70.0	64.0	35.0	60.6	62.5
8-Feb-22	14:30:00 08-Feb-2214:30	60.6	28.2	4.2	71.4	68.0	68.3	68.0	70.0	64.0	34.4	60.3	62.3
8-Feb-22	15:00:00 08-Feb-2215:00	60.6	28.2	4.2	71.7	68.0	68.3	68.9	70.0	64.0	34.0	60.0	62.7
8-Feb-22	15:30:00 08-Feb-2215:30	60.6	28.2	4.2	72.0	68.3	68.0	68.6	70.0	64.0	34.0	60.0	62.2
8-Feb-22	16:00:00 08-Feb-2216:00	60.6	28.2	4.2	71.1	68.0	68.6	68.0	70.0	64.0	34.0	60.0	62.0
8-Feb-22	16:30:00 08-Feb-2216:30	60.6	27.9	4.2	71.6	68.0	68.4	68.0	69.3	64.0	34.0	60.0	62.0
8-Feb-22	17:00:00 08-Feb-2217:00	60.6	27.2	4.2	71.0	67.8	68.2	68.0	69.0	64.0	33.7	59.6	62.0
8-Feb-22	17:30:00 08-Feb-2217:30	59.0	27.2	4.2	71.0	67.0	68.0	67.1	69.0	64.0	33.3	59.0	61.3
8-Feb-22	18:00:00 08-Feb-2218:00	58.6	27.2	4.2	70.3	67.3	67.3	67.0	69.0	64.0	33.0	59.0	61.0
8-Feb-22	18:30:00 08-Feb-2218:30	67.6	27.2	4.2	75.8	71.6	72.6	68.7	69.5	64.0	34.0	60.4	62.4
8-Feb-22	19:00:00 08-Feb-2219:00	67.9	27.2	4.2	77.0	73.7	73.1	69.0	71.7	64.0	34.5	60.6	63.0
8-Feb-22	19:30:00 08-Feb-2219:30	67.9	27.2	4.2	77.0	74.0	74.0	69.0	71.4	64.0	34.9	60.4	63.0
8-Feb-22	20:00:00 08-Feb-2220:00	67.9	27.2	4.2	77.0	73.4	74.0	69.0	71.7	64.0	35.0	60.7	63.0
8-Feb-22	20:30:00 08-Feb-2220:30	67.9	27.2	4.2	77.0	74.0	74.2	69.0	72.0	64.0	35.0	61.0	63.0
8-Feb-22	21:00:00 08-Feb-2221:00	67.9	28.2	4.2	77.6	74.0	74.4	69.9	72.0	64.0	35.0	61.0	63.0
8-Feb-22	21:30:00 08-Feb-2221:30	67.9	28.2	4.2	78.0	75.0	74.7	70.0	72.3	64.0	35.3	61.4	63.6
8-Feb-22	22:00:00 08-Feb-2222:00	67.9	28.2	4.2	78.0	75.0	74.7	70.0	72.7	64.0	36.0	61.7	64.0
8-Feb-22	22:30:00 08-Feb-2222:30	67.9	28.3	4.2	78.2	75.0	75.2	70.4	73.0	64.0	36.0	62.0	64.0
8-Feb-22	23:00:00 08-Feb-2223:00	69.9	29.2	4.2	78.4	75.0	75.4	71.0	73.0	64.0	36.0	62.0	64.1

8-Feb-22	23:30:00	08-Feb-22	23:30	69.9	29.2	4.2	78.7	75.4	76.0	71.0	73.0	64.0	36.2	62.6	65.0

DUTY UT: UT STIEFERMANN
START: 1030

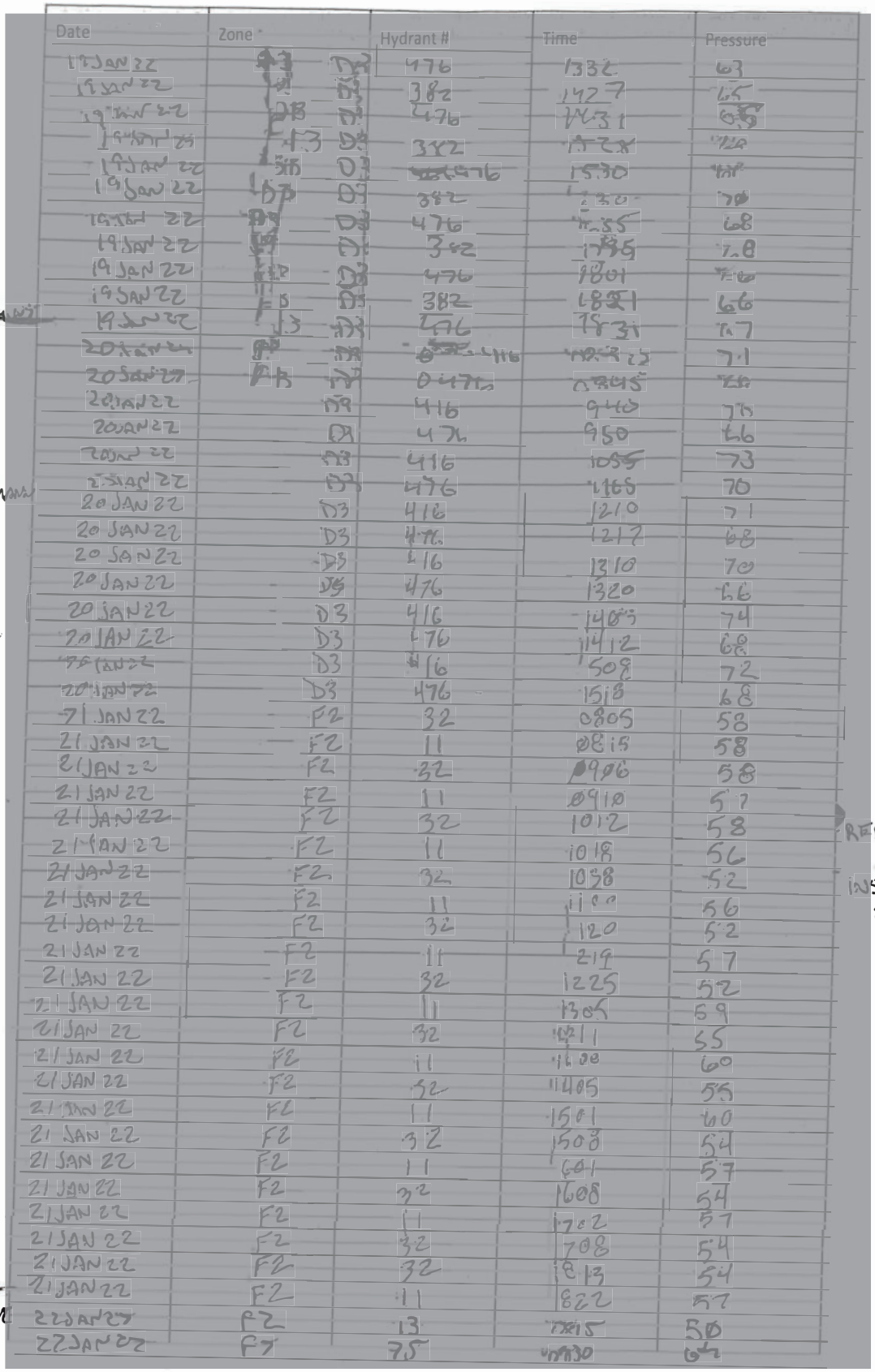
Date	Zone	Hydrant #	Time	Pressure
12 JAN 2022	A2	8-14	1030	70
12 JAN 2022	A2	7-11	1045	70
12 JAN 22	A2	8-14	1130	69
12 JAN 22	A2	7-11	1145	72
12 JAN 22	A2	8-14	1230	70
12 JAN 22	A2	7-11	1236	73
12 JAN 22	A2	8-14	1329	70
12 JAN 22	A2	7-11	1335	74
12 JAN 22	A2	8-14	1433	66
12 JAN 22	A2	7-11	1438	70
12 JAN 22	A2	8-14	1529	67
12 JAN 22	A2	7-11	1536	70
12 JAN 22	A2	8-14	1624	67
12 JAN 22	A2	7-11	1633	70
END OF DAY				
13 JAN 22	F1	21	1212	84
13 JAN 22	F1	FH 42	1230	78
13 JAN 22	F1	21	1318	40
13 JAN 22	F1	42	1323	42
13 JAN 22	F1	42	1415	50
13 JAN 22	F1	21	1422	46
13 JAN 22	F1	42	1456	42
13 JAN 22	F1	21	1502	44
13 JAN 22	F1	42	1605	60
13 JAN 22	F1	21	1621	66
13 JAN 22	F1	21	1707	72
14 JAN 22		42	1712	74
14 JAN 22	F1	42	0808	64
14 JAN 22	F1	6	0818	58
14 JAN 22	F1	6	0934	62
14 JAN 22	F1	42	0942	54
14 JAN 22	F1	6	1045	68
14 JAN 22	F1	42	1054	74
14 JAN 22	F1	6	1141	78
14 JAN 22	F1	42	1149	74
14 JAN 22	F1	6	1250	90
14 JAN 22	F1	42	1258	86
14 JAN 22	F1	6	1352	89
14 JAN 22	F1	42	1405	84
19 JAN 22	D3	382	0810	69
19 JAN 22	D3	476	0815	68
19 JAN 22	D3	382	0915	63
19 JAN 22	D3	476	0920	62
19 JAN 22	D3	382	1020	67
19 JAN 22	D3	476	1030	65
19 JAN 22	D3	382	1131	68
19 JAN 22	D3	476	1138	67
19 JAN 22	D3	382	1231	67
19 JAN 22	D3	476	1235	64
19 JAN 22	D3	382	1330	67

UTC NAIGAN

UT1 MARCS

UT1 RHW2

Enclosure (4)



Date	Zone	Hydrant #	Time	Pressure
19 JAN 22	D3	476	1332	63
19 JAN 22	D3	382	1427	65
19 JAN 22	D3	476	1431	65
19 JAN 22	D3	382	1528	72
19 JAN 22	D3	476	1530	70
19 JAN 22	D3	382	1730	70
19 JAN 22	D3	476	1735	68
19 JAN 22	D3	382	1755	70
19 JAN 22	D3	476	1801	70
19 JAN 22	D3	382	1821	66
19 JAN 22	D3	476	1831	67
20 JAN 22	D3	416	0825	71
20 JAN 22	D3	476	0845	72
20 JAN 22	D3	416	0940	70
20 JAN 22	D3	476	0950	66
20 JAN 22	D3	416	1055	73
20 JAN 22	D3	476	1105	70
20 JAN 22	D3	416	1210	71
20 JAN 22	D3	476	1217	68
20 JAN 22	D3	416	1310	70
20 JAN 22	D3	476	1320	66
20 JAN 22	D3	416	1405	74
20 JAN 22	D3	476	1412	68
20 JAN 22	D3	416	1508	72
20 JAN 22	D3	476	1518	68
21 JAN 22	F2	32	0805	58
21 JAN 22	F2	11	0815	58
21 JAN 22	F2	32	0906	58
21 JAN 22	F2	11	0910	57
21 JAN 22	F2	32	1012	58
21 JAN 22	F2	11	1018	56
21 JAN 22	F2	32	1058	52
21 JAN 22	F2	11	1100	56
21 JAN 22	F2	32	1120	52
21 JAN 22	F2	11	1219	57
21 JAN 22	F2	32	1225	52
21 JAN 22	F2	11	1305	59
21 JAN 22	F2	32	1411	55
21 JAN 22	F2	11	1408	60
21 JAN 22	F2	32	1405	55
21 JAN 22	F2	11	1501	60
21 JAN 22	F2	32	1508	54
21 JAN 22	F2	11	1601	57
21 JAN 22	F2	32	1608	54
21 JAN 22	F2	11	1702	57
21 JAN 22	F2	32	1708	54
21 JAN 22	F2	32	1813	54
21 JAN 22	F2	11	1822	57
22 JAN 22	F2	13	0815	50
22 JAN 22	F2	75	0830	64

Enclosure (4)

Date	Zone	Hydrant #	Time	Pressure	
22JAN22	DZ FZ	13	0925	51	
22JAN22	DZ FZ	25	0936	69	
22JAN22	DZ FZ	13	~~1030~~ 1080	49	
22JAN22	DZ FZ	25	~~1025~~ 1025	68	
22JAN22	DZ FZ	13	1130	46	
22JAN22	DZ FZ	25	1132	60	
22JAN22	DZ FZ	13	1228	47	
22JAN22	DZ FZ	25	1234	67	
22JAN22	DZ FZ	25	1335	64	
22JAN22	DZ FZ	13	1338	47	
22JAN22	FZ	25	1435	68	
22JAN22	FZ	13	1448	46	
22JAN22	FZ	25	1530	65	
22JAN22	FZ	13	1540	48	
22JAN22	FZ	25	~~1706~~ 1706	65	SECURED
22JAN22	FZ	13	1710	49	
23JAN22	FZ	17	0956	60	
~~23JAN22~~	~~FZ~~	~~25~~	~~0956~~		
23JAN22	FZ	17	1105	61	
23JAN22	FZ	17	1200	54	
23JAN22	FZ	17	1310	60	
23JAN22	FZ	17	1415	61	
23JAN22	FZ	17	1500	64	
23JAN22	FZ	17	1610	55	
23JAN22	FZ	17	1651	60	(SECURED)
VI STIEFERMANN 25JAN22	E1	906	0930	52	
25JAN22	E1	906	1030	52	RELOCATED
25JAN22	B1	2	1100	71	
25JAN22	B1	2	1200	71	
25JAN22	B1	2	1300	71	
25JAN22	B1	2	1400	72	
25JAN22	B1	2	1420	72	REMOVED

Enclosure (4)

Residential Sampling Report for Flushing Zone
B1 Zone Residential DW Sampling
Chemistry Results
Drinking Water Sampling, JBPHH, Oahu Hawaii

Location ID:					B1-BLDG0097	B1-BLDG0500	B1-BLDG0503	B1-BLDG0503	B1-BLDG0550	B1-HAPU2865A	B1-HEKA1153	B1-HEKA1153
Location Type:					Non-Residence	Non-Residence	Non-Residence	Non-Residence	Non-Residence	Residence	Residence	Residence
Residence:					Building 97,MARINA AREA RESTROOM, 57 Arizona Memorial Dr	Building 500,ARIZONA/BOWFIN MEMORIAL ENTERANCE, 1 Arizona Place	Building 503,ARIZONA MUSEUM/THEATER, 1 Arizona Place	Building 503,ARIZONA MUSEUM/THEATER, 1 Arizona Place	Building 550,USS BOWFIN MUSEUM, 11 Arizona Memorial Dr	2865A Hapue Loop	1153 Hekau Street	1153 Hekau Street
Field Sample ID:					220128B1AT08	220128B1AT06	220128B1AT04	220128B1AT05	220128B1AT07	220127B1BT04	220127B1BT01	220127B1BT02
Sample Date:					2022-01-28	2022-01-28	2022-01-28	2022-01-28	2022-01-28	2022-01-27	2022-01-27	2022-01-27
Sample Type:					N	N	N	FD	N	N	N	FD
GENCHEM (mg/L)	**Incident Specific Parameters**	**DOH Environmental Action Levels Table D-1A Groundwater Action Levels**	**DOH Safe Drinking Water Branch (SDWB) Regulatory Constituents**	**Environmental Protection Agency Maximum Contaminant Levels**	**SDG: C22A058**	**SDG: C22A058**	**SDG: C22A058**	**SDG: C22A058**	**SDG: C22A058**	**SDG: C22A053rev1**	**SDG: C22A053rev1**	**SDG: C22A053rev1**
Total Organic Carbon	2	None	None	None	0.200 UJ	**1.94 J**	**1.52 J**	**1.90 J**	0.200 UJ	0.200 U	0.200 U	0.200 U
HC (µg/L)	**Incident Specific Parameters**	**DOH Environmental Action Levels Table D-1A Groundwater Action Levels**	**DOH Safe Drinking Water Branch (SDWB) Regulatory Constituents**	**Environmental Protection Agency Maximum Contaminant Levels**	**SDG: DA41360**	**SDG: DA41360**	**SDG: DA41360**	**SDG: DA41360**	**SDG: DA41360**	**SDG: DA41342**	**SDG: DA41342**	**SDG: DA41342**
Petroleum Hydrocarbons (as Diesel)	200	400	None	None	190 U	190 U	190 U	190 U	190 U	190 U	190 U	190 U
Petroleum Hydrocarbons (as Gasoline)	200	300	None	None	40.0 U	40.0 U	40.0 U	40.0 U	40.0 U	40.0 U	40.0 U	40.0 U
Petroleum Hydrocarbons (as Motor Oil)	200	500	None	None	190 U	190 U	190 U	190 U	190 U	190 U	190 U	190 U
HG (µg/L)	**Incident Specific Parameters**	**DOH Environmental Action Levels Table D-1A Groundwater Action Levels**	**DOH Safe Drinking Water Branch (SDWB) Regulatory Constituents**	**Environmental Protection Agency Maximum Contaminant Levels**	**SDG: DA41360**	**SDG: DA41360**	**SDG: DA41360**	**SDG: DA41360**	**SDG: DA41360**	**SDG: DA41342**	**SDG: DA41342**	**SDG: DA41342**
Mercury	0.025	0.025	2	2	0.0250 U	0.0250 U	0.0250 U	0.0250 U	0.0250 U	0.0250 U	0.0250 U	0.0250 U
METAL (µg/L)	**Incident Specific Parameters**	**DOH Environmental Action Levels Table D-1A Groundwater Action Levels**	**DOH Safe Drinking Water Branch (SDWB) Regulatory Constituents**	**Environmental Protection Agency Maximum Contaminant Levels**	**SDG: DA41360**	**SDG: DA41360**	**SDG: DA41360**	**SDG: DA41360**	**SDG: DA41360**	**SDG: DA41342**	**SDG: DA41342**	**SDG: DA41342**
Antimony	6	6	6	6	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U
Arsenic	10	10	10	10	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U
Barium	220	220	2000	2000	**1.90 J**	**1.80 J**	**2.10**	**1.80 J**	**2.60**	**2.20**	**1.80 J**	**1.70 J**
Beryllium	0.66	0.66	4	4	0.150 U	0.150 U	0.150 U	0.150 U	0.150 U	0.150 U	0.150 U	0.150 U
Cadmium	3	3	5	5	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U
Chromium	11	11	100	100	**1.70 J**	**1.10 J**	**1.40 J**	**1.50 J**	**1.60 J**	**1.40 J**	**1.40 J**	**1.40 J**
Copper	2.9	2.9	1300	1300	**47.0**	**29.7**	**44.0**	**45.9**	**86.1**	**14.7**	**19.7**	**18.7**
Lead	15	5.6	15	15	**0.480 J**	**0.380 J**	**0.240 J**	**0.240 J**	**0.480 J**	**0.180 J**	0.130 U	**0.140 J**
Selenium	5	5	50	50	0.300 U	0.300 U	0.300 U	0.300 U	0.300 U	0.300 U	0.300 U	0.300 U
Thallium	2	2	2	2	0.0500 U	**0.0900 J**	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	**0.0920 J**
SVOC (µg/L)	**Incident Specific Parameters**	**DOH Environmental Action Levels Table D-1A Groundwater Action Levels**	**DOH Safe Drinking Water Branch (SDWB) Regulatory Constituents**	**Environmental Protection Agency Maximum Contaminant Levels**	**SDG: DA41360**	**SDG: DA41360**	**SDG: DA41360**	**SDG: DA41360**	**SDG: DA41360**	**SDG: DA41342**	**SDG: DA41342**	**SDG: DA41342**
1-Methylnaphthalene	2.1	10	None	None	0.240 UJ	0.240 UJ	0.240 UJ	0.240 U	0.240 UJ	0.240 U	0.240 U	0.240 U

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Section 2b.2 Residential Sampling Report for Flushing Zone

Location ID:					B1-HONU1077	B1-HONU1140	B1-HONU1191	B1-HONU1191	B1-KAEE2855B	B1-KAEE2855B	B1-KOKI2862A	B1-KOKI2862A
Location Type:					Residence	Residence	Residence	Residence	Residence	Residence	Residence	Residence
Residence:					1077 Honu Loop	1140 Honu Loop	1191 Honu Loop	1191 Honu Loop	2855B Kaee Loop	2855B Kaee Loop	2862A Kokio Loop	2862A Kokio Loop
Field Sample ID:					220127B1AT06	220127B1CT06	220127B1FT05	220129B1AT06	220127B1FT03	220129B1AT04	220127B1CT01	220127B1CT02
Sample Date:					2022-01-27	2022-01-27	2022-01-27	2022-01-29	2022-01-27	2022-01-29	2022-01-27	2022-01-27
Sample Type:					N	N	N	N (72 Hour Stagnation)	N	N (72 Hour Stagnation)	N	FD
GENCHEM (mg/L)	**Incident Specific Parameters**	**DOH Environmental Action Levels Table D-1A Groundwater Action Levels**	**DOH Safe Drinking Water Branch (SDWB) Regulatory Constituents**	**Environmental Protection Agency Maximum Contaminant Levels**	**SDG: C22A053rev1**	**SDG: C22A053rev1**	**SDG: C22A053rev1**	**SDG: C22A063rev2**	**SDG: C22A053rev1**	**SDG: C22A063rev2**	**SDG: C22A053rev1**	**SDG: C22A053rev1**
Total Organic Carbon	2	None	None	None	**1.62**	0.200 U	0.200 U	**1.78**	0.200 U	0.200 U	**1.83**	0.200 U
HC (µg/L)	**Incident Specific Parameters**	**DOH Environmental Action Levels Table D-1A Groundwater Action Levels**	**DOH Safe Drinking Water Branch (SDWB) Regulatory Constituents**	**Environmental Protection Agency Maximum Contaminant Levels**	**SDG: DA41342**	**SDG: DA41342**	**SDG: 5801097501**	**SDG: DA41377**	**SDG: 5801097501**	**SDG: DA41377**	**SDG: DA41342**	**SDG: DA41342**
Petroleum Hydrocarbons (as Diesel)	200	400	None	None	190 U	190 U	93.0 U	190 U	110 U	190 U	190 U	190 U
Petroleum Hydrocarbons (as Gasoline)	200	300	None	None	40.0 UJ	40.0 U	100 U	40.0 U	100 U	40.0 U	40.0 U	40.0 U
Petroleum Hydrocarbons (as Motor Oil)	200	500	None	None	190 U	190 U	190 U	190 U	210 U	190 U	190 U	190 U
HG (µg/L)	**Incident Specific Parameters**	**DOH Environmental Action Levels Table D-1A Groundwater Action Levels**	**DOH Safe Drinking Water Branch (SDWB) Regulatory Constituents**	**Environmental Protection Agency Maximum Contaminant Levels**	**SDG: DA41342**	**SDG: DA41342**	**SDG: 810133881**	**SDG: DA41377**	**SDG: 810133881**	**SDG: DA41377**	**SDG: DA41342**	**SDG: DA41342**
Mercury	0.025	0.025	2	2	0.0250 U	0.0250 U	0.0560 U	0.0250 U	0.0560 U	0.0250 U	0.0250 U	0.0250 U
METAL (µg/L)	**Incident Specific Parameters**	**DOH Environmental Action Levels Table D-1A Groundwater Action Levels**	**DOH Safe Drinking Water Branch (SDWB) Regulatory Constituents**	**Environmental Protection Agency Maximum Contaminant Levels**	**SDG: DA41342**	**SDG: DA41342**	**SDG: 810133881**	**SDG: DA41377**	**SDG: 810133881**	**SDG: DA41377**	**SDG: DA41342**	**SDG: DA41342**
Antimony	6	6	6	6	0.100 U	0.100 U	0.0570 U	0.100 U	0.0570 U	0.100 U	0.100 U	0.100 U
Arsenic	10	10	10	10	0.500 U	0.500 U	0.890 U	0.500 U	0.890 U	0.500 U	0.500 U	0.500 U
Barium	220	220	2000	2000	**1.80 J**	**1.80 J**	**2.00**	**1.80 J**	**2.00**	**2.10**	**2.20**	**2.20**
Beryllium	0.66	0.66	4	4	0.150 U	0.150 U	0.0830 U	0.150 U	0.0830 U	0.150 U	0.150 U	0.150 U
Cadmium	3	3	5	5	0.0500 U	0.0500 U	0.140 U	0.0500 UJ	0.140 U	0.0500 UJ	0.0500 U	0.0500 U
Chromium	11	11	100	100	**1.50 J**	**1.50 J**	**1.60**	**1.20 J**	**1.70**	**1.30 J**	**1.50 J**	**1.40 J**
Copper	2.9	2.9	1300	1300	**24.8**	**42.0**	**9.90**	**29.0**	**19.0**	**17.8**	**11.0**	**11.3**
Lead	15	5.6	15	15	**0.180 J**	**0.380 J**	**0.250 J**	**0.400 J**	**1.10**	**0.150 J**	**0.330 J**	**0.340 J**
Selenium	5	5	50	50	0.300 U	0.300 U	1.60 U	0.300 UJ	1.60 U	0.300 UJ	0.300 U	0.300 U
Thallium	2	2	2	2	0.0500 U	0.0500 U	0.160 U	0.0500 U	0.160 U	0.0500 U	**0.0560 J**	**0.0600 J**
SVOC (µg/L)	**Incident Specific Parameters**	**DOH Environmental Action Levels Table D-1A Groundwater Action Levels**	**DOH Safe Drinking Water Branch (SDWB) Regulatory Constituents**	**Environmental Protection Agency Maximum Contaminant Levels**	**SDG: DA41342**	**SDG: DA41342**	**SDG: 810133881**	**SDG: DA41377**	**SDG: 810133881**	**SDG: DA41377R**	**SDG: DA41342**	**SDG: DA41342**
1-Methylnaphthalene	2.1	10	None	None	0.240 U	0.240 U	0.0200 U	0.240 U	0.0200 U	0.240 U	0.240 U	0.240 U

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Location ID:					B1-KUPA2872A	B1-KUPA2872F	B1-MAKU2885B	B1-MAKU2885B	B1-MAKU2899D	B1-MCGR0371	B1-MCGR0500	B1-MCGR0553
Location Type:					Residence	Residence	Residence	Residence	Residence	Residence	Residence	Residence
Residence:					2872A Kupalii Loop	2872F Kupalii Loop	2885B Makuu Loop	2885B Makuu Loop	2899D Makuu Loop	371 McGrew Loop	500 McGrew Loop	553 McGrew Loop
Field Sample ID:					220127B1CT03	220127B1CT04	220127B1DT01	220127B1DT02	220127B1BT05	220127B1BT07	220127B1DT03	220127B1DT04
Sample Date:					2022-01-27	2022-01-27	2022-01-27	2022-01-27	2022-01-27	2022-01-27	2022-01-27	2022-01-27
Sample Type:					N	N	N	FD	N	N	N	N
GENCHEM (mg/L)	**Incident Specific Parameters**	**DOH Environmental Action Levels Table D-1A Groundwater Action Levels**	**DOH Safe Drinking Water Branch (SDWB) Regulatory Constituents**	**Environmental Protection Agency Maximum Contaminant Levels**	**SDG: C22A053rev1**	**SDG: C22A053rev1**	**SDG: C22A053rev1**	**SDG: C22A053rev1**	**SDG: C22A053rev1**	**SDG: C22A053rev1**	**SDG: C22A053rev1**	**SDG: C22A053rev1**
Total Organic Carbon	2	None	None	None	0.200 U	**2.63**	0.200 U	0.200 U	**1.58**	**2.60**	0.200 U	0.200 U
HC (µg/L)	**Incident Specific Parameters**	**DOH Environmental Action Levels Table D-1A Groundwater Action Levels**	**DOH Safe Drinking Water Branch (SDWB) Regulatory Constituents**	**Environmental Protection Agency Maximum Contaminant Levels**	**SDG: DA41342**	**SDG: DA41342**	**SDG: DA41342**	**SDG: DA41342**	**SDG: DA41342**	**SDG: DA41360**	**SDG: DA41342**	**SDG: DA41342**
Petroleum Hydrocarbons (as Diesel)	200	400	None	None	190 U	190 U	190 U	190 U	190 U	190 UJ	190 U	190 U
Petroleum Hydrocarbons (as Gasoline)	200	300	None	None	40.0 U	40.0 U	40.0 U	40.0 U	40.0 U	40.0 U	40.0 U	40.0 U
Petroleum Hydrocarbons (as Motor Oil)	200	500	None	None	190 U	190 U	190 U	190 U	190 U	190 UJ	190 U	190 U
HG (µg/L)	**Incident Specific Parameters**	**DOH Environmental Action Levels Table D-1A Groundwater Action Levels**	**DOH Safe Drinking Water Branch (SDWB) Regulatory Constituents**	**Environmental Protection Agency Maximum Contaminant Levels**	**SDG: DA41342**	**SDG: DA41342**	**SDG: DA41342**	**SDG: DA41342**	**SDG: DA41342**	**SDG: DA41360**	**SDG: DA41342**	**SDG: DA41342**
Mercury	0.025	0.025	2	2	0.0250 U	0.0250 U	0.0250 U	0.0250 U	0.0250 U	0.0250 U	0.0250 U	0.0250 U
METAL (µg/L)	**Incident Specific Parameters**	**DOH Environmental Action Levels Table D-1A Groundwater Action Levels**	**DOH Safe Drinking Water Branch (SDWB) Regulatory Constituents**	**Environmental Protection Agency Maximum Contaminant Levels**	**SDG: DA41342**	**SDG: DA41342**	**SDG: DA41342**	**SDG: DA41342**	**SDG: DA41342**	**SDG: DA41360**	**SDG: DA41342**	**SDG: DA41342**
Antimony	6	6	6	6	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U
Arsenic	10	10	10	10	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U
Barium	220	220	2000	2000	**2.20**	**2.40**	**1.90 J**	**2.00**	**2.20**	**1.80 J**	**1.80 J**	**1.80 J**
Beryllium	0.66	0.66	4	4	0.150 U	0.150 U	0.150 U	0.150 U	0.150 U	0.150 U	0.150 U	0.150 U
Cadmium	3	3	5	5	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U
Chromium	11	11	100	100	**1.40 J**	**1.50 J**	**1.30 J**	**1.40 J**	**1.50 J**	**1.60 J**	**1.40 J**	**1.50 J**
Copper	2.9	2.9	1300	1300	**19.4**	**26.2**	**61.1**	**22.6**	**28.9**	**22.1**	**9.00**	**3.50**
Lead	15	5.6	15	15	**0.370 J**	**1.20**	0.130 U	0.130 U	**0.230 J**	**1.50**	**0.260 J**	0.130 U
Selenium	5	5	50	50	0.300 U	0.300 U	0.300 U	0.300 U	0.300 U	0.300 U	0.300 U	0.300 U
Thallium	2	2	2	2	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U
SVOC (µg/L)	**Incident Specific Parameters**	**DOH Environmental Action Levels Table D-1A Groundwater Action Levels**	**DOH Safe Drinking Water Branch (SDWB) Regulatory Constituents**	**Environmental Protection Agency Maximum Contaminant Levels**	**SDG: DA41342**	**SDG: DA41342**	**SDG: DA41342**	**SDG: DA41342**	**SDG: DA41342**	**SDG: DA41360**	**SDG: DA41342**	**SDG: DA41342**
1-Methylnaphthalene	2.1	10	None	None	0.240 U	0.240 U	0.240 U	0.240 U	0.240 U	0.240 UJ	0.240 U	0.240 U

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Location ID:					B1-MCGR0593	B1-MCGR0628	B1-MCGR0660	B1-MCGR0730	B1-MCGR0730	B1-MCGR0799	B1-MCGR0838	B1-MCGR0873
Location Type:					Residence	Residence	Residence	Residence	Residence	Residence	Residence	Residence
Residence:					593 McGrew Point	628 McGrew Loop	660 McGrew Loop	730 McGrew Loop	730 McGrew Loop	799 McGrew Loop	838 McGrew Loop	873 McGrew Loop
Field Sample ID:					220127B1DT06	220127B1DT05	220127B1AT07	220127B1AT04	220127B1AT05	220127B1CT05	220127B1AT08	220127B1AT09
Sample Date:					2022-01-27	2022-01-27	2022-01-27	2022-01-27	2022-01-27	2022-01-27	2022-01-27	2022-01-27
Sample Type:					N	N	N	N	FD	N	N	N
GENCHEM (mg/L)	**Incident Specific Parameters**	**DOH Environmental Action Levels Table D-1A Groundwater Action Levels**	**DOH Safe Drinking Water Branch (SDWB) Regulatory Constituents**	**Environmental Protection Agency Maximum Contaminant Levels**	**SDG: C22A053rev1**	**SDG: C22A053rev1**	**SDG: C22A053rev1**	**SDG: C22A053rev1**	**SDG: C22A053rev1**	**SDG: C22A053rev1**	**SDG: C22A053rev1**	**SDG: C22A053rev1**
Total Organic Carbon	2	None	None	None	0.200 U	**1.99**	0.200 U	0.200 U	**1.60**	**1.71**	**1.84**	0.200 U
HC (µg/L)	**Incident Specific Parameters**	**DOH Environmental Action Levels Table D-1A Groundwater Action Levels**	**DOH Safe Drinking Water Branch (SDWB) Regulatory Constituents**	**Environmental Protection Agency Maximum Contaminant Levels**	**SDG: DA41342**	**SDG: DA41342**	**SDG: DA41342**	**SDG: DA41342**	**SDG: DA41342**	**SDG: DA41342**	**SDG: DA41342**	**SDG: DA41342**
Petroleum Hydrocarbons (as Diesel)	200	400	None	None	190 U	190 U	190 U	190 U	190 U	190 U	190 U	190 U
Petroleum Hydrocarbons (as Gasoline)	200	300	None	None	40.0 U	40.0 U	40.0 U	40.0 U	40.0 U	40.0 U	40.0 U	40.0 U
Petroleum Hydrocarbons (as Motor Oil)	200	500	None	None	190 U	190 U	190 U	190 U	190 U	190 U	190 U	190 U
HG (µg/L)	**Incident Specific Parameters**	**DOH Environmental Action Levels Table D-1A Groundwater Action Levels**	**DOH Safe Drinking Water Branch (SDWB) Regulatory Constituents**	**Environmental Protection Agency Maximum Contaminant Levels**	**SDG: DA41342**	**SDG: DA41342**	**SDG: DA41342**	**SDG: DA41342**	**SDG: DA41342**	**SDG: DA41342**	**SDG: DA41342**	**SDG: DA41342**
Mercury	0.025	0.025	2	2	0.0250 U	0.0250 U	0.0250 U	0.0250 U	0.160 U	0.0250 U	0.0250 U	0.0250 U
METAL (µg/L)	**Incident Specific Parameters**	**DOH Environmental Action Levels Table D-1A Groundwater Action Levels**	**DOH Safe Drinking Water Branch (SDWB) Regulatory Constituents**	**Environmental Protection Agency Maximum Contaminant Levels**	**SDG: DA41342**	**SDG: DA41342**	**SDG: DA41342**	**SDG: DA41342**	**SDG: DA41342**	**SDG: DA41342**	**SDG: DA41342**	**SDG: DA41342**
Antimony	6	6	6	6	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U
Arsenic	10	10	10	10	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.510 U
Barium	220	220	2000	2000	**1.80 J**	**1.90 J**	**1.80 J**	**1.70 J**	**1.80 J**	**1.90 J**	**1.80 J**	**1.80 J**
Beryllium	0.66	0.66	4	4	0.150 U	0.150 U	0.150 U	0.150 U	0.150 U	0.150 U	0.150 U	0.150 U
Cadmium	3	3	5	5	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0510 U
Chromium	11	11	100	100	**1.60 J**	**1.40 J**	**1.50 J**	**1.30 J**	**1.40 J**	**1.50 J**	**1.50 J**	**1.40 J**
Copper	2.9	2.9	1300	1300	**5.30**	**17.5**	**17.2**	**6.10**	**7.30**	**7.40**	**30.2**	**6.60**
Lead	15	5.6	15	15	**1.50**	**0.200 J**	0.130 U	**0.140 J**	**0.340 J**	**0.330 J**	**0.220 J**	0.130 U
Selenium	5	5	50	50	0.300 U	0.300 U	0.300 U	0.300 U	0.300 U	0.300 U	0.300 U	0.310 U
Thallium	2	2	2	2	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0510 U
SVOC (µg/L)	**Incident Specific Parameters**	**DOH Environmental Action Levels Table D-1A Groundwater Action Levels**	**DOH Safe Drinking Water Branch (SDWB) Regulatory Constituents**	**Environmental Protection Agency Maximum Contaminant Levels**	**SDG: DA41342**	**SDG: DA41342**	**SDG: DA41342**	**SDG: DA41342**	**SDG: DA41342**	**SDG: DA41342**	**SDG: DA41342**	**SDG: DA41342**
1-Methylnaphthalene	2.1	10	None	None	0.240 U	0.240 U	0.240 U	0.240 U	0.240 U	0.240 U	0.240 U	0.240 U

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B1 Zone Residential DW Sampling
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Location ID:	B1-OLIA2919A	B1-OLIA2919A	B1-OLIA2927
Location Type:	Residence	Residence	Residence
Residence:	2919A Oliana Loop	2919A Oliana Loop	2927 Oliana Loop
Field Sample ID:	220127B1FT04	220129B1AT05	220127B1BT06
Sample Date:	2022-01-27	2022-01-29	2022-01-27
Sample Type:	N	N (72 Hour Stagnation)	N

GENCHEM (mg/L)	Incident Specific Parameters	DOH Environmental Action Levels Table D-1A Groundwater Action Levels	DOH Safe Drinking Water Branch (SDWB) Regulatory Constituents	Environmental Protection Agency Maximum Contaminant Levels	SDG: C22A053rev1	SDG: C22A063rev2	SDG: C22A053rev1
Total Organic Carbon	2	None	None	None	0.200 U	**1.74**	0.200 U

HC (µg/L)	Incident Specific Parameters	DOH Environmental Action Levels Table D-1A Groundwater Action Levels	DOH Safe Drinking Water Branch (SDWB) Regulatory Constituents	Environmental Protection Agency Maximum Contaminant Levels	SDG: 5801097501	SDG: DA41377	SDG: DA41360
Petroleum Hydrocarbons (as Diesel)	200	400	None	None	92.0 U	190 U	190 U
Petroleum Hydrocarbons (as Gasoline)	200	300	None	None	100 U	40.0 U	40.0 U
Petroleum Hydrocarbons (as Motor Oil)	200	500	None	None	180 U	190 U	190 U

HG (µg/L)	Incident Specific Parameters	DOH Environmental Action Levels Table D-1A Groundwater Action Levels	DOH Safe Drinking Water Branch (SDWB) Regulatory Constituents	Environmental Protection Agency Maximum Contaminant Levels	SDG: 810133881	SDG: DA41377	SDG: DA41360
Mercury	0.025	0.025	2	2	0.0560 U	0.0250 U	0.0250 U

METAL (µg/L)	Incident Specific Parameters	DOH Environmental Action Levels Table D-1A Groundwater Action Levels	DOH Safe Drinking Water Branch (SDWB) Regulatory Constituents	Environmental Protection Agency Maximum Contaminant Levels	SDG: 810133881	SDG: DA41377	SDG: DA41360
Antimony	6	6	6	6	0.0570 U	0.100 U	0.100 U
Arsenic	10	10	10	10	0.890 U	0.510 U	0.500 U
Barium	220	220	2000	2000	**2.30**	**2.40**	**2.30**
Beryllium	0.66	0.66	4	4	0.0830 U	0.150 U	0.150 U
Cadmium	3	3	5	5	0.140 U	0.0510 UJ	0.0500 U
Chromium	11	11	100	100	**1.70**	**1.30 J**	**1.50 J**
Copper	2.9	2.9	1300	1300	**17.0**	**18.0**	**8.60**
Lead	15	5.6	15	15	**0.270 J**	**0.290 J**	**0.230 J**
Selenium	5	5	50	50	1.60 U	0.310 UJ	0.300 U
Thallium	2	2	2	2	0.160 U	0.0510 U	0.0500 U

SVOC (µg/L)	Incident Specific Parameters	DOH Environmental Action Levels Table D-1A Groundwater Action Levels	DOH Safe Drinking Water Branch (SDWB) Regulatory Constituents	Environmental Protection Agency Maximum Contaminant Levels	SDG: 810133881	SDG: DA41377	SDG: DA41360
1-Methylnaphthalene	2.1	10	None	None	0.0200 U	0.240 U	0.240 UJ

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B1 Zone Residential DW Sampling
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Location ID:					B1-BLDG0097	B1-BLDG0500	B1-BLDG0503	B1-BLDG0503	B1-BLDG0550	B1-HAPU2865A	B1-HEKA1153	B1-HEKA1153
Location Type:					Non-Residence	Non-Residence	Non-Residence	Non-Residence	Non-Residence	Residence	Residence	Residence
Residence:					Building 97,MARINA AREA RESTROOM, 57 Arizona Memorial Dr	Building 500,ARIZONA/BOWFIN MEMORIAL ENTERANCE, 1 Arizona Place	Building 503,ARIZONA MUSEUM/THEATER, 1 Arizona Place	Building 503,ARIZONA MUSEUM/THEATER, 1 Arizona Place	Building 550,USS BOWFIN MUSEUM, 11 Arizona Memorial Dr	2865A Hapue Loop	1153 Hekau Street	1153 Hekau Street
Field Sample ID:					220128B1AT08	220128B1AT06	220128B1AT04	220128B1AT05	220128B1AT07	220127B1BT04	220127B1BT01	220127B1BT02
Sample Date:					2022-01-28	2022-01-28	2022-01-28	2022-01-28	2022-01-28	2022-01-27	2022-01-27	2022-01-27
Sample Type:					N	N	N	FD	N	N	N	FD
SVOC (µg/L)	**Incident Specific Parameters**	**DOH Environmental Action Levels Table D-1A Groundwater Action Levels**	**DOH Safe Drinking Water Branch (SDWB) Regulatory Constituents**	**Environmental Protection Agency Maximum Contaminant Levels**	**SDG: DA41360**	**SDG: DA41360**	**SDG: DA41360**	**SDG: DA41360**	**SDG: DA41360**	**SDG: DA41342**	**SDG: DA41342**	**SDG: DA41342**
2-Methylnaphthalene	4.7	10	None	None	0.240 UJ	0.240 UJ	0.240 UJ	0.240 U	0.240 UJ	0.240 U	0.240 U	0.240 U
Benzo(a)pyrene	0.06	0.06	0.2	0.2	0.00950 U	0.00950 U	0.00950 U	0.00950 U	0.00960 U	0.00950 U	0.00950 U	0.00950 U
Bis(2-ethylhexyl)phthalate	3	3	6	6	0.570 U	0.380 U	0.380 U	0.570 U	0.380 U	0.570 U	0.380 U	0.380 U
Naphthalene	12	17	None	None	0.240 UJ	0.240 UJ	0.240 UJ	0.240 U	0.240 UJ	0.240 U	0.240 U	0.240 U
VOC (µg/L)	**Incident Specific Parameters**	**DOH Environmental Action Levels Table D-1A Groundwater Action Levels**	**DOH Safe Drinking Water Branch (SDWB) Regulatory Constituents**	**Environmental Protection Agency Maximum Contaminant Levels**	**SDG: C22A058**	**SDG: C22A058**	**SDG: C22A058**	**SDG: C22A058**	**SDG: C22A058**	**SDG: C22A053rev1**	**SDG: C22A053rev1**	**SDG: C22A053rev1**
1,1,1-Trichloroethane	11	11	200	200	0.119 U	0.119 U	0.119 UJ	0.119 UJ	0.119 U	0.119 U	0.119 U	0.119 U
1,1,2-Trichloroethane	5	5	3	5	0.288 U	0.288 U	0.288 UJ	0.288 UJ	0.288 U	0.288 U	0.288 U	0.288 U
1,1-Dichloroethene	7	7	7	7	0.128 U	0.128 U	0.128 UJ	0.128 UJ	0.128 U	0.128 U	0.128 U	0.128 U
1,2,4-Trichlorobenzene	70	70	70	70	0.318 U	0.318 U	0.318 UJ	0.318 UJ	0.318 U	0.318 U	0.318 U	0.318 U
1,2-Dichlorobenzene	10	10	600	600	0.272 U	0.272 U	0.272 UJ	0.272 UJ	0.272 U	0.272 U	0.272 U	0.272 U
1,2-Dichloroethane	5	5	5	5	0.0884 U	0.0884 U	0.0884 UJ	0.0884 UJ	0.0884 U	0.0884 U	0.0884 U	0.0884 U
1,2-Dichloropropane	5	5	5	5	0.129 U	0.129 U	0.129 UJ	0.129 UJ	0.129 U	0.129 U	0.129 U	0.129 U
1,4-Dichlorobenzene	5	5	75	None	0.245 U	0.245 U	0.245 UJ	0.245 UJ	0.245 U	0.245 U	0.245 U	0.245 U
Benzene	5	5	5	5	0.0846 U	0.0846 U	0.0846 UJ	0.0846 UJ	0.0846 U	0.0846 U	0.0846 U	0.0846 U
Carbon Tetrachloride	5	5	5	5	0.165 U	0.165 U	0.165 UJ	0.165 UJ	0.165 U	0.165 U	0.165 U	0.165 U
Chlorobenzene	25	25	100	100	0.146 U	0.146 U	0.146 UJ	0.146 UJ	0.146 U	0.146 U	0.146 U	0.146 U
cis-1,2-Dichloroethene	70	70	70	70	0.0570 U	0.0570 U	0.0570 UJ	0.0570 UJ	0.0570 U	0.0570 U	0.0570 U	0.0570 U
Ethylbenzene	700	7.3	700	700	0.141 U	0.141 U	0.141 UJ	0.141 UJ	0.141 U	0.141 U	0.141 U	0.141 U
m,p-Xylene	10000	13	None	None	0.317 U	0.317 U	0.317 UJ	0.317 UJ	0.317 U	0.317 U	0.317 U	0.317 U
Methylene chloride	5	5	5	5	2.15 U	2.15 U	2.15 UJ	2.15 UJ	2.15 U	2.15 U	2.15 U	2.15 U
o-Xylene	10000	13	None	None	0.157 U	0.157 U	0.157 UJ	0.157 UJ	0.157 U	0.157 U	0.157 U	0.157 U
Styrene	10	10	100	100	0.224 U	0.224 U	0.224 UJ	0.224 UJ	0.224 U	0.224 U	0.224 U	0.224 U
Tetrachloroethene (PCE)	5	5	5	5	0.125 U	0.125 U	0.125 UJ	0.125 UJ	0.125 U	0.125 U	0.125 U	0.125 U
Toluene	1000	9.8	1000	1000	0.120 U	0.120 U	0.120 UJ	0.120 UJ	0.120 U	0.120 U	0.120 U	0.120 U
trans-1,2-Dichloroethene	100	100	100	100	0.0958 U	0.0958 U	0.0958 UJ	0.0958 UJ	0.0958 U	0.0958 U	0.0958 U	0.0958 U
Trichloroethene (TCE)	5	5	5	5	0.0574 U	0.0574 U	0.0574 UJ	0.0574 UJ	0.0574 U	0.0574 U	0.0574 U	0.0574 U
Vinyl chloride	2	2	2	2	0.611 U	0.611 U	0.611 UJ	0.611 UJ	0.611 U	0.611 U	0.611 U	0.611 U

Notes:

– indicates that the sample was Not Analyzed for the analyte

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Location ID:					B1-HONU1077	B1-HONU1140	B1-HONU1191	B1-HONU1191	B1-KAEE2855B	B1-KAEE2855B	B1-KOKI2862A	B1-KOKI2862A
Location Type:					Residence	Residence	Residence	Residence	Residence	Residence	Residence	Residence
Residence:					1077 Honu Loop	1140 Honu Loop	1191 Honu Loop	1191 Honu Loop	2855B Kaee Loop	2855B Kaee Loop	2862A Kokio Loop	2862A Kokio Loop
Field Sample ID:					220127B1AT06	220127B1CT06	220127B1FT05	220129B1AT06	220127B1FT03	220129B1AT04	220127B1CT01	220127B1CT02
Sample Date:					2022-01-27	2022-01-27	2022-01-27	2022-01-29	2022-01-27	2022-01-29	2022-01-27	2022-01-27
Sample Type:					N	N	N	N (72 Hour Stagnation)	N	N (72 Hour Stagnation)	N	FD
SVOC (µg/L)	**Incident Specific Parameters**	**DOH Environmental Action Levels Table D-1A Groundwater Action Levels**	**DOH Safe Drinking Water Branch (SDWB) Regulatory Constituents**	**Environmental Protection Agency Maximum Contaminant Levels**	**SDG: DA41342**	**SDG: DA41342**	**SDG: 810133881**	**SDG: DA41377**	**SDG: 810133881**	**SDG: DA41377R**	**SDG: DA41342**	**SDG: DA41342**
2-Methylnaphthalene	4.7	10	None	None	0.240 U	0.240 U	0.0200 U	0.240 U	0.0200 U	0.240 U	0.240 U	0.240 U
Benzo(a)pyrene	0.06	0.06	0.2	0.2	0.00950 U	0.00960 U	0.00980 U	0.00950 U	0.00990 U	0.00950 U	0.00950 U	0.00950 U
Bis(2-ethylhexyl)phthalate	3	3	6	6	0.380 U	0.380 U	0.590 U	0.380 U	0.600 U	42.4 J	**0.390 J**	0.380 U
Naphthalene	12	17	None	None	0.240 U	0.240 U	0.0200 U	0.240 U	0.0200 U	0.240 U	0.240 U	0.240 U
VOC (µg/L)	**Incident Specific Parameters**	**DOH Environmental Action Levels Table D-1A Groundwater Action Levels**	**DOH Safe Drinking Water Branch (SDWB) Regulatory Constituents**	**Environmental Protection Agency Maximum Contaminant Levels**	**SDG: C22A053rev1**	**SDG: C22A053rev1**	**SDG: C22A053rev1**	**SDG: C22A063rev2**	**SDG: C22A053rev1**	**SDG: C22A063rev2**	**SDG: C22A053rev1**	**SDG: C22A053rev1**
1,1,1-Trichloroethane	11	11	200	200	0.119 U	0.119 U	0.119 U	0.119 U	0.119 U	0.119 U	0.119 U	0.119 U
1,1,2-Trichloroethane	5	5	3	5	0.288 U	0.288 U	0.288 U	0.288 U	0.288 U	0.288 U	0.288 U	0.288 U
1,1-Dichloroethene	7	7	7	7	0.128 U	0.128 U	0.128 U	0.128 U	0.128 U	0.128 U	0.128 U	0.128 U
1,2,4-Trichlorobenzene	70	70	70	70	0.318 U	0.318 U	0.318 U	0.318 U	0.318 U	0.318 U	0.318 U	0.318 U
1,2-Dichlorobenzene	10	10	600	600	0.272 U	0.272 U	0.272 U	0.272 U	0.272 U	0.272 U	0.272 U	0.272 U
1,2-Dichloroethane	5	5	5	5	0.0884 U	0.0884 U	0.0884 U	0.0884 U	0.0884 U	0.0884 U	0.0884 U	0.0884 U
1,2-Dichloropropane	5	5	5	5	0.129 U	0.129 U	0.129 U	0.129 U	0.129 U	0.129 U	0.129 U	0.129 U
1,4-Dichlorobenzene	5	5	75	None	0.245 U	0.245 U	0.245 U	0.245 U	0.245 U	0.245 U	0.245 U	0.245 U
Benzene	5	5	5	5	0.0846 U	0.0846 U	0.0846 U	0.0846 U	0.0846 U	0.0846 U	0.0846 U	0.0846 U
Carbon Tetrachloride	5	5	5	5	0.165 U	0.165 U	0.165 U	0.165 U	0.165 U	0.165 U	0.165 U	0.165 U
Chlorobenzene	25	25	100	100	0.146 U	0.146 U	0.146 U	0.146 U	0.146 U	0.146 U	0.146 U	0.146 U
cis-1,2-Dichloroethene	70	70	70	70	0.0570 U	0.0570 U	0.0570 U	0.0570 U	0.0570 U	0.0570 U	0.0570 U	0.0570 U
Ethylbenzene	700	7.3	700	700	0.141 U	0.141 U	0.141 U	0.141 U	0.141 U	0.141 U	0.141 U	0.141 U
m,p-Xylene	10000	13	None	None	0.317 U	0.317 U	0.317 U	0.317 U	0.317 U	0.317 U	0.317 U	0.317 U
Methylene chloride	5	5	5	5	2.15 U	2.15 U	2.15 U	2.15 U	2.15 U	2.15 U	2.15 U	2.15 U
o-Xylene	10000	13	None	None	0.157 U	0.157 U	0.157 U	0.157 U	0.157 U	0.157 U	0.157 U	0.157 U
Styrene	10	10	100	100	0.224 U	0.224 U	0.224 U	0.224 U	0.224 U	0.224 U	0.224 U	0.224 U
Tetrachloroethene (PCE)	5	5	5	5	0.125 U	0.125 U	0.125 U	0.125 U	0.125 U	0.125 U	0.125 U	0.125 U
Toluene	1000	9.8	1000	1000	0.120 U	0.120 U	0.120 U	0.120 U	0.120 U	0.120 U	0.120 U	0.120 U
trans-1,2-Dichloroethene	100	100	100	100	0.0958 U	0.0958 U	0.0958 U	0.0958 U	0.0958 U	0.0958 U	0.0958 U	0.0958 U
Trichloroethene (TCE)	5	5	5	5	0.0574 U	0.0574 U	0.0574 U	0.0574 U	0.0574 U	0.0574 U	0.0574 U	0.0574 U
Vinyl chloride	2	2	2	2	0.611 U	0.611 U	0.611 U	0.611 U	0.611 U	0.611 U	0.611 U	0.611 U

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Location ID:					B1-KUPA2872A	B1-KUPA2872F	B1-MAKU2885B	B1-MAKU2885B	B1-MAKU2899D	B1-MCGR0371	B1-MCGR0500	B1-MCGR0553
Location Type:					Residence	Residence	Residence	Residence	Residence	Residence	Residence	Residence
Residence:					2872A Kupalii Loop	2872F Kupalii Loop	2885B Makuu Loop	2885B Makuu Loop	2899D Makuu Loop	371 McGrew Loop	500 McGrew Loop	553 McGrew Loop
Field Sample ID:					220127B1CT03	220127B1CT04	220127B1DT01	220127B1DT02	220127B1BT05	220127B1BT07	220127B1DT03	220127B1DT04
Sample Date:					2022-01-27	2022-01-27	2022-01-27	2022-01-27	2022-01-27	2022-01-27	2022-01-27	2022-01-27
Sample Type:					N	N	N	FD	N	N	N	N
SVOC (µg/L)	**Incident Specific Parameters**	**DOH Environmental Action Levels Table D-1A Groundwater Action Levels**	**DOH Safe Drinking Water Branch (SDWB) Regulatory Constituents**	**Environmental Protection Agency Maximum Contaminant Levels**	**SDG: DA41342**	**SDG: DA41342**	**SDG: DA41342**	**SDG: DA41342**	**SDG: DA41342**	**SDG: DA41360**	**SDG: DA41342**	**SDG: DA41342**
2-Methylnaphthalene	4.7	10	None	None	0.240 U	0.240 U	0.240 U	0.240 U	0.240 U	0.240 UJ	0.240 U	0.240 U
Benzo(a)pyrene	0.06	0.06	0.2	0.2	0.00960 U	0.00950 U	0.00950 U	0.00960 U	0.00950 U	0.00970 U	0.00960 U	0.00960 U
Bis(2-ethylhexyl)phthalate	3	3	6	6	0.380 U	0.380 U	0.380 U	0.380 U	0.380 U	1.20 U	0.380 U	0.380 U
Naphthalene	12	17	None	None	0.240 U	0.240 U	0.240 U	0.240 U	0.240 U	0.240 UJ	0.240 U	0.240 U
VOC (µg/L)	**Incident Specific Parameters**	**DOH Environmental Action Levels Table D-1A Groundwater Action Levels**	**DOH Safe Drinking Water Branch (SDWB) Regulatory Constituents**	**Environmental Protection Agency Maximum Contaminant Levels**	**SDG: C22A053rev1**	**SDG: C22A053rev1**	**SDG: C22A053rev1**	**SDG: C22A053rev1**	**SDG: C22A053rev1**	**SDG: C22A053rev1**	**SDG: C22A053rev1**	**SDG: C22A053rev1**
1,1,1-Trichloroethane	11	11	200	200	0.119 U	0.119 U	0.119 U	0.119 U	0.119 U	0.119 U	0.119 U	0.119 U
1,1,2-Trichloroethane	5	5	3	5	0.288 U	0.288 U	0.288 U	0.288 U	0.288 U	0.288 U	0.288 U	0.288 U
1,1-Dichloroethene	7	7	7	7	0.128 U	0.128 U	0.128 U	0.128 U	0.128 U	0.128 U	0.128 U	0.128 U
1,2,4-Trichlorobenzene	70	70	70	70	0.318 U	0.318 U	0.318 U	0.318 U	0.318 U	0.318 U	0.318 U	0.318 U
1,2-Dichlorobenzene	10	10	600	600	0.272 U	0.272 U	0.272 U	0.272 U	0.272 U	0.272 U	0.272 U	0.272 U
1,2-Dichloroethane	5	5	5	5	0.0884 U	0.0884 U	0.0884 U	0.0884 U	0.0884 U	0.0884 U	0.0884 U	0.0884 U
1,2-Dichloropropane	5	5	5	5	0.129 U	0.129 U	0.129 U	0.129 U	0.129 U	0.129 U	0.129 U	0.129 U
1,4-Dichlorobenzene	5	5	75	None	0.245 U	0.245 U	0.245 U	0.245 U	0.245 U	0.245 U	0.245 U	0.245 U
Benzene	5	5	5	5	0.0846 U	0.0846 U	0.0846 U	0.0846 U	0.0846 U	0.0846 U	0.0846 U	0.0846 U
Carbon Tetrachloride	5	5	5	5	0.165 U	0.165 U	0.165 U	0.165 U	0.165 U	0.165 U	0.165 U	0.165 U
Chlorobenzene	25	25	100	100	0.146 U	0.146 U	0.146 U	0.146 U	0.146 U	0.146 U	0.146 U	0.146 U
cis-1,2-Dichloroethene	70	70	70	70	0.0570 U	0.0570 U	0.0570 U	0.0570 U	0.0570 U	0.0570 U	0.0570 U	0.0570 U
Ethylbenzene	700	7.3	700	700	0.141 U	0.141 U	0.141 U	0.141 U	0.141 U	0.141 U	0.141 U	0.141 U
m,p-Xylene	10000	13	None	None	0.317 U	0.317 U	0.317 U	0.317 U	0.317 U	0.317 U	0.317 U	0.317 U
Methylene chloride	5	5	5	5	2.15 U	2.15 U	2.15 U	2.15 U	2.15 U	2.15 U	2.15 U	2.15 U
o-Xylene	10000	13	None	None	0.157 U	0.157 U	0.157 U	0.157 U	0.157 U	0.157 U	0.157 U	0.157 U
Styrene	10	10	100	100	0.224 U	0.224 U	0.224 U	0.224 U	0.224 U	0.224 U	0.224 U	0.224 U
Tetrachloroethene (PCE)	5	5	5	5	0.125 U	0.125 U	0.125 U	0.125 U	0.125 U	0.125 U	0.125 U	0.125 U
Toluene	1000	9.8	1000	1000	0.120 U	0.120 U	0.120 U	0.120 U	0.120 U	0.120 U	0.120 U	0.120 U
trans-1,2-Dichloroethene	100	100	100	100	0.0958 U	0.0958 U	0.0958 U	0.0958 U	0.0958 U	0.0958 U	0.0958 U	0.0958 U
Trichloroethene (TCE)	5	5	5	5	0.0574 U	0.0574 U	0.0574 U	0.0574 U	0.0574 U	0.0574 U	0.0574 U	0.0574 U
Vinyl chloride	2	2	2	2	0.611 U	0.611 U	0.611 U	0.611 U	0.611 U	0.611 U	0.611 U	0.611 U

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Location ID:					B1-MCGR0593	B1-MCGR0628	B1-MCGR0660	B1-MCGR0730	B1-MCGR0730	B1-MCGR0799	B1-MCGR0838	B1-MCGR0873
Location Type:					Residence	Residence	Residence	Residence	Residence	Residence	Residence	Residence
Residence:					593 McGrew Point	628 McGrew Loop	660 McGrew Loop	730 McGrew Loop	730 McGrew Loop	799 McGrew Loop	838 McGrew Loop	873 McGrew Loop
Field Sample ID:					220127B1DT06	220127B1DT05	220127B1AT07	220127B1AT04	220127B1AT05	220127B1CT05	220127B1AT08	220127B1AT09
Sample Date:					2022-01-27	2022-01-27	2022-01-27	2022-01-27	2022-01-27	2022-01-27	2022-01-27	2022-01-27
Sample Type:					N	N	N	N	FD	N	N	N
SVOC (µg/L)	**Incident Specific Parameters**	**DOH Environmental Action Levels Table D-1A Groundwater Action Levels**	**DOH Safe Drinking Water Branch (SDWB) Regulatory Constituents**	**Environmental Protection Agency Maximum Contaminant Levels**	**SDG: DA41342**	**SDG: DA41342**	**SDG: DA41342**	**SDG: DA41342**	**SDG: DA41342**	**SDG: DA41342**	**SDG: DA41342**	**SDG: DA41342**
2-Methylnaphthalene	4.7	10	None	None	0.240 U	0.240 U	0.240 U	0.240 U	0.240 U	0.240 U	0.240 U	0.240 U
Benzo(a)pyrene	0.06	0.06	0.2	0.2	0.00960 U	0.00950 U	0.00950 U	0.00950 U	0.00950 U	0.00960 U	0.00950 U	0.00950 U
Bis(2-ethylhexyl)phthalate	3	3	6	6	0.380 U	0.570 U	0.380 U	0.380 U	0.380 U	0.380 U	0.380 U	0.570 U
Naphthalene	12	17	None	None	0.240 U	0.240 U	0.240 U	0.240 U	0.240 U	0.240 U	0.240 U	0.240 U
VOC (µg/L)	**Incident Specific Parameters**	**DOH Environmental Action Levels Table D-1A Groundwater Action Levels**	**DOH Safe Drinking Water Branch (SDWB) Regulatory Constituents**	**Environmental Protection Agency Maximum Contaminant Levels**	**SDG: C22A053rev1**	**SDG: C22A053rev1**	**SDG: C22A053rev1**	**SDG: C22A053rev1**	**SDG: C22A053rev1**	**SDG: C22A053rev1**	**SDG: C22A053rev1**	**SDG: C22A053rev1**
1,1,1-Trichloroethane	11	11	200	200	0.119 U	0.119 U	0.119 U	0.119 U	0.119 U	0.119 U	0.119 U	0.119 U
1,1,2-Trichloroethane	5	5	3	5	0.288 U	0.288 U	0.288 U	0.288 U	0.288 U	0.288 U	0.288 U	0.288 U
1,1-Dichloroethene	7	7	7	7	0.128 U	0.128 U	0.128 U	0.128 U	0.128 U	0.128 U	0.128 U	0.128 U
1,2,4-Trichlorobenzene	70	70	70	70	0.318 U	0.318 U	0.318 U	0.318 U	0.318 U	0.318 U	0.318 U	0.318 U
1,2-Dichlorobenzene	10	10	600	600	0.272 U	0.272 U	0.272 U	0.272 U	0.272 U	0.272 U	0.272 U	0.272 U
1,2-Dichloroethane	5	5	5	5	0.0884 U	0.0884 U	0.0884 U	0.0884 U	0.0884 U	0.0884 U	0.0884 U	0.0884 U
1,2-Dichloropropane	5	5	5	5	0.129 U	0.129 U	0.129 U	0.129 U	0.129 U	0.129 U	0.129 U	0.129 U
1,4-Dichlorobenzene	5	5	75	None	0.245 U	0.245 U	0.245 U	0.245 U	0.245 U	0.245 U	0.245 U	0.245 U
Benzene	5	5	5	5	0.0846 U	0.0846 U	0.0846 U	0.0846 U	0.0846 U	0.0846 U	0.0846 U	0.0846 U
Carbon Tetrachloride	5	5	5	5	0.165 U	0.165 U	0.165 U	0.165 U	0.165 U	0.165 U	0.165 U	0.165 U
Chlorobenzene	25	25	100	100	0.146 U	0.146 U	0.146 U	0.146 U	0.146 U	0.146 U	0.146 U	0.146 U
cis-1,2-Dichloroethene	70	70	70	70	0.0570 U	0.0570 U	0.0570 U	0.0570 U	0.0570 U	0.0570 U	0.0570 U	0.0570 U
Ethylbenzene	700	7.3	700	700	0.141 U	0.141 U	0.141 U	0.141 U	0.141 U	0.141 U	0.141 U	0.141 U
m,p-Xylene	10000	13	None	None	0.317 U	0.317 U	0.317 U	0.317 U	0.317 U	0.317 U	0.317 U	0.317 U
Methylene chloride	5	5	5	5	2.15 U	2.15 U	2.15 U	2.15 U	2.15 U	2.15 U	2.15 U	2.15 U
o-Xylene	10000	13	None	None	0.157 U	0.157 U	0.157 U	0.157 U	0.157 U	0.157 U	0.157 U	0.157 U
Styrene	10	10	100	100	0.224 U	0.224 U	0.224 U	0.224 U	0.224 U	0.224 U	0.224 U	0.224 U
Tetrachloroethene (PCE)	5	5	5	5	0.125 U	0.125 U	0.125 U	0.125 U	0.125 U	0.125 U	0.125 U	0.125 U
Toluene	1000	9.8	1000	1000	0.120 U	0.120 U	0.120 U	0.120 U	0.120 U	0.120 U	0.120 U	0.120 U
trans-1,2-Dichloroethene	100	100	100	100	0.0958 U	0.0958 U	0.0958 U	0.0958 U	0.0958 U	0.0958 U	0.0958 U	0.0958 U
Trichloroethene (TCE)	5	5	5	5	0.0574 U	0.0574 U	0.0574 U	0.0574 U	0.0574 U	0.0574 U	0.0574 U	0.0574 U
Vinyl chloride	2	2	2	2	0.611 U	0.611 U	0.611 U	0.611 U	0.611 U	0.611 U	0.611 U	0.611 U

Residential Sampling Report for Flushing Zone
B1 Zone Residential DW Sampling
Chemistry Results
Drinking Water Sampling, JBPHH, Oahu Hawaii

Location ID:	B1-OLIA2919A	B1-OLIA2919A	B1-OLIA2927
Location Type:	Residence	Residence	Residence
Residence:	2919A Oliana Loop	2919A Oliana Loop	2927 Oliana Loop
Field Sample ID:	220127B1FT04	220129B1AT05	220127B1BT06
Sample Date:	2022-01-27	2022-01-29	2022-01-27
Sample Type:	N	N (72 Hour Stagnation)	N

SVOC (µg/L)	Incident Specific Parameters	DOH Environmental Action Levels Table D-1A Groundwater Action Levels	DOH Safe Drinking Water Branch (SDWB) Regulatory Constituents	Environmental Protection Agency Maximum Contaminant Levels	SDG: 810133881	SDG: DA41377	SDG: DA41360
2-Methylnaphthalene	4.7	10	None	None	0.0200 U	0.240 U	0.240 UJ
Benzo(a)pyrene	0.06	0.06	0.2	0.2	0.00990 U	0.00950 U	0.00950 U
Bis(2-ethylhexyl)phthalate	3	3	6	6	0.590 U	0.470 U	0.380 U
Naphthalene	12	17	None	None	0.0200 U	0.240 U	0.240 UJ

VOC (µg/L)	Incident Specific Parameters	DOH Environmental Action Levels Table D-1A Groundwater Action Levels	DOH Safe Drinking Water Branch (SDWB) Regulatory Constituents	Environmental Protection Agency Maximum Contaminant Levels	SDG: C22A053rev1	SDG: C22A063rev2	SDG: C22A053rev1
1,1,1-Trichloroethane	11	11	200	200	0.119 U	0.119 U	0.119 U
1,1,2-Trichloroethane	5	5	3	5	0.288 U	0.288 U	0.288 U
1,1-Dichloroethene	7	7	7	7	0.128 U	0.128 U	0.128 U
1,2,4-Trichlorobenzene	70	70	70	70	0.318 U	0.318 U	0.318 U
1,2-Dichlorobenzene	10	10	600	600	0.272 U	0.272 U	0.272 U
1,2-Dichloroethane	5	5	5	5	0.0884 U	0.0884 U	0.0884 U
1,2-Dichloropropane	5	5	5	5	0.129 U	0.129 U	0.129 U
1,4-Dichlorobenzene	5	5	75	None	0.245 U	0.245 U	0.245 U
Benzene	5	5	5	5	0.0846 U	0.0846 U	0.0846 U
Carbon Tetrachloride	5	5	5	5	0.165 U	0.165 U	0.165 U
Chlorobenzene	25	25	100	100	0.146 U	0.146 U	0.146 U
cis-1,2-Dichloroethene	70	70	70	70	0.0570 U	0.0570 U	0.0570 U
Ethylbenzene	700	7.3	700	700	0.141 U	0.141 U	0.141 U
m,p-Xylene	10000	13	None	None	0.317 U	0.317 U	0.317 U
Methylene chloride	5	5	5	5	2.15 U	2.15 U	2.15 U
o-Xylene	10000	13	None	None	0.157 U	0.157 U	0.157 U
Styrene	10	10	100	100	0.224 U	0.224 U	0.224 U
Tetrachloroethene (PCE)	5	5	5	5	0.125 U	0.125 U	0.125 U
Toluene	1000	9.8	1000	1000	0.120 U	0.120 U	0.120 U
trans-1,2-Dichloroethene	100	100	100	100	0.0958 U	0.0958 U	0.0958 U
Trichloroethene (TCE)	5	5	5	5	0.0574 U	0.0574 U	0.0574 U
Vinyl chloride	2	2	2	2	0.611 U	0.611 U	0.611 U

Residential Sampling Report for Flushing Zone
B1 Zone Residential DW Sampling
Chemistry Results
Drinking Water Sampling, JBPHH, Oahu Hawaii

Results highlighted yellow exceed the ISP
Results in purple font also exceed the EALs
Results in green font also exceed the DOH MCL
Results in blue font also exceed the EPA MCL

µg/L = Micrograms per Liter

February 27, 2022

From: Naval Facilities Engineering Systems Command Representative, IDWS Team
To: Interagency Drinking Water System Team

SUBJ: EXCEEDANCE INVESTIGATION SUMMARY AND RESULTS ZONE B1

Encl: (1) Zone B1 Exceedance Investigation Sample Results
(2) AECOM Bis (2-ethylhexyl) phthalate Exceedance Results Memo dtd 20 FEB 2022
(3) National Primary Drinking Water Regulation, EPA 816-F-09-004
(4) 2855 Kaee Loop Resample Results

1. This letter documents the Zone B1 bis (2-ethylhexyl) phthalate at 2855B Kaee Loop and actions taken to address the exceedance, and subsequent test results. Enclosure (1) contains the exceedance sample results.

2. The sample result taken at 2855B Kaee Loop on January 29, 2022 was 42.4J parts per billion (ppb) for bis (2-ethylhexyl) phthalate. This was in exceedance of the MCL of 6 ppb. This type of exceedance had been encountered before in other zones. Investigation into this matter determined that laboratory contamination contributed to the detection of this analyte. Enclosure (2) documents this investigation and states: "the weight of evidence suggests are all the exceedance results are false positives attributable to laboratory contamination, and therefore no further action is warranted at this time." As an additional line of evidence and a precaution, the IDWST members directed that the residence be flushed again and sampled again to confirm that it was laboratory contamination. 2855 Kaee Loop is a six unit residence. All units of the complex were flushed and sampled. Enclosure (3) provides the potential health effects from long-term exposure above the MCL for bis(2-ethylhexyl)phthalate. Enclosure (4) has the resample results for bis (2-ethylhexyl) phthalate at all six residences at 2855 Kaee Loop which were non-detect.

3. There were two exceedances above the ISP of 2 ppm for total organic carbon (TOC). The IDWST reviewed the sample results in their entirety and determined that no further action was required regarding TOC.

4. I certify under penalty of law that I have personally examined and I am familiar with the information submitted and the submitted information is true, accurate, and complete.

MENO.MICHAEL.WAYNE.JR.1088310035
Digitally signed by MENO.MICHAEL.WAYNE.JR.1088310035
Date: 2022.02.27 11:05:03 -10'00'

M. W. Meno
Captain, U.S. Navy Civil Engineer Corps

Zone B1 Exceedance Report
B1 Zone Residential DW Sampling
Chemistry Results
Drinking Water Sampling, JBPHH, Oahu Hawaii

Location ID:					B1-KAEE2855B	B1-KUPA2872F	B1-MCGR0371
Location Type:					Residence	Residence	Residence
Residence:					2855B Kaee Loop	2872F Kupalii Loop	371 McGrew Loop
Field Sample ID:					220129B1AT04	220127B1CT04	220127B1BT07
Sample Date:					2022-01-29	2022-01-27	2022-01-27
Sample Type:					N (72 Hour Stagnation)	N	N
GENCHEM (mg/L)	**Incident Specific Parameters**	**DOH Environmental Action Levels Table D-1A Groundwater Action Levels**	**DOH Safe Drinking Water Branch (SDWB) Regulatory Constituents**	**Environmental Protection Agency Maximum Contaminant Levels**		**SDG: C22A053rev1**	**SDG: C22A053rev1**
Total Organic Carbon	2	None	None	None	--	**2.63**	**2.60**
SVOC (µg/L)	**Incident Specific Parameters**	**DOH Environmental Action Levels Table D-1A Groundwater Action Levels**	**DOH Safe Drinking Water Branch (SDWB) Regulatory Constituents**	**Environmental Protection Agency Maximum Contaminant Levels**	**SDG: DA41377R**		
Bis(2-ethylhexyl)phthalate	3	3	6	6	**42.4 J**	--	--

Notes:

-- indicates that the sample was Not Analyzed for the analyte

Results highlighted yellow exceed the ISP
Results in purple font also exceed the EALs
Results in green font also exceed the DOH MCL
Results in blue font also exceed the EPA MCL

µg/L = Micrograms per Liter

AECOM
1001 Bishop Street
Suite 1600
Honolulu, HI 96813
www.aecom.com

February 20, 2022

NAVFAC Hawaii
400 Marshall Road
JBPHH HI 96860-3139

Subject: Red Hill Bulk Fuel Storage Facility
Bis(2-ethylhexyl)phthalate Exceedance Results

Attention Engineering Working Group:

The table below summarizes the bis(2-ethylhexyl) phthalate (B2EHP) exceedance results with respect to the Incident-Specific Parameter concentrations for this analyte in multiple samples. Mass spectral and chromatographic data were reviewed to determine if the detections were supported by the raw data. All the detections appear to meet qualitative and quantitative method criteria.

SDG	Laboratory Sample ID	Field Sample ID	Zone	Address	Date Collected	Date Extracted	Date Analyzed	Sample B2EHP Result	MB B2EHP Result	Units
DA41377	DA41377-4	220129B1AT03	B1	Trip Blank	1/29/2022	02/01/22	02/02/22	13.2	17.3	ug/L
DA41377R	DA41377-5R	220129B1AT04	B1	2855 B Kaee Loop	1/29/2022	02/01/22	02/02/22	42.4	17.3	ug/L
DA41416R	DA41416-2R	220131C3ET01	C3	690 Cushing St.	1/31/2022	02/04/22	02/04/22	26.4	11.7	ug/L
DA41509R	DA41509-7R	220202D4DT01	D4	625 Mamala Bay Dr	2/2/2022	02/05/22	02/07/22	3	0.60 U	ug/L
DA41509R	DA41509-2R	220202D4DT03	D4	386 Mamala Bay Dr	2/2/2022	02/05/22	02/07/22	4.2	0.60 U	ug/L
DA41509	DA41509-6	220202D4AT07	D4	Trip Blank	2/2/2022	02/04/22	02/05/22	21.6	11.7	ug/L
DA41510	DA41510-4	220202H1FT05	H1	Trip Blank	2/2/2022	02/04/22	02/05/22	28.9	0.64 J	ug/L
DA41395R	DA41395-2R	220129F2CT03	F2	3349 Catlin Drive	01/29/22	02/04/22	02/04/22	23.8	11.7	ug/L
DA41395R	DA41395-5R	220129F2CT01	F2	811 Murray Dr	01/29/22	02/04/22	02/04/22	18.3	11.7	ug/L
DA40816AR	DA40816-38	220111-D1-CT01	D1	1206 Mead Pl	01/11/22	01/17/22	01/18/22	6.3	0.58 J	ug/L

ug/L = micrograms per liter U = the analyte was not detected J = estimated values

B2EHP is a common laboratory contaminant and used as a plasticizer in many plastic materials, including tubing commonly used by laboratories. B2EHP contamination of laboratory extraction equipment and glassware surfaces is a common cause of false positive sample results in semi-volatile methods such as EPA 525.2

The pattern of exceedance results occurs at a single laboratory (SGS-Wheat Ridge) and within a relatively narrow window of time (all laboratory extractions between 02/01/22 and 02/05/22, except for one on 01/17/22). Eight out of ten exceedance results are associated with preparatory batches having B2EHP detections in the method blanks (MB). In six of those eight cases the MB result is more than 40% of the sample result for B2EHP.

Although three of the ten exceedance results are from Trip Blanks, many of the associated field samples collected and shipped together did not contain detectable B2EHP, indicating that the field sampling procedures or containers themselves are an unlikely source of the contamination.

An investigation of the SGS-Wheat Ridge 525.2 QC results for all Red Hill samples confirmed that 23% of the MB records in EDMS contained reported concentrations of B2EHP ranging from 0.58 to 17.3 ug/L. Many of the associated matrix spikes in these batches exceeded control limits for B2EHP by up to 800% indicating sporadic cases of B2EHP contamination in all QC samples.

ENCL (2)

During a review of the laboratory raw data it was noted that all of the highest concentration B2EHP detections are associated with bis (2-ethylhexyl) adipate (B2EHA) detections at concentrations ~ 3% of the B2EHP. B2EHA is another common plasticizer and sometimes used as a replacement for phthalates such as B2EHP. The pattern of B2EHP + B2EHA association in samples from very different field locations is another indicator that the contamination has a common source and is from inside the laboratory, not from the drinking water samples.

The overall pattern of erratic detections in in a single laboratory over a narrow window of time indicates that intermittent laboratory contamination explains all of the reported B2EHP exceedances in the table above, including those results where the associated method blank appeared to be clean or the MB is < 10X the sample result.

The weight of evidence suggests are all the exceedance results are false positives attributable to laboratory contamination, and therefore no further action is warranted at this time.

Questions regarding this letter should be addressed to the DW Task

Manager, Reid Campbell.

Yours sincerely,

Robert Kennedy
AVP, Senior Project Chemist
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Robin Cababa
CLEAN Program Manager
robin.cababa@aecom.com

c: Reid Campbell, AECOM Task Manager
Ken Vinson, AECOM Senior VP Program Manager
Jim Refermat, AECOM Senior Program Chemist
Contracting Officer
Victor Gonzalez, NAVFAC

National Primary Drinking Water Regulations

Contaminant	MCL or TT[1] (mg/L)[2]	Potential health effects from long-term[3] exposure above the MCL	Common sources of contaminant in drinking water	Public Health Goal (mg/L)[2]
Acrylamide	TT[4]	Nervous system or blood problems; increased risk of cancer	Added to water during sewage/ wastewater treatment	zero
Alachlor	0.002	Eye, liver, kidney, or spleen problems; anemia; increased risk of cancer	Runoff from herbicide used on row crops	zero
Alpha/photon emitters	15 picocuries per Liter (pCi/L)	Increased risk of cancer	Erosion of natural deposits of certain minerals that are radioactive and may emit a form of radiation known as alpha radiation	zero
Antimony	0.006	Increase in blood cholesterol; decrease in blood sugar	Discharge from petroleum refineries; fire retardants; ceramics; electronics; solder	0.006
Arsenic	0.010	Skin damage or problems with circulatory systems, and may have increased risk of getting cancer	Erosion of natural deposits; runoff from orchards; runoff from glass & electronics production wastes	0
Asbestos (fibers >10 micrometers)	7 million fibers per Liter (MFL)	Increased risk of developing benign intestinal polyps	Decay of asbestos cement in water mains; erosion of natural deposits	7 MFL
Atrazine	0.003	Cardiovascular system or reproductive problems	Runoff from herbicide used on row crops	0.003
Barium	2	Increase in blood pressure	Discharge of drilling wastes; discharge from metal refineries; erosion of natural deposits	2
Benzene	0.005	Anemia; decrease in blood platelets; increased risk of cancer	Discharge from factories; leaching from gas storage tanks and landfills	zero
Benzo(a)pyrene (PAHs)	0.0002	Reproductive difficulties; increased risk of cancer	Leaching from linings of water storage tanks and distribution lines	zero
Beryllium	0.004	Intestinal lesions	Discharge from metal refineries and coal-burning factories; discharge from electrical, aerospace, and defense industries	0.004
Beta photon emitters	4 millirems per year	Increased risk of cancer	Decay of natural and man-made deposits of certain minerals that are radioactive and may emit forms of radiation known as photons and beta radiation	zero
Bromate	0.010	Increased risk of cancer	Byproduct of drinking water disinfection	zero
Cadmium	0.005	Kidney damage	Corrosion of galvanized pipes; erosion of natural deposits; discharge from metal refineries; runoff from waste batteries and paints	0.005
Carbofuran	0.04	Problems with blood, nervous system, or reproductive system	Leaching of soil fumigant used on rice and alfalfa	0.04

LEGEND

DISINFECTANT | DISINFECTION BYPRODUCT | INORGANIC CHEMICAL | MICROORGANISM | ORGANIC CHEMICAL | RADIONUCLIDES

Contaminant	MCL or TT[1] (mg/L)[2]	Potential health effects from long-term[3] exposure above the MCL	Common sources of contaminant in drinking water	Public Health Goal (mg/L)[2]
Carbon tetrachloride	0.005	Liver problems; increased risk of cancer	Discharge from chemical plants and other industrial activities	**zero**
Chloramines (as Cl_2)	MRDL=4.0[1]	Eye/nose irritation; stomach discomfort; anemia	Water additive used to control microbes	**MRDLG=4[1]**
Chlordane	0.002	Liver or nervous system problems; increased risk of cancer	Residue of banned termiticide	**zero**
Chlorine (as Cl_2)	MRDL=4.0[1]	Eye/nose irritation; stomach discomfort	Water additive used to control microbes	**MRDLG=4[1]**
Chlorine dioxide (as ClO_2)	MRDL=0.8[1]	Anemia; infants, young children, and fetuses of pregnant women: nervous system effects	Water additive used to control microbes	**MRDLG=0.8[1]**
Chlorite	1.0	Anemia; infants, young children, and fetuses of pregnant women: nervous system effects	Byproduct of drinking water disinfection	**0.8**
Chlorobenzene	0.1	Liver or kidney problems	Discharge from chemical and agricultural chemical factories	**0.1**
Chromium (total)	0.1	Allergic dermatitis	Discharge from steel and pulp mills; erosion of natural deposits	**0.1**
Copper	TT[5]; Action Level=1.3	Short-term exposure: Gastrointestinal distress. Long-term exposure: Liver or kidney damage. People with Wilson's Disease should consult their personal doctor if the amount of copper in their water exceeds the action level	Corrosion of household plumbing systems; erosion of natural deposits	**1.3**
Cryptosporidium	TT[7]	Short-term exposure: Gastrointestinal illness (e.g., diarrhea, vomiting, cramps)	Human and animal fecal waste	**zero**
Cyanide (as free cyanide)	0.2	Nerve damage or thyroid problems	Discharge from steel/metal factories; discharge from plastic and fertilizer factories	**0.2**
2,4-D	0.07	Kidney, liver, or adrenal gland problems	Runoff from herbicide used on row crops	**0.07**
Dalapon	0.2	Minor kidney changes	Runoff from herbicide used on rights of way	**0.2**
1,2-Dibromo-3-chloropropane (DBCP)	0.0002	Reproductive difficulties; increased risk of cancer	Runoff/leaching from soil fumigant used on soybeans, cotton, pineapples, and orchards	**zero**
o-Dichlorobenzene	0.6	Liver, kidney, or circulatory system problems	Discharge from industrial chemical factories	**0.6**
p-Dichlorobenzene	0.075	Anemia; liver, kidney, or spleen damage; changes in blood	Discharge from industrial chemical factories	**0.075**
1,2-Dichloroethane	0.005	Increased risk of cancer	Discharge from industrial chemical factories	**zero**

LEGEND DISINFECTANT | DISINFECTION BYPRODUCT | INORGANIC CHEMICAL | MICROORGANISM | ORGANIC CHEMICAL | RADIONUCLIDES

Contaminant	MCL or TT[1] (mg/L)[2]	Potential health effects from long-term[3] exposure above the MCL	Common sources of contaminant in drinking water	Public Health Goal (mg/L)[2]
1,1-Dichloroethylene	0.007	Liver problems	Discharge from industrial chemical factories	**0.007**
cis-1,2-Dichloroethylene	0.07	Liver problems	Discharge from industrial chemical factories	**0.07**
trans-1,2, Dichloroethylene	0.1	Liver problems	Discharge from industrial chemical factories	**0.1**
Dichloromethane	0.005	Liver problems; increased risk of cancer	Discharge from industrial chemical factories	**zero**
1,2-Dichloropropane	0.005	Increased risk of cancer	Discharge from industrial chemical factories	**zero**
Di(2-ethylhexyl) adipate	0.4	Weight loss, liver problems, or possible reproductive difficulties	Discharge from chemical factories	**0.4**
Di(2-ethylhexyl) phthalate	0.006	Reproductive difficulties; liver problems; increased risk of cancer	Discharge from rubber and chemical factories	**zero**
Dinoseb	0.007	Reproductive difficulties	Runoff from herbicide used on soybeans and vegetables	**0.007**
Dioxin (2,3,7,8-TCDD)	0.00000003	Reproductive difficulties; increased risk of cancer	Emissions from waste incineration and other combustion; discharge from chemical factories	**zero**
Diquat	0.02	Cataracts	Runoff from herbicide use	**0.02**
Endothall	0.1	Stomach and intestinal problems	Runoff from herbicide use	**0.1**
Endrin	0.002	Liver problems	Residue of banned insecticide	**0.002**
Epichlorohydrin	TT[4]	Increased cancer risk; stomach problems	Discharge from industrial chemical factories; an impurity of some water treatment chemicals	**zero**
Ethylbenzene	0.7	Liver or kidney problems	Discharge from petroleum refineries	**0.7**
Ethylene dibromide	0.00005	Problems with liver, stomach, reproductive system, or kidneys; increased risk of cancer	Discharge from petroleum refineries	**zero**
Fecal coliform and *E. coli*	MCL[6]	Fecal coliforms and *E. coli* are bacteria whose presence indicates that the water may be contaminated with human or animal wastes. Microbes in these wastes may cause short term effects, such as diarrhea, cramps, nausea, headaches, or other symptoms. They may pose a special health risk for infants, young children, and people with severely compromised immune systems.	Human and animal fecal waste	**zero[6]**

LEGEND DISINFECTANT | DISINFECTION BYPRODUCT | INORGANIC CHEMICAL | MICROORGANISM | ORGANIC CHEMICAL | RADIONUCLIDES

Contaminant	MCL or TT[1] (mg/L)[2]	Potential health effects from long-term[3] exposure above the MCL	Common sources of contaminant in drinking water	Public Health Goal (mg/L)[2]
Fluoride	4.0	Bone disease (pain and tenderness of the bones); children may get mottled teeth	Water additive which promotes strong teeth; erosion of natural deposits; discharge from fertilizer and aluminum factories	**4.0**
Giardia lamblia	TT[7]	Short-term exposure: Gastrointestinal illness (e.g., diarrhea, vomiting, cramps)	Human and animal fecal waste	**zero**
Glyphosate	0.7	Kidney problems; reproductive difficulties	Runoff from herbicide use	**0.7**
Haloacetic acids (HAA5)	0.060	Increased risk of cancer	Byproduct of drinking water disinfection	**n/a[9]**
Heptachlor	0.0004	Liver damage; increased risk of cancer	Residue of banned termiticide	**zero**
Heptachlor epoxide	0.0002	Liver damage; increased risk of cancer	Breakdown of heptachlor	**zero**
Heterotrophic plate count (HPC)	TT[7]	HPC has no health effects; it is an analytic method used to measure the variety of bacteria that are common in water. The lower the concentration of bacteria in drinking water, the better maintained the water system is.	HPC measures a range of bacteria that are naturally present in the environment	**n/a**
Hexachlorobenzene	0.001	Liver or kidney problems; reproductive difficulties; increased risk of cancer	Discharge from metal refineries and agricultural chemical factories	**zero**
Hexachloro-cyclopentadiene	0.05	Kidney or stomach problems	Discharge from chemical factories	**0.05**
Lead	TT[5]; Action Level=0.015	Infants and children: Delays in physical or mental development; children could show slight deficits in attention span and learning abilities; Adults: Kidney problems; high blood pressure	Corrosion of household plumbing systems; erosion of natural deposits	**zero**
Legionella	TT[7]	Legionnaire's Disease, a type of pneumonia	Found naturally in water; multiplies in heating systems	**zero**
Lindane	0.0002	Liver or kidney problems	Runoff/leaching from insecticide used on cattle, lumber, and gardens	**0.0002**
Mercury (inorganic)	0.002	Kidney damage	Erosion of natural deposits; discharge from refineries and factories; runoff from landfills and croplands	**0.002**
Methoxychlor	0.04	Reproductive difficulties	Runoff/leaching from insecticide used on fruits, vegetables, alfalfa, and livestock	**0.04**
Nitrate (measured as Nitrogen)	10	Infants below the age of six months who drink water containing nitrate in excess of the MCL could become seriously ill and, if untreated, may die. Symptoms include shortness of breath and blue-baby syndrome.	Runoff from fertilizer use; leaching from septic tanks, sewage; erosion of natural deposits	**10**

LEGEND DISINFECTANT | DISINFECTION BYPRODUCT | INORGANIC CHEMICAL | MICROORGANISM | ORGANIC CHEMICAL | RADIONUCLIDES

Contaminant	MCL or TT[1] (mg/L)[2]	Potential health effects from long-term[3] exposure above the MCL	Common sources of contaminant in drinking water	Public Health Goal (mg/L)[2]
Nitrite (measured as Nitrogen)	1	Infants below the age of six months who drink water containing nitrite in excess of the MCL could become seriously ill and, if untreated, may die. Symptoms include shortness of breath and blue-baby syndrome.	Runoff from fertilizer use; leaching from septic tanks, sewage; erosion of natural deposits	1
Oxamyl (Vydate)	0.2	Slight nervous system effects	Runoff/leaching from insecticide used on apples, potatoes, and tomatoes	0.2
Pentachlorophenol	0.001	Liver or kidney problems; increased cancer risk	Discharge from wood-preserving factories	zero
Picloram	0.5	Liver problems	Herbicide runoff	0.5
Polychlorinated biphenyls (PCBs)	0.0005	Skin changes; thymus gland problems; immune deficiencies; reproductive or nervous system difficulties; increased risk of cancer	Runoff from landfills; discharge of waste chemicals	zero
Radium 226 and Radium 228 (combined)	5 pCi/L	Increased risk of cancer	Erosion of natural deposits	zero
Selenium	0.05	Hair or fingernail loss; numbness in fingers or toes; circulatory problems	Discharge from petroleum and metal refineries; erosion of natural deposits; discharge from mines	0.05
Simazine	0.004	Problems with blood	Herbicide runoff	0.004
Styrene	0.1	Liver, kidney, or circulatory system problems	Discharge from rubber and plastic factories; leaching from landfills	0.1
Tetrachloroethylene	0.005	Liver problems; increased risk of cancer	Discharge from factories and dry cleaners	zero
Thallium	0.002	Hair loss; changes in blood; kidney, intestine, or liver problems	Leaching from ore-processing sites; discharge from electronics, glass, and drug factories	0.0005
Toluene	1	Nervous system, kidney, or liver problems	Discharge from petroleum factories	1
Total Coliforms	5.0 percent[8]	Coliforms are bacteria that indicate that other, potentially harmful bacteria may be present. See fecal coliforms and *E. coli*	Naturally present in the environment	zero
Total Trihalomethanes (TTHMs)	0.080	Liver, kidney, or central nervous system problems; increased risk of cancer	Byproduct of drinking water disinfection	n/a[9]
Toxaphene	0.003	Kidney, liver, or thyroid problems; increased risk of cancer	Runoff/leaching from insecticide used on cotton and cattle	zero
2,4,5-TP (Silvex)	0.05	Liver problems	Residue of banned herbicide	0.05
1,2,4-Trichlorobenzene	0.07	Changes in adrenal glands	Discharge from textile finishing factories	0.07

LEGEND DISINFECTANT | DISINFECTION BYPRODUCT | INORGANIC CHEMICAL | MICROORGANISM | ORGANIC CHEMICAL | RADIONUCLIDES

Contaminant	MCL or TT[1] (mg/L)[2]	Potential health effects from long-term[3] exposure above the MCL	Common sources of contaminant in drinking water	Public Health Goal (mg/L)[2]
1,1,1-Trichloroethane	0.2	Liver, nervous system, or circulatory problems	Discharge from metal degreasing sites and other factories	**0.2**
1,1,2-Trichloroethane	0.005	Liver, kidney, or immune system problems	Discharge from industrial chemical factories	**0.003**
Trichloroethylene	0.005	Liver problems; increased risk of cancer	Discharge from metal degreasing sites and other factories	**zero**
Turbidity	TT[7]	Turbidity is a measure of the cloudiness of water. It is used to indicate water quality and filtration effectiveness (e.g., whether disease-causing organisms are present). Higher turbidity levels are often associated with higher levels of disease-causing microorganisms such as viruses, parasites, and some bacteria. These organisms can cause short term symptoms such as nausea, cramps, diarrhea, and associated headaches.	Soil runoff	**n/a**
Uranium	30µg/L	Increased risk of cancer, kidney toxicity	Erosion of natural deposits	**zero**
Vinyl chloride	0.002	Increased risk of cancer	Leaching from PVC pipes; discharge from plastic factories	**zero**
Viruses (enteric)	TT[7]	Short-term exposure: Gastrointestinal illness (e.g., diarrhea, vomiting, cramps)	Human and animal fecal waste	**zero**
Xylenes (total)	10	Nervous system damage	Discharge from petroleum factories; discharge from chemical factories	**10**

LEGEND DISINFECTANT | DISINFECTION BYPRODUCT | INORGANIC CHEMICAL | MICROORGANISM | ORGANIC CHEMICAL | RADIONUCLIDES

NOTES

1 Definitions
- **Maximum Contaminant Level Goal (MCLG):** The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety and are non-enforceable public health goals.
- **Maximum Contaminant Level (MCL):** The highest level of a contaminant that is allowed in drinking water. MCLs are set as close to MCLGs as feasible using the best available treatment technology and taking cost into consideration. MCLs are enforceable standards.
- **Maximum Residual Disinfectant Level Goal (MRDLG):** The level of a drinking water disinfectant below which there is no known or expected risk to health. MRDLGs do not reflect the benefits of the use of disinfectants to control microbial contaminants.
- **Maximum Residual Disinfectant Level (MRDL):** The highest level of a disinfectant allowed in drinking water. There is convincing evidence that addition of a disinfectant is necessary for control of microbial contaminants.
- **Treatment Technique (TT):** A required process intended to reduce the level of a contaminant in drinking water.

2 Units are in milligrams per liter (mg/L) unless otherwise noted. Milligrams per liter are equivalent to parts per million (ppm).

3 Health effects are from long-term exposure unless specified as short-term exposure.

4 Each water system must certify annually, in writing, to the state (using third-party or manufacturers certification) that when it uses acrylamide and/or epichlorohydrin to treat water, the combination (or product) of dose and monomer level does not exceed the levels specified, as follows: Acrylamide = 0.05 percent dosed at 1 mg/L (or equivalent); Epichlorohydrin = 0.01 percent dosed at 20 mg/L (or equivalent).

5 Lead and copper are regulated by a Treatment Technique that requires systems to control the corrosiveness of their water. If more than 10 percent of tap water samples exceed the action level, water systems must take additional steps. For copper, the action level is 1.3 mg/L, and for lead is 0.015 mg/L.

6 A routine sample that is fecal coliform-positive or E. coli-positive triggers repeat samples--if any repeat sample is total coliform-positive, the system has an acute MCL violation. A routine sample that is total coliform-positive and fecal coliform-negative or E. coli-negative triggers repeat samples--if any repeat sample is fecal coliform-positive or E. coli-positive, the system has an acute MCL violation. See also Total Coliforms.

7 EPA's surface water treatment rules require systems using surface water or ground water under the direct influence of surface water to (1) disinfect their water, and (2) filter their water or meet criteria for avoiding filtration so that the following contaminants are controlled at the following levels:
- ***Cryptosporidium*:** 99 percent removal for systems that filter. Unfiltered systems are required to include Cryptosporidium in their existing watershed control provisions.
- **Giardia lamblia:** 99.9 percent removal/inactivation
- **Viruses:** 99.9 percent removal/inactivation
- ***Legionella*:** No limit, but EPA believes that if *Giardia* and viruses are removed/inactivated, according to the treatment techniques in the surface water treatment rule, *Legionella* will also be controlled.
- **Turbidity:** For systems that use conventional or direct filtration, at no time can turbidity (cloudiness of water) go higher than 1 nephelometric turbidity unit (NTU), and samples for turbidity must be less than or equal to 0.3 NTU in at least 95 percent of the samples in any month. Systems that use filtration other than the conventional or direct filtration must follow state limits, which must include turbidity at no time exceeding 5 NTU.
- **HPC:** No more than 500 bacterial colonies per milliliter
- **Long Term 1 Enhanced Surface Water Treatment:** Surface water systems or ground water systems under the direct influence of surface water serving fewer than 10,000 people must comply with the applicable Long Term 1 Enhanced Surface Water Treatment Rule provisions (e.g. turbidity standards, individual filter monitoring, *Cryptosporidium* removal requirements, updated watershed control requirements for unfiltered systems).
- **Long Term 2 Enhanced Surface Water Treatment:** This rule applies to all surface water systems or ground water systems under the direct influence of surface water. The rule targets additional *Cryptosporidium* treatment requirements for higher risk systems and includes provisions to reduce risks from uncovered finished water storages facilities and to ensure that the systems maintain microbial protection as they take steps to reduce the formation of disinfection byproducts. (Monitoring start dates are staggered by system size. The largest systems (serving at least 100,000 people) will begin monitoring in October 2006 and the smallest systems (serving fewer than 10,000 people) will not begin monitoring until October 2008. After completing monitoring and determining their treatment bin, systems generally have three years to comply with any additional treatment requirements.)
- **Filter Backwash Recycling:** The Filter Backwash Recycling Rule requires systems that recycle to return specific recycle flows through all processes of the system's existing conventional or direct filtration system or at an alternate location approved by the state.

8 No more than 5.0 percent samples total coliform-positive in a month. (For water systems that collect fewer than 40 routine samples per month, no more than one sample can be total coliform-positive per month.) Every sample that has total coliform must be analyzed for either fecal coliforms or E. coli. If two consecutive TC-positive samples, and one is also positive for E. coli or fecal coliforms, system has an acute MCL violation.

9 Although there is no collective MCLG for this contaminant group, there are individual MCLGs for some of the individual contaminants:
- **Haloacetic acids:** dichloroacetic acid (zero); trichloroacetic acid (0.3 mg/L)
- **Trihalomethanes:** bromodichloromethane (zero); bromoform (zero); dibromochloromethane (0.06 mg/L)

NATIONAL SECONDARY DRINKING WATER REGULATION

National Secondary Drinking Water Regulations are non-enforceable guidelines regarding contaminants that may cause cosmetic effects (such as skin or tooth discoloration) or aesthetic effects (such as taste, odor, or color) in drinking water. EPA recommends secondary standards to water systems but does not require systems to comply. However, some states may choose to adopt them as enforceable standards.

Contaminant	Secondary Maximum Contaminant Level
Aluminum	0.05 to 0.2 mg/L
Chloride	250 mg/L
Color	15 (color units)
Copper	1.0 mg/L
Corrosivity	Noncorrosive
Fluoride	2.0 mg/L
Foaming Agents	0.5 mg/L
Iron	0.3 mg/L
Manganese	0.05 mg/L
Odor	3 threshold odor number
pH	6.5-8.5
Silver	0.10 mg/L
Sulfate	250 mg/L
Total Dissolved Solids	500 mg/L
Zinc	5 mg/L

FOR MORE INFORMATION ON EPA'S SAFE DRINKING WATER:

visit: **epa.gov/safewater**

call: **(800) 426-4791**

ADDITIONAL INFORMATION:

To order additional posters or other ground water and drinking water publications, please contact the National Service Center for Environmental Publications at: **(800) 490-9198**, or email: **nscep@bps-lmit.com**.

OFFICE OF GROUND WATER AND DRINKING WATER

2855 Kaee Loop Resample Results
Chemistry Results
Drinking Water Sampling, JBPHH, Oahu Hawaii

Location ID:					B1-KAEE2855B	B1-KAEE2855B	B1-KAEE2855A	B1-KAEE2855A	B1-KAEE2855B	B1-KAEE2855C	B1-KAEE2855D	B1-KAEE2855E	B1-KAEE2855E	B1-KAEE2855E	B1-KAEE2855F	B1-KAEE2855F
Location Type:					Residence	Residence	Residence	Residence	Residence	Residence	Residence	Residence	Residence	Residence	Residence	Residence
Residence:					2855B Kaee Loop	2855B Kaee Loop	2855A Kaee Loop	2855A Kaee Loop	2855B Kaee Loop	2855C Kaee Loop	2855D Kaee Loop	2855E Kaee Loop	2855E Kaee Loop	2855E Kaee Loop	2855F Kaee Loop	2855F Kaee Loop
Field Sample ID:					220127B1FT03	220129B1AT04	B1-TW-0017588-22048-3-N-72	B1-TW-0017588-22048-N-72	B1-TW-0017477-22048-N-72	B1-TW-0017589-22048-N-72	B1-TW-0017590-22048-N-72	B1-TW-0017591-22048-3-N	B1-TW-0017591-22048-N	B1-TW-0017591-22048-N-72	B1-TW-0017592-22048-N	B1-TW-0017592-22048-N-72
Sample Date:					2022-01-27	2022-01-29	2022-02-20	2022-02-20	2022-02-21	2022-02-21	2022-02-20	2022-02-17	2022-02-17	2022-02-20	2022-02-18	2022-02-21
Sample Type:					N	N (72 Hour Stagnation)	FD (72 Hour Stagnation)	N (72 Hour Stagnation)	N (72 Hour Stagnation)	N (72 Hour Stagnation)	N (72 Hour Stagnation)	FD	N	N (72 Hour Stagnation)	N	N
GENCHEM (mg/L)	**Incident Specific Parameters**	**DOH Environmental Action Levels Table D-1A Groundwater Action Levels**	**DOH Safe Drinking Water Branch (SDWB) Regulatory Constituents**	**Environmental Protection Agency Maximum Contaminant Levels**	**SDG: C22A053rev1**	**SDG: C22A063rev2**						**SDG: DA42162**	**SDG: DA42162**			
Total Organic Carbon	2	None	None	None	0.200 U	0.200 U	--	--	--	--	--	**0.620**	0.200 U	--	--	--
HC (µg/L)	**Incident Specific Parameters**	**DOH Environmental Action Levels Table D-1A Groundwater Action Levels**	**DOH Safe Drinking Water Branch (SDWB) Regulatory Constituents**	**Environmental Protection Agency Maximum Contaminant Levels**	**SDG: 580109750 1**	**SDG: DA41377**						**SDG: DA42162**	**SDG: DA42162**			
Petroleum Hydrocarbons (as Diesel)	200	400	None	None	110 U	190 U	--	--	--	--	--	52.0 U	52.0 U	--	--	--
Petroleum Hydrocarbons (as Gasoline)	200	300	None	None	100 U	40.0 U	--	--	--	--	--	40.0 U	40.0 U	--	--	--
Petroleum Hydrocarbons (as Motor Oil)	200	500	None	None	210 U	190 U	--	--	--	--	--	52.0 U	52.0 U	--	--	--
HG (µg/L)	**Incident Specific Parameters**	**DOH Environmental Action Levels Table D-1A Groundwater Action Levels**	**DOH Safe Drinking Water Branch (SDWB) Regulatory Constituents**	**Environmental Protection Agency Maximum Contaminant Levels**	**SDG: 810133881**	**SDG: DA41377**						**SDG: DA42162**	**SDG: DA42162**			
Mercury	0.025	0.025	2	2	0.0560 U	0.0250 U	--	--	--	--	--	0.0250 U	0.0250 U	--	--	--
METAL (µg/L)	**Incident Specific Parameters**	**DOH Environmental Action Levels Table D-1A Groundwater Action Levels**	**DOH Safe Drinking Water Branch (SDWB) Regulatory Constituents**	**Environmental Protection Agency Maximum Contaminant Levels**	**SDG: 810133881**	**SDG: DA41377**						**SDG: DA42162**	**SDG: DA42162**			
Antimony	6	6	6	6	0.0570 U	0.100 U	--	--	--	--	--	0.100 U	0.100 U	--	--	--
Arsenic	10	10	10	10	0.890 U	0.500 U	--	--	--	--	--	0.500 U	0.500 U	--	--	--
Barium	220	220	2000	2000	**2.00**	**2.10**	--	--	--	--	--	**2.00**	**2.00**	--	--	--
Beryllium	0.66	0.66	4	4	0.0830 U	0.150 U	--	--	--	--	--	0.100 U	0.100 U	--	--	--
Cadmium	3	3	5	5	0.140 U	0.0500 UJ	--	--	--	--	--	0.100 U	0.100 U	--	--	--
Chromium	11	11	100	100	**1.70**	**1.30 J**	--	--	--	--	--	**2.00**	**1.80 J**	--	--	--
Copper	2.9	2.9	1300	1300	**19.0**	**17.8**	--	--	--	--	--	**15.0**	**14.0**	--	--	--
Lead	15	5.6	15	15	**1.10**	**0.150 J**	--	--	--	--	--	**0.200 J**	**0.100 J**	--	--	--
Selenium	5	5	50	50	1.60 U	0.300 UJ	--	--	--	--	--	0.300 U	0.300 U	--	--	--
Thallium	2	2	2	2	0.160 U	0.0500 U	--	--	--	--	--	0.100 U	0.100 U	--	--	--
SVOC (µg/L)	**Incident Specific Parameters**	**DOH Environmental Action Levels Table D-1A Groundwater Action Levels**	**DOH Safe Drinking Water Branch (SDWB) Regulatory Constituents**	**Environmental Protection Agency Maximum Contaminant Levels**	**SDG: 810133881**	**SDG: DA41377R**	**SDG: DA42206**	**SDG: DA42206**	**SDG: DA42206**	**SDG: DA42206**	**SDG: DA42206**	**SDG: DA42162**	**SDG: DA42162**	**SDG: DA42206**	**SDG: DA42167**	**SDG: DA42259**
1-Methylnaphthalene	2.1	10	None	None	0.0200 U	0.240 U	0.240 U	0.240 U	0.240 U	0.240 U	0.240 U	0.240 U	0.240 U	0.240 U	0.250 U	0.240 U
2-Methylnaphthalene	4.7	10	None	None	0.0200 U	0.240 U	0.240 U	0.240 U	0.240 U	0.240 U	0.240 U	0.240 U	0.240 U	0.240 U	0.250 U	0.240 U
Benzo(a)pyrene	0.06	0.06	0.2	0.2	0.00990 U	0.00950 U	0.00950 U	0.00950 U	0.00960 U	0.00950 U	0.00950 U	0.00950 U	0.00950 U	0.00950 U	0.0100 U	0.00960 U
Bis(2-ethylhexyl)phthalate	3	3	6	6	0.600 U	**42.4 J**	0.380 U	0.380 U	0.380 U	0.380 U	0.380 U	0.380 U	0.380 U	0.380 U	0.400 U	0.380 U
Naphthalene	12	17	None	None	0.0200 U	0.240 U	0.240 U	0.240 U	0.240 U	0.240 U	0.240 U	0.240 U	0.240 U	0.240 U	0.250 U	0.240 U
VOC (µg/L)	**Incident Specific Parameters**	**DOH Environmental Action Levels Table D-1A Groundwater Action Levels**	**DOH Safe Drinking Water Branch (SDWB) Regulatory Constituents**	**Environmental Protection Agency Maximum Contaminant Levels**	**SDG: C22A053rev1**	**SDG: C22A063rev2**						**SDG: DA42162**	**SDG: DA42162**			
1,1,1-Trichloroethane	11	11	200	200	0.119 U	0.119 U	--	--	--	--	--	0.500 U	0.500 U	--	--	--
1,1,2-Trichloroethane	5	5	3	5	0.288 U	0.288 U	--	--	--	--	--	0.500 U	0.500 U	--	--	--
1,1-Dichloroethene	7	7	7	7	0.128 U	0.128 U	--	--	--	--	--	0.500 U	0.500 U	--	--	--
1,2,4-Trichlorobenzene	70	70	70	70	0.318 U	0.318 U	--	--	--	--	--	0.500 U	0.500 U	--	--	--
1,2-Dichlorobenzene	10	10	600	600	0.272 U	0.272 U	--	--	--	--	--	0.500 U	0.500 U	--	--	--
1,2-Dichloroethane	5	5	5	5	0.0884 U	0.0884 U	--	--	--	--	--	0.500 U	0.500 U	--	--	--
1,2-Dichloropropane	5	5	5	5	0.129 U	0.129 U	--	--	--	--	--	0.500 U	0.500 U	--	--	--
1,4-Dichlorobenzene	5	5	75	None	0.245 U	0.245 U	--	--	--	--	--	0.500 U	0.500 U	--	--	--
Benzene	5	5	5	5	0.0846 U	0.0846 U	--	--	--	--	--	0.500 U	0.500 U	--	--	--
Carbon Tetrachloride	5	5	5	5	0.165 U	0.165 U	--	--	--	--	--	0.500 U	0.500 U	--	--	--
Chlorobenzene	25	25	100	100	0.146 U	0.146 U	--	--	--	--	--	0.500 U	0.500 U	--	--	--
cis-1,2-Dichloroethene	70	70	70	70	0.0570 U	0.0570 U	--	--	--	--	--	0.500 U	0.500 U	--	--	--
Ethylbenzene	700	7.3	700	700	0.141 U	0.141 U	--	--	--	--	--	0.500 U	0.500 U	--	--	--
m,p-Xylene	10000	13	None	None	0.317 U	0.317 U	--	--	--	--	--	0.500 U	0.500 U	--	--	--
Methylene chloride	5	5	5	5	2.15 U	2.15 U	--	--	--	--	--	0.500 U	0.500 U	--	--	--
o-Xylene	10000	13	None	None	0.157 U	0.157 U	--	--	--	--	--	0.500 U	0.500 U	--	--	--
Styrene	10	10	100	100	0.224 U	0.224 U	--	--	--	--	--	0.500 U	0.500 U	--	--	--
Tetrachloroethene (PCE)	5	5	5	5	0.125 U	0.125 U	--	--	--	--	--	0.500 U	0.500 U	--	--	--
Toluene	1000	9.8	1000	1000	0.120 U	0.120 U	--	--	--	--	--	0.500 U	0.500 U	--	--	--
trans-1,2-Dichloroethene	100	100	100	100	0.0958 U	0.0958 U	--	--	--	--	--	0.500 U	0.500 U	--	--	--
Trichloroethene (TCE)	5	5	5	5	0.0574 U	0.0574 U	--	--	--	--	--	0.500 U	0.500 U	--	--	--
Vinyl chloride	2	2	2	2	0.611 U	0.611 U	--	--	--	--	--	0.500 U	0.500 U	--	--	--
Xylenes, Total	10000	13	10000	10000	--	--	--	--	--	--	--	0.500 U	0.500 U	--	--	--

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING SYSTEMS COMMAND, HAWAII
400 MARSHALL ROAD
JBPHH, HAWAII 96860-3139

11000
Ser PWO/0097
February 19, 2022

Interagency Drinking Water System Team

SUBJECT: CERTIFICATION OF IRRIGATION LINE FLUSHING – JOINT BASE PEARL HARBOR-HICKAM - ZONE B1

On behalf of the United States Department of the Navy, operator of the Joint Base Pearl Harbor-Hickam Public Water System (PWS ID No. 360 Water System), and in connection with and pursuant to the removal action required by the DOH Hazard Evaluation and Emergency Response Office Incident Case No. 20211128-1848, the undersigned certifies that the Navy has made all necessary inquiry into their Water System and represents and warrants as set forth below.

Landscape irrigation systems in Zone B1, generally known as McGrew Point and Halawa Housing, have been operated and flushed following Dept. of Health guidance, and subsequent to the approved distribution line flushing conducted in December, 2021.

The undersigned has due authority to deliver this Certification on behalf of the Navy.

Sincerely,

HARMEYER.RANDALL.ERNEST.1186692663
Digitally signed by HARMEYER.RANDALL.ERNEST.1186692663
Date: 2022.02.19 07:26:16 -10'00'

R. E. HARMEYER
Captain, CEC, U.S. Navy
Public Works Officer
By Direction
of the Commanding Officer

DOH Guidance for Active Irrigation Line Purging and Flushing

Given the minimal quantities and concentration of fuel contamination in the irrigation lines, along with the expected degradation due to time, the following guidance lines are being provided:

System operator responsibility:

- Determine what the irrigation system pipe size is (for volume calculations).
- Calculate the approximate amount of time needed to complete 3 volumetric turnovers of the subject line (est. duration per foot).
- Assess how long each line will need to be purged/flushed based on the above estimates.
- Notify community.
- Cover or otherwise minimize any spray from the system (traffic cone) in order to prevent contact.
- Purge irrigation system under supervision for the estimated duration.
- Allow ground to absorb and dry.
- Notify residents to avoid area for the next 24 hours.
- Prevent/minimize any runoff.
- Prevent contact with the irrigation water.

Navy/Army must develop a standard operating procedure incorporating the above guidance and provide training to personnel responsible for execution of the irrigation line purging/flushing.