August 29, 2025

Kenneth S. Fink, MD, MGA, MPH
Director of Health
Hawaii Department of Health (HDOH)
Kinau Hale
1250 Punchbowl Street
Honolulu, Hawaii 96813

Subject: **Final Summary Report – Specialty Laboratory and Field Support for HDOH CAB – Ambient Community Air Monitoring in Response to Wildfire Cleanup Actions – Lahaina, Maui County, Hawaii. Rev. 1**
Contract No. TO 23206/Project Number 103S9230

Dear Dr. Fink:

Hawaii Department of Health (HDOH) Clean Air Branch (CAB) tasked Tetra Tech, Inc., under Task Order 23206 and Project 103S9230, to perform ambient community air monitoring in response to debris removal and asbestos abatement operations in Lahaina, Maui.

Ambient community air monitoring plans were implemented to help protect the overall community, sensitive populations, and receptors on neighboring properties during debris cleanup operations. Activities consisted of integrated air sampling, real-time air monitoring, and reporting. Field activities were conducted from January 13, 2024, to February 19, 2025.

This Final Summary Report overviews this work and provides analytical summaries and documentation for each location within the scope of work. Comments received by HDOH have been incorporated into this Final Summary Report. As such, all content, technical approaches, and findings of the Final Summary Report have been reviewed and approved by HDOH.

Sincerely,

Chelsea Saber
Project Manager
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Lahaina, Maui
Ambient Community Air Monitoring
Final Summary Report
Revision 1

Prepared for

Hawaii Department of Health Clean Air Branch
Kinau Hale
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August 29, 2025

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ACRONYMS AND ABBREVIATIONS

µg/m^3	Microgram per cubic meter
µm	Micrometer
CAB	Clean Air Branch
CAMP	Community Air Monitoring Plan
CAMSP	Community Air Monitoring and Sampling Plan
CFR	Code of Federal Regulations
EBAM	Environmental beta attenuation mass monitors
F	Fahrenheit
f/cc	Fibers per cubic centimeter
HDOH	Hawaii Department of Health
HV	High volume
ICP/M	Inductively Coupled Plasma/Mass Spectrometry
ISO	International Organization for Standardization
L	Liters
L/min	Liters per minute
MCE	Mixed Cellulose Ester
mg/kg	Milligrams per kilogram
mm	Millimeter
PCM	Phase contrast microscopy
PCMe	Phase contrast microscopy equivalent
PDF	Portable digital format
PII	Personally identifiable information
PLM	Polarized light microscopy
PM	Particulate Matter
$PM_{2.5}$	Diameter less than 2.5-micrometers
PM_{10}	Diameter less than 10-micrometers
PPE	Personal protective equipment
QA/QC	Quality Assurance/Quality Control
s/cc	Structures per cubic centimeter
SOP	Standard Operating Procedure
SOW	Scope of Work
SPM	Suspended Particulate Matter
SQL	Structured Query Language
SSAL	Site-Screening Action Levels
TAT	Turnaround time
Tetra Tech	Tetra Tech, Inc.
TWA	Time weighted average
USACE	United States Army Corps of Engineers
U.S. EPA	United States Environmental Protection Agency

EXECUTIVE SUMMARY

In 2023, wildfires burned more than 1,500 parcels within Maui, with over 2,200 structures damaged or destroyed. The post-wildfire remediation effort had been divided into two projects: Kula and Lahaina. In response to the U.S. Army Corps of Engineers (USACE) debris removal program, the Hawaii Department of Health (HDOH) Clean Air Branch (CAB) initiated an air monitoring and sampling program for both projects to help protect the overall community, sensitive populations and receptors on neighboring properties during the debris cleanup operations.

This report provides all data and information exclusive to the Lahaina project. A final summary report discussing air monitoring and sampling for the Kula project was submitted separately to HDOH on April 26, 2024.

Tetra Tech, Inc. (Tetra Tech) conducted community air monitoring and sampling in Lahaina to determine the airborne concentrations of contaminants of concern related to debris removal operations. This monitoring also allowed the evaluation of best management practices and engineering controls. Because this sampling was conducted during debris removal activities, the results offer a quantifiable estimation of airborne ambient concentrations in the community.

Air monitoring, consisting of monitoring particulate matter (PM) with a diameter less than 10 micrometers (µm) (PM_{10}), and air sampling for asbestos and metals took place throughout the duration of the project. Tetra Tech provided these ambient community air monitoring and sampling services, as well as meteorological data reporting and weekly reporting services for HDOH from January 13, 2024, to February 19, 2025. All activities were conducted under the oversight and approval of the HDOH CAB and in accordance with the Specialty Laboratory and Field Support for HDOH – Ambient Community Air Monitoring Sampling Plan (CAMSP) directive in response to the Wildfire Cleanup Actions, Revision 2, dated May 23, 2024 (**Attachment 1**), and activity-specific work plans. During this project, air monitoring and sampling took place at a total of nine HDOH-selected monitoring and sampling locations, with four stations active at a time. These locations are shown in **Figure 1.**

The comprehensive air monitoring program was conducted over 403 days, from January 13, 2024, to February 19, 2025. Over the course of this program, a total of 1,606 particulate monitoring files and 3,081 air samples were collected, excluding any method-required quality control samples (field or laboratory blanks). Ambient air samples for asbestos (1,556 samples) and metals (1,525 samples) were collected at a total of nine locations, with four air monitoring and sampling stations active at a time.

A brief overview of the data collected includes the following:

- Of the 1,606 particulate monitoring files collected over the course of 403 days, PM_{10} levels exceeded the site screening action levels (SSALs) twenty-eight times over 22 days.
- Based on field observations, none of these PM_{10} exceedances were directly attributable to the USACE operations. The main causes of exceedances resulted from air stations' proximity to nearby highways and environmental or outside factors such as high winds and/or high humidity.
- None of the 1,556 asbestos samples collected exceeded the project's SSALs.
- Of the 1,525 metals-in-air samples collected, results exceeded the SSALs in six instances.
    - Nickel exceedances (above the SSAL of 0.02 µg/m^3) were recorded at three separate instances: at Leialii Hawaiian Homelands (AM-01) on March 4, 2024, with concentrations of 0.0544 µg/m^3 and 0.0678 µg/m^3 following re-analysis, at Opukea

Townhomes (AM-05) on August 25, 2024, with a concentration of 0.0253 µg/m^3, and at Lahaina Recreational Center (AM-07) on September 27, 2024, with a concentration of 0.0219 µg/m^3.

- One arsenic exceedance (above the SSAL of 0.05 µg/m^3) was recorded at Leialii Hawaiian Homelands (AM-01) on June 4, 2024, with concentrations of 0.537 µg/m^3 and 0.499 µg/m^3 following re-analysis.
- Two manganese exceedances (above the SSAL of 0.12 µg/m^3) were recorded at Opukea Townhomes (AM-05) and at WW Pump Station #4 (AM-02) on August 25, 2024, with concentrations of 0.165 µg/m^3 and 0.123 µg/m^3, respectively.

- Of these six exceedances, a review of site observations indicates one may have been attributable to debris removal operations: nickel on March 4, 2025, at Leialii Hawaiian Homelands (AM-01).

A detailed discussion of each exceedance is provided in Section 3.6. Background metals-in-soil concentration data was obtained from the Hawaii Department of Health Hazard Evaluation and Emergency Response Office. The provided report describes the concentrations of metals in soil on the Hawaiian Islands (HDOH 2012). Tetra Tech refined the data by averaging the soil concentrations of arsenic, nickel, and manganese on Maui. The mean background soil concentrations on Maui are as follows: arsenic is 4.54 mg/kg, nickel is 62.84 mg/kg, and the mean background concentration of manganese on Maui is 813.88 mg/kg. Disturbances of native soil were observed from a variety of sources, including USACE and private contractors, high winds across bare soil and highway activity. Considering background concentrations, this may have been a contributing factor in SSAL exceedances.

Over the course of this project, as noted in appropriate weekly reports, a majority of SSAL exceedances were likely related to non-debris removal activities. These include instances of weather conditions such as rain, wind, or heavy fog impacting monitoring equipment and, in some instances, county or private contractor activities taking place near sampling locations. Where these factors impacted results, Tetra Tech has provided notes in the weekly reports and described them below as appropriate. Weather data was also collected throughout this project and is included in **Appendix A**.

In summary, all asbestos samples resulted in analytical results below the SSALs, with a small percentage of metals exceedances and particulate exceedances that were often not attributable to USACE operations. The low particulate concentrations and rare exceedances of SSALs indicate that best management practices/fugitive dust control actions were implemented during the cleanup and appropriate for the activities. USACE operations and associated activities appear to have presented minimal impact to the community's air quality, as SSAL's established were based on an exposure duration of one year.

This report provides HDOH with more details regarding the above findings.

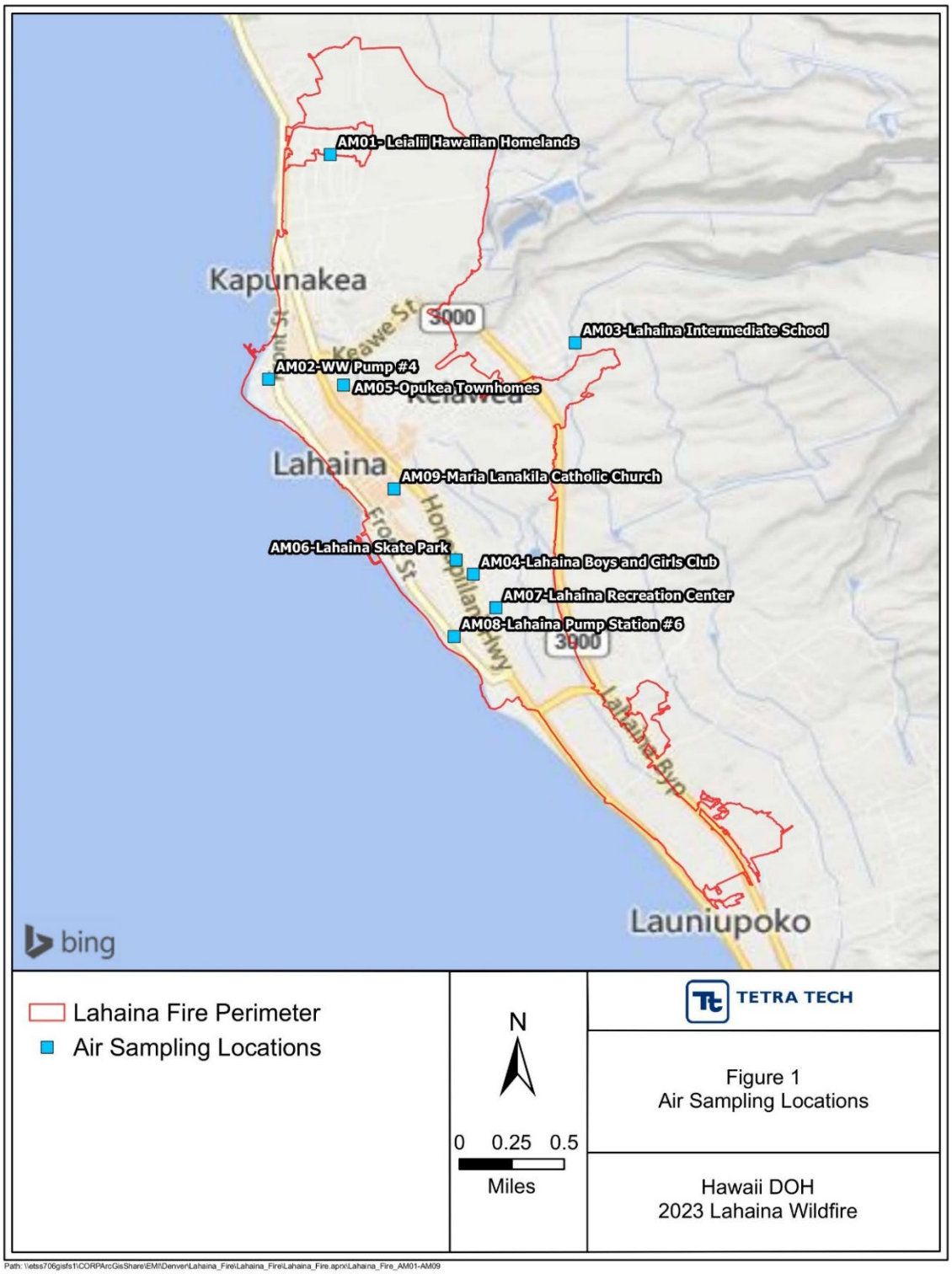

Figure 1 - Lahaina Community Locations

1.0 INTRODUCTION

This Ambient Community Air Monitoring Final Summary Report provides the results of air sampling and monitoring efforts for Lahaina, Maui. This section discusses the background, scope of work (SOW), and report content.

1.1 BACKGROUND

High winds from Hurricane Dora south of Hawaii and dry weather contributed to the development of wildfires in Lahaina, Upper Kula, Pūlehu/Kihei, and Ka‘anapali on the island of Maui on August 8, 2023. The wildfires affected approximately 1,550 parcels and 2,200 structures.

Tetra Tech was tasked by the HDOH Clean Air Branch (CAB) to create and implement a Community Air Monitoring and Sampling Plan (CAMSP) for the Lahaina fire area. Tetra Tech developed this plan in consultation with HDOH CAB and Maui County.

1.2 SCOPE OF WORK

During USACE debris removal and asbestos abatement activities, Tetra Tech conducted comprehensive air monitoring and sampling to assess airborne exposure routes to demonstrate the effectiveness of best management practices and engineering controls used during debris removal and asbestos abatement activities. Air monitoring and sampling data were used to evaluate whether populations in the community were impacted by these activities.

To accomplish the above objectives, Tetra Tech conducted the following field work related to community air monitoring and sampling (weather and site conditions permitting):

- Recorded meteorological data, including temperature, relative humidity, wind direction, wind speed, and current weather conditions.
- Established community air monitoring and sampling stations at locations designated by the CAB.
- Conducted particulate monitoring in accordance with the procedures described in the CAMSP.
- Conducted ambient air sampling for metals and asbestos as applicable.
- Documented all activities, including data, field measurements, and deviations from the CAMSP in a field logbook, on field sheets, or using digital forms.
- Performed Stage 1 data verification of all analytical laboratory reports.
- Reviewed and verified data for the appropriate quality assurance objectives.
- Reported any results above the Site-Screening Action Levels (SSALs) to HDOH CAB.
- Provided weekly summary reports with results from air monitoring and sampling.

1.3 REPORT CONTENT

This summary report documents air sampling and monitoring related to debris removal and abatement activities in Lahaina, Maui. This summary report includes text, references, appendices, and attachments necessary to document the completed SOW.

- Section 1 presents the project background, SOW, and report content.
- Section 2 summarizes data management activities conducted during the response.
- Section 3 presents environmental site activities and results for air monitoring and sampling.
- Section 4 provides references.

Appendices provide supporting information prepared for the summary report, including meteorological data, particulate and air monitoring summaries, and data verification reports.

Attachments include existing documentation or information previously prepared in support of the summary report, documents previously submitted by Tetra Tech in support of the debris removal program, and all of the weekly reports containing comprehensive analytical results.

This report provides a summary of Tetra Tech's support and provides analytical summaries and documentation for the nine stations established within the project area. All content, technical approaches, and findings of the final report will have been reviewed and approved by HDOH.

2.0 DATA MANAGEMENT

Structured and well-defined data management practices provide an important foundation for decision-making in the field and for maintaining data integrity throughout all elements of reporting. With consistent and structured data management practices, errors that may have been introduced during field collection and processing of data were minimized.

The major elements of data management for the project throughout the debris and asbestos abatement process are presented below.

1. **Data Collection, Transmission, and Storage.** Collecting accurate initial data minimized opportunities for human/user error and avoided the need for transcription or labor-intensive data handling.

   Data was passed from its point of origin during the collection phase to an established data repository. A variety of methods and technologies were used to transmit data, based on the type of data being transmitted. Secure repositories were used and were critical to ensuring data integrity. Data repositories were selected for their ability to support advanced data analysis and visualization.
2. **Data Verification.** Multiple quality assurance/quality control (QA/QC) procedures and steps were developed and applied to ensure data completeness and accuracy.
3. **Data Analysis, Reporting, and Visualization.** Qualified scientists then interpreted data to aid in drawing meaningful conclusions to support decision-making.

Maintaining data integrity and accuracy was a primary driver for all data management efforts. Information about the four major phases of the project's data lifecycle is provided below.

2.1 DATA COLLECTION, TRANSMISSION, AND STORAGE

Data for this project included assessment field notes, monitoring, and sampling information. Field notes were recorded on hard copy and electronic project-specific collection forms. Standardized forms were used for pump calibrations, station checks, and field audits. Monitoring data was downloaded from instruments at the end of each day and peer reviewed and verified against the appropriate QA objectives. Daily time-weighted averages (TWAs) for particulate concentrations were calculated from the logged data from each

community particulate monitor and compared to SSALs. Any readings above the SSALs were reported directly to HDOH CAB.

Field measurements were collected and recorded via monitoring on field data sheets and on digital forms using tablets, as well as through direct downloads. Data was evaluated daily as it was collected (particulate monitoring) and received from the laboratory (air sample analytical results) to identify and report any elevated results or screening level exceedances.

All electronic data was stored in a central database (SQL server) that is managed by Tetra Tech. Analytical data was generated by laboratories and provided to Tetra Tech as electronic data deliverables (EDD) and data packages. Analytical data provided by the laboratories was coupled with the monitoring data collected by field personnel.

2.2 DATA VERIFICATION

Air sampling results were received from the off-site analytical laboratories as both electronic data deliverables (EDD) and portable document formats (PDF). All reported data underwent data verification procedures and verification quality control under the supervision of a Chemist (Level 1 Data Verification). Any data qualifications or limitations were noted. Verified analytical data was maintained in an electronic database and compared to project-specific screening levels. Data verification reports are included in **Appendix B**.

Analytical data verification generally consisted of a completeness check to confirm that all the data that was requested from the laboratory was received, and that the lab data complied with specified requirements. Stage 1 verification included a compliance review of sample receipt conditions, of the chain of custody, that all samples were accounted for, that the requested analytical methods were performed, that the analytes dates and results were provided, that all qualifications are defined, and that each lab report contained the units, method detection limits, and reporting limits.

2.3 DATA ANALYSIS AND REPORTING

Any particulate monitoring or air sampling results from community locations that exceeded SSALs were sent to the Operations Division of the HDOH CAB. Analytical data was also shared with HDOH following Level 1 verification.

A weekly summary report of particulate monitoring and air sample results was made available to HDOH CAB. These reports presented verified data from samples collected two weeks prior. The reporting week's schedule was as follows: samples were shipped on Mondays and Thursdays each week, with results received on Fridays and Tuesdays. These results then went through Level 1 data verification and were reported to HDOH CAB. Revised reports were submitted to add data for any sample results that were not received in time or that had not yet gone through proper verification.

2.4 PERSONALLY IDENTIFIABLE INFORMATION (PII)

Tetra Tech implements and uses administrative and technical safeguards that reasonably and appropriately protect the confidentiality, integrity, and availability of PII that it creates, receives, maintains, or transmits. These safeguards include the following:

- Encryption of PII that Tetra Tech stores and transmits.
- Implementation of strong access controls, including firewalls, and strong passwords.
- Use of updated antivirus software.

- Adoption of contingency planning policies and procedures, including data backup and disaster recovery plans.
- Conduct of periodic security training.

3.0 AIR MONITORING AND SAMPLING ACTIVITIES

This section summarizes air monitoring and sampling activities conducted as described in the CAMSP, Revision 2, May 23, 2024 (Tetra Tech, 2024). The CAMSP addresses air monitoring procedures, air sampling procedures, background air monitoring and sampling, community air monitoring and sampling, and deviations from the sampling plan. Complete analytical results from air sampling are provided in **Attachment 2**.

3.1 SAMPLE LOCATION SELECTION

HDOH selected the original sample locations based on providing an even distribution, encompassing the community surrounding the entire work area, and site access or approvals. **Table 3-1** lists all active date ranges of the selected sample/monitoring locations along with their respective name and station ID.

Table 3-1 - Particulate and Sampling Air Monitoring Location Dates

Sampling Dates	Station ID	Station Name
1/13/2024 - 8/23/2024	AM-01	Leialii Hawaiian Homelands
1/13/2024 - 2/19/2025	AM-02	WW Pump Station #4
1/13/2024 - 1/18/2025	AM-03	Lahaina Intermediate School
1/14/2024 - 8/24/2024	AM-04	Lahaina Boys & Girls Club
8/23/2024 - 2/19/2025	AM-05	Opukea Townhomes
8/24/2024 - 9/13/2024	AM-06	Lahaina Skate Park
9/13/2024 - 12/20/2024	AM-07	Lahaina Recreational Center
12/20/2024 - 2/19/2025	AM-08	Lahaina Pump Station #6
1/18/2025 - 2/19/2025	AM-09	Maria Lanakila Catholic Church

At the request of HDOH, and as indicated in the table above, five stations were relocated throughout the project's monitoring period. Details of each station moved, the new location, and rationale for the change are listed below.

- On August 23, 2024, the station located at Leialii Hawaiian Homelands (AM-01) was relocated to Opukea Townhomes (AM-05) to better accommodate the change in active areas of removal activities conducted by the USACE.
- On August 24, 2024, the station located at Lahaina Boys and Girls Club (AM-04) was relocated to Lahaina State Park (AM-06) to better accommodate the change in active areas of removal activities conducted by the USACE.
- On September 13, 2024, the station located at Lahaina State Park (AM-06) was relocated to Lahaina Recreational Center (AM-07) because the monitoring and sampling station was being disproportionately affected by proximity to the nearby highway.
- On December 20, 2024, the station located at Lahaina Recreational Center (AM-07) was relocated to Lahaina Pump Station #6 (AM-08) because the Lahaina Recreational Center was resuming operations at the baseball field.

- On January 18, 2025, the station located at Lahaina Intermediate School (AM-03) was relocated to Maria Lanakila Catholic Church (AM-09) to better accommodate the change in active areas of removal activities conducted by the USACE.

3.2 AIR MONITORING PROCEDURES

Ambient air monitoring was conducted using Met One Instruments, Inc., Environmental Beta Attenuation Mass monitors (E-BAM) to assess real-time particulate concentrations. At each ambient air location, E-BAMs continuously logged concentrations of particulate matter (PM) with a diameter less than 10 micrometers (µm) (PM_{10}) at 1-minute intervals.

This summary report does not address air quality monitoring results for fine particulate matter (particle size diameter of 2.5 µm or less [$PM_{2.5}$]). The Department of Health/U.S. Environmental Protection Agency (U.S. EPA) monitored for this parameter at six locations in Lahaina. The near real-time results of that monitoring were made publicly available at https://fire.airnow.gov/.

Field personnel conducted system checks on the air monitoring stations at a frequency of at least three times each day to ensure equipment was functional and to document particulate concentrations. System checks assessed the physical condition of the equipment, whether the units were collecting data, and current readings to determine whether the readings were approaching or exceeding the SSALs. Data files from each location were downloaded and reviewed at the end of each day to identify data exceedances, irregularities, or concerns requiring further investigation or correction. E-BAMs are factory-calibrated annually and do not require daily calibration (except for a leak check and a flow audit, which Tetra Tech performed before sampling and monthly, in accordance with the manufacturer's procedures).

Meteorological data, including temperature, relative humidity, wind direction, wind speed, and current weather conditions, were recorded where air monitoring activities took place. A summary of meteorological data is included in **Appendix A**.

A summary of the particulate monitoring dataset collected during removal activities is included in **Appendix C**. Information such as dates, 24-hour TWAs, and particulate concentrations are provided for each location. Data files were identified by their respective assigned acronyms (for example, AM-01 for Air Monitoring Location 01). There are no laboratory analytical results for particulate monitoring, as 24-hour TWAs for particulates were calculated at each location and compared to the project SSALs. Air monitoring data was captured digitally throughout the monitoring period. Elevated particulate concentrations were communicated directly to the HDOH, as necessary. At all locations, the dataset was reviewed and evaluated the following day. Particulate monitoring occurred at all locations, with the exception of instances discussed in **Section 3.8** of this report or otherwise directed by the HDOH.

3.3 AIR SAMPLING PROCEDURES

Ambient air samples were collected at community locations throughout debris removal and asbestos abatement operations. These samples were analyzed for asbestos and metals. Ambient air samples were collected using high-volume air samplers drawing air through filter media at specific calibrated flow rates. The sampling methods are summarized below for asbestos and metals.

Asbestos

Ambient asbestos-in-air samples were collected at each community sampling location with air sampling pumps (Casella Vortex or similar). The samples were collected on a 25-millimeter (mm) open-face, 0.45-µm MCE sample cassette with a conductive cowl mounted on a 4- to 5-foot-high cassette tripod stand that was attached to each air pump. The opening faced downward at a 45-degree angle. Air pumps were

calibrated at a flow rate of approximately 4-5 liters per minute (L/min). The flow rate of the assembled ambient air sampling train was calibrated before sample collection and measured after sample collection using a primary gas flow calibrator, such as a Bios DryCal DC-Lite. The flow rate during the sample period was determined by averaging the two readings. The average daily air monitoring and sampling duration was approximately 24 hours or 1,440 minutes per day at each location. During this sampling time, approximately 6,480 L of air was collected.

To avoid the potential for sample filter over-loading (particularly if visibly dusty conditions were observed during sample periods), Tetra Tech staff performed periodic visual inspections of each filter in the asbestos cowling during each sampling period.

All the ambient air samples underwent analysis via the International Organization for Standardization (ISO) method 10312:1995I, "Ambient Air – Determination of Asbestos Fibers – Direct Transfer Transmission Electron Microscopy Method." ISO 10312 (ISO 2019) results were reported as phase contrast microscopy equivalent (PCMe) results in structures per cubic centimeter (s/cc) using counting rules that were considered equivalent to fibers per cubic centimeters (f/cc). PCMe results were compared to project SSALs as data was reported by the laboratory. Calculations were performed for the 95 percent upper confidence limit of the mean of the data over the project duration intervals. The laboratory turnaround time for these samples was 72 hours. Analytical results were uploaded to the project database and posted online in a secure folder shared with the HDOH CAB following Level 1 data verification.

Metals

Daily ambient air samples were collected for selected metals at each of the community sampling locations. Ambient air samples for metals were collected with a Tisch Environmental High Volume Air Sampler and collocated with the particulate monitors and asbestos samplers described above.

Ambient air sampling methods require larger sampling devices and media that can draw significantly more air volume than methods intended for occupational exposure assessments. As a result, air sampling for metals at community locations employed the following air sampling methods:

- U.S. EPA Method IO-2.1, Sampling of Ambient Air for Total Suspended Particulate Matter (SPM) and PM10 Using High Volume (HV) Sampler. EPA/625/R-96/010a. (USEPA 1999a)

- EPA IO Compendium Method IO-3.5: Compendium of Methods for the Determination of Inorganic Compounds in Ambient Air: Determination of Metals in Ambient Particulate Matter Using Inductively Coupled Plasma/Mass Spectrometry (ICP/M")." EPA/625/R-96/010a. (USEPA 1999b)

- EPA 40 Code of Federal Regulations (CFR) Part 50, Method for the Determination of Lead in Total Suspended Particulate Matter. (USEPA 2013)

- EPA 40 CFR Part 58, Appendix E: Probe and Monitoring Path Siting Criteria for Ambient Air Quality Monitoring. (USEPA 2024)

- Standard Operating Procedures for Lead Monitoring Using a TSP High Volume Sampler. (USEPA 2014.)

Samples were analyzed for the following metals: antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, manganese, molybdenum, nickel, selenium, thallium, vanadium, and zinc. Air sampling results were reviewed and compared to project SSALs as data were reported by the laboratory and calculations were performed for the 95 percent upper confidence limit of the mean of the data over the project duration intervals. Air sample laboratory results turnaround times were requested as needed to report

results within 7 days. Analytical results were uploaded to the project database and posted to a secure, online folder shared with the HDOH CAB following Level 1 data verification.

3.4 BACKGROUND AIR MONITORING AND SAMPLING

Tetra Tech initiated air monitoring activities on January 13, 2024, and air sample collection activities on January 14, 2024. Debris removal operations commenced on January 13, 2024. Therefore, Tetra Tech was unable to perform background air monitoring or sampling prior to any debris removal or asbestos abatement operations.

3.5 COMMUNITY AIR MONITORING AND SAMPLING

Ambient community air monitoring and sampling were conducted at four locations per day, pre-selected by the HDOH and in accordance with CAMSP in the Lahaina, Maui operational area, to assess the effectiveness of best management practices and engineering controls used during debris removal activities. HDOH selected the original sample locations to provide an even distribution, encompass the community surrounding the entire work area, and based on site access or approvals. Ambient community air monitoring and air sampling were conducted 24 hours a day, seven days a week, along with USACE debris removal operations conducted daily (including Sundays), throughout the duration of this project, with the exception of holidays and weather shutdowns that are noted in Section 3.8 of this report. Sampling periods were on a 24-hour basis that spanned over two calendar days. **Figure 1** shows sample locations and their respective sample identification numbers. **Table 3-1** (provided in the previous section) lists air monitoring and sampling location start and end dates in Lahaina.

Each community air station included equipment able to (1) monitor air for airborne particles with a diameter of 10 µm or less (PM_{10}), and (2) sample air for select metals (including antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, manganese, molybdenum, nickel, selenium, thallium, vanadium, zinc) and asbestos. Each community air station was also equipped with a weather station to log meteorological data, including temperature (°F), relative humidity, current weather conditions, wind direction, and wind speed.

3.6 COMMUNITY AIR MONITORING AND SAMPLING RESULTS

Particulate Monitoring for PM_{10} Results

A total of 1,606 particulate monitoring files were collected from nine community locations over the course of 403 days. During debris-related operations, the particulate air monitoring levels at community locations exceeded the PM_{10} SSALs in 28 instances on 22 different dates from January 13, 2024, to February 19, 2025. The project SSAL for particulate matter was 150 micrograms per cubic meter ($\mu g/m^3$) based on a 24-hour TWA for PM_{10}. A summary of the particulate exceedances can be found below, with more detailed notes found in **Appendix C**:

On 12 occasions, at the Lahaina Skate Park (AM-06) monitoring location, activity on the Honoapiilani highway, located near the monitoring station, was recorded as likely contributing to the community particulate monitoring results exceeding the project screening level.

On 11 occasions; three at Lahaina Intermediate School (AM-03), five at Lahaina Pump Station #6 (AM-08), and three at Maria Lanakila Catholic Church (AM-09), environmental or outside factors such as high winds, and/or high humidity were noted as contributing factors to the particulate monitoring results above the project SSALs.

On one occasion at Lahaina Skate Park (AM-06), County maintenance crews were observed working at the recreational center pool near the monitoring location, in addition to the station's proximity to the highway.

On two occasions, one at Lahaina Skate Park (AM-06) and one at Lahaina Pump Station #6 (AM-08), private contractor operations were observed working near the air monitoring and sampling stations, in addition to AM-06's close proximity to the highway.

On two occasions, one at Lahaina Intermediate School (AM-03) and one at Lahaina Skate Park (AM-06), Tetra Tech was not able to determine the source of exceedances because the exceedances occurred outside the operational hours of the USACE debris crew operations. However, Tetra Tech was able to confirm that the USACE debris crew operations were not active at the locations when the community particulate monitoring results exceeded the project SSALs.

None of the 28 instances discussed above was observed to be directly attributable to USACE operations. All particulate data and exceedances are summarized in **Appendix C.**

Air Sampling Results – Asbestos and Metals

A total of 3,081 air samples were collected, excluding any method-required quality control samples (field or laboratory blanks). Ambient air samples for asbestos and metals were collected at all nine locations.

A total of 1,556 asbestos samples were collected from January 13, 2024, to February 19, 2025. Of the 1,556 samples collected, 20 were voided. Ten were voided because of a greater than 10 percent discrepancy between the pre- and post-calibration flow rate values, as stated in the asbestos sampling standard operating procedures (SOP) included in the CAMSP. Three samples were voided due to damaged filters. Four samples were voided because of equipment failure or malfunction. Two were voided by the lab because of non-uniform particulate deposition and/or particulate overload. One sample was voided due to sample deployment error. All asbestos results analyzed by the lab were below the SSAL of 0.0030 structures/cc and less than the analytical sensitivity.

A total of 1,525 metals samples were collected from January 13, 2024, to February 19, 2025. Of the 1,525 samples collected, three were voided because of equipment malfunction that resulted in insufficient sample time and volume. Metals samples exceeded the site-specific screening levels in six instances. Of these six instances, three analytes were reported above the SSAL for arsenic, nickel, and manganese. In addition to field notes provided by the team, a study performed by The Hawaii Department of Health Hazard Evaluation and Emergency Response indicated that the mean background concentrations on Maui of arsenic is 4.54 mg/kg, of nickel is 62.84 mg/kg, and the mean background concentration of manganese on Maui is 813.88 mg/kg (HDOH 2012). The background concentrations of metals in soil indicate that significant disturbance of native soils in the vicinity of the sampling equipment may lead to an exceedance of SSALs unrelated to USACE activities. Non-USACE disturbances of native soil were observed to be caused by a number of conditions, including high winds across bare soil, highway activity, or private contractor work.

The six instances where metals exceeded the site-specific screening levels are listed in **Table 3-2,** with additional field observations provided below.

Table 3-2 - Analyte Exceedances

Collection Date	Location	Location ID	Analyte	Result	Re-analyzed Result	Screening Level
				µg/m³	µg/m³	µg/m³
3/4/2024	Leialii Hawaiian Homelands	AM01	Nickel	**0.0544**	**0.0678**	0.02
6/4/2024	Leialii Hawaiian Homelands	AM01	Arsenic	**0.537**	**0.499**	0.05

Collection Date	Location	Location ID	Analyte	Result	Re-analyzed Result	Screening Level
				µg/m³	µg/m³	µg/m³
8/25/2024	Opukea Townhomes	AM05	Manganese	**0.165**	NA	0.12
8/25/2024	Opukea Townhomes	AM05	Nickel	**0.0253**	NA	0.02
8/25/2024	WW Pump Station #4	AM02	Manganese	**0.123**	NA	0.12
9/27/2024	Lahaina Recreational Center	AM07	Nickel	**0.0219**	NA	0.02

Notes: µg/m³ = micrograms per cubic meter; NA = not applicable, **Bold** = Screening Level Exceedance

On March 4, 2024, the sample collected at Leialii Hawaiian Homelands exceeded the SSAL for nickel with a concentration of 0.0544 µg/m³. At the request of HDOH, this sample was re-analyzed to verify results with a concentration of 0.0678 µg/m³. The lab re-analysis showed some variance from the originally reported value and verified the exceedance reported for the sample collected on March 4. Two USACE debris crews were observed working near the sample location on March 3 and 4, with one crew located approximately 600 ft south-southeast and the other approximately 1,000 ft south-southwest from the sampling location. Based on the nature of the work, proximity of the debris removal activities to the sample location, and wind direction, there is a potential that debris removal operations may have contributed to this exceedance. However, no obvious signs of visible dust, variance in work practices, or pertinent weather patterns were observed.

On June 4, 2024, the sample collected at Leialii Hawaiian Homelands exceeded the SSAL for arsenic with a concentration of 0.537 µg/m³. At the request of HDOH, this sample was re-analyzed to verify results with a concentration of 0.499 µg/m³. The re-analysis of the sample showed little variance from the originally reported values and verified the exceedance reported for the sample collected on June 4. USACE debris crews were observed working on June 3 in the area approximately 30 yards southwest and downwind from the sampling station. Field teams observed the use of water for dust suppression, and no visible dust in the area during these activities. Upwind of the sample location to the northeast, private contractors were conducting work on June 4, approximately 10 feet from the monitoring station at an adjacent property, to clear metal debris in the yard. Dust was visible from this work location. An excavator was also in use for the construction of a rock wall across the street, and tree removal crews were observed in the area. Based on wind direction, use of dust suppression methods by USACE, and field observations of other dust and vapor-producing activities, this arsenic exceedance was likely not attributable to USACE debris removal activities.

On August 25, 2024, the sample collected at Opukea Townhomes exceeded the SSALs for manganese with a concentration of 0.165 µg/m³ and nickel with a concentration of 0.0253 µg/m³. Over this 24-hour sampling period, Hurricane Hone was approaching the area to the south of Maui. USACE debris crews were observed working throughout the burn zone on August 24; however, no debris crews were within sight of Opukea Townhomes. Field teams observed high winds and visible dust from the approaching hurricane. No debris crews were observed working on this day. Weather conditions were windy and rainy, and field crews did not record any observations of visible dust.

On August 25, 2024, the sample collected at WW Pump Station #4 exceeded the SSAL for manganese with a concentration of 0.123 µg/m³. USACE debris crews were observed working throughout the burn zone on August 24; however, no debris crews were within sight of WW Pump Station #4. On August 25, Hurricane Hone was passing south of Maui. Field teams observed visible dust on August 25 as a result of the

approaching hurricane. No debris crews were observed working on this day. Weather conditions were windy and rainy and field crews did not record any observations of visible dust.

The monitoring stations located at Opukea Townhomes and WW Pumps Station #4 are located north of the burn zone. Given their location relative to the burn zone and the southerly winds, these stations were likely to be more impacted by Hurricane Hone than the stations located at Lahaina Skate Park and Lahaina Intermediate School. Based on the increased hurricane winds, visible dust, and field observations indicating no debris crews working within sight of the community monitoring stations on August 24 and August 25, it is not likely that the nickel and manganese exceedances were attributable to active USACE debris removal activities.

On September 27, 2024, the sample collected at Lahaina Recreational Center (AM-07) exceeded the SSAL for nickel with a concentration of 0.0219 $\mu g/m^3$. No USACE crews or any other active crews were observed working near the station on September 26. As of September 18, the field team noted the silt fencing that originally provided a barrier around the station had been removed around the area. Visible dust was observed throughout the entire area on September 26. The area located around the Lahaina Recreational Center is surrounded by dirt roads. No water trucks had been observed spraying the roadways in the area. Dirt and dust becoming airborne from road activity in the area, and the removal of the silt fence barrier, likely impacted the air monitoring and sampling station.

Information associated with each air sample collected, including the sample ID, collection date, sample location, metal sampling results, and asbestos sampling results, can be found in **Appendix D.**

Outside Impacts

As discussed in relevant weekly reports (**Attachment 2**), except for nickel on March 4, 2024, the SSAL exceedances discussed above do not appear directly related to USACE debris removal activities. Other notable influences include environmental conditions such as rain, wind, volcanic eruption, heavy fog, and humidity, impacting monitoring equipment. Other non-USACE operations impacting results include private contractor activities and county crew operations.

3.7 METEOROLOGICAL MONITORING

Meteorological data, including temperature, relative humidity, wind direction, wind speed, and barometric pressure, were obtained continuously from the community A10-2 weather meter.

In general, weather conditions remained consistent for the duration of ambient air monitoring activities except for a few instances where high winds and tropical storms were recorded.

All averaged meteorological data is summarized in **Appendix A**.

3.8 DEVIATIONS FROM THE WORK PLAN

As work proceeded, deviations from the CAMSP were documented and included the following:

- **Air Monitoring:** In some instances, air monitoring was interrupted or not obtained for the full 24-hour a day, 7 days a week monitoring period. Monitoring was interrupted six times for station relocation, 31 times because of equipment fault codes, five times for power interruptions, seven times for equipment damage or equipment malfunction, 15 times for equipment maintenance, and three times for a weather standdown. Air monitoring did not occur on 12 days during the project monitoring period because of equipment damage/malfunction, or weather standdown.

- **Asbestos Sampling:** Air samples for asbestos were not obtained for each day of the sampling period. Twenty asbestos samples were collected but voided, as described above. Three samples were not collected because of a power outage in the sampling area, four samples were not collected because of a weather standdown, three samples were not collected due to equipment malfunction, and forty-four samples were not collected due to HDOH-approved holiday breaks where USACE operations were not conducted.
- **Metals Sampling:** Ambient air samples for metals analysis were not obtained for each day of the sampling period. Three metals samples were voided as described above. One sample was not collected due to delays with setup during mobilization, three were not collected as a result of a power outage in the sampling area, thirteen were not collected because of weather related shipping delays for supplies, fourteen were not collected due to equipment malfunction, four were not collected due to a weather standdown, and forty-four samples were not collected because of HDOH-approved breaks where USACE operations were not conducted.
- **Background Air Monitoring and Sampling:** Background air monitoring and sampling proposed in the CAMSP did not take place. Asbestos abatement and debris removal operations began before an active contract was in place, and Tetra Tech mobilized.

None of the deviations represent significant data gaps in the air monitoring program that took place between January 13, 2024, and February 19, 2025.

3.9 WEEKLY REPORTING

Weekly reports were provided to HDOH which summarized ambient air monitoring and sampling activities, field observations, discussions regarding results and exceedances, and any deviations from the CAMSP. All weekly reports submitted to HDOH throughout the duration of this project can be found in **Attachment 2**.

4.0 CONCLUSION

Tetra Tech completed a comprehensive air monitoring program over the course of 403 days, from January 13, 2024, to February 19, 2025. A total of 1,606 particulate monitoring files were collected, and 3,081 air samples were collected, excluding any method-required quality control samples. Asbestos and metals were collected at a total of nine air monitoring and sampling locations, with four active stations at a time. The data collected indicated the following:

- Of the 1,606 particulate monitoring files collected over the course of 403 days, PM_{10} particulate levels exceeded the SSALs twenty-eight times over 22 days, with the main causes of exceedances attributed to proximity to nearby highway and environmental or outside factors. None of the exceedances were attributed to USACE debris operations.
- Of the 1,556 asbestos samples collected, none exceeded the project SSALs.
- Of the 1,525 metals samples collected, results exceeded the established screening levels outlined in the CAMSP in six instances. In addition to field observations related to each exceedance, a report provided by HDOH also discusses the background soil levels, which may have impacted these results as well.
    - Nickel exceedances (above the SSAL of 0.02 $\mu g/m^3$) were recorded at three separate instances: at Leialii Hawaiian Homelands (AM-01) on March 4, 2024, with concentrations of 0.0544 $\mu g/m^3$ and 0.0678 $\mu g/m^3$ following re-analysis, at Opukea Townhomes (AM-05) on August 25, 2024, with a concentration of 0.0253 $\mu g/m^3$, and at Lahaina Recreational Center (AM-07) on September 27, 2024, with a concentration of 0.0219 $\mu g/m^3$.

    - One arsenic exceedance (above the SSAL of 0.05 µg/m^3) was recorded at Leialii Hawaiian Homelands (AM-01) on June 4, 2024, with concentrations of 0.537 µg/m^3 and 0.499 µg/m^3 following re-analysis.
    - Two manganese exceedances (above the SSAL of 0.12 µg/m^3) were recorded at Opukea Townhomes (AM-05) and at WW Pump Station #4 (AM-02) on August 25, 2024, with a concentration of 0.165 µg/m^3 and 0.123 µg/m^3.
- Of these six exceedances, only the nickel exceedance on March 4, 2025, at Leialii Hawaiian Homelands (AM-01) may have been attributable to USACE operations.

Instances of elevated sample results caused by non-debris removal activities, such as inclement weather, nearby traffic, or county and private contractor activities, are discussed where relevant and in the corresponding weekly reports.

In conclusion, USACE operations and associated activities appear to have presented minimal impact to the community's air quality. This is based on conservative SSALs, established on an extended exposure duration of one year, no asbestos exceedances, and the small percentage of metals exceedances and particulate exceedances that were often not attributable to USACE operations. The low particulate concentrations and rare exceedances of SSALs indicate that best management practices/fugitive dust control actions were implemented during the cleanup and appropriate for debris removal and asbestos abatement activities.

5.0 REFERENCES

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